Annual Report of the State Board of Horticulture of the State of Colorado for the Year 1898

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STATE OF COLORADO

BOARD OF HORTICULTURE

STATE CAPITOL, DENVER

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LETTER OF TRANSMITTAL.

OFFICE
STATE BOARD OF HORTICULTURE,
STATE CAPITOL,
DENVER, COLORADO.

TO HIS EXCELLENCY,
HON. ALVA ADAMS,
GOVERNOR OF COLORADO.

SIR—IN COMPLIANCE WITH LAW THIS REPORT IS RESPECTFULLY SUBMITTED.

MARTHA A. SHUTE,
SECRETARY STATE BOARD OF HORTICULTURE.

DENVER, COLO., NOVEMBER 30, 1898.

REPORT TO THE GOVERNOR.

To His Excellency,
ALVA ADAMS,
Governor of Colorado:

Sir—In compliance with the law, we have the honor to submit for your consideration a report of the work of this department for the past year, together with recommendations. The state annual horticultural convention was held November 28, 29 and 30. It was well attended and the interest shown throughout each session by the fruit growers gives evidence that great benefit is gained by the holding of these meetings. The program of addresses and essays included the experience and investigation of practical people, on a wide range of topics pertaining to pomology, floriculture, viticulture, etc.

The counties that have filed reports in this office are Arapahoe, Chaffee, Delta, Fremont, Jefferson, Las Animas, Larimer, Logan, Montezuma, Morgan, Montrose, Mesa, Otero, Prowers and Pueblo. The following tabulated data taken from the county inspectors' reports and other reliable sources shows 118,752 acres planted to fruits, which gives an increase of thirty per cent. over 1897, distributed as follows: Apples, 81,252 acres; stone fruits, 22,920 acres; pears, 6,250 acres; small fruits, 8,330 acres. A careful estimate gives 42,000 acres in bearing. The acreage available for fruit lands is 890,581 acres. The estimated valuation of the fruit crop of 1898 is $6,000,000.

Much care has been exercised in getting reliable data of the production of the fruit crop for 1898, and the outcome is very encouraging and places the orchard products in the line of success. The estimate upon which the valuation is placed is that the yields of the orchards were marketed for higher prices than those of the preceding year. To cite one instance, the estimated valuation of the fruit crop of Delta county for 1897 was $200,000. The county inspector's report for 1898 shows it to be $400,000, or an increase of 100 per cent. The work of inspection in the several counties has been conducted in a very thorough and intelligent manner; the inspectors all receiving the co-operation of the fruit growers in complying with the requirements of the law.

The conditions of the orchards, with few exceptions, for 1898 have been good. The wood growth has been strong in all classes and the trees are in good condition, being well filled with healthy fruit buds for the next season, which is an indication of a large crop of fruits during the year of 1899. Diseases were not so prevalent as to be seriously damaging. In some locations a light form of twig blight, also blight on pear trees, could be seen in a few orchards. No new species of insects have been discovered.

The codling moth, an insect that occasions so great an annual loss to the fruit growers of the eastern orchards, has caused considerable damage

to the apple crop in some sections. Its rapid spread is due to its presence in apple barrels and boxes that are shipped from all parts of the world, therefore the use of second-hand packages for fruits, without first disinfecting them, is not permitted by the practical orchardist.

In the premises where insect pests appear, the trees and vines must be disinfected at once, or a large loss is the result. These pests have come upon us almost unawares and are regarded as a most formidable foe to the interests of fruit culture. During the progress of investigation and inspection of the injurious insects, it has been demonstrated by experiments that we have access to the best remedies known to the authorities on entomology and horticulture.

If the excellent reputation which the fruits of our state have justly earned is to be sustained, every effort must be made to exterminate so far as possible all insects and diseases that are detrimental to the health of the trees and an injury to the fruit crops. The importance of having horticultural inspectors appointed in every fruit county in the state has been very much in evidence during the past season on account of the spread of insect pests, imported through the shipments of both fruits and trees. That these shipments when infested are injurious to vegetation and will easily spread to other places seems too clear to admit of any reason why inspection of the horticultural interest of any fruit section should not be had.

The past season has been one of profit in the display of horticultural products, and obtaining of high awards on the exhibits. The state annual fair at Pueblo in the month of September was very satisfactory to the exhibitors. All cash premiums were paid in full at the close of the exhibition by the Pueblo Business Men's Association.

The horticultural department of our state made a display of fruits only two months out of the six that the Transmississippi exposition was kept open. Colorado made no appropriation for the purpose of defraying the expenses of making exhibits of her varied resources, consequently it devolved upon a number of our people to spend their money if they desired to show the horticultural products of the commonwealth. As the display was a continuous one for two months it required a large quantity of fruit, as well as an endless amount of labor, to obtain successful results. The fruits shown were of the highest quality and were decided by the judges to be the type of excellence as regards fine color, pronounced flavor and appearance.

The apples headed the list with several varieties scoring the full one hundred points, and some specimens weighing twenty-seven ounces. The prizes awarded Colorado horticulture were: Seven gold medals and diplomas, twenty silver medals and diplomas, and sixteen bronze medals and diplomas. These have been received by this department and sent to the various counties and individuals to whom the awards were made. The high honors which our young state has already achieved in horticulture in repeated competition with older states, both at the World's fair in 1893, and at the Transmississippi exposition, is a subject of intense satisfaction to our fruit growers, as well as of financial advantage to Colorado.

The Annual Horticultural Report is now being compiled and will soon be ready for publication. The importance and value of these reports are becoming more generally understood and appreciated by the people as a means of obtaining reliable information. Those who have kept pace with the developments of fruit culture are aware of the importance of having these reports accessible to those interested at an early date, and they also realize the great benefit gained by having all the valuable information contained in these publications issued annually, instead of biennially.

There were published in 1897, 2,000 copies of the horticultural reports, and out of that number there are but few copies left for further distribution. To enable this department to furnish the fruit growers throughout the state

with the publications as they desire them, and to send to those in other states as requested by correspondence, it would necessitate a larger number to be printed. There is no industry in which mistakes are so sadly felt as those made in horticulture, and the want of correct information at the desired time has worked many hardships to the fruit grower. To make a success of fruit culture requires much intellectual discipline and much accuracy of judgment.

With each successive year the correspondence of this department is largely increased and the variety of subjects on which information is asked is more diversified, embodying a range far beyond anything contemplated by those interested. The usual inquiries relating to the many obstacles which confront an orchardist, and the information requested by proposed immigrants, combined with the ordinary inquiries as to new developments in horticulture in all its branches, involves an amount of correspondence which can hardly be inferred from this brief allusion. The results obtained have amply compensated for the increased labors as evinced by the universal approbation shown in the replies, as well as the fact of the wide distribution of many new and important facts which are continually coming to our notice.

In consideration of the vital importance of having the laws already on the statute books enforced, governing the inspection of orchards, nurseries, etc., we recommend: That in accordance with H. B. No. 6, section 1, the county commissioners of each county where fruit is grown appoint a person who shall be qualified by experience, also having a knowledge of entomology sufficient to protect the interests of fruit culture within his jurisdiction. That without inspection in any one county a consignment of nursery stock to that place might result in infesting the entire district. Also: That S. B. No. 399, section 12, relating to the publication of horticultural reports, be changed to read 5,000 copies instead of 2,000 copies. The present demand from the fruit growers in our state far exceeds the number printed, thus leaving none to supply our exchanges, and the requests from other sections of the country.

In conclusion we may appropriately call attention to the important fact that the work already accomplished by this Board is merely the approaching step to a larger and more difficult field of work to be undertaken. The past year has been one of greater activity in this department than it has ever before experienced. The work of the new organizations in this line of work will prove of great value to the future success of horticulture in our state.

Respectfully submitted,

STATE BOARD HORTICULTURE,
MARTHA A. SHUTE, Secretary.

PRAYER BY REV. THOMAS A. UZZELL.

Our Heavenly Father, in the beginning of this convention, we come to thee in prayer. We would not engage in the duties and responsibilities of this hour without first looking to thee for wisdom and for direction in all that shall come before this body. We thank thee, our Heavenly Father, for life and health during the past year, and for whatever of success that may have come to these, our friends, who are engaged in the cultivation of fruits and flowers. We thank thee for the soil; we thank thee for the rain; we thank thee for the air; we thank thee for the sunshine; we thank thee for good health. Accept our gratitude this hour for what we have received from thy hands, and we pray now, as these our friends and neighbors have come together to talk over their particular business, that this shall be one of the most pleasant and one of the most satisfactory conventions that they have ever held. Wilt thou lead us in this especial convention, so that we shall glorify thee in the cultivation of the soil and in the bringing forth of fruits and flowers to make glad the hearts of man. Lead us this day, and all the days of our life. Forgive us all our sins, and give us of thy wisdom, for Jesus' sake, Amen.

ANNUAL STATE HORTICULTURAL CONVENTION.

HELD AT STATE CAPITOL BUILDING, DENVER, NOVEMBER 28, 29, 30, 1898.

PROGRAM.

Convention called to order at 10:00 a. m., November 28, 1898, by W. S. Coburn, of Hotchkiss, Colo., president of the State Board of Horticulture. After prayer by the Rev. Thomas A. Uzzell, Governor Adams was introduced and delivered the following address:

ADDRESS OF WELCOME.

GOVERNOR ALVA ADAMS.

I am glad for the second time to welcome the convention of the State Board of Horticulture. Last year you came jubilant over the abundant harvest that your orchards had borne, but, judging from the scarcity of fruit in the executive department this year, I imagine that the trees have been resting preparatory for another great harvest in 1899. Next year should be the golden year of harvest in Colorado and of markets as well, as the nation has grown and developed since we met a year ago. That growth and expansion will pay tribute to every fruit tree and every field.

I favor these meetings; I believe in the institute farmer; I believe in the man who comes here to study and learn from the experience of his neighbors. I believe in the convention man and in any man who educates himself in the lines in which his work calls him. You come here to gather the scientific knowledge which you can not gain in your own orchard and field. I believe in the professor; it is good for him to come here. We need his microscope, his stereopticon, his book-learning, but if I were going to tie my vote to any one individual, and it lay between a scientific and a practical man, I would for the sake of safety choose the practical man, for, even though he may not be acquainted with books and know all of chemistry and other sciences, still the practical man can make a living, while a man may be as scientific as Darwin and starve in his laboratory if he have no practical knowledge. So that it is best to combine the practical with the scientific.

The professor comes and imparts his special knowledge and he takes from here a practical wisdom which will aid him in his work. It is this union of the two which will bring success and prosperity. We want that scientific

knowledge which will cheapen as well as improve our methods. We do not want a system which, like Horace Greeley's, made his milk cost as much as champagne and his strawberries worth their weight in gold, but we want that which will bring our product within the reach of the great mass of people, which will make it better and cheaper at the same time. The best fruit I ever tasted—to have eaten it would have bankrupted a man—was fruit that was raised in an English hot-house. I saw and tasted grapes and peaches which were perfect, but the grapes cost three dollars a pound and the peaches a dollar apiece. That was scientific culture alone. But we want a mingling of the practical with this scientific attainment, so that it may not be tasted by the very few, but that fruit may be within reach of every man and woman. We can not make our trees as perfect as an experiment tree would be, but we can raise the standard of the ordinary orchard.

Our purpose is not to add to the luxury of the rich, but to bring luxuries and comforts within reach of the moderate means of the masses. Civilization need pay little heed to the rich in legislation, in health, or in comfort which they ever have, for they always will care for themselves. It is the multitude of the average laboring citizen that should be benefited by your study and work; make his condition better as you improve the age. That society is best which does most for the masses. The man who lives in the cottage and upon the farm is the hope of the Republic.

This morning I read a sermon by Myron Reed. Myron may be a little weak on theology, but no man can say more in a sentence. He has the genius of expressing your thoughts, of saying things which we ought to have said, but did not. In his sermon he spoke of the small farmer and of the advantage of the intense cultivation of the soil, and condemned the American hunger for land which aspired to purchase everything adjacent. And he spoke truthfully, as it is intense cultivation of the soil that brings abundance of crops and satisfaction. As a rule, all things that have to do with farm and orchard life in America are supposed to be purely for man. Now, you have demonstrated in your secretary that a woman can be as good a manager as any man. She has attended to the duties of this association and you all endorse her valuable work. Of course each of you thinks that you could have done it just a little better than she has, but you know that there is no other man besides yourself that could have done it as well.

She has been to the Omaha exposition under great disadvantages, with no help from the state, and the result has been satisfactory. No one has had a less amount to do with, and no one with the means at her command has made as good an exhibit as your secretary. Yet that secretary is a woman. She has taken up this work that all supposed to be the duty of a man and she has made a success of it. She brings back medals of gold and silver and adds to the repopulation and fame of Colorado orchards. She has proven that women may be horticulturists. May this not be an avenue by which they may escape some of the drudgery and hardship of house duties? In the uncredited fields of labor woman performs a large part of the necessary duties of daily life, duties that bring pay and little credit. Why not take an interest in the more pleasant and profitable employment of garden and orchard? Not even the field is as hard and wearying as household work—outdoor labor has an end, not so woman's work. For her there is no vacation, no eight-hour system, no benefit of labor unions. Labor laws never consider the mother or the housewife.

To read our laws and study our habits, where benefits are concerned, would lead to the theory that the domain of labor was a masculine world. Yet the muscles and brain of woman are not exempt from the weariness and tire that affect man. Her blood and nerves hunger for the tonic of fresh air, outdoor life as well as the male. We seem to think or at least act as if we believed that habit and custom repeal the decalogue and make void the declaration that man and woman were created equal, but it is not repealed. I envy any

man who has his farm free from debt and can cultivate his acres and work in the soil where God intended he should labor, but for woman there is no life more dreary than that of the ordinary housewife on the farm, yet they do not complain or strike.

There is nothing more sure than that the foundation of our Republic is upon the home, the family life. It is around the family altar that we find the purest and best in American life, and that life seems to be less soiled by what is wrong in the country than in the city. The city people have a peculiar way of looking at the country. They have but to stop a moment to find that the city owes everything to the country, that if it was not for those who plow and reap throughout the land, there would be no city. If you should cut off your support and tribute to the city for a single year it would bring destruction just as surely as the seas would dry up if the rivers ceased to flow. It is the rich, healthy blood from the country sons of the farm and rural village that keeps cities from deteriorating.

I envy the man the life that is out of doors, the man that cultivates the soil. It seems to me that if there is anything in nature that broadens lives it is the cultivation of fruit and flowers. They are garnered sunshine, dew and rain. It is from them that good comes, and it leads man back to the very paradise in which he started. And if there is a flavor of Heaven in the lives of men, there is none richer than that which flows from the blossoming orchard in the spring. I feel that to you the nation owes a debt of gratitude, and I hope to see the time come when every dooryard will have its flowers and its orchard, when every man shall have his little homestead. Jefferson, I think it was, who said that our nation would disintegrate and become decrepit when agriculture and horticulture ceased to be the pursuits of the American people. And other great statesmen, like Webster and Sumner, never forgot the life upon the farm. What were their great speeches? They were as nothing compared to the joy which in later years they found on the homesteads.

Webster went back to the little farm and in the orchard forgot the power and adulation of the world, and to him the pleasures that came from that little farm were more appreciated than the applause that came from a great nation. Sumner said, "For my sons I could wish nothing better than that they have a small farm and orchard, free from incumbrance, and that they should know no one ten miles from their homestead." That was his idea of happiness when looking back from the end of a great and stormy life. So, while you may not have as broad a horizon, it is a pure one and leads to happiness, which is, after all, the ambition of all men who are in the right channel and on the right avenue. It is not the rich who are happy, it is not the prominent that are content, because every time your horizon broadens there come new obligations, new troubles and new turmoils. May happiness, rather than distinction, content rather than great fortune, be your portion. In your lives may there be realized the prayer of the patriarch, when he asked God that to him should be given neither riches or poverty.

RESPONSE.

LUTE WILCOX,
Editor of the Field and Farm, Denver.

It is with a good deal of pleasure and satisfaction that we, as a body, meet here to-day and listen to the welcome of Governor Adams. We appreciate most fully his giving up valuable time to extend to us a welcome, for we must remember that he is in the declining days of his official life as governor, and it was hardly to be expected that he would appear before us, but it is character-

istic of the man to stay with his friends to the end, and I feel that he considers us all his friends. I know from the advice and help that he has given us, in the conduct of his office, that he has been a great and valuable help to our secretary, Mrs. Shute, in her work, and I am glad that he has given us the opportunity of wishing him "Godspeed" as he ends his office and goes out of his public career, which, I know, has been full of care, turmoil and trouble, but his ambitions have been realized, and I believe that he has been the best governor that we have ever had, and he has made little fuss and stir about it.

The last time I saw Governor Adams was before the meeting of the National Editorial Association. I was a member of the association, and he was called upon to deliver an address of welcome. The way he scored those editors was good. He raked them up hill and down, for their methods of conducting newspapers, and while the rebukes were merited, they were severe, but I want to say that those remarks were listened to very attentively, and the members all realized that honest criticism is always fair.

The governor spoke in the course of his remarks this morning about our off years. I believe as we continue to progress, and become more like the eastern people in our methods of horticulture and the conduct of our farms, and all those things, that certain incidents or co-incidents of the eastern habitation will enter into our methods here. In the east it is the invariable rule to have off years in agriculture. In Colorado a few years ago, we had not the insects we have to-day. These things come in with moving civilization. I presume that every car of fruit shipped into Colorado has brought with it insects from the east, so that we may now look for off years, and an off year may be a blessing in disguise. The most of our orchard plantings are of the intensive order, and the richness of our soil, and the warmth of our sunshine, coupled with irrigation, has a tendency to force growth to some extent greater than it should be. Our trees proceed to make wood too rapidly, so that when an off year comes, it is really a blessing in disguise. The tree is like a man in its need of rest. No man can keep along, year after year, in one particular line of work and not fall down sooner or later. So in plant life, the rest which comes with off years must be beneficial in producing substantial orchards and trees.

We have cultivated very intensely this year; we have applied our rather scant supply of water more intelligently, and that fruit which we have produced in the state has been of a superior quality, and buyers have come in search of it. I was reading awhile ago that not over 15 per cent of the visible supply is at hand in the markets, and that which has come to the market is of an inferior grade, but we have done very well considering the injuries done by our enemy, the codling moth, that little insect which all the efforts of man have been unable to put to an end.

I believe it will not be giving away a confidence for me to say that Governor Adams expects, when his term of office is ended, to take a trip around the world. He is a good traveler, and good observer, and I believe that he will come back to Colorado satisfied that we have better fruit and finer apples in Colorado than in any other country on the globe; of course, the dollar peaches of which he spoke would not enter into this argument, as they were undoubtedly very fine, and we hope he may be able to take his trip, as did General Grant when he ended his public career, and that he will come back and settle down to a rural, happy home life in Colorado for the rest of his days, and there spend them in peace and quietude, as he has had a very active life and deserves a good, long rest now.

ANNUAL ADDRESS.

W. S. COBURN,
President State Board Horticulture.

Another year has been added to the laurels of the horticulturists of the state of Colorado, and we have again assembled in mass convention to celebrate this important event. The advanced position of our state in the production of gold has been heralded throughout the world, and we now take our place at the head with unassuming confidence of our ability to remain there. While all this vast wealth was being extracted from our mountains, and great improvements made for the cheap reduction of our metals, the increased output of our coal, silver, iron and copper mines, and the development of our unexcelled and varied building stone quarries has been going on, the fruit growers have been no less energetic in proclaiming to the world that we have just claims for recognition in the line of horticulture. Heretofore we have been laboring under the disadvantages of being confined to the local markets of our own state, flooded with fruit from states both east and west of us. But now we have grown to such proportions that we are now commanding the attention of buyers, not only throughout the United States, but foreign countries as well.

The past season has proven to the fruit growers of this state that the cry of over-production is a thing of the past. Buyers from New York, Chicago and other large cities, have been in our orchards buying every bushel of apples to be had, at prices far in excess of any price paid for apples in eastern orchards. Two firms, one from Chicago and the other from New York City, expressed a wish that in the near future they would be able to buy 1,000 car loads each of Colorado grown apples. When asked why they preferred apples from Colorado, they answered that it was the only place where they could get extra fancy brands, having good size, high color, fine flavor and long keeping qualities. This acknowledgment, together with their presence, only confirms the truth of their statement. The climatic conditions and soil of our mountain valleys have proved to be the most complete for the production of perfect fruit of any place in the United States, and the fear entertained heretofore by some of over production can now be banished from the minds of the fruit growers of Colorado forever.

In some localities we have evaporators, canning and fruit butter factories in operation that consume the over-ripe, small, and damaged fruit. These improvements show the advanced position horticulture has taken commercially. In the near future, in addition to exporting hundreds of car loads of apples to European markets, we shall be able to supply the local markets of our state with canned and evaporated fruits, jellies, jams and fruit butter, thereby saving hundreds of thousands of dollars that would otherwise be sent out of the state.

We feel that we have good cause to be proud of our achievements in horticulture the past decade. Colorado stood at the head at the World's fair in Chicago five years ago, and still retained her exalted position at Omaha the past season, having been awarded seven gold, twenty-one silver and fifteen bronze medals—forty-three in all, the highest number of any other state. All the states excepting Colorado, I believe, made ample appropriations for their display. But the success attained by our state was almost entirely due to the push and energy displayed by our worthy secretary, and the donation of the fruit by the growers themselves.

While we are entitled to a feeling of pride in the past, we see new obstacles arising in the future that will require our combined efforts to combat.

The blight, red spider and brown mite have done more or less damage to some of the orchards in different parts of the state. But the codling moth, we believe, is the most destructive pest that has yet made its appearance. It has spread to nearly all sections of the state and seems to spring into existence in large numbers as if by magic. It is very doubtful, in my mind, whether we shall ever be able to entirely eradicate it. But with constant attention by scraping the trunks of the trees and washing them with strong lye or whale oil soap, spraying properly at the right time and trapping them with bands during the summer, we have been able to produce crops comparatively free from worms. I believe it to be the duty of the State Board of Horticulture to encourage the holding of farmers' and fruit growers' institutes in every locality of the state, to exchange ideas and impart all the knowledge possible on the subject of horticulture, general farming, the most economical and profitable method of handling and feeding poultry and all kinds of stock, and the best way to pick, pack and market our fruits.

ANNUAL REPORT.

MARTHA A. SHUTE,
Secretary State Board Horticulture.

There is little necessity for a lengthy report regarding the work of this office, as many in attendance are familiar with the same, and have assisted largely in creating an interest all along the line of horticulture. There are some things connected with the experience of the past year which may reveal the needs of the present, and are so closely related to the future prosperity of the fruit industry that it may be well to briefly review a small part of the past season's labors and results:

The annual report of the State Board, together with the proceedings of the horticultural convention of 1897, were issued early in the year. These reports have been much sought after by fruit growers and others interested. A very large number of copies have been sent outside of the state, and we trust that they will be the means of inducing many home-seekers to come here and add to our population and wealth. Already, Colorado has received a hundred-fold in return for all the money spent in the publication of the Horticultural Report. It is conceded and has been demonstrated that the horticultural interests of Colorado are worth more to the state to-day than any industry affecting its welfare within the same period of time.

There appears to be too little interest shown in holding horticultural meetings in different parts of the state. It would seem that the members of this Board should make this kind of work their special mission. It is in this manner that we can reach the largest number and can best ascertain the wants of the people, besides getting them more interested in this great industry, and receive their co-operation. Surely no one who has attended these state conventions need be assured that the sessions are interesting, practical and instructive. However, the time is too short for the proper discussion of subjects which are brought forth. The field is broad enough, the interests intrusted to us are of sufficient importance to occupy more of our time and energies in this work.

The county horticultural inspectors have been prompt in their returns. Some of the reports are very full and complete, and all of them should be, for these are the index hand which points to success or failure of different varieties of fruit and of various methods of work in the orchards. Blanks for this purpose were sent out early in the season, and all will have their place in the annual volume of transaction.

So far as it has been possible, a careful watch has been kept in the various fruit-growing districts, for ascertaining the conditions of the orchards, for insect pests and diseases of trees and plants. Through the efficient work of the horticultural inspectors and the mutual assistance of the orchardists, much has been accomplished towards the destruction of insect life. Several complaints have been sent to this office regarding infested nursery stock received at various stations, and of the constant use of second-hand boxes and barrels which are infested with insects. It is very important that the laws governing inspection and disinfection of nursery stock, store rooms, boxes, etc., be enforced. So far as our experience goes there appears to be a willingness on the part of those engaged in the handling of fruit and fruit trees to assist in carrying out the laws. They only need their attention called to this fact, and the necessity of it, to insure success to the fruit grower.

The great importance of careful handling of orchard fruits will be brought before this convention, and many suggestions will be given by those who are competent to discuss this subject. In the packing of fruits, carefulness should be the watchword, for it does not matter how fine the fruit may be, it will not be appreciated and bring the highest prices, unless it is properly shown in neat, attractive packages.

To those who are engaged in fruit growing in our state, it was no surprise to learn of the large number of prizes won by the Colorado horticultural department at the Transmississippi exposition. The honors won at the Columbian exposition in Chicago in 1893 had given our horticulturists confidence in the merits and capabilities of their products. The list of medals awarded the fruits of our state at Omaha are as follows:

State of Colorado—General collection of fruits.....Gold medal

Arapahoe County—Collection of apples.....Silver medal

Delta County—Collection of apples.....Gold medal
Wesley Ault—Collection of fruits.....Silver medal
C. A. R. Bruce—Apples and pears.....Silver medal
W. S. Coburn—Collection of apples.....Silver medal
E. J. Mathews—Collection of apples.....Silver medal
W. J. Sawyer—Collection of fruits.....Silver medal
David Stephens—Collection of fruits.....Silver medal
Mrs. Sarah S. Skiles—Apples for commercial use.....Silver medal
Duke Bros.—Collection of apples.....Bronze medal
C. H. Merchant—Collection of fruits.....Bronze medal
J. B. McGinty—Collection of apples.....Bronze medal
H. E. Roberts—Collection of fruits.....Bronze medal

Garfield County—Collection of fruits.....Gold medal
Louis Bartell—Collection of apples.....Silver medal
J. B. Hurlburt—Collection of fruits.....Silver medal
R. S. Purtee—Apples, pears, plums, etc.....Silver medal
C. H. Harris—Collection of fruits.....Bronze medal
P. A. Hanson—Collection of fruits.....Bronze medal
W. S. Parks—Apples.....Bronze medal
H. C. Russey—Apples, pears, plums, etc.....Bronze medal
W. W. Vorris—Collection of fruits.....Bronze medal
E. S. Yeoman—Collection of fruits.....Bronze medal

Fremont County—Collection of fruits.....Gold medal
B. F. Rockafellow—Fifty varieties apples.....Silver medal
W. B. Felton—Pears.....Silver medal
Henry Catlin—Collection of apples.....Bronze medal

Montezuma County—Collection of fruits.....Gold medal
J. D. Hall—Apples, pears, prunes, etc.....Silver medal
J. H. Hall—Collection of apples.....Bronze medal
C. J. Scharnhorst—Collection of fruits.....Bronze medal

Jefferson County—Collection of fruits.....Silver medal
David Brothers—Peaches.....Silver medal

Larimer County—Collection of fruits.....Silver medal

Las Animas County—Collection of fruits.....Silver medal

Mesa County Horticultural Society—Collection of fruits...Gold medal
William Bomgardner—Collection apples, pears.....Silver medal
Hoyt & Caswell—Apples, pears, etc.....Bronze medal
Robert A. Orr—Apples.....Bronze medal

Otero County Horticultural Society—Collection of fruits...Gold medal
J. H. Crowley—Apples, peaches, etc.....Silver medal
Charles S. Lane—Apples, peaches, etc.....Bronze medal

In addition to the above there were forty-three diplomas awarded to this department.

It may be well to mention one or more of the numerous instances where high compliments were paid our fruits displayed at Omaha. A gentleman who is editor of a leading horticultural paper in New York state inquired: "In what part of Colorado was this fruit grown?" On being informed that the specimens were from several counties, in different sections of our state, he said: "If you can grow fruit like this in Colorado, you have one of the finest fruit producing states in the Union." The judge of horticulture at the Transmississippi said: "Colorado is showing the best fruit in this building."

The exhibit was a great credit to our state and received universal admiration. Indeed, it was a source of measureless interest to the thousands of eastern visitors who were at the exposition, because of their pre-conceived ideas of Colorado as only a mining state, and the impression that many of them have that our mountains are like a fleet of ships with their white sails set, anchored and unloading their cargoes of silver and gold at the feet of her capitol. As the horticultural department of our state at Omaha was placed in my care, I desire to express most earnestly my appreciation of the valuable assistance rendered by so many of our horticulturists, in furnishing the funds and the fruit to make a display which brought such high honors to our state.

APPOINTMENT OF COMMITTEES.

COMMITTEES ON REVISING FRUIT LIST FOR 1898.

Northern District—
W. B. Osborn, Loveland, Colo.
J. S. McClelland, Fort Collins, Colo.

Southern District—
W. B. Felton, Canon City, Colo.
B. F. Rockafellow, Canon City, Colo.

Western District—

C. W. Steele, Grand Junction, Colo.
W. S. Coburn, Hotchkiss, Colo.

Central District—

David Brothers, 1557 Wazee street, Denver, Colo.
Albert Wolfe, Arvada, Colo.

COMMITTEES ON FINAL RESOLUTIONS.

Lute Wilcox, Denver, Colo.
W. G. M. Stone, Denver, Colo.
W. J. Sawyer, Paonia, Colo.

REPORT BY COUNTIES.

ARAPAHOE COUNTY.

E. MILLISON, Horticultural Inspector.

Acres in orchards bearing fruit, 3,541; acres not bearing fruit, 600; acres in apples, 3,000; plums, 200; cherries, 50; blackberries, 25; gooseberries, 20; currants, 25; raspberries, 35; grapes, 5; strawberries, 101.

The varieties of apples that are most profitable are the Ben Davis, Red Astrachan, Oldenburg (Duchess of) and Wealthy. Cherries, the Morello family. Plums, the native varieties. Strawberries, Jucunda.

The condition of the orchards for the past year is much better than last, the trees are less blighted than for several years, but the codling moth was more destructive to the fruit crop than ever known.

The cause of failure has been due to hail storms, cold north winds and frost in spring. The codling moth increased rapidly because of rains when spraying should have been done.

CHAFFEE COUNTY.

J. G. HOLLENBECK, Salida.

Several thousand trees were set out in this county last spring, some of them to replace those which were killed by the early freeze, October 15, 1897. We have learned a very useful lesson, which is to shut off the water from the trees as early as the 10th of September, as should a sharp frost come while the trees are still green and full of sap many of them are killed. Those which suffered most in the early freeze are the Fameuse or Snow apple. I do not recommend this variety at this altitude. The Arkansas valley near Salida and Poncha Springs was visited by a destructive hail storm this year on July 14, which literally destroyed the apple crop. The few which were left on the trees were bruised and stunted, hence, we did not take part in the horticultural exhibit at Pueblo. We are not discouraged, and hope for better success next year.

DELTA COUNTY.

J. B. McGINTY, Horticultural Inspector.

Acres in orchards bearing fruit, 3,500; acres not bearing, 10,000; planted to apples, 8,000; pears, 700; peaches, 3,000; plums, 500, besides small fruits. The average yield of apples was 300 barrels an acre; pears, 100 bushels; peaches, 600 crates. The average price of apples was $2.75 a barrel; average price for a bushel of pears, $2; average price of peaches, 60 cents a crate. The estimated increase of planting of trees was 15 per cent. over 1897. The estimated valuation of the fruit crop for 1898 was $400,000. The number of trees planted in the year of 1898 was 240,000.

The varieties of apples that are most profitable are the Jonathan, Winesap, Grimes Golden, Ben Davis and Rome Beauty. In peaches, Elberta. In pears, Bartlett. The condition of the orchards is good. Some failures have been due to the cold winter, which injured some of the peach trees on the low lands around Delta.

The best method to insure success is to get good varieties, and take good care of them.

The emulsions that have been used most successfully to destroy tree and plant insects are lime, salt and sulphur as a winter spray; paris green for spring.

FREMONT COUNTY.

J. E. BROWN, Horticultural Inspector.

Acres in orchards bearing fruit, 5,900; not bearing, 2,000; planted to apples, 4,000; pears, 150; peaches, 75; plums, 60; cherries, 100; blackberries, 25; gooseberries, 20; currants, 35; raspberries, 60; grapes, 50; strawberries, 200. The average price of apples is $3 a barrel; average for pears, $1.50 a bushel; peaches, 70 cents a crate; blackberries, 10 cents a quart; raspberries, 10 cents a quart; strawberries, 8 cents a quart. The peach crop in Fremont county for 1898 is by far the best we have ever had, amounting to about 75,000 pounds, and bringing in about $26,000 to the growers. Single specimens would measure from 8 to 11 inches in circumference, and weigh from 10 to 14 ounces each. There were 3,000 peach trees planted in the county this spring. Some of the finest peaches this season were seedlings. The Elberta and Crosby were very choice.

Grapes yielded 170,000 pounds, and sold at an average price of 3 cents a pound. The estimate of increase of fruit trees, bush or vines in the year of 1898 is 10 per cent. over 1897. The estimated valuation of the fruit crop for 1898 is $120,000. Number of trees planted, 30,000. The varieties of apples most profitable are Yellow Transparent, Oldenburg, Ben Davis, Gano, Winesap, Missouri Pippin, Jonathan, Maiden Blush. Peaches—Alexander, Mountain Rose, Old Mixon, Stump, Elberta and Crosby. Cherries—Early Richmond, Montmorency, English Morello. Plums—Bradshaw, Lombard, Washington, Yellow Egg, Pond Seedling, Arctic (Moore.)

The condition of the orchards for the past season is very good with the exception of blight on pears and some varieties of apples. The blight will ruin our pear orchards completely in a short time if the disease continues.

Some failures have occurred from late frost in spring in some localities, and from blight and hail in others. To give proper attention in pruning, careful cultivation and thorough work in destroying insect pests is the best method to insure success.

Kerosene emulsion, paris green, white hellebore, tobacco water and whale oil soap have been used successfully to combat insect pests. I would recommend the use of concentrated lye or strong soap-suds as a wash on trunks and main branches of all fruit trees, first scraping off the rough bark. This will not only destroy many insects and their eggs, but will give to the bark a smooth, glossy and healthy appearance. The bandage system on the trunks is good, if attended to, but the bandages should be removed every week or ten days.

GARFIELD COUNTY.

G. W. HOOVER, Antlers.

Acres in orchard, 1,800; bearing, 1,200. Acres planted to apples, 1,000; pears, 250; peaches, 300; plums and prunes, 200; cherries, 25; apricots, 20; nectarines, 5; vineyard, 50. Small fruits—Raspberries, 20 acres; strawberries, 40; currants, 5; blackberries, 10 and gooseberries, 5. The average yield in 1898 was: Apples, 60 boxes an acre; peaches, 250; pears, 110; plums and prunes, 400. Grapes, 5 tons an acre. Received by grower, net: Apples, $1.20; peaches, 40 cents; pears, $1.10; prunes and plums, 45 cents.

The increase in planting was about equal to 1897, but the tendency is to increase the planting of winter apples. Some blight in pears is reported, and the codling moth is getting a foothold in some of our oldest orchards.

A sleet storm in the lower end of the county during the blossoming season cut down the yield of apples one-third in 1898. The Italian and German prunes are being well received in the market, and are next to the native varieties in point of profit, hence are largely planted.

The Japanese plums, too, are doing remarkably well, and are sought after by plum planters, especially Satsuma. This variety is very much in favor for preserving and jellies. The Ben Davis apple is on the decline and buyers do not want it if other varieties can be had. Many trees of this variety are being grafted over to more salable stock.

JEFFERSON COUNTY.

WILLARD M. DAVIS, Horticultural Inspector.

Acres in orchards bearing fruit, 1,000; not bearing, 1,310; planted to apples, 1,825; pears, 25; peaches, 5; plums, 280; cherries, 175; blackberries, 80; gooseberries, 8; currants, 10; raspberries, 182; grapes, 5 and strawberries, 300. Number of trees planted in 1898, 2,500.

The varieties of apples that are most profitable are Oldenburg, Red Astrachan, Yellow Transparent, Wealthy, Jonathan and Ben Davis. Most of the finest peaches raised are Seedlings. The most profitable cherries are English Morello Large Montmorency and Early Richmond. Our best plums are Lombard, Weaver and Bradshaw. Gooseberries—Downing, Houghton and Whitesmith. Blackberries—Wilson and Briton. Currants—Fay's Prolific, Victoria and Cherry. Raspberries—Marlboro, Pride of Kent and Turner. Strawberries—Jucunda and Captain Jack. Black raspberry—Gregg.

Owing to an unusually late frost and cold, wet weather during the spring months, the apple crop, and, in fact, all tree fruit, has been very light. The orchards of the county have, as a rule, been well taken care of, and I have noticed that the trees are being pruned and the small bushes trimmed, which

is not only a benefit to the fruit itself, but makes a very neat appearance. We still have blight in some of the orchards, but think it is on the decrease in this county. The two injurious insects that we have to contend with are the leaf-roller and the codling moth.

For the leaf-roller I have suggested the crushing of the larvae early in the spring. For the codling moth I have urged the scraping of the trees and also using bands. My experience is that this is the best way of destroying that insect. Spraying is all right and should by all means be done at the proper time. So many of our farmers are busy with other work in the spring that the spraying is neglected until too late to have the desired effect. It is a noticeable fact that while our apple crop was a partial failure this year, our peach crop has been larger than was ever known before. Nursery stock shipped in and inspected by me was found to be in good, healthy condition.

LAS ANIMAS COUNTY.

S. W. DE BUSK, Hoehne.

The fruit crop of 1898 was poor, as April frosts killed nearly all fruit buds. We have insects, but to what extent is uncertain. We begin to note wormy apples in our orchards. Trinidad is a place of entry for fruit from all quarters—California, New Mexico, Kansas, Texas and others. Our orchardists pick up empty boxes and barrels and bring to their orchards to use a second time. It is only a question of time until we shall be stocked with all the injurious insect pests known to tree and plant life.

More interest is shown in new plantings now than at any former time. The public is inclined to take up the question whether orcharding on a large scale may not pay. Grocers in Trinidad tell me that the local supply of summer and fall apples well nigh equals their demand. A gentleman owning some fine fruit land announces his intention of adding 4,000 trees to his present orchard of four acres. The time of exclusive plantings seems near. The tree agents fill a great number of small orders each season. In the spring of 1898 the deliveries exceeded those of any other year, but no data exists to define the exact amount shipped in and planted.

We have no horticultural inspector in this county yet. Our commissioners are not inclined to keep a man on salary the year round, as a herder, to keep the insect pests from entering. There is little use to put out a guard, unless he makes thorough work and examines all incoming packages of fruit and trees. This would mean almost daily labor at the county seat for most of the year. Probably we shall compromise the question, by endeavoring to inspect the growing orchards once or twice a year, and endeavor to induce the orchardists themselves to use approved remedies against the pests that infest their premises.

I insist that the horticultural brains of this state devise an efficient, yet simple kind of sheep dip in which to immerse our trees and plants on receiving them from nurseries, in order to kill any and all insects that may be on the stock and yet not kill the trees or plants. A little lye or carbolic acid put in a tank of water makes a proper wash for the aphides. But we need a dip effective against the hard shell varieties also. Besides, these matters should be expressed in explicit formula. It is so easy for the inexperienced to put in too much and kill the trees.

It is getting fashionable for even good nurseries to send out trees on the roots of which little galls and knots are starting. What preventive shall be used? It is of no use to advise the destruction of the trees, for the owners

will not do so and will elude the inspector—in whole, or in part. Not many will destroy fine-looking trees because of slight warts, or a few lice on roots. The nurseryman sells all such stock to the tree dealer; the dealer distributes it and the trees are planted. The planters, however, could be induced to immerse all stock before planting, in an insect killing solution.

LARIMER COUNTY.

W. B. OSBORN, Horticultural Inspector.

Acres in orchards bearing fruit, 3,890; not bearing fruit, 2,700; apples, 3,100; plums, 150; cherries, 2,500; blackberries, 25; raspberries, 75; strawberries, 50. The increase of planting in 1898 is 40 per cent. over last year. The following varieties of apples are most profitable: Winter—Ben Davis, Winesap, Jonathan, Ralls Genet. Cherries—English Morello, Early Richmond, Dyehouse. As to the variety of plums I am unable to say, as new varieties are coming on that will displace the native varieties. Blackberries, raspberries, strawberries and currants are very profitable.

I find in visiting the orchards this year that the orchardists are taking new courage and attribute the cause to the benefits that are derived from the income that they are beginning to realize. Some failures have been due to neglect. Spraying is not done at the proper time, and each seems to have a theory of his own. If the orchard failed to do any good, the owner concluded that spraying was of no effect. The best method to insure success is clean cultivation and proper pruning. An orchard will not take care of itself, and the owner must be a daily visitor to the orchard, if it is but a few minutes at a time. The emulsions that have been used most successfully to destroy tree and plant insects are paris green and white arsenic, according to formulas given out by the State Board of Horticulture.

In my work as inspector I did not see the mistakes of the orchardists the first year or two as I see them now. I have been strengthened in my ideas about orchard planting in my rounds this year and by observations backed up by past experiences. Many orchards have been spoiled by not knowing what to plant. Too many varieties of apples and plums have been planted. One cherry orchard in Larimer county of 11,000 trees contains only one variety—the English Morello. There should have been at least three varieties, so that they would not all be ripening at once.

In the apple orchards for commercial purposes, I believe that five varieties of winter apples are far more profitable than ten. Several thousand boxes of winter apples have been shipped from Larimer county this fall and I believe that four or five varieties would cover the list. The same orchards might contain from ten to fifteen varieties. There are too many idle trees or shy bearers that do not pay interest on the ground occupied. Plant right, do not try to get every good apple, but stay by those varieties that are known and graft all unprofitable ones with something better. I am of the opinion that we have had our worst season of the codling moth because the orchardists are awakening to their interests. Many are fencing their orchards and putting their hogs in to consume the windfalls.

LOGAN COUNTY.

H. C. SHERMAN, Sterling.

There is a very gratifying interest springing up in all parts of this county, where irrigation is practical, in planting both fruit and shade trees, also in putting out ornamental shrubbery. A noticeable feature is the making of attractive homes by several of the farmers, the interest being awakened no doubt by the offering for the last two years of a cash prize of $25 for the best managed farm in the county.

During the past year something over three cars of fruit, shade and ornamental trees were shipped to Sterling for fall and spring planting. Planting trees here in the fall of the year has proven almost a total failure, except where they were heeled in and planted out in the spring. The best results are obtained by planting as late in the spring as possible, and not permitting them to get started too much until the destructive spring winds are passed, which is the cause of most of the failures of young trees to grow.

The tree peddler who comes around early in the fall with his highly colored plate book, recommending fall planting, is the greatest cause of loss to inexperienced persons and tends to discourage everybody. The display of fruit at the last annual exhibition of the county fair was very encouraging. We had no apples on exhibition here as large as were sent to the Omaha exposition from other parts of the state, but they were equal to any I saw there in every other respect.

R. J. Patterson, one of our leading horticulturists, exhibited a plate of Hubbardson's Nonesuch. He reports that this apple excels any other in his orchard, in size of tree, vigor of growth and quality, the fruit being juicy and pleasant to the taste and very attractive in color and appearance.

Only a few strawberries are grown here, although they do well and meet with ready sale. Each year a large quantity is shipped here from Denver to meet home demand. A splendid opening is offered for the raising of small fruits of all kinds.

The list of varieties for Northern Colorado is a valuable guide for amateurs, and will prevent the expense of experimenting with others not adapted to our location and climate. I believe a treatise on how to prepare the ground for tree planting, when and how to set the trees, when and how much to irrigate them would make a valuable addition to the annual list and be the means of spreading the light of experience where it is most needed.

I am pleased to notice the progress made in improving the grounds around our public schools. The trustees of Sterling district purchased 540 shade trees which were put out on Arbor day in four rows entirely around the grounds and the work was so well done that nearly all the trees are growing, the loss being less than two per cent. The grounds around our Court house have been planted with ash trees which are now four years old and show remarkable growth, being more thrifty and vigorous than any I have seen elsewhere in the state. They already make a beautiful ornament at a small cost, and will pay a larger dividend in satisfaction to the people than could have been made in any other investment. For shade the ash succeeds far better here than any other, with the elm a close second, while the black locust and box-elder are also doing well.

MESA COUNTY.

B. F. HUGHES, Horticultural Inspector.

Acres in orchards bearing fruit, 6,305; not bearing, 9,700; acres in apples, 8,900; pears, 1,200; peaches, 4,000; plums, 600; nectarines, 30; apricots, 250; cherries, 225; blackberries, 50; gooseberries, 25; currants, 50; raspberries, 70; grapes, 175; strawberries, 100. The average yield of apples is 4 barrels; average price, $2.25; average yield of pears, 11 bushels to an acre; average price, $1.00 a bushel; peaches, 15 crates, at 60 cents; blackberries, 1,500 quarts, at 22 cents; raspberries, 750 quarts, at 25 cents; strawberries, 4,000 quarts, at 7 cents; average yield of grapes an acre, 5,000 pounds, at 2½ cents. The increase of planting is 10 per cent. over 1897. The valuation of the fruit crop for 1898 is $150,000. Number of trees planted during the past year 145,000.

The following varieties of apples are found to be the most profitable: Ben Davis, Jonathan, Missouri Pippin, Ralls Genet. Peaches—Elberta, Mountain Rose, Early Crawford, Late Crawford, Oldmixon. Pears—Bartlett, Seckel, Mount Vernon, Kieffer, Sheldon, Beurre d'Anjou, Winter Nelis, Flemish Beauty. Cherries—English Morello, Large Montmorency, Olivette and Ostheimer. Plums—Wild Goose, Bradshaw, Botan, Burbank, Hungarian, German, French, Italian. Gooseberries—Downing, Whitesmith, Houghton, Industry. Blackberries—Wilson, Early Harvest, Briton. Currants—Fay, Red Dutch, White Grape and Cherry. Raspberries—Cuthbert, Turner, Loudon, Gregg, Marlboro. Strawberries—Captain Jack, Spear's Prolific, Beder, Gandy.

The condition of the orchards for the past season has not been all that could be desired on account of the extremely cold winter, which was preceded by a warm wet fall which caused a late tender growth of wood. Many fruit trees of nearly all kinds were injured and some of the less hardy varieties were killed. Under these conditions the usual care was not bestowed on orchards. The atmospheric conditions being favorable, insect pests were more numerous than ever before. The codling moth appeared in many orchards for the first time and in such numbers as to destroy a portion of the apple crop. The pear slug is also very common. Several species of locusts were present and aided in shortening the fruit crop.

The best method to insure success is to thoroughly cultivate, judiciously irrigate and properly prune, thin out the young fruit and keep insect pests under control. The insecticides that have been used most successfully to destroy tree and plant insects are kerosene, paris green, Kedzie's arsenite of lime.

MONTROSE COUNTY.

A. F. REEVES, Horticultural Inspector.

Acres in orchards bearing fruit, 2,500; not bearing fruit, 5,000; apples, 1,000; pears, 325; peaches, 500; small fruits, including plums, nectarines, apricots, cherries, 175 acres, 100 trees to the acre, and each tree yields 75 pounds to the tree. Blackberries, gooseberries, currants, raspberries, grapes, strawberries occupy about the same acreage as 1897. The apples yield 150 pounds to the tree, average price for a 40-pound box $1.00; pears, 100 trees an acre, yielding 75 pounds to the tree, average price $1.75 a box; peaches, 100 trees to an acre, yielding 75 pounds to the tree, average price for a crate of 20 pounds, 60 cents; the average price of blackberries, 20 cents a quart; raspberries, 22 cents a quart; strawberries, 9 cents a quart; cherries, etc., 175 acres, 100 trees an acre,

yielding 75 pounds to the tree. Total pounds of fruit produced in the county in 1897 is estimated at 22,472,220. The average price of grapes, 10-pound basket, 2½ cents a pound.

The estimated valuation of the fruit crop for 1898 is $200,000. The number of trees planted in the past year is about 15,000. The following varieties of apples are the most profitable—Ben Davis, Jonathan, York Imperial, Winesap, Missouri Pippin, Wagner. Peaches—Elberta and Crawford. Pears—Bartlett, Flemish Beauty, Duchess and Idaho. Cherries, sweet and sour, not enough even in the market to supply the demand. Plums—Pond Seedling, Yellow Egg, Lombard, and Wild Goose. Blackberries, raspberries and strawberries are also grown in this vicinity.

The condition of the orchards for the past season, in the matter of cultivation, is first class, but insects have increased. Some failures have been due to frost and wind. The best method to insure success is to cultivate, spray, prune, carefully pick and pack fruit for market and make the orchard strictly a business proposition.

The insecticides used most successfully to destroy tree and plant insects are london purple, paris green and coal oil emulsion, while tree traps have been of great benefit. Each orchardist should make himself a committee of one and keep down the insects in his own orchard. The law should be rigidly enforced the coming season with reference to spraying, as the alarming increase of the codling moth threatens to destroy the value of the apple and pear crop. Orchardists must administer the affairs of their orchards in a business-like way instead of treating them as a secondary matter. It is clear to my mind that the spread of the codling moth will never be checked until co-operation is attained and thorough work is done by all at the proper season.

MONTEZUMA COUNTY.

J. D. HALL, Cortez.

Acres in orchards bearing fruit, 400, not including small fruits; not bearing fruit, 300; planted to apples, 300 acres; pears, 35; peaches, 40; plums, 15; nectarines, quinces, and apricots, 1 acre each; cherries, 8; gooseberries, 5; currants, 2; raspberries, 3; grapes, 3; strawberries, 7. The average price of apples this year was $3.75 a barrel; pears, $2.25 a bushel; peaches, 40 cents a crate; blackberries, 20 cents a quart; raspberries, 20 cents a quart; strawberries, 20 cents a quart.

There will be a large increase in the 1899 planting, as people are beginning to realize that this is a fruit county. Our best varieties of apples are the Rome Beauty, Ortly Bell, Jonathan, Smith Cider, Ben Davis, Missouri Pippin and Pewaukee. Varieties that come in later bearing are White Winter Pearmain and Mann. For summer and fall apples, the Tetofsky, Red June and Early June. Our best peaches are the Elberta and Family Favorite. The latter will bear when the Elberta fails, ripens earlier than the Elberta and sells best. Our most profitable pears are Louise Bonne de Jersey, Manning's Elizabeth and Bartlett. In cherries, Early Richmond and Dyehouse do best in the canon, while Montmorency is recommended for the higher country. The Wild Goose is our best plum for sure and early bearing. The Lombard and Damson bear and sell well.

The orchards that have been cultivated are in fine condition. I believe in cutting back peach, plum and pear trees, but some people take the easy way and let the cows do it for them, to save work. Some damage has been done to trees from not knowing how and when to irrigate. We must cul-

tivate thoroughly and early, and not water the trees too late in the season—not later than the 15th of August for apples, and not so late by two weeks for peaches in the higher altitudes. We have not had to use insecticides yet, but soon will if the buyers of fruit trees are not more careful to get clean stock. If we can get rates on car lots of apples, hundreds of acres will be planted in the next few years.

MORGAN COUNTY.

L. C. BAKER, Fort Morgan.

In the way of results from trees in bearing condition, Morgan county can not report so large a yield as last year, but in the matter of planting, a tremendous gain has been made. Thousands of trees in apples, plums, cherries, pears, etc., have been planted. There are no losses of old or young stock. The earlier planters of trees here made unwise selections, which fact developed only after the bearing age was reached, which experience has been for the benefit of later orchardists. The failure of the crop of fruit for the year was due to a snow storm that raged at the time trees were in bloom, destroying the prospects for apples, some varieties of plums, and cherries to some extent. The hardier varieties of plums were little affected, and an abundant crop is reported by those who had planted such.

It has been proven beyond doubt that the Yellow Egg, Green Gage, Lombard, German Prune, etc., may be grown with absolute security from loss of tree and with most satisfactory results as regards fruit harvested. These may be depended upon from the fact that the bloom comes later and escapes occasional late frosts. Many have claimed that pears could not be grown, but this has also been disproven, growers from every section of the county, almost, reporting their trees thriving and bearing well considering their age. We have no blight, but the codling moth has begun to show up among bearing orchard trees, and stringent measures will have to be adopted from now on to keep its effects under. In this work the people of this section ask for information looking toward the eradication of the pests.

Altogether, there is nothing but words of good cheer for the planter in this county, for we have a warm soil and a climate that carries the young tree through with perfect safety. My advice to all is to keep planting, and not to plant scrubs, but in each line choose such as are of known hardihood and good bearing qualities. Two years ago I advocated the planting of the Ostheimer cherry for this section. Later experience shows that it is a failure in this section, bearing good fruit but so scantily as not to be profitable even for the home garden. The Early Richmond, Wragg, English Morello and the like are nearly as good and much more satisfactory.

OTERO COUNTY.

E. N. BERRY, Horticultural Inspector.

Acres in orchards bearing fruit, 1,500; not bearing, 7,000. The average yield of apples an acre, 70 barrels, selling at $3.50 a barrel; the average yield of peaches, 500 crates, at 90 cents; blackberries, 1,000 quarts, at 15 cents; raspberries, 700 quarts, at 15 cents; strawberries, 1,000 quarts, at 15 cents. The average price for a pound of grapes, 2 cents. The estimated increase of planting of fruit trees and vines in the year of 1898 was 2,000 acres, the number of trees exceeding 204,000.

The varieties of apples that are most profitable in this county are the following: Ben Davis, Winesap, Missouri Pippin, Jonathan, Maiden Blush, Rambo, Wealthy, Duchess. Peaches—Elberta, Stump, Crawford, Early and Late, Heath. Cherries—Wragg, Ostheimer, Montmorency, both Early and Late. Plums that are considered most profitable are the Otero, Green Gage, Lombard, and in prunes, the Italian, German and French. Gooseberries—Downing and Houghton. Blackberries—Early Harvest. Currants—White Grape and Cherry. Raspberries—Mammoth Cluster, Gregg. Strawberries—Jesse, Wood (Beder), Edward's Favorite.

The condition of the orchards for the past season has been good in some localities. The blight appeared in May and June to a small extent. The best method to insure success is to cultivate, irrigate and spray the orchard thoroughly. The insecticides that have been used most successfully to destroy tree and plant insects are bordeaux mixture and paris green.

PROWERS COUNTY.

W. FRANK CROWLEY, Holly.

In the vicinity of Lamar are several orchards which have been bearing good crops for several years, the results of which have been published from time to time in connection with reports from Bent, Otero, Pueblo and Fremont counties, showing the adaptability of the entire Arkansas valley to commercial fruit growing. M. D. Parmenter is one of the oldest and most active horticulturists in the county, and the yield of peaches which he has secured from four and five-year-old trees has been phenomenal. He has made the growing of peaches profitable, as well as other fruits, and has several seedlings which are thought worthy of propagation. The finest specimens of the Chinese cling peaches that I have ever seen were grown on Mr. Koen's place near Lamar in 1897.

All kinds of fruit are being successfully grown and fruited, and although the acreage of bearing orchards is small, fruit growing has passed the experimental stage, and those who have been planting orchards the last few years have had the experience of those in their immediate vicinity and also in adjoining counties which has enabled them to make up good lists of varieties. The altitude here is lower than in any other fruit section of the state, being only 3,450 feet at Holly in the east end of the county.

The completion of the largest system of irrigation works in America, that of the Great Plains Storage company, has brought under control and furnished with a sure water supply about 200,000 acres of land in this county, all of which is well adapted to the culture of fruit as well as for general farming. Our farmers seem to realize the importance of planting wind-breaks and trees generally, and fruit growing and farming will be mingled to a considerable extent. The diversified farm idea is one that is being taught by the experience of people throughout the irrigated regions and our people are not slow to take advantage of the experience of others. In the vicinity of the towns the small tract idea prevails, and in this connection the planting of fruit trees and small fruits is an important factor.

The blight has not yet made its appearance in this section of the Arkansas valley, and we are endeavoring as far as possible to plant only such varieties of apples and pears as have proven least susceptible to the attacks of the disease. A horticultural inspector has not yet been appointed, but our commissioners will soon be asked to make the appointment so that all trees shipped in the coming season may be looked after and the importation

of insects and diseases prevented as much as possible. I came here the first of last March, plowed and planted 80 acres of raw sod to trees and vines. In most places to set so large an orchard on land that had never been cultivated would have been considered an impossibility, but I found the sod worked up so nicely that with the aid of irrigation I got my trees out with little more expense than would have been necessary on a piece of old land, and I have never seen a young orchard do better than this has done the past season. My planting consists of 45 acres of apples, the best winter varieties, Ben Davis, Gano, Winesap, Mammoth Black Twig, York Imperial and Jonathan; nine acres of prunes, of the Italian, French, Silver and German; six acres of plums, among which are included the Lombard, Weaver, Bradshaw, Green Gage, Columbia, Shropshire, Damson, Burbank, Abundance, Wickson, Red June, and some native sorts; three acres of cherries—English Morello, Wragg, Early Richmond, Late Duke, Ostheim and Montmorency.

I have six acres of peaches, Oldmixon Cling, Crawford's Early, Alexander, Greensboro, Bokara, Smock, Foster, Heath Cling, Crosby, Elberta, and Triumph. Of this lot 500 Elberta are used in a wind-break, as I have varied the idea of using seedling peaches for wind-break and am using the best budded varieties for that purpose; one acre of pears, Mt. Vernon; three acres of grapes, mostly Concord; three acres of asparagus, while the remaining four acres of the 80 are planted to small fruits, gooseberries, currants, blackberries and raspberries. I have also planted about 500 shade trees of the elm, ash, catalpa and poplars, and it is my intention to add a large windbreak on the east, of which the Carolina poplar and black locust will be the main kinds. A great number of other kinds of trees and vines have been planted in an experimental way, of which reports will be made when I have given them sufficient trial. These varieties which I have put in a commercial orchard can be planted with assurance of success in this section, and for home use the list can be enlarged upon to suit the taste and experience of the individual.

One of the greatest nuisances with the orchardist in this district is the jack rabbit. The veneer wood protectors work very well and afford protection to the body of the young tree from the rays of the sun, but they are expensive and just as good a protection can be made by tying stalks of corn or cane about the bodies of the young tree, and little more time will be consumed in the operation than is required to put on the patent protectors. Common beef blood in which cayenne pepper has been mixed, applied to the tree with a rag will keep the rabbits away, and it is the easiest remedy to apply. So far as we can see, no bad effects result from this treatment.

PUEBLO COUNTY.

B. SWEET, Horticultural Inspector.

Acres in orchards bearing, 1,404; not bearing, 607; in apples, 1,222; pears, 15; plums, 15; peaches, 25; nectarines, 2; cherries, 20; blackberries, 10; gooseberries, 5; currants, 5; raspberries, 15; grapes, 30; strawberries, 40. The yield for an acre of apples is 75 barrels, at $4 a barrel; pears, 10 bushels, at $5; peaches, 150 crates, at 80 cents; strawberries, 1,000 quarts an acre, at 10 cents; the average price of blackberries, 12 cents a quart; raspberries, 15 cents a quart; grapes, 2 cents a pound.

Increased planting is 10 per cent. over 1897. The valuation of the fruit crop for 1898 is $45,000. Number of trees planted during the past year, 4,500. The following varieties of apples are found to be the most profitable: Ben

Davis, Missouri Pippin, Jefferis, Winesap. In peaches, Elberta and Crawford. Pears, Duchess and Bartlett. Cherries, Montmorency and Dyehouse. Plums, Wild Goose and Damson. Gooseberries, Houghton. Blackberries, Early King. Currants, Pomona. Raspberries, Golden Queen.

The condition of the orchards is much improved over last year. The emulsions which have been used most successfully in this county to destroy tree and plant insects are the Woodbury mixture, and formulas as advised by the State Board of Horticulture.

REPORTS BY DISTRICTS.

DISTRICT NO. 1.

W. B. OSBORN.

The orchards in the Northern District compare favorably with the conditions of the farms on which the orchards are located. If the farm is neglected the orchard has to suffer in proportion. Over that portion of the Northern District where all kinds of grain do well you will find fruits of all kinds that are adapted to this climate and altitude.

I am of the opinion that there is no district in the state where fruit trees of all kinds put on greater and healthier growth than in this district. The trees seldom, if ever, winter kill, save the peach, and we are beginning to grow the latter quite successfully. A greater interest is taken now than ever before in the orchards, in the way of clean cultivation, proper pruning, etc.

In the vicinity of Loveland about $10,000 worth of apples were grown and in the vicinity of Fort Collins equally as many. Near Bellevue and La Porte, taking in the northwest portion of the fruit district, there were equally as many more, making total in Larimer county of $30,000 worth of apples. From Loveland $4,500 worth of red and black raspberries, blackberries, currants, gooseberries, etc., were shipped. From Fort Collins, La Porte and Bellevue there was as much more, in all about $12,000 worth. One acre containing 50 trees of cherries 3 years in bearing yielded $250 worth of fruit. Five trees of quite good size yielded at the rate of $500 an acre. Two acres of red raspberries yielded $700.

Mr. McClelland had two tons of plums on two acres and 5,000 bushels of apples in his orchard. Mrs. Quigley had 3,000 bushels of apples on five acres. Alfred Wild had 1,500 bushels on four acres. A. S. Benson, 1,200 bushels on three acres. There are many larger orchards in acreage but lacking in age. This in an indication of what we will have when the 750 orchards in the county come into full bearing. The apple district in Weld county is spreading considerably, with some fine orchards yielding in proportion with those mentioned. Logan county is falling into line and in a few years we shall be able to have a good report from Sterling and vicinity.

Eagle, Morgan, Phillips, Summit, Washington, Pitkin and Yuma counties will eventually be able to raise fruit successfully. Sedgwick county has quite a number of small orchards in bearing, with good results. They have a county horticultural society, and their meetings are well attended and great interest taken. Peaches have been raised out on the bluffs away from irrigation ditches. The pits were planted where they intended the trees to grow, and in several

instances they have come through the winter all safe and have borne peaches of fine size and flavor. A few enterprising men will plant orchards and I am of the opinion they will be successful in their efforts. The townships bordering on Larimer county seem to be more adapted to fruit than any other locality within the borders of the county.

DISTRICT NO. 2.

DAVID BROTHERS.

The report of District No. 2 is not very encouraging for the year 1898 in many respects, as this is our off year, but in some parts there was a fair crop of both large and small fruits. There are many reasons that could be given; the trees want a rest, then early frosts came, sometimes hail storms and many other things that hinder the grower from having things his own way, which may be all right but very unpleasant. I think the codling moth is far the worst enemy the horticulturists have to contend with in Colorado. We have had the blight some but not so bad this year as in the past, and which we hope is passing away. The fruit outlook for the year 1899 is encouraging, as the trees are very full of fruit buds.

DISTRICT NO. 4.

J. C. KAIN.

Bent county is quite alive to the fruit interest, and has some fine orchards which are quite productive. Most of the orchards are yet young, but those in bearing are comparatively free from insects. Prune and apple orchards have but few moths and they are being combated with the usual poisons. The worst trouble seems to be in the blight. One orchard of ten acres, eleven years old, in which especial care was taken in pruning, irrigating and fertilizing and all that goes to make a model orchard was two years ago the worst blighted one there. It was cut back severely and the many sprouts coming from the cut limbs make the trees look stubby and bushy. They produced but little fruit this year. The owner attributes this fearful disease to the barren ground and the reflection of the hot sun, because an orchard just across the road one year older and having much less culture and attention is comparatively free from blight, has nicer growth and bore a bountiful crop this year. People are anxious to have fruit lists for planting or any other information in the fruit line.

Las Animas county has some fine orchards and many additional ones are being planted. They have suffered but little from blight. The codling moth is beginning to arrive, but the apple crop this year was fairly good and clean. Otero county stands as heretofore. Some orchards are clean with but few insects. Blight has been the worst pest during the year. Peaches and prunes are perfectly clean and free of any insects and yielded splendid crops. Pueblo county has added an inspector and from his efforts we may expect better results. Blight has decreased in this county, yet the codling moth is bad. Fremont county has improved some, but their crops were smaller except in isolated orchards where they were extremely good with but few insects.

DISTRICT NO. 5.

C. W. STEELE.

The past season has been an instructive one, having taught us several lessons. Perhaps the most important is that we can not depend with certainty on all fruits in our orchards for an annual income; that off years may occur even in the favored valley of the Grand river. A good crop of peaches was grown in the Palisade section of Grand valley and wherever trees have been planted on Kahnah creek, the upper part of Whitewater plateau, and Rhone valley, as well as in some favored localities of Garfield county. The size and quality of peaches grown were not equal to those of former seasons.

The winter of 1898 was a phenomenal one in Grand valley. Snow fell in unusual quantities, which remained long on the ground, and low temperature with excessive humidity affected fruit trees injuriously, causing in some localities winter killing of the buds on peach trees. After the excessive yield of apples in 1897, a large crop was not expected and the apple crop was below the average. Codling moths were more numerous than ever before and caused greater damage to the crop of apples.

Mesa county has a horticultural inspector in the field the larger part of the year. In spite of all efforts, insect pests are increasing and doing greater damage. Where the remedies recommended by the State Board of Horticulture are persistently used they have proved generally effective. All the common insect pests, except the codling moth, have been successfully combated in most localities. It has been found that the red spider, brown mite, woolly aphis, peach and apple tree borer, may be exterminated or diminished so as to become practically harmless. All insect pests combined are not dreaded as much by our fruit growers as the codling moth, and for no other insect is an effective insecticide more eagerly sought.

Mesa county has an active working horticultural society, with William Bomgardner as president and a very large membership. In consequence, with lessons learned, our people will in the future grow more diversified crops. As has been said, it is not safe to carry all the eggs in one basket. The erection of a beet sugar factory in Grand valley seems at this writing to be assured. The orchards of peach, apricot, nectarines and the tender varieties of plums and grapes will in the future be planted in the upper end of the valleys and near the foothills—the hardier fruits only in the lower parts of the valley.

To grow the finest fruit to keep up the well earned reputation of Colorado as a fruit growing state, not only is constant care and vigilance required on the part of the fruit grower, but the fostering care of the state is needed to protect this great and growing industry. The fall and early spring months of 1898 have been favorable for the fruit grower. Trees and buds are in good condition and are promising for the crop of 1899. With the benefit of past experience in marketing, packing fruit for shipment, cultivation and irrigation, we believe the future of fruit growing in this district is promising and will continue to show a yearly increase in its orchard area.

DISTRICT NO. 6.

W. S. COBURN.

The increase in tree planting for the year 1898 was somewhat below the average, although a large acreage was planted mostly to winter apples and Elberta peaches. Owing to a light fall of snow in the mountains the previous

winter, the water supply in some sections of our district was rather short and a larger per cent. of loss was reported in new plants than any previous year. While the crop in many parts of the state was reported to be under the average, the crop in the sixth district was fully up to the standard. The young trees that came into bearing increased the total from 25 to 40 per cent. The woolly aphis has been almost totally banished from the district by the use of a strong solution of whale oil soap, and the appearance of a small bug or insect that killed the remaining few by puncturing their skins and sucking the substance, leaving the dead skins on the trees. There is no other insect except the codling moth that has done any material damage. This has become a terror to fruit growers and stringent measures are now being discussed for the purpose of keeping them under control.

Our fruit growers are fully alive to the importance of careful pruning, and thorough cultivation of all young orchards, as past experience has taught them that this is the only method for sure success. The prices of fruit for the past season have been unusually good. Buyers from Chicago and New York bought and shipped about 100 car loads of select apples from this district, which left our home market rather short, and supplied only with an inferior quality. The fact that our apples command the attention of eastern buyers for export has infused new energy in fruit growing without fear of over-production.

Large orders for fruit trees are now being placed and the planting of an increased acreage in the spring of 1899 is apparent. Some of our apple growers think they made a mistake in selling to eastern buyers this year, owing to the short crop in other states, but the knowledge gained in learning to pack properly will more than compensate them for any loss during the past season.

Many of the orchards of Montrose and Delta counties were inspected during the months of July and August and most of them were found in a thriving condition, with fair crops of fruit. The growers were all alive to the best methods of treating their orchards and giving clean cultivation. The yield of fruit in most sections was satisfactory, and in the North Fork valley in particular the crop was unusually large. A. R. Bruce of Paonia has a bearing orchard of two and one-half acres of apples of the Ben Davis, Jonathan and Winesap, from which he sold $700 worth of first-class apples to eastern buyers. He had some 300 boxes of second grade left that will net him $200 more. W. T. Hawley of Paonia had 4,000 boxes of Elberta peaches from 500 trees planted five years ago, which netted 55 cents a box at Delta or $2,200 from less than five acres of land. Many other instances might be mentioned that would compare favorably.

OBSERVATIONS AT THE TRANS-MISSISSIPPI EXPOSITION.

DAVID BROTHERS.

I went to the Omaha exposition and the first thing when I arrived at the exposition grounds I could not refrain from going at once to see the Colorado fruit exhibit. It was an eye-opener. I did not expect to see half the fruit on the tables that I saw from Colorado. I join with Governor Adams, and all others who know of it, in saying that our secretary ought to have great credit for the way she managed that exhibit. She worked hard, and with little means, and she had an exhibit that would have surprised any of us. Of course she had some willing friends, but I desire to say that if it had not been for our secretary there would have been no fruit exhibit at Omaha from Colorado.

During the short time I was at the exposition and at the Colorado fruit exhibit there were hundreds of thousands of people coming in and going out, and it was a good deal as we used to tell our good friend Helm from Canon City—that he did not raise his show pears at Canon City, but shipped them in from California—but that was when they first commenced to raise pears in Canon City. Many of the people who visited the Colorado fruit display would not believe the fruit was raised in Colorado. They would say: "Oh, yes, they can raise silver and gold out of their mines out there, but they surely can not raise such fruit." Well, to make a long story short, I wanted to go around and see the rest of the fruit and the fruit raisers that I could meet, for the purpose, more than anything else, of learning about the codling moth. That seemed to be on my mind more than anything else.

I found that fruit growers in other localities work along the same lines that we do, using the same remedies that we use. I heard nothing new from any of them, with one exception. One man told me that he put a fruit jar, about half full of sugar and water, in every four or five of his fruit trees, and in this way caught thousands of the codling moth. I tried something like this once, except that I put vinegar in the jars, and it was not a success at all. I did not catch the moths in that way; the vinegar might have been too sour for them. This man, however, said he could catch the codling moth better this way than in any other. I asked him if he had tried the band system, and he said he had. He had caught some that way, but the sugar and water would catch them the easiest of anything, and he talked so earnestly about it that I made up my mind I would try it next summer.

I asked about spraying, and found that some believe in it and some do not. A gentleman from Idaho, whom I met, said that he might be alone on the proposition, but he did not believe that spraying did any good. I asked his reasons, and he said that he found that he had as many worms in the apples on the trees that he had sprayed as those he did not. He quit spraying, and does not see that he has any more worms than his neighbors who spray, and

not so many as some of them. Then I came along to a friend from Illinois and asked him to give his experience, and he said he believed in spraying. I asked him what formula he used. It was the same as we use out here in Colorado.

They had a few samples of pears in their exhibit, some that had been sprayed and some that had not. The pears from the trees that were sprayed had no fungous growth on them, but were clear and bright like Colorado pears. The ones that were not sprayed had a great deal of fungous growth or scab on them. I asked him about the codling moth, and he said: "Brothers, that is a pretty hard question to answer." He said he had sprayed for it, and believed it did some good, but that they still have lots of codling moth. I went around from one to the other, trying to get some glad tidings of how to deal with the codling moth, but they all seemed to tell about the same story. I found that in other localities they do not seem to use the band system as much as we do here.

DISCUSSION.

Senator Felton: How many states were represented in a horticultural way at the exposition?

Mr. Brothers: Idaho, Wisconsin, Colorado, Illinois, Nebraska, Iowa, California, Missouri, Washington, Nova Scotia and Kansas. New Mexico sent some fruit, but there was no one there to attend to it. Utah was also represented. Michigan and Ohio were not represented.

Senator Felton: How did the Colorado exhibit compare with the exhibits from those states mentioned?

Mr. Brothers: My opinion was that Colorado had the clearest and brightest fruit there, and I think the largest. Colorado had the largest apple in the building, and received more medals than any other state in the Union.

Mrs. Shute (exhibiting apple): This was the largest apple at the exposition, and was raised by J. D. Hall of Montezuma county. He sent thirty-five apples, none of them weighing less than twenty-four ounces, and this (exhibiting a pear) is one of the largest pears shown at the exposition and is an Oregon pear. The best peaches that I saw came from Colorado.

Senator Felton: I would like to ask if the scab, such as Mr. Brothers saw on the fruit from the east, has been observed on fruit from this state, and if so, in what parts?

Mr. Coburn: I have never seen it on any apples from this state.

Senator Felton: If that is the scab on that pear, I have a good many pears afflicted in that way. I have had quite a number of Bartlett pears affected that way, more or less. They had a sort of rust on them heretofore, but this year my Beurre d'Anjou pears were covered all over with it, so that it obliterated the natural color of the pear. It did not seem to hurt the quality of the pear any, and I didn't know whether it was a disease, or caused by insects, and would like to know the cause. Can you tell me, Mr. Coburn?

Mr. Coburn: I am unable to tell you.

Mr. Brothers: I have always understood that it came from a damp climate. I think they are usually sprayed with the bordeaux mixture for that trouble when the pear is of considerable size. None of the pears that we had at the exposition showed any scab.

Senator Felton: I was interested in knowing how our exhibit at the exposition compared with that of other states. I sent seven or eight varieties of pears and got a silver medal, and it seems to me that seven or eight varieties were not very much. Of course my pears were good, but it seemed to be

they must be very superior, or that the other states were not well represented, for seven or eight varieties to take a medal.

Mrs. Shute: When I received the official advice and noticed that Senator Felton's pears had won the silver medal on eight varieties, I asked how that could be, when other people were showing from fifteen to twenty varieties, and was told that Senator Felton's pears, while not the largest shown, were the finest when quality, flavor, color, etc., were considered, and also the keeping quality of the pears, and was told that the senator's exhibit certainly merited the medal.

THE KEEPING QUALITIES OF WINTER APPLES.

PETER YOUNGERS, JR., Proprietor Geneva Nurseries, Geneva, Neb.

In compiling this report of the keeping qualities of winter apples I have taken the scale of 10 points and marked each variety according to the condition in which it was found at certain dates. Those found in perfect condition—or as nearly so as apples could be at that time of year—were marked 10. Those in a more or less damaged or inferior condition were marked accordingly. The following table gives results:

	June 15.	July 14.	Aug. 2.	Sept. 2.	Oct. 2.	Nov. 1.
Ben Davis	10	10	10	10	10	10
Winesap	10	10	10	10	10	10
Genet	10	10	10	10	10	10
White Winter Pearmain	10	7	6	6	4	3
Limbertwig	10	10	10	10	10	10
Allen's Choice	10	10	10	10	9	8
Willow Twig	10	10	10	10	10	10
Sweet Russet	10	10	9	9	8	8
Little Red Romanite	10	10	10	10	10	10
Lansingburg	10	10	10	10	10	10
Jonathan	7	8	8	8	7	6
Grimes Golden Pippin	7	8	8	7	6	5
Missouri Pippin	8	7	6	5	4	2
Northern Spy	..	7	6	5	3	0
Iowa Blush	8	8	8	8	7	5
McIntosh Red	9	9	9	9	9	9
Walbridge	5	3	2	1	0	0
Yellow Bellflower	6	0	0	0	0	0
Eicke	8	8	8	8	8	7
Price's Sweet	..	7	7	6	5	4
Sheriff	8	3	0	0	0	0
Fulton	7	5	4	3	3	0
Rome Beauty	8	8	8	7	6	5
Salome	9	9	9	9	9	3
Minkler	8	7	7	6	5	4
Dominie	9	8	8	8	7	6
English Golden Russet	..	6	5	4	4	0
Roman Stem	8	7	6	5	4	0
Ortley	7	..	6	4	3	0
Milam	7	..	7	7	6	6
Talman Sweet	6	..	5	4	2	0
Perry Russet	6	..	..	..	..	..
Wagoner	5	..	4	2	0	..
Snow	7	..	5	3	0	..

These markings were made at the time apples were taken from cold storage and show the relative condition of the different varieties at the dates named. By examining the table it will be noticed that the following varieties had retained all of their good qualities up to the time of the last marking, November 1: Ben Davis, Winesap, Genet, Limbertwig, Willow Twig, Little Red Romanite and Lansingburg. It will also be noticed that at the time of the second and third markings the Jonathan and Grimes Golden Pippin had gained in the comparative scale, coming out of storage in very good condition, with flavor fully retained, while the Minkler had lost flavor and begun to decay. The Englisb Golden Russet shriveled and lost on scale.

The Roman Stem became mealy and lost flavor. The Sheriff and Walbridge discolored so badly as to render them unfit for show or market, and declined very rapidly in the scale of points. The Fulton shriveled; the Milam, though a good keeper, lost color. The Snow retained color, but many burst, and after a few days became mealy. The Yellow Bellflower had decayed so badly at the time of the second marking that we were unable to get a specimen for exhibition. The Missouri Pippin, while remaining sound, lost color, thus reducing the scale. The Salome remained firm upon the table. Fruit taken from storage and put upon the tables June 1 retained color and firmness for nearly five weeks.

All of this fruit was gathered and placed in cold storage during the fall of 1897, most of it during the month of October; I think a few went in as late as December. Each apple was wrapped first in a sheet of waxed paper, using 9 by 12 inch sheets for small apples and 12 by 12 inch sheets for large ones. Then another covering of common newspaper was added and the apples carefully packed in barrels, filling them up so as to require considerable pressure to get the heads in. They were stored in the cold storage room of Swift & Co., South Omaha, and the temperature did not vary over one degree from 36 degrees from the time they were placed in storage until they were removed.

All of the varieties were kept in the same temperature and treated exactly alike. While some varieties, such as Walbridge and Sheriff, disappointed us, still I am satisfied beyond doubt that wrapping first in waxed paper, then in any common paper, is the best method of packing apples for cold storage. This double wrapping makes practically an air-tight cell for each apple, thus preventing any spread of decay.

In order to test the matter a few barrels were placed in storage without any wrapping whatever. The varieties selected for this test were Ben Davis and Winesap. They were placed in the same storage room and received exactly the same treatment as the others, yet fully 70 per cent. of them were decayed when we took them out June 1. Not only were they decayed, but those remaining in a firm condition were so badly discolored and had lost flavor to such an extent as to render them wholly unfit for either show or market. A few of the same varieties were wrapped simply in newspaper, not using the waxed sheets. Of these about 30 per cent. were in very poor condition June 1, while the same varieties, packed and stored at the same time, using the double wrapping of waxed sheets and common paper, remained in almost perfect condition as late as November 1.

EASTERN DEMAND FOR COLORADO FRUITS.

R. J. COFFEY, Delta.

In the fall of 1894, I shipped my first apples out of Colorado to the big apple show held in October of that year in Missouri. I sent fifteen hundred pounds of Jonathan, Rome Beauty, Grimes Golden, Ben Davis and some other winter varieties, and won all the honors at the three-day show for size, color, flavor, etc., for every apple in the fifteen hundred pounds was a perfect beauty. Immediately after the Missouri exhibit I was deluged with letters of inquiry from leading horticultural editors, fruit growers and apple dealers from Maine to New Orleans and California.

In the following fall of 1895, I visited my old home in Pennsylvania, and also the cities of Chicago, Washington, Baltimore, Philadelphia, New York and Boston, where I looked up all the largest apple dealers and exhibited to them a trunk full of selected specimens of Colorado apples, pears, peaches, plums and prunes which I had taken with me. The fruit dealers were surprised, and in many of the commission houses we compared the Colorado with the choicest California fruits on hand, and even sampled many of the ripest to learn about the flavor and other qualities of the fruits grown in the two states, and won again the honors for Colorado, and could have sold a hundred car loads of our fruit had the season not been over.

In the fall of 1896 I received many small orders for barrels and boxes of the handsome Colorado apples, and sent them on by express, but I was always careful that every apple so sent was perfect in size, color, flavor and all else possible. As a proof of the good results of this rule I will name but one person among the many who have sent orders every fall since. This person is Mr. Messchert, of Douglasville, Berks county, Pennsylvania, who sends his check for from $15 to $30, and simply says, "Please ship me a barrel or two of those grand Delta county Jonathan and Grimes Golden apples." Mr. and Mrs. Messchert, on every Thanksgiving and Christmas, call in their Philadelphia friends to feast with them on the luscious Colorado apples.

In October, 1897, the Armour Packing Company, of Kansas City, gave me their order for one car load of our best winter apples, and I sent them six hundred boxes, containing fifteen varieties, to be held in cold storage until last June, when they disposed of all at from $2.25 to $2.50 for each forty-pound box. This fall the Armours gave me orders to buy from fifty to one hundred car loads of like long-keeping varieties, but so many Chicago, Omaha, St. Louis, Salt Lake and other apple buyers were here that no one got half the car loads wanted.

With these statements I think the State Board of Horticulture and all growers of good winter apples in Colorado can feel encouraged, and be made bold and daring enough to bud every early summer and fall apple tree now encumbering their land into Jonathan, Winesap, Mammoth, Black Twig, Rome Beauty or Grimes Golden varieties and they will never regret it.

THE SCOPE OF THE COLORADO FRUIT GROWERS' FIELD.

HON. B. F. ROCKAFELLOW, Canon City.

Having assigned to me "The Scope of the Colorado Fruit Growers' Field," it is not necessary to apologize for saying what you know full well; the truths of Holy Writ need oft repeating even to the elect. The scope of our field is searching out every available nook where a fruit tree, shrub or vine can be made to grow to perfection. Following in the wake of the pioneer discoverers in the sixties of the fine possibilities of our soil and climate, there are names whom all Coloradoans delight to honor—Uncle Jesse Frazier, and less than half a dozen other pioneer missionaries, who taught thrift and tree culture by irrigation to our generation. It falls to us to discover more perfect details and not be content with having extended fruit culture by irrigation from the base of the mountains to the desert, and gracing the course with fruits and flowers, thence going to the Western Slope of the Continental Divide, and directing the first duty of the sunny slope waters to the cultivation of joy-giving fruits, until in this short time a larger proportion of the agriculturists of our state are engaged in fruit culture, as a business, than in any other state or country.

Of the average production annually for past five years of 51,453,600 barrels of apples raised in North America, the bulk of them are raised in small orchards, on the farms, with little thought or care given to cultivation. Our hope of greater success lies, not only in the high flavor and color given by higher altitudes and brighter skies, but in elevating the industry by making it a business, and drawing to it people of experience, education and abundant means. Colorado lands, formed and made rich by the wash of decomposed vegetable and mineral properties from the higher altitudes, are kept so by the same process, carried to our irrigated fields by ditches, and at much less cost than the foreign and eastern farmer expends for fertilizers and drainage.

Everything that tends to broaden our field of usefulness, in teaching our children how to grow thrifty, producing trees, where we formerly raised half dead ones, thus making rods produce what many acres failed to do, requires practice, thought and experience in new lines for a country under irrigation. We have few horticultural editors and authors. The masters in our art are reared in the temperate regions. We must be industrious students to keep up with them; closely observing the duty of water, that an over-supply is not used, but just enough as the season advances to promote proper growth of branches with their wood and fruit buds, to so harden up at the close of the season that both body and bud shall go through winter in full vigor.

The press of Colorado deserves much of the credit for the phenomenal growth of horticulture, as well as agriculture in general, in Colorado, hav-

ing been from the first most generous in disseminating information on all its topics, having ever heralded that Colorado products of the earth and air are fruit and vegetables most rare. The railroads, too, are granting us much aid and showing evidences of a great desire to make rates that shall speedily place this enticing industry on a paying basis. Without the hearty co-operation of the railroad and express companies, our horticultural fairs could not have been such notable successes.

The agricultural college is a great agency in increasing the scope of our field in nearly all the lines of development. Its painstaking faculty are working with us in vacation as well as in session and the annual convention. They deserve especially our praise and fostering care. Its experimental work on the plains is likely to demonstrate how they can be made more habitable by surrounding the homes of those who must ever be engaged in pastoral pursuits, in that vast expanse of country, with certain fruits, flowers, vegetables and grasses. The depressions often found in the general trend of the country from the high lands toward the low lands to the eastward get more moisture than the average country, which it is made to retain by trimonthly cultivation. At the Cheyenne Wells experiment station apple trees in many of the lowest places have lived and made a slow, moderately healthy growth for four or more years; gooseberries are bearing, and Russian grass is growing, as well as light crops of alfalfa and corn. The varieties of apples and other fruits that can be made to live and bear in those regions will be an interesting study of which this society will be active promoters. It is believed that varieties of very solid wood growth like the Winesap family, must adapt themselves to the conditions existing if trained low. The great belt of country now barren may yet be made fruitful in the highest degree.

In the Arkansas valley the climate is such that the ant and the bee can not be kept housed up winters. All fruits raised in the middle states thrive here without winter protection. It is a natural sugar beet, alfalfa and fruit field furnishing occupation in which there is every incentive to work, in which it is more gentlemanly to rustle than rust. A field large enough to support an immense beet sugar factory like that about to be operated by the Spreckels Company in California, will be by some far-seeing, unselfish legislature—possibly the forthcoming General Assembly—added to our field of usefulness.

A series of small yet safe reservoirs, from the Grand Canon to the eastern state line, inaugurated by those far-seeing commissioners—Captain, now Ex-Lieut. Gov. David H. Nichols, Alexander Gullett and Charles Boettcher—nominally called State Canal No. 1, has been started so high in the Grand Canon as to utilize the fall towards the plains. It thus has its line of small reservoirs every mile if need be, far back in the country, with farm reservoirs all the way to the river, saving to the state in its first division alone, west to the Canon in 32,000 acres, from that point east, 100,000 acres, in one body by simply saving the waste waters of May and June in the Arkansas river and not robbing any farmer under the old canal systems of one drop of water. Instead it furnishes to him through seepage and springs an everlasting means of replenishing his otherwise dried up canals later in the season. This is all to be done by men sentenced to hard labor, that do not get it, and who can build on state lands a line of stone buildings to house and secure them during construction, and afterwards for barns of settlers.

We can comprehend the scope of this field and see in it the solution of the question how to support our large institution, without large appropriations, that are always grudgingly made. We have seen worked out more difficult and costly problems, from the days of the Clear Creek canon ditch to the present extensive systems in the northern, western, southern and lower Arkansas valley regions. If we are to reach out beyond the

steadily growing markets of our own state, with the hope of a standing in the wholesale markets of the old world, we need this field, our altitude and the varied climatic conditions being such as to insure a never failing supply each year. We need a large area planted in each division, the society having recognized different conditions by marking out the state into such divisions. After opening out new fields to conquer, we are not benefactors, if we set trees, unless we make them produce fruit, such as will tempt the appetite and secure a sure market anywhere. I hope our state board will originate and compile budgets of proverbs and trite sayings applicable to fruit culture in Colorado, that we may not have to wade through those lengthy papers to get at the meat in the nut of horticulture. We bow in reverent thankfulness, as we remember the great work accomplished for our cherished industry by Dr. Alexander Shaw, and rise in loud acclaim over the faithful and energetic manner in which our present secretary has continued the work so well begun by him.

In the perfect quality of our fruit, the scope of our field is the world. Horticulturists must reduce the business of raising, packing and marketing to the same close, scrutinizing systems that prevail in nearly every other branch of human effort, by saving every particle of our cull products in canning, evaporating, cider vinegar and jelly stock. The scope of our field is the sun-kissed, frost exempt spots, nestled here and there between four and seven thousand feet altitude, in the parks, basins and vales of our great state. The ratio of effort required fixes the value between the costliest and the cheapest fruit, the same as between the basis of values of precious metals. No one is safe in boasting of millions of pounds of fruit without a worm this year. Those who did it last year have them, thus illustrating that eternal vigilance is the price of clean, perfect fruit.

When I read of this and that man planting 40, 60 to 160 acres to fruit, I wonder if such person has had the experience necessary to succeed—that is, has the planter the ability and means to care for each individual tree, as it should be, to make it profitable? If not, the large acreage in after years will prove a disappointment, and may not show in quality or yield what a small per cent. of the land planted might have been made to produce. It is the history of fruit tree planting the world over, that people plant more trees than they care for, and as a natural consequence raise more imperfect fruit than for which there is a demand, thereby reducing the general fruit market and the price of fancy stock.

We are pleased to be able to show that all the old-time favorites of the several states thrive in this state, that their flavor, richness, and all distinguishing qualities have been improved by growing a mile higher than in their original home. Without boasting I may say this is almost proven in my own Fruitmere orchard. Right here I wish to call the attention of this convention to the fact that in the market reports of New York, Boston, Chicago, Cincinnati and nearly all eastern cities to-day, scarcely any varieties are quoted except the old-time favorites of forty years ago.

The export demand in a full year has risen to three million barrels of apples, our full proportion of which we can supply via Galveston to most European ports at an expense of one dollar a barrel. When we shall become wholesale shippers there is not a doubt about our securing freight rates that will compare favorably with rates now paid from the interior fruit raising states that are heavy exporters.

Finally, let the scope of our field include special encouragement to practical experienced pomologists, and let the tendency be to perfect small, instead of large orchards, and to more setting of evergreens, ornamental and forest trees, thus making the Colorado orchard homes as beautiful as our mountains are grand.

THE RELATION OF BIRDS TO HORTICULTURE.

PROF. W. W. COOKE, State Agricultural College.

In opening this subject I will read that section of the Game and Fish laws of Colorado, which covers the subject of the protection of our common birds, being section 15 of chapter 8, of the Session Laws of 1897, as follows: "No person shall at any time kill, ensnare, net or trap any robin, lark, whip-poor-will, finch, sparrow, thrush, wren, martin, swallow, snowbird, bobolink, red-winged blackbird, crow, raven, turkey buzzard, oriole, king bird, mocking bird, song sparrow or other insectivorous bird or birds, or any pheasant, quail, ptarmigan or partridge."

It is evident that the person who wrote this section was not an ornithologist, at least not a Colorado ornithologist, for you find there a provision that no person shall kill a whip-poor-will. There was no use in putting that provision in for in Colorado there are no whip-poor-wills. We have a bird here commonly called a whip-poor-will, but instead of saying "Whip-poor-will," it leaves off the first syllable and says "Poor-will,"—the "Whip-poor-will" is the eastern bird and the "Poor-will" the western bird.

In a number of the eastern states the bobolink is specially excluded from the protection of the law because in certain parts of the United States it is one of the worst pests to farmers. But there is no use of mentioning the bobolink in a law concerning Colorado ornithologists for, if I remember rightly, there are only three instances known of the bird appearing in this state, and the bird which we call the bobolink in Colorado is not that at all; it is a true sparrow and should be called the white-winged blackbird, or by its book name, Lark Bunting. It has none of the characteristics of the eastern bobolink which have made it so much an enemy of the rice planters of the southern states.

There is one other little section of the law which seems to indicate that the man who wrote it was not an ornithologist; it says "other insectivorous birds." It seems to imply that the birds that have been mentioned are all insectivorous, while among the birds mentioned are the finch, the sparrow, the snowbird and the turkey buzzard. The latter certainly is not an insectivorous bird and the other birds outside of the turkey buzzard are seed-eating birds rather than insectivorous, so that, so far as their protection is concerned, it is more a matter of sentiment rather than that there is any connection between those birds and anything they may do for or against the farming or horticultural interests of the state.

I wanted more particularly to bring attention to the birds not mentioned in this law that should be protected by law. I think it would be a fair inference that the birds not particularly mentioned are not to receive the protection of the law, and really, the birds that are not protected by this law are some of the horticulturists' best friends, and they are the birds that, under the present conditions, are quite likely to be injured; I refer to the

hawks and owls. It is a common idea that they are the horticulturists' and farmers' enemies, and I do not think that under the Colorado law you could prosecute a person for killing a hawk or an owl, and they are really good friends of the horticulturist. Not, perhaps, so directly as some of the birds I shall mention later, but indirectly they are certainly a great help.

Among the owls we have here, there is only one against which any bad qualities can be imputed, and that is the great horned owl. It is not uncommon in the mountains, and it comes down to the foothills in the winter time and comes out on the plains. It is entirely an animal-eating bird, and while it is in the mountains I doubt if it is any good to anybody, but down on the edge of the plains its food is mostly rabbits, and it is in that respect a friend of the horticulturist. It has much in its favor. The rest of its work is rather against the good of the farmer or horticulturist. It feeds on game birds, the ptarmigan, the grouse and the quail, and it has rather a preference for those, but it eats, of course, any bird that comes along. This is the only one of the owls that has anything against it.

The short-eared and the long-eared owls have everything in their favor. Their regular food is vermin, the mice, the gophers, the ground squirrels, or anything that has its habitation under the ground. Through the entire summer season these vermin constitute their only food. When it comes to the winter season, they eat some birds, but the birds upon which they feed are the insect-eating birds that, although they do no harm to the horticulturist, may be called of no use to him. So far as the long-eared and the short-eared owls bear any relation to the horticulturist, their work is in his favor. We have two other owls of smaller size that are fully as vigorous workers in his favor. The little screech owl has the same habits as the long and short-eared owls, except that it does not prey to so large an extent on gophers and ground squirrels, but is quite as vigorous on mice and other annoying animals.

The burrowing owl is a strong friend of the farmer. It has an especial liking for grasshoppers and crickets, and in parts of the country where centipedes and scorpions are found, they form quite a considerable portion of the burrowing owl's food. It has no bad tricks and it kills numbers of ground squirrels and gophers, although they are more than equal to it in size and weight. It alights on the back of a squirrel or gopher, strikes it at the base of the brain and kills it at once. Thus the owl seems to kill a squirrel considerably larger than itself without any effort whatever. We can say, therefore, that the owls are certainly our friends.

In regard to the hawk, there is a common opinion that it is man's natural enemy, and at one time or another a good share of the states have passed laws offering premiums for the killing of hawks. The hawks can be divided into several sections. You can say of one section that its work is all favorable to man, and of another section that it is about half bad and half good, and of another section that its work is mostly good, and of a fourth section more bad than good. For our purpose we can take two sections, those that do more damage than good, and those that do more good than damage. The first section, the hawks that do more damage than good, constitutes largely the mountain hawks; they do not have much to do with the plains region.

Take the two eagles, the bald eagle and the American eagle—they would be counted among those that do more damage than good, but, of course, they do not trouble the folks of the plains. The goshawk has practically nothing in its favor. It lives entirely upon birds or animals more or less useful to man. Fortunately for us, it comes in limited numbers in the winter season, and nests in the mountains at about 10,000 feet, so that we can count it out of the Colorado bird list. We have one true hen hawk, Cooper's hawk, which has justly a bad name. Hawks that do any particular damage

are comparatively rare, and if a person went out intending to shoot the bad hawks only and keep the good ones, he would probably kill as many that do good as harm.

We have here in Colorado four species of hawk, three large and one small, that are quite abundant, about as numerous in Colorado as anywhere in the United States. Two of them are much alike in looks. These are Swainson's hawk and the red-tailed hawk. The other one, the marsh hawk, can be told from the other species by a large white spot on the upper side at the base of the tail. The male is black or blue, and the female is brown or reddish color, but you can always tell it by that large spot at the base of the tail. This is one of the best friends that the Colorado horticulturist has on account of the vermin it eats. It is often called the swamp hawk, for it lives particularly upon vermin that live in marshy places, and that is where it gets its name of the marsh hawk. It is sometimes called the harrier, as it goes back and forth hunting for vermin.

The other two hawks, the red-tailed and the Swainson, have much the same habits but go more toward the higher ground, and their food is more largely ground squirrels and gophers than mice. The Swainson hawk might be called the grasshopper hawk, for it seems very fond of locusts, and where it can get them at all it is very likely to use them as food more than animals. It is estimated that the ordinary Swainson hawk under favorable conditions will eat at least 200 grasshoppers a day. This is probably our most abundant hawk, and yet, going back in the history of Colorado, there was a time when a bounty was offered for the killing of this hawk, which was considered an injurious species.

The third of the four that we have considered beneficial is our little sparrow hawk. It is too bad that it has this name, for it very seldom kills a sparrow—its food being almost entirely insects and grasshoppers. This hawk stays with us the whole year round and in the winter time it does occasionally kill seed-eating birds that are of no value to the horticulturist. We can say the same in general of all the bird-eating birds. Those that are of value to the horticulturist are the insect-eating birds. A bird to catch an insect must be active, and hence is active enough to get out of the way of hawks or owls and it is only the slow, seed-eating birds that fall prey to them.

Another class of birds not thought enough of by the horticulturist would be protected by our Colorado bird law, although they are not especially mentioned. It seems queer that they should not have mentioned the woodpecker. They are among the very best friends that the horticulturist has. However, the words "other insectivorous birds" would cover the woodpeckers, because they are particularly insect eating. We have in Colorado a pretty fair supply of woodpeckers. There are two kinds that come down into orchards in the winter time that are probably as beneficial as any bird. They are the little black and white spotted woodpeckers—the hairy and the downy. They particularly feed upon insects that bore into the wood. They are true woodpeckers. They have to bore into the wood to get their food, and consequently the insects they live upon are those most injurious to trees, so that their work is almost entirely helpful to the horticulturist.

We have two others, one of which stays here all the year round, and the other is common in summer, the red-headed woodpecker, being the summer one, the other one the flicker or the red-shafted flicker, as it is called, because in flying the shaft lines show a red streak. It is sometimes called the pigeon woodpecker and it is one of our most striking birds. It might be called the ant woodpecker, as there is almost no limit to the ants it consumes. As many as 3,000 ants have been counted in a bird's stomach at one time and the digestion is very rapid. If ants are an injury to the horticulturist, then the bird that will take the ants away at that rate ought to be one of your great friends, and yet that is the one woodpecker that is brought

into the market as a market bird of the United States. I have not seen any in the markets here, and I rather think the enforcement of our state bird law is rigid enough so that they would not undertake to bring them to market. It is one of the beneficial birds that should be kept and encouraged to stay around the farms.

The other, the red-headed woodpecker, can hardly be given a clean bill of health, for, although it is an insect-eating bird, it has the habit of eating some of our most beneficial insects. Quite a share of its food is made up of some of the most beneficial beetles that we have, although probably it does more good by killing bad insects than it does harm by killing good. Another woodpecker that has an entirely different habit is not so very common in Colorado. It has no well known name, and if it is known at all it is probably known under the name of sap-sucker. It has bad habits and in some states it is especially cut out of the protection of the law. It has a habit of pecking holes in trees, and in sections where it is common the apple tree is one of its especial pets. It occurs in Colorado, but, fortunately, when it gets ready to nest it goes into the mountains and breeds there from 8,000 to 10,000 or 11,000 feet. It is one of the most common woodpeckers, but it expends its energies mostly on the aspen and leaves fruit trees alone.

I do not remember to have seen an apple tree in Colorado badly injured. The bird occurs all over the state in migration. I have seen some apple trees injured, but not much. I at one time lived in Northern Minnesota, where it was one of the most common birds, and going into the heavy timber you would find acres of trees completely girdled by the holes. However, I do not think we need fear any bad result from the work of this bird. There seems to be a little question as to the idea of the bird in making these holes. It seems to have a double purpose. It likes the sap, and has a tongue the end of which is formed so that it can make a little groove and so get the sap. And in addition to that it seems to like the soft, tender wood under the bark. If you kill a bird after it has been making these holes you will find quite a lot of this soft wood in its stomach. However, it does some good. While it is on the tree trunk drinking the sap, it captures some insects, so even in that case you can not say it is entirely a nuisance.

Among those birds especially mentioned by our state law I wish to notice a few and to treat them entirely from the side of a horticulturist, for the question in regard to some of these is quite a different thing from the standpoint of the horticulturist than from that of a farmer. It is not strange that in making the law they should mention the robin first. I think the horticulturist could make a very severe arraignment of the robin, more severe than of all other birds put together. I doubt if the other birds altogether eat as much fruit as the robins, and take the summer through there are thousands and tens of thousands of robins that go on stealing fruit. It is quite common to hear it said that during the time of year when fruit is plenty, the food of the robin is particularly fruit, and therefore its damage is more than its advantage.

If we had to deal with but the adult bird, there would be quite a good deal of ground for this complaint. It likes cherries better than most anything else of that general nature, but when it comes to feeding the young he makes quite a distinction between his own food and that which he gives to the young. The young do get some fruit, but the amount as compared to insect food is very small. Because there has been so much said against the robin, its friends have put an enormous amount of work into determining just what kind of food it eats, and they have discovered that the young robins are larger eaters than any other birds. The young birds come into the nest about the time the old birds are making their strongest attack on

the fruits, and yet at that time they are feeding to their young enormous amounts of insect food and worms.

It has been found by actual trial that the young robins, for the first ten or twelve days in the nest, eat at least their own weight in insect food a day. Think what that means, a robin's weight of insect food. When you think of that amount of injurious insects that are being taken out of the world by the robins, I think you can at least have a little patience with them. Of course, when you have a nice cherry tree, and cherries are scarce, and the robins stay on there and eat all day, it is a good deal of a temptation to take revenge. Raise enough cherries to have some for both yourself and the robins. I suppose the earthworms that the robins eat would hardly be counted in favor of the robin. There might be some question as to whether the earthworms are an advantage or a disadvantage, but I think the present idea is that they are an advantage, so that the amount of earthworms that the robin eats would hardly be in its favor, but when you take that out, there is still an enormous amount of insect food which it eats, which if left would be a great deal greater disadvantage than the eating of the cherries and raspberries which the robins consume.

What has been said of the robin applies to a greater or less extent to a number of the common birds that interfere with fruit crops. Outside of the robins, there are not very many birds in Colorado that steal fruit to do much damage, and you could afford to have their number increased quite a good deal. The Colorado horticulturist needs to cultivate the birds to the best of his ability. There is no danger of getting too many. By being careful not to disturb the birds you can increase the number.

There is one bird that has made a bad reputation from the standpoint of a horticulturist, and that is the cherry bird, or the cedar bird. I have not heard anybody complaining of this bird in Colorado. However, they grow here; I saw quite a large flock a few days ago, but I do not remember of any one complaining of them here, even where there is quite a large amount of cherries raised. Where I lived in Southern Wisconsin, they were a real nuisance, but in the course of a year they eat quite a number of insects. It is a small bird, rather grayish, and its distinguishing characteristic is a tuft of feathers on top of its head, and a little red sealing wax on the end of the wings. This bird has about as much that can be said against it as any species of bird we have. A great many are killed, on account of their fondness for cherries, but even it can be said in favor of them that they do kill a large number of insects, and their particular food is one of the worst worms, the canker worm, which is a worm that the cherry bird seems to like about as well as anything else. If there are canker worms in the district, even when cherries are ripe, you will find a larger proportion of these worms in the bird's stomach than of cherries.

The oriole, one of our common summer birds, is a beneficial bird; it lives almost entirely upon the bad insects. This law also particularly mentions the raven, although it is not common enough in Colorado to cut any figure. Neither is the crow, which is mentioned in the law. Whether or not the crow is of more benefit than injury does not concern the Colorado horticulturist. The bad they do is not to the horticultural interests, and it is entirely favorable to the horticulturist. What has been said of the crow, can also be said of the red-winged blackbird. Taken in reference to the farmer, it is a question whether there is more good done than evil, but in regard to the horticulturist you can say that the work done is entirely good. It does not injure fruit or vegetables to amount to anything, but it is one of your strongest allies in combating the insect pests.

So in going through the list of Colorado birds you will find that the birds favorable to the horticulturists are infinitely more numerous than those that are

unfavorable. They are helpful to the horticulturist through the insects they kill and the ground vermin they destroy. Take the birds as a whole they are great insect regulators. Wherever you find any kind of an insect getting the upper hand, and becoming more numerous than it ought to be, you will find the coming in of birds to combat them. They are of the greatest help in keeping down grasshoppers. Kill all the birds of the state of Colorado for half a dozen years and all the other agencies we could apply would hardly be a drop in the bucket at combating the ravages of the grasshopper. I have been particularly struck with the action of blackbirds toward the box-elder worms. That is one of our particular nuisances, and just as soon as the worms appear the blackbirds come also. They go to the box-elders and live there, and destroy thousands and thousands of these worms.

It would hardly be expected that I would close my talk without saying something about the English sparrow. It is a newcomer, but is present in all of Colorado east of the main range. I have not received any information of it west of the range in Colorado, although it is very common in Salt Lake City, and pretty much over Utah. But on the plains region, from Kansas and Nebraska through to Denver, they are not uncommon. This is one of the very few birds of which the most ardent admirer has not been able to say a good word. It was brought over here to combat the canker worm in New England. The idea of bringing over a seed-eating bird for the purpose of killing worms! There was once a very exhaustive attempt made to find out what the English sparrow ate, and something over 500 birds were killed and insects were found in the stomachs of rather more than half of them, but when they came to strike the balance they found that the birds had eaten just as many beneficial insects as they had of injurious insects. So far as their insect work was concerned, they were found not to be an advantage.

The man making the investigation had the curiosity to kill at the same time one of the true insect-eating birds. He killed a cuckoo in the same locality and the weight of the insect remains in a single cuckoo was equal to the insect remains in the whole five hundred sparrows. The cuckoo had lived almost entirely upon the injurious insects and the sparrow had taken the beneficial and the injurious in about equal quantities. These birds were killed in a district where the leaves of the trees were being stripped very rapidly by worms, and yet, out of those five hundred sparrows, there were only two that had any of these worms in their stomachs, so that the advantages of the English sparrow are practically none, and its disadvantages are about as many as could be crowded into one bird.

The greatest among its disadvantages is its driving away other beneficial birds. I do not know that the grain that the sparrow eats amounts to very much, although I have seen fields of oats and wheat pretty badly injured. In large flocks they eat a lot of grain in a day. They are not yet here in large numbers, but they increase very rapidly, and by their increasing drive away the very best insect-eating birds. The birds that are most common around our homes, and that live almost entirely on insects are the birds that are the most likely to be driven away by these sparrows. Leaving out that one bird, I think our Colorado bird law should be not only as it is now, covering all birds commonly called insect-eating birds, but I doubt if we should miss it if we should extend the law over the whole of our feathered neighbors.

I am asked in regard to the blue jay—of course it is, to a certain extent, a grain or insect-eating bird, but for the most of the year it lives on animal life. Through the winter time it lives very largely on the larvae of insects. It is decidedly a beneficial bird, and our Colorado blue jay has not the bad habit of the eastern blue jay, that of killing the young of beneficial birds and of eating their eggs. About the same would be said of the magpie, except that it really is more of a nuisance. It kills a good many young birds

and eats a great many eggs. It does not do very much more good than damage. The seed-eating birds ought also to be protected, as they are a source of protection, in case an outbreak occurs. In Nebraska at the time the grasshoppers came all of the seed-eating birds practically ceased to eat anything but grasshoppers, and it is true of all seed-eating birds—they serve as a friend in reserve.

DISCUSSION.

Mr. Sawyer: We have two birds on the western slope. One I believe is a blue bird, commonly called the blue robin, and the other is a small bird which does much damage to the fruit. I have had trees which were almost denuded of fruit by the birds in the early spring.

Professor Cooke: I think perhaps that the latter was the cherry bird. As I said, it has a bad name. The other one belongs to the family of jays, and although it does some damage, it lives almost entirely on insect diet and does some good.

Mr. Sawyer: The woodpecker also seems to destroy trees.

Professor Cooke: I do not think the sap-sucker will ever become a bad factor in Colorado. It is a Colorado bird, but nests in the mountains. There is no record, so far as I know, of its nesting below about 7,000 feet. Its distinguishing mark is the red throat latch, and the male has a little red streak across the tuft.

Question: Which is the burrowing owl?

Professor Cooke: The owl that lives near the prairie dog towns. And the prairie dogs and other animals and vermin serve as a large part of its diet.

Mr. Brothers: I would like to ask if in the interests of horticulture the snakes, toads and polecats should not be protected?

Professor Cooke: That is against the marsh hawk. It does eat snakes, toads, frogs and polecats. The polecat is the very best friend you have.

Mr. Coburn: You would not show any leniency to the coyote, would you?

Professor Cooke: I do not know of any particularly good quality that it has.

Mr. Brothers: Why are the ants counted as the horticulturist's enemies?

Professor Cooke: I suppose the scale lice are among the worst enemies the horticulturist has, and the ant is a friend of the scale lice.

Mr. Coburn: I would like to refer to what you said about sap-suckers. On the western slope the sap-suckers are not there in the summer time, but in the fall of the year, about the time the prunes come, they make their appearance and go onto the healthiest trees and peck a little row of holes around them. If we did not do something they would destroy the whole orchard.

Professor Cooke: That is the condition in some parts of the country, but I have not seen it in Colorado.

Mr. Coburn: We have to take means to kill them off, or they would kill the whole orchard. We can go up into the mountains and see where the ash timber is all dead. They pick holes during the day when the sap is going down. There will be a ring clear around the tree, and early in the morning we find those birds lying there. It seems to be the young birds more than the old ones, and they lie right there, and suck the sap, to get their breakfast. Some of our people have made the practice, where they have picked this ring of holes, to take an old pepper box and pepper the holes full of arsenic, and when the sap-sucker comes and goes to sucking it gets the arsenic, and we find it there with its head dropped back, dead. Then we also get them with a shot gun.

Mr. Upton: Last year you made some remarks and gave us an article in regard to retaining and restoring fertility to the soil, and was asked at the close of your remarks if you thought that seeding the orchard to clover

was advisable, and you replied as follows: "There is a great deal of misunderstanding in the United States regarding red clover and alfalfa. They belong to exactly the same class of plants, and the action of the two plants in regard to taking the nitrogen from the air and putting it in the soil is exactly the same; also in putting their roots down. The alfalfa is the stronger of the two plants. Alfalfa will go down deeper and deposit more at the surface than the red clover. If you were east of twenty inches of rain fall, where the subsoil has water in it, raise red clover. West of twenty inches raise alfalfa, because it will do all that the red clover would and will give longer returns, for red clover lives for only two years, although it is a fact that in Colorado, under our conditions, it soon changes to a perennial. Now, in regard to the setting of the ground in the orchard to clover, it is merely a question of keeping the vegetable matter in the soil. Whenever you keep your orchard clean, and neat and nice, especially a great part of it, you are simply inviting nature to burn out the vegetable matter that is there."

In regard to that, it occurred to me that we were carrying this clean cultivation to an excess. Some of my neighbors have quoted this to me as being an objection to clean cultivation and have claimed that Professor Cooke took the ground that clean cultivation was detrimental, that we should plant alfalfa or clover.

Mr. Honnett: What do you mean by clean cultivation?

Mr. Upton: I mean by cultivating the soil so as to keep down the weeds and any undergrowth.

Professor Cooke: The question of clean cultivation or not is largely a question of the mechanical condition of the soil. You can take soil which had in the beginning, before you planted the orchard, a large amount of vegetable matter, and keep that clean cultivated, and each year you take out some of that vegetable matter. Just how long you can keep that up will depend upon how clean a cultivation you make and how much you turn up the soil, and how much vegetable matter you had to be taken out. If we have a soil which bakes easily we have to work all the time to keep vegetable matter in there, otherwise the soil would bake as soon as the ditch water struck it. If a person has a pride about the matter, and wants to keep his orchard clean cultivated, I suppose it would be best to supply vegetable matter once in three, four or five years, say, put in a crop of clover and turn that under, and just as long as he can keep that vegetable matter in the soil, he can go on with his clean cultivation. The trouble is a person will start with clean cultivation and wait until his vegetable matter gets pretty well out, but if he will begin at the other end and take the soil which has vegetable matter in, and keep it full, there is no particular objection to his using the clean cultivation.

Mr. Coburn: Do you think there is any particular virtue in letting a crop of weeds grow up and then plowing them under?

Professor Cooke: The man who does that is likely to keep the vegetable matter there. It betters the mechanical conditions.

Mr. Honnett: I believe that some of our very best plant authorities go upon the theory that it would be best, every two or three years, to put in a crop of clover, and cut the clover down and allow it to remain there; that it acts as a mulch, keeping the ground shaded, and at the same time provides plant food.

Mr. Brothers: If I do say it myself, I have an orchard that is clean from weeds, and I cultivate it. My main point in doing so has been that I found that immediately after I let the water run on my orchard, if I cultivated it, as soon as it was dry enough, the ground did not bake and it held the moisture three times as long. I let but few weeds grow in my orchard if I can help it; I have had an idea that I could raise better fruit that way, and keep it much freer from insects.

Mr. Payne: How deep do you cultivate?

Mr. Brothers: The last two years I have sown rye in the fall, let it grow about knee high and put a chain on the beam of the plow and turned that rye under, and then from that time on I keep watering and cultivating all summer. We cultivate it two or three inches deep. We first plow it five or six inches deep and then cultivate it the rest of the season, two or three inches deep.

Mr. Coburn: I would like to ask whether you succeed in raising any better or finer fruit than some of your neighbors that let their orchards grow up to weeds?

Mr. Brothers: I think Mr. Coburn knows, and wants to make me acknowledge it. But the truth of the matter is that I believe I work harder to take care of my orchard than any man on Wheat Ridge, unless it is Mr. Byers, and one or two more men there, and I spend more time in trying to get rid of insects. My neighbors say that I sit up nights to study how to get rid of insects, and yet that they do not know of any man whose orchard has more insects. That is what one of my neighbors told me, and I think it is true. I think the worms like the looks of my orchard.

Mr. Tobias: I would like to know how you think this plan would work, professor: To have the orchard clean cultivated until the first of July, then sow it to buckwheat, allowing it to remain on, then repeating the treatment next year?

Professor Cooke: That does fairly well, and still buckwheat does not have much vegetable matter, it does not put much vegetable matter into the ground. The winter rye would put more vegetable matter in the soil.

ORCHARD OBSERVATIONS IN THE YEAR 1898.

W. B. FELTON, Canon City.

The season of 1898 was extraordinarily late in Canon City, owing to a cold March, a favorable May and extreme cold during part of June. The fruit was late in getting started, and was consequently late in ripening. As an illustration of the lateness of ripening, I will say that the Elberta peach, one of the best raised in this state, which I have always heretofore marketed by the middle of September, was not ripe until the first of October. The grapes were also late. I also had another variety of peaches, which are later still, but which always ripen. This year they did not ripen at all.

We had a very fair crop of all the small fruits and grapes; more than an average good crop of plums, and every peach tree in the country was full. I have always been in the habit of laying down the peach trees and covering them, and did so last year, but those that were not covered and had no protection at Canon City were full of peaches this year. The apple crop was very light. From three hundred Ben Davis trees I did not get as many apples as I did from sixteen Winesaps, and yet the Ben Davis were considered a great deal better. The Winesaps did not bear last year, and the Ben Davis were over-loaded, so that I think is the cause. The Ben Davis were not able to make a crop this year. It is a natural result, with trees that have borne two or three crops—they will not then bear two in succession.

My trees have always borne well in favorable seasons. I have averaged 475 barrels of apples to the acre, and when trees bear that way they can not mature the crop and make buds for the next year. So that when we talk about raising a good crop of apples every year in this climate, where we irrigate, it is not true. I suppose that when we see that there are going to be such large crops, if we could thin them out, they would go on bearing the next year. This year I had some new varieties come into bearing. My Japanese plums did this, and I was exceedingly well pleased with them. The only objection I have to them is that they bloom a week earlier than any other varieties, and are more apt to be caught by frost.

I also had two varieties of apples that I never raised before and have never seen in this state. One was the Shackleford, which is a very thrifty tree, with large apples, as large as the Ben Davis, and as attractive in appearance and of considerably better quality. They, however, like the Ben Davis, are afflicted with the habit of being wormy. The other was the Bostwick Queen. I find it to be of a very excellent quality and quite free from worms. There is a theory that has been advanced in the last two years, which is that the apple of which the calyx closes the soonest after the blossom falls is much less likely to be wormy than those that have an open calyx. The first brood of the codling moths lay their eggs in the calyx, and so, on an apple after the calyx has closed up, they are of course unable to lay their eggs in it, and one that closes soon after the blossom falls has, of course, that advantage

—at least that is the theory—and is less likely to be troubled with the codling moth than those where the calyx remains open for a longer time. The Winesap is not a wormy apple; a very small percentage of this apple will be wormy, when the Ben Davis are very wormy. This year, owing to the fact of having a small crop of apples, we naturally expected that about every apple in the orchard would be wormy, from the fact that there were fewer apples and just as many worms, but my Winesap, and one or two other varieties that were full of apples, were more free of worms, but the Ben Davis apples, that were scattered on the trees, were nearly all wormy.

As regards the blight, we have more of it in Fremont county this year than ever before, for some cause unknown, although I had none in my orchard, and none in my immediate vicinity, but other portions of the county were afflicted very badly. Mr. Gale has a place on Beaver creek, about ten or twelve miles from Canon City, and he told me that his orchard of 100 acres was badly afflicted. We had the usual amount of pear blight, and I now desire to say that Mr. Gale used very thoroughly Mr. Woodbury's blight cure, and his testimony is that the trees treated the most faithfully had the blight the worst, and came to sudden and untimely death. The pear blight started in the spring pretty strong and as the season advanced it did not seem to spread. I went through my orchard once and cut out the blighted parts and from that time on there was hardly any appearance of blight among my pears. I do not pretend to know anything about treating blight except to cut out the affected parts.

Regarding the codling moth I have told you the condition of my trees, but I have a neighbor, a Mr. Catlin, who has a large orchard which did not bear much last year, but it was very full this year, and extremely free from worms. He did not spray at all, nor did he put on any bandages, but he washed the trunks of his trees with crude petroleum, using it instead of lye. He had hogs running in his orchard all the time. I have heard from time to time, during the last two years, about the benefit of hogs running in the orchard, but have not had much faith in it. I have picked up apples daily and looked to see how many worms were in them, and could hardly ever find one, and so I concluded that most of the worms leave the apple, and could not see that hogs would do any good, but when I struck this orchard of Mr. Catlin's and saw the trees full of apples, with very few worms, no spraying, no bandages, and nothing but hogs, I thought that it might be worth considering.

On the other hand, a neighbor living a mile and a half from me has an orchard that did not bear last year but did so this year. He sprayed his orchard six times with paris green and it is free from worms, while his neighbor's is wormy. My plan has been to spray and also use bandages, but I never get as good results from spraying as I have desired.

I will state another instance in which I am interested. A man living at Canon City by the name of Bond had two brothers living in Oregon and they came on a visit to him and told him that in Oregon they had a new preparation for spraying trees that was very efficient in cleaning out the worms. Their orchards had gotten so wormy that they thought they would have to give up raising apples, and they got hold of this formula and it was the best thing that they ever tried. There is no arsenic or other poison in it, they say, but what it is I do not know except that it is very cheap. They sprayed once in two weeks for three months, and will give a dollar for every wormy apple found in their orchard. However, it seems that if this is true our scientific men would have gotten hold of it, if it had been used long. I am going to get the formula and try it on my fruit trees.

With our short fruit crop, generally, this year there are very good prices, which is natural. Statisticians state that the apple crop for 1896 was something over seventy million barrels, last year forty-six million and this year twenty-seven million barrels, being the shortest crop in the United States for many

years. What it will be next year is another thing. The probabilities are that with the partial failure last year, and the very short crop this year, next year will bring us a large crop with low prices. This year seemed more like old-time prices.

Another thing that has worked against the apple growers in this state for the last three years is that three years ago just at the time apples were ready to be harvested and marketed there came a railroad cut on rates from the east, and the next year when we did not have much of a crop there was no cut. Last year, when we did have a crop, they cut the rates again. This year the railroad rates are where they ought to be.

DISCUSSION.

Question: I would like to ask about Mr. Frazier's orchard. He never sprayed—when alive. Are the apples wormy?

Senator Felton: I understand he did not have much of a crop, and that the apples are rather wormy. He treated his orchard very thoroughly, washed and scraped the trees. He also put out lamps to catch the codling moth.

I would say I have found that the Bostwick Queen, the Winesap and the Walbridge are good apples, and not affected so badly with the codling moth as many others. We had quite a talk about the Utter's Red, and I found out my Utter's Red tree was a quince tree. I do not agree with some that the Genetons are free from worms, or as much so as some other apples. They grow too much in a bunch. If the Genetons are thinned out and only one apple left on a spur we will have larger and better apples.

THE CULTURE OF FOREIGN GRAPES.

WILLIAM BOMGARDNER, Grand Junction.

The culture of foreign grapes in Colorado as a producer of wealth to the majority of our fruit growers seems to be a small and insignificant matter, but I beg to differ with them, and am satisfied that I have the evidence that will convince some at least that there is gold and silver in the foreign grape in Colorado as well as in the mines. Not only the wealth, but what is any more pleasing to the eye than a large, highly colored cluster of grapes and its foliage? And after enjoying its delicious flavor and abundant, health-producing qualities, this should encourage more extensive production.

In my mind there are thousands of acres of land in the sheltered localities of this state that are well adapted to the culture of foreign grapes. I do not make a specialty of grape culture, merely growing some in connection with other fruits. I have about one acre of foreign varieties, and for the past eight years it has brought me more money than any other acre of fruit in my orchard. This year has been an exceptionally good one for grapes, as Providence has sent us glorious sunshine and no rain; thus we were able to irrigate when it was needed. My own acre of foreign grapes netted me this year, after allowing a good margin for what was sold and consumed at home, over two hundred dollars.

To those intending to plant a vineyard I would say: First select land with thorough drainage, and if possible with a slope to the south. Plat the ground so that the rows for irrigating will not be over ten rods in length; make the rows eight feet apart and set the plants six feet apart in the row. Growers in different localities would have to experiment to some extent to find the varieties best adapted to the soil and climate. For the Western Slope and the sheltered localities of the Arkansas valley I would recommend the Muscat, Malaga, Purple Damascus, Rose of Peru, Black Farrar, Black Spanish, Black Hamburg, Flame Tokay, Cornechon and Sweetwater. Thompson's Seedless and Sultans also do well with us.

In this locality we get best results by covering up the vines in winter. After frost comes, prune off all the vine, leaving only three or four stalks to the plant, and from two to three buds to the stalk or vine, always leaving the new wood. Cultivate after every irrigation, and irrigate when it is necessary. There is no rule or time for irrigating—the grower must use his own judgment in the matter. It is best not to irrigate much the latter part of July and August, until the grapes begin to show signs of ripening; then irrigate again and they will fill out much better and ripen more evenly.

There is work needed in the vineyard before and after the bunches or clusters are formed, in pulling out the suckers and pinching back the vines, which draw heavily on the sap that should go up to the wood bearing fruit. So far I have never seen any sign of fungous growth or disease of any kind, and the plants have been entirely free from insect pests.

The next best wealth-bearing product I would advise Colorado horticulturists and agriculturists to grow is the sugar beet, and the day that Old Glory unfurls on the spire of a beet sugar factory in Colorado, we will all stand at least one round higher on the ladder of success.

CAN PRUNES BE RAISED SUCCESSFULLY IN COLORADO?

O. D. SHIELDS.

One of the leading questions of the day among horticulturists and those who are preparing to enter the field is, what will we plant to insure the largest returns? This is a matter of no small importance, and needs careful consideration—for the Good Book tells us that "Whatsoever we sow that shall we also reap." It behooves us, then, to plant only those things that are in demand, and can be handled with the greatest certainty of success.

What are they? is the next question that naturally arises. Just now a great cherry wave has struck us. During the past season we have sold in Colorado, alone, over 40,000 cherry trees—and other firms also have sold many thousands in the same territory. We are having many inquiries for cherry trees—and the fever does not seem to have abated. That cherries have been profitable we will admit, but will they continue to be? There are enough cherries planted to-day in Colorado to more than supply the demand for that fruit in its fresh state. The only outlet for the surplus is the canning factory—and that can not afford to pay high prices. Then, too, the cherry must be picked and marketed on short notice—or else it is lost. If you do not live near a town you will find it a difficult task to get pickers for a commercial cherry orchard.

The peach is rather an uncertain crop, and, in many years, a total failure. The apple has been the king of fruits, and will continue to be the main stand-by; but it, too, has its off years. In planting we should aim to set something that will fill in, and give us some returns in these off years—if it is possible. What shall it be? I answer prunes. I have been talking prunes so much for the past two years that I am accused by some of my friends of being "full of prunes." But if that is true I would prefer to be filled with prunes than some other things.

Going into the history of the prune we find by statistics that in 1821 there were 125,300 pounds of the fruit imported and that quantity kept upon the increase till we find that in 1888 82,914,579 pounds were brought into this country. In 1882 we paid for foreign prunes $3,084,304! Think of that vast amount of money! In 1854 the patent office imported scions of French prunes and distributed them in the northern and eastern states. At that time it was thought the state of Maine, where the curculio was scarcely known, would in time supply the world with dried prunes. In 1856 scions were sent from France to California—and the industry began to thrive. The growth was but slow at first; in 1881 the largest growers seldom put up over five or six tons of the dried fruit, yet in 1896 the product of the state was estimated at 55,200,000 pounds. Washington, Oregon and Idaho are also engaged in prune culture very successfully, and to-day we are exporting prunes—which I am reliably informed find a ready market, as the American product is usually larger and finer appearing than any others.

In the past two years I have seen many prune trees in Northern Colorado bearing heavy crops, and know of Italian trees seventeen years old which, with little or no care, have not missed a crop in ten years. They are growing and fruiting very heavily. Hungarian trees set three years ago in Loveland have borne heavily the past season.

We have planted many varieties, and, with the exception of the Tennant, all are making fine growth and are hardy. The Tennant seems too tender, and has winter killed. Prunes are being grown successfully in Idaho at an elevation of 6,000 feet. In the Arkansas valley B. U. Dye is raising and drying the prune, and a number of others have done so on a smaller scale, and all are enthusiastic over the results attained. The fruit reaches good size, is very choice, and, while in many sections three pounds of the green fruit are required to make one pound of the dried, in Colorado it takes but two pounds.

In a recent letter from Mr. Dye he speaks of his prune orchard as follows: "The French or Petite prune is a heavy producer and a fine drier. My trees are only six years old, but produced from 100 to 150 pounds to the tree this season. They fruit every year. Our Italian or Fellenberg prunes were set in the spring of '94, and are now beginning to bear. The fruit is excellent and as fine as any prune in Oregon."

Now to the point. That prunes will grow and fruit heavily in all the fruit sections of Colorado there is no doubt. The expense of transporting prunes from California to Denver is from one and one-eighth to one and one-quarter cents a pound. We, in Colorado, have that much the best of it. Land suitable for prune raising costs in California from $200 to $500 an acre; here in Colorado, from $25 to $75 an acre. We can raise just as many pounds to the acre here as can be raised in California. There is to-day a heavy demand for choice plums and prunes in the green state. The past season they brought from four to six cents a pound. If we had raised a surplus we could have dried them and sold the dried fruit at from three to six cents a pound—according to grade. An evaporator, I am told, with a capacity of 600 pounds a day, can be bought for from $25 to $30.

I claim then for the prune that they seldom miss a crop; are heavy yielders; can be dried and held indefinitely; and will give us handsome returns. A prune orchard of ten acres is worth, at a conservative estimate, $5,000 at the end of five years, at the end of which time it will pay interest on that amount, while at the end of eight years will yield an income of at least $200 an acre—at present prices.

A word as to the soil required—also the irrigation. Prunes will thrive on any good soil. In some sections adobe is preferred; others claim that a sandy clay loam is best. It is not advisable to irrigate later than from six weeks to two months before the ripening season—as the fruit is likely to crack and does not mature so well. In some of the prune orchards in California the past season there was no irrigation, owing to shortage of water; and no rain of any consequence fell. Still, by intensive cultivation, fair crops were raised. In conclusion I would say that my convictions as to the three best and most profitable fruits to plant to-day are the apple, the prune, and the large varieties of plums.

DISCUSSION.

Mr. Sawyer: I have looked into the prune question as closely perhaps as any one, and am thoroughly satisfied that in Colorado there is no money in it. On the same mesa on which my place is located there are 17,000 prune trees four and five years old, and any person could buy the ground for $50 an acre. Mr. Coburn said he would give more for the land without the prunes than with them. I have heard the same statement from other people who have looked into the question. It was stated by a gentleman from Oregon that there were thousands of acres in prunes that never paid expenses. Our Colorado prunes would not sell on the Denver market with

the Oregon prunes. Their prunes are put up in better shape and I believe are better protected. Then, we know that help is more expensive in Colorado than in Oregon and California. In order to carry on the prune industry successfully it must be on a large scale. Dried prunes on the Denver market have retailed as low as eight pounds for a quarter, and there is no money in those prunes to the grower. Take the California reports and follow them closely, and you will come to the conclusion that we do not want to raise prunes.

Mr. Kain: During the summer perhaps we had fifty boxes of prunes in the Arkansas valley. We were taking them to La Junta and getting four cents a pound in the green. I went down with a load of peaches, and they sold readily. One of my customers said that a man had come in with a large load of prunes, and started to peddle them over the town, asking seventy-five cents for a twenty-pound basket—three and three-quarter cents a pound—but he finally sold them at sixty-five cents a basket. One of those baskets that would hold twenty pounds of grapes would hold thirty-seven to thirty-nine pounds of prunes. So that the prunes sold at less than three cents a pound. I had great confidence in growing prunes in Colorado, and planted about three acres and they have been bearing this summer. I do not know what we will be able to do with them unless we dry them.

Mr. Crowley: I do not know a great deal about the prune business, but Mr. Dye has had his prunes evaporated, and put up in the finest way. He thinks a great deal of the future of the prune business. If it could be made a success it would be well, for the trees do not have so many insects as other fruits, nor do they have off years. While prunes may have sold at four cents, they probably were of the poorer kind. The best qualities sold mostly from five to six cents. There is no question about being able to grow them —the only question is the market. James A. Davis, the Santa Fe commissioner, has looked into this business, and being in touch with the California fruit growers, should know a great deal about it, and he says the prune outlook is all right and encourages planting them.

Senator Felton: I want to say something that was told me this summer by a man who had lived in California several years, but who now resides in Chicago and does an extensive fruit business. This gentleman told me that there was an immense demand for canned prunes in Chicago, New York and Boston. He said that put up as canned goods they were the best and most desirable on the market at the present time. As for the drying prune he said the French was the best variety.

Mr. Shields: I wished to bring out a point that the prunes might become more profitable than cherries. Cherries have to be picked on such short notice, and prunes can hang there until after the other fruit becomes ripe.

Mr. Wilcox: While I am not "full of prunes," I suppose you have all heard about the experience of the man in Idaho who shipped prunes to the east and his over-draft was $150. Prune growers in California have in the last ten years invested twenty-five million dollars in the business, only to find that it is a failure, commercially speaking. Ten years ago they had 7,000 acres in prunes there, and now they have 55,000 in bearing and 10,000 more which will be fruiting in two years. The prune crop in California alone, this year, is 85,000 tons. In two years more they calculate that the prune yield of California alone will be 100,000 tons. What are they going to do with all those prunes?

Mr. Shields: I would like to ask if the California prunes are not very inferior this year?

Mr. Wilcox: I suppose they are. All fruits are in a poor condition, as they have had no rains in California for eighteen months.

FRUIT CULTURE IN COLORADO.

H. E. VAN DEMAN, Parksley, Va.

It was my pleasure, as judge of horticulture at the Transmississippi exposition, to carefully examine all of the fruit exhibits there, and those from Colorado among them. Knowing what I did of the fruits of that state from having seen them, more or less, for many years past, and having traveled over the regions on both sides of the mountains, I was not surprised to see the fine display at Omaha. Colorado has reason to be proud of her position among the fruit growing states of the West.

While there is reason for the fruit growers of Colorado to congratulate themselves upon their fertile soil, abundant water supply, favorable climate and nearness to markets, yet they must remember that there are other regions in the west where the conditions are quite similar. The displays from other states at Omaha gave positive evidence of this. Idaho had a very attractive exhibit from both the northern and southern sections. Every fruit that will grow in Colorado will grow there. The apples of northern Idaho were especially fine and they gave promise of being good keepers, too. Moreover, they are exceptionally free from insects and fungous diseases. Although New Mexico was, by a blunder of a subordinate official, cheated out of showing her fruit display after it had been received at the exposition, and therefore it did not have an opportunity to appear in comparison with the displays from other places, it was good, no doubt very good.

If there is any fruit that Colorado may justly be proud of, it is her winter apples. The altitude of the valleys in which they are grown, and may be grown much more extensively, makes up for her southern location among the apple growing states. That they will keep well is certain. I have seen it tried repeatedly and the condition of the exhibits at Omaha from various counties, east and west of the Continental Divide, proves this again. In appearance Colorado apples are almost beyond favorable competition from other states. Their freedom from fungus and scab is remarkable in all sections of the state, owing to pure air. As I have often noted before, their complexion and delicate waxen color are almost incomparable among the apples of the whole world.

These facts and the ease of transporation to the great markets, to say nothing of the smaller markets in the mining regions close at hand, should be encouraging to the apple growers of Colorado. The ready cash put into their pockets this year ought to be a convincing argument in this direction. If I had any advice to give the fruit growers of Colorado as to what they should grow mainly, it would be the highest grade of winter apples they can produce. There will always be a fair market for them. The culture of the peach, pear, apricot, prune, small fruits and grapes, proves a success in most parts of Colorado, and while I would not disparage their culture, the apple is her main fruit crop east and west. Peaches, plums, grapes, etc.,

may cloy on the public palate, but good winter apples will always sell well and keep well.

What varieties shall we grow? may be asked by the Colorado apple grower. I would say, only a few. Be careful not to plant too many summer and fall varieties. About all that will be needed is to supply the home markets. There will be little call for apples of this class to ship outside the state, except in case of scant crops to the eastward, as it was this year. Ben Davis is perhaps the most profitable apple to plant in Colorado to-day. York Imperial is my second choice, if not my first. I have been charged with causing the planting of more apple trees of this variety, both east and west, than any other person, and I am proud of it. It is a variety that is liked in the orchards, in the market and in the family. It is a good apple to eat. Unfortunately, very few apple trees of this variety have been planted in Colorado. Let me advise the setting of more trees of the York Imperial. I have known it for more than thirty years and never unfavorably. At Omaha there were displays of it from many states. Missouri and Kansas had it as one of their standard commercial varieties. So should Colorado in the near future.

Rome Beauty is a good apple for western Colorado in particular. It is somewhat likely to be blown off in the eastern orchard, and does not keep as well as from across the Divide. Jonathan is hard to beat for quality and color, and is good in the orchard and in the market it stands high. Grimes' Golden can not be equaled for delicate flavor, and in clear, waxen color it has no superior, and for fancy market and home use there is none better. Missouri Pippin is one of the most profitable, if not the most profitable, apple for the first ten and fifteen years of an orchard of all varieties. It bears so early and so heavily, that it is just the one for a filler. It should be planted between the more hardy kinds, to occupy the space until they use it, more than as a permanent tree. The bright red color and fair keeping qualities of this apple make it a favorite for market, and those who have planted it for home use will soon have plenty of winter apples.

There are many varieties of apples that it is well to try and grow in Colorado more generally, perhaps, than is being done at present, and the Gano is one of them. The Ingram is a red striped apple of medium size and good quality that does well in the orchard. Arkansas or Mammoth Black Twig, by some called the Paragon, is a seedling of the Winesap that is likely to succeed the Winesap, in part, in the markets. The Stayman is a much better tree than the Winesap, is fully as good in color and quality, and is larger. When this variety becomes well known, it is my belief that no one will plant the Winesap, and it is now being discarded by such great growers as Wellhouse of Kansas and Evans of Missouri.

The Lawver is very showy, but does not bear well. Willow Twig rots badly on the tree and is poor in quality. The Arkansas Black drops badly. Ralls Genet is good for family use but too small and dull colored for market. The Wolf River and McMahon are large and showy, but are fall apples of only medium quality. As for the Russian apples, let them alone in a general way. The Colorado fruit growers can do better. These varieties are suitable for a boom in some sections where better apples will not grow. It is my candid opinion that, as the result of the boom created for the sale of Russian apple trees within the last ten years or more, there has been damage already sustained and prospective in the western states alone that will count into the millions of dollars. In many cases money, time and opportunity have all been lost. I do not say that Russian apples are all bad, for some are good summer apples in most apple regions, but beware of getting more than a very few in Colorado.

Perhaps the most instructive part of the exhibit at Omaha was one in the Illinois display. Two lots of Kieffer pears were shown, one sprayed with

bordeaux mixture, and the others not sprayed. The contrast was wonderful. The sprayed specimens were large and clear of all scab and fungus, while the others were small, scabby and covered with blotches of fungous growth. The alarming spread of insect pests in some portions of Colorado demands that a law be thoroughly and sufficiently enforced, or small, wormy, knotty orchard fruits must be the result. Spraying them with arsenicals will keep out the pests, but so long as more and more orchards in the neighborhood are left as breeding pens for the codling moth and other pests, the orchards of the whole neighborhood will be ravaged.

It is one thing to know of a thing at home, and something more for others to know it. Suppose that Colorado had not been represented by a fruit show at the Transmississippi exposition? Then the millions of visitors there would not have been able to see the high class fruit and the varieties that are grown in that state. Besides this, it does the home folks good. It shows them what they can do when they try. It enthuses them with more pride and more determination to go forward. It should be said to the credit of those who made the horticultural display at Omaha, and those who backed it up at home by furnishing the funds and the fruit, that they have saved the honor of Colorado before the world for fruit culture.

DISCUSSION.

Mr. Coburn: The sentiments of the paper agree pretty well with my ideas. In the varieties of apples he recommends for planting there is one, the York Imperial, that we have not had experience in raising. He leaves out the Winesap. My experience is that the Winesap, in the spring of the year, is one of the highest priced and best apples on the market. He speaks of the Staymen Winesap, which appears to be an improvement on the old Winesap. I do not know how the one he speaks of is as to quality, but if it is as good in bearing and quality as our old Winesap, I think it would be a good thing to plant; but I would not forsake our Winesap, until I knew I had something better. The Paragon and Arkansas Black, while they are very showy and demand a high price for looks, are inferior in quality. The Arkansas Black never gets mellow. My experience bears out the statement that the Willow Twig rots on the tree. The buyers from New York this season said they would pay just as much for the Willow Twig as the Jonathan, and I asked them why. They said they were fine lookers and good keepers. They are good cold storage and shipping apples, and that is the reason buyers want them. I have been looking more to quality than to shipping and cold storage apples.

Mr. Wilcox: I would state in regard to the York Imperial that the Pennsylvania pomological society at a recent meeting recommended that they be planted instead of the Ben Davis. They passed a resolution to let the West grow the Ben Davis, and they would stick to the York Imperial. Its objection as a commercial fruit I should think would be that it is lop-sided.

Mr. Coburn: That was an objection of the buyers to it.

Mr. Sawyer: I had occasion to look at that variety in Mr. Ault's orchard. I examined a dozen or fifteen barrels after they had been picked, and I do not think above 20 per cent. of them had that peculiar shape. There were many of them that you would not recognize from the description of the York Imperial. They were of high color and very uniform in size and shape. I do not know of any apple of the same size that presents a better appearance. The trees in Mr. Ault's orchard were six years old and bore quite heavily.

Mr. Felton: My experience with the Willow Twig does not agree with that of Mr. Coburn or Mr. Van Deman. Mine did not rot on the tree, es-

pecially when we had a good crop. I have a good crop every other year. I found that some did have dry red specks, but the same condition prevailed in regard to the Walbridge. Three years ago I picked from twenty-three trees, 328 barrels of fine, sound, Willow Twig apples, and the next year was an off year. When there is a good crop the apples are sound and smooth, and one of the best keepers I have. In regard to the Grimes Golden, while I agree with Mr. Van Deman as to quality, I do not believe it is a paying apple to raise in this state as a commercial apple.

Mr. Rockafellow: Professor Van Deman seems to dislike the Winesap. I believe it one of the best all-round apple we have.

Mr. Felton: I do not believe any apple we grow in Colorado will take the place of the Winesap. The Paragon is larger and would undoubtedly be very salable, but in quality and in bearing it does not compare with the Winesap.

Mr. Rockafellow: The Winesap is the best cooking and the best eating apple, and bears very well. I raised one year, from a short acre, 465 barrels of Winesaps and left the small green ones on the trees to ripen. Afterwards I estimated that there were about thirty-five barrels of those, making a yield of over 500 barrels, and I got $3 a barrel for the ones I sold.

Mr. Camp: When the eastern buyers were looking for fruit, did they mention anything that could take the place of Winesap?

Mr. Coburn: They did not seem to want anything to take their place. The Winesaps seem to catch their fancy more than anything on the place, even more than the Jonathans. They are better keepers. I think I will keep on growing Winesaps. However, they are easily blown over, and for that reason I recommend a heavy, deep soil for them, where it is not necessary for so many roots to gather the fertilizing qualities. On the mesas the Jonathans do fairly well, as does the Rome Beauty. A deep, rich, heavy soil is needed for the Winesap, as it has an inferior root growth.

Mr. Steele: I do not understand what you mean by your statement that the Winesap has an inferior root growth. The apples we plant here in Colorado are not grafted on their own stock, but are regrafted on seedling stock with more or less vigorous growth of root.

Mr. Coburn: We graft all kinds of apples on the same kind of root and the scion governs the root. I am top-working as fast as I can all unprofitable and shy-bearing kinds with the Winesap.

Mr. Wilcox: There is one thing I would like to know—do you top-graft the same year you transplant the stock?

Mr. Coburn: I have done it. I usually do it by cutting back the top and leaving no branches on, and it gives the root the advantage.

UTILIZING SURPLUS FRUITS.

A. A. MILLER, Grand Junction.

From what I learned during a quick trip through California, made for the purpose of finding out the most practical machinery for the evaporation of fruit, I can say without reservation that the most profitable way of utilizing our surplus fruit is by evaporation; but in our state it must be done by machinery, while in California it is done by the action of the sun. Since our fruit ripens at a time when we have passed the extreme of sunshine, and at a time when we are likely to have showers, it will readily be seen that it is neither practical nor profitable to dry fruit in that way.

Fruit dried here, in order to compete with the California product, must be dried and packed in a first-class manner. To me it does not seem profitable for each individual grower to dry his own fruit and prepare it for market. The only profitable way that I can see for disposing of our surplus fruit is for each community to organize an exchange or union and work on a co-operative plan, or let some individual or company do it, so that one set of help can do the drying for that entire community. This is the only way that fruit in a uniform pack can be put upon the market: and also it is the only way in which our state can ever gain a reputation for turning out excellent dried or evaporated fruit. If this is done in a business-like way, our dried fruit should become known the nation over for fine quality and flavor, just the same as our fresh fruits are celebrated.

From personal knowledge I can say that our dried prunes are of better flavor and sweeter than the California prunes. I have dried the French prune of my own raising, and in every instance where it was compared with the California prune, it was conclusively shown that the Colorado specimen surpassed it in flavor. While our prunes may not look quite as large as the California product in its fresh state, yet, when dried, it will be fully up to the California standard, and this is due to the excess of sugar in our prunes. The shrinkage in ours, if properly dried, will not be nearly so great as in the California prune. But in order to prepare prunes properly for the market, they must be graded, finished and packed, and it will require some machinery besides the dryer to do this successfully. As the prune industry in Colorado is in its infancy, there is scarcely a grower in the state that can afford to properly equip himself to dry and prepare prunes for the market.

The surplus of our apple crop, which is the most extensive of any grown in the state, I also believe can be best taken care of by evaporation, and the Ben Davis is the one most largely grown. I think the most profitable apple to grow for this purpose is of a large size and dry nature, which will cause it to hold its size and weight after being evaporated. While evaporation will solve the problem for our surplus fruit, it will not prove profitable unless we raise perfect fruit. We must not think that if we go into

the business of evaporating we can utilize any grade of fruit, for as surely as we do we shall be confronted with a surplus of dried fruits; which will prove fully as disastrous as a surplus of fresh fruit, since we have been put to additional expense.

What we must do is to grow fruit that is fine enough to enter any market in the world, and then if we find we have a surplus, and prepare that surplus properly in a dry state, we shall surely find a market for it. But this can not successfully be done in our state by individual growers. I have seen the experiment made in California and in every instance, except where attempted on a large scale, it proved a flat failure. There have been thousands of dollars spent on experimental evaporating plants, and those that are a success are few and far between, so that the only practical law I can see is for each community to build its own plant and take its surplus to that plant.

This system of taking care of the surplus can easily be learned. An intelligent man can be sent from each community to California during the drying season, and in a short time he will return with sufficient knowledge about evaporating to manage the local plant. I think it will readily be understood that, by adopting the evaporating plan, all our surplus can be worked up by this method; but we must not come to the conclusion that all we have to do is to dry our fruit and the better we dry it the better it will keep, because fruit will not sell in this way. The main secret is to have it dry, and when dry, to have it as nearly in its fresh state as possible, and then I think it will find a market.

PACKING AND MARKETING FRUITS.

W. J. SAWYER, Hotchkiss.

We all know what is required by the market. There is scarcely any one here but has had more or less experience in marketing fruits, and so many of you live in or near Denver that you have frequently visited the Denver markets and have been enabled to talk with those who handle the fruits and ascertain what they require. We all know that the trade wants well-crated, well-packed fruit, and as free from blemishes and worms as possible. There is one thing I have observed—much of the fruit has been more or less bruised in the picking. This is due to carelessness on the part of the growers, and it injures the value of the fruit considerably in regard to its keeping qualities. I saw some nice Winesap apples that had from one to a dozen bruises upon each apple, which was done in picking the apples in a basket and pouring them in piles.

Winter apples must be handled carefully—some one has said as carefully as eggs, and that is true. The manner of picking, of course, does not matter so long as the apples are picked before they are too ripe and are not bruised in the picking. Too many apples put on the Denver market this year have been allowed to ripen on the trees. There are very few varieties of apples which can be allowed to ripen on the trees. If you wish an apple to keep, it must be picked before it has reached its entire maturity. This is especially true of fall apples. One of the best apples put on the market this year is the Utter's Red. It is a light-colored apple, which will show bruises about as quickly as any apple grown, but it came on the market in very good condition, and most growers pick them soon enough. On the contrary, there were some Utter's Red brought on the market that you could take in your hand and crush. They were worthless. The dealers want a firm apple.

I have been speaking particularly of apples, but in all fruits dealers want smooth, perfect, well-colored fruit, and want it picked and packed so as to present an attractive appearance. Peaches are sent on the market in every condition and kind of packages, of sizes varying from 4 inches in depth, 11 inches wide and 9 inches long to 4 or 4½ by 5 by 6. One feature in regard to the packing of some of the Delta and Montrose growers was that they put a nest of unwrapped fruit in the center of the box. Others just wrapped alternate peaches. This was a bad feature and it involved considerable trouble. Where the peaches were well wrapped and closely packed they kept in good condition.

In reference to the packing of peaches, there are two styles used—the solid pack and the California. The California pack begins at one side of the box—the peaches are laid and a little space left between the last peach and the edge of the box, and the next row begins on the side where the space is and the peaches are laid back so that the second layer of peaches, instead of one peach resting on another, rests on two or three, which is an advantage. The main objectionable feature about this is that it is loose packing, so that the peaches may shove about.

The solid pack consists of placing a row in one end of the box and then piling the peaches up to a pyramid, continuing the pyramid until the other end of the box is reached, where it leaves a space. You key in and make the top solid by the use of two peaches, and then turn the box around and pack the top layer in the same way. In that way the peaches are perfectly solid. They do not, like the California peaches, rest on two or three, but on one. It shows a solid pack on the edge of the box.

DISCUSSION.

Mr. Coburn: You saw peaches packed both ways on the market, did you?

Mr. Sawyer: Yes, sir; the solid pack took the best, I think. I talked with several on the subject and they seem to prefer the solid pack. There would be a slight difference in the weight of the boxes, the solid pack being slightly heavier. However, there would be only a pound and a half or two pounds difference.

Mr. Coburn: Do not you think that if you were going to ship the fruit any distance it would ship better in the solid pack?

Mr. Sawyer: I am hardly prepared to say. The Mountain Rose is one of the tenderest peaches we have on the market, and I was surprised to see the Mountain Rose peaches that came from Montrose and other counties. They were a solid pack and came through and held up at least a week on the Denver market after they came. Knowing that peach in Michigan, I was surprised. The same is true of the Oldmixon and the Stump. I do not think I have any particular preference as to the two methods of packing.

Mr. Wilcox: Will the California pack always come true and leave the space at the end?

Mr. Sawyer: No, it will vary unless the peaches are graded almost perfect in size, and you can not count on it that way. Another point is not to have in any little peaches. Great care should be taken that the peaches should be uniform in the box. If they are of different sizes they will not pack well. There is one point in selling the Mountain Rose, Oldmixon, etc. Particular attention must be paid to selling them. They say in the market that they are too small, but they are a good peach, and the demand for the Mountain Rose continued this year until after they were gone.

In regard to the size of the peach box, I think the California size, 11½ by 14 and 4 inches in depth, has been adopted and is in common use. The original box used in Delta county is a little bit smaller. The smooth pine box is preferred to the quaking asp box. I think, however, if the quaking asp was cut green and given a smooth surface it might be all right, but as it is usually left with a rough surface it absorbs the moisture very quickly. I noticed that as one of the defects of the quaking asp box this year.

For the plums they use a box of the same dimensions, but about three inches deep, or the four-basket crate. I think the four-basket crate is the better. It takes better on the market when it is full, but when only half full it does not take at all. A good-sized plum, the Bradshaw or anything of that size, is all right on the market if packed in these baskets and will sell for a fairly remunerative price. The smaller plums seem to have no market except the Damson and the red plums. It is a 20-pound crate, or a 5-pound basket. There were hundreds of them on the market, some from Oregon and Idaho. The trouble I saw with the Colorado pack in that style was that the baskets were not more than two-thirds full. When put on the market in competition with the ones from Idaho and Oregon they do not sell at all.

The apple box, such as used on the western slope has changed size several times. I believe the first box we used was 10 inches deep, or possibly 11 by 19 by 10½. Then, afterwards, the claim was made that it did not hold enough and it was increased to 11 inches deep, and I believe the size they are now using is 11 by 11½ by 19 inside measure, the depth being 11 inches. This year the Chi-

cago people came and said they wanted the California box. So they brought on the box that is 11½ by 11½ by 19.

Mr. Coburn: Was not there a contract with the growers for boxes 11½ inches square by 18 inches long?

Mr. Sawyer: I so understood, but I measured the inside dimensions of a number to see the difference. The apple boxes which are commonly used in California for packing the Bellflower have a different dimension. It is 21 inches long and 10½ inches deep inside measure. That is, the California box which they are using for packing the Bellflower contains a little more than 2,200 cubic inches, but the box which they brought on for packing the Colorado apples contains a trifle more than 2,400. There are 2,250 cubic inches in a bushel, and they are giving more than one-third of the standard barrel, and if these apples are sold on the Denver market for $1.50 a box they are sold cheaper than the eastern apples are sold in the barrels. If you examine the eastern barrel you will find that a pretty good per cent. of them are of the 11-peck variety instead of being the standard 12 pecks.

There is 14 per cent. difference between the bushel and the box which they used in packing Colorado apples this year, and the box used is 8 per cent. larger than the California Bellflower box. If the apples are well crated the box has an attractive appearance, yet the barrel is by all means the proper packing for fruits. I say that after considerable thought, as I have been, since coming to Colorado, much in favor of the box. I find that it takes well with the retail trade, but when you get on the large markets you want the barrel. The time has come when we must send our apples by the train load. The cost of loading and reloading a car of apples in the barrels must necessarily be less than loading or reloading the boxes.

The method of packing used by these eastern people I do not exactly agree is the best. We people on the western slope have a way of our own. It may be characteristic of Colorado. We pack the apples on the side instead of the stem or blossom end. You can observe for yourself in any variety of apple, which looks better, the stem or blossom end or the side.

Mr. Wilcox: Do the apples ride so well with the sideways pack?

Mr. Sawyer: I do not think there is any particular difference in that. It requires a good deal of sideways pressure to injure an apple. The side of an apple, however, adds a great deal to its appearance. When the dealer opens the box the first thing he does is to brush off the dust, and it makes the best appearance with the side of the apple upward. If you give the cheek of the apple a few whisks of the feather brush it is bright and shows its fine coloring. I believe our way of packing, with the cheek down, is the better way.

Those who sell apples to the eastern buyers, or to any one else, as far as that is concerned, must be careful to get the grade of the apples uniform. When the box puts up a fine face and then a large per cent. of the apples do not come anywhere near the grade of the face, the growers of that section suffer very much. If we hope to get a good market for our fruit we must adopt a system of grading and hold to it, and the man who does it will build up a reputation. There is a man over in our western country whose peaches will be called for before they are on the market this year, because they were well graded and well packed. The buyers will remember it and will call for those peaches.

It requires great judgment to know when a peach is ready to pack for the market. Many come on that would have sold at a good figure between the 1st and 10th of October, but they depress the market, because they were picked too ripe and have to be hurried right off. Indeed, many of them ripened on the trees.

DISCUSSION.

Question: Can you tell us something of the relative cost of the boxes and barrels?

Mr. Sawyer: Three of the apple boxes, full size, cost about as much as a barrel.

Mr. Coburn: They charge us 38 cents for the barrel, and the California box costs us 13 cents, laid down; but the quaking asp box, which is the same size, and I do not see why it is not just as good, costs 10 cents.

Mr. Sawyer: I believe that there should be a union of the fruit growers of the western slope. That it would do a great deal of good in the way of getting us better freight rates, etc.

Mr. Camp: What style of picking is recommended, the pole or hand picking?

Mr. Sawyer: The hand picking. Take a step ladder and climb up the tree. Once in a while you find some very nice apples in the top of the tree, and some that you have to pick with a pole with a sack on.

Mr. Camp: Do you use padded baskets on the western slope?

Mr. Coburn: My men use sacks and pour them out on a sagged canvas table.

Mr. Sawyer: The basket is put on the edge of the table and the apples are allowed to roll down the table.

Question: I would like to ask Mr. Rockafellow what size barrel he uses and where he gets them.

Mr. Rockafellow: I buy three-bushel barrels in car lots and they cost me about 30 cents. They come knocked down. I pay the 30 cents for the barrels coopered and set up. I buy several thousand at a time. Two years ago I bought about 7,000 bushels in barrels. I get them a little cheaper than those who buy fewer barrels, I suppose.

Question: Will Mr. Rockafellow please state whether he has used the Red Seal lye in spraying for the codling moth, and if so, what strength?

Mr. Rockafellow: I have never used it for a spray. I have used it high up on the trees and limbs and down to the earth, and let it run down to the roots. The reason I used the Red Seal lye is because it is a potash lye and some of the other makes are not potash. We use a pound of lye to three patent pails of water, about thirty quarts, and sometimes stronger, but I believe it is better to use one pound to nine gallons of water. We apply it with a swab or whitewash brush.

Mr. Wilcox: What time do you begin to wash your trees?

Mr. Rockafellow: As early in the spring as we can, and if we had time we would wash them in September.

Mr. Sawyer: It occurred to me that this work might be done by using the pumps that we use for spraying.

Mr. Brothers: The lye would eat the rubber out. I use a pound of lye to ten gallons of water and a pound of blue vitriol.

Mr. Coburn: I use a pound to five gallons of water.

WINDBREAKS AND HEDGES.

PROF. J. E. PAYNE, Cheyenne Wells.

The subject of windbreaks and hedges is of vast importance to all of us, but in my position where the wind has unlimited sweep for 2,000 miles north and south, it is impressed very forcibly on my mind that we need windbreaks. The question is how to get them where we have no water with which to irrigate. With water for irrigation it is not such a serious problem, because one can turn on the water and the trees begin to grow—those that are hardy enough to stand the climate. I have been raised upon the plains in a country which was not considered fifty years ago to be worth fifty cents. Now we find it dotted with homes and settling up rapidly. Occasionally the tide of migration sweeps in and usually gradually drifts out, but still a few always stick. Those who have the business ability and sense to recognize the conditions and adapt themselves to the new conditions with which they are surrounded have been able to stay in Western Kansas and Eastern Colorado.

The station of which I have charge embraces one-third of the area of the state, probably. As you know, the highest windbreak growing naturally is three inches, so that we are willing to seek the world over to find something adapted to that country. One of the first observations which I made upon this subject was in the year 1894—a very dry season in Central Kansas. At that time I was studying "Cornfield Securities" in the valleys about Manhattan in the Kansas and Blue River valleys, and I went over the country and observed many things beside securities. One of these things was the effect of hills and groves upon corn growing near them. At one place south of Blumont there was a cornfield which had a sort of gulch running through it, so that the south wind swept across and the corn was dried completely. On either side the corn was green through the summer. That put me to thinking upon the subject.

In the spring of 1896 I was called to take charge of the station at Cheyenne Wells. At that time we had some trees planted, but not enough to amount to anything for a windbreak. But I put out some small grain as an experiment, to see what we could raise. On the sixth of May, there came a hard wind storm from the southeast, and the grain was almost entirely cut off. The morning before it covered the ground, the next morning there was very little left. It happened that a few cornstalks were left on the south side of the field. North of them in another place was some fresh plowed ground and north of where the corn had been the grain was not cut off. While the storm was raging, I could hardly get my team out of the stable, but I thought if that plowed ground was saving the grain I would plow furrows back and forth across the field about twenty feet apart. I did so, and when the storm was over I found that the furrows were filled in with the coarse sand grains which did all the damage and the ones which really clipped the grain off a little at a time.

The next year I left a few rows of corn about every twenty rods and I found that they saved a great deal of snow. Along those rows of corn the snow would drift and that would catch the dirt and save the ground from being blown away. In the springs of 1896-7 I noticed it again. The ground had all been plowed except about ten rods, and one day I was on the south side of that strip, harrowing a piece of ground. A wind storm came up and my wife could not see me and thought I was lost. Where I was working there was no dust blowing. It was from that unplowed ground, and the plowed ground was, of course, unmolested. From this I deduced some opinions:

If a person settled in that country and desired it the first thing he could have as a windbreak to keep the ground from blowing away is clods upon the surface. Save the dirt by the use of the harrow. The fine dirt cannot be gotten hold of by the wind. The clods also hold the moisture. The furrows can be used first, then after the ground has been all plowed over use the clods as windbreaks. In that country the east and west furrows are the best. There is very seldom a straight north, east or west wind. Before we can plant trees we find that planting corn stalks and leaving them between the rows of trees is a good thing to protect the trees. It does not require many corn stalks, but just one or two rows between each two rows of trees. This will protect them from the wind. There are very few kinds of corn that make stalks able to stand the wind. The flint is a good kind, and I noticed another kind of corn that seemed to be adaptable. It is called the Giant Mexican. I had stalks of that corn as big as my arm.

When I first went to that country I thought we had everything that nature could provide. We had material with which to build our houses, walls and barns for the cattle, and I thought we could put up such walls to protect the trees from the wind. So I tried it the first summer I was there, but there was a littie too much work about making a sod wall to surround an orchard. It was too heavy for most men to protect a large orchard in that way, and I stopped after we got about twenty rods. However, that wall did good work.

For that country we have rapidly growing trees, like the black locust. I have black locust trees, the seed of which was planted a year ago last spring, that are now five or six feet high. I heard of a Russian plant called Artemesia, that it was grown extensively in British America and North Dakota and I corresponded with several stations in North and South Dakota and got about 100 cuttings a year ago last spring. I had half of them nicely started when Mr. G. Hopper came along one day and seemed to think they were very fine. I have only three or four plants left, which are probably five or six feet high, but they winterkill easily and I do not feel like recommending them for that country.

The black locust planted in rows twelve feet apart and in two or three alternated rows, make a strong windbreak. Some I planted four years ago cover six or eight feet of space, are now eight or ten feet high and the orchard receives a great deal of protection from them. The Russian mulberry has been used in that country a great deal for timber claims and it would have been worth millions of dollars if the land was worth anything to the man who took the timber claim. The mulberry did not grow very well, but it enabled the man to prove up without lying and was a success in that way. Most of the timber claims are identified in that country during a dust storm by more dust therein than anywhere else.

The next best tree is probably the honey locust, which has been grown quite successfully. There are not many in the country, but it seems to be a success. The ash is coming to be the standard tree there. It makes slow but sure growth each year. We can use the honey locust and several varieties of the ash. Our experience has been so very limited that we have not found

the other trees that could be used successfully. Probably there are a great many others.

The use of fruit trees comes in this connection. The cherries and most all kinds of fruit trees seem to thrive and make good growth each year. I have lost very few fruit trees from the weather. One year before I went there the rabbits killed a few, but they have been replaced and I have only one dead tree in the orchard now. I lost only one out of twenty trees set out a year ago last spring. Great stress must be placed upon the advantages of location.

There are many places which are naturally adapted to setting trees, for instance such places as we can run a great deal of extra water around the trees. Our orchard is situated a little lower than the surrounding buffalo grass. Furrows were plowed around the orchard with others radiating from the orchard so that when flooding storms came we got three or four inches of water in the orchard. It is diked around so as to keep the water in and save it. The trees were set in deep furrows, that is, deep furrows were plowed and the trees set in them so they could get all the water possible.

A year ago last spring I received some trees from Fort Collins which had been headed for use in irrigated districts. They had been headed shoulder high. I immediately decided to go against the rules, for I preferred to have a dead switch to having a tree grow up so high as to be switched around by the wind and make a growth of only two inches a year. I dug holes three feet deep and set the trees in them. I saved the top soil and put it in the bottom and planted the trees, carefully filling in with the other soil. Of those trees only one is dead to-day. Some two or three did not start to grow the first year, but the second year they started up from above the graft and I almost wish I had done that way with all the trees I planted.

As the result of this work we have lots of trees growing. We have some cherry trees—Morellos and Early Richmonds—bearing a little each year, and also some gooseberries. They are not quite as fine as I have seen, but some grew larger than my thumb. We have the regular mountain cherry. It makes a first-class frame on which to hang the washing, and we like it for that purpose. We heard that there was a dwarf cherry just about as high as the mountain cherry that bears splendid fruit, and we got a few trees. We thought we could protect a good cherry from the hail, so we put up four sticks and put a wire netting over them, which has been very successful in sheltering the cherries from the hail. If we can ever get to growing the Russian dwarf trees we can make a success of growing trees out in that country in spite of the hail, and we hope to do it some day.

DISCUSSION.

Mr. Coburn: It seems to me that Professor Payne lives in one of the hardest countries I have ever heard about and I think he is entitled to a good deal of gratitude for staying there.

Mr. Wilcox: He spoke about the winds there and I would like to know which are the prevailing winds by the year.

Mr. Payne: The first year I was there during the summer season the prevailing wind was southeast, but this year it is hard to tell which way the prevailing wind is. Sometimes it turns twice and some days it is a good deal of a puzzle. We take two observations a day as a rule, and one day we had a north and a southwest wind and so decided to take a noonday observation also. We found that we got three different winds then. We have thought that we ought to take hourly observations. We feel that by using the favorable locations and by the use of windmills that we shall succeed after awhile. We have plenty of sunshine and at times considerable wind. There are very few days in the year when we could not run a windmill, and

after while by raising water we may be able to irrigate a good deal of the country.

Mr. Brothers: Do you make any attempts at irrigation for the purpose of raising trees?

Mr. Payne: We do not.

Mr. Brothers: Do you subsoil the ground before planting the trees?

Mr. Payne: The ground had not been subsoiled for planting, but it had been plowed ten inches deep and then harrowed. We keep up the harrowing through the summer from every ten days to two weeks.

COMPARATIVE VALUES OF DIFFERENT METHODS OF COMBATING THE CODLING MOTH.

PROF. C. P. GILLETTE, State Agricultural College.

I hesitated to speak to you on this occasion upon the codling moth. I have discussed it before you so many times, and should not do so again this year had I not reached what seemed to me valuable results from a series of experiments the past season to determine the comparative values of some of the different methods of fighting this most destructive pest of our orchards. There are still many intelligent fruit growers who entertain honest doubts as to there being any real good derived from the use of arsenical sprays for the purpose of saving an apple crop from the ravages of the codling moth. I have recently received letters from men who say they have followed my directions carefully and can not see that they have received much benefit. We should be careful not to base our conclusions in these matters too much on general impressions, but rather on carefully conducted experiments where we can be sure of data.

The experiments which I wish to report upon were undertaken for the purpose of determining the comparative values of three of the chief methods of combating the codling moth, namely; spraying with the arsenites, collecting the larvae under bands, and gathering and destroying fallen fruit. There were eight Ben Davis and two Duchess trees entering into the experiments.

In this experiment the apples were gathered from under the trees each morning from the time the wormy fruit began to appear, July 7, until the apples were harvested, August 2, in case of the Duchess, and September 23 in case of the Ben Davis trees. In case of the Duchess trees, the apples were gathered both morning and evening. All wormy apples were sliced to determine whether or not worms were still in them.

From the Duchess trees 751 wormy apples were taken and 120 worms were found in the apples. In other words, about 16 per cent. of all the worms entering the apples of Duchess trees were captured by picking up the fallen fruit every morning and evening until the apples were gathered, August 2d. On the Ben Davis trees there occurred, during the season, 2,851 wormy apples. In the fallen fruit we found exactly 100 worms, which would be 3.5 per cent. of all the worms infesting the fruit of the trees.

The great difference in proportion of worms captured in the two cases is due, I think, to the difference in the varieties of fruit. In the Duchess, which matures early, the injuries of the worms hastened the ripening enough so that the apples would more often fall with the worms in them. The Ben Davis, which clings well to the tree and does not ripen until late in the fall, would seldom let go its hold until after the worm in it had completed its growth and crawled away. It would seem then that this remedy is of much greater value in case of early than in case of late varieties of apples and, if the work can not be done in some way without material expense, it is doubtful if this method can be made of practical value.

The total wormy apples occurring on the trees in this experiment was 3,602. If we subtract from this number the 220 worms that were picked up in apples under the trees and destroyed, we have left 3,382 worms against which the bands were used. Of these, 612, or 18 per cent., were captured. If we also deduct the number of worms—630—which were still in the apples when the latter were picked, we find that the bands caught 22 per cent. of all the worms that left the apples before they were picked.

Here again the best results were obtained on the Duchess trees, where 29 per cent. of all the worms—taking out those that were picked up in the apples and destroyed—were captured. If we deduct from the total worms those that were in the apples when the latter were gathered, we find the bands caught 32 per cent. of the remainder, i. e., 32 per cent. of all the worms that left the apples up to the time the fruit was gathered. From these experiments and other tests that I have made of the bands for the capture of the larvae of the codling moth, I think it is safe to conclude that by careful attention to the bandage system we may expect to capture about 25 per cent. of all the worms that leave the apples before the latter are picked. The later the apples are picked the greater the percentage of worms that will be captured.

Question: Would there not be more than one worm in the wormy apples? Answer: Yes, sometimes two or three, but such cases were rare in the experiments this year.

Mr. Coburn: Did you take any precautionary measures in scraping and cleaning the trees so as not to leave any place besides the bands where the worms might hide?

Professor Gillette: The trees were not scraped, as they did not need it. Those chosen for the experiments had very smooth bark on both trunks and limbs, with almost no possible place for a worm to hide.

THE USE OF ARSENICAL SPRAYS.

There were ten trees entering into this part of the experiment, of which eight were Ben Davis and two were Duchess. Four Ben Davis and one Duchess were sprayed twice with paris green in water in the proportion of one pound of poison to 160 gallons of water, while the remaining trees were left untreated to serve as checks in the experiment. The first application was made June 6, and the second ten days later. At the time of the first application the blossoms had been off the Ben Davis trees fully a week, and from the Duchess trees two weeks. The calyx cups were still wide open, however, in case of the Ben Davis trees, but they were almost entirely closed in case of the Duchess trees.

The untreated Duchess tree had 2,760 apples, of which 349, or 12.6 per cent., were wormy. The treated Duchess had 4,276 apples, of which 402, or 9.4 per cent., were wormy. The difference between these percentages is 3.2 per cent. As there was but 12.6 per cent. of the fruit wormy on the untreated tree, and as 3.2 is 25.4 per cent. of 12.6, the experiment indicates that 25.4 per cent. of the apples that would have been wormy were saved by the treatment. This seems like a very small saving, and its being so small is probably due to the fact that the calyx cups were almost closed when the first application was made, so that very little poison could be thrown into them.

In case of the winter varieties, the four untreated Ben Davis trees bore 6,872 apples, of which 2,135, or 31 per cent., were wormy. The four treated trees bore 5,110 apples, of which 716, or 14 per cent., were wormy. The difference between these percentages is 17, which means that 17 per cent. of the entire crop was saved from being wormy through the use of the paris green. As only 31 per cent. of the apples were wormy on untreated trees, and as 17 is 55 per cent. of 31, the experiment indicates that the spray saved 55 per cent. of the apples that would have been wormy without treatment. Or, to put it still differently, for every 45 wormy apples occurring on the sprayed trees there would have been 100 wormy if the treatment had not been made. This is a smaller

saving than has usually been obtained by those carrying on experiments in the past in states farther east. At Ames, Iowa, in 1889, I carried through a similar experiment on Duchess apple trees which gave a saving of 68 per cent. of the wormy fruit.

I want to show how it is that the indicated saving in these experiments with the arsenites is really much below the real saving. The codling moth has two broods during the summer and the arsenical sprays have their effect chiefly on the first brood. If an orchard were isolated from other orchards and sprayed with paris green so as to destroy one-half of the first brood of worms, that would mean a lessening of the second brood by one-half and, as a result, there would be only half as many wormy apples as if the application had not been made. But if our sprayed orchard is in close proximity to other orchards—as our sprayed trees in the experiment were close to many unsprayed trees—the moths of the second brood will spread almost evenly over all the trees, and a large part of the benefit from the treatment will not be apparent.

So the real benefit from these experiments should be computed on the effect upon the first brood. I found this year, at Fort Collins, that the division of the broods came about August 10. By taking August 15 as the date that most nearly divides the broods and computing the benefits of the spray up to that time, I found that my experiments indicated a saving of 83 per cent. of the wormy fruit, or, in other words, the destruction of 83 per cent. of the worms of the first brood in case of the Ben Davis trees. This is the percentage, then, that should be compared with the 25.4 per cent. of worms destroyed on the Duchess trees, where only the first brood occurred, as these apples ripened before the second brood began its work.

Mr. White: How do you explain the fact that one tree had but 9 per cent. of its fruit wormy while another had 19.6 per cent. wormy? Was it on account of one being the younger tree?

Prof. Gillette: I know no good reason for the difference. Such variations often occur in experiments where there is no assignable cause. I remember that the tree was a little removed from the others and more exposed. We know, too, that insects often prefer individual plants, attacking them badly, while others of the same kind are little injured.

Mr. Coburn: Did you treat these trees with bands also? Answer: Yes, sir.

SUMMARY.

If we discard the two Duchess trees, on which the arsenites did not do their full share of benefit, and sum up the benefits derived on the Ben Davis trees, we find that by gathering the fallen fruit every morning until September 23 we captured 3.5 per cent. of all the worms infesting the apples of these trees. By the use of the bands we captured 18 per cent. of the worms, deducting those picked up in apples, and by the use of the arsenical spray we made an apparent saving of 55 per cent., and an actual saving of 83 per cent. of the fruit that would have been wormy without this treatment.

This looks impossible at first, as 3.5 per cent., 18 per cent. and 83 per cent. would make 104.5 per cent., or 4.5 per cent. more than the entire crop. The estimate should be made in this manner: The 83 per cent. destroyed by the poison never fall to the ground in the apples, nor go down the tree to pupate. This would leave 17 per cent. of the entire crop of worms to be taken in other ways. Three and five-tenths of this 17 per cent. were picked up in wormy apples. Three and five-tenths per cent. of 17 per cent. is 6 per cent. This, subtracted from the 17 per cent., leaves 16.4 per cent of the worms to be caught by the bands. Of these the bands caught 18 per cent. Eighteen per cent. of 16.4 per cent. would be about 3 per cent. This, subtracted from the 16.4 per cent., would leave 13.4 per cent. of the worms still not destroyed after using all three of the remedies on the same trees. Or, to state it differently, by using the three remedies on the same trees we seem to have destroyed 86.4 per cent. of all the worms that occurred on the treated trees.

DISCUSSION.

Mr. Carlzen: Why do we get most wormy apples after July 1?

Professor Gillette: It is because the second brood, which is far more numerous than the first, begins to enter the apples at about that date.

Mr. Carlzen: I sprayed thoroughly up to the 11th of September, and after that I had more wormy apples again.

Professor Gillette: The late spraying does little or no good as the calyx cups have closed and the poison does not get where it will be eaten by the larvae.

Judge Osborn: Now, that this experiment has been gone through with, it seems that the conclusion of the whole matter is when to spray. The professor thinks he should have sprayed a little earlier on some of the trees. I believe it does good to spray three or four times, if possible, within ten or twelve days after the blossoms drop, because, on some varieties of apples the calyx closes quicker than on others; but while we do good by spraying, and I think there can be no question about that, there is a worm that comes later and crawls all over the apple, and tries to get in and fails, but just ruins the fruit, and then it gets between two apples sometimes, and gets in, and I have wondered whether there was not a time when we could spray for that, for this is the worm that makes so many little spots on the apple.

Professor Gillette: What time was the work of this worm done?

Judge Osborn: I do not know. I did not discover it until I picked the apples.

Mr. Brothers: When do you commence taking off your bands?

Professor Gillette: We commenced on July 6 to take the bands off. We took the worms out and killed them, and put the bands back. We got our first worm on the 6th day of July. In regard to the bands, I would say, there is no use to take them off after the 10th of August. The worms that come down and go under the bands after that date will remain there until the next spring.

Mr. Coburn: I would like to know if you are able as yet to give us the length of the miller's life, from the time it hatches until it dies?

Professor Gillette: That can not be definitely stated, for the reason that an insect hatching out, will usually live until it has an opportunity to lay its eggs.

Mr. Coburn: Have you been able to find out what the miller eats during its life?

Professor Gillette: Probably nothing unless it be a little nectar from the blossoms.

Mr. Coburn: Do you think it possible for a moth, hatching out during July, to live over until the next spring?

Professor Gillette: No, sir.

Mr. Coburn: My object in asking these questions was that I have been a pretty close observer of the moths and their hatching, and what I was trying to find out was how late they hatched, and what they ate. We might feed them something that might not be beneficial to their health.

Senator Felton: We have a provision in our horticultural law providing a penalty for spraying before the blossoms fall. Some people take exceptions to that, and want to spray while the trees are still in bloom. What do you think about that?

Professor Gillette: I say, just as I have said here before, there is no reason why any fruit grower should spray his trees early enough to do any injury to the bees. He will get as much benefit, and a little more, to wait until the blossoms are off.

Senator Felton: Our trees may not all bloom at the same time—some are early, some late—and if you leave the early trees until the blossoms are off the late ones, it may be too late to do the early trees any good.

Professor Gillette: In that case it is better to spray the early and the late blooming trees on different dates.

Senator Felton: I mentioned before a new remedy I had heard for the codling moth, and I want to tell you of it. A gentleman living at Canon City had two brothers visiting him this summer, who live in Oregon, and they stated that their apples got so wormy that they were considering abandoning the culture of apples, and then they heard of a new formula, and commenced using that. Now they will give any person a dollar for every wormy apple they will find in their orchard. They did not have the formula with them, but said it was not poisonous and was very cheap. They are going to send it, and I am going to try it. You have to spray every two weeks for three or four months, I believe.

Professor Gillette: Are they wanting to sell the formula?

Senator Felton: No, sir.

Mr. Brothers: I looked up an Oregon fruit man at the exposition, and he said they used about the same formula as we do here; he did not tell me anything new. I went to the Idaho fruit man, and he did not have anything new except that he said the best thing he knew was to take fruit jars and put sugar and water in them. He said he caught thousands of them in that way.

Professor Gillette: I hope you did not believe him, for the codling moth can not be caught in large numbers in that way.

Mr. Rockafellow: I want to ask the professor what his opinion is about bees taking the poison from the blossoms of trees affected with blight and conveying it to other trees that are not troubled with it?

Professor Gillette: I think that it is wholly possible, and it may account for twig blight appearing all over a tree after the blossoms have fallen.

Mr. DeVinney: Do not the yellow jackets and hornets do the same thing? I do not like to have it all laid on the bees.

Professor Gillette: Yes, I think they may.

Mr. Rockafellow: I wanted to ask you to speak about another thing. I notice in some varieties of apples, the Geneton, for instance, the worm will enter where the clusters of apples are, and in among the very solid apples they make quite large nests; sometimes the apples are nearly ruined.

Professor Gillette: These clusters are used as hiding places, especially by the worms of the second brood.

Mr. Honnett: What Mr. Rockafellow refers to is this. In the case of Geneton apples, for instance, which grow in clusters, right in between the apples will be a web, and from that web it would appear as though the worms came out and went into the apples, and they would all be wormy.

Mr. Rockafellow: I wondered why they did so much more damage to the firm meated apples than to the less solid meated ones.

Professor Gillette: I do not know, except that worms have their choice of varieties the same as we do.

Mr. Millison: Is it not possible that you are confusing the work of the leaf-roller with that of the codling moth?

Mr. Rockafellow: It seems to be the work of the worms, because we find them inside the apples.

Query from Box: "Where do the worms go in the fall; do they die or bury themselves during the winter?"

Professor Gillette: They remain in the larval state during the winter in any protected place that they can find.

Mr. Millison: I believe it has been stated that they even go under ground, and I have so found them in four or five instances.

Professor Gillette: When they can find no other protection.

Question from Query Box: "Is there any advantage in more than one band on the tree?"

Professor Gillette: I think not, if the one is a good one. There is a great deal of difference in bands. A band can be drawn too tightly around the tree, so that the worms can not get under it if the trunk is smooth and even. Draw

it rather loosely, so that the worms can get under, fastening it by means of one tack.

Mr. Tobias: A great many think it safer to have several bands. I think the simpler this thing can be made the more likely people are to use it. I have been using one band, perhaps six inches wide, made of gunny sacking, and doubled once, then long enough to wrap around and lap. I use a long, sharp-pointed tack, and fasten it about the middle of the band, so they can get in at the top and bottom. It has been demonstrated that most of the worms come from the top.

Question from Box: "Where are the eggs laid for the second brood, and how are they reached to destroy them?"

Professor Gillette: The question has been pretty well covered. They are laid the same as in the first brood, on the apples or the leaves. Where the worm goes in is determined by where the worm crawls for a hiding place. I would think that the best remedy for the first brood is the spray, and for the second brood the bands.

Question from Box: "Is there any advantage in the occasional use of the bordeaux mixture or of lime in dry form?"

Professor Gillette: The bordeaux mixture is used in the east, where they are troubled with fungous diseases. It is used with the arsenic and sprayed over the trees.

We will have to use bordeaux mixture in Colorado when we get apple scab. You should use lime if you do not use the bordeaux mixture. Some one asked me why we can not use the paris green in solution instead of white arsenic. You must never use arsenic in solution on trees. The lime is put in for the express purpose of taking all the arsenic out of solutions. If any of the arsenic is left in solution it will kill the foliage on the trees. Arsenic in the proportion of one pound to sixteen hundred gallons of water will take the leaves off the trees if applied in solution.

DISEASES OF PLANTS CAUSED BY FUNGI.

PROF. C. S. CRANDALL, State Agricultural College.

In the early years of fruit growing in Colorado there was, as is the case in most new countries, an entire absence of injurious insects and parasitic fungi. As years passed and the business grew in extent and importance, reports went out that certain insects had appeared and were depredating upon fruit and foliage. In succeeding years these insects spread, and others appeared, until now the interest of the horticulturist in these insects is intense. He studies them, and the means by which they may be destroyed, because he has learned by dear experience that neglect means loss and possibly failure.

Insects have better facilities for moving and they spread over the country with greater rapidity than do parasitic fungi. Naturally the first pests with which the fruit grower had to contend were insects. The reports of injurious fungi came later, were fewer in number and from limited localities. The same steps that have developed the interest in insects—their introduction, dissemination followed by serious injury, and the acquirement of knowledge regarding remedies and methods—must be passed through with injurious fungi in order to develop the same degree of interest.

Our climatic conditions are not favorable to some of the fungi that cause epidemic troubles in many eastern localities, but others will thrive with us and to those now here we may expect numerous additions. That the interest in diseases caused by fungi is increasing I can assume from the increased number of inquiries regarding them. During the past summer seven fungi have been sent me with statements of greater or less injury resulting from their attacks, and three of these had not previously been reported as present in the state. Last year I described a few of the fungi of greatest interest and gave remedies. I may add a few words regarding certain others:

Orange Rust of Raspberries and Blackberries, Caeoma nitens Schw.—Of this fungus I spoke very briefly last year, but in view of the fact that it has been sent this season from several localities, it may not be out of place to treat it more at length and repeat what I recently said in bulletin No. 41: "Eastern growers have in many places suffered severely from the disease and it would be well to profit by their experience and use every effort to exterminate it. The cause of the disease is a true fungus which has been known under various names since 1820. Its presence has been reported from nearly every state east of the mountains; it is common in Canada and is also known in Europe.

"Apparently it is confined in its work to plants of the one genus—Rubus, but has been observed on nearly every species of the genus. It works on wild as well as cultivated plants and appears to prefer some species to others. As between the dewberry and the blackberry, it works more upon the dewberry; and between the black and red raspberries, the blacks are more sus-

ceptible to attack. The disease also shows choice of varieties; thus the Kittatinny and the Erie blackberries seem much more susceptible to attack than do Snyder and Wilson.

"The presence of the disease can be detected quite early in the spring in the tufted slender shoots which are produced and in the glandular appearance given to some of the new leaves by an early, and little understood, spore form which the fungus produces. Later, about the first of June the aecidium or cluster-cup spore formation may be looked for. The cluster cups first appear as small raised spots covering the lower surfaces of the leaves; soon the skin is ruptured, the cups containing the spore masses protrude, and then we have that characteristic appearance which suggested the name, orange rust.

"This, the fruiting stage of the fungus, is conspicuous and can not fail to attract attention, but it is not all there is to the plant. The vegetative portion consisting of very minute threads which ramify through the plant, and which must develop before spore formation can take place, is not apparent to the naked eye; it gives no sign of its presence except by inducing the tufted growth of slender shoots. It will readily be seen that this vegetative portion of the fungus is beyond the reach of any curative applications that might be made. It is secure within the tissues of the plant, and since it has been proved that the threads extend into the roots and are perennial, we are led to the conclusion that our only course is to completely destroy the infested plants. Spraying has been recommended as a protection against the spreading of the fungus by the spores, but spraying will be unnecessary if the plants are carefully watched and the infested ones removed before the dissemination of the spores begins."

Anthracnose of the Raspberry and Blackberry, Gloeosporium venetum Speg.—In bulletin No. 41 I have the following to say about this disease: "In 1896 canes of blackcap raspberry infested with this disease were sent us from near Denver. From the fact that nothing has been heard of the presence of the disease since, we regard this as an isolated case introduced, in all probability, on plants from some eastern nursery. The dryness of our climate is not favorable to the development of this disease and we apprehend no serious trouble from it; but as it is likely to appear at any time on introduced stock, it may be well to dwell briefly upon its characteristics.

"The cause of the disease is a fungus, and Professor Burrill of Illinois is credited with publishing the first account of it, in 1882, under the name raspberry cane rust. The disease appears to be confined to the blackberry and blackcap raspberry. As with the orange rust, the vegetative threads of the fungus ramify within the plant and are perennial. The first evidence of the presence of the fungus is seen in small, purplish, circular or elliptical spots on the canes near the ground. As the canes grow the fungus ascends and the spots appear at intervals even to the tips of the canes. The spores are formed about the centers of these spots and as they push outward the bark is ruptured and curled back.

"The spots then appear grayish-white with a purplish border. Often several spots may coalesce forming irregular patches. While the principal work of the fungus is on the canes, it is not wholly confined there, but may appear on the petioles and veins of the leaves. The nature of this fungus suggests the cutting out and burning of all canes seen to be affected. As a preventive measure it is recommended to spray, as soon as the canes are uncovered in the spring, with a solution of sulphate of iron, two pounds to five gallons of water, to be followed later, if the disease appears, by an application of the bordeaux mixture."

Leaf-Spot or Shot-Hole Fungus of the Plum and Cherry, Cylindrosporium Padi Karst.—This fungus was briefly mentioned last year, but as it is each year doing more injury, there is warrant for further mention of it. It has

been present in the station plum orchard for four seasons, but has been controlled by spraying so that no serious injury has resulted from it. The disease makes its appearance early in the summer, or about the time the leaves reach full size. Small circular spots of a red or purplish color are first seen: these enlarge somewhat, becoming an eighth of an inch in diameter. As the fungus matures the spots become dark brown shading to light brown at the center. The affected tissue shrivels and finally drops out, leaving circular holes. Frequently several spots may run together, so that the holes left in the leaf are irregular in form. Under conditions favorable to the fungus, the spots become so numerous as to destroy the leaves attacked and thus check the growth of the tree and prevent the development of fruit. If seedling stocks are attacked, the bark tightens and budding can not be performed.

The injury to orchard trees by this disease is in direct proportion to the percentage of leaves destroyed, but no matter how slight the attack it should receive attention. The tree is entirely dependent upon the leaves for the elaboration of its food, and any injury to them that interferes with the fulfillment of this important office checks growth and injures vitality. Various remedies have been tried, and of these the bordeaux mixture gives the most general satisfaction. In our practice with this remedy we have made two applications; the first as soon as the leaves are developed, and a second about three weeks later. In some seasons a third, and, possibly a fourth application may be necessary as the development and spread of the fungus is in a measure dependent upon weather conditions.

Powdery Mildew of the Cherry, Podosphaera oxyacanthae—This disease has not appeared in the station orchard, but has been reported to us from two counties of the state as injurious to both cherry and plum trees. The fungus works entirely on the surface of the leaves, drawing its nourishment from the cells by means of minute suckers called haustoria. Badly affected leaves have the appearance of having been dusted with a white powder and this suggested the common name. Being on the surface, the fungus is easily reached by any of the fungicides in common use. Finely powdered sulphur, which has been successfully used in combatting the closely related, powdery mildew of the grape, would probably be equally effective in destroying this parasite. The fungus does not usually appear until late in summer. Our specimens were received the last week in August.

Leaf-Spot of Blackberries and Raspberries, Septoria Rubi Westd.—This disease has not as yet given trouble in the station garden, but we have seen plantations of blackberries near Fort Collins that were quite badly affected. It has been sent to us from Otero county with the report that it was severely injuring blackcap raspberries. It also attacks wild plants of our native species. The disease appears as circular, oblong, or often irregular spots on the leaves. The color of the spots is brown at the center with a dark purplish border. The effect is to destroy or at least to injure the leaves so that the fruit dries up before reaching maturity. It has proved troublesome in other parts of the country and is a difficult disease to combat, owing to the tender nature of the foliage. The leaves are injured by the application of any of the copper compounds, unless applied in very dilute form. Such experiments as have been made have proved unsatisfactory, and it is not yet demonstrated that there is an effective remedy that will not work more or less injury to the plant.

During the past season the cantaloupe growers of Otero county have been troubled with a blight disease, which from the reports received, should be looked up as a serious menace to the prosperity of the business. Specimens were sent us by four growers, and all reported that great injury was being done. The disease is caused by a parasitic fungus recently determined by Messrs. Ellis and Everhart as macrosporium cucumerinum. It is a new

disease, and no experiments with remedies have, so far as I am informed, yet been made. It is to be hoped that the disease may not spread to do injury the coming season, but if it appears, experiments should at once be instituted in the field, and carried on until successful remedies are determined.

Work on other diseases attacking other plants of the same family, indicate that the foliage is very easily injured, and it may require some time to find a safe remedy. The business is of sufficient importance to warrant the expenditure of both time and money in combatting a disease, the spread of which means heavy loss, and the attack should be made as soon as the disease appears. There should be no delay.

The department asks the co-operation of fruit growers in the effort to ascertain what diseases are present, their distribution, and the injury done. We are glad to receive reports, and specimens of plants where injury is suspected, and will extend such aid as we can in tracing the cause and suggesting remedies.

SHADE TREES.

W. N. BYERS, Denver.

The first trees planted in Denver were set in the spring of 1865, if I remember correctly, and were cottonwoods. That was the first year we had any water upon the townsite for irrigation purposes, and we had but little at that time. A little ditch was dug by Surveyor General Pierce from Cherry creek, leaving the creek at the Broadway bridge and coming out on the townsite. Surveyor General Pierce, Judge Steck and Mr. Tritch planted a few trees, and possibly a few others planted some. Mr. DuBois is of the opinion that he planted some trees earlier than that date around his lots, where he had a livery stable, and he may have done so, but there was no water to irrigate the trees until in 1865. I could tell some amusing stories about our water rights then, and the defense of the water rights in which Judge Steck and other prominent citizens were interested. If Mr. DuBois planted trees earlier than that time he watered them with a bucket from a well.

I planted some trees along Arapahoe street near Fifteenth in the spring of 1865, and I watered them with a bucket, carrying the water from the Pierce ditch. That was the beginning of tree planting, and it was successful, so that the next year a good deal of tree planting was done. Our trees were mostly cottonwood, and since that time the cottonwood tree has been abused a great deal. Some people complain that it is not neat and handsome, and even that it is a nuisance. I think it is an unjust charge. While the cotton does fly from the trees during a certain short period of the summer, and is somewhat disagreeable, yet it is seldom so, for it is what some people term as clean dirt. There is nothing unhealthful about it and not much that is disagreeable. It is a native of the country. It makes a shade tree quicker than any other, and I still think a good deal of the cottonwood shade tree, as most old timers do.

The next tree planted was the boxelder; that, too, has since come in for a great deal of condemnation because it is infested with worms. That condition did not exist in the early days, and does now only in places. The pest began, according to my observation, along Champa street in 1889 or 1890, and it has spread gradually from that point in a southwesterly direction pretty well throughout the town. It is diminishing now, and I suppose in time will pass away. It certainly will have a tendency to encourage bird life in Denver. I know that the pest is a great deal less now than it was a few years ago and it is distributed over a smaller portion of the city. I do not think it is common in the country at all. It was not until after the worms came in here that much fruit tree planting was indulged in. After the worms came people began planting fruit trees.

Of the choice of shade trees now there is a great difference of opinion. My own preference is for a good compact shade tree, giving a dense protection, like the black locust, for instance. It may not be the best, but it

is entirely free here from the worms, so destructive to it in other parts of the state. There is another locust, a native of the state, looking very much like the other excepting that it has a different blossom. It grows along the streams, and sometimes extends up into the mountains. I do not think it will make as good a tree as the black locust; the timber may be as good, but it does not grow as large. The black locust is a good timber for all ordinary purposes, such as for posts and beams, or any use to which it can be put. It might be grown upon the plains for the rebuilding of the railways, for there is no better railroad tie than the black locust. It will grow in ten or twelve years sufficiently large to make two or three rails to the tree. I have trees that I put out about ten years ago that measure nine and a half to eleven inches in diameter. They have been allowed to spread in the natural way, no trimming or pruning has been done, except to remove branches that were in the way or that interfered with other trees. If they had been planted nearer together the timber would have been longer. There are two other locust trees, one is a thornless locust and the other has thorns. The wood and seed appear very much alike. They grow almost as fast as the black locust; of course the thornless locust is preferred, as the thorns on the other are very troublesome.

Another tree I have planted lately is the Russian olive. It is an olive tree that has been adapted to the climate of Russia and is planted very extensively. I planted a few trees eight or nine years ago. They began bearing very soon and have been bearing ever since. The tree blossoms late in the spring, but generally has a full crop of fruit. One year I experimented in pickling some, and after having forgotten to take them out of the brine for about a year, I found that they had a very natural taste. However, they were small. I do not know as they would be of any value unless they will produce oil. If they will do that it might be made one of the most productive fruit crops in the country. It is as hardy as the cottonwood, and its growth is pretty nearly as rapid. The tree is a pleasant feature in the landscape, because of its variation from the common color of the foliage of other trees. It has a whitish color, and the branches are exactly like the olives of commerce. The olive from this tree is a pleasant tasting fruit, and to eat a common olive of commerce alongside one of these, it would require an expert to tell the difference. I do not think it is infested with any kind of worms.

The next tree is the elm. I have several varieties and one that I am not disposed to favor. It was sold to me for a crimson leaved elm. When the tree is young the leaf is certainly a crimson color, but when the tree gets older that characteristic disappears. The foliage is very light and the tree looks as though it was being shriveled up. It has an appearance of suffering from hot winds. The ash has done well here for a number of years, and I had formed a great liking for it, but the last two or three years it has been troubled with borers, and it looks to me as if they will be destroyed.

I have four or five varieties of the soft maple, or water maple. They do not differ very much, and they are, generally speaking, very good trees, but are a little subject to being broken from a strong wind, or a late snow storm in the fall or early in the spring. Against that I have the Norway maple, which is a good, sturdy tree. It does not grow so rapidly as the soft maple, and is nearly akin to the hard maple.

I have four or five varieties of the oak. I have a burr oak that is making as good a growth as I have ever seen in any oak. I have a red oak doing quite as well, and it is as finely colored in the autumn as I have ever seen any place. I heard a discussion by the Natural Historical society here in which it was deplored that we have no trees of fine coloring in the fall. There are trees here that do have just as fine coloring, but the conditions are different. Very often an early frost comes and kills the leaves before

they have a chance to change color. I have the swamp oak, and the pyramidal oak, which is a fine tree, but I notice in it a disposition to winter kill sometimes in the young and tender shoots.

I have taken a great liking to the wild black cherry. It is a beautiful tree, with dark foliage and wide branches. I have quite a number. It bears fruit abundantly and is a great favorite with the birds. I have planted the Russian mulberry, too, and it is always very attractive to the birds, but the fruit does not last long unless the trees are planted so that the fruit ripens at varied periods. I have the fruit in varied periods of ripening so that it lasts from a month to two months, and the birds harvest the crop. Three years ago the mulberry trees killed quite seriously when we had a snow storm in September. There had been no frost to kill the leaves and the trees were heavily laden with foliage. The snow fell very deep, loaded them down and broke the mulberry and cherry trees. My plantation of walnuts happened to be very full of fruit and was almost destroyed. The addition to the weight by the snow upon the leaves, and the abundance of fruit was too heavy, and broke most all of them down, and they have not recovered yet, although they have borne some fruit every year since.

That storm was also serious upon the locust trees, and more or less upon others. The locust trees suffered mostly from the following winter; the trees were broken more or less in the branches, some of them were split but many of them had small branches broken, but wherever these broken branches occurred the trees died. The trees that were not broken at all did not seem to suffer. I may be mistaken but I attributed the killing of the mulberry trees to the breaking of the small branches in the fall before the foliage had matured, causing damage by the drying of the wood where the wood was exposed to the air.

A great many people favor pruning trees in the fall for the reason that they have more time then. It is almost fatal to prune trees in the fall for the reason just alluded to—the exposure of the wood permits the trees to dry up. I think it great folly to go around trimming trees in the fall, yet there are people in this town who make a business of it and they actually butcher them. I have refused to allow men to go into my trees in the fall for that purpose. It is almost as bad to take up trees, cut off the roots and plant them again in dry ground in the fall, leaving them subject to the effect of the dry ground and the wind and air. You can not protect them from the air and the roots are as bad as the limbs, the soil extracts the moisture from the roots that are cut off.

There are a number of trees in the mountains that stand transplanting well and are very pleasing trees for the dooryard or for the sidewalk, but some of them do not grow fast enough. The black birch and the black elder are both good, and the dwarf maple, which is near akin to the fine leafed maple, is very handsome and naturally adapted to planting here. I have them all growing. I do not think much of the catalpa. When I was planting trees nine or ten years ago I put out some and they did very well for several years and I began to think it was a mistake about them dying off. They got along handsomely, had great leaves on them and blossomed beautifully, but the hard winter three years ago and the snow storm in the fall pretty near settled the catalpas. The mountain aspen does well.

There are several trees that are not suitable for planting in a city. The wild black cherry and the catalpa, for instance, are too attractive for the boys. In the spring they break down the trees to get the blossoms, and if there is a stem left in the fall they will break down the trees to get the fruit. If you plant them at all in the city, do not plant on the street line, plant them in an enclosure. I would like to see the wild black cherry very much more extensively planted. There are not many in the nurseries here. I know of one lot of very choice trees planted two years ago last spring

in adobe ground that have almost all died. There was too much clay there and too much alkali. The trees did better the first year than the second, but now it is a very disreputable looking lot of trees, although with cultivation they might have made very handsome and sightly trees. With the objection that they ought not to be planted where they are exposed to the boys, they are very fine trees.

DISCUSSION.

Mr. Wilcox: Is the black cherry of Pennsylvania thoroughly rugged in Colorado?

Mr. Byers: Thoroughly so, but it would prefer a sandy loam.

Mr. Millison: You did not mention the linden tree.

Mr. Byers: I have a number of them growing, and I have come to like them more in later years than a few years ago. They grow rather slowly the first two years, but after that they gain head-way and make handsome trees. My trees are eight and nine years old. They have blossomed several years and have great attraction for bees. Another tree is the common sycamore of the Mississippi valley. I have a number of these trees and never lost one except by the breakage of branches under snow storms. The leaves are very large and some of my trees have been injured in that way, otherwise they have been very satisfactory.

Mr. Millison: They are the prettiest street trees that grow. The trouble is in planting them when too large.

Mr. Byers: I do not believe in planting any large tree. I believe in starting in early.

Mr. Camp: I would like to ask regarding the wild black cherries. I sold some to a nurseryman here, and he distributed them around through the city and found out they were very hard to grow unless dug when very small. There are very few roots.

Mr. Byers: My trees when transplanted were about four of five feet high. I think I got my cherries from the southeast part of Nebraska and I do not think I lost one of my wild black cherries. The Balm of Gilead trees have done well, too. The Balm of Gilead is a very rapid grower and very handsome and attractive, but it is the second to fall a victim to the borers. The first tree most likely to be attacked by the borers is the Carolina poplar. I have some of them, and the borers have cut most of them down. Around the foot of each tree is a bank of saw dust. They make no growth and I expect to take them out. The next tree for the borers, according to my observation, is the ash. I never noticed them in the ash until two or three years ago, but from the progress they are making I think the borers are going to destroy my white ash trees.

I made a discovery in laying down some raspberries. I found that one of the bushes had been covered with earth, and quite a number broke off six or eight inches from the ground. I found that the borers had attacked them. I had a great many black walnuts, but have not more than a dozen left perhaps. They are about six or seven feet high. They bore fruit last year but not this. I have noticed that where the walnuts do not get water enough the leaves begin to ripen in July, but the trees are not affected. I have noticed this on one of my trees which is never watered.

Mr. Millison: Did you ever see any borers in the blue ash?

Mr. Byers: I think I have not.

Mr. Kain: Are there borers in the catalpa?

Mr. Byers: I can not say, I never examined them for borers. As to trimming the trees, I would say that the trees should be trimmed in the spring, about the time the buds are opening, especially the maple. If the maple is trimmed now it will bleed from this time until the weather gets warm after the first of January. I would trim the maple when the leaves are as big as a squirrel's ear.

Query: Have you tried buckeye or dogwood in Colorado?

Mr. Byers: I have a red dogwood that is growing well. I have tried the white buckeye, which was a tree that I wanted very much to grow and preserve, but after a year or two it died and I was unable to get another.

Query: Would you transplant the evergreen trees of our mountains—spruce, blue spruce and pine—and at what season are they best transplanted? What would you advise for a wind-break?

Mr. Byers: What I would advise for a wind-break is dependent upon where the wind-break is to be planted. I would transplant the evergreen just as the tree is ready to begin growth in spring. I would, if possible, take up the evergreen with a considerable quantity of earth around the roots and secure it in a sack or canvas, tied tightly around the trunk of the tree, and put it in its new place of transplanting with that earth remaining around it. I think it is advisable to shade them.

Query: Is the butternut valuable as a shade tree?

Mr. Byers: The butternut is about as valuable as the black walnut as a shade tree, but it does not grow as rapidly. It will not give a dense shade.

Query: What foreign country, or city, plants fruit trees along its public highways, and is it not a commendable practice?

Mr. Byers: I think it is a commendable practice. It is done in many old countries—Spain, for instance. It is a very commendable practice to plant trees along the country roads. Where a farmer has water to irrigate his crops he can irrigate his trees, and it is hardly any trouble to produce and maintain them. They cost comparatively nothing, and add very greatly to the beauty of a farm.

Mr. Sawyer: In Michigan I know of one row a quarter of a mile long of Black Tartarian cherries; the trees are very large and it is one of the prettiest sights in the country.

Mr. Coburn: I believe Mr. Rockafellow of Canon City has his roads about his farm lined with fruit trees.

Query: Can the black walnut be transplanted?

Mr. Byers: Yes, I cut off the tap roots in transplanting the black walnut.

Query: Can you raise the wild black cherry from the seed?

Mr. Byers: Yes, sir. If you want to wait for it that long. You can plant the cherries this year and have the plants next year. They grow quite rapidly. I have one twenty feet high.

Query: What is thought of the silver maple as a shade tree?

Mr. Byers: I think the silver maple is a good shade tree.

Judge Osborn: I can answer that from experience. I have two trees in my door yard that have grown very rapidly, and we think a good deal of them, but you want to keep a good mattox on hand if you have the silver maple. The roots spread very badly. I know of an orchard near Fort Collins that has a row of silver maples along the fence and I was over there this fall and noticed that the silver maple had extended half way across the orchard. It will grow long after you cease to water it. The roots go until they find water. I think that there is not a tree that makes better bee food than the Russian olive. It blossoms for a long while, and makes the air for a distance around fragrant with perfume.

THE NEED OF TREE PROPAGATION.

J. S. McCLELLAND, Fort Collins.

Every practical orchardist sees the need of propagating stock under his own directions, if not by his own hand. He often has special kinds or choice strains he wishes to increase. He can not purchase these in the market, so he must depend upon his own resources. Should he be thoroughly prepared for this line of work, he is always in readiness to grow the varieties that experience may prove to him to be best for the soil and climate. It costs no more to propagate these new or promising varieties after the proper buds or wood is secured than the most common or inferior ones, and dealers usually charge from five to ten times as much. Then, too, if we depend upon many of the nurseries we too often find after years of labor that indeed we have leaned upon a broken reed.

Every intelligent fruit grower should be, to some extent as least, an experimenter. As soon as he discovers a variety seemingly suited to his needs, whether it is an old or a new kind, or a promising sort, he should be in a condition to give it further trial. As time is passing rapidly, and it may take years to test its value, no time should be lost in producing the stock necessary. As we are all well aware, some trees produce more fruit than do others, or it may be larger, better colored, or of superior flavor. These are the varieties we should multiply. Scions should be taken from these trees in order that we may perpetuate this tendency to produce more or better fruit than do other trees. In fact, to make our experiments of any avail to ourselves or others, we must then increase such stock.

Should we take the only other course available—buy trees of the same name from nurserymen or dealers—we may find after years of weary labor and waiting that our trees are not true to name, and perhaps varieties we have already discarded. Then there are trees and trees. One tree of a variety may bear more, larger and better fruit than do the others; we should take advantage of this peculiarity to add to our gains. This can, of course, be done only by propagation.

There is also an economical side to this question. While the prices of fruit trees remain so low as they have been for a number of years, one could buy about as cheaply as he could propagate; but now that prices have almost tripled in a wholesale way—cherry trees jumping from five to fifteen cents, apples and plums from two and one-half to eight and ten—one can grow his stock at very much less cost than he can buy them, besides preserving valuable characteristics, getting stock true to name, thoroughly acclimated, and just when ready to plant. Every one must see the great benefit of following the recommendation herein made.

In this I am not discussing a theory, but giving the results of my experience in growing fruits in Colorado for twenty years. It is necessary at times, of course, to buy new varieties, in a small way to test. By purchasing some

grafting wood, or one or two trees of a variety, one can readily propagate all the stock necessary to give such varieties a fair and impartial trial. For a number of years past I have been procuring grafting wood from the Wizard of Horticulture, as Mr. Burbank is called by his admirers, and I now have growing and ready to bear fruit many of his new fruits. We can experiment and propagate also, if we will, and many of our varieties have been brought to notice and fame by those who have been in no wise smarter than ourselves.

My experience has been a little different, perhaps, from those who have grown many kinds of fruit in Colorado, paying high prices for trees said to be of varieties that we were led to believe might prove more valuable than those we already had, only to learn after years of care that they were not what we ordered, were not true to name, and that we not only had all this trouble for nothing, but we had thus been prevented from testing varieties that proved successful with others who had procured the varieties that we had ordered. In very self-defense we will either have to propagate our own trees or else form a combination to expose those nurseries and dealers who are either so careless or dishonest as to send out stock which is not true to name.

We can plant seed of apple, plum, etc., and grow our own stock, but it will, perhaps, be more satisfactory to purchase apple seedlings of some one who makes a specialty of this business and grows them in very large quantities. Plum and cherry seedlings are usually imported from France, where they are grown very cheaply in immense numbers. These stocks or seedlings are usually cut back both top and root, and planted in the spring and buds inserted in the new growth during August and September. The following season they should make a growth of from two to six feet and give us excellent yearlings to plant out.

We can, of course, plant root grafts, especially of apple, but in my experience the practice of budding is more satisfactory. The better system is suitable to all varieties, and does not take one-fourth of the wood or root to be used in grafting. In propagating stone-growing varieties, I find if we use vigorous stock of two, three or even four years' growth, we can often get a growth in a single year that would take five or six years by using them as root grafts on a yearling root. Do not say you can not learn to bud and graft, because by giving a little attention to theory as well as the practice any one can learn it. If you do not wish to try, however, you can get some one else to do the work, and you will find it both pleasant and profitable.

FORESTRY.

J. B. THOBURN.

It may be truly and literally said that forestry has become a "burning" question in Colorado within the past few months. During the past season more timber was destroyed in ten weeks during August, September and October than has been consumed by all the timber men, railway construction, mining, agricultural and domestic industries of the state since its first permanent settlement forty years ago.

A year ago the annual horticultural convention devoted considerable time to an intelligent and very interesting discussion of this topic. Now the situation has grown still more grave and critical. Yet there is reason to be encouraged. Indeed within the last year the forestry movement may be said to have entered upon a new epoch. The era of agitation has been a long one and the process of educating and enlightening public sentiment in regard to this matter has been most tedious, but the ultimate result, always certain, has now become apparent. The time for action is at hand.

Within five years a definite and effective forest policy will probably be inaugurated by this nation, at least in the western mountain region. The nature of this policy is still to be determined, yet it may be safely predicted that the matter will be subject to federal rather than state control. Many elements must enter into the consideration of the question leading to the adoption of a final and lasting policy. The one point on which I wish to lay especial emphasis is that the people of the several states should be ready to extend active co-operation to the federal government to the end that the best and most rational solution of the problem may be attained. No state in the Union has a greater interest in this matter than Colorado, and some new legislation seems necessary at the coming session of the General Assembly.

In writing this paper I have deviated from the well beaten path of past discussions upon this subject—I have not referred to the agency of the forest in conserving the water supply and preventing floods, to its economic value as a source from which to draw fuel, fencing and building materials, nor to its sociological effect upon the life of a nation and the character of its people. These facts are now generally recognized and admitted. It is the personal duty of intelligent agriculturists and horticulturists to see that state and federal legislators are impressed that they have a responsibility to discharge in this matter.

A few public spirited individuals, possessed of infinite patience, and animated by an unselfish enthusiasm, have maintained an organization known as the Colorado State Forestry Association for a number of years past in spite of many discouragements. This association is worthy of your most cordial support, and I wish to urge upon those in attendance at this meeting, that as individuals each should make an effort to attend the next annual meeting

of the Forestry association, which will probably be held in Denver in January. Make an effort to attend, even though it be inconvenient and necessitate some personal sacrifice of time. It is a duty that you owe to the state, to your own generation and to posterity. In conclusion let me express the hope that you will place yourselves on record as demanding immediate and progressive action for a more rational treatment of the forests. Remember that he who now proves his friendship for the forest is a benefactor of his race.

THE EUROPEAN LARCH.

W. C. EDWARDS, Denver.

I desire to bring to the attention of all lovers of horticulture and forestry in Colorado a tree which, in my opinion, would add great beauty to the state. And if beauty is not the only requisite in a tree to deserve the consideration of our utilitarians, I can add that this tree is one of the most valuable that can be cultivated by foresters. This tree is the European larch, L. Europaea. I have often wondered why it is never seen in Colorado. It is one of the beauties of the forest, and I think, ought to be peculiarly adapted to our soil and climatic conditions.

It was first brought to my attention when I was a boy on my father's farm in Illinois. It came about in this way: The Illinois Central railroad became apprehensive over the disappearance of timber along its line, and desiring if possible to provide for the future in securing railroad ties, decided to encourage the planting of the larch. The encouragement consisted in advertising this tree in all its depots and in offering to transport the young stock free of freight from several mentioned nurseries, the farmers paying only for the stock.

My father thought well of the proposition and ordered 5,000 trees from the nursery of Robert Douglass & Sons of Waukegan. I remember his disappointment when the shipment arrived. The 5,000 trees only filled a big dry goods box. He imagined from the liberal (?) offer of the railroad company that 5,000 would fill several box cars. We planted these miserable looking little trees in the cold days of early spring. They were about a foot high and as thick as a lead pencil. My father dug the holes and required me to straighten out the roots and sift the fine dirt between them. My fingers almost tingle with the cold now as the memory of that episode in my life comes back to me. These trees were planted in 1872 or '73.

I have been to some pains to learn what success has attended its culture in Illinois. When I left home these trees were six or seven years old. Only a small percentage died. In seven years they were twelve to fifteen feet high. Every one admired them. I wrote a few days ago to the purchaser of the home farm. His reply to me was substantially as follows: "I only regret that your father did not plant 50,000 larch trees instead of 5,000. They are now from sixty to eighty feet high, six to ten inches in diameter, as straight as an arrow, and there is no more beautiful tree in the state of Illinois. Several years ago I cut a few for fence posts and they are as sound to-day as when I put them in the ground."

The European larch is a deciduous conifer, with spike-like foliage similar to the firs. When grown to perfection, it is straight, gradually tapering, stately and possesses all the attributes of a royal sovereign of the forest. Its branches are horizontal to the trunk, at regular intervals. From the main branches there droop pendulous sub-branches, not unlike the weeping willow,

on the ends of which there are cones about four inches long of the brightest vermilion red. The leaves are a soft but brilliant green. The trees flower in April or May and the seeds are shed the following autumn. When grown in an open space the limbs come near to the ground, but when more crowded the trunk is almost bare. It will attain a height of eighty to one hundred and fifty feet, and a diameter of three to five feet.

It is indigenous to the Tyrolean Alps and is pronounced by European travelers to be the most conspicuous tree in the Alpine mountains. For posts or piles it has been famous in Europe since the days of Pliny. The wood is almost impervious to decay and it is also almost inflammable. The tree must not be confounded with the American larch or Tamarack, L. occidentalis.

My reasons for believing it is adapted to this soil and climate are that it is successfully grown in the Alps, Carpathian mountains and Highlands of Scotland. The first year or two it may require liberal watering, although I am not sure of it, but afterwards I think it ought to thrive in a dry soil, particularly as it has a large tap-root which will naturally seek moisture deep down.

Because of this tap-root it must be transplanted when very small—a foot high is big enough. Planted in a row the trees will be large enough in five or six years to string barb wire on. I feel confident this tree will thrive in every valley of Colorado, and possibly on the mountain sides where now grow the spruce and balsam, and it might be grown in the foothills where it is very arid and where we now see the pinon and scrub pine. For the landscape gardener whose chief aim is the picturesque, there is no more desirable tree known to forestry.

WINTER PROTECTION OF THE PEACH.

PROF. J. C. WHITTEN, Horticulturist, University of the State of Missouri.

In this latitude winter killing of the fruit buds of the peach is usually due to the unfavorable effects of freezing after they have been stimulated into growth by warm weather during winter or early spring. This early swelling and growth of the buds is due to the warmth they receive, is practically independent of root action, and may take place on warm sunny days in winter while the roots are frozen and dormant.

Peach fruit buds may safely endure a temperature of ten or twenty degrees below zero provided they mature well in the autumn, are entirely dormant, and the cold comes on gradually. Zero weather may kill fruit buds that have swollen during previous warm days, or that were not properly ripened in autumn. Shading or whitening peach trees to prevent their absorbing heat on sunny days opposes growth of the buds and is consequently a protective measure.

Shading the trees with board sheds enabled peach buds to survive the winter uninjured, when 80 per cent. of unprotected buds were killed. Trees protected in this way blossomed later, remained in bloom longer, set more fruit in proportion to the number of apparently perfect flowers, and held their fruit better than any other trees on the station grounds. This is the most effective means of winter protection tried at this station, but it is probably too expensive for commercial orchards.

Whitening the twigs and buds by spraying them with whitewash is, on account of its cheapness and beneficial effects, the most promising method of winter protection. Whitened buds remained practically dormant until April, when unprotected buds swelled perceptibly during warm days late in February and early in March. Whitened buds blossomed three to six days later than unprotected buds. Eighty per cent. of whitened buds passed the winter safely, when only 20 per cent. of unwhitened buds passed the winter unharmed. Thermometers covered with purple material registered, during bright sunny weather, from ten to twenty degrees higher than thermometers covered with white material of similar texture, thus indicating that whitened peach twigs might be expected to absorb much less heat than those that were not whitened.

Low temperature and consequent severe freezing is often the direct cause of winter killing of the fruit buds of the peach. Peach buds, however, have often withstood a temperature of ten degrees, or even twenty degrees below zero, and subsequently produced flowers and fruit. On the other hand, five degrees below zero has sometimes entirely killed the peach buds throughout considerable areas. This shows that other conditions besides mere cold weather must be studied in attempting to ascertain the causes of winter killing of buds or plants.

Imperfect ripening of the wood and buds in autumn renders them more susceptible to injury from cold weather. This imperfect maturity may be caused

by late cultivation or by warm autumn rains which prolong the season of growth. Often the dry weather and cool nights of August induce partial ripening of the wood and buds. Subsequent rains and warm weather induce an autumn growth that is somewhat akin to a spring awakening; so much so that occasionally some of the flower buds burst into bloom in autumn.

Sudden change of temperature is always more dangerous than gradual change. A sudden drop from our ordinary winter temperature to five degrees below zero, particularly if accompanied by strong wind, is more severe on peach buds than a gradual fall to ten or fifteen degrees below zero. Sudden thawing sometimes is more damaging than sudden freezing. Buds and twigs are also unfavorably affected by bright sunlight during times of low temperature. Growth of buds during warm weather in winter renders them very susceptible to injury from subsequent freezing. This is the most common cause of winter killing of peach buds.

It very often happens that a warm spell as early as February causes the peach buds to make considerable growth. If growth starts to any extent the subsequent cold weather is almost sure to kill the buds. The peach is quite easily stimulated into growth by warm days even in winter. The purple color of the twigs favors the absorption of heat during sunny days. Purple-twigged varieties are more easily stimulated into growth than the green-twigged varieties like Snow. Peach buds sometimes remain dormant throughout the winter and suffer from late spring frosts after they have begun to blossom.

Numerous methods of protecting peach buds during winter have been tried with more or less success. Layering or bending down in autumn and covering with soil, mats, pine branches or other protecting material has been successfully tried. To facilitate bending down, the trees are usually headed low, the roots are cut on one side and the tree is then bent down over in the direction of the cut side, and may be quite readily laid on the ground. This should only be practiced on trees that have been bent down each year after setting. If an old tree is treated in this manner for the first time it may seriously impair its vigor.

The Iowa station advises shaping trees to be thus protected by training the trunks horizontally along the ground and allowing the upright head to form several feet to one side of the stump. Grown in this position, the prostrate trunk may be twisted sufficiently to allow the head to be laid over on the ground. Some growers are reported to have successfully laid down the peach by planting the young tree so its roots are guided laterally in two opposite directions, by a trough-shaped piece of sheet iron embedded in the ground. The roots in this position may be twisted sufficiently to permit the layering of the tree. Coating the buds, by spraying with glue and other sticky substances, has been tried, with the hope of affording winter protection. Baling; or drawing together the branches as closely as possible in a vertical bundle, has been tried with some success.

Whitening the twigs and buds by spraying with whitewash has been given more attention at this station than any other means of protection. Careful observation has shown that warm sunny days in winter or very early spring are indirectly more dangerous to the peach buds than is the very cold weather. Peach buds are able to endure fifteen or twenty degrees and possibly more below zero without injury, provided the wood ripens properly in autumn, the cold weather comes on gradually and the buds remain dormant. On the other hand, the buds of peaches on a southern slope may swell and grow perceptibly when the atmospheric temperature reaches fifty or sixty degrees below zero, if there is bright sunlight. After a few days of such weather, a sudden drop to near the zero mark is almost certain to destroy the fruit buds that have been stimulated even in slight growth during the previous warm days.

Reference to the reports of the United States Weather Bureau and the State Board of Agriculture shows that the temperature seldom goes low enough in any part of the state to kill dormant peach buds. The same reports, however,

record frequent winter temperatures sufficiently high to cause peach buds to swell perceptibly, and also show that a fall of sixty degrees within less than a week is not uncommon. Last winter a fall from sixty-nine degrees above to four degrees below zero during January killed a portion of the fruit buds of the peach in the vicinity of the station, and weakened many buds that were not killed.

It should be constantly borne in mind that peach buds may swell and grow when the ground is frozen, and the roots of the trees are inactive. There is an erroneous opinion in regard to this among fruit growers, some of whom believe that growth of the buds can not take place unless the roots are thawed and active. In conformity with this theory, they advise heavy mulching under the trees after the ground freezes to keep the roots frozen and dormant. This is supposed to retard swelling and growth of the buds until danger of frost is over. The error of this theory has been amply proved. Many years ago it was shown that when the branch of a grape vine which stood near a building was drawn through the wall into a warm room it could be forced into considerable growth, while the parent plant to which it was attached remained frozen solid outside.

Circumstances are frequently met which tend to disprove the necessity of root action in promoting the growth of winter buds on warm days. Trees of certain varieties, if cut down while frozen in winter, will often leaf out in spring when their trunks are entirely severed from the stumps. Inside of lumber camps built in winter of certain kinds of logs sprouts of considerable length are stimulated into growth by the warmth of the camp fire, while the outer sides of the logs are still frozen. Florists force lilacs into growth in winter by drawing branches of dormant lilacs into the forcing house through the wall. All parts of the twigs that receive warmth begin growth, while the rest of the plant is frozen. Twigs of early flowering plants like the peach may be forced into bloom in winter by cutting them and putting them in a vase of water in a warm sunny room. These facts, corroborated by other investigations, indicate that the starting of dormant buds into growth is due to the warmth they receive, and is practically independent of root action. The twigs contain sufficient stored food material to promote considerable growth before the roots and developing leaves are called into use.

Some plants require much more heat than others to begin growth. The peach is quite easily stimulated into growth. Its buds will swell during quite low temperatures, especially if the sunlight is intense. Whitened buds are less subject to injury, as they absorb less heat, and are therefore less likely to be stimulated into growth during warm weather. The effect of different colors on the absorption of heat is too well known to need extensive comment. Every one knows that a black garment is warmer on a hot day than a white one of similar texture. A black hat is said to draw the sun and is warmer than a white one. A black cloth spread on the snow will absorb enough heat from the sun to melt its way down into snow much faster than a white one of similar texture will do.

The expense of whitening is not great. A common lime whitewash was at first used, but it washed off badly during rainy weather. Finally a whitewash of lime, with one-fifth skim milk added to the water, was tried with much more satisfactory results. About one pound of salt was also dissolved in each bucketful of the whitewash. Four applications of this wash, applied during the winter and spring, are sufficient to keep the peach trees thoroughly whitened. The first whitening should be done early in winter, shortly before Christmas. The wash may be sprayed on with almost any kind of a spray pump. We found the bordeaux nozzle to be satisfactory, as a solid stream could be readily turned on if the lime clogged the nozzle.

The whitening should be repeated as often as the lime is washed off by rains. A good wash, however, will adhere well for weeks. The trees need two

sprayings to begin with, just as wood needs two coats of paint in order to cover it well. Two subsequent sprayings are sufficient. The whitewash should be made as thick as can be sprayed through a bordeaux nozzle. We used a small bucket spray pump and applied about one-half a bucketful to a tree at each spraying. The time required to apply the whitewash will vary from five to ten minutes, according to the kind of pump and the size of the trees. The more trees that are sprayed, the cheaper it can be done. Altogether the cost need not exceed ten cents a tree for the winter.

As fungicides are more safely applied to peaches when they are dormant than when they are in leaf, we tried adding copper sulphate to the whitewash. The copper sulphate was dissolved in the liquid used to thin the lime, at the rate of one pound to ten gallons. This discolored the whitewash somewhat, and another spraying of the wash without copper sulphate was given to cover it. We are not yet ready to report on the efficacy of the winter application of fungicides for the disease of the peach. More recent experiments on our grounds show that where thermometers are inserted in twigs, tunneled for this purpose, that the natural twigs register as much as fifteen degrees higher than the whitened ones when the sun is bright. At night or on cloudy days they register alike. A difference of fifteen degrees is equivalent to a difference of six weeks in time of spring; that is, on the first of March, when the whitened twig registers fifteen degrees more, or equivalent to weather on April 15.

The effect of the whitewash is shown only on those parts that are well covered. If a single bud lose its white coat it will absorb heat and flower about as soon as it would if the rest of the tree were not whitened. Thermometers placed in twigs a few inches apart, in alternate white and purple strips around the twig, show as much difference as if they are put in separate trees, the one white and the other not. So it is necessary to keep the buds well covered. A tree may appear to be white after the wash has cracked from its buds. A number of practical growers this year attest the commercial value of whitening to save the buds from winter killing.

It should not be believed that the winter whitening of the peach will be found a reliable prevention of all classes of injuries caused by cold weather; yet, from the results already given, it is clear that it tends to check swelling of the buds on warm days of winter, and to retard blossoming in spring. We have not been able to detect any injury to the trees by this practice. Wherever peach buds are subject to winter killing by fluctuating temperatures and where their flowers are frequently killed by late spring frosts, we suggest that whitening be tried on a small scale at least.

PLANTING AN ORCHARD.

W. E. ALEXANDER, Fowler.

Byron, who wrote many beautiful things, never expressed finer sentiment than he did in these two lines:

"He who plants trees
Loves others besides himself."

To practice horticulture is the most ennobling pursuit in which man or woman can engage. It brings them nearer to nature and fills their souls with humanity. No bad man ever grew an orchard.

The subject of this article is an important one, not alone to the beginner, but to all who expect to make tree planting a success. Having planted in our beautiful state something over five hundred thousand trees in the past eight years, my remarks will be based on experience and close observation and not be entirely theoretical. To paraphrase an old piece of advice I would say, first select your land, then civilize it. The greatest care should be exercised in selecting the land, that you may begin right, and by beginning right make a successful ending. The topography of the country and many other conditions, as well as the soil, should be taken into consideration in making a choice so as to avoid seepage or alkali land or land that is likely to become so.

A sandy loam that is warm and friable is the best for all around orchard purposes and holds moisture best. If this kind is selected its reclamation is very easy because there is no greasewood or other brush to grub out. In preparing sod or new land of this kind we obtain the best results by plowing six or seven inches deep as early in the spring as possible and then thoroughly tearing up the sod, if any, with harrows. We then mark off the ground and plow three deep furrows where the tree rows are to be, then we make a round trip in the bottom of the furrows thus made with a sub-soiler so that we have the ground beneath, where the trees are to go, well torn up for twenty to twenty-four inches below the surface. After all this is done we dig large tree holes with a shovel and are ready to plant.

We put two men in each gang, one to hold and set the tree, while the other shovels in the dirt. In the meantime another man, who can keep several gangs supplied, has cut open a bunch of trees and with a sharp knife or a hatchet and block, has trimmed off all broken or bruised roots and put a tree in each hole for a short distance ahead of the planters, so as not have them exposed long to the sun and wind. The planter then sights the tree in by posts previously set both ways and holds it in place, gently sifting it up and down, while his helper throws in two or three shovelfuls of good top soil, so as to leave no airholes around the roots; then he jumps into the hole and, with the heavy boots he wears for the purpose, tramps it down solidly

and hard and goes on to the next, leaving the helper to fill up the hole heaping full.

Now, the boss of all the gangs should follow them along and trim up all limbs as severely as the roots have been trimmed, but taking care to leave as many as possible on the side toward the 2 o'clock sun. At this point the water should be ready and turned into the trench to settle the dirt around the roots and start them growing, and they should be irrigated every three or four weeks during the summer, according to the conditions, and again after the wood has ripened in the fall.

It is a good plan to plant corn or vine crops between the trees for the first two or three years, leaving six feet on each side of the trees for cultivation. This takes off the intense glare of the sun and helps to hold the moisture in the ground. Cultivation and irrigation should be the motto from now on, not forgetting to protect the trees during the winter from rabbits.

It is difficult to answer the question so frequently asked as to how often a young orchard should be irrigated, on account of the varying conditions, but our experience is that an orchard on land that has never been cultivated before will require five or six times as much water as one on old land. The late fall irrigation is of the utmost importance and should never be neglected, because thousands of trees die for lack of moisture during the dry, warm days of our beautiful winters. The work necessary to grow a young orchard savors considerably of a continuous performance, but in a country like ours, where it begins to bear in three or four years and never fails, the reward is sure and large and compared with eastern states is much more quickly realized.

THE QUESTION BOX.

EXPERIMENTS WITH THE PERSIMMON.

Who has raised persimmons in Colorado?

Mr. Coburn: I had some persimmon seed sent to me about twelve years ago and planted them. They came up, but I think other trees may have shaded them too much, for they only grew knee high and then winter killed. I have heard they were of very slow growth.

Mr. Felton: W. A. Helm had two or three persimmon trees at Canon City a number of years ago, that bore fruit.

THE CHESTNUT IN COLORADO.

Who has raised chestnuts, Japan or American?

Mrs. Shute: W. E. Alexander has.

Mr. Brothers: The only ones I have seen in Colorado are at the Martin Everett place on Wheat Ridge. In 1868 he sent to his old home in Ohio and got some chestnuts and also some peach pits, which he planted. Some of the peach trees are growing yet. They have killed down and grown up, and killed down and grown up, but they are there to-day. Some years they have tremendous crops of seedling peaches. Once in a while the chestnut trees have a few nuts, but very few. I have tried the Italian chestnut time and again, but they kill down every winter.

Mr. Camp: I think the Japan chestnut does very well. It sheds its leaves early in the fall. I planted some, and they are in good, healthy condition.

Mr. Byers: I have a few American chestnut trees and have had no trouble in transplanting them. I had no fruit this year, but one tree bore last year. They make growth as fast as most trees. The horse chestnut kills here, and I have quit trying it.

BLASTING HOLES FOR TREES.

What kind of powder should be used in blasting holes for trees, and what has been the experience of any member of the association in that method of making holes?

Mr. Brothers: I think it puts the ground in very good condition, but it ought to be done in the fall. The stick of powder, containing a pound, costs about 13 or 13½ cents. I put a hole in the ground with an iron rod, about two or two and one-half feet deep and a half inch in diameter. The rod is perhaps five feet long and diamond pointed. I then put the stick of giant powder in the hole, put the cap on the fuse and the fuse in the hole, light it, and it is not more than half a minute before I have a big hole. It disturbs the dirt all

around, and if done in the fall the snow and frost of winter puts the ground in fine condition. It is like planting a tree in an ash heap.

Mr. Camp: The action of the giant powder has a tendency to deepen the holes, and of course it pulverizes the sides. The tendency of black powder is to throw the ground up; it does not deepen the holes any deeper than where the powder is put.

SMALL FRUIT IN THE ORCHARD.

What is the disadvantage of planting small fruit in an orchard?

Mr. Felton: It depends upon the nature of the soil. If you have ground that is well drained underneath, so that by applying the extra amount of water to raise the small fruit it will not injure the apple trees for the first few years, but if you have an impervious subsoil, the large amount of water applied to small fruit will injure the trees.

Mr. Brothers: That is our experience on Wheat Ridge.

Mr. Wilcox: I would like to say that in the Pecos valley, in Southern New Mexico, they find it necessary to plant corn for the first two years of the life of the trees on account of the blistering sun. Irrigating the corn seems to do the trees good.

Mr. Osborn: I have many varieties of apples in my orchard, and I raise raspberries and small fruit between the rows. I irrigate whenever it seems necessary and I have never noticed any bad effects on the apple trees. My land is sandy loam with a gravel subsoil.

Mr. Brothers: My land is different, and the difference is altogether in the soil, just as Senator Felton has stated.

STOCK FOR THE PLUM TREE.

Which is best—plums propagated on the peach or plum stock?

Mr. Coburn: It would be owing to the soil and the climate. If on heavy soil do not put it on peach, but put it on plum. On light or sandy soil on peach stocks, if it has a good drainage.

Mr. Brothers: Some eighteen years ago the Stark Bros. nursery people grafted all their wild goose plums on peach roots and I never had a better lot of plum trees, or any that turned out better, in my life. But the borers got into them and they did but very little good. I have had a great many grafted on plum roots and never had that trouble. I think the peach roots make the worst things for borers to get into.

Mr. Coburn: Did you plant them on high, dry soil? Ans. Yes, sir. I did.

Mr. Steele: I planted out over 400 plum trees on peach roots some thirteen years ago. I was told when I was planting these trees that I was making a mistake, that over in Utah some place they planted plum trees on peach roots and they lived only six or seven years; that my trees would all die in a few years, and some of my neighbors planted on plum roots. My trees have been bearing every year since they got old enough, and are healthy and vigorous. I would not think of planting a plum tree on any other than a peach

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ERADICATING THE PEAR SLUG.

Will some one please state a preventive against the pear or cherry slug?

Mr. Devinney: Ashes or lime sprinkled upon the slugs will kill them. They are of a slimy nature, and as soon as the ashes fall upon them they cause their death, at least within ten minutes after being put on.

root.

Mr. Honnett: London purple is probably better.

Mr. White: I have tried paris green, and it works successfully.

Mr. Kain: I would like to ask if the slugs are not on cherry trees at the time when the cherries are ripe, and if paris green would not be injurious to the fruit?

Mr. White: I spray my cherries when I spray my apple trees, and the slug does not make its appearance after that is done. As a preventive the paris green is put on before the cherries are ripe.

Mr. Tobias: It can be done while the cherries are ripe by using white hellebore.

Mr. Brothers: I never have tried spraying for slugs, but in the morning, before the sun dries the leaves, I take about a bushel of lime, get on the right side of the tree, with reference to the wind, and throw air-slaked lime all over my trees. I have had splendid success in this way. I believe paris green is good, but it requires more work than the other.

CALIFORNIA QUAIL.

Does the California quail eat insects?

Professor Cooke: Personally, or from personal observation, I can not say; but so far as I know the habits of the California quail, they are about the same as the Virginia quail. The quail eats quite a number of insects, perhaps a third of their food. It is a native of the southwestern states.

CAUSE OF CRACKS IN TREES.

Last February I had a number of apparently healthy Winesap apple and plum trees cracked from the branches to within six inches of the ground. Most of these trees died during the spring or summer. Can any one give me the cause and a preventive?

Mr. Coombs: I asked that question. It was not confined to any particular variety of plums. No apple trees cracked except the Winesaps. The trees appeared to be healthy until February, and I then noticed they were cracked, and a majority of them died. I filled some of the cracks with wax, and I believe it helped them. The trees were three years old. I will say regarding the Winesaps that two falls before they had been affected with green aphis. and the leaves were covered with green lice. I do not know but that had something to do with it.

Mr. De Vinney: Anybody that has the green aphis knows what it is. Some of the trees for the first few years grow very rapidly, and when the green aphis is bad they get on the under part of the leaves, and almost before a man knows it, the substance is extracted and the consequence is that in the spring the limb dies.

Mr. Brothers: Some twenty years ago I had the same experience. I planted 275 Winesaps, and to-day there is only one standing. I think the trees grow too long in the fall, and they winter kill. I got sick of the Winesaps after my experience that time, and did not plant any for a good many years. I wish I had some, like my neighbors have, in bearing now.

Mr. De Vinney: I am growing an apple nursery for the purpose of experimenting. There are a good many trees that early in life—the second, third and fourth years, grow very rapidly and after that they begin going down. I find that if we keep cutting off the old branches they will grow slower and become very hardy.

J. B. Adams: Although not a member of your association, I have been getting some very valuable information, and am willing to give any that I can. About sixteen or seventeen years ago, in February, we had quite a deep snow with considerable wind, and it swirled around the trees, forming a bank sloping towards the bottom of the trees on the south and west side. A frost came immediately after the storm and the sun came out bright. Every tree in my orchard frost cracked on that side.

CARE IN PICKING APPLES.

In picking Winesap apples it is claimed, if care is not taken, the next year's buds will be damaged.

Mr. Brothers: That is true of any variety.

Mr. Coburn: More especially of Winesap. The sprig is very brittle and if given a twist it will take off nearly every sprig, if the pickers are not careful.

REPORT OF COMMITTEE ON RESOLUTIONS.

Your Committee on Resolutions beg to report and recommend the following:

Fruit growing is becoming an important commercial interest in the state, and inasmuch as the industry is in its infancy, with many things necessary to success yet to learn, therefore,

Resolved, That it is the sense of this convention that the time has come when we should recommend special study looking to careful selection of the best apples as keepers, shippers and sellers.

Resolved, That too much care can not be exercised in the selection of thrifty, healthy trees for setting, as a mistake here means failure in the end.

It is not usually advisable to accept such varieties as are recommended by agents, and buyers who are not well informed should apply to the most experienced orchardists in the neighborhood for advice and instruction as to the best kinds to plant in special situations, even in given districts.

Resolved, That this convention appreciates the value of honesty in packing fruits, connected with attractive appearance in sending goods to market, for it is along these lines, together with the superiority of our fruits, that Colorado's reputation as a pomological success has been attained.

We can not emphasize too strongly the necessity for careful grading and packing of fruits and the use of new packages, neatly stenciled with name of grower and variety.

We must urge upon the county inspectors the necessity for the most thorough execution of the law in relation to insect pests and fungous diseases as well as closer observance of the regulations governing the use of second-hand packages.

Resolved, furthermore, That we heartily favor the holding of Farmers' Institutes for the discussion more generally of horticultural subjects and we would recommend in this connection that the various boards of county commissioners be invited and urged to attend these meetings in order that they may become better acquainted with the importance of these interests, and lend more ready assistance to the inspectors in the execution of the laws.

We also contemplate the advantages of organization in the broad sense of the term, and believe that great benefit may be derived from horticultural associations in every fruit district, as much good has resulted from these in the past.

Whereas, In Colorado all rural industries are dependent upon irrigation, and inasmuch as the economic distribution of water depends largely on the conservation of snow in the mountains, and recognizing the fact that our mammoth forests are the great conservators of snow, and during the past summer many forest fires have destroyed vast ranges of timber, and,

Whereas, Forestry is an art, the successful practice of which can only be attained by scientific education and training, and as the forests of this nation are of such great value and importance that it is of questionable expediency to trust them to the care of men other than those who, by training and sentiment will most zealously guard their welfare, therefore be it,

Resolved, That we, the horticulturists of Colorado, favor the creation of a separate Bureau of Forestry in the Department of the Interior, together with the organization of such a force of trained men as may be necessary for the proper management and care of the forest reservations and a better administration of the laws, and be it further

Resolved, That we favor such state legislation as will tend to promote the best interests of forestry in Colorado by co-operation with the Federal government in providing adequate protection to the forest areas, thereby conserving the water supply.

Resolved, That this convention desires to express its appreciation of Governor Alva Adams' address of welcome and hereby extend its thanks to his Excellency for his earnest, cordial words of wisdom and encouragement. His actions at all times during his official life, in advancing our material interests, are very commendable and must meet with the approval of every horticulturist in the state.

Before concluding, we wish to express our appreciation of the people of Pueblo for donating funds with which it became possible to give a state fruit show at the Mineral Palace in that city, and that such aid and assistance must be recognized as a warranty for other successful fruit shows in the future until in time we may be able to participate in a great state fair at Denver, a movement with which we are in sympathy and which we hope to see as a grand realism within a few years.

Whereas, Our legislature made no provision for a horticultural exhibit at the Transmississippi exposition at Omaha, and the officers of this society without the encouragement of state aid undertook to make a state exhibit without such help; and,

Whereas, A large number of citizens contributed funds to that end, and the railroads and express companies extended liberal and generous aid; therefore,

Resolved, That this convention do here and now express to our officers its profound sense of appreciation and hearty thanks for their brave, energetic and loyal efforts to advance the interests of this society and the good name of Colorado abroad. Be it further,

Resolved, That we sincerely thank every contributor of money, fruit or time given in the interests of the exhibition.

Resolved, That we thank the railroads one and all as though called by name, the express companies and the cold storage companies, for the liberal assistance they rendered our officers in making the exhibit, and but for which help the exhibition could not have been made.

Resolved, That special thanks be expressed and extended to Mrs. Martha A. Shute, the secretary of the board of horticulture, for her heroic generalship in so commanding and leading her forces so meagre at the beginning, as to maintain for Colorado first rank in the sisterhood of states as a fruit producing country.

LUTE WILCOX,
W. G. M. STONE,
W. J. SAWYER,
Committee.

SUPPLEMENTAL RESOLUTIONS.

Resolved, That this convention express its hearty appreciation of the interest the president and members of the faculty of the State Agricultural College have taken in our work, and especially in our annual sessions; and earnestly solicit their continued aid in the way of experiments and instruction in horticultural matters.

Resolved, That it is the sense of this convention that the horticulturists of Colorado are deeply indebted to the press of the state for its diligent presentation of the growth and progress of horticulture. It has ever been at our service, and day and night has been our friend and advocate.

HORTICULTURAL NOTES.

During the Transmississippi Congress the Omaha Bee said:

"Of all the exhibits in the Horticultural building, there is none that attracts more attention and is more generally admired than that from Colorado. The exhibit is not outclassed by any of its competitors, for it is showing every variety of fruit that can be raised in any northern climate. The fruit is excellent and is pronounced superb, both in flavor and quality, and exceptionally fine and free from specks or blemishes. The exhibit contains apples, peaches, pears, grapes, prunes, plums and every other variety of fruit found in semi-tropical countries. It is the size, appearance and flavor that strike the public most favorably.

"Senator Swink is showing a large quantity of fine honey in connection with the horticultural exhibit. It is all from alfalfa and consequently is almost as transparent as water. Being a specialist in the apiary work, he has compelled his bees to do some fancy building and has forced them into glass cases, where they have constructed the comb in the form of stars, cubes, squares and circles. In addition to this he is exhibiting extracted honey that is pronounced as fine as any ever seen. He received two silver medals for his exhibit."

On the subject of pruning, A. W. Carr, of Delta, says: "The most important pruning which is performed upon an orchard is the first one, for it is this pruning which makes for the orchard a standard apple or pear tree when taken from the nursery to be planted out. We will suppose it to have a straight, stout trunk, four to six feet in height, as the case may be, and a head composed of a certain number of shoots or branches, but shoots of one year's growth at the time of planting. Three or four of these shoots should be selected to form the main branches, or frame work, on which to build the whole head, and the remainder cut cleanly out. Those reserved should be cut back fully one-half and from the shoots produced by these, at and below the cut, two of the strongest should be selected, on opposite sides, and all the others rubbed off while they are soft. In selecting these shoots care must be taken to have them equally distant from one another and pointing in opposite directions, in order that they may not cross or interfere.

"During the first season these young shoots must be watered and kept in a regular state of vigor; if any threaten to become too vigorous they should be pinched back or checked at once, so that perfect uniformity be preserved. This is the time to secure a well formed and nicely balanced head. A very slight circumstance sometimes throws the growth all to one side or one branch of a young tree and produces a deformity from which it never recovers. The trunk must be kept clean of all shoots by rubbing off such as appear, at the earliest possible moment, when it can be done without the use of a knife. Supposing we commence the head with three branches

at the time of planting, there will be six at the end of the first season. The attention required after this will be to maintain a uniform growth among these six branches and their divisions, and to prevent the growth of shoots in the center.

"The leading defect in all our orchards is too much wood. The heads are kept so dense with small shoots that the sun and air are, to a great measure, excluded and the fruit on the outside of the tree only is marketable or fit for use. The head should be kept open so that wood, leaves, blossoms and fruit may all, on every part of the tree, enjoy the full benefit of the sun and air, without which they can not perform their proper functions or attain maturity and perfection. I am partial to the pinching system if it is done properly during the growing season. Very little knife pruning will be necessary to shorten the leading shoots. The great advantage of pinching is that it economizes sap; that which would be expended on superfluous shoots is turned to the benefit of the parts reserved, and thus the growth is greatly promoted."

A. A. Miller, president of the Grand Junction Fruit Growers' Association, recently returned from a trip to California, whither he was sent to investigate the processes in use for evaporating fruit. His report recommended the erection of an evaporating plant in the Grand valley, of sufficient capacity to handle all fruits that could not be profitably marketed and as much of the first grades as might be desirable; also the addition of a cider and vinegar plant and, subsequently, preserving works.

Mr. Miller says: "I believe as great a problem is involved in discovering the best way of preparing and marketing fruit as in the raising of it. For instance, if I attempt to market a lot of inferior fruit, there is no one but myself stands to lose a cent thereby. There is no business man who will take the slightest chance of financial loss on inferior fruit, therefore it must be consigned to the commission houses. If the commission man gets one dollar above freight out of the shipment, that dollar belongs to him.

"My experience in the fruit belt of California has proven beyond question in my mind that there is only one thing left for us to do, and that is to raise better apples and peaches than our competitors in any other section of America, and I fully believe we can do this on the western slope of Colorado. But some will ask, how can we do this? I answer, by labor; for what labor can not do, nature herself has provided—climate, soil and water. Therefore, we must thoroughly cultivate our soil, and I mean by cultivation a continuous stirring of the soil from the time the fruit is formed, until it is nearly ready for market. By so doing we shall have a much healthier tree and at the same time have to use a great deal less water, and everybody knows that it takes a healthy tree to grow fruit and that the less water found necessary to its growth, the healthier the tree will be.

"It is altogether unnecessary to grow as much annual wood as we have been doing in Grand valley. It only makes more work for us and the kind of work to which we all seem to be averse—pruning. As pruning, especially in the peach, is one of the most essential points, every peach tree when filled with fruit buds should be pruned thoroughly and carefully, thinned out properly and every limb shortened back to hold about the required amount of fruit. By so doing the laborious work of thinning, which we all dread so much, will prove to be but a slight task. We must also apply machinery that will cultivate closer to our trees, so that the surface roots, instead of weeds, may get the moisture from below. In spraying, also, we should improve, as, if we permit insects to prey upon our trees all our labor is thrown away."

The value of a wind-break for an orchard is not fully understood by many growers. A man near Denver in 1876 planted on ground not then protected by any wind-break, 100 Winesaps and 1,000 Jonathan apple trees and all but three of each variety were dead in a few years. He afterward grew a wind-break around the same ground and reset it to the same varieties of apples, and the trees are now doing well. The heavy winds in March and April and the fore part of May are very trying to young trees not protected. It is not known just what is the best to plant for wind-breaks, but the following varieties are well recommended: Cottonwood, Carolina poplar, Lombardy poplar, box-elder and Russian mulberry. The latter has the double advantage of bearing fruit well liked by the birds, as well as making a dense hedge if closely planted, but it is a gross feeder and must be planted quite a distance from the trees to be protected. A wind-break of some kind is a matter of the first importance in the successful growing of all kinds of fruit.

A good way to plant for an evergreen wind-break where there is plenty of room is to set trees of three to four feet size. Place them about six feet apart. When the trees touch each other, which should be in about six years' time, dig up every other tree and form an inner line with them at a distance of fifteen feet from the outer row. If preferred, the two lines could be set permanently at first. The single line has a better appearance at first, the plants being nearer and one protecting the other. On the other hand, a young tree is planted with less risk than a larger one, though there should be no losses in transplanting such trees as referred to a distance of a few feet. The best time to transplant conifers is early spring, just as soon as the ground is fit. Get transplanted trees, as those from the mountains or from a nurseryman's seed bed may not live.

In cutting out the blighted limbs of trees the pruning knife should be sterilized every time an incision is made. The solution to be used in disinfecting the pruning knife may be a carbolic acid solution, which is doubtless best for this purpose. It is made by shaking up the acid, preferably the crystalline form, in a bottle with water. The solution should contain about five per cent. of the acid. A piece of cloth or a sponge should be fastened inside the vessel containing the solution, and each time the knife is used it should be wiped on this cloth or sponge. A solution of ordinary chloride of lime is also good for disinfecting the knife. It should contain about two or three per cent. of the chloride of lime. Another solution which can be used for this purpose is corrosive sublimate. A solution containing one-tenth of one per cent. would be sufficiently strong. Tablets containing sufficient corrosive sublimate for a quart of water can be obtained at almost any drug store.

One of the best plum growers in Boulder county always advises root grafting the plum on peach roots and planting rather deep to secure rooting of the plum near the surface of the ground—each variety thus eventually being upon its own roots. He objects to the Mariana for stock, as it is grown from cuttings, is inclined to produce suckers and is otherwise objectionable. The European plum or Prunus domestica, he claims, is not sure nor profitable, while the Japanese varieties are not much longer lived than the peach and bear inferior fruit, subject to rot and not to be recommended. "Plums of American origin for Americans" is his motto, and he predicts that real advantages in plum culture must be made along this line.

The drying of fruit in Colorado has not been considered of so great importance in the past as it will be in the future, when the question of surplusage and the utilization of culls will force itself upon us. The idea is gaining ground, however, and the following from a local paper in Montrose county is interesting at this time: "Ed. Silva, of the famous Ashenfelter fruit ranch, has been experimenting lately with the drying of apricots and gives us his experience. He has succeeded in bleaching the fruit to the richest of colors and in drying it to perfection in the open air. In California it takes from three and a half to four days to properly dry apricots, and on account of the dew the fruit must be taken in each night. Mr. Silva dried the fruit in two and a half days, and there being no dew, was not forced to move it at night. This he considers a very valuable feature, and one which places Colorado far ahead of California in the fruit drying line. Natural conditions are ideal here. It will be a great thing for our farmers when they learn that apricots may be prepared which will outclass the famous California product, and that it may be done with little cost. Already people are beginning to interest themselves in fruit evaporation, and indeed they must if the problem of disposition of fruit is to be solved, and the successful drying of apricots will certainly be a long step in marketing that fine fruit and bring thousands of dollars to those who profit by the experience of Mr. Silva." There is so much cull stuff in every orchard that it should be worked up and disposed of, and thus far science has found no better way than to dry it, and this is about the only way that pit fruits can be worked up.

In root-grafting the plum, cherry, peach, apricot and fruits of that class, the whip graft or side graft is used, and is made as follows: The scion used is about six inches in length. The whole root is used for the stock with these fruits, cutting off about an inch from the end of the root. The scion and stock should be about the same thickness. Both are cut off with a slanting cut, about an inch long and a tongue is then formed on each by cutting the wood longitudinally for a short distance on the bevel already made. In joining, the tongue of the scion is well inserted into the split of the stock, pushing it well down with considerable force, fitting it so that the cambium of the scion will coincide with the cambium of the stock. The parts are held together best by means of waxed cloths or bands, made by spreading melted wax over thin muslin, which is cut into narrow strips when dry. The wax for making waxed cloth is made of a mixture of four parts of resin, two of tallow and one of beeswax. All of the parts about the union should be well covered with the waxed cloths or bands. The grafts are then packed in sand or sandy loam in a cool cellar until spring. The scions should be covered by the earth, packing in such way as to cover only the waxed cloth. In planting out in the spring place the grafts in the ground up to the top bud.

There has been considerable inquiry about the Ostheim cherries, a valuable sort, which was brought to this country by Professor Budd. It has been planted more largely in the west and northwest than elsewhere, owing to the fact that it is exceedingly hardy. G. J. Carpenter, of Mesa county, says: "While in attendance at the state horticultural convention in Denver I did not hear the Ostheim cherry recommended for culture in Colorado, and am surprised that anything so valuable should escape the notice of our horticulturists. The tree is hardy, with drooping habits, bears immense crops of large, fine fruit, which when fully ripe is jet black and nearly sweet to the taste with a flavor unequaled among the cherries. Ripening

after the Early Richmond and before the English Morello, it fills a niche of its own and always brings a good price."

Currants are very easily grown from cuttings and for that reason it would seem unnecessary that any one should be without them. To get a start a few choice varieties may be purchased, and by setting them in rich soil and giving extra culture and irrigation during the summer, several hundred cuttings may be secured in the fall. Cut the sprouts after growth is completed and the leaves have fallen, about nine inches long, tie them in bunches of fifty and heel in for a few days for the raw cuts to callous over. In taking the cuttings use particular care as to the shape in which the old bushes were left. One must exercise considerable judgment in this by noting the strongest buds and cutting back so as to leave three or four upon each branch and take out all stray laterals. It is possible to so train a bush that it will grow symmetrically and will also produce fine fruit and be much longer lived. Cut the wood as diagonally as possible, thus giving a sharpened end to each cutting which makes it easier to insert in the soil. The ground, previously well manured, should be plowed nine or ten inches deep. Trench rows three feet apart and six or eight inches deep. In the bottom of these trenches stick the cuttings about four inches apart and at an angle of forty-five degrees along the row, leaving about an inch of the tops protruding above the ground.

W. S. Coburn, president of the State Board of Horticulture, makes the following statement regarding a few varieties of fruit trees planted on his fruit farm at Hotchkiss, in Delta county: One Moorpark apricot tree, twelve years old, is 11 inches in diameter, has a spread of top of 38 feet, and bears 1,100 to 1,300 pounds annually. The fruit has sold at 1½ cents a pound. In 1890 500 Winesap, Jonathan and Ben Davis trees were planted. In 1894 these 500 trees bore 75 bushels; in 1895, 700; in 1896, 1,200; in 1897, 2,200, and in 1898, 3,100 bushels.

Prowers county is one of the newer fruit districts, and M. D. Parmenter writes of it as follows: "We have a few very fine orchards in Prowers county. Our trees are perfectly healthy and free from disease, and make good growth every year. Our fruit is large, free from worms, of high color and fine flavor. We have many advantages over other localities. Our soil is adapted to fruit culture. Our irrigation system is complete. The water for irrigation is full of sediment that is a perfect fertilizer for fruit trees. Our climate is just right—short, mild winters and long, dry summers. We have no use or room for bums and English sparrows, but we will gladly make room for a few practical fruit growers."

After anxious watching through several dreary New England winters, Dr. L. O. Martin, of Boston, has made an investment of $10,000 in fruit lands in the vicinity of Grand Junction. He is not selfish. He acknowledges that God has granted him health whereby he has accumulated a small fortune, and in return he is willing to expend it for the benefits of mankind. He has eighteen consumptive patients in Boston, and proposes to give every one of them an opportunity to come to Colorado and get well.

The doctor says: "At least six out of the eighteen will, in my opinion, ultimately recover if given a chance to get to Colorado and live in the open air.

Of the remaining twelve, I think the lives of half of them will be prolonged from five to ten years, if they are permitted to come to this state.

"Physicians in the east know practically nothing of the sunshine of this state and the beneficial effects of the climate upon consumptives. A careful estimate of the people who come here in the first stages of consumption will show that seven-tenths recover. Medical science has discovered no cure for the disease excepting Colorado sunshine. The wealth of this state is not all in its mines, nor its agricultural advantages, but in its sunshine. It is surprising the class of people one meets on the ranches of this state. I have traveled all over it since July 15 last and find the people of a high intelligence and a superior training. I am glad that they see the mistake of huddling in hotels and have chosen the outdoor life."

The question has often been asked: What does it cost to grow an acre of cantaloupes? It has been intelligently answered in the following sworn statement of a prominent grower: I herewith submit report on cost of growing and marketing cantaloupes on seventeen acres of ground, lying just north of the Santa Fe depot, in the town of Fowler, Otero county, Colo.:

Preparing ground for seed		$ 38.00
Seventeen pounds of seed, at $1.75		29.75
Labor, growing crop, at $20.00 a month		160.00
Five months board for two men		180.00
Labor, gathering crop		271.00
Cost of team, gathering and delivering crop		24.00
1,721 crates, at 9 cents each		159.00
Seven per cent. commission on $1,677.97		117.15
		$ 979.39
1,721 crates cantaloupes, at 97 cents a crate	$1,677.97	
800 pounds seed, at 50 cents	400.00	
	$2,077.97	
		$1,079.58

The 800 pounds of seed were taken from 800 crates of number one cantaloupes, which could have been marketed had it not been for mistakes made on the part of the directors of the Rocky Ford Melon Growers' Association. Had the 800 crates been marketed at the above price it would have made a difference of $380.00 which, added to the above figures, would make the gross receipts $2,457.97, and the net receipts $1,477.58.

The cost of growing cantaloupes an acre as above is, therefore	$ 23.98
The cost of gathering	17.35
The cost of crates	9.36
Seven per cent. commission paid association	6.87
	$ 57.56
Gross profit an acre	144.58
Net profit an acre	86.91

Respectfully submitted,

FRANK S. FAUROT.

Subscribed and sworn to before me, this 28th day of October, A. D. 1898.

U. S. RINGER, Notary Public.

My commission expires October 19, 1900.

This crop was grown on sod land, without any preparation whatever except plowing and harrowing. With ground properly prepared cantaloupes are made

to yield from $50 to $200 an acre, according to the soil and the experience of the grower.

During the past year 685 car loads and 12,447 crates of cantaloupes were shipped over the Santa Fe route from Holly, Granada, Lamar, Las Animas, La Junta, Swink, Rocky Ford, Manzanola, Fowler and Nepesta.

P. S. Taylor, of Cortez, Montezuma county, writes: "The Horticultural Report of 1897 contains, in concise and explicit form, just the information needed by a newcomer to the state. During the past year I traveled through Kansas, Missouri and Iowa looking up a location for a home for my family and, by chance, I learned of the fruit interests of Colorado, and concluded to investigate the reports. On first seeing the sage brush country I was utterly disgusted, but on seeing the fruit trees and fruit I at once decided to cast my lot in Colorado, for, in all truth, I never saw such vigorous trees and such superb fruit. I am almost prepared to accept as true any statement of the possibilities of Colorado as a fruit state. It is my intention to start a nursery here in the spring and to engage also in fruit growing. I have had thirty-five years' experience in fruit growing, and believe I know what I can depend upon here."

There is a market for Colorado apples in England and on the continent of Europe. George W. Derbyshire, manager of the North England Fruit Brokers, limited, of Manchester, England, wrote to Secretary Shute as follows: "We can strongly recommend this market for apples, as it is the center of a population exceeding 8,000,000, excluding Liverpool, and this means an enormous consumption of fruit. The prospect for American apples of good quality, size and color is good, as the crops in this country and on the continent are small. If your best shippers would make a trial consignment we have no doubt that they would be pleased with the result as compared with the other markets in this country, and that a good trade would result to mutual advantage."

Thomas Tonge, in a communication to the Manchester, England, Daily City News, after giving the value of Colorado's fruit crop as more than £1,000,000, including 500,000 barrels of apples, and referring to our gold output for the same year as exceeding £4,000,000, and making the entire industrial output of the state at £20,000,000, goes on to say of the fruit question that, while there are isolated orchards dating back from twelve to twenty years, the great development of fruit culture in Colorado has really taken place in the last ten years and in over twenty different counties, on both sides of the Atlantic and Pacific slopes of the Rocky mountains, between the altitudes of 5,000 feet and 7,000 feet, and by the means of irrigation.

Concerning the future of Colorado as a fruit-producing state, Mr. Tonge thus sums up: "As to the future of Colorado horticulture, it is estimated by the State Board of Horticulture that at the present time the state has 1,350,000 bearing standard fruit trees, many of them very young, however, which by 1900, by means of large acreage of trees already planted out but yet too young to bear, and those which will be planted, will reach a total of 9,000,000 trees. On the California basis of £1 to a tree, with an ordinarily good season, the standard fruit crop alone of Colorado for 1900 may reach £8,000,000, and will certainly exceed £5,000,000, to say nothing of small fruits."

Enlarging upon the magnitude of Colorado as a fruit state, present and prospective, Mr. Tonge shows his familiarity with her resources in this respect by writing as follows: "There are now 180,000 acres in Colorado planted to standard bush, and small fruits, of which about 60,000 acres are already in bearing. Each year not only sees a large acreage come into bearing, but also a

large new acreage planted. Careful estimates from the records on file in the state engineer's office show that, apart from agricultural lands, there are in Colorado over 500,000 acres under ditch, that is, capable of irrigation from existing canals, specially suitable for fruit culture, and also practically ready for the planting of fruit.

"It is only a question of time when the whole of such additional area will be so utilized, inasmuch as the experience of the past dozen years has demonstrated that Colorado land, between the altitudes of 5,000 feet and 7,000 feet, cultivated by means of irrigation, and with the immense advantage of the exceptionally sunny climate, produces not merely large crops, but fruit of very superior quality as to size, color, flavor and keeping qualities. As instances of this, during the past summer Colorado apples, in car load lots, have been shipped to California, Utah, Nebraska, Iowa, Illinois, Michigan, New York, Pennsylvania and Delaware."

Writing from Las Animas county, S. W. De Busk says: "I set a small orchard in 1872, but lost it all through ignorance and inexperience. I did nothing more toward an orchard for six years, beyond studying the problem. I traveled as far as Denver and Canon City to see the first orchards there and seek information. In 1881 I set another orchard eighteen miles from Trinidad. This proved successful. I fruited twenty-eight varieties of apples in that orchard, besides numerous varieties of pears, plums, grapes and berries. I became convinced that almost any fruit trees that flourish in the wind and sun of Kansas and Nebraska will do well here.

"Standard fruit trees do well in Las Animas county on all the irrigated lands east of Trinidad, and west also up to altitudes of near 8,000 feet. George A. Storz, at Stonewall, grows apples, plums and pears of large size and excellent quality at an altitude of 7,500 feet. Mrs. Russell's orchard is still higher and gives good results. Near El Moro E. J. Hubbard kept one acre of grapevines for some ten years and demonstrated the profit on Concord, Champion and Delaware grapes. In one year Judge Hubbard sold $120 worth of strawberries from one-eighth of an acre. In the berry season Trinidad pays out not less than $300 a day for berries. Not an individual has ever tried to supply this demand.

"In Sunflower valley is a tract of land, four miles long by three miles wide, that is perfectly adapted to all the small and standard fruits. There are other smaller tracts equally as good. Tomatoes are grown by the ton, which begin to ripen in August. This tract of territory ought to be taken from alfalfa and given to fruits. Some influential body of business men ought to take up the question of sub-dividing the lands and selling out in small tracts, with profit to themselves and great benefit to the country. After spending much labor and some money, during twenty-six years past, on the problem of fruit growing in Las Animas county, I do not regret it. One generation is required to work out these problems in any new country. There is not a county in Colorado better adapted to fruit growing than our own. It could be made the greatest strawberry county in the state. The strawberry would begin to ripen on the low farms and finish on the high farms of 10,000 feet altitude."

David Brothers of Wheat Ridge says: "Some ten or twelve years ago we had an idea that mulching the trees would keep back their blossoming in the spring. Mr. Coburn was appointed on the Western Slope, Mr. Ackerman in the Northern, and I in the Central districts, to mulch trees as an experiment. I mulched mine with stable manure, after which we had a snow, and then I stamped it down and got it ready for another good snow, which came pretty soon thereafter. I made it very thick with manure and snow and ice together,

and I think Mr. Ackerman did about the same. My trees were Duchess and Ben Davis, and his were Transcendent crabs and Walbridge apples. He said he had his man go every morning after they had mulched them and throw buckets of water on each one of the trees that he had mulched, so there was a bed of ice. In the spring of the year, as soon as the frost was out of the ground, I went into my orchard with a fork. I supposed the frost was all out, and I found that around the trees that were not mulched the frost was out of the ground, and around the trees that were mulched I could hardly get the fork through the manure, as ground was frozen so hard. They were just coming into bloom, and there was not a day's difference between the trees so mulched and the ones that were not—they both bloomed at exactly the same time. Though the ground was frozen solidly around the mulched trees, they blossomed just as early as the unmulched trees. Mr. Ackerman's experience was just the same. He had ice around his trees that he had mulched when they were in full bloom."

In this connection, Mr. Coburn of Delta county says: "I used cane refuse for mulching, and mulched the trees clear up to the limbs, putting ice and cane refuse around every other tree. I put water on it and froze the whole thing up solidly, and when they came out in the spring they all blossomed at the same time, with not five minutes' difference between the mulched and the unmulched trees. Then it occurred to me that there was sap enough in the limbs of the trees to develop the buds and make them blossom, and it occurred to me, where are they going to get the sap for their further maintenance after this sap in the limbs is gone, if the sap is not unlocked from the bottom, so I took away the mulch, and the ground did not thaw out until the blossoms had fallen off, and for two years those trees never had an apple on them. If the limbs are shaded they can be kept from blossoming, but it is the sunshine on the limbs that starts the sap."

E. R. Parsons of Parker, Douglas county, has been quite successful in producing a dry orchard. Trees planted in the spring of 1895 are now from ten to fifteen feet high, with a spread of from seven to ten feet. One lot of forty cherries gave a yield of 400 quarts last year. He has succeeded, without any watering whatever, in growing cherries, plums, apples, pears, currants, gooseberries, caneberries and a few peaches. He plants very close in the row and heads as low as the habits of the tree will allow.

A. M. Daniels of Delta county recommends the canning of grape juice, sealing it up in cans or bottles. The juice is treated very much like the ordinary canning of fruit, and may be used for sacramental purposes, and in summer for refreshing, cooling drink. Dilute when using with two-thirds water. One way is to place the grape juice in bottles, place the bottles in a boiler, bring the water to a boil, boil for half an hour, then use a special cork of excellent quality, to be pressed in, cover with sealing wax and tin foil. Prepared in this manner, it will keep any length of time and is refreshing and useful. This plan will solve the question of surplus grapes if such should happen to exist at any time.

The largest orchard in the world is in Kansas and belongs to Fred Wellhouse of Topeka. He planted his first orchard in 1876, and now has 1,954 acres in apples alone. His largest single orchard consists of 800 acres, at Wakarusa, Osage county, and his smallest is a patch of 117 acres, at the village of Glenwood, near Leavenworth. He has apple farms in four other counties, including altogether about 100,000 trees.

PREMIUMS AWARDED AT THE ANNUAL STATE HORTICULTURAL FAIR HELD AT MINERAL PALACE IN PUEBLO, SEPTEMBER 28 TO 30, 1898.

COUNTY PREMIUMS.

For the best and largest collection of fruits by a county—First, Mesa county; second, Jefferson county.

For the best and largest collection of apples by a county—First, Fremont county; second, Larimer county.

For the best and largest collection of peaches by a county—First, Mesa county; second, Otero county.

For the best and largest collection of pears by a county—First, Mesa county; second, Delta county.

For the best and largest collection of plums by a county—First, Jefferson county; second, Pueblo county.

For the largest and best collection of grapes by a county—First, Mesa county; second, Fremont county.

For the best and largest collection of fruits in the Northern District, embracing the following counties: Eagle, Grand, Larimer, Logan, Morgan, Phillips, Sedgwick, Summit, Washington, Weld, Pitkin, Yuma—First, Larimer county.

For the best and largest collection of fruits in the Southern District, embracing the following counties: Baca, Bent, Chaffee, Cheyenne, Custer, El Paso, Fremont, Huerfano, Kiowa, Lake, Las Animas, Otero, Prowers, Pueblo—First, Fremont county; second, Las Animas county.

For the best and largest collection of fruits in the Central District, embracing the following counties: Arapahoe, Boulder, Clear Creek, Douglas, Elbert, Gilpin, Jefferson, Kit Carson, Lincoln, Park—First, Jefferson county; second, Arapahoe county.

For the best and largest collection of fruits in the Western District: Archuleta, Conejos, Costilla, Delta, Dolores, Gunnison, Hinsdale, La Plata, Mesa, Garfield, Montezuma, Montrose, Rio Grande, Routt, Rio Blanco, Saguache, San Juan, San Miguel—First, Mesa county; second, Montrose county.

B. F. Rockafellow, Canon City—First premium, best collection apples, best plate Jefferis, best plate Rome Beauty, best plate Paragon, best plate Rhode Island Greening. Second premium, best collection native grapes, best plate Lawver, best plate Duchess. Third premium, best collection fruits, best plate apples.

George W. Griffin, Canon City—Second premium, best plate Beurre d'Anjou.

Eugene Weston, Canon City—Second premium, best collection of quinces.

C. W. Burrage, Canon City—First premium, best collection native grapes, best plate native red grapes, best plate native black grapes, best plate native white grapes, best plate Brighton grapes, best plate Catawba, best plate Concord, best plate Niagara.

Mrs. C. Dittmer, Carlile Park—First premium, best plate of Sops of Wine, best plate of Missouri Pippin, best plate of Lombard plums. Second premium, best plate of Jefferis apples, best plate of Willow Twig. Third premium, best collection of apples.

L. J. Artman, Vineland—Second premium, best plate of Globe peaches, best plate of Concord grapes.

J. W. Coleman, Wetmore—First premium, best plate of Willow Twig. Second premium, best plate of McMahon, best plate of Missouri Pippin, best plate of Lombard plums.

J. S. Greene, Avondale—Second premium, best plate of Bartlett pears.

J. H. Crowley, Rocky Ford—First premium, best collection peaches, best plate peaches, best plate native plums, best and largest specimen pear, best plate Jonathan, best plate Winesap, best plate Gano, best plate Globe peaches, best plate Delaware grapes, best plate Elberta peaches. Second premium, best collection fruits, best collection apples, best plate apples, best plate native black grapes, best plate native white grapes, best plate Maiden Blush apples, best plate Rambo, best plate Silver prunes, best plate Brighton grapes, best plate Niagara. Third premium, best collection native grapes.

M. M. Marble, Fort Collins—First premium, best plate Rambo, best plate Damson plums. Second premium, best collection foreign plums, best plate Duchess apples, best plate Ralls Genet.

Preston Taft, Fort Collins—First premium, best plate Lawver apples.

Mrs. Ed. Warren, Fort Collins—First premium, best plate Duchess.

J. S. McClelland, Fort Collins—First premium, best plate Maiden Blush.

W. B. Upton, Montrose—Second premium, best collection of foreign plums, best and largest specimen of apple, best plate of Rhode Island Greening. Third premium, best collection of pears, best collection of peaches.

J. C. Bell, Montrose—Second premium, best plate of Utter's Red apples.

U. S. Stone, Montrose—Second premium, best plate of pears.

W. S. Coburn, Hotchkiss—First premium, best collection of pears, best collection of native plums, best and largest specimen of apples, best plate of Wealthy, best plate of McMahon, best plate of Utter's Red, best plate of Beurre d'Anjou, best plate of Seckel, best plate of Flemish Beauty, best plate of Duchess pears. Second premium, best plate of Rome Beauty apples, best plate of Elberta peaches, best plate of Satsuma plums. Third premium, best collection foreign plums, best plate of pears.

W. E. Renick, Palisade—First premium, best plate of Ben Davis. Second premium, best plate of Jonathan. Third premium, best plate of peaches.

Fred Baisch, Palisade—First premium, second best plate of peaches, best plate of foreign black grapes. Third premium, best collection of foreign grapes.

Wm. Bomgardner, Grand Junction—First premium, best collection fruits, best collection foreign grapes, best collection foreign plums, best plate apples, best plate pears, best plate Ralls Genet, best plate Bartlett, best plate Satsuma plums, best plate Silver prunes, best plate Black Hamburg grapes, best plate Muscat. Second premium, best collection pears, best collection peaches, best and largest specimen of pear, best plate foreign red grapes, best plate foreign white grapes, best plate Wealthy apples, best plate Ben Davis, best plate Winesap, best plate Flemish Beauty, best plate Flame Tokay. Third premium, best plate foreign plums.

A. A. Miller, Grand Junction—First premium, best plate foreign plums.

J. F. Spencer, Grand Junction—First premium, best collection quinces.

A. C. Newton, Grand Junction—First premium, best plate foreign red grapes, best plate foreign black grapes, best plate foreign white grapes, best plate Flame Tokay. Second premium, best collection of foreign grapes, best plate Muscat.

THE COMMITTEE'S REMARKS.

The committee on awards added the following comment to its official report:

"State Board of Horticulture:

"In making awards we find quality so near equally balanced in exhibits, that it is exceedingly difficult to draw the line of excellence between them. They are all worthy of the highest premium.

"GEORGE SEAVER,
"C. W. STEELE,
"S. K. WOODBURY,
"Awarding Committee."

REMEDIES AND FORMULAS ADOPTED BY THE STATE BOARD OF HORTICULTURE FOR THE EXTERMINATION OF PESTS INJURIOUS TO TREE AND PLANT LIFE.

At a meeting of the State Board of Horticulture, held in Denver, November 30, 1898, the following resolutions were adopted, in accordance with S. B. 399, section 6, approved April 15, 1897, creating a State Board of Horticulture, and are therefore binding upon all persons:

To the Horticulturists of Colorado:

In submitting the regulations, remedies and formulas adopted by the State Board of Horticulture for the extermination of pests injurious to tree and plant life, and to prevent the importation and spread of insects and diseases detrimental to the horticultural interests of Colorado, the co-operation of all persons interested is solicited in carrying out the important work required to successfully cope with the insects and diseases now making inroads upon the horticultural industry.

Regulations established by the Colorado State Board of Horticulture for the purpose of preventing the spread of contagious diseases among the fruit and fruit trees, and for the prevention, treatment, cure and extirpation of fruit tree pests and diseases of fruit and fruit trees, etc., in compliance with section 6 of an enactment by the Eleventh General Assembly of the State of Colorado, entitled "An act to create a State Board of Horticulture; define its duties and compensation; to protect and promote the horticultural interests of the state," etc., approved April 15, 1897:

Article I. It shall be the duty of every owner, possessor or occupier of an orchard, or land where trees are grown within this state, to disinfect all trees, bushes or vines grown on such lands infested with any insect or insects, or the germs thereof, or infected with any contagious disease known to be injurious to fruits, trees, vines or bushes, in accordance with the provisions of the laws, the regulations of the State Board of Horticulture, and the directions of the county horticultural inspectors.

Article II. The owner or owners of any nursery, or nurseries, shall disinfect all their nursery stock of insects or diseases injurious to fruit or trees before the removal of the same from their premises for sale, gift, distribution or transportation.

Article III. Fruit boxes which have been used for shipping fruit to any destination are hereby required to be disinfected previous to their being used for any purpose. All boxes returned to any orchard, storeroom, salesroom, or any place used or to be used for storage, shipping, or any other purpose, must be disinfected within three days after their return. All packages known as free packages must be destroyed, or disinfected before being used again.

Article IV. All orchards, nurseries, trees or places infested by any insect or insects, their germs, larvae or pupae, or infected by any disease known to be injurious to orchards, nurseries, trees or places, and liable to spread contagion, must be cleaned or disinfected on or before the first day of May of each year. All owners or occupants of land shall comply with the provisions of this section. All fruit packages, trees, vines, plants, cuttings, grafts and scions that shall not be disinfected within forty-eight hours after notice by the county horticultural inspector, shall be liable to be proceeded against as a public nuisance.

Article V. It shall be the duty of the county horticultural inspector in each county to see that the provisions of these regulations are put into force and effect within his jurisdiction, and all offenders punished according to law.

Article VI. Disinfection as provided by these regulations shall be to the satisfaction of the county horticultural inspector, and the member of the State Horticultural Board having jurisdiction. By order of

STATE BOARD OF HORTICULTURE.
W. S. COBURN, President.

MARTHA A. SHUTE, Secretary.
November 30, 1898.

S. B. No. 81, by Senator Felton:

A bill for an act to amend section seven (7) of an act entitled "An act concerning horticulture," etc., approved April 16, 1897.

Be it Enacted by the General Assembly of the State of Colorado:

Section 1. That section seven (7) of an act "concerning horticulture," approved April 16, 1897, be amended so as to read as follows:

Sec. 7. It shall be the duty of the county horticultural inspector in each county, whenever he shall deem it necessary, to make an inspection of any orchard, nursery or trees, or any fruit packing house, storeroom, salesroom, or other place or article within his jurisdiction, and if found infested with insects, or pests or diseases injurious to fruit, fruit trees, vines, any bushes or other horticultural interests he shall notify the owner, or owners, or person or persons in charge or in possession of such trees, place or other thing as aforesaid, that the same or any of them are infested with insects, or their eggs or larvae or with fruit or fruit tree diseases and shall give a formula for the treatment thereof, and such person or persons so notified shall eradicate or destroy the said insects or pests, or their eggs or larvae, within a certain time to be specified in said notice. Said notice may be served upon the person or persons, owning or having charge of such infested trees or places or articles aforesaid by any inspector, or by any one deputized by him, or it may be served the same as a summons in a civil action. If the owner or owners, person or persons, in charge or possession of orchard, or nursery, trees or places, or articles infested with said insects, or any of them, their larvae or eggs, after having been notified as above by said inspector to destroy the same or make application of treatment as directed, shall fail, neglect or refuse so to do, he or they shall be guilty of maintaining a public nuisance, and shall be punished by a fine in a sum not less than five (5) dollars nor more than one hundred (100) dollars; and any such orchard, nurseries, trees, or places, or articles thus infested, after such conviction shall be adjudged, and the same is hereby declared a public nuisance, and may be proceeded against as such. If defendant be found guilty, the court in its judgment shall order the said inspector to abate such nuisance, and the expenses thus accrued shall be taxed up as costs against the defendant. The district and county courts shall have jurisdiction in such cases.

Sec. 2. In the opinion of the general assembly of the state of Colorado an emergency exists; therefore, this act shall take effect and be in force from and after its passage.

S. B. No. 82, by Senator Felton:

A bill for an act to repeal section eight (8) of an act "concerning horticulture," approved April 15, 1897.

Be it Enacted by the General Assembly of the State of Colorado:

Section 1. That section eight (8) of an act entitled "An act concerning horticulture," etc., approved April 15, 1897, is hereby repealed.

(This act refers to section 8 of S. B. No. 399, approved April 15, 1897, and should not be confounded with H. B. No. 6, section 8, approved April 16, 1897.)

INSECTS CLASSIFIED.

Insects with biting mouths always gnaw into and devour the tissues of the part of the plant on which they feed. Biting insects would include all of the caterpillars, commonly called worms, whether hairy or naked; all of the so-called slugs, the grasshoppers, crickets, potato beetles, leaf-rollers, the codling moth, etc.

Insects with sucking mouths always turn the leaves a pale or brown color, and include plant lice, scale lice, aphides, thrips, leaf hoppers, squash bugs, etc.

REMEDIES.

NO. 1.—PARIS GREEN OR LONDON PURPLE. (Arsenicals.)

These are especially adapted to biting insects, including the majority of the injurious caterpillars, many beetles, locusts, codling moth and leaf-rollers.

Paris green or London purple	1 pound
Water	160 gallons
Lime	8 pounds

First make a paste of the poison, in a small amount of water. Then dilute to the proper proportions. By adding the fresh lime, slaked and strained, it will prevent injury to the leaves. Apply in fine spray as soon as blossoms have fallen, and again in ten days. If heavy rains follow, repeat the spraying. For peach or plum trees a solution of one pound of the poison to 200 gallons of water may be used, with the same amount of lime.

NO. 2.—ARSENIC BRAN-MASH.

Arsenic	1 pound
Sugar	1 pound
Bran	6 pounds

Add the ingredients to water sufficient to make the mixture moist, and scatter the poisoned bran in places where the grasshoppers are the thickest. The mash may be scattered in orchards, vineyards, etc., where hopper pans can not be used. Much care must be exercised in preventing domestic animals or fowls from having access to the poison.

NO. 3.—WHITE HELLEBORE

Is valuable in destroying the currant worm, pear-tree slug, rose slug, and the larvae of saw flies, etc.

White hellebore.....1 ounce
Water .....3 gallons

Air-slaked lime or fine road dust may be used.

NO. 4.—BORDEAUX MIXTURE

Is used for all fungous diseases.

Sulphate of copper.....4 pounds
Quicklime .....4 pounds
Water .....45 gallons

Dissolve the copper sulphate in a gallon of hot water, slake the lime in another gallon of water, and then add the milk of lime slowly to the copper sulphate solution while the latter is being constantly stirred. Then add forty-three gallons of water.

NO. 5.—KEROSENE EMULSION

Is especially useful in destroying sucking insects, including plant bugs, plant lice, scale lice, thrips and plant-feeding mites.

Kerosene .....2 gallons
Whale-oil or hard soap.....1 pound
Soft water.....28 gallons

Dissolve the soap in one gallon of boiling water. If the water is hard, break with lye. Heat the solution to boiling and, away from the fire, add two gallons of kerosene. Agitate violently for five minutes by pumping the liquid back upon itself with a force pump until the mixture assumes the consistency of cream. Dilute with twenty-seven gallons of water and the emulsion is ready for use. This formula must never be used on the roots of trees or shrubs.

NO. 6.—DISINFECTANT.

Concentrated lye.....1 pound
Water .....10 gallons

This disinfectant can be used for boxes, barrels, etc. Use boiling hot and keep the material in one minute.

NO. 7.—DISINFECTANT.

Whale-oil soap.....¾ pound
Water .....1 gallon

This disinfectant to be used for trees, vines, bushes, etc. Allow to cool to blood heat before dipping the trees.

NO. 8.—FORMULA FOR FISH-OIL SOAP.

Concentrated lye.....3½ pounds
Water .....8 gallons
Fish oil.....1 gallon

First dissolve the lye in boiling water and then add the oil, and boil for two and one-half hours longer.

This is an effective remedy for scale insects, plant lice and generally for sucking insects which can be killed by contact.

NO. 9.—WINTER RESIN WASH.

Resin	30 pounds
Caustic soda (75 per cent.)	9 pounds
Fish oil	4½ pints

Water to make 100 gallons.

Boil the resin, soda and oil until thoroughly dissolved. Then boil for three hours, during which time hot water should be added slowly, so as not to stop the boiling, until the whole is diluted to fifty gallons. The other fifty gallons may then be added cold. The resin wash is valuable in destroying scale insects in dry seasons, and root lice, root maggots and white grubs.

NO. 10.—LIME, SALT AND SULPHUR WINTER WASH.

Unslaked lime	50 pounds
Sulphur	25 pounds
Stock salt	18 pounds

Water to make 100 gallons.

Put the sulphur and one-half the lime in twenty-five gallons of water and boil until the sulphur is thoroughly dissolved. Mix the remaining lime with the salt and slake with water, and then add this to the lime and sulphur mixture and boil for another hour, when the whole can be diluted to 100 gallons with water. Strain before using.

NO. 11.—WHALE-OIL SOAP.

This substance stands close to kerosene emulsion in importance as a destroyer of soft-bodied insects. It is used in various strengths, but the ordinary preparation is:

Whale-oil soap	1 pound
Water	8 gallons

As a winter wash, it is sometimes used as strong as four pounds in a gallon of water for the destruction of San Jose, Putnam and other scales. A pound to eight gallons destroys the eggs of plant lice or of the brown mite.

ARSENICAL SPRAY.

(For experiment only.) Boil two pounds of white arsenic and eight pounds of sal-soda for fifteen minutes in two gallons of water. Put into a jug, label "Poison," and lock it up. When ready to spray, slake two pounds of lime and stir it into forty gallons of water, adding a pint of the mixture from the jug.

APPLE TREE ENEMIES.

For Codling Moth (Apple Worm): Use remedy No. 1; first application as soon as blossoms fall; second, eight or ten days later; trapping larvae by applying bands to the trees. (See bands on trees.)

For Leaf-Roller: Use remedy No. 1, applying the spray as soon as first leaves appear, and repeat once a week while the worms last.

The Apple Flea-Beetle: A small metallic-green beetle, about one-eighth of an inch in length, that eats holes in the leaves and jumps or takes wing quickly when disturbed. Use remedy No. 1.

Colony Caterpillar: The colony caterpillar is a native of Colorado. The eggs appear in grayish white rings around the twigs and limbs of the trees.

They hatch out about the time the leaves appear in the spring and form little webs on the ends of the twigs. When they mature they leave the web and form colonies and during the day stay on the trunks of the trees. By spraying or sprinkling with warm soapsuds it kills them instantly.

The Fall Web-Worm: A yellowish or brownish caterpillar with a black head that forms a loose web or tent in a great variety of trees, beginning to appear about the first of July and continuing through the summer. The larvae are rather sparsely covered with long hairs that are whitish or yellowish in color, with occasional black ones for variety. When the webs are small, cut out and burn. If the web has become large, enclosing many branches of the tree, it may be better to burn out the worms with a torch. When there is no danger of poisoning fruit, use No. 1.

The Apple Plant-Louse: During the winter and early spring there are small shining black specks in rough places in the bark and about the buds, or, as is often the case when abundant, distributed promiscuously over the surface of small limbs, usually most abundant where there are numerous fine plant hairs making a felty covering to which the eggs are easily attached. The best time for treatment is while the trees are dormant, any time after the leaves fall and before the buds open. Use whale-oil soap in the proportion of one pound to six gallons of water. After the leaves are out use No. 5.

For Flat-Headed Borer: First protect the trees from sun scald and other injuries. In winter or spring the borers can be grubbed out with a sharp knife and destroyed. The flat-headed borer can be kept in check by washing the trees with No. 9 or No. 10 about the time that the insect eggs are laid; that is, about the 1st of May.

For Leaf-Feeding Caterpillars: Found during the heat of the day on the cool side of the trunk of the tree in colonies, an application of strong soapsuds will exterminate them.

The Scurvy Bark Louse: The presence of this insect is indicated by very small white scales upon the trunks or limbs of the trees, when abundant, entirely covering the bark and appearing like a covering of scurf or dandruff, and hence the common name. The use of No. 9 or No. 10 while the trees are dormant will probably kill the scales. After the leaves are out, if the lice appear, use No. 5 the last of May and again about the 10th of June.

The same remedy may be applied to eradicate the oyster-shell bark louse and the Putnam scale.

The Apple-Twig Borer: A cylindrical, mahogany-colored beetle, about one-third of an inch in length, boring holes in twigs of apple, pear, cherry, osage orange and other trees and grape vines, the burrow starting just above a bud and extending downwards.

Remedy—Cut out the infested stems and burn them.

For Woolly Aphis: As soon as they appear on the trunks of the trees in the spring, before they get into the branches, apply kerosene oil with a brush or swab. By repeating the operation as often as they appear, they may be kept from the tops of the trees. One form of this insect occurs on the roots of the trees and produces wart-like swellings; another appears on the trunk and limbs and is usually densely covered with the woolly excretion. Probably the best remedy for the root form is tobacco dust worked into the ground to the amount of three to six pounds about the crown of the tree and then wet with water. In the hands of one who has had experience, carbon bisulphide may be used effectually by injecting it into the ground about the crown of the tree.

If the lice spread over the tops of the trees they may be treated with formula No. 11, or No. 5, ordinary strength, but it is necessary to throw it with a great deal of force so as to wet through the "wool" which protects the lice from any light spray.

Where the lice are found on the roots of nursery stock, it is advisable to dip the roots in No. 7, or to fumigate with hydrocyanic acid gas.

Traps for Leaf-Roller Moths: As soon as the moths begin to fly, in July, place in the orchards eight-quart milk pans, filled one or two inches deep with cider vinegar diluted with water; one pan to a square of twenty-five trees. Remove the drowned moths each morning, and continue so long as any appear.

Bands on Trees for Codling Moth: Trapping larvae by applying bands to trees. Wrap around the trunk, one or more feet from the ground, three thicknesses of burlap, six inches wide. Put in one tack in the center where the burlap joins. The bands should be in place by June 10, and examined every week, destroying the worms until the apples are gathered.

A good plan is to provide 100 or so extra bands. Take along a tight bucket, in which to put the bands that are taken off. Be very careful not to drop any worms in taking the bands off and replacing with fresh ones. Scald the removed bands, press out the water and replace them on other trees. Or in a large orchard take a tight wagon sheet, put it on a wagon going through the orchard and gather all the bands, put them in the wagon sheet, take them to the house and scald them, running them through a wringer, and go back and replace them.

It is also well to place folds of burlap in the crotches of the trees, replacing as with the bands.

PEAR TREE ENEMIES.

For Red Spider or Brown Mite: For spraying while the trees are dormant in winter use remedy No. 9 or No. 10, or whale-oil soap, one pound of soap to two gallons of water. For spraying after the leaves are out, use No. 5.

This insect also attacks cherry, apple and plum trees, also rose bushes and sweet peas.

For Pear Tree Slugs: The plum and cherry trees are also infested by these slugs. Use remedy No. 3.

The Pear-Leaf Blister: This disease is indicated by small black spots appearing upon pear leaves, sometimes so numerous as to run together and involve a great portion of the leaf. Before turning black the spots are green like the rest of the leaf. The parasites spend the winter chiefly under bud-scales upon the trees, and may be killed during winter or early spring, when the trees are dormant, by a spray of kerosene emulsion in which the kerosene is one-fifth of the mixture.

PLUM TREE ENEMIES.

For Green Aphis on Plum Trees: Apply warm soapsuds on the under side of the leaf with force. This does no harm to the lady-bird, which preys on all plant lice.

For Plum Gouger: Many of the plum gougers can be destroyed by jarring the trees as soon as they are in bloom, placing a sheet under the trees to catch the insects. Also attend to the collecting and destroying of all the stung fruit before the plums ripen.

The Plum-Leaf Nail-Gall: The leaves of the American varieties of the plum are sometimes injured by the production of a large number of slender tubular projections standing out from their upper surfaces. Inside each gall is a large number of very small spider-like insects or mites. Probably nothing can be done of much value while the leaves are on the trees. Fallen leaves should be destroyed as far as possible by fire and the trees should be sprayed during the winter with No. 9 or No. 10.

The Plum Curculio: Jarring as for the plum gouger is the best remedy for this insect. Some benefit can be derived from the use of arsenical sprays.

PEACH TREE ENEMIES.

The Peach Borer: A yellowish white larva, or borer, working beneath the bark at the crown of the tree and down on the roots causing the exudation of a gummy substance. The eggs are laid about the crown of the tree by a small moth with narrow steel-blue wings that flies in the bright sunshine and much resembles a wasp in appearance. Where the gummy exudation is seen, cut out the borer with a knife. This should be done early every spring, without fail, and if thoroughly attended to, will keep the insect in check. A little dirt should be brushed away from the crown of the tree to discover any burrows that may not be apparent at the surface. Many preventives have been recommended to keep the female moth from depositing her eggs upon the trees. Other insects that may be found attacking the peach are plum curculio, San Jose scale, red spider, brown mite and plant lice.

INSECT ENEMIES OF SMALL FRUITS.

For the Western Currant and Gooseberry Span-Worms: For the destruction of these worms use remedy No. 5, or buhach or insect powder, as in the case of plant lice.

For Grape Leaf-Hopper: Spray with solution No. 5, before sunrise. Apply with force, so as to knock the insects from the vines, and wet the ground to destroy the hoppers. Avoid spraying while the vines are in blossom. The grape leaf-hopper appears on currants and gooseberry bushes and on Virginia creeper.

Strawberry Leaf-Roller: After the berries are picked mow the vines and mulch with a light mulch of straw or other rubbish that will burn quickly, and then burn when there is a brisk wind. When the rubbish is burnt off irrigate immediately. If after the plants grow or the leaves start worms appear later, spray with paris green.

The Imported Currant Borer: The moths begin to fly in June and are easily caught in a net at egg-laying time and destroyed, and much can be done in this way to lessen the number of eggs to be laid, and hence the number of larvae to bore in the currant stems. By cutting out and burning all the infested stems in the spring, the injuries for the following year will be less.

SHADE TREE ENEMIES..

Cottonwood Borer: This insect is also known as the oak carpenter worm, but in Colorado it is known almost exclusively as the cottonwood borer. The larva, when fully grown, is nearly three inches in length, with a shining black head, and it cuts large holes in the trunks of the trees. The castings of the borers are pushed out on the surface and the tree bleeds as a result of the wounds made to the surface. The sap runs down on the trunk and sours, making a breeding place for maggots of certain flies. With a stout wire one could kill many of the larvae or pupae in their burrows. Avoid scarring the trees as much as possible, as the borers usually enter at such places. The cottonwood is also attacked by plant lice, fall webworm and Putnam scale.

The Box-elder Leaf-roller: This insect is a close relative of the fruit tree leaf-roller and it seems to confine its attacks exclusively to the box-elder in this state. The eggs are laid in the crevices of rough bark and are covered with the scales from the under side of the abdomen of the female, which are placed like shingles upon a roof. Use remedy No. 1.

The Ash Gall-Louse: Greenish plant lice curling the leaves of white ash. The lice usually accumulate on the leaves at the end of a limb. The leaves curl and become so swollen and loaded with lice that the limb will often be bent down with the weight. As soon as the leaves at the end of the limb begin to curl, cut the limb off far enough back to include all the infested leaves and burn it.

The Elm Leaf-Cluster Louse: Trim out all the clusters and burn them as soon as they appear. To prevent their appearance another season, thoroughly spray the trees during winter with No. 9 or No. 10.

The Cottony Maple Scale: A yellowish or brownish oval scale on the twigs of soft maple. During the fall, winter and early spring the scales are quite flat, but, during May, the scales become convex and, finally, a mass of white cottony threads appear at one end, raising that end of the scale from the limb to an angle of about forty degrees or even more. In this cottony mass an enormous number of minute yellowish eggs are deposited, often as many as 2,000 to the single scale. A thorough spraying with No. 5 will kill the young lice.

The Pine-Leaf Scale: White elongated scales appear on leaves of pine and spruce trees, and beneath the scales, in the spring, will be found a mass of purple eggs, sometimes very abundant, causing the leaves to fall. Use one pound of whale-oil soap to four gallons of water, after the young lice have hatched, which will be about the first of June.

THE SYRINGA BORER IN TREES.

Podosesia Syringae: C. P. Gillette, Department of Zoology and Entomology State Agricultural College, says that it would be well to thrust a stiff wire into the burrows before plugging them in hopes of killing the borers by that means. After the larvae have pupated, which will be about the middle of May, it is possible that some benefit may be gained by spraying the trunks of the trees with strong kerosene emulsion about once a week between May 20 and June 20 for the purpose of killing any eggs that are being deposited upon them. Sprays for the purpose of repelling the insect from the trunk of the trees can hardly be of much value, as the borers work freely upon the upper portion of the stem and branches.

ROSE BUSH ENEMIES.

For Aphis on Rose Bushes: Warm soapsuds, from 105 to 110 degrees Fahrenheit, applied with a spray pump, will be effective and destroy these lice, but several applications are necessary to reach all of them, and they must be watched at intervals during the summer.

For Rose Slugs: Apply remedy No. 3. If solution is used, spray with force on the under side of the leaves.

INSECTS INJURIOUS TO FARM AND GARDEN CROPS.

The Squash Bug: There are two broods, the adults of the second brood living over winter under rubbish. By visiting the vines each morning the bugs can be rapidly crushed or collected and destroyed. A little later the

eggs, which are deposited on the under side of the leaves in loose clusters, can be quite rapidly destroyed by hand collecting. When the young hatch, take a basin or other suitable dish, with a little water in the bottom and a spoonful of kerosene on top, and quickly brush the bugs into the basin.

The Striped Cucumber Beetle: The beetles appear soon after the cucumber, melon and squash vines are up and eat holes in the leaves until the plants wither and die. Eggs are also laid about the stems of the plants and the grubs hatching from these burrow down into the roots of the plants, which also causes their death. Dust the leaves freely with lime, plaster or ashes or insect powder in the evening or early morning, while the dew is on.

The Bean Beetle: The beetles deposit their yellow eggs in patches on the under side of the bean leaves. The insect, in all stages, feeds upon the leaves and green pods of the cultivated beans, and particularly wax beans. Lima beans are seldom eaten by them. Spray with No. 5. Onion thrips and cabbage lice should also be treated with No. 5.

For Cut-Worms: Place poisoned green clover or any green bait about the ground where the worm appears, late in the evening, and gather the poison before sunrise, that the birds or domestic animals will not have access to it. Do not hoe the garden too clean of weeds while cultivated plants are small, as the cut-worms like the weeds as well as anything for food. If the latter are all cut down there is nothing but cultivated plants for them to feed upon. This may seem to be questionable advice, but it will work well if the weeds are not neglected too long, so as to choke the other plants.

For Grasshoppers: Poisoned bait or arsenic bran-mash, No. 2; catching with hopper dozers; ditching, burning, rolling and plowing under of eggs.

To Prevent Rabbits from Girdling Trees: The best plan is to use tree protectors. The following mixture is recommended by Downing: Take one spadeful of hot slaked lime, one of clean cow manure, one-half spadeful of soot, one handful of flowers of sulphur; mix the whole together with the addition of sufficient water to bring it to the consistency of thick paint. At the approach of winter paint the trunks of the trees high enough to be beyond the reach of these vermin. Experience has shown that it does no injury to the trees. A dry day should be chosen for the application. Never use axle grease.

Grafting Wax: One pound of tallow, two pounds of beeswax, three pounds of resin. Mix this all together, heat to boiling heat, stirring continually, and then dump into tub of cold water. Then work it like taffy. While using grafting wax place in the sun to melt to the right consistency.

CAUTIONS REGARDING BLIGHT.

A careful inspection of the orchard should be made in the fall or early winter, cutting every branch showing any signs of hold-over blight, the germs of which remain during winter in partly dormant condition. Not only is it necessary to cut out these branches, but it is important that they be completely destroyed by fire. Following this practice carefully, it has been found practicable to eradicate the blight not only from the orchard, but also from the nursery, where the conditions for spreading are much better, owing to the way the trees are planted. In cutting out blighted portions there is one precaution that should always be observed, and that is the sterilization of the knife

after each cut; if this is not done, germs may be left upon the cut surface of the branch and the disease will continue to spread. The sterilization of the knife may be effected either by passing through a flame or by immersion in carbolic acid or other germicidal solution.

B. T. Galloway, chief division of vegetable physiology and pathology, United States Department of Agriculture, Washington, D. C., says, in the Year Book of 1898, of blight: "In the laboratory it has been found that blight is invariably accompanied by a minute organism, a bacillus, allied to those which cause diseases as tuberculosis and typhoid fever in man. These minute germs have been found in countless millions in the delicate cells of the plant, but to prove that they were the actual cause of the disease it was necessary to separate them from the pear tissues and all other organisms present, to grow them wholly apart and in absolutely pure state, and finally to bring them again into contact with healthy pear trees and produce the disease. This has been done. The germs of pear blight, free from all other organisms, have been made to grow on potato, on various kinds of gelatin, and on other media, just as the farmer grows a crop of corn on a soil free from all other plants. The germs grown in this way, when pricked into the delicate tissues of a young pear shoot, multiply rapidly, and in a few days there is a well-developed case of the disease. The cause of the disease being thus definitely determined, it remained to find out how it was spread from tree to tree, and how, after seemingly disappearing in late summer, it would break out again the following spring. The work was now transferred from the laboratory to the orchard itself. Here it was found that insects, particularly bees, play an important part in disseminating the disease. One very destructive form of blight occurs in the blossoms, and the bees, visiting these for honey, carry the germs to healthy flowers. Thus, from one center a whole orchard may soon become infected, and with what results will be easily understood by those familiar with the way the blight works.

"While bees were found to be a really serious factor so far as the spread of blight was concerned, the work brought out a fact heretofore unknown, but of vast importance to fruit growers, namely, that many varieties of pears will not fruit at all unless bees have access to them—in other words, their own pollen is not potent, and they require the pollen from some other variety in order to set fruit. This fact explains why large blocks of certain varieties are unfruitful, and suggests a way to overcoming the difficulty.

"Coming back to blight, the studies in the orchard further revealed the very important fact that while the branches killed during the summer usually contain no living germs after a few weeks, in a certain small proportion of them, at the point where the diseased part merges into the healthy, they do remain alive, and also that these germs pass the winter in a partly dormant condition. As soon as spring opens the germs in these few 'hold-over' cases again start into active life and in a short time become so numerous that they ooze from the wood in gummy masses. Insects are attracted to this more or less sweetish gum, and by visiting it and then going to other trees, especially to the blossoms, they redistribute the organism. So much, therefore, for what has been developed by a long and careful study of this disease. It now remained to apply the knowledge in a practical way, which was done by what has come to be known as the winter method of combating blight."

Composition for Wounds Made in Pruning: Take a quart of alcohol and dissolve in it as much gum-shellac as will make a liquid of the consistency of paint. Apply this to the wound with a common brush, always paring the wound smoothly first with a knife. The liquid becomes hard and excludes the air, and is not affected by any change of weather. If the white color is objectionable, use a little lamp black.

FRUIT LIST RECOMMENDED FOR GENERAL PLANTING IN THE VARIOUS FRUIT DISTRICTS OF COLORADO.

NORTHERN DISTRICT.

The northern district, embracing Eagle, Grand, Larimer, Logan, Morgan, Phillips, Sedgwick, Summit, Washington, Weld, Pitkin and Yuma counties:

Apples—Summer varieties: Oldenburg (Duchess of), Yellow Transparent, Sops of Wine, Red Astrachan, Early Cooper, Chenango Strawberry. Fall varieties: Wealthy, Gravenstein, Utter's Red, Holland Pippin, Yellow Bellflower, Jefferis. Winter varieties: Ben Davis, Jonathan, Winesap, Ralls Genet, Scott Winter, Walbridge, White Pearmain, Rome Beauty.

Peaches—Elberta, Crosby, Bokara No. 3, Globe, St. John.

Pears—Bartlett, Flemish Beauty, Sheldon, Kieffer, Duchess.

Plums—Weaver, Pond Seedling, Lombard, Green Gage, Yellow Egg, Imperial Gage.

Cherries—English Morello, Wragg, Large Montmorency, Mayduke, Black Heart, Early Richmond, Dyehouse.

Red Raspberries—Marlboro, Cuthbert, Turner.

Black Raspberries—Gregg, Miller, Tyler, Kansas.

Blackberries—Wilson, Jr., Erie, Wilson.

Dewberries—Lucretia, Austin.

Currants—Red Dutch, Cherry, White Grape, Holland (Long Branch).

Gooseberries—Downing, Whitesmith, Industry, Houghton.

Grapes—(Red) Brighton, Lindley, Catawba, Delaware, (Black) Concord, Moore *Early*, (White) Niagara.

Strawberries—Jucunda, Captain Jack, Wood (Beder), Gandy, Jessie, Michel Early.

APPLES FOR COMMERCIAL PLANTING.

Summer varieties: Oldenburg (Duchess of), Yellow Transparent, Sops of Wine, Early Cooper.

Fall varieties: Gravenstein, Utter's Red, Holland Pippin, Wealthy.

Winter varieties: Ben Davis, Jonathan, Scott Winter, Ralls Genet, Winesap.

W. B. OSBORN,
Loveland,
PROFESSOR C. S. CRANDALL,
State Agricultural College, Fort Collins,
Committee.

SOUTHERN DISTRICT.

Southern district, embracing Baca, Bent, Chaffee, Cheyenne, Custer, El Paso, Teller, Fremont, Huerfano, Kiowa, Lake, Las Animas, Otero, Prowers and Pueblo counties.

Apples—Summer varieties: Yellow Transparent, Oldenburg (Duchess of), Early Cooper, Sops of Wine. Fall varieties: Wealthy, Rambo, Jefferis, Gravenstein, Buckingham, Utter's Red, Maiden Blush. Winter varieties: Ben Davis, Gano, Winesap, Jonathan, Willow Twig, Missouri Pippin, Ralls Genet, Paragon, Rome Beauty, York Imperial, Rhode Island Greening.

Pears—Tyson, Bartlett, Sheldon, Beurre d'Anjou, Mount Vernon, Louise Bonne de Jersey, Duchess, Flemish Beauty.

Peaches—Triumph, Globe, Alexander, Hale, Elberta, Mountain Rose, Oldmixon Free, Lemon Cling, Stump, Crawford Early, St. John, Wonderful, Oldmixon Cling.

Prunes—German, Italian, Silver, French.

Nectarines—Stanwick, Violet, Golden.

Apricots—Moorpark, Peach, Royal.

Plums—Forest Garden, De Soto, Lombard, Arctic (Moore), Green Gage, Yellow Egg.

Cherries—Early Richmond, Wragg, Large Montmorency, Morello, Ostheim.

Blackberries—Snyder, Briton (Ancient), Wilson, Wilson, Jr.

Black Raspberries—Tyler, Souhegan, Gregg, Mammoth Cluster.

Red Raspberries—Marlboro, Loudon, Cuthbert, Gregg.

Currants—Cherry, White Grape, Red Dutch.

Gooseberries—Smith, Downing, Industry.

Strawberries—Wood (Beder), Warfield, Jessie, Jucunda, Gandy.

Grapes—(Black) Concord, Worden, Moore *Early*, (Red) Brighton, Delaware, Lindley, (White) Lady Washington, Niagara.

Quinces—Orange, Champion.

Almonds—Princes, Hardshell.

APPLES FOR COMMERCIAL PLANTING.

Summer varieties: Yellow Transparent, Oldenburg (Duchess of).

Fall varieties: Wealthy, Jefferis, Buckingham.

Winter varieties: Ben Davis, Jonathan, Missouri Pippin, Paragon, York Imperial, Winesap, Rome Beauty.

W. B. FELTON,
Canon City,
J. C. KAIN,
Rocky Ford,
Committee.

WESTERN DISTRICT.

Western district, embracing Archuleta, Costilla, Delta, Dolores, Garfield, Gunnison, Hinsdale, La Plata, Mesa, Montezuma, Montrose, Rio Grande, Rio Blanco, Routt, Saguache, San Juan and San Miguel counties:

Apples—Summer varieties: Red June, Sops of Wine, Chenango Strawberry, Yellow Transparent. Fall varieties: McMahon, Rambo, Wealthy, Maiden Blush, Utter's Red, Golden Sweet. Winter varieties: Jonathan, Paragon, Winesap, Smith Cider, Gano, Ralls Genet, Willow Twig, Missouri Pippin, Winter Pearmain, Rome Beauty, Ben Davis.

Peaches—Triumph, Alexander, Hale's Early, St. John, Foster, Globe, Bergen Yellow, Elberta, Wonderful, Lemon Cling, Oldmixon Cling, Oldmixon Free, Stevens Rare Ripe, Stump.

Plums—Wild Goose, De Soto, Lombard, Botan, Bradshaw, Yellow Egg, Shropshire, Damson, Satsuma, Burbank, Arctic (Moore).

Prunes—German, Italian, Silver, French, Hungarian.

Pears—Bartlett, Seckel, Lawrence, Kieffer, Beurre d'Anjou, Mount Vernon, Winter Nelis, Beurre Clairgeau, Flemish Beauty.

Cherries—Early Richmond, English Morello, Wragg, Large Montmorency, Ostheim.

Apricots—Moorpark, Peach, Royal, Early Golden, New Castle.

Nectarines—Early Violet, Stanwick, Boston, Golden.

Grapes—(White) Niagara; (red) Brighton, Goethe, Catawba, Lindley; (black) Worden, Concord, Moore (Early); (foreign) Muscat, Chasselas, Black Hamburg, Flame Tokay, Seedless Sultana, Malaga, Peru (Rose of).

Gooseberries—Downing, Houghton, Industry, Whitesmith, Crown Bob.

Currants—Red Cherry, Red Dutch, White Grape, Fay.

Blackberries—Snyder, Briton (Ancient), Kittatinny, Wilson.

Dewberries—Austin, Lucretia.

Black Raspberries—Gregg, Early Ohio, Souhegan, McCormick (Mammoth Cluster).

Red Raspberries — Brandywine, Cuthbert, Marlboro, Loudon, Thwack, Turner.

Strawberries—Captain Jack, Champion, Jucunda, Gandy, Jessie, Manchester, Miner, Parker Earle, Vick.

Quinces—Orange, Meech, Rea, Mammoth.

Almonds—Hardshell.

APPLES FOR COMMERCIAL PLANTING.

Summer varieties: Yellow Transparent, Red June, Sops of Wine.

Fall varieties: Wealthy, Golden Sweet, Rambo, Maiden Blush, Utter's Red, McMahon.

Winter varieties: Jonathan, Winesap, Missouri Pippin, Rome Beauty, Ben Davis, Ralls Genet.

C. W. STEELE, Grand Junction,
W. S. COBURN, Hotchkiss,
Committee.

CENTRAL DISTRICT.

Central district, embracing Arapahoe, Boulder, Clear Creek, Douglas, Elbert, Gilpin, Jefferson, Kit Carson, Lincoln and Park counties:

Apples—Summer varieties: Oldenburg (Duchess of), Sops of Wine, Red Astrachan, Red June, Yellow Transparent, Early Harvest, Chenango Strawberry, Early Cooper. Fall varieties: Wealthy, McMahon, Utter's Red, Gravenstein, Jefferis. Winter varieties: Ben Davis, Smith Cider, Rhode Island Greening, Jonathan, Winesap, Ralls Genet, Walbridge, Winter Pearmain, Wagner, Gano, Arkansas Black, Paragon, Northern Spy.

Plums—Lombard, Burbank, Weaver, Arctic (Moore), Wild Goose, Golden Drop, Bradshaw, Washington, Miner, Yellow Egg, Pond Seedling.

Grapes—(Red) Delaware, Brighton, Lindley, (black) Moore's Early, Worden, Concord, (white) Niagara.

Blackberries—Wilson, Briton (Ancient), Wilson Jr., Erie.

Peaches—Elberta, Bokara No. 3.

Gooseberries—Downing, Whitesmith, Houghton, Industry, Triumph.

Currants—Fay, Red Dutch, Victoria, Cherry, Red Grape, Defiance, White Grape.

Red Raspberries—Cuthbert, Marlboro, Loudon, Red Antwerp, Clark.

Cherries—Morello (English), Wragg, Large Montmorency, Ostheim, Dyehouse, Mayduke, Richmond.

Strawberries—Wood (Beder), Champion, Crescent, Downing, Gandy, Jessie, Parker Earle, Vick, Wilson, Jucunda, Captain Jack.

APPLES FOR COMMERCIAL PLANTING.

Summer varieties: Oldenburg (Duchess of), Yellow Transparent, Sops of Wine.

Fall varieties: Utter's Red, McMahon, Wealthy, Maiden Blush.

Winter varieties: Ben Davis, Jonathan, Ralls Genet, Winesap.

DAVID BROTHERS, Denver,
ELWOOD EASLEY, Golden,
Committee.

DISTANCE FOR PLANTING.

Apples	25 to 35 feet
Peaches	16 to 18 feet
Nectarines	16 to 18 feet
Cherries	15 to 20 feet
Quinces	8 to 10 feet
Currants	3 to 4 feet
Raspberries	3 by 6 feet
Strawberries	1½ by 4 feet
Pears (standard)	18 to 20 feet
Pears (dwarf)	10 feet
Apricots	16 to 18 feet
Plums	12 to 16 feet
Grapes	6 to 8 feet
Gooseberries	4 to 6 feet
Blackberries	5 to 8 feet

Office of
STATE BOARD OF HORTICULTURE,
Capitol Building.

Denver, Colo., December 30, 1898.

At a session of the annual State Horticultural Convention, held November 28, 29, 30, 1898, a committee was appointed for the purpose of revising the fruit list. This list is the result of their work. It has been demonstrated by experience that all varieties of fruits (except citrus fruits) can be grown successfully in Colorado. Special care has been exercised in this publication to select varieties which are adapted to the various fruit districts of the state.

W. S. COBURN,
President.

MARTHA A. SHUTE,
Secretary.

REMEDIES FOR A FEW INSECT PESTS.

SPRAY CHART

BY PROFESSOR CLARENCE P. GILLETTE, ENTOMOLOGIST STATE AGRICULTURAL COLLEGE, FORT COLLINS.

INSECTS	PLANTS ATTACKED	REMEDIES	TREATMENT HOW MADE	WHEN TO APPLY	REMARKS
Codling Moth.	Apple, Pear, Quince.	Paris Green, London Purple, White Arsenic, Bandages.	Paris Green or London Purple in water, 1 lb. to 160 gallons, sprayed. Arsenic ½ this strength.	As soon as blossoms are fallen. Repeat in ten days. If rainy, repeat a second or third time.	If cloth bands are used on trunks, they should be removed every 8 to 10 days and the larvæ under them killed.
Pear and Cherry-tree Slug.	Pear, Cherry, Plum.	Hellebore, Paris Green, Slaked Lime.	Lime applied dry. Paris Green as for Codling Moth. Hellebore, 1 oz. to 3 gallons water.	Whenever the slugs are found on the leaves.	Paris Green or Hellebore may also be used dry, diluted several times with flour, and dusted lightly over the foliage.
Leaf Rollers.	Fruit Trees in general.	London Purple, Paris Green.	As a spray, putting 1 lb. of the poison in 160 gallons of water.	As soon as the leaves begin to roll.	Repeat as often as is necessary to thoroughly destroy the rollers.
Plant Lice.	Apple, Plum, Cherry, Peach, etc., etc.	Kerosene Emulsion, Whale-oil Soap.	In the form of a spray, and with as much force as possible.	Just before the buds open in the spring, and when ever lice are found.	As eggs on out-door plants hatch before the buds open, this is the best time to destroy the entire brood.
Woolly Aphis.	Apple.	Tobacco Stems, Tobacco Dust, Kerosene Emulsion, Whale-oil Soap.	Work the tobacco into the soil about the stems of the trees. Spray the emulsion or soap *forcibly* on to the lice on the trees.	Tobacco early in spring. Spray foliage and branches whenever lousy.	Pure Kerosene may be used with a swab to destroy the colonies of lice as they appear on trunk or branches.

REMEDIES FOR A FEW INSECT PESTS.—Continued.

INSECTS	PLANTS ATTACKED	REMEDIES	TREATMENT HOW MADE	WHEN TO APPLY	REMARKS
Flat - headed Borer.	Chiefly Apple and Pear.	Pocket Knife.	Dig out the grubs and kill them.	During winter and spring.	These insects usually enter where the trunk is scalded by the sun. Prevention of sun scald will lessen borer injuries.
Plum Gouger.	Fruit of Plum.	Gathering infested fruit, jarring trees.	Collect every infested fruit and destroy it, or jar the trees and catch the beetles on a sheet.	Destroy fruit about August 1. Collect the beetles at blossoming time and after.	If jarring is practiced it should be done in the early morning or in the evening. Continue while one beetle to a tree is taken.
Grape Leaf Hopper.	Foliage of Grape-vine, Virginia Creeper, Str'w berry.	Kerosene Emulsion, Whale-oil Soap, Fire.	Apply as a spray very early in the morning. Burn old grass and leaves.	Whenever the hoppers are abundant. Burn on cold days.	Spray forcibly in the early morning before sunrise. Rake and burn leaves during winter.
Grasshoppers.	Vegetation in general.	Arsenic Bran-mash, Hopper Pans.	Arsenic, 1 lb.; sugar, 1 lb.; bran, 6 lbs.; wet together and scattered in field.	Whenever grasshoppers are abundant.	The "mash" is scattered in orchards, vineyards, etc., where hopper pans can not be used.
Brown Mite.	Chiefly Apple, Pear, Cherry.	Kerosene Emulsion, Whale-oil Soap, Lime, Sulphur and Salt Mixture.	As a spray or wash.	During the winter or spring, before the eggs hatch.	The eggs remain over winter and appear as rusty brown patches on the limbs and trunks of the trees.
San Jose Scale	Pear, Apple, Plum, Cherry, etc.	Whale-oil Soap, Lime, Sulphur and Salt, Gas.	Gas by fumigation; other substances are sprayed.	Gas treatment during the summer. Others while trees are dormant.	Whenever this scale is suspected, specimens should be sent the Exp. Sta., Ft. Collins, for determination and full directions for treatment.

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