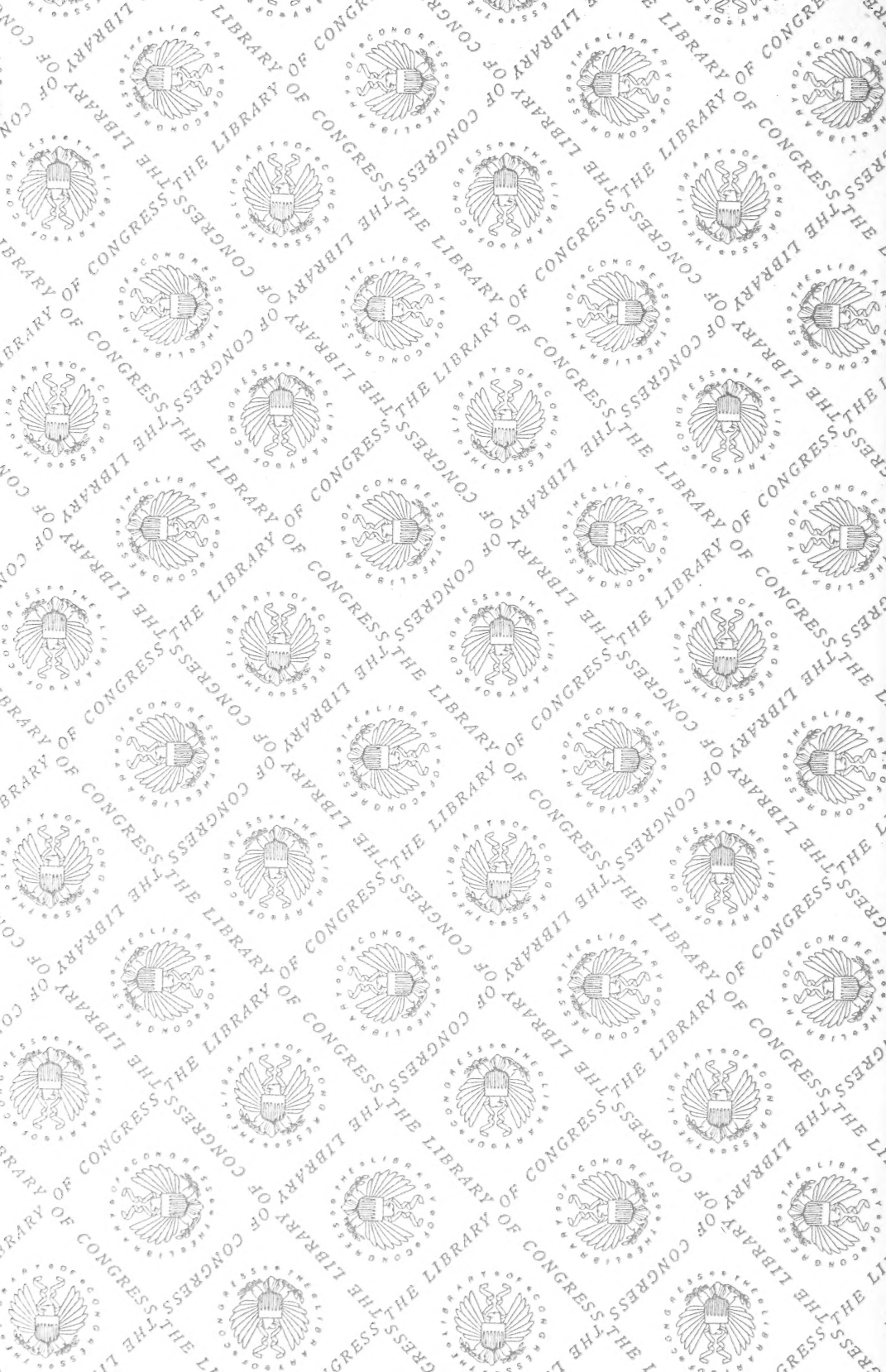


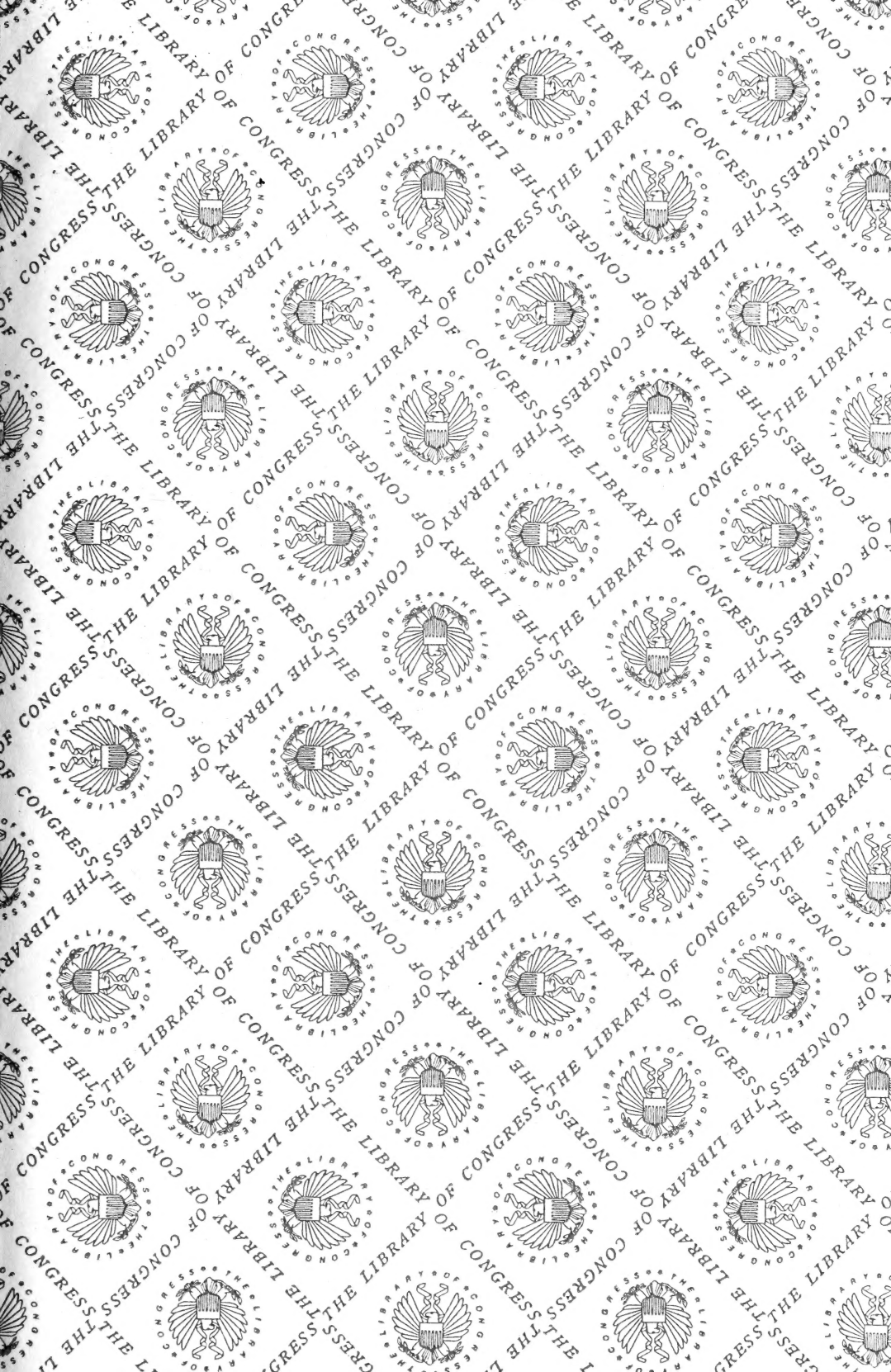
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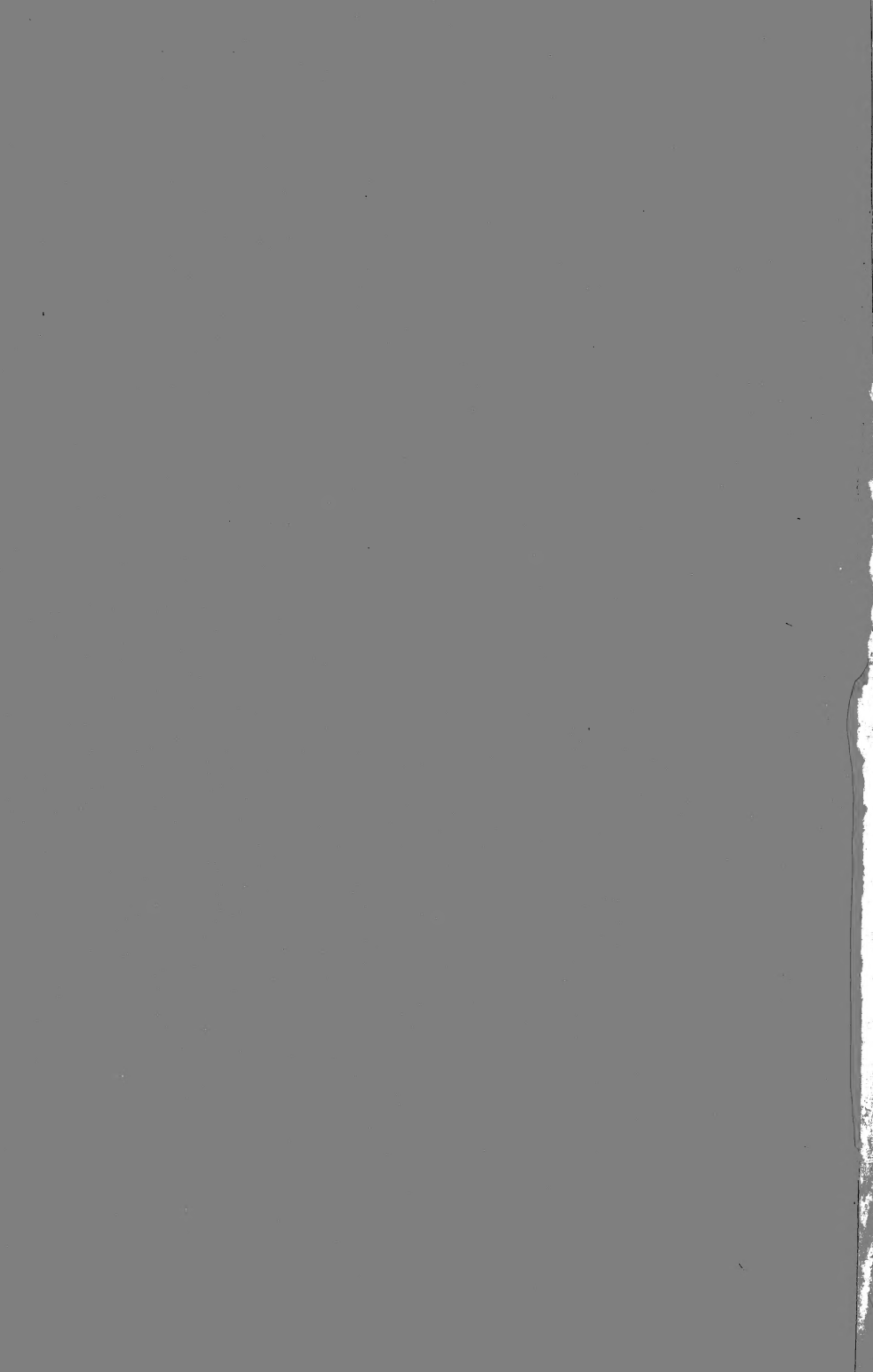
*of the Second Session  
of the*

# Trans-Missouri Dry Farming Congress

**Salt Lake City, Utah**

**Jan'y 22, 23, 24, 25, 1908**

*Published by* The Commercial Club  
Salt Lake City, Utah



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Press of  
THE F. W. GARDINER COMPANY  
Salt Lake City, Utah

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# Trans-Missouri Dry Farming Congress

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- |                                    |  |
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| J. M. PATTERSON, The Dalles, Ore.  |  |



**STENOGRAPHIC REPORT OF PROCEEDINGS OF SECOND AN-  
NUAL SESSION OF THE TRANS-MISSOURI DRY FARM-  
ING CONGRESS, HELD AT SALT LAKE CITY,  
JANUARY 22-25, 1908.**

The Congress was called to order at 10 o'clock a. m., on Wednesday, January 22, 1908, by Prof. B. C. Buffum, of the Wyoming State Agricultural College.

PROF. BUFFUM (Presiding): Gentlemen, in behalf of your distinguished president—and it is very sad that he cannot occupy this place—I now declare the second annual convention of the Trans-Missouri Dry Farming Congress in session.

It is your purpose, gentlemen of this convention, to deal with a problem of most inestimable importance to the human race—the larger development of the great agricultural area of arid America. This arid region is the largest factor in the United States, and it is my firm belief that when it is developed it will outweigh in wealth any other portion of humid America—which we call East. One of the first factors among the big broad mountain states is the one which is in the center—Utah. (Applause.) Here—in this very spot—in 1847, the hardy pioneer smote the rock and let the waters of your own City Creek out onto these lands, giving birth to modern irrigation. All honor to those people, and to that system which reclaimed from the desert perhaps one acre in ten. But that reclamation enabled them to build cities, make millions of happy homes and create a vast amount of wealth. Now, gentlemen, I believe it is your duty to treble, yea, you will more than quadruple the number of acres which will be brought under cultivation in this vast domain. Utah gained recognition, which is distinguished, in the reclamation of arid land, and now she has shown again her determination and her faith by making liberal appropriations to further the interests of dry farming and to increase her agricultural development. It is, therefore, indeed a high honor for me to attempt to get my clumsy feet into the shoes of your distinguished president, Mr. Fisher Harris, who has overcome obstacles—how great none of us may know—to make this meeting a success.

It is my honor, gentlemen, to introduce to you this morning, the most distinguished and favored citizen of this commonwealth, Honorable John C. Cutler, Governor of Utah, who will be your temporary chairman, and who will now address you. (Applause.)

After the invocation by the Reverend P. A. Simpkin, Pastor of Phillips Congregational Church, the Congress proceeded to its regular order of business.

**ADDRESS OF WELCOME.**

(By Hon. John C. Cutler, Governor of Utah.)

Mr. President, Members of the Congress, Ladies and Gentlemen:

In welcoming such a Congress as this to Utah, I realize that I am helping celebrate an epoch-making event in the history of the State, of

the arid West, and of the nation. Utah's first settlers were the pioneers of irrigation in America. With the aid of science and of the National Irrigation Congress and other agencies, irrigation has been developed from crude beginnings into an exact science; and its benefits have received world-wide recognition. So Utah, in common with other western states and territories, has a number of pioneers in dry farming. Some of them are here, honored delegates to this Congress. I hope they are all here; for we may well sit at the feet of such men and be instructed in the arts by which they have brought this industry to the point of excellence it has reached.

I think we shall soon welcome the day when from their more or less experimental efforts arid farming will be evolved into as exact and useful a science as irrigation. This will be accomplished by the efforts of this Congress and like agencies and with the aid of the science evoked in the cause of irrigation. With this difference: That dry farming will be of application on a much larger acreage than irrigation can ever hope for.

For the initiative in organizing this Congress we are indebted to former Governor J. F. McDonald of Colorado. It will be a perpetual monument to him. I pay him the tribute of sincere admiration for the idea. If Colorado has the honor of originating the Congress, Utah has the distinction of furnishing its first president. (Applause.) I like to see Fisher Harris mixed up with dry things. (Laughter and applause.) They don't remain dry very long. And everyone knows that no company he mingles with and no discussion he engages in can be dry very long. (Applause.)

We regret very much that he has sustained a loss of voice. We hope the loss is only temporary. But if his vocal chords are temporarily paralyzed, we have the best of evidence from the splendid preparations he has made for this Congress and the large and representative attendance he has secured, that his good right arm and his brain are not paralyzed. (Applause.) And though we miss his silver-tongued oratory, we get the benefit of his unceasing labor. Ladies and gentlemen, Utah is proud of this Congress and of its president.

Coupled with the formation of the Congress is another event equally important. I refer to the formulation and introduction of an act in Congress by Senator Smoot of Utah, proposing such amendments to the homestead law as will make it possible for thousands of families to make homes and farms in what have been thought irredeemable wastes. I am very much mistaken if these two events do not prove of incalculable value to the West and to the Nation.

Regarding one of the subjects that will doubtless come before the Congress, I wish to make a brief statement of my position. I am strongly in favor of the preservation of our resources and I endorse the Government's public land and forest reserve policy. The fundamental principle involved is correct. It has developed in recent conventions that certain interests are opposed to these policies. It is a question in my mind if it is not a disagreement as to some minor details of enforcement rather than opposition to the principle of conservation. If it should happen that any



of you delegates are opposed to these policies, it may be that by conferring with the proper officers and getting a thorough understanding of the motives and the plans of the Government you can come to terms of agreement and thus remove whatever differences there may be.

Speaking for myself, and I think I speak for the State of Utah, as well, I am thoroughly in sympathy with the steps being taken by the Government to save the public lands for homeseekers and the public range and the forests for the home-makers and their children. I am sure this is the only object sought by the Government. If there are interests opposed to this laudable purpose. I believe they will have to yield to the general good. While I should very much dislike to see any worthy industries crippled, yet if they are being conducted in such a way as to endanger the wealth or the safety of future generations, I think it is the right and the duty of the Government to interfere. As to the proper extent and means of interference, there may be differences of opinion among the interests concerned. It is with this view that President Roosevelt has invited the governors to go to Washington in the spring and consult with him and the heads of departments. But it is decidedly impolitic, in my opinion, for these various conventions to pass drastic resolutions of disagreement with the general policy of the Government, or censure the officers entrusted with its enforcement.

The country has no greater benefactor than the man who makes the land productive. Those who own and till the soil form the best element of any nation's citizenship. I do not mean the large landed proprietors nor the serfs that till these men's lands; but those who own the farms and gardens, whether large or small, and who take their sustenance from the earth. As a rule there are no better citizens. They are the mainstay of the Nation; they support the merchant, the manufacturer, the professional man; they feed the world. They are intelligent. Their children are among our leading students. There has been a change since the great French artist produced his immortal painting, the fame of which has been made still more secure by Markham's equally immortal poem, "The Man With the Hoe." The farmers of to-day and especially of this country are not the woebegone, hopeless, downtrodden, spiritless clods the Frenchman painted, but intelligent, hopeful, progressive, and useful citizens. (Applause.) Their combination of brawn and brain is irresistible; and neither envious man nor the destructive forces of nature can stand in the way of their great achievements.

The Nation does not need to fear its farmers. Who ever heard of the prosperous American farmer talking anarchy? He may get out among his neighbors once in a while and say that this or that condition should be bettered, or that socialism or some other "ism" will cure certain ills. But it doesn't last long. He is nearly always too busy for that sort of thing; too much occupied with his multiplied duties. And as the golden grain falls before his reaper and he garners and markets it and the price goes jingling into his pocket, he forgets all about his little troubles and decides that things are about right after all. For anarchy does not

thrive on well-filled pockets and well-occupied time. The anarchist is usually idle or needy or both.

The more men and women there are in a community who own their homes, till their own land, raise their own stock, and train their own children, the stronger and better will that community be. We are therefore under lasting obligation to those who show us how to produce good harvests on arid land, and to those who legislate to make the settling of such land possible. As a result of the work of this Congress, supplemented by the wise acts we hope the national Congress will pass for our benefit, we expect to see homes made on arid wastes for teeming millions.

I do not know just what progress dry farming is making in the states and territories. I suppose you will be officially informed as to that. I was greatly impressed with its possibilities when I stood last summer on a large plain in central Utah, on which within the memory of man nothing had been raised but sage brush and sand-storms, and saw the first combined harvester and thresher imported into the inter-mountain country cut and thresh a splendid crop of dry land wheat. (Applause.) And I thought of the hundreds of thousands of acres of just such land that I had seen scorched and blistered by the sun, yet bearing as evidence of fertility gray shrubs as large as trees. And I am sure that with proper methods and thorough training almost innumerable dependent families can soon be made prosperous on this land, and the state and nation be immensely enriched. I think that time is at hand for Utah and for all the West.

From the standpoint of one who has not made a technical study of the subject, I can see two great agencies by which extended success is to be achieved. One is the scientific application of preserving moisture; the other the development of plants adapted to arid soils. These problems are being successfully solved by experiment stations and the men connected therewith, and other scientists. It may be of interest to the delegates to know that the Utah Legislature, in its recent session, passed measures providing for experiments in procuring water on dry farms for culinary purposes, and in ascertaining the best methods of preserving moisture, selecting seed, enriching soils, etc. We are on the threshold of this great work; and no man can even imagine in his heart the riches we shall find on entering the door.

People were once afraid of men increasing so rapidly that the earth could not sustain them. There appears to be no danger of this as long as men are found who by the improvement of one plant, the potato, can increase the value of its annual yield in this country alone by millions of dollars; who can evolve plants that will flourish in the most sterile and forbidding wastes. Such work is wonderful; akin to the miraculous giving of manna and water in the desert to the children of Israel. These things have been done. I don't know what may be done in the future. I do not fix bounds to the possibilities of modern science,

Ladies and gentlemen, you are heartily welcome to Utah. The walls you see about you—these great mountain ranges—are not placed there to keep visitors out. They are intended to make you prolong your stay. People become so enchanted with gazing on them and on the beautiful valleys lying between, that they want to get a time extension on their return tickets. And some of them forget all about other places, and settle here permanently. We hope some of you will do that. (Applause.)

We are glad to see so many present who are eminent in their respective lines of work. Perhaps I should particularize; but there are so many of them that time will not permit. We are honored in their presence; and I am sure we shall be greatly helped. To all of you I extend the freedom of the State; and whether your stay with us is long or short, we shall make it as pleasant as possible.

May this Congress realize all our hopes in advancing the interests of the arid lands, the great West, and of our glorious Nation. (Applause.)

HON. JOHN C. CUTLER (Presiding): Ladies and gentlemen, the next speaker will be the mayor of the city, Hon. John S. Bransford, who will welcome you. (Applause.)

### ADDRESS OF WELCOME.

(By Hon. John S. Bransford, Mayor of Salt Lake City.)

Mr. Chairman and Gentlemen of the Trans-Missouri Dry Farming Congress:

It affords me very great pleasure to be here on behalf of this great inter-mountain city to extend to this representative body of soil scientists and practical farmers a cordial welcome, and to express to you the earnest hope that you will avail yourselves of their hospitality while you are here. We stand assured, Mr. Chairman, when we look into the intelligent faces of those present that although you have met here for the express purpose of discussing a dry subject in detail, it will not be treated in a dry manner.

Farming is regarded by the city born and bred as being more or less prosaic in its character and nature. Plowing the land, sowing the seed, reaping the harvest, and all the other operations necessary to the production of good and plentiful crops, do not usually offer to the mind of the average city man anything of enough romantic interest to require his consideration.

I believe that in the topics which will occupy your minds during this conference, and which have brought you together, many things will be said, many ideas brought out that will be of great benefit to the people, not only of this state, but of all the arid and semi-arid states; yes, I might say to the people of the Nation.

This gathering is expressive, it would appear to me, of what might be termed the gospel of action. You are the exponents, in a large measure, of that gospel. You have come, I take it, to present to us a particular phase of this gospel, a phase of it which is opposite of what has hitherto been regarded as the orthodox, in schemes of desert-land redemption.

I have said that you were the exponents of a special phase of the gospel of action, and I have no doubt the missionaries in your particular field of

investigation and research have had to meet and overcome many obstacles and prejudices—long established customs often confront you just as they have confronted others who have opened up a new field of thought and activity.

Utah has the distinction, acquired perhaps by that force which has been in the past, and yet is, the mainspring of many endeavors—I refer to the force of circumstances—of being the first among the arid states to perceive the great possibilities of dry farming.

Lying within her borders is a large area of land upon which nature, it would seem, has set the seal of disapproval, by withholding from it the moisture necessary to make it fertile. But this disapproval has been the incentive to thought, reflection and action on the part of her citizens in other instances, too numerous to mention, so that their skill, genius and industry have wrested from nature the sovereignty she has long exercised, and has used the bountifulness of her resources which she has poured out in some parts of the land, to nourish and invigorate other parts, so as to make them fruitful.

The farmers, therefore, in past years, have had to depend upon the rains and snows of winter and of spring, in addition to hard work, for a successful crop. With these and a careful selection of the seeds suitable to the constitution of the soil, the Utah farmer has been eminently successful.

Utah, in my opinion, is excellently adapted to the kind of farming which you have met here to discuss. The usually heavy rainfall and the snows that mantle with whiteness our valleys and our mountains during winter, and which, with the advent of spring, invigorate the land with bounteous streams, nourish into animation the grain which has already been planted.

I might mention here the assistance which the Department of Agriculture has rendered in the development of this kind of farming. In using expert knowledge, resulting from experimentation, and from a study of the cereals, alfalfa, and the many grasses which flourish under climatic conditions, with which you are confronted, the department has lent great aid.

In conclusion, Mr. Chairman, I would state that in behalf of the people of Salt Lake, I hand you the keys of the city; all the doors are open, and when your conference is over and you depart to your homes, I hope that experience and observation will enable you to say that Salt Lake City is not only one of the most beautiful, hospitable, progressive cities of the country, but that it understands the great value of dry farming in furnishing it with the necessities of life.

With the hope that you will all enjoy the hospitality of the people here, and that when you leave you will have kind words for us I will now leave you to your deliberations. I thank you. (Applause.)

HON. JOHN C. CUTLER (Presiding): I am requested to announce that the delegates from Idaho are requested to meet in the corner of the hall opposite the entrance immediately after the conclusion of this morning's session.

I now take much pleasure in introducing to you the President of the Commercial Club of Salt Lake City, the Honorable W. J. Halloran. (Applause.)

HON. W. J. HALLORAN: Mr. Chairman and Gentlemen of the Congress: On behalf of the Commercial Club of this city I extend to you the welcome of the Club during your stay and hope you will make the Club apartments your headquarters while you are here. The Club has taken a very active interest in this Congress, and it is our desire that your efforts shall be successful from every standpoint.

The work of this Congress is of vital importance to western agricultural interests and I believe that your labors and conclusions at this session will mark the beginning of a long career of usefulness for your organization.

We have here a city of 100,000 people, contented and happy. Our city has prospered beyond our expectations in the past few years. I may say, gentlemen, that we have grown in population in the past two years at least twenty thousand people. We are situated here in a beautiful valley, with no competing point for from five to eight hundred miles in all directions. We are not only extending our farming interest and our cattle and stockraising interests, but our mining interests have grown until we have become, in the last few years, the center of mining in the United States. We have here the greatest smelting center in the United States, and the prospects for the future of this city never looked brighter.

I thank you, gentlemen, and again extend to you the courtesies of the Club, and bid you welcome. (Applause.)

GOV. JOHN C. CUTLER (Presiding): Gentlemen, I take pleasure in introducing to you Mr. John T. Burns, of Colorado, who will reply to the addresses of welcome. (Applause.)

MR. JOHN T. BURNS: Mr. Governor and Chairman, and ladies and gentlemen of the Dry Farming Congress: I am not a "Dry Farmer." In fact I am not a farmer in any sense of the word, but being from Colorado—where dry farming has certainly made good, the pleasant duty has devolved upon me of making response, in behalf of the Trans-Missouri Dry Farming Congress, to the very clever words of welcome that have been given to us by the representatives of this state and the convention city.

It is indeed fitting that we should meet here in Utah to discuss the scientific farming; for this congress is a pioneer in a field of unexplored possibilities, and, by the handwriting upon the walls of this convention hall, we find that Utah is the pioneer in irrigation and in dry farming. (Applause.) So, my friends, you see we have merely returned home, like the prodigal son, to allow our genial president, Fisher Harris, to kill the fatted calf of Utah's traditional hospitality.

In accepting the entertainment offered to us by our hosts in this city, the Congress will always keep in mind the fact that here, in this historic spot, where men forced an unwilling soil to give up untold wealth, where, far from other civilization, and without hope of transportation, de-



terminated pioneers fought against great odds, conquered Nature and brought forth from a forbidding desert a commonwealth vast and powerful, we are assembled to absorb some of the true Utah spirit.

The pioneers of Utah were but a type of the pioneers of to-day. They had problems to face—they solved them. The men who are building the greater West of to-day have always been obliged to face problems, and they are always facing them, and usually they always solve them and overcome them. There was a day when our National Congress looked upon the West as a place where Nature had placed insurmountable barriers; thought it was impossible to continue on the forward march. To-day the West has given proof of her independence by turning the vast wealth of her broad acres into the breach in the Nation's financial wall.

There was a time when irrigation was looked upon as "play farming," fit only for theoretical agriculture. To-day the irrigated states are far surpassing in production and values the acreage of the East.

There was a time when it was believed that the agricultural development of the semi-arid states must of necessity be limited to the exact acreage of water distribution under irrigation methods. Men marveled that God should give to a people a territory so vast and yet so worthless, except, perhaps, to make distances magnificent and transportation expensive. Some men still believe that this is true.

I recently overheard a controversy between two prominent farmers of Colorado—one an irrigationist—died in the wool—and the other a dry farmer and an experimenter. The one said: "This dry farming business is all dry rot; it never did mean anything and never will." The other replied: "The proofs of a proposition are the results obtained by application. Come with me and see what you can see." The wet farmer replied: "I don't care to see; there is nothing to see; there never can be any results from dry farming; it is all rot and nothing else; I will give ten dollars a stack for every stack of dry farmed wheat straw to be found on a bee line between Greeley and the Wyoming line." The dry farmer said: "I will give you three hundred dollars if I cannot take you on a line fifteen miles wide from Greeley and the Wyoming line and show you one thousand stacks of dry-farmed straw." "But pshaw," said the irrigationist, "I will not gamble with a dry farmer; he has not sense enough to keep himself from poverty." And that ended the discussion. (Laughter.)

That is the argument, gentlemen, against dry farming.

I believe that there will be a day when scientific agriculture, as represented by dry farm development, will stand side by side in the public estimation as an element in state building. I believe that this Dry Farming Congress will play an important part in working out the problem.

It was my pleasure to be a member of the committee of arrangements which organized the first Dry Farming Congress in Denver one year ago. We had but a small appreciation of the probabilities of such a movement. We prepared for two hundred delegates—we had nearer six hundred. After the first day we were obliged to hire a larger auditorium, and we were glad of it. For the first time in history men of affairs assembled

to discuss ways and means of getting honest dollars out of arid soil without the aid of irrigation, and for the first time irrigationists realized that there might be some truth in this dry farming talk after all. Resolutions were passed, officers elected, and the Congress adjourned. The discussions were valuable, the Government redoubled its efforts to assist in scientific experiments in behalf of arid states—but the Congress as a Congress became inactive. President Harris, a man of splendid executive ability, with a knowledge of dry farming in its every phase and his heart filled with enthusiastic belief in the movement, was left to stand practically alone, to work out the salvation of the Congress.

At the expense of health and his own business affairs President Harris has kept the newspapers and magazines of the country supplied with live discussions of scientific farming and its results, and to him and his loyal supporters, you gentlemen of Salt Lake City and of Utah, belong the credit, and to these people we are heavily indebted as a Congress. (Applause.)

We are also indebted to the loyal men of the state and government experimental stations, who, encouraged by the splendid enthusiasm of the Denver convention, have worked without stint of time or energy to prove that dry farming crops are to make the "desert to bloom as the rose."

But we are here to-day to shed our swaddling clothes.

The results of scientific farming during the past year have strengthened this movement. Now let us, out of this Second Congress, evolve a great dynamic power that shall force the enemies of soil culture theories to their knees.

This Congress should not close without adopting definite plans for future operations. First let us rectify an error in organized machinery. Under our constitution our executive committee, which is the governing power of the Congress, must be elected at the close of the convention. It is within the power of the retiring committee to select the next place of meeting. Let the new executive committee of this Congress be selected early in the deliberations of this convention; let this new committee meet often during these sessions, formulate plans for the permanent life of the Congress and select the next meeting place. Such a change would give the new officers actual control of the Congress, while still in full swing; and it should be their duty as well as pleasure to keep the swing in full motion for at least a year.

I suggest a few objective points that should be parts of the working plan of such a body.

In order to create enthusiastic competition between dry farming districts, let the next annual meeting of the Trans-Missouri Dry Farming Congress have as a feature a great interstate exhibit of dry farming products. This would prove to the skeptical just what is being accomplished, would create inter-state rivalry, and will attract a large attendance of delegates and visitors.

A fundamental principle of this Congress should be the creation and influencing of state and national legislation for the establishment of more and better equipped experimental farms.

The Congress should maintain a press bureau for the purpose of giving publicity to every line of dry farming news through the columns of the farm and commercial publications and in the weekly newspapers. Such a bureau could secure the publication of thousands of columns of newspaper discussion on subjects vital to this campaign.

The Congress should assemble and publish every fact pertaining to operative results in dry farming districts. These might be published in a bulletin or magazine to be issued monthly.

The Department issues similar bulletins, but they are not generally sought after by the men who are operating farms. If we have as a part of our machinery, in an organization in which they have a personal part as members, such a publication, I believe that its work will be greatly strengthened throughout the West.

Who present in this hall can point to the map of the western states and place their finger upon the districts where dry farming operation is possible and can be successfully carried on? I believe that there is not a man here who can do that. This Congress should make it a business matter to know every such district with its climatic and soil condition, and as a result of this information scientific cultivation should be given local encouragement.

In states where the agricultural colleges have no available funds for the purpose, this Congress should organize and maintain dry farming institutes until such time as state appropriations can be secured. And to the credit of Utah may it be said that this state has taken splendid hold of that proposition. It is also the pioneer in this work.

Some of these points are partially covered in the by-laws of this Congress, but they are well worth special emphasis. To carry out this vast scheme money will be necessary. It can be secured if we show that we are earnest and that its expenditure will be honestly and carefully controlled. But the matter of finance is one best discussed by your newly elected executive committee, and I will close with one reason why this Congress need not be afraid nor ashamed to go before the men of the West to seek support.

Agriculture is the hub of the wheel of commerce. From this hub extend the spokes of the great banking, mercantile, manufacturing and transportation systems of the country. Therefore, no element of commerce exists which is not financially interested in the reclamation of the more than one hundred millions of acres of now almost worthless arid soil west of the Missouri River.

The work before this Congress is two-fold—educational, to secure the co-operation of our westerners in the further adoption of scientific methods; and publicity, by which we can fill the arid lands of the West with actual settlers. Gentlemen, I thank you. (Applause.)

GOVERNOR CUTLER (Presiding): The next thing in order will be the appointment of a committee on credentials—five in number—to be named by the Congress. Nominations are now in order.

The following named persons were, by delegates, nominated for places on the committee on credentials: George Paxton, of Evanston, Wyoming; Heber Bennion, of Salt Lake County, Utah; James Lovelace, Utah County, Utah; J. F. Osler, of Juab County, Utah.

MR. EVANS (From Utah): I desire to call the attention of the Congress to the fact that there are to be but five delegates on this committee and other states should be recognized. Most of the delegates nominated are from Utah. This ought not to be. (Applause.)

A DELEGATE: I nominate Hon. Thomas Webster, of Rexburg, Idaho.

A DELEGATE: I nominate C. R. Root, of Denver.

THE CHAIRMAN: Are there any other names? We have now six names. I think the point taken by Mr. Evans of Utah County a good one, that the majority should be from outside of Utah. However, it is for you to say, gentlemen.

A DELEGATE: I nominate John W. Tate, of Tooele County, Utah.

Other delegates were nominated as follows: Judge E. O. McCutcheon, Idaho Falls, Idaho; George R. Day, of Idaho; Richard A. Riepe, Ely, Nevada.

MR. EVANS: Mr. Chairman, it seems to me that we are getting into some confusion with respect to this matter. I therefore move that the secretary call the roll of the states represented here and that each delegation of the state name its committeeman on credentials. I think there should be one committeeman from each state.

A DELEGATE (From Utah): I second that motion. I think this is a time when Utah can afford to be magnanimous in matters of this kind.

THE CHAIRMAN: That would mean some fifteen or eighteen members. The committee consists of five members.

MR. EVANS (From Utah): I move a suspension of the rules, and that we appoint on this committee on credentials one member from each state represented here, and that when the roll of states is called the various states name their man. I move that as a substitute for this other motion.

A DELEGATE: Do I understand that this committee consists of five members?

THE CHAIRMAN: Yes, sir.

DELEGATE: Then I move that the first man named from each state be the committeeman on credentials.

Motion duly seconded.

MR. BURNS: I would like to offer as a substitute to cover all of the various motions and amendments, in order to save confusion, this motion: That the chairman be allowed to nominate this entire committee from the list which he will secure from the various states, and report this afternoon or evening.

MR. EVANS (Utah): I accept that substitute.

The motion was duly seconded, put to a vote and declared carried.

THE CHAIRMAN: The committee will be named this afternoon. The permanent chairman will name the committee on resolutions this afternoon.

PROF. B. C. BUFFUM (Wyoming): I move you, sir, that the committee on resolutions consist of fifteen members, to be selected by the President of this association, from the accredited delegates present, and that he report these names to this convention this afternoon.

The motion of Prof. Buffum being duly seconded, was put to a vote by the Chairman and declared passed.

THE CHAIRMAN: I do not know of any other business to come before the Congress this morning.

It has been suggested that we appoint a temporary secretary to attend to the work of the convention. If there are no objections Mr. C. R. Root, of Colorado, will be appointed temporary secretary of this convention.

MR. ROOT (Colorado): I would object to that. I think there are people in the convention more competent to do that than I——

THE CHAIRMAN: All in favor of Mr. Root acting as temporary secretary will signify by saying aye.

The motion carried unanimously.

THE CHAIRMAN: A motion to adjourn is now in order.

On motion duly seconded, the convention adjourned until 2 o'clock p. m.

#### AFTERNOON SESSION.

The Congress was called to order at 2 o'clock by Hon. John Dern, of Salt Lake City.

MR. DERN (Presiding): Owing to the inability of the Governor, your temporary chairman, to be present this afternoon, a committee has requested me to preside at this gathering. I do not know why I should have been selected to preside at a gathering of this kind unless my friend, the President of your association, takes it from the fact that for a great many years when they speak of John Dern or the Salt Lake crowd they speak of the Nebraska farmers. I have never resented that, because I am proud of the fact that I, in my earlier days, was a farmer and made the start of my life on the farm. (Applause.) There is nothing more honorable than the life of a farmer; you are nearer nature than a people following any other vocation which man is engaged in. Yours is similar to the vocation of the miner. You are not taking away from another in barter or trade, but you produce whatever you do produce from mother earth. But you have the advantage over the miner, because the miner when he once works out his ore it does not grow again; it cannot be replaced; it simply means exhaustion, whereas, on the other hand the farmer tills the soil, seeds his ground in the fall or spring, and mother earth brings forth another crop and yields her harvest year after year. Thus you are adding to the wealth of the country and creating homes for many.



The object of this organization is, as I understand it, to further promote the dry farming of a vast area of land which for many years past has been considered as absolutely valueless. It is no more an experiment; it is a fact established that the tilling of the soil in a proper method will produce results. Naturally there are many who will say, "Oh, that is all right; you have had considerable rain during the last year; wait another year and you will find these theories will not hold good." But after all, when you go back over the prairies of Nebraska, Kansas, Iowa, and Illinois you do not always have a full crop every year. There are certain seasons when they do not raise the same crops they do other seasons. They are not so fortunate as the farmers of the West who have plenty of water to irrigate their lands. This farming, you may say, is absolutely certain. But I venture to say that the time will come, in the not very distant future, when you can count with certainty on a crop on these arid lands—as much so, nearly, as these farmers who live in the great middle West.

I have kept, or have been trying to keep fairly well posted as to the progress of this movement, and as I said before, my heart and soul is in it. While I am not actively engaged in farming yet I own land in eastern Nebraska where irrigation is not necessary, where we have an abundant rainfall, and I also own land in the western country which I know this dry process development will greatly benefit.

I do not want to detain you any longer with any idle talk I may make. I know you are here for business and we will proceed with the program.

I have before me a list of the Committee on Credentials, as appointed by your Chairman: James Webster, of Idaho; George Pexton, of Wyoming; R. A. Riepe, of Nevada; C. R. Root, of Colorado; Heber Bennion, of Utah. This committee is requested to meet at the Registration office at once.

MR. E. A. BURRELL (Idaho): On behalf of the delegation from Idaho, Mr. Chairman, I would say that we have selected the Hon. O. E. McCutcheon, from Idaho Falls, as the representative of the Idaho delegation on the Committee on Credentials, instead of James W. Webster.

MR. DERN (Presiding): I have just been informed by the President that Mr. McCutcheon has been appointed on the committee on resolutions, and as these two committees will probably want to meet at the same time it would not be proper for the same gentlemen to be on both committees.

MR. BURRELL (Idaho): I would ask by what authority Mr. McCutcheon was placed on the committee on resolutions.

CHAIRMAN DERN: By authority of the convention, the president informs me.

MR. BURRELL: By authority of the convention?

CHAIRMAN DERN: Of the convention, sir.

MR. BURRELL: The Idaho delegation to this convention has selected another representative on this committee, Mr. Chairman.

CHAIRMAN DERN: I would state that if the delegation has taken that up among themselves, and that is most satisfactory to the delegation,

the wish of the delegation certainly should be considered, and these names can be substituted, as requested by the gentleman in behalf of the delegation. Will the gentleman please announce the name of the party who has been selected by the delegation from Idaho to act on the committee on resolutions?

MR. BURRELL: Senator George A. Day. I will state that the Idaho delegation has selected the name of James W. Webster as representative on the Committee on Permanent Organization—the Executive Committee.

CHAIRMAN DERN: We have not reached that yet.

I will now announce the Committee on Resolutions: E. C. Chilcott, Washington, D. C.; H. T. Davidson, Wyoming; John T. Burns, Colorado; William Morfitt, Oregon; R. E. Twitchell, New Mexico; Douglas White, California; Gordon H. True, Nevada; Dr. E. R. Nichols, Kansas; D. Clem Deaver, Nebraska; Samuel H. Lea, South Dakota, Alfred Atkinson, Montana; O. W. Roberts, North Dakota; John Field, Oklahoma; E. E. Elliott, Washington; Rev. G. H. Adams, Arizona; Sen. Geo. A. Day, Idaho; Dr. John A. Widtsoe, Utah.

This committee is requested to meet at the room to the left of the stand. This constitutes the two committees which were to be appointed by the chairman. Will the Committee on Credentials meet with the president in the registration office at once?

I presume that any resolutions to be offered by members will be referred to the Committee on Resolutions, for their action, unless you have some resolutions prepared on which it is necessary to act at once. Otherwise I do not see why they should be acted on now, except for the purpose of organization, and it might be well, for the purpose of organization, for the committee to meet at once.

MR. BURNS (Colorado): I should like to place a resolution before this committee, and will preface the resolution by requesting that the suspension of the rules be authorized by this Convention in order that we may have immediate action on this and other resolutions pertaining to the same subject to be presented now.

Resolved, That Article Four of the Constitution of the Trans-Missouri Dry Farming Congress be hereby amended to read as follows: "The length of each session shall be determined by the Executive Committee and the selection of officers and committees as provided in section 3 shall take place during the first session of the second day of the Congress."

I would add that under the present provision of the Constitution the Executive Committee is to be elected at the close of the Congress.

MR. HERRINGTON (Utah): I second that motion, Mr. Chairman.

CHAIRMAN DERN: It has been moved by Mr. Burns of Colorado and seconded by Mr. Herrington, of Utah, that the rules be suspended and the resolution just offered by the gentleman be acted on by the Convention as a whole immediately. Are you ready for the question?

(Question called for.)

CHAIRMAN DERN: All of you who favor the motion that this resolution be acted on immediately will signify by saying "aye"; contrary

minded "no." The motion prevails. Will the secretary please read the resolution.

MR. MOORE (Colorado): I beg to present the following resolution—

CHAIRMAN DERN: I understand that we have only voted on the suspension of the rules, this being irregular, bringing this up before the convention as a whole. The vote on the resolution has not been taken as yet. My purpose is, so that everyone may understand it, to have the resolution read and then a motion for its adoption will be in order, and its adoption can be voted on. The Secretary will please read the resolution.

SECRETARY ROOT: The resolution as offered reads: "Resolved, That Article Four of the Constitution of the Trans-Missouri Dry Farming Congress be hereby amended to read as follows: 'The length of each session shall be determined by the Executive Committee and the selection of officers and committees, as provided in Section 3, shall take place during the first session of the second day of the Congress.'"

MR. EVANS (Utah): I desire, if you have it at hand, that the article proposed to be amended be read, if it is not too long, so that we may know what the difference will be.

SECRETARY ROOT: The material difference is this: The length of the session and the selection of officers and committees as provided in Article 3 shall take place at 3 o'clock p. m. of the last day of each session. It merely changes the day.

MR. BURNS (Colorado): Mr. Chairman, in moving the passage of that resolution I wish to merely repeat, perhaps, a statement made by me from the platform this morning. This resolution is the result of the failure of this Congress to show active life during the past year, and I believe that the only reason for that was that the Executive Committee and the officers of this Congress were selected at the close of the last Congress, and that they never had any heart interest in the movement because they never held a meeting. Now, if we proceed to elect our officers and Executive Committee early in this session we will have their heart interest in this movement, and they will become a working part of this organization immediately and will start the work which they propose to carry on without any delay. Therefore I ask the passage of the resolution.

MR. BUFFUM (Wyoming): I second that motion.

The motion was thereupon put to a vote by the Chairman and declared carried.

MR. MOORE (Colorado): Mr. Chairman, am I now in order?

CHAIRMAN DERN: You are.

MR. MOORE: Then I offer the following resolution:

"Resolved, That Article 1 of the Constitution of the Trans-Missouri Dry Farming Congress be hereby amended to read as follows: 'This Congress shall be known as The Trans-Missouri Dry Farming Congress and shall hold annual sessions at such time and place as shall be recommended by the Executive Committee, subject to the approval of the Congress then in session. The selection of place for future meeting shall be made a special

order during the closing session of the Congress. A majority vote of the Congress shall be necessary to approve the action of the Executive Committee.'"

CHAIRMAN DERN: If there is no objection this resolution will be referred to the committee on resolutions. I hear none, and it is so ordered. What is your further pleasure, gentlemen?

A DELEGATE: I move you, Mr. Chairman, that we proceed with the regular order.

CHAIRMAN DERN: It is not necessary.

MR. V. T. COOKE (Wyoming): I want to take this opportunity to say, Be it Further Resolved, That the Officers and Executive Committee of the Trans-Missouri Dry Farming Congress should be elected during an early session of each meeting of the Congress, in order that matters pertaining to the policy and work of the Congress may come before each Executive Committee during the sessions of the Congress then being held.

Resolved Further, That the election of officers and Executive Committee be made a special order for Thursday at 11 a. m.

CHAIRMAN DERN: Do you offer that as a resolution?

MR. COOKE: I do.

MR. BURNS (Colorado): I second the motion.

CHAIRMAN DERN: I believe it ought to take the regular course. I believe all of these resolutions ought to go to the Committee on Resolutions. It will be referred to the Committee on Resolutions.

MR. BURNS (Colorado): Before the Chair acts, I wish to say that it seems to me if the election of officers is to take place to-morrow morning under this resolution, provided it is adopted, it would be well for this Congress to have a vote on this, so that they can proceed under it early to-morrow morning to select their committees.

MR. BUFFUM (Wyoming): It seems to me that this Resolution Committee should be appointed this afternoon. They will have time to report back early in the morning on the resolution and the resolution could take the regular course and still be in plenty of time.

CHAIRMAN DERN: I believe these are matters of great importance, and the Committee on Resolutions being so large, and being representative of each state, I believe the best way is to refer this resolution and others to the Committee on Resolutions, and I so order. We will now proceed with the regular program.

MR. CHILCOTT (Washington, D. C.): I would suggest that the Committee on Resolutions meet at once in order that they may organize and take up the consideration of the resolutions already offered. The names of the Committeemen might be read so that we may know who they are, and they could meet at once if that is the wish of the Convention.

CHAIRMAN DERN: As suggested at the time of announcing the committee, I believe it would be well for them to meet now, and I will read the names again for the information of those who may not have been in the room at the time the committee was announced: E. C. Chilcott, Washington, D. C.; H. T. Davidson, Wyoming; John T. Burns, Colorado;

William Morfitt, Oregon; R. E. Twitchell, New Mexico; Douglas White, California; Gordon H. True, Nevada; Dr. E. R. Nichols, Kansas; D. Clem Deaver, Nebraska; Samuel H. Lea, South Dakota; Alfred Atkinson, Montana; O. W. Roberts, North Dakota; John Field, Oklahoma; E. E. Elliott, Washington; Rev. G. H. Adams, Arizona; Sen. Geo. A. Day, Idaho; Dr. John A. Widsote, Utah.

The regular order of business for this afternoon is the report of members of the executive committee on the progress of dry farming development during 1907 in the following states and territories: Arizona is the first on the list. Is there any report from Arizona?

(No response.)

CHAIRMAN DERN: There seems to be none. I will call the next. California. Is there a member from California who has a report to make. (No response.) Colorado? (No response.) Idaho? (No response.)

I don't believe you did very much farming last year, from the way you are responding. (Laughter.) Kansas? (No response.) Montana?

MR. F. B. LINFIELD (Montana): I am not a member of the Executive Committee. The member of the Executive Committee from Montana is not here. As a delegate from that state I thought it might not be out of place to say something about what we are doing in dry farming in that state.

CHAIRMAN DERN: I think you are perfectly right, and I would ask the gentleman to come on the platform so that all can hear him better than we could from the audience. (Applause.)

MR. LINFIELD: It would look like the state were going by default, and while it was not suggested that I should say anything at this meeting until after I came to this hall this afternoon, I thought I would tell you a little about what we are trying to do in that state.

I felt somewhat at home (pardon me for digressing) to begin with, in coming to Salt Lake City. I lived for nine years in Utah. I was connected with the experiment station at Logan. I know something of what you are doing; of what you have been doing down in this part of the country in regard to the matter of dry farming. I remember, after taking a trip around through the state in the year 1896, traveling over a considerable of the area of Utah, going down through the Grass Valley and down to Panguitch and so on, down to Kanab, and around through Arizona and coming back by way of St. George, Cedar City, Beaver City, etc., and in traveling over a good deal of the dry country, I remember in some places of seeing large numbers of sun flowers growing nearly as high as a man on a country that looked dry and barren, a country that never had been cultivated. And I said, if that land is properly taken care of, if it is cultivated and attempts are made to conserve the moisture, if it will grow sunflowers standing thick for four or five feet high, it will grow wheat as high as that. And after coming back—I remember well of the Legislature being in session—I stated to Governor Wells the possibility of doing something to encourage such an experiment as would help to show how some of the drier portions of the state might be made profitable for agricultural purposes. I had faith in

the idea. Going from here to Montana, and as I had the opportunity and responsibility of traveling over nearly all of that great state, it occurred to me, I remember very well, during that winter, traveling from where the college is located at Bozeman, from Helena to Great Falls, on up to the Milk River Valley, where I could see great plains of prairie country extending for miles, grass and sod that was apparently yielding abundant crops of pasture all through the year, and as I traveled from the Utah country to one very much more sparsely covered with grass, yielding crops of grain, that the opportunities for the Montana farmer were none the less, perhaps in some respects greater, from a dry farming standpoint than those of his neighbor in Utah. And so, since that time, as the opportunity has offered, as the occasion has arisen, I have urged, in season, and perhaps some people who are interested more particularly in using the country as a grazing country might say, out of season, the importance of taking up and studying this question of dry farming. Already a good deal has been done in that regard in Montana. In the Gallatin Valley, in which valley, by the way, the people will swear by the irrigated crops that they grow, a great deal has been done by dry farming. Probably 1000 acres of that country, in the foothills of the mountains, above the irrigation ditches is farmed, and the yield they get is very good indeed, although the months of moisture consumption are not what we would in anywise call ideal. So in regard to other parts of the state. There were a few places up around the Great Falls, up in the foothills of the Highwood Mountains, in the mountains surrounded by the little flats they are beginning to understand quite rapidly the probabilities of dry land farming.

Another thought that has impressed itself upon my mind, urging the necessity of study along this line, has been that we have a large number of settlers coming into Montana within the past two or three years who are taking up this dry land; not, perhaps, on account of the investigation and advertising we have done, but rather because of the general influence, or general advertising that has been going on all over the country. The people are coming. It has impressed itself upon my mind that if we are going to help these people to make the best for themselves and make a success out of that dry farming work, they are going to need a lot of help. They should be able to get the information that is going to tell them what kind of crop to grow, how to cultivate their soil, how to seed their crops, how to sow and till their land so as to get the maximum crop and take it out of the element of chance as far as possible, and place their probabilities upon science, which makes it more probable, the larger probabilities that they are going to get a successful return from their endeavors on that dry land. We have, during the past few years, taken up this study of dry land cropping in something like six or seven parts of the state. We are trying to find out two or three things, namely: In the first place the months of cultivation which are going to give the maximum crop, or, in other words, store the largest amount of water in the soil for the crop. We talk about dry land cropping, and yet we know that we cannot grow crops without water; and so we must know how we are going to save all of the water

that falls on the ground for use of the crops. The science of dry-land farming is the science of saving the moisture that falls upon the ground for the crop that is to grow, and we have found, as my colleague may refer to later, that we can actually, by our methods of cultivation, and have during the past year, stored the equivalent of eight inches of rainfall in our soil during this past year. You know if we can save all that for the crop next year we have stored enough moisture—supposing there is no more fall—we have stored enough moisture to grow for us ten to fifteen bushels of wheat to the acre.

Another point we have been working out in connection with our work is to find out what crops are going to succeed. We find that those crops that are rapid growers are the ones we want.

Those that grow and mature best are those that come quickly in the spring. Those that grow in June do well, for the rain is plentiful, and we get a larger crop. We must learn to improve on our methods. So a crop that ripens early in the season is desirable. We are working along these lines.

Another line we have been working on which we find has been a great advantage is the amount of seed that can be sown per acre. We have shown in our results that a small amount of seed gives the larger returns per acre than the large amount of seed. The farmer that knows that is one of the fundamental rules is a long way ahead in regard to returns he is going to get from his land; he has started on the basis of success in his work.

We found also by our methods that ground does best that is not cropped every year. Some of our farmers are cropping their land every year, year after year, and the result is they are drying up their soil, and if their soil is dried up there are none of those processes going on in the soil which tend to fertilize the soil enough, and it does not produce the crop they otherwise would get. We have to figure out the question whether to crop every year, every second year or two years in three. We have established things of that kind that are of help to the farmers of our country. These are a few of the things we are doing.

In connection with this I want to say that the state is helping us, giving something like four thousand dollars a year last year as an appropriation for this work. Also by the co-operation of the Northern Pacific Railway and the Great Northern Railway we got about five thousand dollars a year to carry out this work, so that with the two together we have a very nice sum of money to carry on this dry farm work over the state. And they promise to continue on that same basis for next year.

In regard to the area we have suitable for that kind of farming in Montana, that is one thing we haven't made very careful estimates of as yet, but it is in all probability not less than twenty million acres, and it may reach as high as thirty million acres in the state suitable for this class of farming. A great deal of this area is considerably lower than your elevation here. A great deal of it is as low as from 1,800 to 2,500 feet above sea level. A great deal of the state is below 4000 feet in elevation, so that while we are north of you you see the climatic conditions are not as ex-

treme as some people might suppose they would be. I remember very well, when I think of that matter, that while I lived in Utah, in Cache valley, I traveled about three or four hundred miles south, into San Pete county, and found we had the same kind of climate in Cache County as they had in San Pete County, and yet they were three or four hundred miles south. I figure on this basis, in reference to climatic conditions, that when a person travels a thousand feet in the air he is doing about the same thing as traveling from three to five hundred miles north. So that you can see that is one reason why, even though we are up north, we can grow crops.

There is another thing about that. Right across the line between the United States and Canada, I find, right along the line, just above the Montana line, there are a great number of farmers in Canada that are making a success out of farming. I have not been able to understand yet why it is that an imaginary line, just above that line there are hundreds and thousands of people that are farming successfully, while so many people on this side of the line it seems can't make a success of farming at all. I ran across the same thing in North Dakota on the Great Northern. The same thing seems to be true of the imaginary line between North and South Dakota. Out in Williams County, North Dakota, there has been several thousand of people come in there and settled up that whole country—all farming successfully, but right over the line in Montana it was too dry and too cold—they could not farm. It is higher over there. I have not been able to figure out why it is an imaginary line of that kind makes such a difference in climatic conditions. One of the things we are trying to do is to convince people that it does not make any difference; that the ground is just as rich, the amount of moisture the same, and if they will follow the same plans they will get just as good crops; and, more than that, we are going to do the very best we can to show them how to get those results. (Applause.)

CHAIRMAN DERN: The secretary informs me that the member of the Executive Committee from Colorado has prepared a paper and is not present to read it, and has sent it to him. He will now present it.

SECRETARY ROOT: This paper is from Prof. W. H. Olin, of Colorado. It is on the subject of

### DRY FARMING IN EASTERN COLORADO IN 1907.

Many new settlers unfamiliar with soil or crop conditions in eastern Colorado arrived late in the season, and the dry year discouraged some and sent them back to "their wife's people," caused many of them to have crop failures in some one line, but the experience of older settlers, who understood the local conditions, enabled them to get some feed crops to help them tide through.

While some farmers have suffered losses from hail, drought, and other causes of crop failure, yet no crop has suffered a total loss in this, the closest year eastern Colorado has known for some time.



This past season has taught the importance of thoroughly understanding the principles of dry farming, the necessity of using drought resistant crops and the great advantage of marketing the bulk of the crop through some profitable form of live stock fed on the farm.

It also shows the wisdom of holding over feed and seed from one year until the following year's crop is assured.

The man with small capital must begin in a small way. Experience teaches that here, as elsewhere, it is advisable to start with something, to plan to have capital enough to tide over a period of at least eighteen months, better, still, twenty-four months. In the meantime the new settlers should get the hog, hen and dairy cow busy buying groceries and laying by for a "dryer" day, as soon as possible. This year has brought out the individuality of the farmer. Back of all systems and theories must be the resourceful, purposeful farmer, who "mixes brains with his soil." Such a man wins success wherever success be possible.

While the writer continues to urge conservative action, he feels the time has passed for all doubtings of the sanity of the farmer who settles in eastern Colorado. The lessons of the past year were needed by the real estate man, the settler and the pessimist.

The former will find henceforth that truth is stronger than fiction, the second helpful suggestions in the lessons of the year, and the third has absolutely lost his argument, his case is gone. The pessimist on this subject is no longer needed nor desired, for his work is done. Having past his most crucial year, with credit to himself, let us give our eastern Colorado brother the glad hand of congratulation and bid him God speed in his earnest work of building up that section of our young but virile state. He is entitled to his full meed of praise, for he has problems which our brother, on his irrigated farm, knows not of, and cannot therefore appreciate.

W. H. OLIN,

Colorado Member Executive Committee.

Gentlemen, Mr. J. W. Paxman, of Utah.

## A REPORT OF THE PROGRESS OF DRY FARMING DEVELOPMENT IN UTAH DURING THE YEAR 1907.

(By J. W. Paxman, Nephi, Utah.)

Mr. Chairman, Ladies and Gentlemen:—

I have been asked to make a brief report on the progress of Dry Farming development in Utah during the year 1907. In reviewing the efforts that have been put forth in this state since the first session of this Congress a year ago, I find that much has been accomplished, both in the added acreage that has been subjected to methods of Arid Farming and in arousing the public sentiment to a favorable consideration of the possibilities of redeeming our vast areas of hitherto dormant deserts and sage-brush lands.

Stimulated by the recurring success of their neighbors, many new disciples of this new industry have put forth their hands to wrest from the

parched deserts the reward that Nature had so copiously bestowed upon the former disciples, and as a consequence much new territory hitherto barren and waste has felt the earnest touch of the husbandman, and will in time respond with vigorous crops of grain to the delight of the skilful tiller of the soil. We need only to take a glimpse into the immediate past to find that there were doubting Thomases, not a few, in every community, regarding the producing of crops without irrigation, and some there were who even looked upon the efforts of the arid farmer in derision and prophesied his failure. It is now a noticeable fact that such men have become poorer and poorer in clinging to the old methods of raising grain upon their small irrigated farms, while the men of whom they predicted failures have given every sign of prosperity by building fine, modern homes, placing improvements upon the farms, investing in modern machinery, and otherwise becoming independent, public-spirited and progressive men.

Arid farming in Utah is no longer an unsolved problem. It is a repeatedly demonstrated success and the year 1907 happily sees every progressive farmer converted to the great possibilities that will grow out of this new but all important movement. This sentiment is not confined to the farming class; the merchants, too, see that prosperity comes to the man who, with proper skill, goes to grapple with the dry lands, with the determination of applying science with his efforts. The banker also is beginning to recognize that there is value to the dry lands and that the "dry" farmer is as reliable financially and fully as able to meet his obligations, as the man who has much water on his small farm. As a rule the arid farmer in Utah is more prosperous, more contented, and has much less to annoy him than the irrigator. It is a notable fact that less failures exist among the arid farmers than among any other class of those who follow agriculture as a profession. It cannot be said, however, that there are no failures among them, for there are those who operate carelessly and without regard to scientific methods, that are apt to make failures, and this is the great danger that confronts this new industry. It may be regarded that this State need not fear an application on the part of its citizens in the attempt to reclaim the thousands of acres yet to be subjugated; but it may well fear a reckless ambition on the part of the uninformed to get quick returns without a thought of the scientific principles that underlie every successful operation. Thanks to a wise legislation, our state has done much (probably more than any other state in the Union) towards giving intelligent and practical demonstrations of what can be done to obtain profitable crops, by establishing at least six experiment stations throughout the state, solely to demonstrate the methods of success and failure in what is commonly known as "dry" farming. These farms, being veritable object lessons to the people, have been and are perhaps the most potent agencies in stimulating the movement in our state and in carrying the practical lessons to the very doors of the farmers. The State would do well to continue and even enlarge upon these very valuable schools, as a means of education to the prospective disciple of arid farming and thus

avert much danger that otherwise would imperil this wonderfully productive industry.

I cannot pass here without giving a meed of praise to the man who has fathered this movement and given us the scientific methods that have always proven successful when rightly applied. Simultaneous with the State proffering its aid that great scientist and apostle of the doctrine of scientific soil culture for the production of profitable crops without artificial irrigation, Dr. John A. Widtsoe (applause) stepped to the public rostrum and proclaimed the gospel of reclaiming our arid regions by means of scientific soil culture, and the great first impetus given to this movement west of the Rocky Mountains is due to this good man's enthusiasm and sound doctrine and the wise leadership he has ever given his disciples. May he live to see the realization of what his prophetic eye has seen in vision—the reclamation of the western region by means of scientific soil culture, and see the happy homes and golden harvests that shall be the heritage of a contented and intelligent people. Arid farmers of Utah will always recognize him as the father of their profession.

But to return to the subject of the progress made during 1907, it reflects credit on the movement to report that no less than 50,000 additional acres have been brought under cultivation; fourteen steam and one gasoline plowing outfits have been put to work and farming on a much larger scale has been the result. The one obstacle that confronted the man operating the brush lands (and most of our arid lands are covered with sage brush) was to obtain an implement that he could hitch behind his engine and successfully grub the brush. A number of experiments were made along this line at considerable sacrifice of time and money, with no satisfactory implement resulting. Some grubbers that have been produced have done reasonably good work in some sections, but some machine or tool that will successfully obliterate the brush from our native lands, preparatory to plowing, is now the crying need to more economically subdue the deserts. Will not someone with inventive genius produce us this implement so essential to the future development of our brush lands? Notwithstanding this obstacle the operator has not lacked the nerve to proceed with crude and imperfect implements, and under many difficulties he has done well with his work, and large tracts of brush have disappeared and fields of grain will appear in their stead. Hundreds of thousands of acres have been added to individual holdings; many new harvesting machines have been installed upon the farms, including the only combination harvester and thresher in the inter-mountain region, and several new large threshing outfits bought expressly for the threshing of dry grain were kept busy during the fall months. The precipitation has been above the average and the yields (except in a few instances where the June frosts did some damage) have been satisfactory and highly remunerative. The markets have been excellent and high prices have prevailed, which with the increased yields because of better methods, have made the arid farmer a very happy man at the close of 1907.

Something near 200,000 acres have grown dry wheat, yielding about 3,500,000 bushels; besides thousands of bushels of oats, barley, rye, corn, potatoes, and thousands of dollars in hay and alfalfa seed. The arid crops of 1907 are estimated to aggregate \$3,000,000 in value—forming a very handsome portion of the resources of the State. It has been demonstrated that potatoes can be grown successfully. Sumptuous fruits are also a product of the arid farms. Who can tell what we may not grow, with new light constantly coming to us? And who shall say that the prophets did not have their eyes upon this very movement when they sung with ecstasy regarding the parched grounds and the desert wastes being made to blossom as the rose and showing forth glory to God by yielding their substance for the profit and happiness of mankind? (Applause.)

CHAIRMAN DERN: Is there anyone present from Washington who wishes to present anything to the convention? (No response.) From Wyoming?

MR. J. T. TOWER (Wyoming): In compliance with the request for a report sent to the director of the Experiment Station, we have with us here our irrigation engineer, who will respond to this request for Wyoming—Mr. H. T. Nowell, Irrigation Engineer of Wyoming. (Applause.)

MR. NOWELL: Mr. Chairman, Ladies and Gentlemen: I was introduced as an irrigation engineer. I want to say that I believe in dry farming. I believe that dry farming is the greatest discovery in agriculture. I won't say discovery, but the greatest application in agriculture to our country since irrigation was first instituted. I have prepared a little paper on "Some Aspects of the Dry Farming Situation in Wyoming," and with your indulgence I will read it.

### SOME ASPECTS OF THE DRY FARMING SITUATION IN WYOMING.

(By H. T. Nowell.)

During the past year dry farming has grown to be an important branch of agriculture in certain localities in Wyoming. Cheyenne may be considered as a nucleus of one dry farming community and Newcastle of another; Evanston of a third. There is such an influx of new settlers on the open prairie lands near these places that the public land office shows a considerable increase of business, especially in homestead entries.

The office of Experiment Stations of the United States Department of Agriculture has broadened the scope of the work on the government farm at Cheyenne, both in dry farming experiments and in investigation of the possibilities of small quantities of irrigation water as a means of extending dry farming to fresh areas, and making it more attractive to the settler. A government farm has been started at Newcastle for the investigation of the same problem. Dr. Cooke will tell you of the results of State aid to dry farming.

The University of Wyoming Experiment Station has been for two years co-operating with the government in these investigations, both by

financial aid and advice and by a series of soil moisture investigations. The soil moisture work is intended to determine, if possible, the fundamental principles of soil culture under dry farming conditions. Many of you perhaps appreciate that in this great dry farming Conference there are many differences of opinion expressed by practical farmers and experts. "Dry Farming," in the first place, is a very unfortunate term for so great an industry as this promises to be. Everyone with any practical experience knows that crops cannot be made to grow without a supply of water. The name "dry farming" has given rise in some localities in the East to the erroneous opinion that some new system of farming has been discovered which enables plants to grow without water. Should any person settle on the dry farming areas of the arid West with this notion they are doomed to disappointment. It is true that certain crops have been educated through many generations, by being exposed to drought, to become drought resistant, or have been so adapted as to do with less water than crops of the same varieties or other close relations grown under conditions of plentiful moisture. The name "dry farming," however, appears to have come to stay, and it becomes the duty of everyone who has the best interest of the science at heart to try to discover the real principles on which this small rainfall farming is based and spread reliable information among those who are interested in the subject, but have not thoroughly understood the conditions.

From the standpoint of an irrigation engineer, dry farming did not at first appeal very strongly to me. Many irrigation men felt at first, and some still feel, that the great areas of the arid West subject to irrigation should first be settled and brought into a state of intensive cultivation before a system of agriculture, new as far as the Rocky Mountain States are concerned, should be initiated and experimented with. There was also a memory of the great farming boom in western Nebraska and Kansas which ended in disaster in many localities in the early eighties. With a need of thousands of settlers to take advantage of the areas reclaimed by irrigation under private enterprise, the Carey Land Law and the Reclamation Act, the irrigationists felt an injustice was being done to farmers induced to settle the open range with no other resources than those they could find in the comparatively dry soil.

But dry farming is becoming more of a science, a less hazardous occupation than it was in the early eighties. It has been found by such pioneers in this line as Doctor Cooke of Cheyenne and Mr. Campbell of Lincoln, Dr. Widtsoe of Utah, and many others here to-day, that there is a sound basis for dry farming—in conserving practically all of the moisture that does fall from the sky and turning it to a useful purpose in growing crops, instead of allowing it to evaporate from the soil into the air or seep far below the roots of the crops, thus being wasted so far as agriculture is concerned.<sup>6</sup> Sometimes this moisture, especially from a light rainfall, and I might say a very light irrigation, was worse than wasted, for it did a positive injury to the soil and hence to the plants on the soil. A light rainfall on a fine mulch on the soil has a tendency to form a crust

full of tiny pores that draw up the water from below by capillarity, until much more water is lost through evaporation from the soil than was gained by the light rainfall—unless a harrow is put on and the crust broken into a mulch again.

Irrigation men who have kept in touch with the progress of dry farming are realizing its great possibilities. We see that our water supply unless used over and over again, is only sufficient to reclaim by irrigation perhaps an extreme maximum of ten per cent. of the arid country. This leaves a tremendous area that must always be devoted principally to the livelihood of the steer and the sheep, many acres being required for the support of one animal, unless there is a wide ultimate success for dry farming.

In Wyoming alone there are more than sixty-two million acres, of which it is estimated that there are now irrigated, or under irrigation projects now in construction, 1,500,000 acres, and that the extreme possibilities of irrigation in the state will mean an ultimate reclamation of 10,000,000 acres. There are some 10,000,000 acres covered with timber, and there are mountains that perhaps would prevent agriculture of any kind over an area of 12,000,000 acres more. This leaves an area of over 30,000,000 acres within the state of Wyoming that will in all probability never be used for agriculture, unless the science of dry farming is so developed, as the years go by, and methods are so improved, that the farmer will take up the public lands of Wyoming, which are now some 48,000,000 acres in area, subject to entry under the land laws of the United States. Will this area, or any large part of it, be reclaimed by dry farming methods? We hope so. We have seen crops grown under dry farming conditions where the rainfall during the year averages less than ten inches. At Laramie, where the average rainfall is about nine and one-half inches, crops were raised with no irrigation, in fact, with very little cultivation, that took the second prize for dry farm products at the State Fair at Douglas. If this can be done without great stress laid on the special methods best for dry farming, what can be done by scientific farming, of which we hear so many advocates at this meeting?

Perhaps you will be interested in hearing of the methods we are using at Cheyenne, Newcastle, and Laramie to find out the principles underlying the conservation of soil moisture, that great principle on which dry farming is founded. Two years ago we began taking samples from different plots at the government farm at Cheyenne. These samples were taken at the average depth of one, two and three feet, and the moisture percentage was determined in the chemical laboratory of the University of Wyoming. In connection with the crop, the amount of seed used, the width between rows, the cultivation given the land, the quality of the soil, and the yield, these soil moisture determinations gave us some valuable data. The past season, for twenty-seven weeks, samples were taken on the plots at the government farm at Cheyenne. Samples were also taken weekly from the government farm at Newcastle and the Experiment Station farm at Lara-

mie. Some of the indications shown by the experiments the first year may be interesting to you.

#### Indications Given by Soil Moisture Tests.

Comparison of Crops.—One of the most important things for success in arid land farming is growing drouth-resistant plants. The evidences of drouth resistance shown by the moisture experiments are the power of the plant to live and grow while the amount of moisture in the soil is at the minimum, and also the use or evaporation of the least amount of moisture in the growth of the plants to maturity. Taking the former as a criterion, it was found that, in general, the alfalfa and oats subsisted with the least amount of moisture in the soil of any of the crops grown at the Experiment Farm. Next, in order of the minimum amount of moisture found during the season in the several plats of each crop, came fall rye, field peas, spring rye, and Defiance wheat. It would not be fair to say, however, that the crop of oats, with a small amount of alfalfa mixed with it, was the most drouth-resistant of these crops. The charts show that they had more drouth to stand and stood it fairly well, while the others perhaps were not tested by the dryness to the limit of their resistance. Taking the second criterion, that of the crops which used least moisture during their growth, we find the order almost reversed—the potatoes, which were planted very wide apart in the rows, standing at the head of the list, and the field peas standing at the foot, using the most moisture during the time in which the observations were taken. Between these two extremes came the other crops in the following order: Defiance wheat used perhaps the least moisture after potatoes, then alfalfa and oats, spring rye, and fall rye, which used most moisture, excepting the field peas.

Comparisons of Soil Culture.—According to the original plan of the cultivation of the plats, different methods of soil culture were to be thoroughly tested in the depth of plowing, sub-soiling, harrowing with various makes of harrows, and cultivation by inter-tillage in wide rows after the grain reached some height. The experiments of this year seem to show that the deep plowing was beneficial, but the sub-soiling did not have any apparent effect, and that the shallow cultivation produced better results in retaining the moisture than did the deep cultivation. The more thinly planted crops naturally retained more moisture throughout the season than those more thickly planted, and on the plats where the same amount of grain per acre was planted in eight-inch and sixteen-inch rows, the plats planted in eight-inch rows retained more moisture than those in sixteen-inch rows, possibly because the grain was much thicker in the sixteen-inch rows than in the others. Much of the cultivation was not carried out as thoroughly as was planned in the beginning, probably because of the large number of plats and the lack of time and men. These deductions, as indicated in the sub-head, are only preliminary, and before they are taken as authoritative they should be corroborated or disproved by subsequent tests.

There is one feature of much dry farming that does not appeal to us, and that is the absence on the farm of domestic water supply and water

supply for such shade trees, windbreak and certain shrubs, vines and garden vegetables as are not drouth resistant and are not adapted to dry farming. This is an important thing in the settlement of our arid lands, for on it depends the attractiveness of the home and the contentment with existing conditions that should be one of the attributes of the farmer who is to help build up his community. For those conditions where it is possible to secure a small supply of water, either by storing in a small reservoir the flood waters of some stream or torrent that comes with the melting of the snows, or by pumping from a sub-surface water supply, supplemental irrigation supplies the needed solution of this problem.

Even though it may provoke some dissension, it seems to me only just to say that dry farming without a domestic water supply at least on the land, or where water has to be hauled some distance, even for drinking and live stock supply purposes, life on a dry farm is not attractive. If these points are brought out fully to new settlers there will be less possibility of disappointment and failure. Now it is surprising over what a great area of the western country there is some form of sub-surface water supply. In many valleys and even on the plains distant from mountains, there are to be found artesian water supplies which will give a flowing well simply for the pains of boring it. At other places, while a flowing well is not to be found, sufficiently deep boring will often tap some supply that will rise within a short distance of the surface, and may thence be pumped to the surface and even to a tank that will supply the house with running water and be a great advantage in case of fire. In closing I wish to say that the irrigation man sympathizes most heartily with the legitimate dry farming movement, especially that which is based on the most scientific methods yet discovered, but thinks it for the best interest of the dry farm propaganda itself, as well as of the settler, that the most exact information be supplied settlers as to what they may expect, and that enthusiasm should not be allowed to run away with sound common sense in pushing this great industry.

MR. CHILCOTT (Washington, D. C.): Mr. Chairman, your Committee on Resolutions would like to report.

CHAIRMAN DERN: We will hear your report.

MR. CHILCOTT: Your Committee on Resolutions hereby recommends the adoption of the following resolution: "Resolved, That the election of officers and Executive Committee be made a special order for Thursday, January 23rd, at 11 a. m."

MR. BUFFUM (Wyoming): I move the adoption of the resolution, Mr. Chairman.

The motion put to a vote and declared carried.

MR. CHILCOTT: Further, your committee recommends the adoption of the following resolution:

"Resolved, That Article One of the Constitution of the Trans-Missouri Dry Farming Congress be hereby amended to read as follows: 'This Congress shall be known as The Trans-Missouri Dry Farming Congress and shall hold annual sessions at such time and place as shall be recommended



by the Executive Committee, subject to the approval of the Congress then in session. The selection of place of future meeting shall be made a special order during the closing session of the Congress. A majority vote of the Congress shall be necessary to approve the action of the Executive Committee.'"

MR. BUFFUM: I move the adoption of the resolution.

The motion was duly seconded, put to a vote and declared carried.

CHAIRMAN DERN: I am informed that His Excellency, the Governor of Kansas, has addressed a letter to this Congress, and I will ask Mr. A. T. Evans to now read this letter to the Convention. Gentlemen, Mr. Evans, of Utah. (Applause.)

MR. A. J. EVANS (Utah): Mr. Chairman, Ladies and Gentlemen:—I can only conceive of one reason why I should have been selected to read the letter from His Excellency the Governor of Kansas. It must have been that he has become acquainted with my political aspirations, and thinking that perhaps I would never realize their fulfillment he would give me the opportunity of reading a letter written by a governor. (Applause.)

Mr. Fisher Harris, President, Trans-Missouri Dry Farming Congress, Salt Lake City.

Topeka, Kansas, Jan. 9, 1908.

My Dear Sir:—I have convened the Kansas Legislature in extraordinary session and will be overwhelmed with official matters in this connection when your great Congress assembles on the 22nd of this month. It will be impossible therefore for me to attend, as I must deny myself this great privilege and pleasure for the reasons stated. But I beg to express to you and through you to the great body over which you will preside my profound interest in the great work the Congress will meet to consider and foster.

A line drawn north and south across a map of the United States through St. Louis, for instance, will reveal the fact that about one-third of the territory of this country lies east of that line, while an investigation will also reveal the fact that two-thirds of the present population of this country is east of that line. That is to say that two-thirds of the territory but only one-third of the population of this country lies west of a line drawn north and south through the city of St. Louis. It is conservatively estimated that the population of this country in forty years from now will be two hundred million, and that in less than 100 years it will be five hundred million. This additional population must largely find homes west of the line described. Finding homes they must find subsistence. Scientific farming must largely solve this problem for all the arid and semi-arid territory in this country is west of the line described. These simple facts should suggest the great field of operation with which your Congress will have to do and suggest the great problem which it will be its business to help solve. Surely such an undertaking is worthy of the best thought

and best effort of the intelligent, thoughtful and determined men who will constitute the second session of the Trans-Missouri Dry Farming Congress this month.

I send you greeting. The western fourth of my own State is vitally interested in this great project. The Almighty never made a more wonderful land or a richer soil, and I have always contended that He makes no mistakes; that the needed elements would sometime be had to make this part of our State, like similar lands elsewhere, sometime blossom as the rose. Dry farming will help mightily.

Regretting more than I can tell you my inability to attend personally, believe me when I say that my heart will be with you and that I look for large results from the deliberations of the Congress.

(Applause.)

Cordially yours,

E. W. HOCH.

CHAIRMAN DERN: We also have a letter here from Prof. E. A. Burnett, of Lincoln, Nebraska, which will be read by Lieutenant-Governor Burrell, of Idaho. Gentlemen, Lieutenant Burrell, of Idaho. (Applause.)  
Lincoln, Neb., Jan. 11, 1908.

Mr. Fisher Harris, President of the Trans-Missouri Dry Farming Congress, Salt Lake City, Utah.

My Dear Sir:—At the request of Chancellor Andrews I am writing to acknowledge your kind letter of the 7th inst., with suggestion that the Chancellor offer an address at the meeting of the Trans-Missouri Dry Farming Congress to be held in your city on the 22nd to 26th inst.

Dr. Andrews wishes me to express to you his very high appreciation of the work which this Congress can do in helping to develop the great semi-arid areas through the application of scientific methods to the production of the soil. The extent to which production can thus be increased can of course only be determined by careful trials in which the Experiment Stations of the country should take a leading part. If even a small portion of the area which is now used purely for pasture purposes can be brought under the plow and be made to produce forage and other crops so that these regions will support an agricultural population, the work of your association will be most fruitful.

My belief is that this question is of such national importance in connection with the settlement of the great arid West that national aid to investigate these problems should be generously given, and that a period of careful investigation of these regions should precede the period of active settlement. The occupation of hitherto unoccupied lands, the opening up for settlement of great areas of country which have hitherto had small economic value, is as surely a national problem as the question of the forestation of waste areas or the preservation of forest areas which are still a part of the public domain. It seems to me that this question stands out clear and distinct as separate from the general question of the promotion of agriculture in the settled regions of the country, and should be joined with the question of the reclamation of arid lands through irrigation, now receiving the support of the national government.

I very much regret that I shall be unable to be present at your meeting on account of the public meetings to be held at our institution at the same date, a copy of which program I herewith enclose.

I expect the University will be represented at this meeting by Mr. W. P. Snyder, the Superintendent of our Sub-Station farm at North Platte, Nebraska, where we are studying the questions of agriculture under semi-arid conditions in an effort to make more available the areas of pasture land in the western portion of our State which have hitherto been almost undeveloped as a farming region.

I am very truly yours,

E. A. BURNETT,

Director Nebraska Agricultural Experiment Station.

CHAIRMAN DERN: To show you, fellow delegates, that our government at Washington takes a live interest in our deliberations and our work, and the ultimate success of it, the Secretary of Agriculture, the Hon. James Wilson, has addressed a letter to the Congress, which will be read by Mr. Burns of Colorado. (Applause.)

Washington, D. C., January 17, 1908.

Mr. Fisher Harris, President Trans-Missouri Dry Farming Congress, Salt Lake City, Utah.

Dear Sir:—In compliance with your request of January 6th, I send you the following remarks on our investigations in dry-land agriculture.

The investigations in dry-land agriculture in the Great Plains area consist of a thoroughly systematized set of experiments in crop rotations and cultivation methods, carried on at twelve stations in the Great Plains.

Eight of these stations are in co-operation with the experiment stations of the states of Montana, North and South Dakota, Nebraska and Kansas. Four, located at Belle Fourche, South Dakota; Akron, Colorado; Dalhart and Amarillo, Texas, are independent of the state experiment stations.

These experiments are so followed as to thoroughly test the various agricultural practices now in vogue in the area for the conservation of moisture and production of crops under semi-arid conditions, as well as many that have recently been devised or proposed by practical farmers and scientific experts. This is the first attempt to get actual quantitative and comparative results on a comprehensive scale, and it is believed that the work will prove of inestimable value in forwarding the development of agriculture in the semi-arid lands east of the Rocky Mountains.

#### **Dry-Land Agriculture in Texas.**

The investigations in dry-land agriculture at San Antonio, Texas, are very similar in their general nature to those conducted in the Great Plains area, but as San Antonio lies at a much lower altitude as well as at a lower latitude, the character of the crops grown is very different from that of the Great Plains area. At San Antonio cotton is the important crop; in the Great Plains area it is wheat that ranks as the principal crop. No effort has been made, in view of these facts, to bring about a very close co-relation of the work of this station and those in the Great Plains area.

### **Dry-Land Arboriculture.**

The importance of tree growing in connection with dry-land agriculture has not yet been fully realized in the United States. However, the Bureau of Plant Industry has taken up the matter, and drought-resistant trees, valuable for their fruits, timber and as sources of forage in exceptionally dry years, are being studied.

A variety of olive, very rich in oil and grown successfully without irrigation under an average rainfall of 9.3 inches, has been found in southern Tunis; and has been introduced into the United States where it is being tested in the arid region from western Texas to southern California.

Other useful tree crops now under investigation are desert varieties of the peach and plum. These promise to be valuable as stocks on which to graft less hardy varieties and for crossing with the latter.

In the Mediterranean region and in the drier parts of Asia, drought-resistant varieties of most of our principal orchard trees exist and it is believed that these will be found better adapted to the arid and semi-arid parts of the United States than many of the varieties now grown there.

In Australia and in northern Africa certain species of trees that are able to grow with very little water are the dependence of stockmen as a source of forage in years so dry that the range grasses fail. It is believed that the introduction of such trees will greatly benefit portions of the western United States where the live stock industry is paramount. They will be valuable not only as a reserve supply for forage but as windbreaks, shade trees and a source of fuel.

### **Breeding Crop Plants for Drought-Resistance.**

The Bureau of Plant Industry is experimenting with various forage plants with a view to increasing their ability to grow in comparatively dry soils; the method being the selection of the individual plants that show themselves most resistant to drought. Seed from these selected plants is sown the following spring and the most drought-resistant individuals among the progeny are again selected. This is continued year after year until a distinctly drought-resistant variety is obtained.

This work has been in progress for two years in co-operation with the South Dakota Experiment Station, at Highmore, South Dakota, and plans are being made to extend it to other stations in the Great Plains area. The most important crop plants being bred for increase of drought-resistance are alfalfa, sorghum, broom corn millet, fox tail millet, smooth brome grass and some of the native wheat grasses.

### **Value of Native Growths in Classifying Land.**

The problem of the classification of land with respect to its crop producing power is a very important one in the arid and semi-arid parts of the country where vast tracts of public land held for sale by private corporations still remain unbroken. Both buyer and seller desire to know what the land is good for, and how many acres of it will be required to support a

family. In newly settled regions this is largely a matter of guess work, since not enough crops have been grown on the different types of soil to determine what they are best suited for.

Almost everyone who has to form an opinion of the value of a tract of unbroken land is guided more or less by the character of the native vegetation which covers it. The kind of plants present and the luxuriance of the growth they make are often the best possible indicators of the texture, moisture-holding capacity and fertility of the soil beneath. There is great possibility of going astray, however, in classifying land on this basis. Often two species of plants resemble each other so closely that an untrained observer will take them to be the same, while in reality they are entirely different and are indicative of very different soil types.

On the other hand, a certain plant may in one region indicate one type of soil while in another locality where, let us say, the climatic conditions are different, the same species occur abundantly on quite a different soil.

Evidently careful investigation is necessary to work out an accurate method of classifying soils on this basis of the native growth. Work along this line has been started by the Bureau of Plant Industry and the results obtained during the past season indicate that it will be possible to work out a reasonably accurate method which will prove very useful in classifying land.

#### **Dry-Land Alfalfa Experiments.**

As is the case under irrigation, alfalfa is one of the most if not the most important crops for use in dry-land farming. Experiments are being conducted in both the Great Plains and the Inter-mountain areas to determine the proper rate of seeding, the best methods of soil preparation and subsequent cultivation. A number of very drought-resistant strains of alfalfa are already in use. These have been originated chiefly through unconscious selection in the dry farming centers of the Great Plains area and Utah. Especial emphasis is being placed in these investigations on the dry-land production of alfalfa seed. Breeding and selection work is also being carried on in the hope of securing still greater drought resistance.

#### **Dry-Land Grazing.**

Great attention is being given to securing drought-resistant varieties and strains of the important grain crops. This work is being developed along two lines, namely by introduction from the Old World and by selection and breeding. The most important introductions which have been made are the Durum wheats, which grow throughout our dry-land areas. Emmer, an important dry-land grain in Russia, is being carefully studied, as are the numerous varieties of sorghum, many of which are especially drought resistant and yield excellent crops of both grain and fodder.

Very truly yours,

(Signed) JAMES WILSON,

Secretary.

CHAIRMAN DERN: I have another letter here from one I am sure you will like to hear from, which I have been requested to read at this session. You will learn who it is when I have finished reading it and announce the name.

Washington, D. C., Jan. 17, 1908.

Hon. Fisher Harris, President Trans-Missouri Dry Farming Congress,  
Salt Lake City, Utah.

Dear Mr. Harris:—I am in receipt of your letter of January 4, 1908, enclosing the official call for the second session of the Trans-Missouri Dry Farming Congress, to be held in Salt Lake City, Utah, January 23rd to 26th, 1908.

I regret that it will be impossible for me to be present; nothing would give me more pleasure than to attend the Congress and to participate in its deliberations, for I consider the subject of dry farming one of the greatest, if not the greatest, means of advancing America's undeveloped natural resources and for providing homes for millions of her people. Under the improved plan of dry farming the greater part of the arid lands of the West can be reclaimed. The future supply of cereals grown in this country should be on dry farm lands, and I believe that millions of acres of lands in many of the western States, now considered absolutely worthless, will in the near future be in great part the granaries of the United States.

It is fitting indeed that the second session of the Congress should be held in Utah, and through you, its president, I send greetings. As early as 1870 the first systematic dry farming occurred in Cache Valley, near Logan, Utah. The first attempts resulted in failure, but not many years passed until enough had been learned to justify a continuance and an extension of this class of cultivation. The Twelfth Census gives us some idea of the rapid growth of dry farming in Cache county. We find that the total acreage of crops grown in 1899 by irrigation was 58,658 acres, while the total acreage in specified crops for the same year was nearly twice that area; thus for that year the acreage farmed without irrigation nearly equalled the irrigated acreage. I believe that to-day there is more dry farmed land in Cache county than irrigated land. What has been done in this regard in Cache county can be done in nearly every county in Utah, and I might say in nearly every western state.

The fact that the Legislature of Utah has made direct appropriation to establish and maintain experiment farms for working out scientifically the best methods of tillage and rotation of crops, shows the importance of dry farming as a factor in the development of the State. Six such farms have been established in different parts of the State, each of which contains forty acres of land and is equipped with the necessary machinery and is well fenced. I hope in the near future to see placed on these experiment farms other improvements such as buildings, live stock, etc. These farms will no doubt solve many of the problems touching dry farming and will prove of inestimable value to the people as a whole.

In many sections of the West dry farming can best be developed as supplementary to irrigation, since nearly all irrigated localities are surrounded by lands which are too high to admit of the cost incident to putting water upon them; or, in a majority of cases, such lands remain undeveloped simply because there is a lack of a water supply.

I consider it very doubtful indeed whether a settler could homestead and start a farm on the very best of the dry lands. Most of the dry farming at present is done in connection with some irrigation farming, or by companies principally composed of men who follow some other vocation in life.

I have introduced a bill in the Senate, a copy of which I enclose you, permitting any person qualified to make a homestead entry to enter three hundred and twenty acres in a compact body of arid or semi-arid non-timbered, non-irrigable, unappropriated, unreserved, surveyed public lands, devoid of potable water, not requiring residence thereon, but in lieu thereof requiring certain cultivation. If this bill becomes a law it will provide the means for thousands of citizens to obtain a farm, and in so doing redeem the greater part of the Great American Desert.

It has been thought that the wealth of the United States in timber, fuel, minerals, lands and water were unlimited, but in the mad rush to make use of some of these resources and to acquire wealth through their development we have lost sight of the fact that the supply of these natural products, however unlimited they appear, will be ultimately exhausted by wasteful use. It is estimated that at the present rate of consumption our timber supply will be totally exhausted in twenty years. Our public lands capable of irrigation are practically exhausted. The cost of fires in the United States in 1906 amounted to \$500,000,000,00, which was eighty per cent. of building operations of that year. The supply of coal and iron ore is fast going. These are only a few of the agencies at work destroying our natural resources, and I believe that the time has arrived when the natural resources of our country should be conserved. This can be done by developing the water supply for irrigation of arid lands, by developing the water power of the country, and thus save fuel—it is estimated that ten million horse-power can be developed in this way—by educating the people to manage scientifically the forests, by substituting concrete for wood in all kinds of buildings, and by demonstrating to people that our waste lands of the West can be successfully and profitably dry farmed.

This Congress must guard against the booming of any particular section; it must enter upon a campaign of education. I assure you it will be no easy matter to subdue the arid West. In order to be successful and to accomplish it without large and costly failures, it must be done slowly and by the closest application to conservative, practical methods. Any wholesale attempt to colonize large areas of this arid land by people accustomed to farming only in humid regions is almost certain to result in total failure. Do not forget the fact that the West has had much more rain during the last two years than usually falls, and that we will have drier years again.

Stick close to the objects sought as outlined in your official call. It is up to this Congress to show the American people that dry farming in the arid West can be made profitable. Will it do it?

Yours truly,

(Signed) REED SMOOT.

(Applause.)

CHAIRMAN DERN: I also have a telegram which I wish to read at this time.

Washington, D. C., Jan. 22, 1908.

Fisher Harris, President Dry Farming Congress, Salt Lake City.

My sincere good wishes for a successful meeting of the dry farming Congress by affording an opportunity for exchange of views, discussion of new methods, and strengthening interest in this great question. The idea of holding this Congress cannot be too highly commended. I confidently believe that the time is not far distant when the area of cultivated dry farms in the arid West will exceed the irrigated lands of that region.

GEO. SUTHERLAND,

U. S. Senator from Utah.

CHAIRMAN DERN: I am requested to announce at this time that the Utah delegates are requested to meet at the stand of this hall immediately at the close of this session. By request of Mr. Paxman, of the Executive Committee.

This really concludes the program for this afternoon. If any delegate present wishes to speak on the subject of dry farming he can be heard now.

MR. E. A. BURRELL (Idaho): I would just like to make an announcement that immediately after the adjournment of the morning session tomorrow it is desired that the delegates from Idaho hold a meeting at the rear of this hall.

MR. E. C. CHILCOTT: Mr. Chairman, I would like to announce that the Committee on Resolutions will meet at seven o'clock in the office of the Commercial Club. If there are any members of the committee now in the city that were not here this afternoon we would like to have them present. Also, if there are any resolutions to be submitted to the committee it can be done at that time.

CHAIRMAN DERN: You have heard the announcement of the Chairman of the Committee on Resolutions. You will govern yourselves accordingly.

What is the further wish of the convention, gentlemen?

MR. O. E. McCUTCHEON, Idaho. I move we adjourn until to-morrow morning at 10 o'clock.

CHAIRMAN DERN: I wish to state that according to the program we have an evening session.

MR. McCUTCHEON: I will amend the motion and make it eight o'clock this evening.

Motion duly seconded, put to a vote and declared carried.

The Congress then adjourned until eight o'clock this evening.



## EVENING SESSION.

The Congress was called to order at 8:20 o'clock p. m. by the Honorable John Dern, of Utah, presiding.

CHAIRMAN DERN: The first thing on the program for this evening is an article or address on "The Range and Dry Farming," by Gordon H. True, of the University of Nevada. If the professor is present I invite him to come to the platform. (No response.)

CHAIRMAN DERN: Evidently the gentleman is not here with us this evening. I will call on Dr. E. D. Ball, Director of the Utah Experiment Station, who will address us on the subject of "State Aid in Dry Farming." Will the Doctor please come forward. I have pleasure in introducing to you Dr. Ball. (Applause.)

DR. E. D. BALL (Utah): Gentlemen of the Arid Farming Congress: The subject to which they have assigned me to-night is a very important one from the standpoint of the dry farmer himself, and still more important, I believe, from the standpoint of the state's development.

I am glad to-night to be able to stand before you as a representative of the great state of Utah, which has done so much in the way of aiding the advancement of this dry farming; not only in the advancement of dry farming, but she has given liberally of her money to every form of agriculture and agricultural education, and I am very pleased to be able to stand here as her representative to-night. In the few words I shall say I am afraid I shall use her largely as a text. When Dr. Widtsoe and Professor Merrill first conceived the idea that arid farming would be a profitable industry in this state they went before the Legislature of this state, unfolded to them their plan, told them that they would like to start five demonstrating, experimental dry farms, and asked them for a certain amount of money to carry them on. They got it. They got more than they asked for; they got more money than they asked for, and they simply told them to take this money and go and start these farms. That was the beginning of scientific arid farming in the State of Utah. At the very beginning the State was generous to those who came and asked, because they came with faith; they came with knowledge, and they explained the thing so that the people could see—the members of the Legislature could see that they were investing their money where it would bring them returns.

These dry farms were for the purpose of demonstrating the success of the venture. They were more than that; they were for the purpose of finding out the fundamental principles that underlie the science of arid farming.

They thought first that they would be able, by locating these farms in the different sections of the state, to prove to the people in these sections of the state, by actual demonstrations, the value and possibilities of dry farming. But they would do more than that—they would find out for themselves the fundamental principles which underlie that science. They did more than that. They brought home to these people on the surrounding farms the possibilities of dry farming, and then they established ex-

cursions, so that the people farther away could come in and see for themselves what these farms were doing. They did even more than that—when they could not get men to come to the farms to see what the possibilities of arid farming were, they took the farms, or as much of them as they could take, to the State Fair, and exhibited there the products of these farms, before thousands and thousands of people, that they might know the possibilities of arid farming. It was a great success. It lent enthusiasm to the movement.

Let us for a few minutes view it from its standpoint of advantage to the arid farmer himself. By establishing these farms the farmer himself was able to go and see a farm that had been carried on under definite plans and scientific principles, and he could get results that he knew were the results of these experiment stations; they were not the figures given out by land-boomers and real estate men; they were thoroughly worked out scientific statements, upon which he could depend. Such things as that cause confidence, and that is the first requisite of success in anything you are inviting people to invest their money in. They got even more than that. They saw tests of the different crops, the different ways of handling the soil, the different ways of handling these crops. I cannot go into that side of the subject, because I would be trampling on the ground of many who are to follow me in speaking to this convention. But it was a demonstration in more than one way. The success of the different processes could be explained to them, and they could go and see for themselves. And as I said in the beginning, it was of immense benefit to the dry farmer himself; but the benefit to the state was even greater than that to the dry farmer. The result of these demonstrations has been, as President Paxman told you, that we have had a wonderful increase in the sale of that land, which has brought a large revenue to this state—land that has been before considered worthless. That has been only a fraction, however, of the material gain to the state. The land has been sold and is now owned by the people, and is subject to taxation, and from this year, or from the year in which it was bought, on and on, and on, forever, there will be coming back to the state the increased revenue in the form of taxes on that land. That is not all. Every time that you establish an acre of dry farming land you take the burden off at least half an acre of irrigated land of producing wheat.

I remember well that when Dr. Widtsoe and Professor Merrill were going out over this state, preaching the gospel of arid farming, they were down in a country town one year talking, or rather reiterating the prophecy you have heard so many times, and which you will see fulfilled, and that is that within ten years from the establishment of our arid farms that the wheat from the state of Utah will not be raised on irrigated land, but on arid farms, and I remember there was an old man back in the audience who seemed to be troubled—more than troubled—he was highly indignant. He said, "I have been raising wheat here or forty years, and now you fellows, you big farmers—you new-fangled farmers, are coming down here and you will start this arid farming business, and you will raise so much

wheat there won't be any profit in it, and you will drive me out of business." (Laughter.) And he really felt very bad about it.

That reminds me of what I heard on the train, going up to Boise, Idaho, to the sheep convention. The train was loaded with sheepmen, and we ran by a sugar factory, and the question came up about raising sugar beets, and we were commenting upon the material gain that this state had incurred through the raising of sugar beets, and the more I said the madder the sheepman got. He kept getting madder and madder. I could not think what was wrong with him. I didn't understand. Finally he said, "They are just simply ruining this country." He says, "It is the worst thing that ever happened. Why, before these sugar beets came into this country I could buy all the lucern hay I wanted at two dollars a ton, and now," he says, "I have to pay four and six." (Applause.) And that is the way he looked at it; and that is the way the old man looked at it. But that old man's land now, that he raised wheat on for forty years and didn't make very much, is probably raising sugar beets and netting him three or four times as much per acre as it did when he was raising wheat, or may be he has planted it in orchard and is making ten or twenty or even forty times as much per acre as he ever did before. (Applause.) And the great state of Utah is getting revenue from the increased production of the arid farm land; getting revenue from the increase of production of irrigated land, and getting revenue from the increased value of both arid and irrigated land. And just as true as I stand here is it that the introduction of any new industry in agricultural line in any community will help further the industry in the community, unless it be something inimical, like smelter smoke, perhaps, or something like that. But in a general way that will be true, and the state—you count the measure of value to a state by the development of a single industry, by the revenue of that single industry alone. It means a great deal more to a state than dollars and cents in revenue, in the sale of land, from taxes from the increased price of the land or anything of that kind. Yes, it means one thing that means a great deal more than all of those put together; it means an increased farming population, which the gentleman from Colorado this afternoon told you, I think, was the foundation of prosperity. That is what it means to encourage any industry; that is what it has meant to the state of Utah to develop our arid farming.

One of the speakers to-day said that it had already been demonstrated, in 1908, and the placard there in front of you says that in 1908 it is already a science. Does that mean we are ready to stop? Does that mean that it is all settled and that we don't need any more state aid? We have state aid in a number of states now. Utah is not the only one. I believe Utah was the pioneer in the work, but the good word and the gospel is spreading and a number of our states have been aiding dry farming. Is the work all done? Are we ready to quit? No, we are just about ready to begin. Dr. Widtsoe and Prof. Merrill did not promise if they would give us these farms here that they would demonstrate the entire matter in five years; they said they would demonstrate whether it was a success or a failure in

five years, and they have kept their word. But we have known, oh, ever since the first Indian warriors came onto these bleak hills, that farming was a success. It had to be, or we would have starved to death. But since that day to this the great farming area has been increasing, and since the establishment of our experiment station it has developed wonderfully. Even in the science of farming, as old as it is, we are only in the beginning. There are more things to come than have come. So in the science of arid farming, although we say on the placard that it is a science, it is a very, very young one; it needs all kinds of encouragement; it needs all kinds of investigation in order to make it a true science.

Some of the lines now that we may take up and go on with—I don't know as I could mention a line we cannot take up and go on with. We are just in the beginning. We have demonstrated—and I believe that is correct—that arid farming is a success. We have demonstrated in a few cases that it is a failure. But almost every line of arid farming development needs still more experimentation. We have not demonstrated which is the best wheat, and we may hear from someone before this convention is through, which is the best wheat. Now suppose they tell you which is the best wheat for arid farming, that is only the beginning; and I doubt very seriously whether we have got to the stage that we know which is the best wheat we know of now for arid farming. When we do find out which is the best wheat, then the proposition is to take that wheat and make of it what we want. We have seen in almost every channel men who understand their business taking some particular breed of live stock and making that come up to their idea or ideas of what that animal should be, creating if you please, a breed of livestock, creating a flower or a fruit; and I tell you that we are, before we finish, going to create an arid farm wheat that will be adapted to the conditions that it meets on the arid farms. We have that to do. We are going to do that and a great deal more than that.

We want "wheat" on the arid farm. Wheat is only the beginning. We talk wheat because we can raise wheat on the arid farm. I am not a prophet, but I venture to say that the day will come when wheat will be a subordinate crop on the arid farm.

I wish Professor True had preceded me. I was hoping he would talk about the livestock industry in connection with the dry farm. There is a paper coming on the program, "Dairying Under Dry Farm Conditions." When that day comes wheat will be a minor factor. We must have other crops. We must develop an oat which will be a successful arid farm oat. We have one started, but it will take years of work, of development and experimentation to overcome difficulties and make that a universally successful arid farm crop. When we have got wheat, oats, barley and rye we have only made a beginning. We must have other crops; we must have diversified farming on the arid farms the same as on other farms.

If Dr. Widtsoe were making this talk, as he should be, in place of myself, he would begin with the question of handling the soil. I know the question of handling the soil on an arid farm has not been scratched over the surface yet. We have made a little bit of a beginning; but we can't

even tell what we have done yet. There is a great problem to handling the soil that is yet to be worked out. I could go on and enumerate problems of that kind almost indefinitely, that are not only possibilities, but probabilities of the future of arid farming. But what's the use?

There is even more than that. There is one problem Mr. Paxman spoke to you about this afternoon, the very beginning of arid farming. We must have better tools—better methods in that way, all through to the end of arid farming.

I would say this—that when on the dry farm there goes up to Heaven with the smoke of the steam plow the smoke of the fireside of the home; when we hear along with the click of the threshing machine and the reaping machine the lowing of the cow, the cackling of the hen and the laughter of the children, then and not until then will we begin to have solved the problem of the arid farm. (Applause.)

How are we going to get state aid for arid farming? We are going to get it through just such conventions as this. We are going to get it through educating a conservative, careful public sentiment that believes in dry farming; a careful, conservative public sentiment that will relieve a person from the stories of the land promoter; a public sentiment that will encourage the careful, honest and earnest investor; a public sentiment that appreciates the difficulties of arid farming and also appreciates the fact that they are easily overcome with intelligence. This great convention here can do wonders, and will do wonders along that line.

But this is only the beginning. If we want intelligent, rational state aid for our arid farming investigations, we must educate the public to the results, of the possibilities, of the probabilities, of the certainties of this matter. All of these things in this western country require capital, and capital comes just in proportion to the confidence—public confidence. I believe in educating the public. Educate them. If you have a proposition that is good, financially, fundamentally good, the more education, the more enlightenment, the more understanding the people can have the better. If you are selling some punk stock, or something of that kind, it is well to keep quiet. But arid farming is a certain, reasonable, intelligent investment for the man that understands it.

I remember of traveling miles and miles—hundreds of miles, I was going to say—in eastern Colorado and western Nebraska and western Kansas, over abandoned farms. That was my first introduction to arid farming. But it didn't discourage me. It discouraged thousands there and they left. I looked over that land and I looked over it from the experience I had had in Iowa, and I said to myself, "That land will raise a crop if it is treated properly." My profession, you know, probably, some of you, at least, is—I am an entomologist, and I have no more business to be up here talking about arid farming than anything in the world, except, perhaps, that I am in charge of the experiment station. But as an entomologist I traveled over that country. I had nothing to do except handle their insect pests; but I found it to be almost universally true that the man that telegraphed for help to get rid of his insect pests was the man that put his

harrow in about an inch deep. The man that put his plow down there and plowed his ground never sent for me. (Applause.)

I am not going into the methods of arid farming, but there is a question. The men on these farms are not like those who settled in western Kansas and Eastern Colorado, men lured there by false promises; men that knew absolutely nothing at all of these principles we are trying to work out today; men that went out there, as I said before, believing that all they had to do was to do what they had done in the Eastern States and they would raise a crop, and they failed, and they will fail everywhere that that kind of a proposition is started. We don't want that class, but we do want state aid, and when I say state aid I mean more than money of the state. We want that intelligent public sentiment of the state back of us, that will help us, that will stand up and encourage us when we do something that is for the development of the state, and censure us when we do not. That is what we want. We want that sentiment, then we can go before our legislatures and put before them that proposition, and get the money. The western people are the most enterprising people on the face of the earth, and they don't turn down a good thing. They don't turn down anything, if you show them that to investigate any proposition will bring back five or ten times that much in material welfare. That is the kind of state aid for arid farming we want, and that is what we are going to have. (Applause.)

CHAIRMAN DERN: The Secretary informs me that a telegram has been received from Prof. True that he has been delayed, but we may have the pleasure of having him with us tomorrow.

This afternoon we listened with considerable interest to an entertaining address from a gentleman from Montana, on the subject of dry farming in his locality. I understand we have another gentleman from the same state with us who desires and is willing to address us on the same subject in regard to his locality. I would like to call on Mr. F. A. Carnal of Montana. (No response.)

CHAIRMAN DERN: Evidently Mr. Carnal is not here. Does any other gentleman wish to address the convention on the subject?

A DELEGATE: Mr. Carnal left this evening. He received a telegram that sickness called him away, so he had to leave.

CHAIRMAN DERN: What is your further pleasure, gentlemen? Will we have the pleasure to hear from anyone else?

MR. D. CLEM DEEVER (Nebraska): I would like to call on other members of the convention that are here to tell about what has been done in their states. For instance, I have come about 1,200 miles, and I came principally to find out what had been accomplished since our last meeting. That more than anything else brought me here. I, unfortunately, was out in the Committee meeting when the gentleman addressed the convention this afternoon from Montana. As soon as I heard about his address I discovered immediately that that was what I came out here to hear, and I would like to have the Chairman call that roll of states again. I believe there are a good many delegates here who are too

modest. I believe there is not a man here but what can tell something about dry farming in his locality, if he will do it. One gentleman this evening, with whom I am not acquainted, mentioned about what he had raised, and in about one hundred words said some things that would be very interesting to this Congress. In view of the fact that the gentleman who is on the program is not here to talk to us on a subject I was very much interested in, I would suggest that you call these states again, and urge upon these gentlemen not to be too modest in telling about what they know about what has been done in their locality.

CHAIRMAN DERN: As suggested by the gentleman from Nebraska, I will call the states again, so those who did not respond this afternoon may have another opportunity now to respond on this subject. Is there anyone here from Arizona who wishes to address the convention? From California? Colorado has responded. Idaho? I think Idaho responded this afternoon.

MR. DEEVER (Nebraska): I would like to hear from Mr. Day of Idaho, if he is here. (No response.)

CHAIRMAN DERN: Mr. Day evidently is not here this evening. Kansas? Nebraska? I think I will have to call on the same gentleman from Nebraska.

MR. DEEVER: Mr. Chairman, I have an address for tomorrow.

CHAIRMAN DERN: All right; we will hear from the gentleman tomorrow. Nevada? Prof. True was to have addressed the convention today, but, as stated a while ago, he is not here, and we may have the pleasure of hearing from him tomorrow. New Mexico? North Dakota? Oklahoma? South Dakota? Texas? Washington. I think I have gone over the whole list, except those who have responded. I call on anyone else who wishes to address the convention.

MR. BENNION (Utah): I did not come here with the expectation of having anything whatever to say to this convention, as, I only regard myself as one of the small fry in dry farming. I know there are a great many men who have had a great deal more experience than I have along those lines, but it looks to me as though the gentleman from Nebraska spoke the truth when he said we are altogether too modest; we are altogether too afraid of getting together and imparting a little information, or at least showing our ignorance along these lines. It appears to me that if we are afraid of imparting any of our information to our fellows—

A DELEGATE: Mr. Chairman, I move you that the gentleman be required to take the stand.

CHAIRMAN DERN: Will the gentleman please come forward to the stand?

MR. BENNION: Ladies and Gentlemen: I assure you I did not expect to get myself up here at all. (Laughter.) I had no idea of such a thing. But I don't like to see everybody holding back. We came here for information; we came here to learn something, and we had better make a break and show our ignorance than to say nothing at all and have a Quakers' meeting. (Laughter.) I think probably some of our delegates are

off to the theatre and places of amusement, or taking in the city tonight, and probably others have more legitimate excuses. But, at any rate, it seems that we want to get what we can out of this convention, and we can only do it by talking freely. There are a good many things that can be talked over in an interesting way. I know I would like to get a good deal of information, if I could get it. While I know that deep plowing and cultivation, thorough cultivation, cuts a big figure in dry farming, there are some other conundrums that are bothering dry farmers, and one of them has been the high price of help, and in fact the scarcity of help at high wages, and in consequence of this I know that a good many dry farmers have resorted to steam power and engines, and have had a great deal of trouble with them too. The greatest conundrum in my mind today is the question of power for the working of these dry farms. I have noticed, in looking around a little, in my experience, that the small dry farm is quite successful in some ways. There are a great many small dry farms right around in the central part of Utah—men that dry farm on a small scale, and while they raise fairly good crops, it seems to me they are handicapped. It is hard for them to make a living entirely on a small dry farm. The dry farm may be, as suggested, some distance from the irrigated farm, and it is pretty hard work, especially when you have to go a good ways to get to it. And another thing is water. The water question bothers a great many of them. They can't very well put up a windmill, and have to haul water for their horses, probably, and there is another drawback. And another thing—they are handicapped when it comes to getting any benefit from their pastures from their dry farms. A small farm is hardly worth fencing. As a consequence, dry farming on a large scale is, I have found, the better plan; and in order to do that it is generally necessary to organize companies in order to work on a large scale. There are a great many advantages in working on a large scale. They cannot afford motive power, for they cannot get the right kind of power; that is out of reach and out of the question in the case of a small dry farmer. Another thing, where there is extensive farming, on a large scale, there is a fine opportunity for pasturing, and pasturing, in my estimation at least, is one-third of dry farming, and I have followed it up a little in my way. I have seen a good many dry farmers setting fire to their straw and burning it up to get it out of the way. To my mind that is a great loss, and still that is about all a small dry farmer can do. He can't very well do otherwise than burn it, unless he has got cattle to eat it up. I find that where you can use it for cattle, where you can get water, have a place large enough so that you can afford to get water, and use your straw for cattle and sheep and hogs and so forth, that the pasture means about one-third of it. I have found in my experience in dry farming that the profit end of my dry farming comes out of the stock raising, because I make good use of the straw in that way, and I raise a good many sheep and hogs. But that can't be done on a small scale; you have to have a large farm to do it, and it is rather burdensome and difficult for one person to do it alone, consequently the co-operative sys-



fem comes in there, and I think it worthy of discussion in our Congress. I would like to hear something, and probably will before the convention is over with, in regard to the best motive power. If there is any engine that is a success, a positive success, it is a great thing to the dry farmers to find it out, and not flounder and lose a lot of money in finding it out. That is what we are here for, to profit by each others' experiences. Therefore I simply rose to my feet to ask for a discussion of these matters by those who have had experience, and did not intend to make a speech myself.

MR. ALFRED ATKINSON (Montana): I would like to ask, along the line of discussion in regard to small farm or large farm, about how small do you think a farm could be and yet be handled profitably by dry farming?

MR. BENNION: About 160 acres is the usual dry farm, but in my estimation it is too small altogether. I think that a dry farm should run up into thousands of acres, and something that would justify some motive power better than horses.

MR. ATKINSON: Does your experience indicate that 640 acres would be a fair acreage?

MR. BENNION: Yes, that will do. But that will hardly justify an engine. That will justify horse-power, and it may be large enough also so that a man will make use of his pasture; it would be sufficiently large to justify corrals, and possibly fencing. The question is, and I think we would like to know each others' experience as to whether horse power is the best on these dry farms, or gasoline or steam engines, or what kind of engines. These are some of the questions I wish to throw open for discussion. I will say while I am on my feet that from my experience I have thought that we wanted some power; that horses were too slow, take too many drivers, too much harness and too much looking after, and that by getting some power we would be able to do better. But I have tried steam power and feel like going back to horses myself. (Laughter.) Some of my friends, however, who have different kinds of engines, think they are successful. I have some cattle running on my farm, several hundred cattle, that wintered over nicely—

MR. JORDAN: I would like to ask, while we are on horse-power or steam engines for plowing, if there is not someone in the audience who could give us a little experience with steam engines. There have been some fourteen, I believe, working in the state, and it seems to me that is a very good question to discuss. There is a great diversity of opinion on the comparative value of steam power and horse power. I believe it is possible here tonight to answer this either in the negative or affirmative to a considerable degree, at least, and I believe considerable information can be thrown on it right here, and there is no question that the arid farmer is more interested in than the question of power. It seems to me just right to take that up.

MR. WALKER (Utah): I would like to ask Mr. Bennion what difficulties he experienced with the steam engine.

MR. BENNION (Utah): The difficulties I have had are they don't do the work. With the best kind of care there are too many breakages. Breakages consume profit. They are breaking, breaking, breaking all of the time breaking down. I don't know whether it is the fault of the engineers or not, but I have traded engineers pretty often, and they are about all the same. (Applause.)

MR. ALLEN (Utah): I move that Mr. Paxman of Juab, who is here, take the stand and explain this question.

MR. BRUNTER (Colorado): In our country there are two disc steam plows and there is one mold board steam plow, and I have had a chance to have some of the disc plow work done on my place ten miles south of Akron. I have had forty acres, or forty-five acres, rather, plowed on the experiment station east of Akron, with a mold-board plow. The work that was done was very nice, but when the ground is a little wet—what we would call nice for breaking with teams—the engine could not work very good; when it was dry the plows slipped out of the ground, so that it took about two weeks to get that forty-five acres plowed. (Laughter.)

MR. BRUNTER: The gentleman that was with us could run a threshing engine in fine shape. He was a good engineer. So it was not the fault of the engineer. Now the difficulty with us at that time was the traction wheels were narrow, consequently it mired down deeper and didn't have the pulling power it should have had if it had had wider wheels. Wider wheels with the same size engine would have saved considerable time. This turned a 16-inch furrow. When the ground was dry it worked pretty good. As soon as it got in nice breaking condition for the teams we had the same difficulty. We had a 32-horse-power double cross compound engine. Every time we came to a low place where the water happened to lodge and made it a little wetter than the balance, we had to stop and get a spade and dig the engine out before we could go ahead. (Laughter.) While the ground was dry, making a successful run, in three hours we plowed 13 3-4 acres. If that speed could be maintained the steam plow would be a great success, but, unfortunately, it rains once in a while on our place.

I think there is another gentleman down in my country who is thinking of getting some breaking done, and he advances the theory, why wouldn't oxen be just the stuff. They cost little on the St. Louis and Kansas City market. (Laughter.) In the first place, he could break all of the prairie he wanted to during the month of June and perhaps until July, and then he could take and turn his oxen on the grass and put them on the market and get his money back. (Laughter.)

But that is my experience with the steam plow. If the ground is in fair condition, you can make very good progress; otherwise the steam plow seems to be a failure. (Applause.)

A DELEGATE: Professor Merrill! (Applause.)

CHAIRMAN DERN: Will Professor Merrill please come forward?

PROF. L. A. MERRILL (editor of The Deseret Farmer and manager of the Utah Arid Farm Association, Salt Lake City): Ladies and Gentlemen: I have had considerable experience with this question of machinery on the farm. As some of you are aware, we have had a farm down in Juab county, consisting of some nine thousand acres. Some three or four years ago we made up our minds that the only way to bring that under successful cultivation was by means of the traction engine, and there are those of you here tonight who know of our experience, probably, with the first traction engine put there. I am free to say that I believe that the men who sold the first traction engines in the state were entirely honest. I believe that they were just as honest in selling those engines to us as we were in buying them. They had had no experience with traction plowing in the arid country. Our soils are entirely different from the soils of the East. And before purchasing these engines we went East, two or three members of the company, and saw traction engines successfully plowing the soft lands of the humid West, and especially in Iowa and Illinois, and for that reason we thought that traction plowing would be successful here. But when we came to ordering the engines and got them here, we found that the ground would simply slip underneath the wheel, and the engine was not able to make any headway at all, and no matter how we reduced the number of plows behind the engine—cutting down from 12 to 8 plows—the engine would not work successfully under those conditions. We were very much discouraged. We were of the conviction that arid farming would be a failure in this state if we had to resort to horsepower. Last spring we tried this. We purchased a large number of horses and attempted for weeks to plow our tract of land with horses, but made such slow headway that we became entirely discouraged, and finally made up our minds we had to purchase another kind of engine. I am not selling engines. I want to make that clear right here. I am not the agent of any engine or concern, but I am convinced that there are engines on the market that can be successfully made to plow this land; and I believe on our farm we have successfully solved the problem of farming or plowing the land. I believe in handling large tracts of land under arid conditions. It is absolutely essential that we have machinery that will enable us to reduce the cost to a minimum. I don't believe it is possible, where we expect such small yields as are expected on arid farms, where the expenses are so great and labor so expensive, to farm with success on a small farm. We have to introduce expensive machinery, and we have to reduce the cost to the very lowest minimum.

We purchased an engine with a wheel five feet in width—with tire five feet wide—

A DELEGATE: Five feet!

MR. MERRILL: Five feet, yes sir. The wheel has a diameter of seven feet. The engine is a 110-horse-power engine. And I want to say here—and there are those in the audience who can corroborate what I do say—that we went out for many days during last season and plowed eighty acres during the twenty-four hours. We have procured two sets

of engineers and two sets of water-haulers, and from seven o'clock one morning to seven o'clock the next morning, for a number of successive days, right along, we turned over at least eighty acres a day, and we reduced the cost of plowing that land. And I want to say it was plowed well. It was plowed down from seven to eleven inches deep. And we reduced the cost of plowing to less than fifty cents per acre. (Applause.)

That engine wasn't used alone for plowing. I might say that we bought the engine for the purpose of running a combined harvester and thresher. We believed in handling these large tracts of land it was absolutely essential to get some method of harvesting our crops by means of which we could reduce the expense of labor.

In this state it has been absolutely impossible to procure enough labor during the past two years to get enough on our farms to handle the grain by the old method. We purchased a large combined harvester and threshers—one of those California machines—and this engine was purchased with the idea of pulling that thresher. This combined outfit contains a separate engine, a little auxiliary engine, which is fastened onto the separator, and receives its steam from the main engine. This little engine furnishes the power to keep the separator and header in continuous motion. Before beginning the cutting at all this little engine is set in operation, and it runs the thresher and header. The large engine moves across the field at any rate you desire. On heavy grain that you want to cut thoroughly, you run the engine slowly, and where the grain is very thin, you can let it run faster than a team can walk. Oftentimes the teams followed along on a trot, so rapidly would the machine go through the field.

I want to say in addition to this, in connection with this machine, we succeeded in cutting and threshing our grain and putting it in sacks, ready for market, at a cost of sixty cents per acre. The average cost in this state for cutting and heading grain and putting it in the stack, before threshing at all, is something like \$1.25 per acre. So you can see there is a great reduction in the price by this method.

In conclusion I want to say that the engine has proven satisfactory in every respect. We have in cultivation, in wheat 1,850 acres, and in addition to that 1,850 acres plowed after the first day of September 150 acres that we have not planted yet that we expect to plant this spring. During the time of plowing nearly two thousand acres and cutting and harvesting one thousand acres we never had one dollar's worth of repairs on the engine or harvester. (Applause.)

A DELEGATE: I would like to ask what kind of plows you use with this engine.

MR. MERRILL: I don't like to say, because it would not be fair. There are so many manufacturers of plows around here it would not be safe to live here after telling you. However, we are using disc plows altogether. We have tried the mold board plows without success.

MR. OLSEN (Utah): I would like to ask the dimensions of the piece of ground you are working.

MR. MERRILL: We never measured it; I could not tell you.

MR. OLSEN: Approximately.

MR. MERRILL: We have divided it up into a number of pieces. I would say that the field we divided it into, to go clear around, would be about four miles.

MR. DEAVER: I have had experience with several different kinds of engines. I would like to ask if it is possible to plow the ground without bringing the engine onto the ground at all, by establishing a donkey engine on each side of the field and stringing cables to draw the plow back and forth, working both ways.

MR. MERRILL: It would be simply a matter of experimenting with me; I have never had any experience with that at all.

MR. DEAVER: That system is used especially in forests, where they take a cable and haul timber for miles, bringing logs into camp with these little donkey engines. It seems to me the same principle could be established for plowing the ground, without taking the engines over the ground at all. That might be something worth discussing.

MR. MERRILL: I would like to say before taking my seat that Mr. Howard Cox, who is on the program, has had some experience with gasoline traction engines within the past year, which, I understand, was entirely satisfactory. He reduced the cost of plowing within the past few weeks to less than fifty cents per acre. This was during October or November. I haven't seen this engine work, but I would say that gasoline, as a motive power, offers some advantages.

MR. LAMBKIN (Salt Lake City): I would like to ask Professor Merrill whether the figures he has produced here this evening include interest on the cost of machinery.

MR. MERRILL: It simply means the cost of actual operation. I simply gave the cost, the actual cost of operation.

MR. LAMBKIN: What would be the increase if you were to add interest on the cost of the machinery?

MR. MERRILL: I haven't had enough experience to tell. It has only been in operation for a very little time. It would depend entirely on the number of days you used the machinery, the time lost, etc. That would add to the cost. But if you use that machinery from eight to nine months in the year, that would reduce the cost. It is a matter that would have to be worked out; we haven't had enough experience to say. We did not put the combined harvester on the place until the 25th day of August of this year.

A DELEGATE: How much grain did you raise per acre on that field?

MR. MERRILL: I am not prepared to say. I will say that there were some tracts of that farm that raised 27 bushels per acre and others 23 bushels. I will say this, however: We have sufficient confidence in the yields we have been able to secure during the past two years that we are going on and making greater investments. As I have told you, we have

two thousand acres under cultivation, and we expect, during the next year, to double that amount.

MR. MADSEN (Provo, Utah): How do you manage to get the brush out of the way?

MR. MERRILL: President Paxman explained our difficulties pretty thoroughly this afternoon. The first year we operated we cleared about five hundred acres very successfully with simply a V-shaped device with long knives. It is very similar to the Bates grubber, that has not been entirely successful. Last year we made contracts with men to clear the prairie with the Alboid grubber. That is simply a device with two rows of teeth, with one row of teeth in the ground, and when that gets full, drop it, and the other flops over. It is pulled by six horses. They can clear about 16 or 18 acres a day, putting the brush in the winrows. Most of our ground has been cleared by contract, we simply giving the contract for clearing at two dollars an acre, and the men say they make very good wages at that rate. The year before we paid \$1.60 for the work, and the same man said he didn't make anything. I imagine that the cost of labor to clear is about \$2.00 an acre.

MR. BENNION (Utah): I would like to ask the gentleman if on a part of the land there is not brush enough to justify grubbing.

MR. MERRILL: We haven't had any on our farm but what has sufficient brush to warrant clearing. We clear the whole field. We haven't any patches that haven't brush.

MR. PARKINSON (Idaho): I would like to ask whether or not this land that was plowed for fifty cents per acre was stubble land.

MR. MERRILL: The land I speak of was all stubble land. The cost of plowing stubble land was fifty cents an acre. I think the gross cost would be somewhat increased. Of course, that would depend upon the thoroughness with which the ground had been cleared. I failed to emphasize the point that where you have expensive machinery it justifies working for all it is worth while it is in operation. We got two capable engineers. We paid them their own salary. In fact, we didn't ask them what the salary was. We paid two engineers to do the work, simply because we knew that if they did make it work it would be less expensive to us, and I want to say here that I believe that is one great fault with a great many of us—that we depend upon some cheap man to run the engine, and we get a man who has had no experience with machinery, who can't take an engine and make it work. Some of us made the mistake of employing a locomotive engineer, who has been accustomed, whenever anything is wrong with his engine, to running the engine to the shop and getting it fixed up, and as soon as anything is out of repair with the engine they are at a loss, and consequently have to go up town, sometimes many miles away, to get the engine in repair. The great need of the arid farming region of this industry today is to get men who are preparing themselves to take care of traction engines—men of dry farming experience and good judgment and men of reliability, who are willing to go out and win success. I believe we have made our suc-

cess simply because we relied upon men who have been following that up all of the time, men who have been successful in plowing in California. If we can't get men here at home, we expect to go to California again and get men who do understand this business, and we think it pays us to do so.

MR. CARGO (Colorado): I would like to know whether that soil that he plowed is sandy loam or whether it was heavy, hard grain.

MR. MERRILL: Our soil is sandy loam.

MR. CARGO: Doesn't that have a great deal to do with the success? Of course, the ground I had reference to in my talk was pretty hard ground.

MR. MERRILL: The soil is very loose in some places. But I found this out: that this engine we had the tire didn't seem to make any difference with its tractive power whether we went over plowed land or solid land. We plowed over some places where the land is very soft, and a number of places where it is slightly sandy. It worked very well till we got down to where it was a little wet; the engines would slip.

MR. DEAVER (Nebraska): I am very much interested in what Professor Merrill has said, and I wanted to ask the Professor one question, which may not be of interest to all of the delegates, but which is to me in the particular line I am following. I would like to ask the Professor about what depth is the water on this ground that he raised 23 to 27 bushels per acre.

MR. MERRILL: That is something we haven't yet found out. That is still a question with us. I may say that we began hauling water some seven or eight miles. The question came to us whether we had better purchase some springs some five miles away and pipe these springs to this land, or whether we should drill or bore for water. We were very anxious to get the state to help to investigate the depth of the water, but we are willing to wait until that question is solved.

MR. DEAVER: Do you think it is more than forty or fifty feet?

MR. MERRILL: I think it is at least five or six hundred feet—probably a thousand feet. I will say this: that a well dug on the hill goes down 100 feet, and it is just as dry in the bottom of the well as it was when we started, and if anything, a little dryer. (Laughter.)

MR. DEAVER: That is a very important point.

MR. MERRILL: I might say I was not holding up that yield as being anything like what it ought to be. I think it is to our lasting disgrace, or discredit, that we did not get more than that. We have neighbors on the north, on ground somewhat similar to ours, raising 51 bushels per acre, and Mr. Grace, sitting in this audience, would think it a disgrace to him if he did not average 35 bushels to the acre each year. With proper methods, I believe that the time has come for Utah when a man who does not raise 35 bushels to the acre on arid land would not be successful.

MR. WALKER: What is the average rainfall on that land?

MR. MERRILL: The average rainfall at Nephi, Juab County, has been, for some twenty-one years, about 18 inches. Last year it was slightly in excess of that.

MR. GRACE: Eighteen inches, did you say, was the average rainfall? About 13 inches, I think, is the average rainfall. The average of the state is 13 inches.

MR. MERRILL: I am willing to bet Mr. Grace (and I am not a betting man, either) half of that farm we have over there.

MR. GRACE: It is all right just as it is, anyway.

MR. MADSEN (Jenson, Utah): What has been the most successful plow—the mold-board plow or the disc plow?

MR. MERRILL: We are using entirely the disc plow.

MR. MADSEN: Disc plows? You find them most profitable, do you?

MR. MERRILL: We are using the disc plow; yes, sir. (Laughter.) We have used the mold-board plows.

MR. HALL (Weber County, Utah): What method do you use in planting your wheat? How do you plant it?

MR. MERRILL: This is stealing all of my thunder for tomorrow, I say that we use a disc press drill. The only reason for using the disc press drill is because we believe that where the ground is new and there is bound to be more or less litter, some brush in the ground, you can get the seed sown more uniformly by using the disc press drill and put the seed down to a depth where you find moisture. Where it is four or five inches thick, we put the seed down below that, and if the moisture is five or six inches thick we try to go on down.

MR. HALL: How is that done—with horse power?

MR. MERRILL: Yes; we are doing our drilling with horse power.

A DELEGATE: What is coal worth where you plow for fifty cents an acre?

MR. MERRILL: It costs us five and a half per ton. We used slack and run of mine coal during the past season, and found we got practically as much heat out of it, and it is practically as good for our purposes as any. (Applause.)

CHAIRMAN DERN: Gentlemen, unless someone else wishes to address the convention at this time, our program for the evening will be closed. Before we adjourn, the Secretary has an announcement to make.

SECRETARY ROOT: I would like to say that those bringing credentials will kindly return them tomorrow early to the Credential Committee, so that they can make their report. Kindly get these in early.

With the permission of the chair, I would like to say that those who have resolutions to offer, as already mentioned, we ask that they come in, and that they will be taken and referred to the Resolutions Committee, and they can be taken up at their proper time.



CHAIRMAN DERN: If there is nothing further, a motion to adjourn is in order.

MR. MADSEN (Utah): I move we adjourn until ten o'clock tomorrow morning.

The motion was duly seconded, put to a vote, and declared carried, and the Congress thereupon adjourned until ten o'clock Thursday morning.

## THURSDAY, JANUARY 23, 1908.

(Second Day.)

### MORNING SESSION.

The Congress was called to order at ten o'clock a. m. by Hon. John Dern, presiding.

CHAIRMAN DERN: I want to impress upon the delegates present that whenever gentlemen arise to address the convention, in order to keep our records complete, that they must announce their names and the state from which they hail distinctly.

I now have the pleasure of introducing to you Professor Samuel Fortier, chief of Irrigation Investigations, Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C. (Applause.)

PROF. FORTIER: Mr. President, Ladies and Gentlemen: A few days ago I read in one of the San Francisco dailies that Arthur R. Briggs, of San Francisco, who is manager of the California State Board of Trade, should represent that state at this convention. I was very much pleased to hear of this because Mr. Briggs, as you know, is well informed as to all kinds of farming, and it is a matter of deep regret that he is not with you today to represent the great state of California. I did not know at that time that I would have the honor of meeting with you, and in preparing a few notes I took care that I would not get my wheelbarrow in the way of Mr. Briggs' four-in-hand, so I have prepared a paper which will not take more than fifteen minutes to read, confining myself to the subject which has been announced.

I am not sure, gentlemen, that I have any right to appear before you, because there are many of you who know that my feeble efforts in seeking to develop this western country which we all love so well, have been spent under the canal in connection with water supply and irrigation. It is about seventeen years since I came from Denver to construct the Ogden water works, and I had the honor of turning the water into the Bear River canal in 1904. With L. D. Adams, of Ogden, who is now dead, and Johnnie Charles, I located the only high reservoir you have in Utah today—the East Canyon reservoir. So I cannot claim to be an arid, or dry farmer; I am only a web-footed irrigator. (Laughter.) But I think I can give you a few suggestions in my line, and if you will bear with me I will read these few notes:

### The Utilization of Limited Water Supplies on Dry Land.

The purpose of this Congress is to devise ways and means of developing the agricultural resources of those large areas of fertile lands which lie above and beyond the irrigation canal. Although irrigation and dry farming differ in many essential features, yet there are many reasons why western farmers who follow these two methods of farming should be on friendly terms. In the first place, they are neighbors. There is, as a rule, only a silver thread of water between the irrigated alfalfa and the dry land wheat. I regret to say that some of the actions and utterances of these two classes have not always been neighborly. There has been more or less mud-slinging on their part and dry clod throwing on your part across the canal. (Laughter.) Those who practice and believe in irrigation have at times attempted to belittle the possibilities of the dry upland and to consider it a region suitable only for grazing stock. On the other hand, the dry farmer frequently declares that irrigation water is a nuisance and that he would not use a drop if a ditch crossed the upper boundary of his farm. (Laughter.) I take it, gentlemen, that these are extreme views, and to my mind the sooner these two classes get together and work harmoniously for the up-building of this western country the more rapid will our progress be. In that western country, which people designate the Mountain States (and do you know it is a wonderful country—Utah, Colorado, Wyoming, Idaho, Nevada, New Mexico, Arizona and California too—all of this great Rocky Mountain region in fact) the soil of the upper benches is frequently better and deeper than that of the valleys. In my own experience in locating irrigation canals I have found to my deep regret that the best land is frequently above the proposed canal. I remember some years ago when I was locating the extension of the Bear River Canal, some of the best land in that valley was left above the canal, and it has been a matter of deep regret to me ever since that we could not have raised it twenty-five or fifty feet and covered all of that area. Then, too, under favorable conditions, this deep fertile soil which cannot be artificially watered, produces a better quality of grain. Another reason, its extent is also much greater. No one knows how much land can be irrigated in the arid and semi-arid regions of the United States. It has been variously estimated all the way from sixty to one hundred million acres. This much we do know, that for every acre that is irrigated by the generations that will follow us there are likely to be several acres of equally fertile soil that must be cultivated without irrigation, if cultivated at all. Our children and children's children may in time reclaim by irrigation 70,000,000 acres, but these descendants of ours will still gaze just as we do now on from one to two hundred million acres of arable and irrigable lands for which no water can be obtained. Nothing that I may say can show more clearly the magnitude of the problem you may have undertaken. In your praiseworthy efforts to establish happy and prosperous homes on what is now the uncultivated and uninhabited uplands of this western country, I bring

you the greetings and best wishes of your neighbors and friends who toil amidst the irrigated furrows. (Applause.)

In this age of diversified farming in the West and of the winter feeding of stock, it is no longer possible to draw any sharp line between the farmer and the stockman. The small farmer keeps stock and the large stockman grows alfalfa. For the same reason, no sharp line of demarcation exists between the irrigator and the dry farmer. The irrigator has frequently a more or less extensive tract above the canal which he cultivates without water and the dry farmer derives a great deal of profit and satisfaction from the small tract which he irrigates. This is surely another reason why the dry farmer and irrigator should be on friendly terms.

This brings me to the subject that I would like to present in the briefest possible manner, namely, The Use of Limited Water Supplies on Dry Farms of this western country. I know some will tell you that artificial supplies of water are not needed and to prove their statements they will point to the rich valley lands that have been converted into marshes, to the barren stretches rendered valueless by the rise of alkali and to the troubles and controversies which arise over the division and use of water. But I want to say that most of these troubles are of our own making. I speak now in behalf of the irrigators. Most of these troubles are of our own making. This is the penalty we pay, gentlemen, for our mistakes. If less water was wasted the rise of the ground water and the rise of the alkali would not be such troublesome factors, and if we had started out in this work of reclaiming the desert by irrigation with better laws on our statute books governing the appropriation, diversion and use of water, there would have been fewer legal battles over water rights. The beneficial effects of irrigation should not be lost sight of on account of these drawbacks. Apart from the disadvantage of irrigation, I trust you gentlemen will be fair-minded enough to appreciate the beneficial effects of irrigation.

I believe so implicitly in the advantages of irrigation that I have come here to urge the use of more water on the dry farms. I know you have other remedies which have for their object the production of larger and more valuable yields under arid conditions, and I trust that you will test these remedies to the fullest extent. Some think that the proper selection and breeding of seeds will do much to overcome arid conditions. I understand that Mr. Chilcott, who was kind enough to give me a few minutes of his time, is to follow me, and he will speak on that subject. Others pin their faith to suitable cultural methods, another class advocates the rotation of crops, and still others would conserve the soil moisture by summer-fallowing and other means. I have nothing but commendation for all of these remedies, because I believe they are important factors in the solution of this great problem. I wish it distinctly understood, however, that in my humble opinion none of these remedies are deserving of a first place in your deliberations. If the establishment of permanent and prosperous homes is your main purpose, then the utilization of water wherever and however it may be obtained is of first importance.

As many of you know by actual experience, one of the chief drawbacks of the dry farm is the difficulty encountered in securing water for the home and the corral. Both man and the domestic animals under his care must have water to drink and a family soon wearies of driving stock long distances to the nearest water hole and of hauling water in barrels from the nearest spring or well for drinking and culinary purposes.

Again, the sunshine is so intense in summer that shade trees around a home are a necessity to comfort and even to happiness. If to shade trees one adds a small family orchard, a vegetable garden, a patch of clover or alfalfa, and sufficient water to keep all in a vigorous condition there exist all the essential elements required to make a country residence attractive.

Water is not only needed for household and stock purposes and for the irrigation of trees, lawns and gardens, but it is the most important factor in the production of field crops. The soil is fertile, the climate favorable, but the proper amount of water is frequently lacking and low yields or crop failures result. If the dry farm could only obtain and apply the water which the irrigator wastes it would greatly increase the yields from arid lands.

Now I want to touch very briefly, friends, upon a few sources from which water supply can be obtained, and in advocating this do not misunderstand me. I do not wish to thrust irrigation upon you. I only wish to recommend to the farmer who has 160 or 320 or 640 acres that he is cultivating to try to find some water for a limited area—enough to grow shade trees—enough to afford a few apple and peach trees, and for the irrigation of a garden. My first subject is:

### Winter Irrigation.

By "winter irrigation" is meant the application of water to the soils outside of the regular irrigation season. The latter seldom lasts more than four months. During the balance of the year, particularly in the early spring, a large quantity of water passes the dry farm on its way to the ocean, or, in your case to the Great Salt Lake. This water is not utilized by either the dry farmer or the irrigator, yet it is capable of producing valuable results. If one excludes the Great Plains region, where there are few rivers, and considers the more mountainous portions of the states and territories west of the Missouri river, there is presented a well-nigh limitless opportunity for the diversion of water from western streams and its application to dry farms during periods of the year when it is not used by the irrigators of the lower valleys.

Winter irrigation has got beyond the experimental stage. In Arizona, California, Eastern Oregon and Eastern Washington, many of the streams discharge the greater part of their flow during the non-irrigating season. This water when not retained in storage reservoirs would be entirely wasted unless diverted and used. Quite often fields and orchards are irrigated in this way when the plants and trees do not require water, but

in order to store up a supply of moisture in the soil for future use. A deep, retentive soil forms one of the best natural reservoirs.

Winter irrigation as practiced in the Santa Clara Valley, California, may serve as an example. In 1898 the rainfall was only one-half of the normal. Instead of 16 inches the precipitation was 8 inches. The year previous was likewise one of scanty water supply. These two dry years coming in succession and followed by others of medium rainfall compelled the orchardists to irrigate, and since that time they have continued the practice. Investigations made there by our office in 1904 showed that one ditch supplied water to 1,241 acres from February 27 to April 23. That is their irrigation season. It is the only time they could irrigate. During these 56 days in winter and early spring the land was flooded to a depth of 19 inches—19 inches in depth over the entire surface irrigated. Another ditch covered 3,000 acres to a depth of 21 inches from February 12 to April 23. Still another covered 900 acres to a depth of 40 inches during the early spring months. The average cost of this water to the irrigators under these three ditches was \$4.66 per acre. This water which averaged nearly 27 inches in depth was applied at a time when the orchard soil was wet from rains, when the trees did not particularly need irrigation, but for the purpose of storing sufficient moisture in the soil to nourish the trees during the warm, dry months of summer.

This is not the only case where I have made inquiry into winter irrigation. I remember a few years ago I took a trip up into Oregon, in the region just beyond Umatilla, in Butter Creek valley. I stayed over night with a man by the name of Mr. Thompson, who had practiced winter irrigation for about twenty years. He had a splendid orchard of deciduous trees. Mind you, this Butter Creek contains no water in summer, and Mr. Thompson and his associates in that valley had to apply the water in winter, when it was in the creek. But the soil was so retentive—they had about ten feet of good soil—that they were enabled to raise three good crops of alfalfa under winter irrigation. But it was rough irrigation. They did not pay any attention to the ditches, and they paid less attention to the application of the water over the surface. They just opened the flood-gate and turned it on, and Mr. Thompson told me that they averaged, I think, about three feet over the surface. But that thorough soaking in the early spring months stored sufficient water in their deep retentive soil to produce three crops of alfalfa, and to nourish those trees.

Now, when I was up in Dillon, Montana, I spent some time with Mr. J. E. Morse in looking over his reservoir. Mr. Morse is not content in using the creek water during the few months of the summer. He has built a large string of reservoirs in the mountain and in addition to that if any water is found in the creek when these reservoirs are full he turns it loose on his land in winter irrigation. I saw there a crop without winter irrigation and one with it, and there was a marked difference. I wish some time you would get Mr. Morse down here at this convention to tell you about his success in winter irrigation.

As the area devoted to dry farming increases, the use of water outside the regular irrigation season is destined, I believe, to increase in a much greater ratio. To make this use possible we ought to begin soon to define by legislative enactments all kinds of rights to the use of water. One man desires water only during the crop-growing season, which in Utah, for example, may be assumed to be five months; another desires to divert a part of the flood flow for storage purposes, while a third wishes to use water for winter irrigation at favorable times in the seven months when it is not otherwise needed. Now, it would seem to be the duty of the state to issue permits for all of these appropriations, but to so define the rights of each that conflicts may be avoided.

### Small Storage Reservoirs.

The storing of water from springs, creeks and streams furnishes another means of providing limited water supplies for dry farms. During the past few years a large number of reservoirs have been built in Colorado. According to the State Engineer, sufficient water was stored in reservoirs in 1906 in Division No. 1, to cover more than a third of a million acres 12 inches deep. The chief purpose of this stored water is to supplement the flow in canals that are short during the last half of the irrigation season. If the Colorado irrigator considers it a paying investment to store water to increase his supply the dry farmer who eats canned vegetables the year through, because he lacks water to grow them, should not hesitate to do likewise. It seems to me that for every reason that might be advanced in support of reservoirs for water users under a canal, two might be given in favor of the dry farmer above the canal. The excuse so often made by the farmer that neither water nor good sites can be had is seldom true. This may be true in certain localities, but it is not generally true.

I remember when I was building the Ogden water works and the president, President Armstrong, came up, and he saw that I had a pipeline laid down the canyon, and then we ran up 275 feet, or thereabouts, to the hill opposite, to get it over on the Ogden bench, and he said, "Fortier, you will never do it." He seemed to be sorry that an engineer even with the small reputation that I had should make such a blunder. But the water has been coming up over that hill for something like sixteen years.

Now, I want to show you by that that in building reservoirs you don't need to build your dam in the canyon or in the creek. It is not necessarily so, but it is best if you tap the stream high enough to syphon the water down and up over into your dry land farming. Then it is often possible to get a much better site, by going out away from the stream altogether; it may be several miles from the stream. Of course this will take more money than one dry farmer can well afford, but you dry farmers must co-operate just as the irrigators of Utah have done.

The irrigators of Utah set the pace for all of the rest of this arid country in co-operation, and I believe it is possible for the arid farmer to join hands and construct storage reservoirs and the like, build canals for winter irrigation and all of that sort of thing.

Such reservoirs may vary in size from the small one on the farm supplying water for one or two acres to the large co-operative reservoir supplying water to small portions of a score or more of dry farms. As sources of supply, there are the spring, the small creek, the dry stream at flood times, and the river. The cost of storing water depends principally on the site selected and the size. A small reservoir costs much more per acre irrigated. In the larger class of reservoirs water is usually stored for less than \$25 per acre foot. Under careful use one and one-half acre feet will irrigate an acre of orchards or vegetables. The cost per acre for this class would thus vary from \$20 to \$40; in the smaller reservoirs it would be more. This, however, seems small in comparison to the net profits per acre that can be had from such crops as strawberries, tomatoes and deciduous fruits.

### Windmills.

On dry farms where no water is available for either winter irrigation or storage reservoirs a small supply can often be obtained by means of windmills. These wind motors may be used to pump water from canals, reservoirs, lakes or wells for the irrigation of a small orchard and garden, as well as for domestic and stock purposes. The extent of land which a windmill is capable of supplying water for depends on a large variety of conditions. The chief of these are the lift, or head, the kind and size of mill, the velocity and uniformity of the wind, the economy practiced in using the water and such like conditions.

The United States government, about a year and a half ago, erected some seven wind mills in connection with their dry farm at Cheyenne. Some of you from Wyoming may be able to tell more about it than I can. I visited the station last fall and Mr. Blair was determining what these different makes of windmills would do. He had, in connection with these, a series of reservoirs and he was determining the loss from these reservoirs by percolation and seepage, and the best method of preventing that loss. He intends to get out a publication, not very large, but something that will give you men an idea of what a windmill will do under proper conditions. That publication ought to be ready by the time we meet again.

One of the best types of windmills operating under an average wind movement of ten miles per hour should pump sufficient water in a season through a lift of 20 feet to irrigate 5 acres. I think here is a chance for some of the inter-mountain states. I have spoken of the irrigation canal and the fact that the best land under that canal is the arid land that is not under it at all, but is above it. I believe installing windmills and pumping water above that canal twenty or thirty feet would prove to be a paying investment. The cost of a twelve-foot windmill would be about \$230. Then one should have as a necessary adjunct to a mill a tank or small reservoir to store the water until it was needed for irrigation, and that might possibly bring the cost up to \$500. But the interest on \$500 at six per cent is only \$30, and if this will irrigate four or five acres it seems to me to be a paying investment.

### Pumping Plants.

I come now to pumping plants. When water has to be pumped from deep wells or when a considerable area of land has to be irrigated, some kind of engine or motor is to be preferred to a windmill. Pumping water for irrigation purposes has reached its highest development in southern California, where about four-fifths of the water used in the irrigation of citrus orchards is pumped from wells. The gross revenue from this crop was estimated at \$30,000,000 for the past year. In 1906 in that region it was something like \$36,000,000. This will show you what water pumped from wells in that climate will do.

Lemons and oranges cannot be grown on the dry farms of the Rocky Mountain states, nor is crude oil or gasoline so cheap or abundant, but this region possesses other advantages. There is an abundant supply of good coal, scarcely any limit to the electric energy that may be created from the torrential streams and an opportunity to raise a large variety of crops which may prove in the end nearly as profitable as the orange. A few years ago my friend, Mr. T. T. Black, of Whitehall, Montana, raised 27,000 quarts of strawberries on three acres and after shipping them to a commission house in Vermont, received a net return of \$900 an acre. This reference to a commercial berry patch in Montana is only one of hundreds that might be given of the profitable crops that might be grown all over the Rocky Mountain region. It is well to note, however, that such crops and such profits can only be obtained as a result of irrigation. No amount of scientific seed breeding or culture can ever take the place of a little water applied at the right time.

In this belief the irrigation division of the U. S. Office of Experiment Stations began some time ago the investigation of practical means of supplying the dry farms with a limited amount of water. These investigations include storage reservoirs, winter irrigation, windmills, pumping plants and a comparison between the yields and profits on both irrigated and non-irrigated land under similar climatic and soil conditions. Before this Congress convenes again we hope to have ready for publication a practical treatise on the windmill, another on the small storage reservoir and a third on pumping plants. The purpose of these manuals is to furnish such information as the settler desires.

In the prosecution of these studies we would like to have the advice and helpful criticisms of this body. If the investigation of small water supplies, such as are derived from wells, springs, dry ravines and other sources, with a view to their utilization by the dry farmer, is not likely to prove valuable we wish to know it. On the other hand, if the storage reservoir, the windmill, the pumping plant and the application of waste water in the late fall or early spring months are certain to become well nigh essential features in the establishment of permanent homes on the dry western prairies and mountain slopes we would like you to voice your approval and pledge your support.

In this connection I have to suggest that the President of this Congress appoint a standing committee of five members whose duty it shall be to



collect information on the best means of providing limited water supplies for dry farms and report the results of its labors at the next annual meeting. By appointing these standing committees on these subjects, these standing committees would keep in touch with certain branches of the work from the time you meet here, say until you meet in some other state next year, and I would suggest, Mr. President, that you appoint a standing committee of five members, whose duties it shall be to collect information on these subjects and report at the next annual meeting.

I thank you, gentlemen, for the attention you have given me. (Applause.)

CHAIRMAN DERN: The next thing in order will be the report from the chairman of the committee on resolutions, Mr. Chilcott.

MR. CHILCOTT: Mr. Chairman, Ladies and Gentlemen: We seem to be up against a condition. Professor Fortier, who has just addressed you, found it necessary to leave, and therefore he took my place on the program. I was very glad to be able to do him this courtesy, but you know there is one thing about the people down there at Washington, when they get agoing they are very apt to talk and consume more time than they figure on. The time that was to be used by Professor Fortier and myself previous to the election of officers has been consumed, and in order to expedite matters, it occurred to the resolution committee that if a committee were appointed, a nominating committee, that could receive the nominations from the delegates from the various states and could get them in such shape to present to this body it would save much time. While that committee was in action we could go on with the regular program. It is not the purpose of this resolution to take from the delegates from the several states the power of appointing their representatives on the executive committee nor to interfere in any way with their views in the nomination of the officers of the convention. It is simply a part of the machinery to expedite the business of this Congress. Therefore your resolutions committee wishes to submit this report for your consideration, and hopes that you may adopt it in order to expedite matters.

RESOLVED, That it is the sense of your committee on resolutions that owing to the short time for preparation for the selection of your officers and executive committee under the amendment to the constitution, it would avoid confusion in the convention to have such officers and committee selected by a committee on nominations, consisting of five accredited delegates to be named at once by the chairman of the Congress, such committee to receive nominations from state delegations as provided by the Constitution, nominations to close at 12 o'clock noon, and to be reported back to the Congress before the close of this session.

MR. CHAIRMAN: I move the adoption of this committee report by the convention.

MR. ATKINSON: I second the motion.

CHAIRMAN DERN: You have heard the motion. Are you ready for the question?

The motion was then put to a vote and declared carried.

CHAIRMAN DERN: The chair will appoint as the nominating committee, Mr. Burrell, of Idaho; Mr. Root, of Colorado; Mr. Paxman, of Utah; Mr. Buffum, of Wyoming, and Mr. Atkinson, of Montana.

MR. BURRELL: I believe it would be wise for this nominating committee to meet now. Where would be a convenient office to meet in.

CHAIRMAN DERN: The committee may meet at once in the resolutions committee room right to the left of the stand.

MR. BURRELL: I would ask that the committee retire at once.

CHAIRMAN DERN: I believe it would be a good plan.

The Congress will now listen to an address by Professor E. C. Chilcott, in charge of Office of Dry Land Agriculture, Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C., on the subject of

### **DRY FARMING—PAST AND FUTURE.**

(By E. C. Chilcott, Agriculturist in Charge.)

Ladies and Gentlemen: You will remember that I pointed out to you one of the failings of the people from the department—that they talk too much. I have therefore taken the precaution to write down what I want to say to you and shall read a portion of it to you. If I wander off at a tangent someone can call me down. I am liable to do such things.

#### **Dry Land Agriculture Investigations in the Great Plains Area.**

One year ago we met in the city of Denver on the eastern slope of the Rocky Mountains to inaugurate an experiment. Today we meet on the western slope to analyze the first results of this experiment, which was to determine whether the great diversity of interests concerned in the development of agriculture without irrigation in the semi-arid portions of the United States could be brought together, harmonized and organized. The large attendance and active interest shown at this meeting gives a most emphatic affirmative answer to the major question involved in this experiment. From now on we are an organization, not an experiment. But this organization must foster and utilize many experiments in order to accomplish the purpose of the organization. Perhaps the most important experiment of all is to determine how best to utilize the vast wealth of experience, theory, hopes, fears, dreams, ambitions, systems, schemes, plans, projects, and investigations that have been or are to be developed and promulgated by the members of this organization. I see before me all sorts and conditions of men; men who have theories to sell, and men who have theories to give away; men who are seeking information, and men who are overburdened with information that they want to impart; men who have land, books, implements and systems to sell, men who are willing to buy all these things if they can be convinced that they are what they are represented to be; men of wide experience representing vast interests; and men of very limited experience with very narrow interests; men who are cocksure that they have solved all the more important problems involved in dry land agriculture, and men who are equally sure that little or nothing has yet been learned concerning some of the great fundamental principles

involved; men who believe that climatic conditions are being modified to fit the needs of agriculture, and those who are equally sure that climatic conditions are practically constant and unchangeable from generation to generation; men who want to improve their methods of farming, and men who want to tell others how to farm; representatives of great transportation companies who want to haul people into the country and to carry the products of the activities of the people out of the country. There are representatives here of the various agencies calculated to minister to all the wants, spiritual and material, of a dense and highly civilized population, which we hope may some day occupy the semi-arid portions of the country that are now but sparsely settled, and where the comforts and luxuries of life are in a more or less primitive state, and where agricultural methods are still crude and unsatisfactory. But with all this diversity of interest, the heterogeneous mass of humanity has one common interest, and that is the successful agricultural development of the semi-arid lands of the United States. If this organization does not become an effective machine to aid in bringing about this result it will not be from need of common incentive, nor the lack of mechanical material, for I am sure that we can furnish an ample supply of mechanical parts for almost any kind of a machine. Nor does it seem probable that there will ever be any difficulty in generating sufficient heat to run the machine. What we need perhaps more than anything else at this stage of our development is a saving sense of humor that will enable us not only to see the amusing side of the foibles of our associates, but also of ourselves, when they are pointed out to us; that will allow us to submit good-naturedly to a considerable amount of hammering; filing and fitting of the various parts of the machine, if they do not go together just as they ought, and even if the machine "wobbles a bit" after we get it going, to enable us to patiently adjust its parts so it will run more steadily. I cannot better express my ideas on this point than by a short quotation from Samuel McChord Crothers' essay on "The Mission of Humor."

"This is a big world and it is a serious business to live in it. It makes many demands. It requires intensity of thought and strenuousness of will and solidity of judgment. Great tasks are set before us. We catch fugitive glimpses of beauty and try to fix them forever in perfect form—that is the task of art. We see thousands of disconnected facts and try to arrange them in orderly sequence—that is the task of science. We see the ongoing of eternal force and seek some reason for it—that is the task of philosophy.

"But when art and science and philosophy have done their best there is a great deal of valuable material left over. There are facts that will not fit into any theory, but which keep popping up at us from the most unexpected places. Everything is under the reign of strict law, but queer things happen nevertheless. What are we to do with all the waifs and strays? What are we to do with all the sudden incongruities which mock at our wisdom and destroy the symmetry of our ideas?

"The solemnly logical intelligence ignores their existence. It does not trouble itself about anything which does not belong to its system. The system itself has such perfect beauty that it is its own excuse for being.

"More sensitive and less self-centered natures do not find the way so easy. They allow themselves to be worried by the incongruities which they cannot ignore. It seems to them that whenever they are in earnest the world conspires to mock them. Continually they feel that intellect and conscience are insulted by whipper-snappers of facts that have no right to be in an orderly universe. They can expose a lie and feel a certain superiority in doing it; but a little unclassified truth downs them to their wits' end. There it stands in all its shameless actuality asking, 'What do you make of me?'"

"Just here comes the beneficent mission of humor. It takes these unassorted realities that are the despair of the sober intelligence, and extracts from them pure joy. If life depends on the perpetual adjustment of the organism to its environment, humor is the means by which the intellectual life is sustained on those occasions where the expected environment is not there; the adjustment must be made without a moment's warning to an altogether new set of conditions.

"Humor is impossible to the man of one idea. There must be at least two ideas moving in opposite directions so that there may be a collision. Such an accident does not happen in a 'mind under economical management that runs only one train of thought a day.'"

Considering the Trans-Missouri Dry Farming Congress as a somewhat complex machine made up of many parts that have not yet been perfectly fitted together, I will attempt to define briefly what I conceive to be the function of the office of Dry Land Agriculture as a part of this machine, relying upon your sense of humor to dispose of any incongruities that may appear.

I will again quote briefly from the same author in his essay on the "Honorable Points of Ignorance."

"It must have occurred to every serious person that the pursuit of knowledge is not what it once was. Time was when to know seemed the easiest thing in the world. All that a man had to do was to assert dogmatically that a thing was so and then argue it out with someone who had even less acquaintance with the subject than he had. He was not hampered by a rigid scientific method, nor did he need to make experiments, which after all might not strengthen his position. The chief thing was a certain tenacity of opinion which would enable him in Pope's phrase, 'to hold the eel of science by the tail.' There were no troublesome experts to cast discredit on the slippery sport. If a man had a knack at metaphysics and a fine flow of technical language, he could satisfy all reasonable curiosity about the Universe. It was the golden age of the amateur when certainty could be had for the asking, and one could stake out any part of the wide domain of human interest and hold it by right of squatter sovereignty. But in these days the man who aspires to know must do something more

than assert his convictions. He must submit to all sorts of mortifying tests and at best he can obtain title to only the tiniest bit of the field he covets."

This, then, I conceive to be the legitimate function of the Office of Dry Land Agriculture. It is to afford facilities for bringing into the field of investigation of the scientific problems of Dry Land Agriculture a corps of trained scientists, each one a specialist in some one line. These men may prove to be "troublesome experts" who will "cast discredit on the slippery sport" of "holding the eel of science by the tail," if there chance to be those who are still addicted to this slippery sport. They certainly will "submit to all sorts of mortifying tests" any theories that may be advanced concerning the practice of dry land agriculture in the Great Plains Area, and it is quite possible that they may play havoc with some systems and theories that are "so beautiful that they are their own excuse for being." But the fact that the conclusions arrived at by these experts will be the consensus of opinion of a considerable number of trained specialists, serves to completely eliminate the personal element and ought to give greater weight to their conclusions than would attach to those of any other body of investigators along the same line, not so much on account of their individual superiority as investigators, but because they have better facilities for carrying on their investigations over a wide area under a system that subjects the work of each to the rigid scientific scrutiny of all the others. It must not be understood that the work of these investigators is primarily destructive, for such is not the case. Their work is constructive and conservative. Theirs will be a search for truth, and any fact, theory or system that will stand the test of rigid scientific methods will be welcomed by them no matter what its source.

A residence of twenty-five years in the Great Plains, during all of which time I was in close touch with agricultural problems and during half of which I was in charge of the agricultural field investigations of the South Dakota Experiment Station convinced me that no progress could be made toward a solution of the fundamental problems of dry land agriculture until a large number of trained experts could carry on thoroughly systematized investigations at a considerable number of representative stations, distributed over a wide area having somewhat similar soil and climatic conditions, and that these investigations must be continued uninterruptedly for a long term of years. When I was called to Washington to organize the work in Dry Land Agriculture Investigations I accordingly established the work on this basis. I first sought the co-operation of the trained experts in soil physics, meteorology, chemistry, plant physiology, plant breeding, cereal investigations, soil bacteriology, sugar beet investigations, forage crop investigations, and later, pomology, forestry and animal industry. I then sought, and in most instances obtained, co-operation with the State Experiment Stations throughout the Great Plains. We now have eleven stations in successful operation, seven of which are in co-operation with State Experiment Stations and four of them independent. The co-operation stations are located at Judith Basin, Montana; Dickinson and Edgeley, North Dakota; Highmore, South Dakota; North

Platte, Nebraska; Hays and Garden City, Kansas. The independent stations are located at Belle Fourche, South Dakota; Akron, Colorado; Dalhart and Amarillo, Texas. An additional co-operative station will in all probability be established at Williston, North Dakota, early in the spring, making twelve stations that will carry on work during the coming season. At five of these stations two years' results have been obtained; at two a single year's results; and at the other five the land has been fitted and the organization effected preparatory to beginning field work as soon as spring opens. The general plan of the work at all these twelve stations is the same, so the results obtained at each station are strictly comparable with those of all the others.

In planning this work I have freely availed myself of the counsel and advice of practically all the investigators, both in the U. S. Department of Agriculture and in the State Experiment Stations of the states of the Great Plains who are engaged in investigations along lines having a bearing on the problems involved in dry land agriculture. The technical details of the field work are under the immediate supervision of trained experts located at each of the stations, who act under the direction of the specialists of the U. S. Department of Agriculture in the various lines of investigation. These field men are all brought into Washington at the close of each season and the results of their season's work carefully analyzed, compared and recorded under the direction of the specialists in each of the several lines of work already enumerated, and in the case of the co-operative stations the results of each season's work is also sent to the State Experiment Station co-operating and there subject to criticism and analysis.

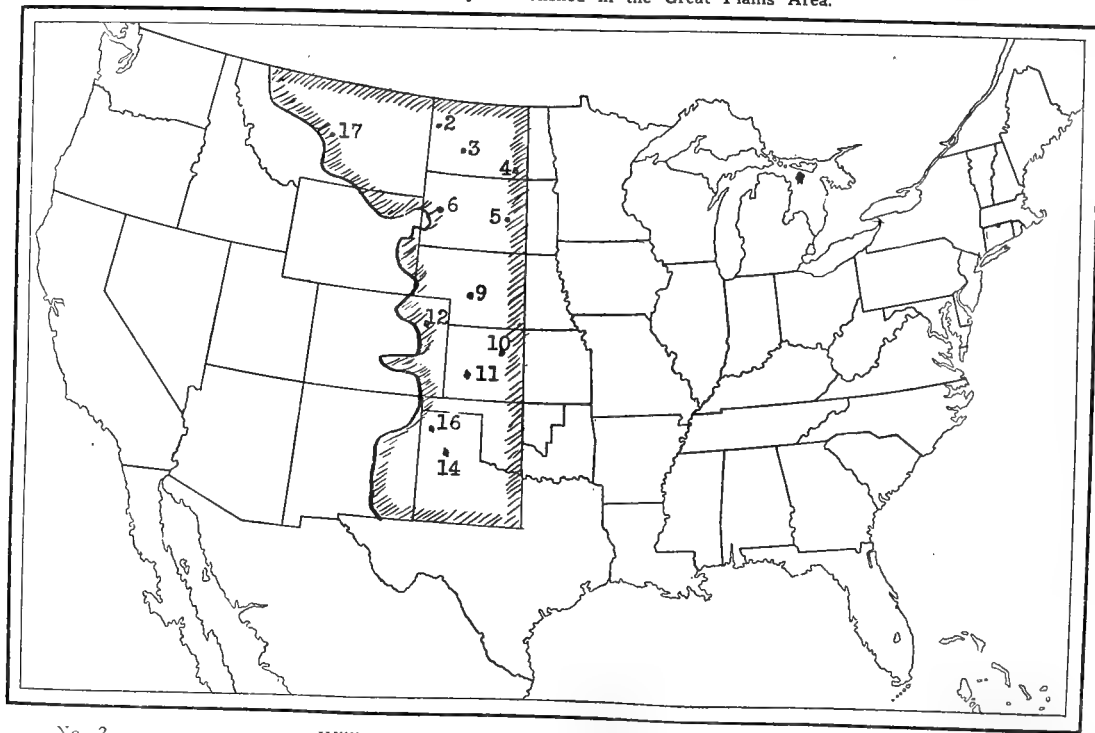
All of the stations are equipped with necessary tools, implements, etc., for carrying on the field work and weighing and measuring the results. The plats are very accurately laid off. Great care was taken in the selection of the land in order to insure uniformity and the work has in every way been conducted according to the most approved methods. Each station also has a full set of instruments for measuring the various meteorological and physical factors, which work is under the supervision of Dr. L. J. Briggs, Physicist of the Bureau of Plant Industry, who will have something to say to you on this subject. At nearly all of the stations work in Cereal Investigations is being conducted by W. M. Jardine, Assistant Cerealists, who will address you. At some of the stations investigations in Soil Bacteriology have been carried on. The Soil Bacteriologist is present at this meeting and may have something of interest to present to you. At each station from seventy-five to one hundred and fifty plats are used for the investigations in crop rotation and cultivation methods. They are divided into three groups: one for testing methods of soil preparation, continuous cropping with and without special precautions for moisture conservation, alternate cropping and summer tillage; one for testing the effect of crop sequence and time of plowing; and one for testing the effect of humus conservation by the plowing under of green manure crops, both legumes and nonlegumes being used. The work is so arranged as to allow of an elaborate and accurate system of cross checking, not only between the







Sub-Stations Already Established in the Great Plains Area.



- No. 2.....Williston Project.  
 No. 3.....Dickinson Project.  
 No. 4.....Edgeley Project.  
 No. 5.....Highmore Project.  
 No. 6.....Belle Fourche Project.  
 No. 9.....North Platte Project.

- No. 10.....Hays Project.  
 No. 11.....Garden City Project.  
 No. 12.....Akron Project.  
 No. 14.....Amarillo Project.  
 No. 16.....Dalhart Project.  
 No. 17.....Judith Basin Project.



plats and rotations of a single station, but also between those of all the stations. In this way practically all of the various methods of agricultural practice in common use in the area, as well as those which have been advocated and advertised as "new" are being thoroughly tested under rigidly scientific methods, which should give thoroughly reliable quantitative values for each and every practice. The mass of data already obtained is far too great to give in detail at this time, but nevertheless the investigations have not extended over a sufficient length of time to warrant us in drawing definite conclusions, although some very suggestive results have been obtained. I do not wish to call attention to these suggestions at this time, but rather wish to point out some of the difficulties in the way of obtaining reliable data, and some of the dangers involved in drawing conclusions from a too limited field of observation. For this purpose I have tabulated the results of the yields of spring wheat from the plats in the various rotations at North Platte, Nebraska. I have selected this station for several reasons. First, it is very nearly in the geographical center of the Great Plains Area and therefore represents the average conditions of the area. Second, the land upon which the plats are located is very uniform and representative of a very considerable extent of upland in Nebraska, Kansas, and Colorado. It is what is known to geologists as loess. Third, the work is in charge of one of our most accurate and painstaking investigators, Mr. W. W. Burr, a graduate of the University of Nebraska, who has been in charge of this work for the last two years. I have selected the spring wheat crop rather than oats, barley, corn, or any of the other forage crops, because it is more generally grown throughout the area than any of the others. I think therefore that we can safely assume that the accuracy of the work and the consequent reliability of the results will compare favorably with those of any other investigations along similar lines.

## Results Obtained at North Platte, Nebraska, 1907.

## Yields of Wheat—Different Methods of Culture.

Rotation No.	Plat	Total lbs.	Straw lbs.	Grain lbs.	Bu. per acre.
Spring Plowing.					
2	C	305	163	142	23.7
9	A	251	126	125	20.8
Tillage	A	351	204	147	24.5
48	C	336	195	141	23.5
Average....		311	172	139	23.1
Fall Plowing.					
4	A	361	216	145	24.2
8	A	470	300	170	28.2
3	C	263	139	124	20.8
Tillage	B	410	254	156	26.8
43	C	355	210	145	24.2
49	A	309	175	134	22.8
Average....		361	216	146	24.3
Disced Corn Land.					
41	E	363	203	160	26.7
42	E	335	200	135	22.5
1	C	325	191	134	22.3
44	C	...	...	150	25.0
16	A	406	234	172	28.7
14	A	337	186	151	25.2
19	A	320	180	140	23.3
Average....		348	199	149	24.8
Summer Tilled.					
5	C	439	283	156	26.0
Tillage	D	524	333	191	31.8
Average....		481	308	173	28.9
SUMMARY.					
Method.			No. Plat average.	Avg. yield per acre in bushels.	
1—On summer tilled land.....			2	28.9	
2—Fall plowed oat land.....			2	26.3	
3—Fall plowed wheat land, thorough tillage..			1	26.0	
4—On disced corn land.....			7	24.8	
5—Spring plowed wheat land.....			1	24.5	
6—Spring plowed corn land.....			1	23.7	
7—Spring plowed sorghum land.....			1	23.5	
8—Fall plowed corn land.....			3	22.4	
9—Spring plowed oat land.....			1	20.8	

It must be borne in mind that these are the results of a single crop grown at a single station for a single year. We have, however, nineteen plats which may be grouped so as to give **average** results of the various methods of farming used. When we take into consideration the fact that many of the claims made for various methods of tillage are based upon the com-

parative results of only **two** plats or fields, and in some instances upon the yields of only a **single field** with nothing to compare these yields with except the average yields of the county or state, with no attention being paid in either case to the many other factors involved, such as character, past history and uniformity of soil, I think the significance of the facts to which I am about to call your attention will become apparent. It is perhaps unnecessary to state that upon all of these wheat plats the same variety of grain and the same rate of seeding was used, and that every precaution was taken to eliminate all factors that might influence the results, except the two factors of crop sequence and tillage.

In the first part of the accompanying table we have arranged the 19 plats in four groups, representing spring plowing, fall plowing, disced corn land, and summer tilled land. In this grouping it will be noticed that we have disregarded the factor of crop sequence entirely and have based our groupings entirely upon the difference in methods of tillage. In the summary we have arranged the same 19 plats in nine groups, basing our subdivisions upon both the method tillage and crop sequence, or the kind of crop that had been grown on the plat during the previous season.

It will be noticed that the four spring plowed plats gave an average yield of 23.1 bushels per acre; the six fall plowed plats gave an average yield of 24.3 bushels per acre; the seven plats upon disced corn land gave an average yield of 24.8 bushels per acre; and the two summer tilled plats gave an average yield of 28.9 bushels per acre, thus showing that the summer tilled plats yielded 5.8 bushels per acre more than spring plowed plats, 4.6 bushels per acre more than the fall plowed plats, and 4.1 bushels per acre more than the disced corn land plats. This comparison shows a decided advantage of the summer tilled plats over any of the others, but in no instance does the average yield from the summer tilled plats exceed that from the others sufficiently to warrant the extra expense and loss of the use of the land for a whole season which is involved in the practice of summer tillage.

I wish to say right here in that connection that summer tillage, or summer fallowing, as it is sometimes called, is undoubtedly of greater advantage on the west side of the Rockies than it is on the eastern side. I base this supposition upon the reports I get from men who are thoroughly familiar with the principles of alternate cropping on the west side of the Rocky Mountains. But it does not follow that because it is a successful practice here it is a successful practice on the east side, and, as a matter of fact, at none of the stations during the past season did we get a sufficient increase of any crop to warrant us in the practice of summer tillage, with one exception, at Edgley, North Dakota, we got a yield of 125 bushels of oats per acre from a summer tilled plat, whereas we only got about half that much from fall plowed land. But that is the only instance last season where we got a sufficient increase to warrant the expense of this practice. I don't say that will follow for another season. I just simply throw that out to show you that we cannot get any system that is going to fit all conditions.

It will be noticed also that the difference in yields between the two summer tilled plats, one of which yielded 26 bushels per acre and the other 31.8 bushels per acre, was 5.8 bushels, which happens to be exactly the same difference as the average yield between the summer tilled plats and the spring plowed plats. It will also be noticed that there were two of the disced corn land plats, each of which yielded more than one of the summer tilled plats; that there was one of the fall plowed plats that yielded more than the summer tilled plats, and another that yielded exactly the same. If, therefore, instead of having had nineteen plats of wheat, we had had but five, and those five were the summer tilled plats, yielding 26 bushels per acre; the two disced corn plats, yielding 28.7 and 26.7 bushels per acre and the two fall plowed plats, yielding respectively 28.3 and 26 bushels per acre, we would have arrived at the conclusion that summer tillage actually gives less yield than either fall plowing or seeding wheat on unplowed disced corn land. If on the other hand we had had but four plats and those four plats were the plats on summer tillage, yielding 31.8 bushels per acre, the one on disced corn land, yielding 22.3 bushels per acre, the one on fall plowing yielding 20.7 bushels per acre and the one on spring plowing yielding 20.8 bushels per acre, we would have arrived at the conclusion that summer tilled land gave 9.6 bushels per acre better yield than disced corn land, 11.1 bushels per acre more than fall plowing, and 11 bushels per acre more than spring plowing, and that summer tilled land gave 10.5 bushels more than the average yield of the other three methods. If we were to take the largest yield obtained from any of the spring plowed plats, 24.5 bushels per acre, and compare it with the smallest yields obtained from the fall plowed and disced corn plats, respectively 20.7 bushels and 22.3 bushels per acre, we would come to the conclusion that spring plowing was superior to either fall plowing or disced corn land. If we were to compare the best three fall plowed plats with the poorest three disced corn plats we would come to the conclusion that fall plowing was superior to disced corn land. Many other hypothetical groupings of a relatively small number of plats might be made, from which equally diverse and misleading conclusions might be drawn. I think, however, that enough has already been shown to indicate the utter futility of any attempt at making broad generalizations from the comparison of so small a number of plats.

Referring now to the summary we find that spring plowed oat land gave the lowest average yield, 20.8 bushels per acre; that summer tilled land gave the highest average yield, 28.9 bushels per acre, a difference of 8.1 bushels in favor of summer tilled land. We find that fall plowed corn land gave next to the lowest yield, 22.4 bushels per acre, but there were three plats of fall plowed corn land, one of which gave 20.7 bushels per acre, one 22.3 bushels and one 26 bushels per acre, the fall plowed corn plat giving the highest yield of the three yielding within .3 of a bushel per acre as much as the average yield obtained from the fall plowed oat land, which yielded 26.3 bushels per acre. But there were two plats of fall plowed oat land, one of which yielded 24.2 and the other 28.3 bushels

per acre, thus showing that the variation of yield within the groups, both in the first and in the second part of the table, is greater than the difference between the average yields of the groups as arranged.

The extreme range in yields in the spring plowed group of the first part of the table is 3.7 bushels per acre. The extreme range of the fall plowed group is 7.6 bushels. The range in the disced corn group is 6.4 bushels. As has been mentioned, the range in the summer tilled group is 5.8 bushels. Taking these figures as just given, we find that the average range of yields within the four groups is 5.8, while the greatest difference between the averages of the two extreme groups, spring plowing and summer tillage is almost exactly the same, that is 5.8 bushels per acre.

In the summary we find that one fall plowed plat of wheat land gave a yield of 26 bushels per acre, while the average yield obtained from the two fall plowed plats on oat land was 26.3 bushels per acre, but as already noted, the two fall plowed plats of oat land gave yields of 24.2 and 28.3 bushels per acre, respectively. Now, if we compare our 26 bushel yield, obtained from the fall plowed wheat plat with the 24.2 bushel yield of the fall plowed oat plat, we come to the conclusion that continuous cropping to wheat gives a yield of 1.8 bushels per acre more than following wheat after oats. If, on the other hand, we compare the yield from our fall plowed wheat plat with that of the other fall plowed oat plat, which gave 28.3 bushels per acre, we come to just the opposite conclusion, which is that following wheat after oats gives 2.3 bushels more than continuous cropping to wheat.

We might continue this kind of regrouping and cross checking indefinitely, but I think that enough has been said to indicate the dangers of too much generalization, from a too limited observation.

We find that our figures instead of not proving enough, prove altogether too much. We find, to use Mr. Crother's expression, that we have discovered a large number of "little unclassified truths that drive us to our wits' end." There they stand, each in its shameless actuality, asking, "What do you propose to do with me?" Mr. Crothers suggests that at this stage it is the mission of humor to appear upon the scene and convert these incongruities into pure joy. I think, however, that we can devote them to a much better purpose, although we are not disposed to deprive ourselves or anyone else of any of the joy that they may be able to derive from them. I think that these facts which refuse to be classified according to any system yet established do not indicate that they cannot be systematized, but simply show us that no system has yet been devised that will fit all of the facts; that in attempting to draw conclusions based upon the consideration of only the facts of tillage and crop-sequence we have ignored other factors that are of even greater importance than those we are considering. Just what the factors are that have played havoc with our conclusions, I will not attempt to state. I have no doubt that some of them are entirely unknown. I will venture to say, however, that they are mainly physical, chemical and bacteriological; that if we knew all that might be known concerning the physical, chemical and bacteriological conditions of the soil

on the several plats we would find much less difficulty in reconciling our results. Looked at, then, from this point, our experiments instead of establishing too many facts, have, so far as this table shows, established too few. If we had even the additional facts which have been established by the physical investigations carried on by Dr. Briggs upon these plats we could come much nearer to an explanation of the seemingly incongruous results obtained. But even these facts would not be sufficient to enable us to draw any definite conclusions. We must not only know something of the chemical conditions and changes in the soil, but we must also learn much more than we now know concerning the bacterial life of the soil, before we can venture to draw any definite conclusions, and the work must, as has already been repeatedly stated, be carried on for a long term of years at many different stations before we can reach that degree of certainty concerning many of the problems involved, that will warrant us in formulating our knowledge into any definite system. As I stated at the beginning of the discussion of results from the North Platte Station, all of the theories which have been formulated and all of the systems, the establishment of which has been attempted, either by theorists or practical farmers, have been based solely upon differences in crop yields obtained from different fields, receiving different methods of tillage, often without any precautions whatever being taken to see that the two fields in question were of uniform condition at the time the experiment was undertaken. If there were the same opportunity to analyze the facts upon which the attempt has been made to establish these theories and systems that there is to analyze the results of last season's work at North Platte, there is no doubt that the number of unclassified facts would be even greater in this instance.

I here submit the conclusions at which I have arrived from a study of the two years' work at the North Platte Station.

1.—The problems involved in crop rotation and cultivation methods are exceedingly complex and are made up of many factors, such as seasonal soil and air temperature, evaporation, humidity, wind velocities, sunshine, altitude, topography, exposure or lay of the land, chemical composition, physical composition, structure and tilth of the soil, effect of previous cropping and tillage, crop sequence, varietal and physiological peculiarities of crops grown, and probably many other factors even more obscure and difficult to deal with.

2.—From the standpoint of the practical farmer the above mentioned factors may be divided into two groups: the modifiable and the unmodifiable. The modifiable factors are those which are more or less under the control of man, such as the chemical composition and physical structure, tilth and moisture of the soil, crop sequence, seed selection, etc. The unmodifiable group includes by far the greater number of these factors, which can be controlled by man to only a very limited extent or not at all, such as general climatic conditions, topography, physical composition of the soil, etc. If these unmodifiable factors were constant in their occurrence, and in their relations to each other, the problem would be



comparatively simple, but they are not. They are continually combining and recombining in ever-changing relations to each other and to the modifiable factors; sometimes one group and sometimes another being the controlling one.

3.—When we consider that the modifiable factors are not only relatively few in number, but that they can be controlled by man to only a limited extent, and that their effect upon the peculiar combination of unmodifiable factors existing at the time is problematical when modified in any given direction, the difficulties and dangers involved in any attempt to deduce any general principles governing the effects of various agricultural practices calculated to so modify the soil conditions as to insure the maximum yield of crops at once become apparent.

4.—The above considerations lead us to an explanation of the fact that although farming has been carried on in the Great Plains Area for more than a quarter of a century, very little progress has been made toward a solution of some of the simplest problems of farm practice, such as the best time and depth of plowing, crop rotation, tillage, summer fallowing, etc. They show also the utter futility of any attempt to establish a definite system of tillage based upon any limited experience in restricted localities and under circumstances where at best only a very few of the many factors involved can be measured, such as has been made by parties interested in the commercial exploitation of lands in the semi-arid districts.

5.—On the other hand we believe that the results so far obtained at this station lend strong support to the belief held by those in charge of this co-operative work that some very definite relations can be established between methods and results which will be applicable to the entire practice of agriculture in the semi-arid districts, if this work is developed as it has been begun, by first attempting, so far as possible, to measure every factor, physical, chemical and biological, that enters into the production of crops; and in the second place having a large number of closely correlated rotations at each station, upon many of which the same crop is raised under like conditions, thus affording an opportunity for cross checking and averaging results so as to eliminate many of the unknown factors which are likely to vitiate results where only one or two fields are used.

6.—Even after every precaution has been taken to eliminate errors by exercising the greatest possible care in the selection of the land, the laying out of the plats, and the harvesting and weighing of the crops, and by the correlation of rotation, duplication of plats, checking up results obtained from crop yields by physical, chemical and botanical determinations, and the continuation of the work under a definite system through a long term of years, as has been planned for this station, it will not be until the results of the work at North Platte have been compared with the results from a dozen or more other stations in the Great Plains Area, as will be done by the Office of Dry Land Agriculture, U. S. Department of Agriculture, that definite conclusions can be drawn con-

cerning many of the vital problems of Dry Land Agriculture. It is believed, however, that the results already obtained at North Platte will prove of value to the farmers of Nebraska, if in no other way than by pointing out to them how little is really known about some of the simplest problems of farm practice; how difficult it is to obtain definite and reliable information and how dangerous it is to draw hasty conclusions from a too limited experience.

MR. ELDRIDGE, of Utah: I wish to ask whether the period of planting was at the same time in the season with the spring plowed and summer tilled.

PROF. CHILCOTT: The planting was on the same day.

MR. ELDRIDGE: At what season did you plant?

PROF. CHILCOTT: I could not give you the exact date of the planting there, but I should say in the early part of April. It was a Durham wheat that was planted there, and it was during the first weeks of April, I think. It was at the season when it seemed to be the best time to sow. It came off cold and dry along in May, however, and it suffered somewhat from the cold weather after it had come up. That was one point brought out in that connection, that these summer tilled plats, where the conditions for germination were most favorable, grew faster in the early part of the season, and therefore when the frost came on in May they suffered more than the other plats. That probably is one reason why we did not get a greater yield. It possibly may account for the difference between these two plats. But very often we find that if we have adverse conditions during the growing season those plats that are in the best condition and therefore produce the most strength and best growth early in the season suffer the most. Sometimes the very things from which we think we can reasonably expect good results turn around and work just in the opposite direction. What we want to do is to carry on these investigations long enough so we can find, in a given locality, what practice will result in the best way on an average through a long term of years.

A DELEGATE: I would like to ask what is the character of the soils on these plats?

MR. CHILCOTT: It is a very fine soil. It is supposed they are made by the combined action of sun and water—a very fine soil. It is what you would call a fine sandy loam, although more loam than sand, a very tillable soil—a soil that is an excellent corn soil, a fair wheat soil, such as I presume many in the audience are familiar with in Kansas and Nebraska.

MR. BECK, of Utah: I would like to ask how that summer tilling was done?

MR. CHILCOTT: I haven't the figures at hand and I can't give you the time that each plat was tilled, but in a general way the summer tillage was as follows: In the year, we will say 1905, the fall of the year of 1905, the summer tilled plats were plowed and packed and thoroughly put in thorough good tilt in the fall. The next spring they were double

disced and then kept harrowed after each rain, and they received two double discings, two cultivations with a Planet Junior cultivator, and, if my recollection serves me right, seven harrowings. It was very close to that. The tillage was thorough. It was as thorough as anyone could ask for or expect, and as thorough as could have served any purpose whatever. We don't adopt exactly the same method of tillage at all of the stations, because the frequency of tillage depends, of course, upon the rains. Whenever a rain came that crusted it over it was harrowed, if a longer time elapsed between rains a longer time elapsed between the different harrowings. But in a general way that is what is meant by summer tillage.

MR. BECK: Was any of this plowing done during the growing season?

PROF. CHILCOTT: Yes, the plats were harrowed after the grain came up; at the time of seeding and then after the grain came up; they were harrowed as long as could be done without injuring the plats.

MR. ELDRIDGE, of Utah: There is another question I would like to ask. I see there is a slight difference in the acreage. Was the plowing about the same period in the field that fixed your 28.3 and your 24 bushels?

PROF. CHILCOTT: Yes, sir; just as near as possible. The plowing was done on exactly the same day where we were testing these things. I would not say it was done all on actually the same day, but not more than two days could possibly have elapsed between the times of plowing. Every precaution is taken to eliminate all of these factors as far as we can.

MR. ELDRIDGE: I would just say, my reason for asking that question is, I have demonstrated that three days' difference in plowing in the field will make a difference of ten bushels per acre in the yield.

PROF. CHILCOTT: I have no doubt of it. I have no doubt that would occur.

MR. ELDRIDGE: I don't wish to take your time, but I wish to say that the time of plowing has a great deal to do with it. I know that in plowing there came a snow and the plowing was continued after the snow, and from the very line that the furrow was struck where the snow fell that produced a difference in the yield.

PROF. CHILCOTT: Yes, I think that is right along the line of what I have said. There are factors. There it was the fall of the season. There was something tangible, that you could go back from results to cause. But there are things that happen that are not so tangible, that we are not able to understand. These are the whipper-snappers of facts—facts that ought not to exist in an orderly universe, but they are there, and we might just as well recognize them, and we will come to the conclusion that we cannot lay down any hard, fast rule to fit all conditions. There are lots of things of this kind that are liable to happen, but we can come to a general practice that will fit the general average conditions, and when we find we have got a misfit make the best of it. That is the only way I know of solving the problem.

I wanted to say, before I close—and I know I have consumed a lot of your time—it may appear to some who have listened to my paper that I have made this problem so difficult that it will tend to discourage people. They may say, if all these difficulties are in our way we might as well give it up. Not at all. Nor do I want to convey the idea that because we have this improved system or machinery for investigation of these things that we have any monopoly on the origination of ideas. Right here is where the people represented in this audience—where their function comes in. That is the function of the individual farmer, and it is the function of this organization to bring these farmers together, and whenever we have one of these meetings the men can get together and relate their experience, and here is where we get a great many ideas, and when we get these ideas together we can work out from them a system; it gives us material from which to work. I have no doubt when I go back from this meeting I will carry with me many ideas based upon just such suggestions as have already been thrown out here, that I will find will be necessary to test. That is what I want; that is what I am here for. A farmer may be able to work out, or he may already have worked out a system applicable to his particular conditions. He may have, from long experience, found out what the best average practice is for his farm. Now, if he will tell us about it and let us know what that is, in all its minor details, then the problem for us to find out is whether that practice will fit somebody else's farm and so on, so that we can bring these things out and sort them out and work them out and thoroughly test them and then distribute them back to the people so that they will be much more valuable, not for the individual farmer that originated them, but for all other farmers who are situated under like conditions. And that is where this great organization, the Dry Farming Congress, can do a wonderful work, if it only will, if it can bring these various interests together. There is no conflict really, or, at least, ought not to be any conflict between the interests with reference to this question. We are seeking to develop this country. We want to develop the country. What for? Simply so that it will produce something; so that we can take this something out of the country. The farmers want to produce their yield, to make it more profitable. I hope before this organization closes its session that all of these various systems sometimes considered antagonistic will be found right together and working harmoniously.

I have been taking too much of your time, and I thank you. (Applause.)

MR. DAY, from Idaho: If I understand correctly there has been a resolution adopted here to perform certain business; if not this session adjourns. I move that the convention take a recess of ten minutes in order to allow the different delegations to hold meetings to do that business.

CHAIRMAN DERN: It would seem to me, it being very near twelve o'clock, it would be much better to simply call upon those who

are present and desire to offer any resolutions that they now do so, and then adjourn until a later hour. By taking a recess it will probably take ten minutes, it may take fifteen minutes or more to call the convention to order again, and it will carry us over the hour in our deliberations until very close to one o'clock. It is the judgment of the chair that the gentleman had better withdraw that motion and let us take it up in regular order this afternoon.

MR. DAY: I withdraw my motion, and move that we take a recess and not an adjournment.

MR. BURNS, of Montana: I would like to second the motion for a recess and not an adjournment, owing to the action of this convention yesterday, in which it decided that the election must take place during the first session of the second day of the Congress. Should this Congress adjourn the election would not be constitutional. I second the motion that we take a recess until two o'clock and in the meantime these delegations can do their talking between now and two o'clock. Call it a recess.

CHAIRMAN DERN: Before putting this motion I wish to state that the Secretary has some announcements to make.

SECRETARY ROOT: A telegram from Tombstone, Arizona: "Would be pleased to have next meeting Dry Farming Congress at Douglas, Arizona." Signed A. Wentworth, Mayor.

One from Cheyenne. "Don't forget Cheyenne wants the next Dry Farming Congress. Give us your vote and influence." Signed P. S. Cook and addressed to Fisher Harris, Secretary Commercial Club. (Applause.)

A DELEGATE: Good for Cheyenne.

SECRETARY ROOT: Another from Cheyenne. "The Industrial Club of Cheyenne and the citizens generally extend to your organization an invitation to hold your next Dry Farming Congress here. We are sending a delegation to Salt Lake City to solicit the convention. A. H. Marble, President."

Another from Cheyenne. "Cheyenne wants next Congress and will make it a success. W. C. Deming, Editor Tribune."

The Credentials Committee has turned in its report, as follows: "Your Committee on Credentials begs leave to report that the delegates named in the subjoined list, in which they appear by states, are entitled to seats in this Congress. The committee will submit a further report tomorrow morning." Here follows a list of the delegates. I take it it is not necessary to read the list. In totals there are 382 delegates registered: 286 from Utah, Idaho 52, Washington, D. C., 5, Oregon 2, Montana 3, Nebraska 2, Nevada 2, California 3, Arizona 1, North Dakota 1, Wyoming 18, Colorado 7.

CHAIRMAN DERN: What shall be done with the report of the Committee on Credentials?

MR. EVANS: I move that the report of the Committee on Credentials be received and approved.

The motion was duly seconded, put to a vote and declared carried.

MR. DERN: We will now vote on the motion to take a recess until two o'clock.

The motion was then put by the chair and declared carried. Thereupon the Congress took a recess until two o'clock P. M.

#### AFTERNOON SESSION.

The Congress was called to order at two o'clock P. M. by Hon. John Dern, presiding.

CHAIRMAN DERN: Before we proceed with the regular order of business the Secretary has some telegrams and communications which he will read.

SECRETARY ROOT: "On behalf of the citizens of Douglas I extend to you an invitation to hold the next Dry Farming Congress here. W. M. Adamson, Mayor." This is from Douglas, Arizona.

A letter from Benson, Arizona: "Mr. Fisher Harris, President Trans-Missouri Dry Farming Congress, Salt Lake City. We have, under date of the 9th inst., a letter addressed to the Benson Board of Trade, by Mr. G. J. McCabe, one of the representatives of this county, appointed at the last session of the Board of Supervisors, and we would say that we heartily endorse and appreciate this scientific movement and any co-operation in which this Board can be of service to you and its followers will be gladly given.

"Mr. McCabe, the representative from Cochise County, Arizona, is the 'right man in the right place,' and we hope through his efforts and others, that the next convention of the Congress for 1909 will be held in this county, and ultimately the establishment of experimental farms to determine limitations of scientific soil culture and seed selection in Cochise County, which with upwards of two million acres of agricultural lands, offers the heartiest possible inducement of any county in this great southwest.

"We believe that the City of Douglas would be the best point in this county at which to hold the next Congress.

"We hope that the united efforts of yourself and the representatives will be a success. Benson Board of Trade, by W. P. White, President."

CHAIRMAN DERN: The next in order will be the report of the Nominating Committee. The election of officers has been made a special order for this afternoon. Is the Committee ready to report?

MR. BURRELL, of Idaho, Chairman Nominations Committee: I submit, as chairman of the Committee on Nominations, this report, and move its adoption:

CHAIRMAN DERN: The Secretary will please read the report.

SECRETARY ROOT: "Your Committee on Nominations present the following nominations: For President, Governor B. B. Brooks, Cheyenne, Wyoming; for 1st Vice-President, E. A. Burrell, Montpelier, Idaho; 2nd Vice-President, H. W. Campbell, Lincoln, Nebraska; 3rd Vice-President, Governor Currie, Albuquerque, New Mexico; Executive Committee, from California, Douglas White, Los Angeles; South Dakota, Samuel H. Lea,

Pierre; Colorado, C. R. Root, Denver; North Dakota, O. W. Roberts, Bismarck; Arizona, G. J. McCabe; Montana, A. Atkinson, Bozeman; Idaho, F. C. Bowman, Idaho Falls; Nebraska, A. P. Moore, Brule; Oregon, J. M. Patterson, The Dalles; Wyoming, H. B. Henderson, Cheyenne; Kansas, H. J. Evans, Garden City; Nevada, Geo. F. Parker; Oklahoma, L. A. Morehouse, Stillwater; Utah, J. W. Paxman, Nephi; New Mexico, J. D. Tinsley, Agricultural College; Washington, Dr. Thatcher, Pullman; Department of Agriculture, Dr. L. J. Briggs, Washington, D. C. (Signed) E. A. Burrell, Chairman."

CHAIRMAN DERN: Gentlemen, you have heard the report of the committee. It has been moved that the nominations as made by the committee be declared the nominations of the convention. Are you ready for the question?

Question called for.

The motion, having been duly seconded, was put to a vote and declared unanimously carried.

CHAIRMAN DERN: The nominations of the committee are unanimously elected.

Having disposed of the special order of business, we will now proceed with our regular program. The next in order will be an address by Mr. D. Clem Deaver, of Nebraska, on "The Relation of Railroads to Dry Farming."

Gentlemen, I take pleasure in introducing to you Mr. Deaver, of Nebraska. (Applause.)

### THE RELATION OF THE RAILROADS TO DRY FARMING.

(D. Clem Deaver, Passenger Department, C., B. & Q. Ry., Omaha, Neb.)

Delegates to the Convention: I have been asked by the executive committee of your Congress to address this convention on the subject of "The Relation of Railroads to Dry Farming."

I am not a public speaker, and I shall not undertake to deliver an extended address, but I will do my best to explain to you, as I understand it, the relation of the railroads to this movement.

I think it unnecessary to say to this convention that the railroads operating in the west are all in favor of a legitimate movement of this kind, as I believe this convention to be. I think that a great many of the delegates here understand that as well as myself—that while the railroads as a general proposition might not come out and take a prominent part in this Congress as some may feel that they should, I think you all agree with me that generally speaking the railroads operating in the west, where dry farming lands are situated, are each individually helping along the movement. I know that at least half a dozen large systems of railroad have their department, where they employ experts, that have their own land and have also contributed to the experimental stations wherever it was thought it was wise to do so. One way that the railroads can help this movement in a legitimate way is by demonstrating results. As I stated last night on the floor of the convention, I came about 1,200

miles to find out what progress had been made. I want to say now that everything that has been stated on this convention floor showing what has been actually done, things that have been accomplished, if furnished to at least half a dozen large systems of railroad by the secretary of this convention, will be given as wide publication as it is practicable to give it, and it is practicable to give a very wide publication to such a move.

I have prepared a few remarks along the line of the subject assigned to me, and if you will bear with me I will read them.

The propaganda as to dry farming that is going out over the country is proper enough, and largely based on legitimate motives by those interested in settling up dry land areas. The constant work done by the Burlington Route during the past fifty years or more in settling western lands, is, I believe, generally known to the delegates here present. I think you are also familiar with the work done generally by all the western railroads, looking toward the settlement of the west.

If all the settlers in the dry farming area could be depended upon to absolutely follow the scientific method of soil culture now generally well known, the railroads could afford to be less conservative in their position toward dry farming, for the reason that more success would be assured. But the truth is that only comparatively few of the settlers coming to the dry land areas today can be depended upon to get all out of the soil that it is possible to get. That has been my experience. I want to say, however, that since I have come to Salt Lake City I believe I have found the best dry farmers there are in the country in Utah, from what I have learned. (Applause.) Now there may be a reason for that. It may be—to use the slang phrase—that you are “up against it” so hard that you know it, and you go at it right. (Applause.) The results of successful and profitable dry farming are so profitable per acre compared with the cost of dry land that if these results could be relied upon to be permanent, those lands would not need the railroads to help exploit them.

The railroads can support the dry farming idea and the effort to bring settlers on so-called dry lands only as far as the results from year to year will prompt them to do so, and no further and no faster. In that connection I want to say that the railroads will support facts; they will give publication to facts when they are presented to them. The railroads will, of course, include dry farming areas in their general scheme of homeseekers' rates probably as long as they ever make homeseekers' rates, and to this extent they can be expected to help the movement. The railroads could, of course, spread the information that certain scientific methods applied with intelligent and hard work to dry land farming, together with a certain amount of rainfall, brought certain good and profitable results; it can publish these results, and it can publish the rise in land values, and can help in a score of ways to spread reliable information before intending settlers, provided it be done in a conservative way.

The railroads can, perhaps, with greater safety, exploit the dairy farming enterprise on dry lands than the usual farm crop enterprise on dry lands. We know that through a certain period of dry years the dairy



interests in some localities saved the country. The railroad can only safely advertise for the future what has successfully stood the test over a stretch of years of all kinds of weather.

In these days what the railroad says to intending settlers is listened to and largely believed, and the destinies of thousands of families have been largely influenced by railroad literature. Therefore, the railroads must not be expected to say one word more than the truth about dry farming, or wet farming, or irrigation, nor can it encourage any land agent along its lines in saying or promising what the railroad cannot safely say.

Much of the development of the west in the last five years has, of course, been along the frontiers, and on so-called dry lands, as dry lands and irrigated lands are about all that are left within reasonable prices for the settler; along the Burlington's lines in Nebraska, Eastern Colorado, Wyoming and Northwest Kansas there has been an increase in the past three years of new acreage of approximately two million acres of western lands, with ninety per cent of this acreage on so-called dry lands. This great increase of wealth and population has been brought about during the past three years or four years, when as we all know, for the last five years the far west has been favored with a bountiful and most extraordinary moisture covering the great plateaus and slopes east of the Rocky Mountains clear through to the Mississippi Valley. The dry farming idea therefore has had a wonderful boost to this extent. In fact, the dry farming idea, to a considerable extent, has not been dry farming, as the greatest apostles of dry farming so understand it. Therefore, for the bulk of the settlement of the west during the last five years the dry farming ideas have not yet received a thorough test, and until we go through a period of two, three and four years of dry times, such as those at all familiar with the west know we must go through every so often, will the true value of the dry farming idea be known and understood. And that is the one great reason why the railroad must be cautious and careful as to the amount and manner of exploiting the successful tillage of the dry western prairies.

The day of fooling the intending settler has gone, or should be gone. Western railroads have enough population along their lines today, following the entire range of methods of farming, so that they can afford to wait upon honest truths for development. Twenty-five years ago, and even later, perhaps (remember I wasn't in the business then) the need of filling up the sparsely settled west was so great that exploitation was careless, if not more or less untruthful; and any means were employed to bring settlers out west. And when some years later thousands of those settlers had to pull up and go back to the east, the thoughtful railroad man realized then the need of saying only the truth in the future, and, therefore, those who firmly believe in the profits from dry farming must understand how careful the railroads must be in exploiting any kind of farming until there can be no doubt whatever of its permanent value.

If all that some claim for dry farming is true, that kind of farming needs no special help from the railroad in the development. Lands that yield annually \$20.00 per acre do not need the help of the railroads to sell such lands at \$10 an acre. Lands that yield that amount each year for two or three years and then yield practically nothing for two or three years more, need help in their sale and settlement, but it is a sure thing that the railroad must be very careful what it does or says toward the settlement of such lands. The railroads, of course, have a mutual interest with the community in settling it up, in its prosperity and in its poverty. It is idle here to talk of what the railroad has done in settling the west, and it can, of course, be expected to continue helping in that work, just as honestly and safely as it can do so. The west cannot afford to have one single broken-down and impoverished settler turned back to the east again. The west cannot profit from any premature ripening of the truths of dry farming. The truths of dry farming must be of slow development, and cannot be known except after a number of years of experience by the scientist and by many years of study by the farmers and settlers. We have seen the bad effects of a too rapid settlement of the western prairies; those owning dry areas will make more money from them, and the states in which those dry areas are located will draw into their midst a better class of farmers by going slow with the dry farming idea, instead of going too fast with it, thus inducing many to try it and fail, because such failure from year to year will be exactly the thing that will lower the selling prices of these areas, and keep a higher class of farmers from moving in.

The railroads want to see the dry farmer succeed, his success is their success. To be assured of success I think the dry farmer should take with him to his farm the idea that he must also engage in live stock, dairying and the raising of poultry.

In conclusion let me offer a few remarks which I consider pertinent to the question, but outside of the subject assigned me, which represent only my individual views. The relation of the Government to the actual settler is of vital interest to the dry farmer. In all of the states except Nebraska where homestead lands may be had, the settlers can only file on 160-acre homesteads, while in former times when the Missouri and Mississippi valleys were being settled and where the rainfall is plentiful, the settler could take up 160 acres under the pre-emption law, could file on 160 acres under the homestead law, and take up another 160 acres under the timber-culture law; three quarter sections or 480 acres under the three acts, at a total money cost of approximately \$225. Aside from the pre-emption, homestead and timber culture laws, we had in early days lands that were known as "offered" lands, where township after township was set aside and offered for sale at public auction, the practice being that individuals could buy these lands at \$1.25 per acre. To my personal knowledge a large percentage of the land in eastern Nebraska was disposed of by the government in this way. The government land in Missouri today can be bought outright. It appears to me of the greatest importance that

the homesteader in the west should be permitted a larger area than now allowed.

I am also clearly of the opinion that the old method of offering lands, which was found so successful in the disposition of public lands years ago, be made applicable to the purely grazing lands in the west, at least in a limited way, so that purely grazing lands might be sold outright to actual settlers residing in the locality in reasonable sized tracts, and on long time payments so that title would not pass until the dry farmer and the stock raiser combined had ample time to establish himself in the profitable business of mixed farming and stock raising. It may be said that that would throw open the doors to fraud, but I don't believe it would. I believe that the experience that the department has had in the past two years with the men who have been guilty of this practice has been such that in the future men will not settle on lands for another. If these lands were cultivated and sold out to actual settlers in blocks necessary to maintain a family—whatever acreage is found to be necessary, and on ten years' time, requiring a small payment down and a little every two years—if it runs for ten years—and make the settler at the time he wishes to prove up on the land show certain use of the land in grazing, that would prevent it going in large bodies, and after the farmer had used this for five or ten years he would not want to sell, because he would be the most independent man in the United States. (Applause.)

MR. HODGES: Before the gentleman leaves the stand, I would like to put him right with reference to the land office rules in Nebraska. I would like to ask him a question and fix this thing right. I have been in the United States Land Office eight years and a half, and anyone in Idaho, or this portion of the country, can take up but 320 acres of land. The pre-emption law, you know, has been repealed. You can take up timber 160 and homestead 160, or you can take up 320 acres of desert land, but you can't take any more.

MR. DEAVER: That is what I am complaining about. (Laughter.)

MR. HODGES: You **are** complaining?

MR. DEAVER: Yes.

MR. HODGES: Well, I don't hear very well. I thought you were wrong; that is all.

MR. DEAVER: My theory is it is purely nonsense to expect a man to go up here and take 160 acres and move on it with his family. That is silly. That is my idea. (Applause.)

CHAIRMAN DERN: Gentlemen, we have another distinguished gentleman with us here today, Mr. W. M. Jardine, Assistant Cerealist, Office of Grain Investigations, Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C., who will address you. I take pleasure in introducing to you Mr. W. M. Jardine. (Applause.)

**DRY LAND GRAINS.**

(Wm. M. Jardine.)

Delegates of the Convention: Mr. Chilcott told you right in saying to you this morning, that Government men were usually long-winded when they had an opportunity of speaking. After having listened to Mr. Chilcott's paper and after you have listened to me you will know that he told you the truth. The subject that I am about to discuss, that of dry land grains, is a very broad one, as you all know, comprising, as it does, many different crops and many different varieties of each crop, every one of which is of vital importance to complete development of our dry lands. They are vital because the grain crops form the basis of our cropping system on the dry land areas. You all know, for instance, that the first crop you think of on the dry land is wheat. We are thinking altogether too much of wheat; but nevertheless it is always going to be the main crop, the money crop, and that, after all, is what we have to look for on the dry land. Hence it is vital, and cannot be discussed other than in a general way in a very short paper.

I have only touched on some of the points I think worthy of bringing before the convention. Before beginning my paper, which I will have to read, since this subject is so broad and general, I wish to say a little about what we are doing in the Government in the way of improving the cereals of the land.

Mr. Chilcott told you what the Department of Agriculture, the Office of Grain Investigation has done in the Great Plains area, in connection with the series of stations established there for dry land agricultural demonstrations. In addition to the work of these farms we have independent stations organized under our office for the production, improvement and development, through individual plant selection, through the introduction of seed selection, and through breeding thus improving the varieties we already have and varieties we bring to this country, and finding those best adapted to our dry conditions.

We have one in your own state here, in Utah, in co-operation with the State Experiment Station. The State Experiment Station is carrying on the work of thorough tillage, the rotation of crops; and the office of Grain Investigation is co-operating with the state in demonstrating and in finding out what grains are best suited for the conditions in Utah, continuing the work already started by the state. We have a man who is a graduate of your own institution here, the Agricultural College of Utah, and the son of one of the noted dry farmers of the state, George L. Farrell, in charge of this work. It has just started. It is going to be conducive of a great deal of good. We hope to see more stations established for the intermountain area as they have been in the Great Plains area. You will remember Mr. Chilcott is operating in the Great Plains alone. We hope to see in the future, and the near future, more stations for the intermountain states. They need them.

### Dry Land Cereals.

Experience has shown that when excessively large companies farm great tracts of land, the tendency is to exploit the land for the greatest immediate profit at the expense of the permanent value of the soil. Proper soil cultural methods are not observed; rotations for the preservation of soil fertility are neglected; the great crop, wheat, is grown continuously and the seed is allowed to degenerate through too careless methods. There are undoubtedly exceptions to this rule. I do not wish to intimate that rational dry farming is impossible when carried on by large companies, but the general rule has been as stated here. It is evident that the homesteader, having in mind the value of his home and the welfare of his posterity, is more likely to perpetuate the value of his land. And right here, in this connection, I wish to endorse the statement of the last speaker, that 160 acres of land is entirely too small a tract to ask a man to move onto. It is too small for the maintenance of a family. It is an injustice. (Applause.)

Arid farming then, in its most comprehensive sense, should include the production of such crops as will make home life in the arid section profitable and attractive. It must be so conducted as to insure permanent settlement by the homesteader.

### Diversity of Crops Necessary.

In order to bring about these desirable conditions, it is necessary to produce a variety of crops. Forage plants, such as sorghum, alfalfa and other legumes must be grown to feed the domestic animals on the homestead, and to take their proper places in a rational rotation. Drouth resistant trees should be developed and grown so that the farmstead will be a pleasant place to live. Doubtless we shall sooner or later have orchard trees which will be successful in the arid sections. These and many other crops all have their places, and aid in making the arid farms habitable, but the fundamental crops in arid farming are, and always will be, as at present, the production of the cereals. The cereals which are grown under arid conditions are wheat, oats, rye, barley, spelt, emmer, corn and the grain sorghums. We all recognize the value of oats and barley as a feed for the farm horse, and we all know too that they are usually salable at profitable prices. Corn is a very valuable stock feed, and will some day be raised extensively either for grain or forage on arid lands. It is also a valuable crop in a rotation, since it is a cultivated crop and hence may act as a substitute for the expensive practice of summer fallowing. Rye, spelt and emmer are excellent hog and cattle feeds and can often be raised under conditions which do not permit the growing of wheat, oats and barley. Oats and barley being at present largely spring varieties, their yields are not so large and reliable as that of wheat. Considerable work is now being done to develop hardy winter types. Results already obtained indicate that this can be accomplished.

### Winter Barley and Oats.

For example, we have what is known as Tennessee winter barley. This was originated at the Tennessee Experiment Station in 1900. It has been successfully grown as a winter variety as far north as Central Nebraska. Its popularity is constantly increasing, especially in Kansas, where it is rapidly displacing the spring type. Its yield is usually about one-third better than the spring varieties and its quality is equal to the best. A bulletin on this subject is now in preparation by the Department of Agriculture and we hope will soon be published. The variety is considered as thoroughly established. Seed can be obtained from the leading dealers in the Central Great Plains area.

At present we have no completely established variety of winter oats that can be considered as perfectly adapted to the Great Plains region. We have, however, some very promising indications, but these varieties are as yet in the experimental stage. We hope that within a very few years we shall have developed one or more winter types that will be adapted to large areas. Probably the most promising one we have at present, and the one that can be considered as established in various sections of the intermountain states, is a black winter variety of excellent quality, coming originally from England and grown for the past eight years by Mr. Stephen Boswell, foreman of the Nephi Substation, Nephi, Utah. We have every reason to believe that it will be equally successful in the eastern sections of the country. We now have it planted in a large number of places on the Great Plains and farther east. It has gone into the winter in perfect condition at most of these points, and its vegetative habits indicate that it will survive the winter in good shape.

### Spelt and Emmer.

Spelt and emmer are less generally known than the other grains. This is largely due to their comparatively recent introduction into this country, they having been imported only a few years ago from southern and eastern Russia—sections similar in soil and climatic conditions to those in the Dakotas and southward. There is some confusion regarding spelt and emmer. They are generally both called spelt. The two are quite distinct, however, especially in outward appearance, and their botanical characteristics are as different in some respects as those of spelt and wheat. And right here I would like to say that there is no spelt grown in this country on a commercial scale, at least. It is all emmer. They are similar in the fact that the chaff adheres closely to the berry after threshing. This is probably the cause of the confusion. Botanically, they are closely related to wheat, but, economically, they might better be classed with oats and barley, since they are cultivated in this country for stock food only. In their native country, Russia, they are used to some extent for flour, but they produce a very dark and heavy loaf. In feeding value they have been found quite equal to barley. As a mixture with other grains, such as corn, barley and oats, they are highly

prized. Coming, as they do, from a section having hot, dry summers, their success in our arid region is practically assured. Their ability to resist drouth is remarkable, in spite of the fact that they are mostly spring varieties. The Department of Agriculture has succeeded in obtaining a black winter variety of emmer that shows remarkable yielding power and ability to withstand our most severe winters and great variation of climatic conditions. The future popularity of these two grains will be measured largely by their ability to adapt themselves as winter types, just as is the case with oats and barley.

### The Grain Sorghum.

The grain sorghums are another class of cereals that are proving valuable in the arid region. Milo, Blackhull Kaffir and Red Kaffir are already grown extensively for this purpose in the southern part of the Great Plains area as well as in California. These three varieties, with Brown Kaoliang, a Chinese grain sorghum, are the most promising for use in extending this crop into other dry regions.

Milo belongs to the durra group. It was originally a tall, uneven, freely stooling, much branched crop, seven to ten feet high, with pendant or goosenecked heads. It has been greatly improved in earliness, habit of growth, and productiveness. Today we have a dwarf and uniform crop, the standard strain four and one-half feet high, the dwarf strain three and one-half feet tall, both stooling and branching but little, and bearing from 75 per cent to 90 per cent of their heads erect. The average yields of shelled grain in the Panhandle country are about 40 bushels to the acre. This is at an elevation of from 3,000 to 4,000 feet, with an average rainfall of 22 inches. In 1907 the crop was ripened in Colorado at an altitude of 5,500 feet, and in South Dakota at 2,000 feet elevation and 44 degrees of latitude. The improved Milo crop is adapted to rapid and economical handling on a large scale by machinery. It is sown with the corn planter, harvested with the corn binder or grain binder and threshed in the grain separator. As soon as 95 per cent of the heads are erect, the grain header can profitably be used in harvesting. Milo seems fully adapted to successful extension over much of the Plains region and is to be tried throughout the intermountain areas.

The kaffir varieties are equally drouth resistant and productive, but rather later in maturing and not adapted to such high altitudes or latitudes. They are better combination grain and forage crops, because of greater juiciness and more abundant foliage. In the kaffirs the heads are naturally borne erect and adapted to heading, if desired.

The group of Kaoliangs or Chinese grain varieties contains the earliest strains yet known. The best variety matured in the Panhandle of Texas this last season in 85 days. They must, however, be selected for greater productiveness before they will be ready for general distribution.

### Rye.

Rye is so well known that little need to be said of it. The growing of rye is often objected to because of its persistency and its tendency to

volunteer and mix with other grains. It is, in some sections, coming to be considered as a weed, and something to be avoided. Notwithstanding these objections, rye has some valuable qualities. It can nearly always be relied upon to produce a crop under conditions of drouth too severe for wheat or any other grain. There are both spring and winter varieties. The spring varieties are especially valuable as a green manuring crop and also for summer forage and pasturage. Winter varieties are useful for the production of grain and forage. The feeding value of rye as forage is almost equal to timothy, if cut at the proper time. When grown as a forage there is no danger of its spreading or mixing with other grains. The ability of rye to produce a strong foliage even under very dry conditions makes it especially valuable as a dry farm forage crop. Its grain, too, is valuable as a stock food.

### **Wheat, the Principal Cereal.**

Thus we see that all of the cereals named occupy important places in arid farming. Wheat, however, is the most widely used of the cereals and for this reason the demand for it is always strong and its sale practically sure. The demand for the other crops, being more limited than that for wheat, is liable to greater variation, and hence these grains will never be as generally popular as wheat. From these considerations we see that, though oats, barley, spelt, emmer, rye and corn are extremely important, both as salable products and in rotations, wheat is, and probably will remain, the great basic cereal of the Arid West, and it will receive the greatest consideration here.

### **The Arid Region.**

The section which we consider as more or less arid includes the western half of the Dakotas, Nebraska, Kansas, Oklahoma, the Panhandle of Texas southward to the Gulf, and the region westward to the Sierra Nevada mountains, thus including the greater part of the so-called Great Plains area, the intermountain West and some vast areas in California, Oregon and Washington. The annual precipitation in this territory varies from 4 to 20 or 25 inches. Altitude and climatic and soil conditions are extremely variable and determine to a greater or less extent the varieties that can be grown and the methods that must be employed.

### **The Great Wheat Groups.**

Several hundred varieties of wheat, more or less distinct, are grown in this section. The great bulk of wheat production, however, falls into four groups:

1. The hard spring wheats including the durum.
2. The hard winter wheats.
3. The intermountain wheats (or semi-hard white winter varieties.)
4. The Pacific wheats (or soft white winter wheats.)

Each group characterizes a certain belt. These belts are, of course, not sharply defined; but certain types of wheat predominate in each.



### The Hard Spring Wheat Groups.

The hard spring wheat belt is included in the states of North Dakota and South Dakota and a portion of Northwestern Nebraska. This section can also be considered as the home of the durum wheats in the United States. It is here that they flourish best and are grown most extensively. The two most prominent varieties of common wheat grown here are Blue Stem and Red Fife. These two varieties and the durums are the principal wheats grown in the section. The milling quality of Fife and Blue Stem is considered to be superior to that of all other grains. The grains known as "No. 1 Hard" and "No. 1 Northern" come from these two types, and they always bring the highest price on the market. The Fife is a native of Russia and is sometimes called "Scotch Fife," but we should not think from this that the variety originated in Scotland. The growing of winter wheat has, as yet, not been practicable in this area, because of the long, severe winters, light fall precipitation, and severe alternate freezing and thawing winters. We hope, however, through the development of some hardy types to extend the winter wheat district as far as possible, since we know the great value of growing winter wheats wherever possible.

### The Durum Wheat.

The durum wheats have been grown in this country in insignificant quantities for about 35 years, but until 1900 there was no organized effort to induce extensive cultivation of this grain. During that year the Department of Agriculture sent a representative to the durum wheat sections of Russia and Algeria to investigate the conditions favorable for durum wheat production. As a result of this investigation, a large number of durum varieties were introduced by the department. They were distributed among various stations of the Great Plains area, also mountains, where the conditions seemed to be very similar to those found in the native countries of the wheat. At first these grains were received with but little favor, in spite of the fact that they produced excellent yields and exhibited remarkable rust resistant and drouth resistant qualities. Their rust resistance is especially important. This was particularly noticeable in the rust epidemic of 1904, when so much damage was done to the common varieties. Something you did not really know the danger of in the intermountain states, and you can thank goodness you did not, yet it is a vital question, and one we want to constantly keep in mind, rust-resistant varieties. It is something that will come in a day, almost, and entirely destroy your crop, and just before the time you are ready to harvest.

The later popularity of durum wheats in this section is largely due to their great resistance of the rust in this epidemic. They are, in fact, coming to be considered as the only reliable spring varieties to grow in sections where rust is frequently prevalent. Their drouth resistant qualities are constantly being brought to our attention. In Texas, Montana, California, Utah and in many other sections where severe drouth occurs,

they are outyielding all other spring varieties, and in many instances are rivaling some of the leading winter grains. It has been found that these grains are particularly adapted to the Dakotas. About 80 per cent to 85 per cent of the durum wheat produced in 1907 was grown in this belt.

### Growing Popularity of Durums.

The opposition to the durum wheats, especially among the farmers, is rapidly disappearing; in fact, they are even being grown in sections where they should not be planted. They have been taken to Minnesota, a section wholly unsuited to their production because of the high precipitation and the excessive humidity of the atmosphere. They are pre-eminently grains to be grown where the summers are hot, and the atmosphere dry. The farmers of Minnesota, however, have come to value the durums because of the aforementioned rust resistance rather than because they are otherwise adapted to that section. In some parts of the state they are displacing Fife and Blue Stem. For this reason the millers are inclined to oppose them very vigorously, and in this they are fully justified. The Department of Agriculture has never recommended the growing of durum wheats in the humid regions.

The durums became prominent commercially in 1903, when six million bushels were produced. The production has continually increased until the present time. The crop of 1906 was between 40 and 50 million bushels; that of 1907 was even greater, notwithstanding the unfavorable conditions for grain in the Dakotas. In this connection I would like to say, a great many of us hear something of the great wheat belt of Canada. I had the pleasure in traveling through northwestern Canada this fall to become acquainted with what they are doing there, and I learned why some of our people are going to that country. But I just stated here that the wheat yield of the durums in the United States was 60 million bushels this year. That is not very much when we think of the 750 million bushels we raise in the United States, yet compared with Canada's 70 million bushels, their total production in the west, including the provinces of Manitoba and Alberta, it does seem considerable. Probably 56 million bushels was as much as they raised in Canada this year, while we raised comparatively this much durum wheat, and almost confined to the Dakotas.

One of the striking features in favor of the durum wheat is the growing demand for it in both foreign and domestic markets. Of the crop of 1906, some six to ten million bushels were consumed in the mills of Minneapolis in blending with other wheat; 20 million bushels were shipped to foreign markets, some of it going back to Russia, whence it was originally introduced; some five million bushels were used for seed in 1907 and the remainder was used by small mills throughout the country. Before the harvest of the 1907 crop, the 1906 yield was entirely consumed. The 1907 crop is going even more rapidly. One man, representing a foreign firm, purchased last December 1,500,000 bushels for export. This is the largest amount ever bought at one time by one man

for export trade. The spread in price between the durum and the No. 1 Northern is becoming less each year. Durum now sells for about two cents more than No. 2 Red Winter at the Chicago market. The attitude of the northwestern grain journals regarding durum is rapidly becoming less antagonistic, and even the millers are beginning to concede points in its favor. As the millers perfect their methods for milling these wheats, they invariably recognize the merit of the durums, especially as blends with the softer varieties for flour and as a source of semolina or "macaroni flour." It seems certain that the durum wheats are destined to become the leading spring varieties throughout the whole Arid West.

### The Hard Winter Wheats.

We shall next consider the hard winter wheat belt. This is probably better known to the members of this Congress than any other wheat belt of the United States. It is included in the states of Kansas, southern and central Nebraska and Oklahoma, and extending into the Panhandle of Texas, the maximum production being in central Kansas.

The Crimean group of wheats predominates in this belt. The typical varieties of this group are the Turkey (sometimes called "Turkey Red"), the Kharkov and the Crimean. These are commonly known as the "hard red winter wheats." The Kharkov is probably the most highly valued. In appearance it very closely resembles the Turkey, the variety most generally known among the farmers because of its widespread growth prior to the more recent introduction of the Kharkov. In brief, the wheats of this group are all bearded, have white chaff and medium hard red berries. They usually do not grow very tall but are very heavy yielders. They are in great demand as a milling wheat, although they are not equal to the Fife and Blue Stem of the Dakotas (or the No. 1 Hard and No. 1 Northern). No. 1 Hard Winter, the best wheat of this belt, brings about the same price as No. 2 Hard Spring, of the northern belt.

These hardy winter wheats originated in Russia and get their name from the province of Crimea, where they are most prominent. They have long been known in that section as leading varieties and have always been subjected to extremely severe winter conditions. They have been grown in the United States for a third of a century. They were probably first grown by the Mennonite colonists who came here from Russia, bringing their seed with them. They have continually advanced in popularity up to the present time, but the area of winter wheat production has been greatly extended through the more recent introduction of still hardier types of the Crimean group, the most conspicuous among them being the Kharkov before mentioned.

The production of these winter wheats is by no means limited to this belt. They are successfully grown locally in various sections of Montana and Colorado, where they are becoming recognized as the leading winter types. They are also becoming prominent as far north as the wheat areas of Alberta, Canada. In some of these sections their quality is

often better than it is in Kansas, but the Kansas belt is pre-eminently the center of the hard winter wheat production. About 70 million bushels have been produced there each year for the past three years.

#### **Intermountain Wheats.**

Proceeding westward from the hard red winter wheat belt, we come to the intermountain area. The wheat of this belt may be considered as intermediate between that of the Great Plains and that of California, Oregon and Washington. In this belt we find a more or less heterogeneous mixture of nearly all kinds of wheat, with a tendency towards the production of a white, soft berry, thus resembling the grain of the belt farther west. This we believe to be due largely to climatic and soil conditions different from those of the Great Plains. Here, too, the winter varieties predominate; in fact, it appears that before long winter wheat will be grown almost exclusively in this area, and that what spring wheat is grown will be confined to the durum group, since these are practically the only varieties capable of withstanding the extremely hot dry summers.

We cannot say, as we did in discussing the previous belts, that this area is typified by any particular variety or varieties. The lack of a predominating type is probably due to the fact that this region has heretofore been somewhat inconsequential in the world's wheat markets. The production has been entirely local and has attracted but little outside attention. Since the recent development of arid farming is making possible an enormous output of wheat in this region, there is no question that the same influences that work on the Great Plains will ultimately bring about a uniformity in the wheat varieties here. In my judgment, the coming wheats for this region will be the Crimean group for winter wheat and the durumms for spring.

#### **Greater Uniformity Necessary.**

Beyond all question, a greater uniformity must be brought about before the full possibilities of wheat production in the intermountain section can be realized. This can be accomplished largely by discarding all of the inferior varieties, by introducing new and superior types, and by improving them still further. With this in view, the Department of Agriculture is establishing cereal stations at various places in the arid region and is doing a large amount of work independently and in co-operation with the state experiment stations. With the proper co-operation and support of the farmers, this much-needed change can certainly be made, but whether or not you are willing to discard entirely your soft white wheats, it is certainly true that you must sooner or later grow a uniform variety, be it hard or soft. Before you can attract a market, you must be known as producers of some particular wheat. Fruit growers recognize this principle of uniformity and profit by it. This point has also been forcibly illustrated by the durum wheats in this country. When the durum wheat was produced entirely in small local quantities it had absolutely no mar-

ket, but just as soon as the Dakotas began to make a specialty of it, its sale became easier and a market is now firmly established, as I have already indicated. You should strive for uniformity at all times, and this will be best accomplished by your co-operation with the stations and through your agricultural organizations.

### **The Pacific Wheats.**

The last belt to be considered is the region lying between the Rocky mountains and the Sierra Nevadas. It includes the San Joaquin and Sacramento valleys of California, and the Palouse and Yakima and Big Bend sections of Oregon, Washington and northern Idaho.

The grains of this belt are the extreme opposite of those of the Kansas belt; in other words, they are very soft and white, and very low in gluten—the highly prized constituent of the wheat berry—while the Kansas grains are hard, red and rich in gluten, and hence more desirable. The wheats of the Pacific belt are not readily salable in the Minneapolis and Chicago markets; they find their sale mainly on the Pacific coast and in the Orient.

The main varieties are Red Russian and Palouse Blue Stem, in Washington; Red Chaff in Oregon; and Sonora and White Australian in California.

So far attempts to maintain high gluten content in varieties introduced into the Pacific belt have been unsuccessful. As soon as the hard varieties become acclimated in this region, they become starchy and soft and closely resemble the older types in chemical composition. This is especially noticeable in the wheat section of California, where wheat growing has been conducted on a large scale, with the careless methods suggested in the beginning. Fifty years ago a better quality of wheat was produced than at present, but the farmers have allowed the fertility of their soil to decrease. As a result, they are now reaping the harvest of their unscientific methods. This might well be taken as an object lesson by those who are beginning in the newer sections, as it emphasizes the necessity for crop rotation. It often becomes necessary to import hard wheats in California for use as blends in flour making. It seems to me that this would be another plausible use for the durum raised farther east. Such a thing would increase the market for these wheats and at the same time be of vast service to the farmers and millers of the Pacific belt.

### **Conclusion.**

In conclusion I would like to leave with you a concrete conception of cereal production about as follows:

1. That from a disorganized condition, the production of cereals, especially wheat, has, through the introduction of foreign varieties of grain, elimination of inferior types and a uniform system of grain growing, become concentrated into four belts, more or less distinct, and with one exception characterized by the production of one or two standard varieties especially adapted.

2. That the durum wheats have proved themselves especially valuable as spring types, particularly as regards drouth resistance and rust resistance, and that they will ultimately become the leading spring type.

3. That winter wheats will always be grown where wheats can survive winter conditions, and that the Crimean group, because of their wide adaptability, excellent quality and ability to withstand drouth, will probably supplant all other winter types in all the belts, with the possible exception of the Pacific area.

4. That the only possible way to obtain a steady and permanent market for grains is to concentrate on as few types as possible, this being especially necessary in the intermountain area at the present time.

### Future Improvement.

I would like to have discussed the important question of scientific grain improvement by breeding, selection, etc., but lack of time prevents an extended discussion. I may say, however, that we shall undoubtedly realize much from this source. The system of improvement is too expensive of both time and money to be followed by farmers exclusively. It must include the co-operation of the Department of Agriculture, the State Experiment Stations and the farmers. The Department is now co-operating with the stations in the arid region to do the scientific work pertaining to the system of improvement. It will rest with the farmers, individually and through their organizations, to do the final work. Farmers' organizations will play a specially important part. Heretofore, too often the work has stopped with the purely scientific results, but for permanent benefits, the farmer himself must assist. Stations are being established and the work is now in progress. If our present plan operates, we can confidently expect vast benefits and improvements.

W. M. JARDINE,

Agronomist in Charge of Experiments with Dry Land Cereals.

MR. HADLEY, of Utah: I would like to ask the gentleman, Prof. Jardine, what is the proper scientific rotation for the maintenance of soil fertility in arid farming?

PROF. JARDINE: I will refer that question to Prof. Chilcott. That is his special work and he can answer it very capably.

CHAIRMAN DERN: Is Prof. Chilcott in the room?

PROF. CHILCOTT: I did not hear the question.

CHAIRMAN DERN: If the gentleman will repeat his question Prof. Chilcott will answer it.

MR. HADLEY: The proper rotation for the maintenance of soil fertility in arid farming. It is a serious question to a great many of us.

PROF. CHILCOTT: It certainly is to me. But it is a question, I would say, that I am trying to prepare myself to answer **some time** in the future. The question, as it is given there, is so broad that it never can be answered in a precise way.

A DELEGATE: Get up on the rostrum.

PROF. CHILCOTT: I think I have served my time on the rostrum. (Laughter.) The rotation best adapted to the maintenance of fertility in one locality may not be the one best adapted to another locality where the conditions are equal. I do not believe that any rotation will ever be devised that will fit all conditions. But I do think that any rotation that will maintain the fertility of the land must have certain features. One of these important features is, it must in some way restore to the land at least a portion of the plant food that is taken from the land by such crops as wheat and other small grains. There are many ways of doing this, adapted to many different conditions. I believe that the proper rotation for maintaining the fertility of the soil involves the maintenance of the humus in the soil—the organic matter in the soil, and I believe wherever it is possible that some kind of a hay crop should enter into the rotation. If this hay crop can be a legume, like alfalfa or clover, it is better, because we all know that the plowing under of a legume, or even the growing of a legume on the land adds certain elements of fertility to the land in a greater quantity than will any non-leguminous product. How well alfalfa will fit into a rotation scheme we do not yet know. It will probably fit better in some localities than others. But I believe the time will come when it will be used extensively in rotation in certain places. It seems, of course, almost like a waste of time and energy now to plow under a good alfalfa field when it is at its height of production, and if there was only one object in view, that is, of getting all you can out of the land, it would be better to keep that land in alfalfa just as long as it would produce alfalfa. But I believe that the time will come when the production of a crop of alfalfa will be a secondary consideration, and the benefit to the land from growing alfalfa will be the prime one. How long it will be best to keep this land in alfalfa before it is broken up, what crop will be best adapted to follow the alfalfa, how long it should be cropped before it is again seeded down are questions that have not yet been solved for any locality; so far as I know, and when it is solved for one locality it may not fit other localities. Now where alfalfa cannot be successfully grown, or perhaps even where it can, there are other grasses—*Bromus Inermis*, particularly—or I should not say other grasses—alfalfa is not, of course, a grass—but there are other hay crops. *Bromus Inermis* will grow in a very thrifty condition. It reaches its maximum production about the third year, and I think that is one of its strong points, because then the farmer will be almost forced to plow it under, and that will be a good thing; it will bring about a rotation of crops rather than continuous cropping of one part of his farm to grasses and of another portion of his farm to grain. I believe that the growing of corn or some other cultivated crop should enter into every rotation scheme, where the growing of that crop is possible or profitable. And I would go further than that, I think. I think it would be of advantage to grow corn simply for the sake of having it in the rotation, even though the yield of corn itself would not be sufficient to make it a profitable crop. In South Dakota, we have carried out experiments for a number of years,

just at the edge of the humid belt, and we have found that a rotation into which corn enters produces fully as good results, after ten years, as rotation by which grain is produced by summer fallowing. In other words, we can get just as good results as in summer fallowing. How long a period that will apply to I do not know, but certainly wherever that will apply it would be better to raise a crop of corn than it would to summer fallow the soil. The result is as good, so far as our experiments go, from the growing of a crop of corn as it is from leaving the land lying open, as in summer fallowing, during the summer, and there is no question but that there is considerable loss of organic matter in the soil during the period of summer fallowing. Just how much we do not know. We are carrying on experiments to determine that. In time, however, it may be we will be able to answer that more in detail.

I have taken up more of your time than I intended to. I thank you for your attention. (Applause.)

MR. WHITBY, of Utah: What amount of precipitation did you have on that plat you gave us this morning?

MR. CHILCOTT: I am sorry to say I am not able to tell you just what the precipitation was at that place. The normal precipitation is in the neighborhood of twenty inches, about fifteen inches of that coming during the growing season; that is, from April to September inclusive—about fifteen inches, and the other five inches coming during the winter. That is the normal precipitation. I do not think the precipitation departed far from the normal there during the past season. It may have been slightly less than that, but it was poorly distributed. It was too dry in the early part of April and May, and fore part of June, and then heavy rains came on, and it was too wet in the latter part of June and July.

That is another point that is often spoken of—how much precipitation does it take to raise a crop? Well now, that is very largely a matter of distribution. You may have an ample precipitation during the growing season, but if it is poorly distributed you may suffer one part of the season from drouth and during another part of the season from excess of rain. So that the mere number of inches that fall during the season is a very questionable criterion for determining whether a good crop can be grown or not.

CHAIRMAN DERN: Gentlemen of the Convention: I desire at this time to express my gratitude for the large attendance we have and the close attention paid by the delegates to the proceedings of the Congress. It shows that your heart and soul are in the work; that you came here for a purpose; for the purpose of exchanging views and learning what can be learned from these distinguished gentlemen who have had the matter of dry farming in hand for years. But the committee that arranged the program realized that you are entitled to some recreation in addition to the regular work and close attention you are paying to business, and I want to call your attention to the entertainment which is provided for you, and arranged for you tonight, such a one as can only be given here in



Salt Lake City, (applause) and I hope that each and every one of you, with your ladies, will avail yourselves of the opportunity to be at the tabernacle this evening, beginning at eight o'clock promptly, to attend the musical festival in the great tabernacle. (Applause.)

The Secretary informs me that delegates with tickets will have admittance at the south door, and others at the other door.

Mr. Burns, of Colorado, has requested me to call him to the platform and give him the privilege of addressing the delegation here for a few minutes. While what he may say may not be strictly germane to the subject we have under consideration, yet the suggestions which he will probably make may lead to something which will be of vital importance and interest to this project.

MR. BURNS: Mr. Chairman, and Members of the Convention: I take it we are all boosters for dry farming, and for the west. My object in coming before this convention this afternoon was to do something that I found utterly impossible to accomplish by personal solicitation. I come here representing a unique daily newspaper which is giving its time and space to publishing the interesting facts about the development of the great west. It has a very large circulation, largely east of the Missouri river. I came here expecting to ask probably two-thirds of the men personally to take an interest in assisting the Mining Record, of Denver, to place before the people of the east the facts in connection with dry farming development, but I found that after two days in this busy convention I have button-holed about twenty individuals, therefore I have twenty promises. Now, gentlemen, this is something in which you, as farmers, as development men, and as westerners are interested. My request is that if any one of you or all of you can devote a few moments of your time to writing a letter or telling a story to me while I am here, stating your experience in dry farming, giving me some idea of the things you are doing it will help me materially in the compilation of a number of stories, serial and otherwise, to be published in the east. There is no string attached to it; it is purely a matter of enthusiasm and western boosting spirit, and therefore, you gentlemen all will recognize me. I do not know all of you by name, so if you can, will you please button-hole me anywhere in the hallway after this meeting this evening, anywhere, any time, give me your name and address so that I may write you and remind you of this request. And won't you please, also, gentlemen, assist me in assembling the names of men in your own communities who will be able to write forcibly on this subject and give us special articles. That is all. We are all here for one purpose, Mr. Chairman, and that is to boost the west, and it is utterly impossible for me, in this busy convention, to meet you all individually. If you will help me to that extent I will give you a card with my address, and you can write me when you have time, within the next few months.

I thank you very much for allowing me to intrude upon your time.

CHAIRMAN DERN: Before proceeding with the regular order, the Secretary has some telegrams to read.

SECRETARY ROOT: A telegram from Idaho Falls. "Idaho Falls will care for Dry Farming Congress in 1909. D. G. Platt, Mayor."

Another telegram, from J. Ross Clark, Los Angeles. "Present my congratulations and compliments to Trans-Missouri Dry Farming Congress now in session at Salt Lake, and assure them of my appreciation of the vast importance of the subject with which they have to deal. I have every confidence that the work of this Congress will do much towards the advancement of the great project of bringing under cultivation the arid lands of the west. J. Ross Clark."

MR. TOLTON, of Utah: Is the introduction of a resolution at this time in order?

CHAIRMAN DERN: I believe it would be, yes sir.

MR. TOLTON: Mr. Chairman, I have in my hands a copy of a bill introduced by the Honorable Reed Smoot in the Senate of the United States, providing that bona-fide settlers may settle upon 320 acres of land in the arid and semi-arid region; and along the same line as suggested by the first speaker this afternoon, I desire to introduce a resolution. The bill is somewhat lengthy and I shall not intrude upon the time of this convention to read it, but it will be filed with the Secretary in connection with the resolution, and anyone desiring to know the contents of the measure can do so by calling for its reading.

"WHEREAS the Hon. Reed Smoot, Senior Senator from the State of Utah, has introduced Senate Bill 1543, providing for making homestead entries upon arid and semi-arid lands under such rules and regulations as may be prescribed by the Secretary of the Interior;

"BE IT RESOLVED, That the Dry Farming Congress in its second annual session at Salt Lake City does hereby endorse and approve said bill, and does hereby authorize its President and Secretary to advise Congress of our action and to request that due and proper consideration be given said measure, and,

"BE IT FURTHER RESOLVED, that the thanks and appreciation of this Congress be conveyed to Senator Smoot for his timely action in introducing this measure."

(Applause.)

I move, Mr. Chairman, the adoption of this resolution.

The motion was duly seconded.

CHAIRMAN DERN: Gentlemen of the Convention, I presume it is your desire to act upon this motion immediately in a body instead of referring it to a committee.

MR. EVANS, of Utah: Mr. President, I move that all rules interfering with the passage of this resolution be suspended and that it be voted on at the present time.

The motion was duly seconded, put to a vote and declared carried.

CHAIRMAN DERN: All of you that favor the adoption of the resolution as read by the gentleman from Utah, will signify by saying aye.

The motion received a unanimous affirmative vote.

MR. REED, of Nevada: I wish to offer the following resolution:

CHAIRMAN DERN: The Secretary will read the resolution.

SECRETARY ROOT: "By Mr. Reed, of Nevada. Whereas the experience of the management of conventions similar to the Trans-Missouri Dry Farming Congress has shown the necessity of having positive arrangements of the local entertainment and convention expenses, and

"WHEREAS, a rule has been adopted by the National Irrigation Congress, the Trans-Mississippi Commercial Congress, The American Mining Congress and other similar organizations whereby the city and state entertaining the conventions of these bodies shall make a positive guarantee in bidding for these conventions of a certain amount of money to be subscribed for the expenses;

"BE IT FURTHER RESOLVED, That it is the sense of this convention that any city and state desiring that the annual convention of the Trans-Missouri Dry Farming Congress shall be expected to present to this Second Annual Congress through its properly accredited delegates, some stated guarantee of entertaining and the expenses of the publication of the report."

CHAIRMAN DERN: The resolution will be referred to the Committee on Resolutions.

We will proceed with the regular order of business, unless there are other resolutions to be offered. Hearing none we will proceed with the regular order.

The next on the program is an address by Dr. V. T. Cooke, of Cheyenne, Wyoming. I take pleasure in introducing to you Dr. Cooke, who will address you on the subject of "Drouth Resistant Crops and Their Treatment." (Applause.)

## DROUTH RESISTANT CROPS AND THEIR TREATMENT.

(V. T. Cooke.)

Ladies and Gentlemen: I have written a short treatise that is a little more practical than technical, on Drouth Resistant Crops and Their Treatment, which I will, with your permission, read.

There is an important distinction between a drouth resistant plant and a drouth resistant crop. A crop is something raised in quantity by the farmer, dependent directly or indirectly on the land and raised directly or indirectly for market or profit. The question of importance to the dry farmer is the production of a crop with a minimum amount of moisture and in such proportion to the cost of production as will insure a fair margin of profit.

In the presentation of this paper, therefore, it is my intention to be practical rather than technically scientific. There are many plants growing under natural conditions in the arid region which are of value

to stockmen, and some have even acquired the ability to exist on our dry deserts. However interesting the fact may be that certain plants will exist with so little moisture it has little bearing on the practical side of our question, for the amount of growth made by such plants is ordinarily too small to be of great value during the lifetime of a man. The problem before us is how to produce a profitable crop with an amount of moisture which has ordinarily been considered insufficient.

The measure of practical drouth-resistance then, is the actual growth or production of our domesticated crops. It is true that mere ability to retain life within the plant in the absence of practically all available moisture often has an important bearing on our crop production, as in the case of such plants as some of the non-saccharine sorghums and others which have the ability to suspend growth, or stand still, during the time that moisture is not available and again resume their growth when a rain occur. This is undoubtedly an acquired character and only occurs in plants which have become accustomed to arid conditions. Enough has been learned to indicate the great value of acclimatization, hardiness and vigor of growth of crop plants. I do not think we have given too much attention to the problem of the conservation of soil moisture, but the adaptation of plants to arid conditions is equally important, and has not been given the thought that this branch of our profession deserves.

The fact seems pretty well established that the most drouth resistant crops have come from arid or semi-arid countries. Alfalfa was originally a native of a dry country, Media and Persia. Our drouth resistant wheats are the durum or macaroni types from Mediterranean countries. Potatoes originated from native plants of arid and comparatively high altitude districts of America. Kaffir corn came from desert Africa and spelts from regions of little rainfall in Russia. Who shall say what improvement may be possible in these and other crops when they have been intelligently bred at home, and we have had time to adapt our own species and varieties to our dry farm conditions?

My own observation coming from an experience of some 25 years of dry farming in the arid west, leads me to select the crops I will name as the ones which will produce largest returns with least available moisture. At the head of the list I must put the potato, which originated more closely at home than any other. Of course the potato may not be the most important crop for general culture but it finds an important place in our farm practice. The large areas under irrigation which are devoted to potato culture make the raising of seed potatoes by dry farming an important industry, and the dry farm potato is unexcelled for domestic use.

My recommendation to the man who would do dry farming, is to make live stock his primary crop—feeding at home so far as possible everything that is raised. This system makes the most valuable plant; those which will supply the largest quantity of the best stock food. I advocate the greatest economy possible in labor and other expenses on

the farm, and to that end advise raising crops which can be turned into meat, or other animal products with the least handling.

Among the fodders, corn, kaffir corn, millet and sorghum are quite profitable where the altitude and other conditions are favorable, but the small grains are and will be more generally raised in this country. All the small grains, rye, wheat, spelts, oats and beardless barley, I feel sure can be raised in the arid and semi-arid regions with far less moisture than we imagine, provided we do our part. We have the soil, climate, and really more moisture than many of us have any conception of; nature has been far more kind than we realize.

Spelts should be threshed before fed to stock, but wheat may be headed and fed in the straw. The grain I hold in high esteem is the six-rowed beardless barley, which retains its hull. This grain should be cut in the stiff dough, and fed either alone or in conjunction with alfalfa. I have fed this combination to fatten sheep with the very best success. In my opinion the two greatest stock foods for production with minimum amounts of moisture are alfalfa and the Canadian field pea. These crops are of first importance for two reasons: First, they are stock foods par excellence, and second, they gather nitrogen from the air, so improving the fertility of the soil that they are essential in our systems of rotation. In places where there is little winter snow the field pea can be pastured by stock instead of harvested, saving an important item of expense. Pea fed lambs finished in this manner have become famous, and pea fed pork is unexcelled. Peas are excellent feed for either horses or cattle, fed as hay, or the peas may be threshed and ground. I have raised excellent crops and last year secured good results with them, where the rainfall in twelve months amounted to only ten inches. Alfalfa is an important dry farming crop both for hay and seed production. It takes time and the right method to get a stand, and on many of our soils, no doubt, inoculation will be necessary. Most of us are in too great a hurry to sow alfalfa. We do it before we have properly prepared our seed bed, or have sufficient moisture stored up.

There are several crops of importance for green pasture and hay, and this brings me to a consideration of the use of winter grains. There is perhaps no plant more sure to produce where the rainfall is scanty than winter rye, and it may be used for green pasture both in fall and spring, after which it may be allowed to grow up and either be cut for hay, or allowed to get ripe for its grain. Rye grain is one of the most valuable foods for hogs. Winter wheat should be grown wherever it can be made successful as it gives the farmer a long season instead of a short one in which to do his work, and our spring moisture is usually sufficient to mature a good crop. Winter wheat will be generally successful where there is either winter rain or snow, or the previous season's moisture has been properly conserved, and my demonstrations make me believe it will succeed practically anywhere if proper methods are carried out. Winter emmer, which is now being grown for general introduction by the Wyoming Plant & Seed Breeding Company, Wyoming,

promises much as a dry farm crop. It will produce both pasture and grain, and is an important fattening feed. Among the grasses I think the two Brome grasses, viz.: smooth Brome Grass (*Bromus Inermis*) and Western Brome (*Bromus Marginatus*) and the slender wheat grass will prove of greatest value for pasture and hay over the larger part of the mountain region. We should not pass without mentioning root crops for stock feed. I have raised good quantities of sugar beets with very little moisture, and believe mangels, turnips and carrots will be profitable.

There are many secondary crops which should be produced for the home comfort. Everyone wants trees and fruits, garden vegetables and flowers, and with intelligent management and care no one need do without them. On my farm in the west in the early days the idea was scouted when one talked of raising trees, or any kind of fruit; yet, today eastern Oregon and eastern Washington are raising all kinds of fruit without irrigation, and this is done by frequent cultivation. I raised Black Hamburg, Flaming Tokays, Muscats and other grapes; also a large variety of apples, pears, plums, peaches, apricots and small fruits. No doubt the influence of the winds from the Pacific ocean tempered by the Japan currents, enabled me to raise many varieties which are too tender to be raised farther east.

#### Treatment.

The general principles of the preparation of the soil and its after management, along with summer fallowing and cultivation for conservation of moisture, need not be discussed in a paper of this scope. I should like, however, to explain briefly what I believe to be the best treatment to give the different kinds of dry farm crops which are mentioned. We must start out with the supposition that the land has been properly ploughed, kept free from weeds, and all the moisture saved in it that is possible. Our handling the crops in question begins with planting the seed—unquestionably, however, the old statement made that in order to make a “good man out of the boy you must begin with his grandfather” is true, and the analogy holds good for crops. In other words, good seed is absolutely essential, and the success of the crop is profoundly influenced by the hereditary tendencies, wrapped up in the seed as well as by its physical condition as indicated by its purity, maturity and availability. Begin then by selecting the cleanest, plumpest and heaviest seed and one that has been tested to prove its germinating qualities have not been impaired. A difference of cost within reasonable limits should never deter the farmer from buying the best at a higher price. For instance, if a farmer buys untested alfalfa seed at 15 cents per pound, and plants 20 pounds per acre, his expenditure for seed amounts to \$3.00. Should the seed fail to grow, he not only loses the amount of money expended, but his labor, and what is of far more importance, he loses a season of time, and the results of not being able to take advantage of his properly prepared seed bed and carefully conserved moisture, brings irreparable damage when we consider life is short and time is fleeting. In

addition to poor seed, should he plant noxious weeds, there is sure to be long continued vexation and loss. On the other hand, if he should pay 25 per cent more for an absolutely reliable seed, the difference in expense gives him insurance, which will, one year with another, return many fold.

One of the basic principles in dry farming is the maintenance of a surface soil mulch. In general it may be said small seeds should be planted as deeply as can safely be done. This will be governed very largely by the condition of the soil. Where the press drill is used small seeds like alfalfa can be planted shallower, as the compacting of the soil helps bring the moisture around the seed, and therefore insures its germination. Perhaps the mistake more generally made in depth of planting is getting such seed as alfalfa too deep. One cannot apply the same rule to all conditions. I have known of one instance where a man who had planted his potatoes eight inches deep secured an excellent crop. This was done near Greeley where the average depth of planting is four inches, and undoubtedly there are many soils where planting deeper than four inches would result in a partial or total failure. Absolutely no rule can be given which will govern the amount of seeds per acre to plant in order to obtain the best results. It is always safe to recommend a minimum amount of seed either where the soil moisture is small in amount or fertility is low. The size of seeds vary in wide limits. There will be twice as many germs in a pound of one variety of wheat as there will be in another; again, there are some wheats like the drouth resistance sorts, which produce few or no tillers, while another variety may have 90 stems on a single stool. If soil conditions are right, and the seed bed in perfect condition, 99 per cent of the seed planted may germinate. On the other hand in a poor seed bed, perhaps less than half of the seed will grow.

Every crop used by the dry farmer should receive that treatment which best conserves the moisture. Small grains, alfalfa, corn and potatoes, may be and should be cultivated with the harrow or weeder. If I had a choice of the two I would usually select a weeder for this work. The weeder with wheels and lever can be made to do better work than the harrow; that is, two horses and a 12-foot weeder perhaps will not cultivate quite so much ground as a three-section steel harrow with four horses, but will pay the best on account of doing more effective cultivation.

To sum up the discussion of the treatment of drouth resistance crops, we should first plant those which have acquired the quality of drouth resistance. Second, use the best seeds or plants, and third, give them that cultivation which will most effectually prevent the unnecessary loss of moisture.

MR. BELLISTON: The gentleman stated that he had raised various kinds of fruit without irrigation. I would like to know about the annual precipitation in that district.

DR. COOKE: Fifteen inches.

CHAIRMAN DERN: To conclude our regular program for this afternoon Prof. Merrill, of Utah, will address the convention on the subject of "The Methods of Dry Farming in Utah."

While the gentleman is on his way to the platform I desire to announce that the Executive Committee just elected will meet for the purpose of organizing at the close of the session. I presume they will meet in the committee room here on the left.

Gentlemen, Professor Merrill. (Applause.)

### THE METHODS OF DRY FARMING IN UTAH.

(Prof. L. A. Merrill, Salt Lake City.)

Gentlemen of the Convention: I will have to beg the indulgence of the convention for not having a paper prepared. I had one in view until I heard the remarks of my worthy friend from the Department of Agriculture, when he stated that he had reduced his speech to writing in order to economize time, and I thought I would try the other course. (Applause.) Then when his assistant came on this afternoon and repeated the statement I was quite sure I was right. (Laughter.) I was just thinking after all if dry farming in Utah hadn't received a little more attention than it ought to receive. It reminded me of the story of the boy who, along about the holiday season, after he had been given gander for a good long time, was asked to ask the blessing one day, and said: "Of gander hot, of gander cold, of gander young, of gander old, of gander tender, of gander tough, good Lord, we have had enough." (Laughter.)

My subject tonight is "Methods of Dry Farming in Utah." I will say that in speaking on this subject I feel somewhat delicate, from the fact that there are before me this afternoon men who have been following methods of dry farming in Utah since 1864, and for that reason, in speaking in their presence, I feel somewhat embarrassed, because they have had so much more experience along this line than I have. But I do want to say one thing, that dry farming in Utah is no longer an experiment, it is a demonstrated success, and our practice in Utah is based on scientific methods. We do not base our methods in Utah upon the theories of work in some other state, but we base our work here, our practice in this state upon the work conducted by our experiment station, and upon the experience of those following dry farming in this state successfully for a great many years. The theory of dry farming is simply this—the amount of water that is required in the production of crops. It has been demonstrated time and time and again, in Germany, and at our experiment station in Utah, that a certain amount of water is required. For instance, it has been definitely determined that to produce a single pound of dry plant substance in wheat, 1,200 pounds of water is required. That seems almost incredible, when you think that one pound requires 1,200 times as much water to produce it, and yet it has been demonstrated time and time and again that it is absolutely



necessary. When we realize that, and think of the amount of water that falls, it seems it is incredible. Our precipitation, as I said last night, is, on the average, about 12 inches. I want to repeat the statement, that the average precipitation is 12 inches. In some parts of the state it reaches 18 inches. The question is simply what is the amount of water necessary to produce a certain definite amount of plant substance. An acre inch of water falling over an acre of ground means something like 113 1-2 tons of water, and 12 acre inches of water is twelve times 113 1-2 tons. It is an easy matter, a simple problem in arithmetic to determine just about how much plant substance can be produced if the average precipitation is 12 inches and each inch means 113 1-2 tons. This matter has all been carefully worked out by our Experiment Station some years ago, and working on this theory as established it was demonstrated it would be absolutely impossible, in Utah, to produce a crop year after year, and for that reason I want to object to the idea that has been advanced here that we need to rotate our crops. If we grow a crop of corn on the land, alternating with wheat, it simply means that that corn is going to take so much moisture out of the land. I want to say that the Utah method of fallowing the land, the practice of summer fallowing is not a question of fertility of soil but simply a question of conservation of moisture. The great problem in Utah in relation to arid farming is the best way of conservation of the moisture we have. That is our problem. It is not a question of the fertility of the soil. We know, for instance, over the state, where crops have been produced for forty to fifty years in succession without any diminution in the yield at all. But the simple problem is this, how can we best grow crops with the amount of moisture we have, and I say that the only practice that can be followed successfully is the practice of summer fallowing the land. In some parts of the state it might be it is best for the ground to be summer fallowed only once in two years, and in other parts once in three years. In most parts of the state it is best to summer fallow every other year, and for that reason I was glad to see this resolution passed this afternoon. The arid farmer cannot succeed on the same amount of land used by the irrigating farmer, even if his crops were as large, because he requires double the amount of land because of the fact that half of the land must lie idle every year. We have here, in one of the tables spread upon the wall, that idea carried out. It has been demonstrated time and time and again that a yield of 33 bushels of wheat could be produced on land fallowed every other year, and where it was continuously cropped the yield would be cut down to 12, or 13 or 14 bushels, and we were doing double the amount of work required to produce 12 or 13 bushels as required to produce 33 bushels. So it has been demonstrated, and it is conceded that our summer fallowing is a matter of preserving the moisture.

I thoroughly agree with the statement made regarding the advisability of introducing a variety of crops. I don't believe we ought to confine our operations in dry farming to growing wheat, but I do believe that we ought to grow other crops—oats, barley, rye, lucerne, and any

other varieties of crops that can be produced by arid farming. And we have here before us demonstrations of what can be done by following scientific methods in soil culture. But whatever we do, I advocate fall plowing of the land; I unequivocally stand upon the ground that the land must be fall plowed if the best results are to be obtained, and it has been demonstrated again and again that in order to get the greatest amount of moisture retained by the soil it is absolutely essential to plow the land in the fall.

We have here on the left a little table which tells the story in one locality at one certain time—the amount of precipitation, the amount of moisture in the soil. The amount of moisture in the soil was found on the land that had been fall plowed as compared to that which had been spring plowed, which was only one-third of one year's precipitation. That has been demonstrated time and again. If you want to have the moisture in the ground at the time of seeding the crop, it is necessary to have the land plowed in the fall. I want to say that there are men giving a great deal of time and thought and intelligence to this subject, who feel that fall plowing is desirable in every instance.

President Paxman, who spoke to you yesterday, and who is one of our best dry farmers, is thinking now that perhaps we can get rid of the weeds and vegetation by discing the land in the fall and then in the spring, along in May or June, thus killing the vegetation, and with the fall plowing he is going to do that in the two years in which we are producing the one crop. That has some merit. It has some merit in getting rid of the weeds. It is a matter of economy. But I take it that if we want to conserve all of the moisture we must stand by the method that has been demonstrated to be a success in this state for years, and that is to fallow the land in the fall. After the land has been plowed in the fall to great depth—it may be that isolated experiments here and there can be stated to show where ground plowed five or six inches deep gives best results, but take the experiments conducted in this state as a whole and group them together, and you will find the best results on the average have been secured, without an exception, in my mind, without a single instance, in my mind, where the general results are taken, comparing the results in one part of the state with others, but that the best results have been by deep plowing. I stand here to advocate deeper plowing in order that the water held in the soil for the use of the plants may stay there in a certain, definite way. It is a well-known fact that plants will sometimes die from drouth when the water stands within sixteen inches of the surface, simply because the feeding area of the root surface is not sufficient to allow the plant to take up the moisture from the soil. We must have this moisture which is going to be taken by the plant stay in the soil in a certain, definite way; it must stay as a thin film of moisture around each grain of soil, and for that reason we believe in having as many grains of soil as we can stay in a limited space. These other theories may be all right for Colorado, or Nebraska, or in the east, or central west, but for Utah, under

our conditions, we say that the land must be loose underneath; it must stay in a granular form; it must be in such condition that the soil grains will be surrounded by grains of moisture, and it must stay as an entity, so that each grain of soil will be surrounded by a film of moisture, and that the soil shall retain sufficient moisture to allow the grain to take proper root.

There are a great many people who say that the question of arid farming depends very largely upon the way the moisture is distributed throughout the season; if we get a rainfall during a certain season we can dry farm successfully. I have heard even in our state, here, where we are farming successfully, a great many farmers depending on May or June, when the showers come. I want to say if you will follow this through, the years that we get the best results are the years when we have light rains during that season. If you are a praying man or believe in prayer, pray that we don't have any moisture, or pray that the moisture that comes in May or June shall be very light, simply because that is the period we want to be our period of drouth, if we are going to have a period of drouth. You want the root to extend down in deep into the soil and not spread out over a large area, and if the rains come in the early spring months the roots have a tendency to spread out near the surface, if the water is very near the surface, and we get a shallow-rooted plant, whereas we want the plants to have a tendency to send their roots down deep into the soil, and for that reason we don't care whether the rains come during that particular season of the year, and in fact would rather they would not. It has been demonstrated we can go for months without any rainfall at all, if we have the moisture stored in the soil. There are places in this state where they have been storing and conserving the moisture for ten or twenty years, keeping it stored up in the soil, and then when the plant is put in the soil there is sufficient moisture to carry it through whether they get any rain or not. That is the idea we are trying to follow in dry farming in Utah. We believe in deep plowing because we want this moisture to spread down around each one of these soil grains. When Bishop Farrell first started his experiments in Cache Valley, many years ago, and Mr. Salisbury started his experiments, they both had this experience: They went out and sowed the same amount of seed on their land as they had been accustomed to sowing on irrigated land, a bushel and a half and two bushels and a half, and as a consequence there wasn't sufficient moisture in the ground to nourish the plant. The plants came up, and there not being sufficient moisture in the ground to carry them through they waited and died. And Mr. Salisbury said that his failures during the first three or four years were simply because he did not learn the great lesson of simply putting sufficient seed on the land to be reconciled with the amount of moisture present there to carry it through. So now it has come, in Utah, that we are advocating the idea of seeding a very small amount of seed. We don't lay down any very set rules. We say about two pecks, or three pecks, or four pecks of seed ought to be used. But

we have been told, nowadays, by the experiment station, that the number of seeds in a given quantity of wheat are so much. It is almost impossible to give any rule. The same quantity of seed, for instance, could not be sown to advantage in Juab as in Iron county, where the precipitation is not the same. And there is a difference in the number of kernels in the same quantity of wheat of from twenty to twenty-five per cent. So that in Iron county a man seeding three pecks might be seeding a great deal more than the dry farmer in Juab county. It is not a matter that can be worked out very easily. If we follow the suggestion given by Prof. Jardine, and a very excellent suggestion, which is that the farmers of the section, this intermountain region, shall select one variety of wheat—select a variety which excels for our purposes, and establish this, then it should be an easy matter to lay down the amount of seed that ought to be sown in this region. Deep seeding, and seeding with a drill, and putting it down where the result is found, are the means by which we have been able to succeed in dry farming in this state.

Last night I said I believed that the matter of harvesting must be a matter of co-operation. I believe that the dry farmer, above all other men—above all other lines of agriculture—wants to co-operate, because it requires expensive machinery if we are going to reduce the cost of harvesting this grain to the lowest possible limit. There must be no division fences. The fences must be torn down, if we are going to dry farm at a profit, and a man should start in and go right through his own farm and his neighbors' farms, then they want to get together and buy a machine which will most economically put that crop on the market—a combined harvester. Combined headers and threshers in use in this western part of the United States have been demonstrated to be a success without any question today, and the cost of harvesting grain has been reduced from \$1.25 and \$1.50 to 60c and 75c per acre. And I say we cannot afford, under this movement that is coming in this state, in this section, in harvesting our grain to follow the old methods. We want to throw down the division fence and put on the combined harvester and thresher and thus put the wheat on the market at the least possible expense.

I just want to say a word or two in regard to selection and variety. We in this state, as said this afternoon, grow great varieties of wheat. The people in the western part of the state cling tenaciously to the Droubay; our people in Juab County are emphatically in favor of a wheat known as Koffoid wheat; in Cache County the Gold Coin, and some others favor growing the Lofthouse. In that section of the state which is the pioneer in arid farming—that is in recent times—Davis County, I believe, is the pioneer of this state in recent times—and in Cache County they use the Lofthouse and Gold Coin wheat. We want the arid farmers of the state to get together and adopt the best variety of wheat, and let us grow that particular variety, if we can be convinced that there is a variety that is preferable to the one we are now growing. The question of variety of wheat we will select will depend upon scientific basis. Our

object in selecting a variety of wheat should be to get one that will go best into the market. Our wheat now is mostly blended with the California wheat. They desire a high percentage of gluten to mix with their softer wheat, so that they can make a greater quantity and better quality of flour. For that reason we want to select a wheat that has a high percentage of gluten. The experiment stations have already taken this work up and they have been surprised to find that the wheats that are most popular in our state have proven to be highest in the amount of gluten contents, and fortunately for us one of the best wheats we have, as far as gluten contents is concerned, is also proving itself to be, in our experimental farms, one of the best yielding varieties of wheat, and that is especially desirable.

I know that the convention has been together a long time, and I do not feel like I ought to prolong my remarks, but I do want to say that the question of arid farming in Utah is based upon scientific principles, worked out by our local people. We are very glad of that, and that the state has come to our aid, and has given us the assistance it has, in enabling us to get the experience we have. Those of you who are not familiar with the state aid will find a chart showing the proportion of irrigated land in this state to that of unirrigated, and also showing where the state has established demonstration farms. And I want to take this opportunity to say that there are in this state millions of acres of as fertile land as has ever been put on the western market, and we have an abundance of precipitation. In some of the localities where arid farming has been practiced we have a precipitation of 18 inches. Down in San Juan County we have two million acres of land, and the state is demonstrating down there that wheat can be produced which will go forty to forty-five bushels per acre by following the plan of summer fallowing every other year.

We invite you to come to Utah. We invite you to come here and help us to reclaim our deserts. We want settlers. We want this land to be made productive of the very best kind of wheat that can be grown without irrigation, and we believe that by following the methods that have been demonstrated to be a success in our state this can be done.

In reference to tilling our crops, we believe in constant cultivation of the crops. We believe in the winter time, after the wheat is up, it is absolutely essential to go on with the harrow and harrow the wheat, two, three, four or five times, in order to break up the crust and destroy the crust so that the water will not come to the surface and evaporate. We believe in plowing, harrowing, discing and in doing anything and everything on the dry farm to keep the water that falls, the precipitation, stored up there for the use of the plant. I thank you. (Applause.)

PROF. JARDINE: I fear the speaker has misunderstood some of the points the government men are trying to make here. If I intimated in my paper that the farmers of Utah should discontinue summer fallowing I certainly did not mean it, and I submit my paper did not say so. There was no occasion, I believe, for the remarks in the beginning. I am also

familiar with agriculture in Utah. I have had something to do with it. I never said to the farmers of Utah, or ever advised their abandoning summer fallowing. I said that wherever summer wheat has followed corn or a cultivated crop throughout the United States it has always been found possible to grow equally as good a crop as to summer fallow, even under the driest conditions. That has never been demonstrated in Utah, to my knowledge, in a series of experiments, and I did not advance these theories. I said, Is it not possible to do this, and I still mean it, so far as results so far obtained go to show. The farmers of Utah are good farmers and I know it, and they all know I know it. (Applause.) I believe in them just as much as any man in Utah. And I claim to be a Utah man, too. And I am not deriding their system, and I want them to understand that I will back them up just as long as anyone. I said, Is it not possible to make their lands more profitable; when the lands are becoming more expensive, as settlers are coming into this country from the east, and as our lands advance from \$2.50 to \$15 and \$25 an acre; is it not possible to increase the value of these crops by introducing and rotating corn with the wheat, even though we do not get within two or three bushels as by summer fallowing, will it not increase the profit on the dry farm? I am not deriding the Utah farmer. I say to every Utah farmer here, Stay with your summer fallowing until you find something else that is better. I did not say that summer fallowing was not all right, but I certainly believe that there is a possibility of introducing a system of rotation of crops onto our summer fallowed land, and I wish to take issue with any gentleman—I don't care who he is—whether he is from Utah, from the department or anywhere else—I believe in it; our results prove it. I don't believe—and if I am mistaken in this I hope someone will correct me—I don't know where Utah has grown for a series of years wheat after a summer fallow and wheat after a rotation of crops on her dry land. Maybe the speaker knows; I don't. I would like to know, if I am mistaken, but I don't think I am. Before sitting down I want to say that I don't want the farmers of Utah to think I am deriding their summer fallowing methods; but I do say that if there is a possibility of getting more returns from our dry land, especially as they become more and more valuable, I believe in trying to accomplish it. I believe in looking to the future and not the present merely. I don't think thirty years is long to look ahead. We have a good, strong, rich land—as rich as any in the world—in the United States. That don't go to say, however, that in fifty or a hundred years from now we are going to continue to have it. We are young in Utah, and now we have the time to consider these things, and I will guarantee that every farmer will get just as large returns off of his land if he devotes a little of his time to diversified farming as he would by growing wheat exclusively. (Applause.)

CHAIRMAN DERN: Prof. Merrill referred to Joshua Salisbury. I am pleased to say that the gentleman is here, looking well and hearty—looking just as well as he used to. He is one of the pioneers, coming here in the sixties. He has followed, to a certain extent, dry land farm-

ing, and has had a considerable experience in that line. Some good friends referred to him some years ago, and that is why this picture was framed. As the gentleman has prospered under dry farming, I just wanted to make mention that he is one of the many that is still growing and prospering, even at old age, under dry land farming.

MR. PAXMAN: With your permission I would like to call the attention of Prof. Merrill to one thing in regard to fall plowing. I believe he has impressed this congress with the idea that I am somewhat averse to fall plowing. Now, I don't desire to take issue with him in any respect, and I believe he will agree with me if I shall call his attention to my conversation with him. It was to this purport: That it was not fully demonstrated, in my mind, as to the economical side of fall plowing versus that of fall discing and spring plowing, and I should, in the future, demonstrate that to my own satisfaction before I should to any great degree advocate staying with the method of fall plowing. I do not want this convention to conceive the idea that I was advocating a policy against fall plowing, for I believe in fall plowing, and all of my operations have been done, in the main, in fall plowing. I believe there is virtue, also, in another method, that can be followed up; which is, discing thoroughly in the fall, allowing the moisture to go into the ground, then giving your ground a light plowing in the spring to kill the vegetation and the wheat that may grow in the spring voluntarily. Likewise, I have an idea that deep plowing is not essential every year. I believe in disturbing the soil deeply, and I believe that that will last for a series of years—a number of years and do just as well in the conservation of moisture as plowing deeply every year. I believe that that theory is worthy a trial and I am going to try it. I believe that we should plow deeply once; afterwards plow shallow and that we will have better results, because we keep the fertility on the top.

CHAIRMAN DERN: Gentlemen of the Convention, I take very great pleasure in introducing to you Mr. Joshua Salisbury, the pioneer of dry farming in Utah. (Long applause.)

MR. JOSHUA SALISBURY, of Utah: Gentlemen: Mr. Merrill was the one to push me up to advertise the picture in this frame, and the one to scold me because I left it so long without publishing it to the public. Well, I told my reason to him in this way: I am not an educated man; I did not get any schooling to amount to anything. "Well, Mr. Salisbury," he says, "you have got the best school of all; we get a theory from such men as you old scholars; you have got the practical part of education." (Applause.) Well, anyhow, after I started—I came here in the early sixties—I traveled two thousand miles from the Ohio River, to Wellsville, Cache County, with one yoke of cattle, which Mr. Listman mentioned in this picture here. Anyhow, I crossed this land in '61 to hunt for my cattle, and I looked at the land and examined it; what kind of vegetation was grown upon it. I found out if this vegetation grew on land where wheat would grow, and other products, and better. Well, anyhow, I watched carefully for the time to come for the wheat to come to market. I went right away

and entered this land; using my franchise to obtain it. Well, anyhow I work around it back and forward till I get ready to grow corn, and anyhow, before I started growing President Young used to come up yonder two, three times in the year, with his company, and he began to talk about it and he said plainly and in a clear language, "Is this the best land you have got at the foot of these mountains to grow grain?" (Applause.) Well, I went to work. I tell you I didn't get any credit nor sympathy from any man; I was a fool and a fanatic. (Laughter.) I have met hundreds, even thousands of fools and fanatics since then. (Laughter.) Well, anyhow, to go on a little more, I began to plow the land and I hired teams. Mr. Listman is one of the best farmers I believe in Utah, or any other place, in Wellsville yonder, and I hire him to plow for me my land. He plowed, I believe, either ten or twelve acres, deep and good, with two yoke of cattle. Well, my grain failed but a very little through overseeding the ground, and I watched closely the cause of it. One half of the wheat came before the other half grew. Well, I realized my bread that year was dependent upon that crop that time, because I sold my land in the fall yonder with water to it. And one of my best friends said I was a fool to sell my land with water and go on dry farm. That is the character I have. (Laughter.) And Bishop Mann of Wellsville, he did just the same thing. In a business meeting yonder, "Brother Salisbury," he said, "I am afraid you will have to wear a good many patches on your overalls." (Laughter.) "Well," I said, "I am not ashamed of that, provided I have got a wife who can put a workmanlike patch on my pants." (Applause.) "I tried to get that kind of woman to make my patches neat." (Laughter.) Well, anyhow, the next thing was for me to provide myself with proper machinery to gather the grain. I went to Brother Harold here and I bought a self rake to cut the wheat. First—I am ahead of my story—with a cropper and then I find out the self rake was an improvement and I got one from him—and I paid for it (Laughter), and the third crop I grew a grand crop of grain. And there was a man named John Bankhead—the biggest farmer in Cache County, Utah. I was working on the temple at the time, stone cutting there, and he went on his horse, which he used often to hunt cattle and horses, and he turned to my boys—I don't know if he is here now but he was here yesterday—and said, "Boys, what are you going to do with this wheat?" They said, "Going to sow it." He said, "Better take these sacks of wheat and empty them in the big creek yonder." He think it is folly for us to do it. Well, John Bankhead went away, and next fall about harvest, he was going on his horse again, it was a beautiful crop of nice wheat, and he turned to them and said, "Well, boys, I am ashamed to show my face to you for saying anything; I never made myself a bigger fool in my life than I did then." (Laughter.) And the machines threshed for me 1,500 bushels of wheat. (Applause.)

Well, anyhow, after I had this self rake the self binder came along, and I purchased one of them—the Champion, and then after that



other kinds of machinery. The header came and my son Joseph bought one of them and he has got one now.

Well now, in relation to one thing, you have all talked of the best methods to grow grain. Not one of you has mentioned one thing—Lucerne. Lucerne is a benefit to the land. I have sunk down as much as nine feet and found Lucerne roots, and the roots will rot and will be full of holes, and the sun will draw the moisture from the ground to the top of the land. (Applause.) And I didn't state, there are articles from the garden, and different things on the tables there. I grew cauliflowers in the garden, one weighed 14 pounds 8 ounces, and there were two alike which we had yonder at the time, and the other cauliflower weighed lacking two or three ounces of fourteen pounds. I got a medal there and diploma—a medal for those things, and onions and other things I had there at the fair. And Mr. Sanborn, principal of the Agricultural College, he took that big cauliflower to the State Fair, and then between Christmas and New Years he sent his son to my house and he dined with me. He got a portion of my stuff, everything I had, and he shipped it right to Chicago to the Fair. Well, I got a grand diploma—medal worth a hundred dollars—golden and silver—and I have them there in my house now. (Applause.)

Well, my brothers and fellow workers on the earth, go on, and the Lord will bless you.

I see Brother Farrell is here today. I say that a man that grows 20,000 bushels of grain is a Joseph in Egypt. And even President Roosevelt has put in his message quite a stress on the people to grow wheat. Is it not the life of the world? Well, Joseph, when he went to Egypt, what did he get from the King of Egypt—Pharaoh? He got a gold chain. I tell you, Brother Farrell, for the amount of grain you grow you ought to have a diamond ring with a gold chain. (Applause.)

You go on, my fellow men, and improve all you can in raising wheat and everything else that is for the benefit of man. As one man here talked in relation to how lazy man is, good for nothing, only to devour what a laboring man has labored to raise. (Long applause.)

CHAIRMAN DERN: I want to announce that the Committee on Resolutions will meet at nine o'clock tomorrow morning. If anyone here desires to offer any resolutions they will do so now, so that they can be considered by the committee in the morning.

This will conclude our regular program for this afternoon. A motion to adjourn will be in order.

On motion duly seconded the Congress adjourned to meet at ten o'clock tomorrow morning.

FRIDAY, JANUARY 24, 1908.

(Third Day.)

MORNING SESSION.

The Congress was called to order at ten o'clock a. m., by Hon. E. A. Burrell, of Montpelier, Idaho, presiding.

CHAIRMAN BURRELL: The first number on the program this morning is a paper on "Good Roads and the Farmer," by Prof. H. M. Bainer, which will be read by Prof. Jardine, of Washington. Prof. Jardine, gentlemen. (Applause.)

MR. JARDINE: I certainly did not want to inflict you with my presence much longer, but it seems that Mr. Bainer, being a friend of mine, and I having been at the Fort Collins Agricultural College the other day, he desired me to read his paper here. I am afraid it will be done rather poorly, however, since I have not had time to look it over. Mr. Bainer is Professor of Farm Mechanics at the Colorado Agricultural College, at Fort Collins, Colorado.

#### CONSTRUCTION AND MAINTENANCE OF EARTH ROADS.

(By H. M. Bainer, Professor of Farm Mechanics, Colorado Agricultural College, Fort Collins, Colorado.)

There is no one question of greater importance to the Western States than that of good roads. Good roads are a great advantage to the financial, social and educational conditions of a country. The success of many undertakings depends upon the road conditions. Good roads decrease the cost of transportation, facilitate rural mail delivery, and permit more easy intercourse between the rural and city population. They make living along them more desirable; they economize time and power in transportation of products, reduce wear and tear on horses, harness, and vehicles, and raise the market value of real estate.

The American people are beginning to realize that road building is a public matter and that their best interests demand the construction of good roads. Money wisely spent for this class of roads is certain to return with interest and large profits. Earth roads must be used almost entirely in the West. They are not expensive, comparing them with other forms of roads made of gravel, broken stone, etc. One mile of good earth road can be constructed at less cost than ten miles of broken stone or gravel roads, especially where these materials are hauled from a distance.

The main traveled roads leading into cities should be constructed of either broken stone or gravel, however. The cost of these roads will vary from \$1,000 to \$5,000 a mile, and for general use throughout the country must be considered too expensive. For this reason it is necessary that we become educated as to the best methods of constructing and caring for our earth roads.

### Road Location.

In most of the western states roads are laid out on the section lines. In traveling from one place to another over these roads it is very often necessary to cross and recross hills and valleys which might have been avoided had the roads been laid out according to the general lay of the land rather than on the section lines. An error made in locating a road becomes more costly as the use of the road increases.

Place roads on dry soil, back from a low, wet creek bottom, rather than follow a section line through it. More time and money has been wasted in trying to keep up a single mile of such road than it would have cost to build and keep in repair two miles of good road.

According to Eldridge, "Even if the distance around a hill be much greater than over it, it is often more economical to construct it that way rather than make it necessary to expend large sums of money and time in reducing the grade, or a waste of much valuable time and energy in transporting goods that way."

### Drainage.

There is no agency more destructive to successful road building than water. Drainage alone will often change a bad road into a good one, while on the other hand the best road may be ruined in a short time from lack of the proper drainage. The keeping of the road dry, both above and below, is a fundamental necessity for a good permanent highway.

In some places surface drainage only is required. In those places where the surface is more or less rolling and especially where it is underlaid with porous materials as sand or gravel, so that the ground water does not come near the surface, underdrainage will not be necessary. But at any place where the adjacent fields will be benefited by underdrainage, but all roads should be surface drained. similar manner. In the West, the larger part of the roads do not need underdrainage, but all roads should be surface drained.

The crowns of many of our road beds are too flat to shed water. The large part of them are not only flat but concave, the center being the lowest part; in other words, the crowns are turned the wrong side up. Roads in this condition are naturally less firm than the adjacent fields. A water-filled soil will not bear up an empty wagon; while the same soil thoroughly drained will become firm and make an excellent road bed.

### Crown.

A crowning road bed is absolutely necessary for best road conditions. For the main traveled portion of the road, a crown of one inch to the foot is recommended with steeper slopes outside of this to the side ditches. For a steep road grade the crown should be increased to carry the water to the sides rather than allow it to run for some distance on the road. One inch crown to the foot under ordinary road conditions is sufficient for thorough surface drainage. Under these condi-

tions a twenty-foot roadway would be ten inches higher in the center than at the edge where the slope becomes greater to the bottom of the ditches. The slope from the edge of the crown to the bottom of the side ditches should have a fall of at least four inches to the foot.

#### Side Ditches.

Open side ditches are also absolutely necessary to thorough surface drainage. The bottoms of these ditches must be carefully graded so that all water falling on the road bed will be quickly carried off rather than be left in pockets along the road sides to gradually soak away, thus softening the road.

For the safety of travellers and also from the point of economy of first cost and maintenance, these side ditches should be made broad and shallow rather than deep and narrow. The water should not be conducted for long distances as it increases the washing and makes the ditches too deep at the outlet end.

#### Underdrainage.

Tile drainage will greatly improve the conditions where the ground water rises to a level of from eighteen inches to two feet of the surface. Water seeping from springs or irrigation ditches can be readily removed by carefully placed tile drains.

Under ordinary tile drainage conditions, one line of tile placed just inside of the open ditch under the road bed is sufficient. This line is to be placed at a depth of from three to four feet, according to the soil conditions. Exceptionally wet places sometimes require two lines of tile, one on either side. Seepage water usually comes from one side of the road; this can be cut off by placing a line of tile as heretofore described on the side of the road nearest the source of water supply.

For carrying water distances of not over 1,000 feet a four-inch tile is large enough. For distances from 1,000 to 1,500 feet a six-inch tile is to be preferred and for greater distances an eight-inch. The size of tile, however, will vary with the soil conditions and grade and not entirely by the length of the line.

In tile drainage, great care must be exercised in locating it true to grade. The tile should be placed below the frost line. It must be large enough to carry all the water. The outlet must be protected to prevent it from being washed out and it should also be covered with grating to prevent the entrance of various small animals. Above all, first class tile only should be selected.

#### Grade of Road.

A grade may be reduced by going around a hill or by zigzagging up the slope. For ordinary roads the road bed must conform with the natural lay of the surface over which it passes. Hills which are short and steep may usually be graded down to better advantage than to pass around them. Increasing the length of a road adds to the cost of construction and of transportation, while cutting down a hill adds only

to the cost of construction. A grade may be so steep as to limit the size of load that can be moved over the road, thereby making it necessary to carry smaller loads than otherwise would be required.

#### **The Power of a Horse on the Road.**

A horse, with reasonably good footing, can exert a pull equal to one-tenth of his weight, at a speed of two and a half miles per hour, for ten hours per day, for six days per week, and keep in good condition. At this rate a thousand pound horse would exert but two-thirds of a horse power and a 1,500-pound horse would exert one horse power. The maximum draft of a horse is about one-half his weight; he can exert this much energy at a slow walk for a distance not to exceed 100 feet. At this rate he would develop energy enough for ten hours, in two hours' time. A horse can exert a draft equal to one-fourth of his weight and stand it for a much longer time. Then the working tractive power of a horse may be taken as one-tenth his weight, with an ordinary maximum of one-fourth, and in great emergencies a maximum of one-half his weight. According to Baker, it requires a tractive force of 100 pounds to move one ton of load over an ordinary level earth road. A team of 1,200 pounds each, pulling at the rate of one-tenth their weight, would be able to pull 2.4 tons on the level. Pulling at the rate of one-fourth their weight, this team would be able to pull this same load up a five per cent grade, and would probably be able to pull it 400 or 500 feet. This load pulled by the same team exerting a pull equal to one-half their weight could just be moved up a twelve per cent grade for a short distance only. Thus we see that if there was a short, steep, twelve per cent grade on a certain road, the largest permissible load that could be carried over the road with a team of 1,200 pounds each, would be 2.4 tons.

According to Gillespie, "It costs one and one-half times as much to haul over a road having a five per cent grade, and three times as much over one having a ten per cent grade as on a level grade."

#### **Care of Earth Roads.**

The work of maintaining an earth road is largely that of keeping the drainage system free from obstruction, and the surface smooth.

Outlets to tile drains should be examined frequently. Trash which may have been collected at the mouth of the tile should be removed.

Side ditches must be kept open and free from weeds. Where the sides begin to wash badly they should be protected with stone, brick, plank, or tile, and should not be allowed to wash deeper or wider than is necessary.

Traffic over any road has a tendency to wear the surface of a road unevenly. For this reason it is necessary to provide some means for keeping the surface smooth, thus keeping out the water. If this is not done, as soon as ruts are formed, the water will stand in them and soften the surface and in a short time the road is nearly impassable if not entirely so.

### The Road Drag.

After the road bed has been formed by the blade grader, as is commonly used in road building, there is no other tool better adapted to road maintenance than the road drag.

A drag of this kind can be made for two-horse work either by the use of a split log or a 2-in. by 12-in. by 16-foot oak plank sawed in two. If made of a log, it should be from seven to nine feet long, ten to twelve inches in diameter and split into two as nearly equal halves as possible. They are set on edge with the flat side to the front, thirty inches apart, and are fastened together with three strong tie pieces wedged in. A chain is used for pulling the drag and is so attached to the double trees as to pull it at any angle desired, which is usually about 45 degrees. The cost of this road implement will vary from seventy-five cents to \$2.50 each.

The oak plank drag is made in a similar way as the split log drag just described. Either of these drags should be shod on the front piece with a piece of flat steel. This will not only prolong the life of the drag but will at the same time cause it to do better work.

### Use of the Drag.

The time to use the drag is after each wet period just as the road is beginning to dry. This tool fills all ruts and levels the surface putting it in condition to shed the next rain. The drag being hauled at an angle of about 45 degrees moves a small amount of earth to the center of the road at each time, thus keeping the crown well rounded.

The mud formed on the road after a rain represents the dust, in part, which has been made by constant tramping and wear of the road surface. When moistened, this dust forms a paste similar to cement. By the use of the drag as soon as this mud begins to dry this "dust paste" is crudely troweled or smeared over the surface. The action of the wind, sunshine and travel have a tendency to dry, harden and beat down this mud covering until it becomes a sort of roof which turns water very readily. Travel then begins to work up more dust, this is again formed into a "dust paste" by another rain. Another dragging spreads the coat over the first and the surface becomes harder, smoother and more nearly water tight than before.

A road dragged after each rain, when the mud does not stick to the drag, will become practically water proof, resist the action of frost and will remain hard and smooth throughout the year. Every time the mud is spread over the surface and is beaten down and hardened, the road is improved.

In Iowa the drag has proven very successful, from the fact that next to the last session of the legislature passed a law directing township road supervisors and trustees to have the roads dragged at least ten times a year with a split log or plank drag and to pay fifty cents a mile for each dragging. Certain counties also offered premiums to farmers for the best mile of earth road maintained by the use of the drag.

There should be some inducement to encourage farmers to drag roads adjoining their property.

### **Road Machinery.**

The common scoop scraper, owing to its small size, is adapted only to side work and not to hauling dirt for any distance. The larger sizes of wheel scrapers are to be recommended for short hauls of not over 300 feet. In filling them, a snap team or second team is of great value, as all scrapers will then be loaded to full capacity, and will not go half loaded.

The blade road grader or reversible grader is well adapted to finishing a road after the cuts and fills have been taken care of by the wheelers. To do good work this machine must be handled by a skillful operator and pulled by trained teams.

The common practice still found in different states of allowing each individual to work out his taxes by placing his team in connection with several others, before a grader, and driving it himself is very expensive. By this method it takes from three to five men to operate the grader and very little work is done because the teams are not trained to work together. One skilled driver with trained teams will do twice as much work at very much less cost.

The elevating grader can be used successfully in filling wagons for hauling at a distance. They are also adapted to the building of high grades. Trained workmen and teams are also necessary to the successful operation of this machine. For ordinary road grading purposes this machine cannot compete with the reversible or blade grader.

### **Education on Modern Road Building a Necessity.**

There is no other one question at the present time on which we need instruction more than on modern road building. The method of road construction and maintenance as carried out in eastern states is not entirely adapted to use in our Western states. The principles, however, are the same, but in order to adapt them to our best use, it is necessary to study our conditions and build our roads accordingly.

The old method of allowing each tax payer to work out his own tax under a road overseer is expensive. Two experts with trained teams will do more than twice as much work as four or five untrained men with the same number of teams and at no more expense.

We need road specialists. Our present day methods of road building are entirely too expensive. Old methods of road building can be greatly improved. We must educate our own road builders.

We believe this can be accomplished by the establishment of good roads schools in connection with the various State Agricultural Colleges. Special appropriations should be secured from the various state legislatures for the support of these schools.

Road specialists should be in charge of these schools. The instruction given should cover the best methods of building and main-

taining stone, gravel, or earth roads and especially the roads best suited to the particular state. Road drainage and maintenance would be thoroughly discussed. Lectures should also be given by road experts from other states. Road building demonstrations would also be carried out in connection with this work.

Sample road machinery and drags of various makes would be secured for exhibitional and demonstrational purposes. In fact, every detail of road building should be thoroughly taken up.

CHAIRMAN BURRELL: The next paper is "Summer Fallowing in Relation to Dry Farming in the Great Basin," by Prof. Scofield, in charge of Office of Agricultural Extension, Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C. The paper will be read by Prof. Chilcott.

PROF. CHILCOTT: Ladies and Gentlemen: Prof. Scofield is carrying on a series of experiments at a number of places in the western part along this line, the principal part of his work being at San Antonio, Texas, but he is working in connection with the Reclamation Service at several other points. The title of his paper is "Summer Fallowing in Relation to Dry Farming in the Great Basin."

I take the liberty of calling your attention to a criticism that has been offered against the Department men concerning the method of summer fallowing. I think there is a misconception on that. I tried to make it clear in my talk that I dealt entirely with conditions east of the Rocky Mountains. I know nothing whatever from a practical standpoint, of conditions west of the Rockies. As you are all aware, the conditions west of the Rockies are very different from those east of the Rockies, particularly as you have a winter rainfall here, while on the eastern side of the Rockies we have a summer rainfall, and we arrive at very different conclusions concerning various methods.

You will see that Prof. Scofield, who is also a government man, takes a very different attitude towards the subject of summer fallowing than myself. If I were operating on this side of the Rockies it is altogether probable that I would agree with Mr. Scofield, and with the men who are advocating summer fallowing. I do not believe it is a good practice east of the Rockies. I have reason to believe, from the experience of others, that it is a good practice west of the Rockies, and there are reasons for that.

### **SUMMER FALLOWING IN RELATION TO DRY FARMING IN THE GREAT BASIN.**

(C. S. Scofield.)

In view of the fact that the practice of summer fallowing the land for moisture conservation, together with alternate year cropping, has made dry farming possible in Utah and throughout the Great Basin, a careful study of this practice may be justified. No one who is familiar with the facts can question its importance as a factor in the utilization of the agricultural possibilities of this great region.



Although the practice of fallowing land is almost as old as agriculture itself, its extensive use to conserve soil moisture and to permit crop growth in arid regions has not been so generally used until recent years. It seems not to have been realized that the soil is capable of acting as a storage reservoir for water when proper tillage is used, and that under favorable circumstances enough moisture to mature an ordinary annual crop can be stored in the soil before the crop is planted. Even if this fact had been appreciated, it was not practicable to put it into general use until farm machinery capable of cheaply getting the soil into proper condition was devised and constructed.

So far as American agriculture is concerned, effective summer fallowing became possible only with the invention and general use of the disc harrow. This implement, together with the plow and the ordinary smoothing harrow, makes an equipment cheap enough to be available to every farmer, and efficient enough to make tillage for moisture conservation entirely practicable. The highest development of summer fallowing for moisture conservation has probably been obtained, in this country at least, in the region west of the Rocky Mountains. In all this region, the greater part of the annual rainfall comes during the autumn, winter and early spring months, when évaporation is at its lowest point, and the greatest penetration of the rain into the soil is possible. Under these conditions, a thorough summer fallow, established as soon as possible after the spring rains have ceased, can be cheaply maintained throughout the summer and is wonderfully efficient in preventing évaporation of water from the soil.

Although it has been a well known fact for many years that a well maintained surface mulch is very efficient in preventing évaporation of water from the soil, definite facts as to just what this efficiency is are extremely rare in our agricultural literature. Within the past two or three years, however, experiments have been undertaken in a number of places to ascertain just what this efficiency is under various conditions, and we may now hope in the course of a few years to have a body of knowledge on this subject from which to make deductions and upon which to make generalizations.

For practical purposes, however, it is sufficient to know that where the annual rainfall comes during the colder months of the year, it is possible to use a system of summer fallowing, together with growing crops on alternate years, that will secure paying crops where the rainfall is altogether too light to permit farming without irrigation with the ordinary cultural methods.

It must be kept in mind that the best use and highest development of summer fallowing and alternate year cropping is only possible where the rainfall is largely concentrated in the cooler months. Where the rain comes at frequent intervals during the summer months, the maintenance of an adequate surface mulch to retain this moisture is both difficult and expensive. It must be remembered that there are some conditions under which summer fallowing, together with alternate year

cropping, cannot be economically used. This is true where the soil is so light and open in texture as not to be able to hold a large quantity of water. Only the heavier soils are capable of holding enough water to justify the expense of summer fallowing. Where the soil is light there is also great danger of serious injury through wind erosion. There have been cases, in fact, where fallow soil has been blown entirely off a field to a depth of several inches. In other cases, where the land is rolling and the rains are frequently torrential, there is danger in leaving land exposed in a fallow condition on account of the erosion by water that will result. These and other similar possibilities must be kept in mind in discussing the applicability of practicing summer fallowing and alternate year cropping for any region or any soil type.

This much is certain, however, that on most of the mesa and high valley lands of Utah, where the rainfall is too light to produce an ordinary crop every year, it has been demonstrated beyond the shadow of a doubt that the practice of summer fallowing and growing crops every other year is sufficiently profitable to justify an enormous extension of the cultivated acreage of this state.

It remains to be seen just what the ultimate effect of this practice will be on the continued fertility of these soils and on their mechanical condition. It may be found, for instance, that this practice of growing wheat, or some other grain crop, continuously would, in the course of a generation or half a century, seriously reduce the fertility of these naturally rich soils or result in a change in their mechanical condition that would sooner or later make a continuation of this practice impossible. If this is the case, the sooner it is discovered and some means taken to postpone or avoid the result, the better it will be for all concerned. For this reason, it is highly desirable that the future as well as the present effect of this practice be considered rather critically. It would be perfectly natural to assume that here in Utah it will be found, as it has been found in many cases elsewhere, that the continuous growth of any one crop on the land will only result in a decreased yield, due either to the actual depletion of the plant food needed for that crop or to some other modifications resulting from such continuous culture.

While the practice under consideration has not been generally applied over a large area for a sufficiently long period to give conclusive results, it is very gratifying to observe that the present indications are that rotation of crops is apparently by no means so necessary under dry farming conditions here in Utah as it might be supposed to be, or as it has been found to be in other regions for the maintenance of a high state of productiveness. If this inference be correct, it is a matter of no little interest and importance to this whole section and to others having similar conditions. As a matter of fact, it has been found that in the Cache Valley, for instance, where dry farming has been carried on for about one-third of a century and where some fields have been used exclusively for growing wheat, that the yields obtained at present are quite as good, if not better, than when these fields were first broken up. This continued pro-

ductiveness may be due in part to an improvement of tillage methods, but there are indications which should not be overlooked, that some of these fields are actually more fertile than they were at first. In any event, it seems true that the productiveness of these lands has been maintained to a surprisingly high degree. In the great wheat belt of the valley of the Red River of the North, it is a matter of common knowledge that after 12 or 15 consecutive crops of wheat have been grown on the land, it is no longer profitable to grow this crop except in a rotation.

In the Cache Valley, however, indications are that the equivalent conditions have not yet been reached. If this be true, it is important to discover the causes involved and to determine if the tillage methods used are largely responsible for the present condition, and, if so, what features are the most important and need greater emphasis. In the first place, it must be kept in mind that the soils which have given the best results under this system of tillage have been those sufficiently heavy to retain without leaching all of the annual rainfall. As a result, all of the soluble mineral matter, the product of centuries of weathering to which the soil has been subjected, is held in the surface layers and is available for the use of the plants. Furthermore, the methods of tillage followed give conditions that enormously accelerate this weathering process, so that so far as the mineral salts are concerned, the indications are that summer fallowing and alternate year cropping can be depended upon to keep up the supply of mineral plant food. It is necessary, however, to provide for a continuous supply of nitrogen in soil being continuously cropped with grain. Grain crops require a considerable nitrogen supply, and they require that it be in an immediately available form and at a very definite period in the life of the plant. The available nitrogen of the soil is drawn partly from the organic matter, which contains nitrogenous compounds, and partly from the air by micro-organisms capable of utilizing nitrogen gas. Since these organisms must have organic matter of some sort to live on, it becomes doubly important to provide a continued supply of organic matter in soils being continually cropped. By a fortunate coincidence, this result has been achieved probably without conscious design. It has been the custom in farming the dry land of this region to use headers instead of binders in harvesting grain. As a result, a large amount of loose straw is annually plowed under, and the amount of organic matter in the soil is probably increased at a more rapid rate than it was under virgin conditions. If this custom is, as it now appears to be, an important factor in maintaining the productiveness of these dry farms, it should most certainly be preserved. It would be a misfortune, indeed, if this continued supply of organic matter should be reduced, which would be the case, for instance, if it became the custom to burn over these wheat fields after harvest instead of plowing under the straw, or if the straw should be cut close to the ground and hauled away and not returned to the land in the form of manure.

The conclusions are, in part at least, based on theory rather than on actual observation or experiments. They are of sufficient importance to warrant serious consideration until effectually disproved.

To summarize these conclusions briefly, it might be said that the present indications are that summer fallowing with alternate year cropping, applied to grain production in the Great Basin, makes it possible to grow profitable crops with a rainfall so light that cropping every year would be impossible; also, that the practice of summer fallowing as applied in this region, particularly when it includes the plowing under after each crop of a large amount of organic matter, results in keeping up, if not in actually increasing, the producing capacity of the soil. There are one or two minor features in connection with this practice that need further emphasis. It has been found, for instance, on some soils, particularly those rich in lime, that continuous shallow cultivation in summer fallow results in the formation of a thin hardpan at a depth of about two or three inches in the furrow slice, just below the dust mulch. This condition can be avoided, or at least its injurious effect reduced, if the depth of cultivation in maintaining the dust mulch is varied with each operation; that is, in using the disc harrow, for instance, if it can be run deep one time and shallow the next the formation of this hardpan can be nearly, if not quite, avoided. This hardpan is injurious, not only because it prevents the ready penetration of the first autumn rain following the season of summer fallow, but it also excludes the air from the lower part of the furrow slice, where it is needed to carry on the humification of the organic matter previously plowed under. It is needed also by the bacteria that live in the organic matter and elaborate the nitrogenous compounds. Furthermore, it is desirable that when the organic matter is plowed under, it should be plowed under deeply. This is on account of the well known fact that there is little or no humification of organic matter in very dry soil, such as that in the dust mulch. An ideal condition for humification and for moisture conservation is produced when the summer fallow is made by plowing under the wheat straw to a depth of seven or eight inches, and then following this with a surface tillage that establishes a dust blanket to the depth of three inches. There remains, then, below the dust blanket a layer of four or five inches of soil, rich in organic matter, well aerated, and with sufficient moisture to promote the rapid humification of the organic matter and the growth of soil bacteria to elaborate nitrogenous plant food. With these conditions provided, it is reasonable to believe that dry farming on the semi-arid and non-irrigable lands of Utah may become as firmly established a feature of western agriculture as the irrigation farming which has made this region so popular and so famous. It should not be taken for granted, however, that the problems of dry farming are as yet all solved, or even all appreciated. In the campaign for the subjugation and utilization of these semi-arid lands the same optimism, the same perseverance, and the same ingenuity that have characterized this work up to the present stage must be continued many years

to come, if the great resources of this region are to be developed to the highest possible degree.

CHAIRMAN BURRELL: The next on the program is "The Control of Moisture on the Dry Farm," by Prof. Alfred Atkinson, of the Montana Experiment Station, Bozeman, Montana. Professor Atkinson, ladies and gentlemen. (Applause.)

PROF. ALFRED ATKINSON: Ladies and Gentlemen of the Congress: The question which I have to deal with this morning has as its basis an established basic difference between arid farming and humid farming. The only reason we have come here to consider this proposition of dry farming is because we haven't moisture enough to do it on a humid basis. Humid farming has been demonstrated and has been accepted as a success. And the different features of that are considered, as a general proposition, to be long past the experimental stage. So that the subject of controlling moisture on the dry farm is one of prime importance.

The subject of the adoption of different methods and systems of farm management, and many other things, are important to the problem of conserving the moisture, in order that we can produce that one thing that is lacking on the dry farm. It seems to me this is very nearly of prime importance. We have fertile soil; we have good conditions of temperature and other growing conditions; and the only one that is not present in abundance is our moisture. Experience and investigation, as far as it has been carried on, would indicate that certain methods in certain localities are superior for the control of moisture. In the discussions that have taken place, and in the papers that have been read, we find that the practical farmers, those who have been looking into the subject, have discovered that methods which will apply in one locality will not necessarily apply in a different locality. We find, for instance, that in some places the proposition of summer fallowing the land to accumulate moisture is decidedly the most economical. The experience of farmers and those who have been looking into the subject indicates that this probably will not apply in other localities. So in speaking of the general proposition of conserving soil moisture we must know in the beginning that we cannot lay down any rules which will apply in every locality.

We know some investigators have taken up the problem to determine the relation between the amount of rainfall and the possible crop that might be produced; that is, the amount of moisture it takes to produce a certain number of bushels of a certain crop. I believe, gentlemen, that this will vary very greatly in different localities. The experiments conducted in the humid west indicate that it takes a larger amount of water in the arid west than it would in the humid central west or the east. This past year our Montana Experiment Station has been doing a little work in that connection, and I would just say that our results are not entirely concordant with results gained so far in other states.

Some of our yields, taken in the light of the amount of rainfall in the past season, would indicate that the amount of water used was not so great. However, our season was cooler and the evaporation lower, and a thing of this kind, it seems to me, ought to be looked into for many years before we can come to definite conclusions on it. As I said, the experience we had at our Montana station this year would indicate that the amount of water required for crops is not so great as that even in Wisconsin. However, I do not offer this as a conclusion. The season was a little cooler and consequently I don't wish you to take any results I have given, because the results of succeeding years at our station may be entirely different from the results this year. But from experiments so far in that section we are not in position to say just how much water it will take to grow a certain amount of crop. For instance, the ground we broke year before last and seeded last fall—broke in the spring of 1906 and seeded the fall of 1906—we grew on that ground 59 bushels of Turkey Red wheat to the acre, in addition to the straw. To account for this in inches of rainfall would be rather difficult on any basis we have yet devised. My point is it is a little hard to say definitely. Possibly south of Montana it would take more water, and possibly in different sections it would vary. I know in different sections of the state, and on different sides of the range it will vary greatly. That is a problem we must solve before we can say definitely just how much water it takes to produce plants under the different conditions.

Those who do not believe that the dry farming movement is destined to become a success and to reclaim for market a large agricultural area, and who wish that it would not, say, "Just wait until you get one of those dry years." To the Montana farmers they say, "Just wait until you get another year like 1904 or 1905 and we will see this dry farming business going up in smoke." For that reason I believe that the farmers—while I am as optimistic as others, and believe that the dry farming business is destined to be a success—when they have learned the different methods of handling the soil and crops, I believe we will have a universally successful dry farming practice. But, nevertheless, we do get dry years, and I believe that one of the points the dry farmers should look to and have in mind is to fortify himself each year for a succeeding dry year. In Montana we do get some years drier than others. Two-thirds of our rainfall comes during the latter part of April, through May and June and the first part of July. Sometimes that is very fortunate. That is the growing season. If it is particularly heavy in June it will pretty nearly carry our crops through the ordinary year, but that is not always the case. I believe one thing a farmer should have in mind in his system of moisture conservation is to fortify himself for the succeeding year; so conduct himself that he is not liable to lose out entirely any year.

Beginning the first of April and ending the last of October this year we have made moisture determinations once every week on soils handled in several different ways. We found this spring, in making our determinations at the beginning of the season on a plat of land that had

been summer fallowed the previous year and a plat of land that had grown a crop the previous year, on the summer fallowed that we had in the spring in the first six feet soil moisture contents equivalent to nine inches of precipitation—our average precipitation is 13.14 inches in Montana—we had in our summer fallowed land the equivalent in the first six feet of nine inches precipitation, while in the area where a crop had been grown we had a little over the equivalent of two inches precipitation in the first six feet. That does not necessarily indicate to me that we should always summer fallow. The summer fallowing is certainly one of the methods of fortifying against the succeeding dry year—a thing we ought to look out for. It is very fortunate that the attention of the Department of Agriculture has been directed to the possibility of taking the problem up over a larger area and getting larger results from which to draw conclusions than have been heretofore obtained.

Other stations are looking to methods more economical than that of summer fallowing. The investigations carried on indicate that from the very nature of the case, corn or intertilled crop is not so expensive as a crop that cannot be intertilled. If we can find that locally and alternately we can substitute an intertilled crop which is equal to corn I would say it is fortunate that that problem is being investigated.

These investigators recognize the fact that we ought to fortify for each succeeding year. The Department of Agriculture, in recognition of that, the Montana Experiment Station is putting in a process of rotation. I don't know that they are doing work in Utah, but they are doing it in many states and are extending it to take up this problem and investigate it.

The other night in an open discussion on the floor here it seemed to be the consensus of opinion that dry farming could be carried on successfully on large areas, or wide tracts only. Gentlemen, stop to think for a minute. What about the farm unit? Where are the millions of homes coming in if the farmers have to have several thousand acres before they can be handled economically. (Applause.) That is a question I would like to have considered. Therefore the problem is, what are the methods by which we can handle the farm and get maximum returns with the smallest possible farm? I believe, and it is the general idea, and my observation has led me to conclude, that 160 acres is entirely too small. My plea is it should be a section, or something of that kind. These farm management problems are very important. And so when we look into the problem of growing the other crops in place of summer fallowing we are simply trying to help out the situation. If we are going to have large tracts and expensive machinery it is not the question of management that makes homes for the people and brings the biggest returns from the land. My proposition is the small farm unit, from which the family can make a livelihood and be content, comfortable and happy. (Applause.) But the point I wish to make for the present and always is, that I believe that the dry farmer will have to fortify himself for the succeeding year, to adopt some method by which he comes up to the succeeding spring

properly prepared in his moisture contents for starting his crop and carrying it over a period which may be devoid of rain, unusually so, and abnormally so the succeeding year. The experience here in Montana and in most dry farming areas indicates that careful cultivating and summer fallowing will do this. Whether it is most economical is another problem, but that is one way. Cultivating one year in three will fortify and insure to a large extent crop returns. And when the pessimist on dry farming says to me, "Just wait until you get one of those dry years," I usually smile a little bit and say, "Well, possibly if we get one of those dry years the year preceding it will probably be a wet one, and we have a lot of that moisture in the soil to carry us over, and we are not going to suffer when the dry year comes." Sometimes the dry years may make it difficult, but these are the things we have to take up and handle. I believe some management must be devised by which the dry farming business will be a universal success.

I do not intend to go into the full discussion of the proposition of the different methods for conserving soil moisture. I believe you are all very familiar with the various methods by which we can conserve the moisture in the soil. I intend to offer you here some results we have gained this year as the result of our investigations in soil moisture. These are the results of one year only, remember, and they were made from observations made every week, down to a depth of from four to six feet, as we thought it necessary, and with the experiment station people the question of fall or spring plowing has received some consideration. That is a question that is far from being settled. We are running a test of fall, early spring and late spring plowing, but for the present we will need to consider only fall and spring plowing, plowed the same depth—plowed in the fall, about the middle to the last of October, as compared with spring plowing, as early as we can get onto it in April, which, possibly, would be the fifth of April to about the first of May. We worked along the line of moisture contents, yield of crop and organic contents. We found in moisture contents that the area plowed late in the spring would have about as much moisture in it as any of the areas. The proposition of letting the stubble stand, not turning it under but allowing it to stand to hold the snow so that it would melt and run directly into the soil—that idea has a place in the minds of some of the dry farmers, thinking that to allow it to stand a little longer you will really gain from the melting of the snows and treating of the soil more than you would from early seeding. We found our moisture contents—we had just about as good returns on our late spring plowing as we had on any; that is, starting right in the spring early and making four determinations before it was complete. Of course the thing that interested the farmer probably in the last season is crop yield. We found that on our fall plowing that we cultivated early in the spring, for some reason or other we got nine bushels of wheat to the acre more than we did under any other kind of management. (Applause.) This may not be borne out, but I was simply telling you our results for one year. This



may vary, as I have said. In the question of farm management, the question of horsepower and everything of that kind is to be considered. But this was the difference in the crops—nine bushels to the acre. That crop, of course, was irrigated, but our moisture contents was determined before irrigation. Under that condition we found that we got about nine bushels of wheat more per acre on the fall plowed ground with early spring cultivation. We had that running two years, and our second best yield, taking the two years into consideration, came with our late spring plowing.

MR. D. W. WARNER, Alberta, Canada: I want to ask Mr. Atkinson how he prepared that ground in the fall after plowing, before the winter came on?

PROF. ATKINSON: The question has been asked how the ground was prepared in the fall before the winter came on. It was not prepared. We plowed it just as it was, which, I believe, is the common practice. It is the common practice with us.

We intend to extend this work. The results here do not necessarily indicate that fall plowing is best, but that was our experience—not particularly on the soil moisture contents. Of course I am not discussing soil moisture contents. But there is a soil management phase which enters in, which, to return to the summer fallowing again, to a point I neglected to mention, I believe you will appreciate very well, which, of course, will apply to the intertilled. Our crops are not intertilled. These soils have never been intertilled, and our soils over in Montana are good in moisture contents. We have the light feeding crop—the intertilled crop, and summer fallowing. We may find later that the summer fallow may be more effective than some other points. The qualities of the soil which bring plant food into available form require moisture just the same as the growing plant requires moisture, consequently if you have the available plant food it takes moisture the same as the crop. This may not become a factor for a great many years, as it has in the Red River area and the Dakotas. We may find that the summer fallow has an effect in allowing the plant food to become worked up and become available because of the fact that the moisture is held there and not taken out by the plan. The objection to summer fallowing for humid districts is that the plant food is worked up and worked out. Allowing our moisture to lay for a year to work up the plant food we may find will have a prominent place in our system.

Our method of handling that soil to conserve the moisture on the dry farm is to plow the land in the fall after our crop is off, just as soon as we can get to it, and leave it laying right there. We believe, from observations, that the deep plowing is very important on the dry farm. Some one mentioned here yesterday that it is a wrong idea because you will turn the humus away from the surface, and it is a wrong idea to turn that down deep because you turn it away from use by the plants. But we believe, from our observations, that a deep moisture reservoir is desirable. And we are frequently asked how deep we break our soil. Break it up just as deeply as you can get it broke. The best breaking

we have had is six inches. Possibly you can get it broken eight or ten inches. But that was broken just as deeply as we could and just as quick as we could. Get it broken down eight, ten and eleven inches, down to ten inches, probably, for its effect on the soil moisture conservation. You create, in that way, a deep, loose soil moisture reservoir which will hold a great deal more moisture than a layer of four inches deep and then a hard surface below.

Subsoiling is a question that may have a place in dry farming. Plow as deeply as you can get down—eight or ten inches—and leave it lay right there. The sub-surface packer—I think I heard it mentioned here and all over through the arid west—I don't know how generally it is used, or whether it is used at all or not. I believe the theory is all right, when you are breaking your land, perhaps, packing it down and establishing the contents of the top soil and layers below. The theory is all right, but it can be done nearly as effectively by some instrument like the roller. I don't believe that they are the secret of success in dry farming, but the packing of the soil down when you are breaking it. I believe is of value. But the disc will do this. Discing four to six times will do this very effectively.

Another method we take: we leave our lands lie and get onto them in the spring just as early as we can, and, of course, deep early seeding. On a piece of summer fallowed, where we kept it cultivated—cultivated in the spring and harrowed after every rain—as compared with a piece not touched (and on the piece not touched very few weeds came up, simply because the soil was packed, while those on the summer fallowed did) the piece not cultivated took very nearly the same proportion of moisture at the end of the season as the piece that had been summer fallowed, and on the piece that had not been touched took not quite as much moisture, but in a large degree as much as the one the crop had been grown on. We exercised that precaution—thinking it is important—that if the weeds came up of discing and of harrowing after the rains. Of course you can't go on after all of the rains, since it is too wet, and as long as it was too wet we don't go onto the soil, but as soon as it is dry we follow the practice of summer fallowing our soils. We practice cultivating our ground just as long as possible. We do not use the weeder. We cultivate it until the plant is up nearly meeting between the rows, and after they come to entirely shade the ground, of course we have to quit it then.

There are several systems for the proposition of breaking the soil crust and conserving the moisture. These systems are commonly used and you are familiar with them and with the reasons for them.

My purpose, as I said, in coming up here, was to present data along two or three lines, which we had gained in our experience. Our conditions are very different to yours, and it simply emphasizes—the difference of opinion expressed here emphasizes the importance of every state establishing its own bureau of investigation and experiment stations, in order that they may work out their own problems. Our soil is very different

to the Utah soil, consequently our experience would not amount to much in getting at the best basis for handling your soil.

Just a word as to the moisture conservation on the range. I don't know whether you have much pasture land, that is, rough land that cannot be farmed, that will always be range land or not, but we have. We have possibly an area of 20,000,000 acres, estimating it broadly, that will always be range land, and that is an area getting along pretty nearly as large as the state of Iowa. The state of Iowa has only 26,000,000 acres in it, and we have an area going on five-sixths of that that will always be range land. We made a determination on a piece of range. We had a little piece that had been fenced, not handled with any particular care, on a homestead lot, a piece that had been ranged every year by the sheep that came along, and cattle, and we found that taking the season over there was an average of about four per cent more moisture in the piece inside of the fence than there was outside of the fence, where the grass was very much shorter. There was more grass getting away with that moisture on the inside than on the outside. We frequently hear men say our seasons are changing and things getting dryer because certain springs they have never known to be dry in the last thirty or forty years are dry now. I believe that because of removing the grass from the range much of the water has gone down the creeks instead of being held by the grass and sinking into the soil, will explain in part why the springs are drying up. I believe the proposition of so handling the range as to hold the moisture is an important thing. That is, the proposition of handling the range a section at a time and allowing the other section for the grass to grow up for the purpose of holding the moisture and allowing it to penetrate into the soil instead of running off is one question that is important in areas where we have as much rain to deal with as we will always have.

Dr. Brooks will present, at a later meeting, his observations on the conservation of moisture—his observations made on many stations through the Great Plains area. He can give you much more data than I have been able to give you. This question will receive fuller discussion later. The point I wish to make, and the point our experiments would place before us as important, is the fact that the dry farmer—that there are ways for the dry farmer to fortify himself for the dry years—always for the succeeding year. And I believe that as a judicious matter at the present time the best we know of is summer fallowing. I believe there are others we may have to include, that are being investigated, but at the present time summer fallowing is the method best known for fortifying for the succeeding year. I believe whatever method you take up that is one of the things the dry farmer will have to look out for. I thank you. (Applause.)

MR. ELDREDGE, of Utah: You spoke of an experiment on the farm. I would like to ask you to what point of the compass does your land slope?

PROF. ATKINSON: You ask about the fall and spring plowing?

MR. ELDREDGE: No, sir. You were speaking of your experiments on the experiment farm. I wanted to know to what point of the compass the land sloped on that farm.

PROF. ATKINSON: The land on the farm on which we made the investigations is not characterized by any marked slope, but if any possibly slightly south.

MR. ELDREDGE: To the south?

PROF. ATKINSON: Possibly slightly.

MR. ELDREDGE: Now what depth of soil do you have?

PROF. ATKINSON: We can go down into that soil seven feet.

MR. ELDREDGE: What underlies the soil?

PROF. ATKINSON: It appears to be a rather coarse gravel.

MR. ELDREDGE: Gravel?

PROF. ATKINSON: Yes, sir. We can go down seven feet with our augurs.

MR. ELDREDGE: The reason why I asked these questions, in our section of the country the slope of the land to the compass cuts a great figure.

MR. SMALL: Prof. Atkinson made the statement that it was held in some parts of Montana that the stubble would serve to hold the snow. I would like to ask him if under those conditions your snow drifts badly or whether it simply falls like it does here in Utah and remains.

PROF. ATKINSON: The question is asked whether the snows in Montana have the habit of drifting, or if they tend to fall gently, as I get the question, and lay, and not pile up. In the Gallatin Valley, where the experiment station is located, there is very little wind and the snow does not drift very much. Go directly over the mountain, into the next valley, which I think is called Paradise Valley, the snow tends to drift very markedly. Many farmers believe it is best to leave the stubble standing for the purpose of holding the snow. They don't try to plow it under. That practice varies very much, however, with the locality. Farmers in that section have found in the last three years, many of them are convinced of the wisdom of the method, and investigation would seem to show there might be something in it. It will have to be looked into.

CHAIRMAN BURRELL: This concludes the regular program of the morning session. The Secretary has some announcements to make, and some communications on his desk which will now be placed before the Congress.

SECRETARY ROOT: I would like to mention first in regard to the credentials you brought with you. There are still some of them out. The Registration Committee would like to have them all turned in. Please do so.

We have a telegram from Reno, Nevada. "Regret cannot be present. Best wishes for success of the Congress. Gordon H. True."

Telegram from Boise: "Idaho would appreciate very much holding the next Dry Farming Congress at Idaho Falls. In Idaho there are more than six million acres of land to be reclaimed under the dry farming pro-

cess. I regret exceedingly that I have not been able to be with you to participate in the great work of the Congress. Boards of Equalization and assessors of the various counties of Idaho have been in session in this city for several days. My duties to the state demand my close attention of this meeting of the Board of Equalization. My heart is with the Congress in its great work and I have only regrets that I have not been able to be with you to give my assistance to the question which means so much for the settlement and development of a large portion of our country. F. R. Gooding, Governor." (Applause.)

I have a letter here of the 8th, addressed to President Harris. I think I had better read it. "I much appreciate your kind invitation to attend the Second Session of the Trans-Missouri Dry Farming Congress, which meets in your city January 22-25, 1908, for I take a great interest in the subjects that will be discussed at the Congress; but at the time mentioned I shall be busy in attendance on the committees in Congress with matters connected with the work of the Weather Bureau during the coming year. However, I assure you of my desire to have the Weather Bureau co-operate with you, and to that end I have authorized Mr. Roberts, the Section Director of the Climatological Service of North Dakota, to attend the Congress. I shall also authorize Mr. Hyatt, who has charge of the station in your city, to be in attendance; and it is probable that other officials of the Bureau may attend. W. L. Moore, Chief of U. S. Weather Bureau." (Applause.)

I have here a letter from W. X. Sudduth, Director of the Broadview Experiment Station, Billings, Montana, too long to read.

CHAIRMAN BURRELL: Without objection this communication will be allowed to go into the record. The chair hears none and it is so ordered.

#### **RESULTS OBTAINED AT BROADVIEW EXPERIMENT STATION, BILLINGS, MONTANA, FOR THE YEAR 1907.**

While the past year has had fully the average amount of precipitation yet it has not been a good growing year. It was cold and dry during the month of April with only .29 inches rainfall. The month of May showed a very considerable increase in precipitation, being 3.61 inches, but the weather still continued cold and backward with frosts during May and June. The precipitation for June at Broadview was 4.32 inches but at Billings it fell short of the corresponding month in 1906 by 1.21 inches. All crops were late starting, the seed lying in the ground so long that much of the vitality of the young plant had been sapped before it had fairly started. The precipitation for the year beginning November 1st, 1906, and ending October 31st, 1907, at Broadview has been 16.4 inches, the larger portion, which is the case every year, falling during May and June. The deficiency during April, however, was marked, as shown above.

Notwithstanding the adverse conditions with which we had to contend the crop yield has been fairly good and will exceed the yields reported from Iowa, Illinois, Wisconsin, the Dakotas and Nebraska.

### Varieties of Crops Grown.

Almost all the crops grown under the ditch can be grown above the ditch. The yield will be lighter in nearly all instances, yet in many varieties the quality is so much improved that it stands as an offset against the lessened yield. This is especially true of the Kubauka durum wheat and potatoes, as before stated, but the most remarkable difference is to be noted in legumes, when left for seed. Dry land seeds, especially alfalfa and clover, are in a class all by themselves and are destined to form the source of the seed supply of the nation on account of their higher germinating qualities and the cheapness of their production. All root crops do exceedingly well above the ditch in this country and when properly tilled equal in size those grown under the ditch, while far excelling the latter in flavor.

Flax is par excellence the dry farm crop, yielding as high as 16 bushels per acre on spring plowing. Fall and spring rye and all varieties of barley do well and are especially adapted to the semi-arid region as they require very little moisture. All varieties of wheat, especially the winter wheats, do well.

The yield from the alfalfa meadows this year at Broadview was very satisfactory although it was not a good hay year. April and May were cold and not good growing months, still the first cutting gave one and one-half tons to the acre and the second cutting made better than a ton. We tried some experiments last season on a wild meadow. Taking a piece of land that had been fed into the ground for the past fifteen years, we put twelve loads of manure to the acre and disced it thoroughly in March and harrowed it in April and May with the result that it produced fully three-fourths of a ton of nice blue stem hay to the acre the first season. Next year we plan to disc again in March and harrow later and we confidently expect it will produce a ton to the acre.

### Land Hide Bound.

Most wild lands in this section of Montana are improved by thorough discing, as the tendency of the soil is to form a solid layer on the surface that is impervious to water and air and by loosening it up with the disc and harrow this crust is broken and water and air are fully admitted to the roots of the plants. The theory is advocated that nearly all plants, especially the legumes, have parasitic growths on their roots that require air in order to produce the nitrogen which serves as a plant fertilizer. Acting on this theory we have adopted the system of thoroughly discing our meadow lands in March and harrowing them until the crop is high enough to cover the ground. The same procedure is followed after the first cutting. This served so well with alfalfa that we adopted it in our wild meadows with equally good results.

### Methods of Soil Culture.

This naturally brings us to the consideration of the methods in vogue at Broadview for the soil culture and moisture conservation as the two go hand in hand. We are not ashamed to admit that we are disciples of

Campbell and advise all who anticipate engaging in farming in Montana to procure his manual and follow the methods therein outlined, at least until they have mastered them or discovered other and possibly better methods, which are especially adapted to their particular soil. Soils vary and require different handling the same as people and no occupation requires more brains than farming. Study the conditions carefully and note the effect of different methods of handling on your own particular piece of land and apply the method that gives the best results.

The beginner naturally looks for instruction as to the best way to break out his land and is anxious to get results the first season. In many instances this very anxiety to get a crop leads to his undoing. Those who have recently located on land around Broadview will hardly get any land broken next spring before June, when it will be too late to put in any crops that season. The best plan for them to adopt would be to break out their land during May and June with flat bottom plows and roll it thoroughly so as to press the sod down flat and then go over the field with a smoothing harrow with the teeth slanting well back to avoid tearing up the sod. The Acme harrow or the John Deere pulverizer is better than the smoothing harrow as they cut up the surface of the sod and tend to fill the cracks between the layers of the sod better than the latter. The object sought is to form a sod mulch which corresponds to the dust mulch which Prof. Campbell advocates. Land prepared in this way will be in good shape the middle of August to back set for winter wheat or wheat may be drilled in with disc drills and harrowed immediately before the wheat comes up. If it continues dry during the fall the harrow should be run over the field several times, provided the sod is well rotted, but should the sod remain intact it must not be harrowed because the young wheat will be torn by the roots. If the soil, however, was not broken too deep, say two and one-half to three inches, and well rolled and harrowed during the summer, it ought to be pretty well rotted and not interfere seriously with harrowing, provided the harrow teeth are set well aslant.

In case the sod is back set, ie., plowed again with the disc plows, it should be broken five or six inches deep and the plows followed immediately with the Campbell Subsurface Packer. By "immediately," I mean all land plowed should be packed each half day before the team leaves the field, otherwise the ground will dry down to the depth of the plowing and there will not be sufficient moisture to sprout the winter wheat and it will not come up until the following spring, in which case the yield will be cut short.

The breaking may be continued all summer and fall but as soon as the ground gets dry so that the mold board plow does not do good work the disc plows should be substituted. Land plowed in the fall should be left rough in order to catch the snows and thus acquire additional moisture during the winter. As soon as possible in the spring these lands should be disced and harrowed and worked down into as fine a condition as possible. As soon as the soil is in good condition, even in March, small grains may be drilled in. Never sow broadcast, but use some form of drill, and in

light sandy soils a press attachment is especially valuable. The spring crops that are best sown are: spring rye for hay, white beardless barley, flax and last, oats. Oats require more moisture than any other crop and consequently are not as sure a crop as speltz, which makes an excellent substitute for horse and hog feed.

The three varieties of spring wheat sown yielded twenty-seven bushels per acre. Two fields of Kubauka durum wheat of five acres each yielded 27 bushels and 42 bushels, of fine flinty kernels, per acre. The first smaller yield was on sod plowed in the October previous, and drilled in in April. The larger yield was on old ground in which the wild nature was thoroughly killed and the land which had been sown to Canadian Peas the year previous was fall plowed, thus putting the soil in the very nicest state of cultivation. Fifty acres of beardless barley made 38 bushels per acre, speltz made 31 bushels, and oats made the phenomenal yield of 55 bushels and weighed 46 pounds to the bushel, or 80 bushels standard measure. The field sown to winter wheat was "hauled out" three separate times and still made 12 bushels per acre. The hail storm was local and did not injure our other fields less than a mile distant.

Several plats of alfalfa were left for seed and set a fine crop, but on account of the lateness of threshing much of the seed was wasted and no results can be reported. We are fully convinced from the showing made that alfalfa seed growing will be eminently successful and it is our intention to put in a large acreage next year.

#### The Garden.

The truck garden was all that could be asked; all kinds of garden stuffs did exceedingly well. We had all the radishes, lettuce, onions, peas, beans, carrots, parsnips, beets, turnips, cabbage and summer squash we could use at headquarters all summer. We put in only a small patch of potatoes but they made a good yield and furnished what was needed for immediate use during the summer and there were several sacks to be dug the first of October. Everyone remarked upon the fine quality of our garden vegetables and said they had never eaten finer in any country. No one need go hungry if he will only bestir himself and till his garden sufficiently.

Respectfully submitted,

W. SUDDUTH, Director.

SECRETARY ROOT: We have here the print of a paper that would have been brought here by Mr. F. A. Carnal, of Fort Benton, Montana. It was called for and he was not present, and it has been printed in an outside paper, and that has been left with the Secretary.

CHAIRMAN BURRELL: Without objection this communication will also be allowed to go into the record. The chair hears none and it is so ordered.



**DRY LAND FARMING IN NORTHERN MONTANA.**

(F. A. Carnal, Fort Benton, Montana.)

It was not many years ago that dry farming was considered an impossibility in Montana, but the development of the past few years has proven beyond question that it can be conducted successfully and I predict that twenty more years of progress in Montana will find all the better class of lands, considered worthless a few years ago, because of absence of water, the homes of settlers who will make a comfortable income from their efforts.

**Erroneous Contention.**

Within the memory of even the tenderfeet of the state the assertion has been made that no crop could be grown without irrigation. Later years have proven this contention to be erroneous. Northern Montana is the pioneer in the movement for dry farming in Montana and the crops which have been grown throughout Chouteau and Cascade counties without a drop of water save that which falls down from the skies, during the past few years have proven without a doubt that dry farming has come to Montana to stay. Why, it was nothing uncommon to record 50 or more bushels of wheat to the acre last fall upon unirrigated farms and 80 bushels of oats was a common occurrence. True, the year was an uncommonly good one, with an abundance of rain, and this helped out materially in the good crops that were harvested.

In the Gallatin Valley, along the high bench lands in the section where the Madison and the Gallatin have made their efforts to come together and help form the Missouri, I am told, phenomenal crops have been raised this year, in a few instances 100 bushels of oats to the acre having been threshed. That is out of the ordinary, but it is a good assurance that dry-land farming is here to stay.

The coming of ranchmen who will take their chances on a good yield of grain, as the farmers of Dakota and other western states are doing, means much to the state of Montana. Naturally these ranchmen are all tree planters; they aim to surround their places with trees to use as wind breaks and help beautify their holdings. Every tree planted is conducive to a greater rainfall—that has been the history everywhere. When the trees disappear the rainfall also disappears; and the restoration of the forests means renewed rainfall and a greater storage of the snows of the winter. Every drop of water thus stored means additional moisture for the crops of the summer, for none of it is wasted, as it percolates through the soil, feeding the hungry plants, even when the surface appears parched and dry.

**Benefit Expected.**

I expect much good will come from the dry-land farming conference. Experiences will be swapped and the delegates from Montana will be given the experiences of the farmers of older sections of the country, where the practice has longer been in vogue. You can truthfully say that

the experiment of dry farming in this state has just begun, but it is proving successful and it is only a matter of a few years when it will be in practice in every county in the state. True, there will be some disappointments from dry years and drouths, but even the farmer with an irrigation ditch at his command has these, more or less, so that is no reason to condemn the system. It surely means thousands of new settlers in the state and will add millions of dollars annually to its resources.

SECRETARY ROOT: I have here a resolution, presented by Mr. McCabe, of Arizona, which has been adopted by the Resolutions Committee:

“RESOLVED, That an annual fee of one dollar be charged for affiliated membership in the Trans-Missouri Dry Farming Congress, and that a life membership fee of ten dollars be charged, and that for such a certificate of membership and all literature issued by the Congress, including the proceedings of the present Congress, be forwarded to each member by the Secretary.”

CHAIRMAN BURRELL: The Chair will lay this resolution before the Congress. What will you do with it?

MR. TOLTON, of Utah: Before voting upon that resolution I desire to know what constitutes a membership and what would be required under the provisions of the resolution?

CHAIRMAN BURRELL: Will some member of the Congress who is familiar with the constitutional provision make this plain? The Secretary has volunteered to offer some information.

SECRETARY ROOT: When this matter was brought up before the Executive Committee the point was brought up as to what constituted a membership. This matter was not brought up as early as it might have been, perhaps, and that is why it is offered now. A membership would be in compliance with the original call, to attend here on the floor, but the original constitution limits the number of votes from each state. That part may be taken up later—as to how many votes each state may be entitled to, but at present any state cannot have more than twenty votes. Each state may have the votes of delegates up to that number. This resolution was offered in fact to further the complete organization of the Congress and to bring up the matter of expenses. And right here let me mention that all of the expenses of this Congress in this city have been taken care of—every cent of it to and including the close of the session—by the Commercial Club of Salt Lake City, and through the efforts of Fisher Harris. (Applause.) Now we want it so that we don't have to depend on such. I think it is good to have it that way, but we ought to be independent; an organization that will run itself, with its own money. I will say, gentlemen, that the membership is not defined further than I have stated, and that the literature that will be given will include all these proceedings, which are complete and in detail. These papers will be reprinted, and you know very well they are worth many dollars, and to the man who has not had the experience yet they are worth many more dollars than that. The nominal sum of one dollar establishes his member-

ship, and ten dollars for a life membership. The literature that we refer to for the future is what we are outlining for the secretary and assistant secretary, which will consist of circulars and bulletins to be issued by the Congress. That is our hobby; we want the people to be informed every few months of what is going on. That you will receive. You will be on the mailing list. You will get everything that is doing in the Dry Farming Congress wherever it is held. The secretary will look after your wants. You can write the secretary and tell him about your wants, what you think your locality is interested in and it can be attended to. The nominal sum of one dollar makes you immensely wealthy in that particular line.

I will say that it is the wish of the Executive Committee that all people that have attended here as delegates or voluntarily, become members. There will be a blank prepared in time for this afternoon's session, which you can get, including a receipt which will entitle you to the literature, and as the resolution outlines, you will receive the proceedings of this meeting. I believe it is the intention of President Harris to have them pay this out and get the receipt at the registration room right as you go out, which you are all familiar with. If that is not the place it will be announced at the beginning of the next session.

CHAIRMAN BURRELL: The Chair will announce for the information of the Congress that this question is fully determined by Article IV of the Constitution, which reads as follows:

"The members of this Congress shall be:

"The Governor of each state and territory may appoint ten and not more than twenty delegates.

"The Mayor of each city, five and not more than ten delegates.

"The County Commissioners of each county, five and not more than ten delegates.

"National and State Agricultural Associations, not more than five delegates each.

"Railroad Companies, not more than four delegates each.

"Chambers of Commerce, Commercial Clubs and other commercial bodies, two delegates each.

United States Senators and Congressmen, Governors of states, officers of State Agricultural Colleges, officers of State Universities engaged in agricultural work, officers of the United States and State Experiment Stations, State Engineers and members of State Land Boards, by virtue of their position, will be entitled to membership in the Congress."

MR. SMITH, from California: The proposition involved in this resolution simply fixes the standard in regard to this matter and makes provision in relation to membership.

CHAIRMAN BURRELL: The gentleman is somewhat misinformed, I take it. The resolution provides a membership fee only—an affiliated fee.

MR. TOLTON, of Utah: If I understand the proposition then it simply resolves itself in this: that those who desire to become members have the privilege of contributing one or ten dollars, as they may determine, for the right to become members. That does not give them a seat in the

assembly unless they would be specially appointed by one of the bodies designated in the article of the constitution which was just read by the chairman. Am I right?

CHAIRMAN BURRELL: The resolution will be read again.

"Resolved, That an annual fee of one dollar be charged for affiliated membership in the Trans-Missouri Dry Farming Congress, and that a life membership fee of ten dollars be charged, and that for such certificate of membership and all literature issued by the Congress, including the proceedings of the present Congress, be forwarded to each member by the Secretary."

The chair would suggest that a permanent membership should be provided by the constitution, and it would therefore be subject to amendment.

MR. WHITE, from California: I have been requested by the Executive Committee to call the attention of the delegates upon the floor of the Congress to the exact wording of the resolution, which was passed by the Executive Committee.

This membership has no direct bearing upon the fact that any person is a delegate to this Congress. You will find, if you will listen carefully to the reading of the resolution, it provides for an affiliated membership. Now, any gentleman who owns a farm in New Hampshire, or one who owns one up in Oregon, or British Columbia, no matter if he is not a delegate to the convention, can become an affiliated member of this congress and at the same time get all of the literature, including the proceedings of the Congress.

There was a great deal of discussion on that point in the committee, and it was finally decided for that very simple reason, to make that membership an affiliated membership, and to send to each of the affiliated members the full proceedings of this and future conventions, which, of course, includes all of the reports, which are worth far in excess of the amount charged for the affiliated members, and gives an opportunity for people who are not sent by their various states, Commissioners, Boards of Trade and so forth as delegates, to secure the literature and to become, to a certain extent, supporters of this movement.

MR. ELDREDGE, of Utah: I understand, under the provision of the constitution that membership simply applies under one sitting of the Congress. That is, it rests with the different organizations or corporations having the appointive power. For instance, the Governor of the State, Mayor of a city, Board of County Commissioners so many—they may name certain delegates this year to attend the Congress and next year they may send somebody else, consequently the membership by the payment of a certain fee by the individual is in conflict with our constitution, and it seems to me therefore it must be amended to meet the requirements.

MR. BRIGGS, Washington: I think the gentleman is confounding a delegate and a member. The constitution provides that the Governor of a State, or Mayor of a city shall nominate certain delegates—he will appoint certain delegates. This is a question of membership—not delega-

tion. The member so provided has no authority, so far as the future is concerned, by his membership. He does not carry the authority that comes with the delegate. Do I make the difference clear? The Governor, or Mayor, or other duly authenticated person according to the constitution appoints a delegate. That man may also be a member of the Congress by the payment of his dues. He may be a member without being a delegate, or he may be a delegate without being a member. They are two distinctly different things.

MR. RIEPE, from Nevada: I myself am a mining man, but I am interested in this proposition. In that association I believe the delegates are appointed on the same proposition as here, or on some proposition like this, and there not being anything in their constitution still members are admitted. The Mississippi Congress charges five dollars a year, and they have members and they have delegates, and as I understand this it is on the same proposition. Therefore I hope that this resolution will pass and one and all of you will come up and pay your little dollar in order to keep the business of the Congress running. We can't do anything without money. (Applause.)

MR. ATKINSON: I believe that the gentleman from Utah was correct when he said that this would require an amendment to the constitution. I believe, as I understand, the proposition has been an entirely desirable one, and the constitution can be amended to cover this new feature of membership. I therefore move this matter be referred to the committee on resolutions and reported back to the house here at the earliest possible date.

Motion duly seconded.

MR. ADNEY, of Utah: I am very much in favor of both the resolution and the motion, but I think that some suggestion as to the feeling of the house should be indicated to the committee on resolutions. Individually it seems to me that an amendment which will provide that all delegates become either affiliated or life members should be added. (Applause.)

CHAIRMAN BURRELL: That can be taken up as soon as this question is disposed of. Are you ready for the question?

Question called for.

The motion was put to a vote and declared carried.

MR. ADNEY, of Utah: I move you that for future conventions of the Dry Farming Congress each and every delegate to that convention be either an affiliated or a life member of this Congress.

Motion duly seconded.

CHAIRMAN BURRELL: I believe that the gentleman from Utah intends to have that as the sense of the convention conveyed to the Committee on Resolutions. Isn't that it?

MR. ADNEY: I accept the suggestion of the chair.

CHAIRMAN BURRELL: You have all heard the question. Are you ready for the question?

MR. TOLTON (Utah): I am opposed to the motion for this reason: That in many localities until members or citizens of various states have participated in these assemblies and have seen the benefits that will accrue they will not appreciate the movement that is now before this Congress. If you are going to bar citizens of the state, of the various states, from participating as delegates and they will not be qualified as such unless they have already subscribed to and become members of the association, you will baffle the efforts of the various corporations and appointive powers in the selection of delegates. It is not always a question of membership from outlying counties in the state as to who can come and participate as delegates, but it even becomes a burden on the part of the citizens to leave their affairs at home to accept an appointment from their respective states or counties and give their time in waiting upon this Congress. If you are going to add to that an additional burden and say before you can be appointed by any of these appointing powers, before you can accept of an appointment to the position of a delegate you must first pay into the treasury of the Congress one dollar or ten dollars, as the case may be, you will simply prevent a great many good men from coming here and participating in the proceedings of this Congress. I say, Mr. Chairman and gentlemen, that I would favor the proposition to make an affiliated membership, and give all who are willing to contribute the necessary sum to become members an opportunity to do so, but leave the question open that delegates may be appointed and may participate in these proceedings without requiring them to become members. (Applause.)

MR. BENNION, from Utah: I would like to hear the motion read, if you have it there. I think it should be amended.

CHAIRMAN BURRELL: Will the gentleman please state his motion again?

MR. ADNEY: My motion was simply and merely to voice the sentiment on the part of this convention to be a guidance to the Committee on Resolutions in the framing of a resolution amending the constitution with reference to membership. While I am on the floor I desire to say that it seems to me that unless the Committee on Resolutions should see fit to bring in a resolution along these lines suggested that nullifies the original intent of this resolution. It is not a hard thing on any member who comes here as a delegate and presents his credentials, if he has not done so before, to pay to the secretary or treasurer his one dollar for his membership, and we want all of the dollars we can get, both from members and outside sources.

MR. BENNION, from Utah: I would suggest that considerable confusion on this motion might be eliminated from the resolution if the word "member" or "delegate" should be dropped out. The one, as I understand it, is in favor of membership, and we don't want to force it upon any delegate that may come here. I think there is no danger but what they will desire to become members of this Congress. I am in favor of eliminating the name "delegate" there and taking a vote on it.

MR. CHILCOTT: The Committee on Resolutions will meet at once to take up this matter that is now laid before them.

CHAIRMAN BURRELL: The question is on the adoption of the motion by the gentleman from Utah. The official stenographer will read the motion as made.

THE STENOGRAPHER: "I move you that for future conventions of the Dry Farming Congress each and every delegate to that convention be either an affiliated or a life member of the Congress."

CHAIRMAN BURRELL: The effect of the motion is that it is the sense of this Congress that every affiliated member or delegate shall be regarded as a member of the Congress, as I understand it. Is that not the motion?

MR. ELDREDGE: I made my motion that it be referred to the committee so that it can have the whole matter in hand on this question. Have the motion repeated to them and let them vote on it.

CHAIRMAN BURRELL: That is the purpose of this motion; that it be the sense of this Congress. It is for the Resolutions Committee. That is the purpose of this motion.

MR. SMITH, from Utah: I believe we have got to make provision to support some of those officers, and this is the only means you can do so by. My experience in various congresses where I have been is that while the cities pay the general expense of the business there is a line of officers that have always got to be provided for, and a provision of this kind will reach that, and I don't believe that there is a granger in the land that is not able to pay his dollar. (Applause.)

CHAIRMAN BURRELL: Are you ready for the question?

Question called for.

The motion was put to a vote.

CHAIRMAN BURRELL: The motion prevails.

MR. TOLTON, of Utah: Division.

CHAIRMAN BURRELL: Does the gentleman insist on a division?

MR. TOLTON: I believe it is but fair.

CHAIRMAN BURRELL: The Chair will recede. The Congress will vote on this question again. The Chair will appoint as tellers Mr. Tolton, of Beaver, Utah, and Mr. Bowman, of Idaho Falls. Now you will please remain standing until you are counted. As many of you as are in favor of this motion will make it known by rising to your feet.

MR. SMITH, from California: Will the Chair please explain the motion? There are some gentlemen who do not understand it.

CHAIRMAN BURRELL: It is to the effect—it is on the opinion of this Congress as to whether there shall be a membership fee charged.

MR. TOLTON, of Utah: I disagree with the explanation of the Chair. It is not a question of membership, Mr. Chairman, it is a question as to whether a man must become a member before he can become a delegate. (Applause.) I say a man who is a citizen is entitled to become a delegate to this Congress. I don't object to membership. I believe it is necessary. But I submit, Mr. Chairman, that that disability should not be placed

upon a citizen, that he must first become a member before he may receive an appointment at the hands of the County Commissioners or the Governor of the state. That is the question, gentlemen.

MR. BALL (Utah): I don't believe that was the intent of this motion—to prohibit a person from being appointed a delegate who was not already a member, but to have that man, when he came up here to this Congress, put up a dollar to help defray the expenses of the Congress.

MR. ADNEY: That's it.

CHAIRMAN BURRELL: The Chair will rule that that is the intent of this motion; and to establish a membership fee of one dollar. That is the effect of this motion. The Chair will so rule. As many as are in favor of that motion will rise to their feet.

A DELEGATE: (While the affirmative vote is standing.) It would be easier to count the other side.

CHAIRMAN BURRELL: Does the gentleman insist upon further count?

MR. TOLTON: I desire to see the contrary vote called.

CHAIRMAN BURRELL: All those opposed will please arise.

MR. TOLTON: I am satisfied.

THE CHAIRMAN: The motion prevails.

MR. M'CABE: In view of the large attendance at this the second anniversary of this body of men that has come to discuss this great question, the question of housing them, if you will permit the farmer's phrase, after they get together has held me back on the opposition side of this motion. Here we are on the second gathering, in a crowded auditorium, if you please. If this membership that is now sprung upon us, without questioning the statement of Hon. John Henry Smith when he said every farmer is willing to give his dollar or ten dollars to pay for that membership, I want to know if I get a life membership if that membership will entitle me to every gathering of this honorable body?

CHAIRMAN BURRELL: It will.

MR. M'CABE: If every delegate here takes out a membership and they are not considered at the next anniversary to be appointed by a Governor, or by the Mayor, or by an honorable Commissioner of the County, how are we going to house this membership, with the additional delegate-ship, with the interest that is now being taken in this great Congress?

MR. JOHN HENRY SMITH, of Utah: Pardon me for interrupting so often. I desire to say, no one need take any concern on that proposition. I have been a member of nearly all of these congresses, various kinds, in our line, and it is very seldom that a neighborhood cannot provide for them. The rule should be established and fixed that the town that accepts this business must bear the expense and make provision for a proper hall and proper accommodations for the delegates—every fellow paying, of course, his own expenses, as far as his immediate expenses are concerned, and I don't think any member need to have any concern in regard to overstocking of the business. Some of them are intensely in-



terested for a time and then they drop down and out. It is just a few paid members that hold the thing together.

MR. RIEPE: Mr. Chairman, I arise to a point of order. This matter I believe has been decided, and if it has been decided, there is nothing before the house.

CHAIRMAN BURRELL: The gentleman's point of order is well taken.

MR. BALL: It seems to me now that we have voiced the sentiment of the convention in regard to this matter that we should also state to the Resolution Committee that it is the sentiment of this house that up to a certain limit at least that these members be allowed to represent their states. We might not be able to allow all members, in such a convention so held to vote in the proceedings, but can't we amend that constitution so that members coming from other states may have a vote and then limit the vote of the membership in the state in which the convention is held? We have seven votes here today, I believe, from the great state of Colorado. Now, if any member takes it upon himself to come here to Salt Lake to take part in the arid farming Congress he is certainly showing his interest in it, and his enthusiasm in it, and if he puts up his dollar and becomes a member of this Congress it seems to me he should have a right to vote. I move you—

CHAIRMAN BURRELL: The Chair will state for the information of all persons present that this question can be discussed in detail when this matter comes before the convention from the Resolution Committee. No doubt the resolution to be framed by the Resolution Committee will cover all of those points. If it does not the Chair will entertain a motion to amend the resolution.

It is now 12 o'clock and a motion to adjourn will be entertained by the Chair.

Thereupon, on motion duly seconded, the convention adjourned until 2 o'clock p. m. today.

### AFTERNOON SESSION.

The Congress was called to order at 2 o'clock by Hon. E. A. Burrell, presiding.

CHAIRMAN BURRELL: The Chair will announce that the first number on the program for this afternoon was to have been an address by Dr. Widtsoe, President of the Agricultural College of Utah, but he states that he is called home by sickness, but if possible he will return tomorrow to give his address as per the program. The first number on the program, therefore, for this afternoon, will be "A Record of Twenty Years in Dry Land Farming, Minutely Recorded," by Senator John Barnes, of Kaysville, Utah. I have the pleasure of introducing the Honorable John Barnes, of Kaysville, Utah. (Applause.)

**SYNOPSIS OF RECEIPTS AND EXPENSES OF 90 ACRES OF LAND  
BELONGING TO JOHN G. M. BARNES, KAYSVILLE, UTAH.**

Ladies and Gentlemen: I am such a small farmer, after listening to the size of the farms that it is thought people must have in order to make it pay, that I certainly feel a great delicacy in presenting my experience as a practical farmer. Dr. Widtsoe, however, insisted that it be presented before this convention, as he states he thinks this is the only record covering a period of twenty years. While I know that figures and statistics are necessarily very dry, if this will be of any benefit to you who are about to embark in dry land farming you are entitled to the benefit of my labor.

As our worthy chairman stated, the record will be given minutely. I have, in keeping my record, tried to make my farm pay for itself, and I have therefore charged everything that I could think of against the farm, with the possible exception of the taxes, and through inadvertence I omitted to charge the taxes. But everything else I can think of I have charged against the farm. In buying the land I was, as a good many of us at the present time are, a little short of money and had to borrow the money to buy the farm, and I have charged the interest that I paid until the land had paid for itself. So in my remarks you will notice occasionally I say, paid so much for interest.

March, 1887.—Purchased farm at \$20 per acre.....	\$1,800.00
May.—Plowing 89 acres at \$1.50 per acre.....	133.50
93 bushels wheat at 65c.....	60.45
18 pounds vitriol and dressing wheat.....	6.70
Sept. 15.—Drilling 89 acres at 50c.....	44.50
Cost for plowing, drilling and seeding, \$2.75 per acre.	
Owing to dry fall and winter, complete failure.	
May, 1888.—Plowing 89 1-2 acres at \$1.50.....	134.25
96 bushels wheat at 80c.....	76.80
18 pounds vitriol and dressing wheat.....	4.30
Pulling sun flowers.....	12.75
Sept.—Drilling 89 acres at 45c and use of drill.....	42.50
Nov.—Re-seeding 20 acres that were thin.....	20.00
Cost of plowing, drilling and seeding, \$3.20 per acre.	
July, 1889.—Heading 84 acres at \$1.25.....	105.00
Hay, \$7.20; hauling water, \$10.00.....	17.20
Threshing .....	56.00
Hauling grain to warehouse.....	64.92
Boarding threshers.....	25.00
Plowing fire guards around stacks.....	3.00
July, 1889.—Paid interest.....	323.00

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By—1,860 bushels wheat sold at 65c, being a yield of 22 1-2 bushels per acre.....		\$1,209.00
Dec.—Straw sold.....		15.00
Cash from railroad company for grain burned....		70.00
To—Grain put in on burned piece of land.....	\$4.25	
Paid interest.....	46.65	
That fall, object lesson in having stubble burned.		
July 8, 1890.—Repairing shanty.....	4.50	
Heading 88 acres at \$1.25 per acre.....	110.00	
Plowing fire guard.....	4.75	
Threshing .....	29.75	
Hauling grain to warehouse.....	54.00	
Paid interest.....	40.00	
By—1,360 bushels wheat sold at 62 1-2c.....		849.85
Straw sold.....		14.00
Average yield for Volunteer, 15 1-2 bushels. About one-half of the land the stubble had been burned, which was estimated at 10 to 20 bushels per acre, the other one-half with stubble not burned estimated at 10 to 12 bushels per acre.		
May, 1891.—Plowing 89 acres at \$1.50.....	133.50	
Harrowing rough piece.....	11.50	
20 pounds vitriol.....	1.80	
Pulling sunflowers.....	4.30	
103 bushels wheat (seed) at 70c.....	72.10	
Increased amount sown to 70 pounds per acre.		
Drilling 88 acres at 45c.....	39.60	
Harrowing where wheat came up thin.....	11.25	
Cost for plowing and seeding, \$3.08 per acre.		
July, 1892.—Heading 88 acres at 93 3-4c.....	82.50	
Boarding headers, \$16.50; hay \$6.00.....	22.50	
Threshing .....	27.86	
Boarding threshers and haulers.....	24.75	
Hauling grain to warehouse.....	44.52	
Paid interest.....	96.00	
By—Straw sold.....		10.00
1,702 36-60 bushels wheat at 65c.....		1,106.70
Average yield per acre, 19 1-4 bushels.		
May, 1893.—Plowing 88 acres at \$1.50.....	132.00	
Harrowing 88 acres at 17 1-2c.....	15.40	
102 5-6 bushels wheat (seed) at 62 1-2c.....	64.30	
20 pounds vitriol, \$1.60; vitrioling wheat, \$2.65....	4.25	
Drilling 88 acres at 45c.....	39.60	
Cost per acre for plowing, drilling, etc., \$2.90.		
July, 1894.—Cleaning floors.....	2.00	
Heading 88 acres at \$1.10.....	96.80	
Boarding headers.....	17.00	

Hay and plowing fire guards .....	\$7.65	
Threshing .....	28.12	
Boarding threshers.....	25.00	
Hauling grain .....	54.55	
Burning stubble, etc.....	2.25	
By—Straw sold .....		\$20.00
2,293 bushels wheat at 50c.....		1,146.50
Average, 26 bushels per acre.		
May, 1895.—Plowing 88 acres at \$1.25.....	110.00	
Harrowing 88 acres at 12 1-2c.....	11.00	
Aug.—Discing 88 acres at 35c.....	30.80	
110 bushels wheat at 45c.....	49.50	
24 pounds vitriol and vitrioling wheat.....	5.64	
Drilling 88 acres at 45c.....	39.60	
Cost for plowing, seeding, etc., per acre, \$2.80.		
1896.—Heading 88 acres at 67 1-2c.....	59.40	
Threshing .....	27.75	
Boarding headers and threshers.....	33.80	
Hauling grain to warehouse.....	44.10	
Hay .....	4.00	
1896.—By straw sold.....		10.00
1,945 bushels wheat at 45c.....		875.25
Average yield per acre, 22 bushels.		
1897.—Plowing 88 1-2 acres.....	88.50	
June.—Harrowing .....	11.00	
110 bushels wheat, 1 1-4 bushels to acre, at 70c....	77.00	
20 pounds vitriol.....	1.40	
Drilling 88 acres at 45c.....	39.60	
Cost for plowing, seeding, etc., per acre, \$2.47.		
Aug., 1898.—Heading 78 acres, 117 bushels, at 55c.....	64.35	
Threshing, \$35.00; plowing fire guards, \$2.50....	37.50	
Boarding headers and threshers.....	41.50	
Hauling grain to market.....	37.50	
By—Straw sold .....		10.00
2,313 bushels wheat sold at 50c.....		1,156.50
Average yield per acre, 26 bushels. .		
May, 1899.—Plowing and harrowing 89 acres at \$1.27 1-2 .....	113.47	
June.—Harrowing and pulling sunflowers.....	18.20	
110 bushels wheat at 50c.....	55.00	
24 pounds vitriol and dressing wheat.....	4.80	
Drilling 88 acres at 45c.....	39.60	
Harrowing rough portion.....	3.00	
Average cost for plowing, seeding, etc., \$2.66 per acre.		
July, 1900.—Plowing fire guards.....	2.00	

Boarding headers .....	\$28.60	
Heading 88 acres, 1 1-2 bushels wheat at 45c, (67 1-2c) .....	59.40	
Threshing 1,800 bushels wheat at 7c.....	126.00	
Hauling grain to warehouse.....	25.60	
By—Straw sold .....		\$10.70
2,061 bushels wheat sold at 45c.....		927.50
Average yield per acre, 23 1-2 bushels.		
June, 1901.—Plowing and harrowing 89 acres at \$1.30..	115.70	
Replowing and harrowing to kill weeds.....	23.50	
22 pounds vitriol and dressing grain.....	6.75	
110 bushels wheat at 50c.....	55.00	
Drilling 88 acres at 45c.....	39.00	
Cost per acre for plowing, seeding, etc., \$2.75.		
Aug. 1.—Heading 50 acres at \$1.15.....	57.60	
Hauling wheat to warehouse.....	17.00	
Threshing 580 bushels at 7 1-2c.....	43.50	
By—Straw sold .....		20.00
600 bushels wheat at 67c.....		402.00
Cash from railroad company for grain burned....		1,300.00
Average yield per acre, 28 19-22 bushels.		
Sept., 1902.—Plowing 89 acres at \$1.25.....	111.25	
20 pounds vitriol and dressing wheat.....	5.70	
90 bushels wheat at 70c.....	63.00	
Seeding 88 acres at 15c.....	13.20	
Harrowing three times.....	35.60	
April, 1903.—Harrowing wheat.....	15.40	
Average cost per acre, plowing, seeding, etc., \$2.77 1-2.		
August.—Heading 88 acres at \$1.25.....	110.00	
Plowing fire guards.....	2.50	
Threshing 1,040 bushels at 7 1-2c.....	78.00	
Hauling wheat to warehouse.....	18.80	
By—1,109 bushels wheat sold at 82c.....		909.38
Average yield per acre, 12 1-2 bushels.		
1904.—Harrowing and plowing.....	135.50	
Vitriol and dressing wheat.....	5.00	
Sept.—Seed wheat .....	86.15	
Drilling 88 acres.....	39.60	
Winter very dry, grain did not come up; had to plant part in barley.		
March, 1905.—Barley, \$21; drilling, \$27; plowing, \$2.75	50.75	
Average cost per acre for seeding, plowing, etc., \$3.60.		
August.—Heading 88 acres at \$1.25.....	110.00	
Threshing 2,265 bushels grain at 8c.....	180.80	

Hauling grain to market .....	\$45.50	
By—623 bushels wheat sold at 70c.....		\$436.17
68 48-60 bushels barley at 60c.....		41.28
1,572 bushels barley.....		555.00
Cash from railroad company for fire guard.....		50.00
Average yield per acre, wheat and barley, 25 3-4 bushels.		
May, 1906.—Plowing .....	119.35	
Sept.—Discing 88 acres twice at \$1.00.....	88.00	
Pulling weeds and sunflowers.....	25.00	
Vitrioling and dressing wheat.....	7.98	
110 bushels wheat .....	66.00	
Drilling .....	45.00	
Average cost per acre for plowing, discing, seeding, etc., \$4.00.		
		\$7,390.51
		\$11,144.85

### Summary.

First crop.—Failure; plowing and seeding, \$2.75 per acre.  
 Second crop.—Total cost, \$572.00, or \$6.50 per acre.  
 Second crop.—Sold for \$1,294.00, or \$14.70 per acre.  
 Third crop.—Volunteer, total cost, \$202.50, or \$2.30 per acre.  
 Third crop.—Sold for \$863.85, or \$9.81 per acre.  
 Fourth crop.—Total cost, \$572.00, or \$6.50 per acre.  
 Fourth crop.—Sold for \$1,116.70, or \$12.69 per acre.  
 Fifth crop.—Total cost, \$528.40, or \$5.55 per acre.  
 Fifth crop.—Sold for \$1,166.50, or \$13.25 per acre.  
 Sixth crop.—Total cost, \$418.00, or \$4.75 per acre.  
 Sixth crop.—Sold for \$885.25, or \$10.00 per acre.  
 Seventh crop.—Total cost, \$398.20, or \$4.52 1-2 per acre.  
 Seventh crop.—Sold for \$1,166.50, or \$13.25 per acre.  
 Eighth crop.—Total cost, \$475.20, or \$5.40 per acre.  
 Eighth crop.—Sold for \$938.20, or \$10.66 per acre.  
 Ninth crop.—Total cost, \$360.80, or \$4.10 per acre.  
 Ninth crop.—Sold for \$1,722.00, or \$19.55 per acre.  
 Tenth crop.—Total cost, \$453.20, or \$5.15 per acre.  
 Tenth crop.—Sold for \$909.38, or \$10.33 per acre.  
 Eleventh crop.—Total cost, \$662.64, or \$7.53 per acre.  
 Eleventh crop.—Sold for \$1,082.45, or \$12.30 per acre.  
 Twelfth crop.—Total cost for plowing and seeding, \$352.00, or \$4.00 per acre.

PROF. CHILCOTT: I have some resolutions from the Committee on Resolutions. Is it the wish of the body that they be reported at this time, or would you prefer to go on with the program and hear them later?

CHAIRMAN BURRELL: The Chair would suggest that if there be no particular objection that these resolutions be deferred until after the regular order of business. However, it is within the province of the

Congress to take up these resolutions at this time. What do you prefer to do? Will the Congress consider these resolutions now or defer them until after the regular order of business?

MR. ELDREDGE, of Utah; In order to get the matter before the house I move that the order of business be suspended and the resolutions be taken up.

The motion was duly seconded, put to a vote and declared carried.

PROF. CHILCOTT: "Whereas, The people of the West are deeply indebted to the men who are giving their lives to the development of scientific methods of overcoming the semi-arid agricultural districts, through soil culture, conservation of rainfall and seed breeding; and

"Whereas, Professor H. W. Campbell, originator of the Campbell system of soil culture, is deserving of especial commendation because of his unselfish devotion to the commercial development of dry farming; and

"Whereas, Professor Campbell is prevented from attending this meeting of the Congress because of serious sickness; therefore, be it

"Resolved, That the Secretary of the Trans-Missouri Dry Farming Congress be instructed to wire the sympathy of this Congress to Professor Campbell."

PROF. CHILCOTT: I move the adoption of this resolution as offered by the committee.

The motion was duly seconded, put to a vote and declared carried.

PROF. CHILCOTT: Is it the wish that we submit any further resolutions?

CHAIRMAN BURRELL: All of the resolutions are before the Congress.

PROF. CHILCOTT: "WHEREAS, Farmers' Institutes are a powerful factor in the education of the farmer in the encouragement of the adoption of scientific methods, be it

"Resolved, That the Trans-Missouri Dry Farming Congress shall in every practical manner foster and encourage the holding of "dry farming" institutes in the States and localities where scientific soil culture is necessary to profitable farm operation and that in the states where no state appropriations are available for this purpose, this Congress shall endeavor to organize such institutes through the aid of local, state and government departments."

I move the adoption of the resolution as coming from the committee.

The motion was duly seconded, put to a vote and declared carried.

PROF. CHILCOTT: "RESOLVED: That the thanks of this Congress are hereby tendered to the city of Salt Lake, her people, the Commercial Club and Public Press, for the unusually hospitable entertainment of the members of the Congress."

I move the adoption of the resolution.

The motion was duly seconded, put to a vote and declared carried.

PROF. CHILCOTT: "RESOLVED, That the English language fails to supply the necessary adjectives to properly express our feeling of

appreciation for the entertainment given at the Tabernacle for the benefit of the Delegates to this Congress." (Applause.)

MR. RIEPE, of Utah: I move the adoption of the resolution.

The motion was duly seconded, put to a vote and declared carried.

PROF. CHILCOTT: "RESOLVED, That the thanks of the Trans-Missouri Dry Farming Congress be expressed to its retiring President, Mr. Fisher Harris, of Salt Lake City, for his untiring efforts in behalf of this Congress." (Long applause.)

MR. RIEPE, of Utah: I move the adoption of the resolution.

The motion was duly seconded, put to a vote and declared unanimously carried.

PROF. CHILCOTT: Now, Mr. President, I have here a resolution that was reported from the Executive Committee to this body and by them reported back to the Committee on Resolutions. The resolution as coming from the Executive Committee is as follows:

"That an annual fee of One Dollar be charged for affiliated membership in the Trans-Missouri Dry Farming Congress, and that a life membership fee of ten dollars be charged, and that for such fee a certificate of membership and all of the literature issued by the Congress, including the proceedings of the present Congress, be forwarded to each member by the Secretary."

That was reported to the Committee on Resolutions. Our understanding was that the purpose of that reference was to have the committee draw up a resolution that would make that consistent with our constitution, or if necessary, draw up a resolution for an amendment to our constitution that would be consistent with this idea. Was that the understanding of the Chair?

CHAIRMAN BURRELL: That is right, as the Chair understands it.

PROF. CHILCOTT: Acting upon that, then, we have prepared the following resolution, which we present to the Congress for its consideration.

"RESOLVED, That Article V of the Constitution of the Trans-Missouri Dry Farming Congress be amended to read as follows:

Delegates to this Congress shall be as follows:

The Governor of each state and territory may appoint ten and not more than twenty delegates;

The Mayor of each city, and the President of each Board of Trustees of any incorporated town or city, five and not more than ten delegates;

The County Commissioners of each county, five and not more than ten delegates;

National and State Agricultural Associations, not more than five delegates each;

Railroad Companies, not more than four delegates each;

Chambers of Commerce, Commercial Clubs and other commercial bodies one delegate for each one hundred active and certified membership.

United States Senators and Congressmen, Governors of States, officers of State Agricultural colleges, officers of State Universities engaged in



agricultural work, officers of the United States and State Experiment stations, State Engineers and members of the State Land Boards, by virtue of their position, will be entitled to membership in the Congress.

Each delegate upon his appointment according to the foregoing clauses shall become ex-officio a member of this Congress.

In addition to the delegates appointed according to the foregoing clauses of this Article, there shall exist an affiliated membership of this Congress, said persons constituting this affiliated membership to be assessed an annual fee of \$1.00.

In addition to this affiliated membership, there shall exist a membership known as life membership in this Congress, and for each life membership a single fee of \$10.00 shall be paid.

That both aforesaid affiliated and life memberships shall have all the privileges of a delegate to the meetings of this Congress and shall further receive from the Secretary from time to time such bulletins or other information as may be printed by this Congress for circulation among its delegates and members, which shall include to each member and delegate an official copy of the proceedings of the meetings of each Congress.

The provisions of this Article shall not be construed to affect in anywise the provisions of Article VI of the Constitution."

I will say, in explanation of this, we have changed, in one or two instances, this article of the constitution, in conformity with other resolutions brought in. For instance a Commercial Club, under the old regulation could send a certain number of delegates without reference to its number of members, and here we have specified that one delegate shall be appointed for each one hundred active members. I would say that there was a resolution to that effect, so that we might as well include it in this resolution.

This last proviso, in relation to Article 6 of the Constitution, which was put in to prevent the packing of the convention, which restricts the number of delegates or the number of votes that can come from any state or any organization. This is now before the Congress for its consideration.

CHAIRMAN BURRELL: What will we do with this proposed amendment to the Constitution?

MR. HALL: Move its adoption.

MR. RIEPE: I second the motion.

The motion was then put to a vote and declared carried.

Prof. Merrill then presented the following resolutions which were referred to the Committee on Resolutions:

"WHEREAS, The term "dry farming" does not represent accurately the factors and methods of farming without irrigation in arid and semi-arid districts; and,

"Whereas, the term "scientific soil culture," or scientific farming" is applicable to all properly conducted farming;

Resolved, That this congress adopt the name "arid farming" or semi-arid farming" for the production of crops without irrigation in arid or

semi-arid districts, and the name of this congress be changed to the Trans-Missouri Arid-Farming Congress.

Whereas, The successful development of farming without irrigation depends primarily upon the establishment of scientific principles on which the farmer may vest his practice; and

Whereas, Such scientific investigations cannot be carried on properly by private enterprise; and

Whereas, The different Trans-Missouri states differ in their climate and soil conditions, and, therefore require that special attention be given to the conditions prevailing in each State; therefore,

Resolved, That the Trans-Missouri Dry Farming Congress favors the establishment by State legislative action of experimental farms for the scientific study of farming without irrigation, such stations to be under the direction of the respective State Experiment Stations.

CHAIRMAN BURRELL: If no other member of the Congress desires to introduce a resolution at this time we will proceed to the regular order of business.

The next number on the program is "Dry Farm Wheat Growing in the Great Basin," by Prof. J. C. Hogenson, Agronomist, Agricultural College of Utah, Logan, Utah.

I take pleasure, ladies and gentlemen, in introducing Prof. Hogenson, of Logan, Utah. (Applause.)

### DRY FARM WHEAT GROWING IN THE GREAT BASIN.

(Prof. J. C. Hogenson.)

Ladies and Gentlemen: Since listening to the sweet strains of music and the melodious voices at the concert last night I have been wondering what the next treat for the arid farmer will be. In coming to the platform I heard a gentleman say: "I hope he will cut it short." (Laughter.) I take for granted that the gentleman is not very much interested in arid farming, and that he is more interested in something else. I assure him, however, that I shall be brief. Not because brevity is the soul of wit, but because if there is any one thing I like more than any other it is the truth boiled down. I am not in favor of talking for hours upon a certain subject which could be just as well said, and perhaps better said, in a few words.

The problems before the arid farmers in the west are very broad problems. They are problems which cannot be solved in a day or two, neither can they be solved in a year or a dozen years; and I doubt very much if there are some of them that can be solved in a lifetime. Therefore, if I shall say some things which are not absolutely demonstrated facts they are indications of facts, at least. When I say that a certain strain of wheat is better than another strain of wheat, I do not mean that it is absolutely so, but I mean merely that the experiments which we have been carrying on indicate that it is better for that particular section where it has been tried.

In the Great Basin, which lies between the Rockies and the Sierra Nevada mountains, there are millions of acres of good, fertile land which today is raising nothing of any economic value. It is raising large crops of sage brush, large crops of sun flowers and other weeds, and I believe that it is a fact that where these crops grow wheat and other arid farm crops of economic value might just as well be grown, and the state and the people who raise these crops would be that much better off. I believe that it will not be very many years before most of this land which is now lying idle will come under cultivation to do man's bidding and bring forth an abundance of the beauties and fruits of the field. There are thousands of acres, of course, that we know can not come under the irrigation canal. These thousands and millions of acres will have to be cultivated, and they cannot be cultivated except by scientific investigations and the application of those scientific principles upon these lands. It has often been said that not many years hence in the west all of the cereals and other extensive crops will be grown upon the arid lands, while the irrigated lands will be devoted to the production of more intensive crops. This statement is being verified year by year.

Glancing back over the pages of time we see that where the Great Basin now lies there was once a monstrous lake, dashing its waves against the mountain tops, washing the soil from this mountain and that, depositing it upon the bottom of the lake, hundreds of feet below. These dashings and washings have gone on for almost countless ages. Year by year the soil in the bottom of the lake grew thicker and thicker. Finally the waters disappeared and these vast stretches of fertile land are the result. So that we are assembled today upon the bottom of that vast lake and upon that slowly formed fertile soil.

As a general thing the soils of the Great Basin are very deep for the very reasons that they have been formed as I have told you. Not only are they very deep, but most of them are quite retentive of moisture. In selecting soil for an arid farm of course we know that we should choose a soil that is quite retentive of moisture. But I believe that above that we should choose a deep soil rather than the kind of soil, for, if we have a deep soil, even though it be somewhat less retentive of moisture we can cultivate it in such a manner as to store the moisture there to a considerable depth, and I believe that is better than a retentive soil which is poorly cultivated. The rainfall, though scant, if controlled and made to do the bidding of man, is sufficient for the production of fair crops.

Wheat has always been and perhaps for a number of years to come will be the leading arid farm crop. Utah, in 1907, on 109,000 acres of arid land, grew 1,630,000 bushels, or something more than 15 bushels per acre, of good marketable wheat. This, however, is only a beginning of the great possibilities of arid farming in the state of Utah and in the Great Basin. The total amount of land tilled in Utah at the present time is only 3.3 per cent of the total area of the state, so that we have yet vast areas of humid irrigated as well as arid lands which are yet undeveloped. For the most successful growing of wheat on arid lands I believe that it is abso-

lutely necessary that the land be thoroughly prepared before the crop is planted. I do not believe that a person can make a success of arid farming who is not in the habit of thoroughly preparing his land before his crop is sown. In fact, I believe that if the land is not thoroughly prepared over one half of the profits which could be derived from that land is practically lost. I believe, further, that the fall plowing of the land has a tendency to be more successful for arid farming than has the plowing of land at any other period of the year. In fact, in preparing the land, it is absolutely necessary that there be sufficient moisture in the soil to sprout the plants quickly and to keep them growing. If there is only sufficient moisture in the soil to sprout the plants and then to let them die out, I believe that the chance for success in arid farming under that condition is very sparse. I believe that it is the check that the growing plants receive that determines very largely the low yield of the crop. If the plants are allowed to grow without those checks the chances for success are very much greater. There is another reason why I believe the land ought to be plowed in the fall, and plowed deeply too. One reason has already been given here, and that is that if the land is plowed in the fall all of the moisture which falls during the fall and winter and spring sinks into that soil, and if the land is properly cultivated in the spring it remains in that soil until it is needed by the crop and is taken out of the soil only as the crop needs it. There is another consideration to be taken into account, and that is that where the land is plowed in the fall there is a great deal more surface exposed to the action of the snow, exposed to the action of the freezing and thawing of winter. And it is my opinion that these—the action of thawing and freezing of winter—have the effect of making a great deal more of that unavailable plant food which is in the soil available to the plant, so that the plants of the next season will be able to get a great deal more food for their development and growth than they would have been able to get had the land not been plowed until spring.

Now, it is true that wheat is the principal arid farm crop and will be at least for a number of years to come. One gentleman said yesterday or the day before that it would not be many years until wheat would become a secondary crop on the arid farm. I believe we will have to wait until that time comes before we can discard wheat. If wheat is the principal arid farm crop, then the advantage of growing a variety which is particularly suited to our conditions is obvious. If one variety of wheat withstands drouth better than another, if it produces more wheat per acre, if it is of as good or better quality, if it is the kind that finds a ready market, if it demands the highest possible market price, if it resists diseases better than another, if a greater variety of products of as good or better quality can be made from it, that is the variety we ought to grow upon our arid farms. If a variety can be secured that will, on an average, yield even one more bushel per acre it will mean much to the arid farmers of the west as well as to the wealth of the nation. In the experiments that have been carried on by the experiment station for a number

of years fall wheats have always given us better results than spring wheats, because fall wheats are able to grow and are able to benefit fully by all of the moisture which falls during the fall, winter and early spring, and are capable, also, of taking advantage of the early spring sun, which means much to the better development of those plants. We have found that sowing with a press drill has always given us better results than sowing broadcast because by sowing with a press drill our seed is put into the soil at a very uniform depth and is scattered evenly over the soil. And, also, the press wheel has a tendency to pack the soil around each kernel of wheat, which has a tendency to cause the moisture to rise into that particular portion of the soil and thus cause the wheat to sprout or germinate more quickly than it otherwise would do. We have found that on an average of a number of years deep seeding has given us better results than shallow seeding, because in the deep seeding the seeds are always put below the dry soil mulch, where they can get the moisture necessary for their rapid germination. On an average, too, we have found that October seeding has given us better results than even later seeding or earlier seeding. In order to be fully successful with winter wheat it is necessary that the wheat come up in the fall. If the wheat does not come up in the fall the chances are against its fully succeeding. Of course there are many cases where it is successful even if it does not come up in the fall. If the seed is planted so late in the fall that it does not come up in the fall we are not going to get a full crop. If the seed is planted so early in the fall and there is moisture enough in the soil only to sprout that seed and then not enough to keep it going, then chances again are against our succeeding. But if there is moisture enough in the soil to not only sprout the wheat but to keep it growing until the late fall rains come, then our early fall seeding is going to be better than our late fall seeding. We have demonstrated that on the experimental farm. The farm has been running there now for four years, and for three years we have found that the October seeding has given us better results than has either later or earlier seeding. This last year—the one which has just passed—we found that the plot seeded on August 15th gave us better results than that we seeded later than that, for the reason that just after that crop was planted we had one heavy rain storm, which caused moisture to sink into the soil so that there was enough not only to sprout the seed enough to sink into the soil so that there was enough not only to sprout the the other by spring and kept ahead until it was ripened, so that it yielded on an average from 10 to 15 bushels per acre more than that seeded later. We can't always depend upon that—upon the rain storms just after we have seeded. So that on an average, I say, of a number of years, I believe the arid farmers are more safe in planting their seed either the latter part of September or in October.

Now, I just want to read you a short paragraph from an article on Durum wheats. The Durum wheats, as we understand, are hard wheats. They are wheats that are planted in the spring. Not that I want to ad-

vocate spring seeding of wheat; because we know that the fall seeding of wheat is better, but I shall also give you some figures on the value of wheat. But for a spring wheat there is no wheat that will give us a higher yield of a good quality of wheat than the Durum wheat.

"The Durums, also known as Macaroni wheats, are hard grained, the plants are tall, the heads are slender and compactly formed and are always bearded. The kernels are proportionately rather long. These wheats are as yet but little known in the Great Basin. They are native to the Mediterranean and Russian regions of Europe and Asia, and are adapted to grow on soil rich in plant food, even inclined to alkalinity. Best results are secured in a hot dry climate. These conditions make them well adapted to Utah soil and climate.

"The questions naturally arise, Will Macaroni wheat make good bread? What is its milling value? By some it is claimed that it yields only a small quantity of flour. Some declare that the flour is yellow, that bakers refuse to buy it. Some claim that the bread has a poor flavor. The South Dakota Station has done considerable work in determining the value of Durum wheats. Their statement is as follows:

"The uses of the Macaroni wheats are more extended than those of the common wheats used for breadmaking alone. The common soft wheats make an inferior macaroni. Nothing but good Durum wheat can be used for macaroni. Most of the Durum wheats make elegant bread that is scarcely equalled by the best of soft wheats. The products of Durum wheats are as a rule richer in protein than are the products of the soft wheats. They make good macaroni, an attractive flour and a good bread that is satisfactory in loaf, color and flavor.'

"What more can be asked of a wheat? The volume of flour from plump Durum wheat is greater than the volume of flour from soft wheats. The color of the flour and loaf made from it depends upon the fineness of the flour. The finer the flour the lighter is its color and the color of its products.

"The one difficulty with Durum wheats is that they are hard to grind. Yet, where millers are prepared they prefer Durum wheat to the soft wheat, because of the high grade of flour it produces."

Now during the last season and for three or four years, in fact, we have been experimenting with a number of Durum wheats, and during the last season we had a severe frost in July. This frost damaged very materially the wheat grown upon that farm. In fact all of the soft wheats were damaged to the extent that they were not worth while harvesting, while the macaroni wheat, or hard wheats grown on that farm came through untouched. So that they are better frost-resisting varieties of wheat than are the soft wheats.

On the experimental farms located in different parts of the state we have found that there is one fall variety of wheat which stands out above the others in quality and yield. In fact it has produced a higher yield of wheat on all of our experimental farms located in these different parts of the state than has any other variety, and by chemical analysis it has

been determined, too, that it stands out ahead in protein quantity, or very near the head in protein contents. This variety is the Turkey wheat. The Turkey wheat, in a great many of the wheat-producing sections of the United States and Canada, is considered the standard milling wheat. Another variety that stands out with the Turkey in yield, but which, I am sorry to say, is low in protein contents, is Koffoid wheat. Koffoid wheat is a soft, white, local wheat, grown almost locally in Juab County. It has a stiff straw and has the quality of not shelling easily. It has the good quality of resisting disease and frost and blight, but the one thing against it is that it does not have the high protein contents which to a certain extent determines the value of a wheat. There are many other varieties that are grown—a great many good varieties and some bad, poor varieties. I believe that we make the mistake that we grow too many varieties of wheat, and I believe the sooner we get down and grow one or two varieties of a uniform quality, that is particularly adapted to our particular section, the more prosperous will the arid farmer become. When this has been accomplished then a particular section of the country will become known and become recognized for a particular variety or kind of wheat. This variety will then be demanded by the trade and will be sought after and the highest possible market price will be paid, because if the same variety of wheat is grown on all of the farms in a particular section of the country it can be taken out in trainload lots. I believe as long as we raise any old kind of wheat the highest market price cannot be secured. I believe the great watchword of the arid farmer will be "Co-operation in production and uniformity in product." Co-operation to cheapen the cost of production and uniformity to secure the highest possible market price.

For the successful growing of wheat on the largest number of acres in the Great Basin it is necessary that we have a more thorough survey made of not only the character of the surface soil of this region but more particularly of the under soil, as to its uniformity, as to its porosity, as to its depth and water-holding capacity. When this is done we can determine more fully what particular sections are best adapted to the growing of arid crops.

There is one most vital problem which lies as yet unsolved by the experimenter as well as the arid farmers in this region, and that is the study of the millions of living organisms which we have found in the soil—the bacteria, which do so much in rendering the soil fertile or in making it capable of producing profitable crops. We have studied for a number of years the dead mineral elements in the soil and know pretty well how they work, how they act and how they are acted upon by the crops, but as yet we have done very little in studying the living side—in studying the bacteria, as to just what they do in the soil. There is no question to my mind but that the mineral elements and the moisture are great questions, and that they go far on arid lands to determine the productive ability of an arid soil to grow wheat. But they are only one side of the problem of soil fertility in arid regions. The other side, which has not as yet

been touched, is the living side, or a study of the bacteria of the soil which, under favorable conditions, may either make or destroy in a very short time vast quantities of plant food.

It has been determined by actual tests that the grain grown upon arid lands is of a better quality than that grown under irrigation—that it has a higher protein contents than the wheat grown under irrigation or oats grown in a humid climate. If this is the case then I believe we can look forward with certainty to the time when the arid lands will become the granaries of the world—when the flour (the staff of life) will be grown almost entirely upon the arid lands.

The Utah Experiment Station is co-operating with the United States Department of Agriculture in determining the wheats that are adapted to this particular section of the Great Basin. We at present have under consideration about sixty different varieties of wheat that we are adapting to this section, that we are examining yearly as to their manner of growth, as to their contents, as to their disease-resisting qualities, as to their fitness to be grown in this section; and it is hoped that from these or from others we shall take up later on, we will be able to get a wheat extremely drouth-resistant, that will give us a high yield, that will have a high protein contents—in fact, a wheat that has all of the good qualities—if that might be—and none of those bad qualities. When that has been accomplished and the regions that are adapted to arid farming in the west have been fully determined, then the arid region may well smile, because then beautiful fields of golden grain will cover the face of the land, happy, prosperous and contented families will multiply in numbers and new evidences of thrift and prosperity will be seen on every hand.

I thank you. (Applause.)

CHAIRMAN BURRELL: The next number on the program is "The Size of a Dry Farm," by Mr. I. H. Grace, of Nephi, Utah.

The Executive Committee desires to have the Chair announce that they will hold a meeting in this room here at four o'clock for the purpose of determining the place of holding the next meeting.

MR. BOWMAN (Idaho): And that the committee will report to this Congress the result of its deliberations at 2:30 p. m. tomorrow.

CHAIRMAN BURRELL: I have the pleasure of introducing Mr. Grace, of Nephi. (Applause.)

### THE SIZE OF A DRY FARM.

(I. H. Grace, Nephi, Utah.)

Mr. Chairman, Ladies and Gentlemen: My only excuse for appearing before this grand audience is because of the invitation I received from the committee to speak to you. The subject that has been assigned to me was not of my own choosing, but I will endeavor to say something upon it, and give you the benefit of my experience along that line. I had nothing in my mind to say when I first came up, but when I had heard so much of different ideas upon farming, methods and tillage, etc., I am



almost bewildered as to what to say as to the size of a dry farm, and I have been attempting to kind of gather my senses, also to know whether I have been figuring right for the last eighteen years or not. When I hear the statements that have been made and of the great successes that have been obtained by methods that have been in use, and the enormous yields and vast amounts of money that can be made in dry farming I am almost staggered, and feel that I have lost almost half of my life in not finding out these things before. (Applause.) It puts me in mind, a little, of the fellow that was going into the poultry business. He had about a dozen hens and had an idea he could make money out of the poultry business, so he began figuring, and began taking poultry magazines, and he was enabled to figure in a very short time that there would not be room upon the face of the earth for his chickens, after a few successful years, (Laughter) because of the many chickens that he could hatch. And when he came to compute the production of those chickens there was no place on the earth for them, and so he backed out and didn't go into the chicken business. (Laughter.)

I am a little of the opinion that many of the dry farmers who are contemplating filing on these lands and working for a living will be disappointed in many respects, at least. I have been, in some respects, and I will say that I have not been able to reach the success that many have reached along this line, yet I feel perfectly satisfied with dry farming and feel that it is the best business we have ever gotten into, and I am not very anxious to get out of it. But I hope the soils will be still productive in the future, and by meeting in this Congress and exchanging ideas that we may use the very best methods that are within our reach and profit by them.

I presume if we were to ask Prof. Merrill what the size of a dry farm should be he would say nothing less than eight thousand acres. I may ask some one else and they would say, perhaps, forty or fifty acres. So you will see there is a diversity of opinion in regard to this matter, and perhaps I shall be criticised when I tell you what I think the size of a dry farm ought to be. Of course it depends altogether on the conditions. If I am going to run a dry farm merely for what I can do on that farm, with one pair of hands, and take all of my time, and work it to the very best advantage there is a certain limit, but if I have half a dozen boys growing up that have got two hands, the same as I have, each of them, then I would have to view that matter from a different standpoint, because I would need more land to accommodate them. But I take it the average man in the community wants to know what he can do with his hands and be employed practically the year around and have all that he can do and all of the land he can use under the very best conditions that come to him during the season. That, I think, is the important point, because I believe eight-tenths, at least, of the men who contemplate following dry farming as a livelihood do not want a thousand acres, or even five hundred acres to work upon, but, as I stated, they want all that they can put their time to good use on during the season. Now the capacity of the man has

something to do with this, and it would be difficult to draw a line there. A man who wants to spend all of his time upon the dry farm will want more land to accommodate him than the one that spends half of the time going to and from his farm. So that all of these conditions must be taken into consideration. But I believe that the average man, if he has 160 acres, can get more out of it, if he will spend his time upon it and use his brain and benefit from the experiences we have had in this Congress, he can get more out of it than he can get out of 320 acres. I believe the trouble with most of us is we don't cultivate properly; we don't get the best results out of our farming, and our experience has told us—I am speaking now of my brother, whom I work in connection with upon the dry land farm—that our best results have been in going down, and not in trying to reach out too far, but finding out just exactly what one man and four horses, with the requisite implements and tools, can do during the year, and we have decided the best man we can get hold of can perhaps during the season handle one hundred acres, but the average man I don't believe can handle over eighty, and I think if you will figure this out, that will give farmers on an average about twice as much as they are making on their farms today, because I believe land that is properly tilled under these methods that have been suggested, and we know that most of them are good, at least I have found many of them are good, or at least satisfactory to me, and we raise our grain at a very reasonable profit, and find, by figuring, that we get sufficient results to justify a man to work at eighty acres during the season. That is, I believe in summer following one eighty one year and cropping the other, therefore a man spends all of his time upon an eighty. A man with good management and ability perhaps can handle 100 acres. We have tried one man with two teams on 300 acres, and we found to our sorrow that we could not handle it, and the yield in crops wasn't that which we were looking for. But every season we have plowed any particular ground, or any particular part of it, plowed it in the right time, cultivated it in the right time, seeded it in the right time, we have been enabled to get splendid results, and the further we get away from this condition the less the good results. So we have concluded to at least discard 100 acres of land for these two men and two teams and we look for better results. Rather, instead of discarding our 100 acres we have divided our farm and use but 200 acres at a time, and by using four horses we are counting on running our farm 100 acres for every man and four horses. Of course we have to have additional help during harvest time, but I am speaking of general conditions.

I presume many persons in this room will take issue with me and say they can do more than that. Perhaps they can. I can't. I will guarantee to do this, though. I will take a farm of 200 acres and farm one end for one year, summer following the other end, and any other fellow can take 400 acres, and if he will try to farm 400 acres in the course of five years I think I will have raised more grain on my 200 acres than the other fellow would on his 400. So much for good tilling.

When the gentleman from Montana—Mr. Atkinson—was speaking this morning it seemed to me and I felt that maybe he had been experimenting down in our locality, for his ideas in many respects have proven what I have found out in my experience in dry-land farming.

Now, our method is and always has been to plow in the fall from seven to nine inches deep, and plow as soon as we can after the crop is taken off. We don't do any more then on the farm until the following spring, and I can't tell you just what time to start in the spring, because I wait for conditions. I was told to harrow my ground early in the spring—as soon as spring opened up. I did it one year and I have never done it since under those same conditions. I put my horses and harrows on the ground early in the spring, and for two years afterwards I could see where every horse stepped—there was a lump as big as my head where every horse stepped. I got onto it too early. I didn't do that this season on my land, because of the wet condition. However, there are seasons when two harrowings can be done. It is a good thing to harrow in the spring but not always to do it. So that I wait for the condition of the season. Our season changes. Most every season we can make our plans for next season by those that have come this season. Of course we find things we can profit by. We have to wait for conditions to come, size them up and then act accordingly. As soon as the land becomes dry enough in the spring—and I decide that matter when I go on the land and don't allow the teams to go on until it is dry—but when it is dry enough to work I put my teams on the land and plow. And I try to be economical in this matter. I use five horses. I believe it is economy to use five horses. Sometimes the horses get stuck, and I like to have plenty of teams. Put five horses on it and plow it. I plow, as I said before, in the fall and in the spring. And sometimes we have been rather up against it to know what to do with the weeds and voluntary wheat that comes up on the farm and how to dispose of them. You can dispose of a few acres very nicely, but when you wait until the land is dry enough to get onto it with your team and cultivate it the voluntary grain and weeds are growing so fast you often have to wait three weeks to accomplish this end. We have tried the disc harrow and it is good, but you can only use that successfully two or three weeks, or until the weeds get so large it don't cut. The method we use now is we plow with disc plows. We can put four discs on. In the fall I use them with two discs on and five horses, as I have stated, and in the spring I use four discs with the same team, and plow just as shallow as I can. It isn't much more than a discing, but plow just as shallow as I can in order to cut the weeds. We don't care what method we use, so we keep the growth down and keep the land in good, nice tillable condition. We do that and immediately after follow it right up with the harrow, and then as often as we can, or whenever we can. When a rain comes, we go over that and immediately after follow it right up with the harrow, and then we have a harrow we use which is 24 feet wide, for four horses. It is a light harrow that we use only for breaking this crust to keep the mulch on top of the ground. In fact we have tried to make every implement so

that when the men change from one implement to the other the men and horses have all they can handle. We find in breaking the crust that the 24-foot harrow can get along better and faster and just as good as we can with a 16-foot harrow that is much heavier. We find when we come to prepare it in the fall it is practically ready, and we have only to go over it once, if at all, before we come onto it with the drill.

Now, as stated, 100 acres, I believe, is all one man can handle and handle to the best advantage. I know it will be said that one man with four horses can plow 80 or 100 acres in perhaps 35 days. That is true. But there is not more than 35 days in the spring of the year to cultivate. There are not that many days to cultivate in the spring of the year. There are not half that many at the very best time to cultivate. A gentleman made the remark here yesterday that there was a difference of from eight to ten bushels per acre in three days difference in plowing in the fall of the year. I think that was a little bit of a stretcher, but there is truth in it just the same. I know there is a vast difference in the time of plowing. As I stated in the beginning, I like to plow in the right time, I like to cultivate in the right time, and I like to seed in the right time, and the further we get from the right time the less the good results.

To illustrate. Of course when we went into dry farming we got the very best information we could get at that time by writing to the gentlemen who had been in the business for a number of years and who gave us some good advice, and we have followed it and are following it today. And I follow the advice of the professors. Everything they can tell me that I can absorb I use and reduce it to practice. That is, advice we can follow. I sometimes think I need summer fallowing myself so some of these suggestions will soak in. (Laughter.) I believe many of us need to do the same thing.

Now, as stated, there is not a very long time in any of these periods in which to do our work to the best advantage, but if we do it at the right time the better the results.

As I was going to say, I told my brother at one time that we needed another drill. We had been using a press drill, and we could plant eighty acres a week with four horses—one man with four horses, and in three weeks we could plant our crops. Several years ago I told him, says I, "Let's get another drill." He says, "What do you want of another drill; we can plant all of our grain with one." Says I, "Yes, that is true. We can do it, but I believe there will be an advantage in planting it sooner, when the proper conditions come, and I believe it will more than justify us in getting another drill, because two weeks' difference in the time of plowing, when conditions are ripe, makes all the difference in the world in the crop." Any way, we come to the conclusion not to get another drill, and this was the result: We planted eighty acres along, I think it was, the last of September or the fore part of October. There was a beautiful rain came and our land was in excellent condition—I believe as nice as we ever got. In the spring we put the drill to work. I started the harrows, preparing the ground and we followed right up with the drill, and planted

eighty acres the first week. We got in the next week another eighty acres and the following week another eighty acres, and I believe the land was in just about the same condition in the main—at least they were a good deal the same. The result of that crop was 28 bushels per acre on the first eighty, on the second we got 24 bushels and on the third we got 20 bushels. That was a sticker. After that crop was harvested I never said anything more about a drill but early in April my brother said, "We'd better get another drill, hadn't we?" I told him I didn't know as it was necessary but he could suit himself about it. "Well," he says, "you had better order another drill." We ordered another drill. (Laughter.)

That is the condition not only in dry farming but in irrigation farming as well.

We have used this method of summer fallowing every other year on our irrigated farms, and I am not convinced it is a wrong thing on the irrigated farm, because our farm that has been farmed ever since I have been big enough to reach a plow handle, is producing better crops today than it has ever done. And I have learned by practical experience that plowing and cultivating in the proper time and proper season gives the very best results of anything we know about. Of course I would like to get better methods, but I am perfectly satisfied with the methods we are using. We are successful, and perhaps successful enough. And I believe some of these big stories about the success that can be accomplished in dry farming don't always pan out that way when it comes stock-taking time. Of course a man can start out in the morning and plow so much—plow so many acres today, and it has cost him so much to plow an acre of land. Well, it doesn't cost very much, but when he comes down the next spring and takes stock there is a thousand and one incidental expenses, and it don't figure out just that way, and he finds out he is not making fifty or a hundred per cent profit on his investment, but it is reduced to fifteen or twenty. If I can get twenty per cent on dry farming I am satisfied. Of course I am better satisfied if I can get more, but I won't quit it because I am only getting fifteen or twenty.

I will just give you a little statement, as I have it, of the facts that come to me in regard to the cost of cultivating, and I do it from this point of view: That is, our horses, harness, plows and all of the implements that we have I call it capital stock, and it is a part of the farm, and I am hiring so many men, with four horses and a plow to do our work. But I claim this, that the cost to us is what our horses eat, what our men cost us, and what the wear and tear is on our implements, so that the cost would not be over sixty per cent of what it would be if we were hiring men with their implements to come and work for us. We have this advantage when we have our own horses and our own implements, if I tell the boys to plow eight, nine or ten inches deep they plow that way, and if you hire men to do it unless you are over every plow you have got on the place they may plow nine inches deep, and they may plow four inches deep, so that when you come to drilling your land in you find that it is not plowed at a uniform depth, and the result is

that you are not doing what you have anticipated you were doing. So that there is an advantage in owning your own implements. It costs us, using five horses and two plows, and plowing deep—seven to nine inches—one dollar per acre. Of course I get at these expenses in the way I have indicated. That is all we do in the fall of the year on our land. The next spring we put the same plows onto this land, as I have explained, and we plow from two to four inches deep—just so we can cut the weeds, as I have told you. That costs us sixty cents per acre to cultivate in that way. Harrowing twice with these large harrows costs us fifty cents an acre, two harrowing. Drilling the grain in costs us forty cents. It don't cost us quite that much, but I put it forty cents at the outside. Now that is about all of the cost in the way of working the land, except perhaps twenty-five cents for sharpening the plow, or something of that kind. We use forty or forty-five pounds of grain for seed, which ordinarily costs about fifty cents per acre. Our present method of harvesting costs us one dollar per acre for cutting and stacking the grain with the header and header boxes. Threshing costs us this year \$1.85 an acre. I am basing my calculations on a crop of 25 bushels to the acre. Of course in the cost of the work it doesn't make much difference whether the crop is 25 or 35 bushels, but in threshing and delivering your grain to market makes a difference, so I have averaged it at 25 bushels. Hauling our grain seven miles from the farm to market costs us 75 cents. And all this makes a total of \$6.85 per acre. Our crops yielded this year—our land yielded this year an average over the whole field of 25 bushels to the acre, which would be, the cost of producing that, would be about 27 cents per bushel the way I figure it out. And as I stated a while ago, I figured in the beginning that it cost us so much to feed the horses, and general expenses. And that reminds me I have got to take stock when I go home, and I have just added \$600 to this, calling it 35 cents per bushel our crop has cost us to produce during the year 1907. Our grain sold for 71 cents. So I believe the actual result is 50 per cent. That has satisfied me perfectly well, and I am not going to hunt for new methods and leave the old ones out until I know something about them.

As I say, when these professors give suggestions I can understand and reduce to practice I am going to do it, but I want to do it in a small way first, convincing myself by actual demonstrations that these things can be accomplished. When I can do that then I will change, but I am pretty well satisfied with the methods we are using today, and most of them have come about by listening to the professors and learning as much as we can, and reducing their suggestions to practice.

I take it this way: These professors are giving the better part of their lives for the benefit of the farmers. I for one appreciate the efforts they are making, but when they have presented these ideas to us then we have got to find a way to reduce them to practice and make them profitable. They mention one thing, I mention another and you mention another, and the one that can reduce the cost to a minimum is the method we want to follow. I know Dr. Widtsoe and Prof. Merrill and all these professors like

to get suggestions from the farmers, to find out what they are doing in regard to these things, and they like to exchange these ideas.

I was very much interested in the remarks of Professor Atkinson today, because, as I say, his experiences have taught him about the same lessons that mine have taught me.

I heard Prof. Chilcott last year in Denver, speak upon a similar subject he was speaking on in this room. But their conditions are altogether different from ours and viewed from a different standpoint. I believe the conditions even in Cache Valley are different from those in Juab County, and all of these conditions must be taken into consideration. And I believe to use the methods they use in Colorado, the Campbell System, would be injurious to us here. For instance that sub-surface idea I feel would be an injury to my land, because it would pack the land, and my land don't need packing. I have to do something to loosen it up rather than to pack it. I believe we should take these things into consideration. That is not a success for Utah land, but it is for the east, and these gentlemen are giving us the benefit of what their experiences over there have been, and the experiences they have had in particular localities I can leave—throw them to one side. I am not interested there. I am not very much interested in the paper Prof. Chilcott read. It is all right for Colorado. Many of the points are good for Utah. I have got to sift them out and find out what are good for me, and take only those things I know are suited for conditions in Utah, and there is nobody better prepared to determine the things we want to find out than is the experiment station. They have been a fine thing. But I believe the thing we most need today above all other things on the dry farm lands is water. It adds one-fifth to the expense of dry farming to haul water to the land for your animals. That is quite a strain on us, and it is very inconvenient, and I hope that some means may be taken so that we may have aid, that wells will be sunk somewhere in the different localities that will prove to men whether or not water can be had. I would be perfectly willing to spend a thousand or fifteen hundred dollars on a well on our place if I was sure I could get water when I got there. But I don't know that. I think it would be all right for the state, or national government, I don't care which, to demonstrate this fact, so that if we were to dig wells, commence digging wells, we would be sure there was water. This is an important question and I think something can be done in this respect, because it is a serious drawback, and it has something to do with the size of a dry farm.

I don't wish to weary you. My brother said, when I came up, "Mind what you do—don't take up too much time," and I don't want to. I am glad to be here, to participate in these exercises, and I have attended every meeting and I am going to attend every meeting until the last, because there is money in it for me, and I hope that every dry farmer in Utah, whether he becomes a member of this Congress or not, will put himself in possession of these articles that have been read in our hearing, and digest them, make them your own, and glean out those things that are for you, that you are particularly interested in. There are many suggestions

made that I can't take in, and there are others, many others, that I can take in. When I am vitally interested in any particular line, and a suggestion comes from any of the speakers, I have got it and it is mine. A thousand and one things have been said here today that nine-tenths of us will lose entirely. Therefore, I say, "read and study." I scarcely have time to read the books of my religion for wanting to keep up with the times of dry farming (laughter) and other lines. And I have come to the conclusion that the best thing for me to do, whatever I read, is to understand, and not take a thousand and one journals, but take a few and read them and make them my own. If you will do this you will get the benefit of them. I have gone into the poultry business a little, and I sent off for some pamphlets to read, in order to inform myself on the poultry business. I sent off for a little pamphlet written on "The 200-egg hen a year," and read it and re-read it, and felt a little like the fellow who was figuring on going into the chicken business I was telling you about. But after I had had one year's experience I came to the conclusion I hadn't read the book at all, then I started and read it over, and I could see new facts in it. In fact I began to think I hadn't seen any of the facts in it before. And I re-read it, as I stated, and it was worth reading the second time, because I had proven by my experience different things that were suggested in it. The only way I can make anything of benefit to me is to make it my own, and then use it. I read the bulletins that are issued from the experiment stations and those different sources of information we have for the dry farmers. If the dry farmers will read them and try to understand them, and practice them in their farm methods I want to tell you that we will have better results even than we are having now. But I claim this: that the proper method is to study the time of cultivation in the way I have suggested, and it is just as easy to prepare our land for a crop that will yield 35 bushels to the acre as it is to prepare one that will yield 20 bushels to the acre, and we have got this advantage, if a favorable season comes and the rainfall is plentiful we will raise a 35-bushel-to-the-acre crop, and if we have an unfavorable season I believe we will be pretty sure of 20 or 25 bushels. But, on the other hand, if we prepare our land for a 20-bushel crop we may get it, if we have a favorable season, and if it is unfavorable we will fail, and we don't want to do that. So that I claim, gentlemen, you that have good ability can handle 100 acres a year, or a total of 200 acres of land, letting half of it be summer fallowed one year and the other half in crops, and I believe it will be more profitable to you than it will to take a greater amount and have a less yield. Of course there are many conditions I would have liked to have heard discussed here today, but I believe it is best for a man to take 100 acres, if he can till his land right, and use the best means in his reach, and he will be able to make a comfortable living and will be perfectly satisfied with his condition in life, more so than to try to spread out all over creation, and he will be more successful if he will concentrate his efforts, and let him keep his horses under control, and let him drive his own horses and not let his horses drive him. (Applause.)



MR. BOWMAN (Idaho): Gentlemen of the Convention: The Executive Committee has directed me to appoint a committee of ten to solicit subscriptions for affiliated and life membership. I will appoint on that committee Mr. L. A. Merrill, of Utah; W. H. Harting, of Wyoming; John Henry Smith, of Utah; Isaac H. Grace, of Utah; Geo. A. Day, of Idaho; Jno. T. Burns, of Colorado; Mr. Cranney, of Wyoming; O. A. Johanneson, of Idaho; Mr. Peacock, of Colorado; R. A. Riepe, of Nevada. The gentlemen named will please, in taking these subscriptions, be sure and get the names and addresses correctly. I thank you.

SECRETARY ROOT: I have here a communication, or rather a paper, by Prof. W. H. Olin, which is too long to read.

CHAIRMAN BURRELL: Without objection it will be placed in the record. I hear none and it is so ordered.

### DRY FARMING IN EASTERN COLORADO IN 1907.

(By W. H. Olin.)

"What are the facts on eastern Colorado crops for 1907?" is an important question and not an easy one to answer. The writer has spent many weeks obtaining what he believes to be an authoritative answer. Many local areas varying from less than a mile to possibly two to four miles wide and several miles long, were struck with hail the latter part of June to late in July, destroying crops in the path of the storm. These storms were peculiarly local in origin yet more widely distributed over both irrigated and non-irrigated regions than in previous years.

Cheyenne Wells—One of the oldest settlers, Mr. J. B. Robertson, told us that 1907 was the driest year he had seen in Cheyenne County since he came there twenty years ago. The rainfall from October, 1906, to October, 1907, at Cheyenne Wells was less than nine inches, the lowest recorded precipitation since a record has been taken at that station. In the fall of 1906 Mr. Robertson seeded twenty acres of winter wheat on summer cultured ground making a test amount of seed sown as follows: Twelve acres seeded at rate of sixty pounds per acre yielded seventeen bushels per acre. Four acres seeded at rate of forty-five pounds per acre yielded twenty-one bushels per acre. Four acres seeded at rate of thirty-two pounds per acre yielded twenty-one and one-eighth bushels per acre.

The growing grain received just two and one hundredth inches of rainfall up to nine days before harvesting.

This is one of the best object lessons in favor of good farming in dry years which the writer has ever known.

Mr. Richard Envin raised a very satisfactory crop of potatoes for any year, supplying himself and neighbors with the choicest of spuds on this "our dryest year in Cheyenne County."

While some newcomers did not succeed in getting their ground in crop condition for so dry a year and had "little to reap," there is absolutely no foundation to the story that "sixty families had starved out in this vicinity and were forced to leave the country."

From this section we will go to Haxtum and Holyoke in the northeast portion of Colorado. Most of the farming around Haxtum is on a black, sandy loam soil which on dry years is quite superior in crop results to the clay loam or "hard lands." Here winter wheat runs from fifteen to twenty-seven bushels per acre; spring wheat (durum) twelve to twenty bushels; corn fifteen to thirty-five bushels; potatoes of good quality yielding as high as 150 bushels per acre. Cane, millet and other feed crops did well and all kinds of livestock are, therefore, faring well this winter. Wheat has gone into the winter in good condition.

Holyoke reports winter wheat yields from ten to twenty-one bushels; spring wheat, fifteen to twenty bushels; corn, ten to twenty bushels with a very satisfactory yield of feed crops. Mr. George Wilcox reports 1,520 bushels Turkey red wheat from forty acres. A. C. Cauble, thirty-four bushels per acre of speltz (emmer) and Pennington & Son, 240 bushels potatoes (14,400 pounds) per acre.

Mrs. S. S. Worley of Holyoke shows how the hen works to "help out" on the farm. She started in the spring with eighty B. P. Rock hens. She raised 325 chicks, supplied her table with eggs and poultry meat and, after accounting for what grain she had to feed the chickens, beside what they picked up and thereby saved on the farm, she had \$200 to her credit and has ninety good pullets to repeat her experience in the spring. She sold 500 dozen eggs during the season. She also cleared \$110 from three dairy cows. The hen and the dairy cow should be welcomed and kept on every eastern Colorado farm. It is an astonishing fact, too, that when ten or more hogs are raised there is either no mortgage or it soon disappears.

Sterling and LeRoy report one of the best upland crops which they ever raised. Winter wheat ran fifteen to forty-five bushels per acre; potatoes, fifty to one hundred sacks "above the ditch" and as high as 230 sacks largely grown in this section, oats running ten to twenty bushels; wheat, five to twenty-five bushels; barley, ten to eighteen bushels. Corn was a fairly good crop, yielding from eight to thirty bushels per acre. Cane gave fifty to one hundred sacks "above the ditch" and as high as 230 sacks "under the ditch." The financial panic is only a joke to Logan County farmers.

Akron, next to Cheyenne Wells, is considered the highest section of eastern Colorado. It lies about 115 miles east of Denver and some seventy miles from east line of the state. One farmer, from eighty acres of rye, wheat and barley, threshed 1,300 bushels of grain. Small grain was quite largely grown in this section, oats running ten to twenty bushels; wheat, five to twenty-five bushels; barley, ten to eighteen bushels. Corn was a fairly good crop, yielding from eight to thirty bushels per acre. Cane gave two to three and one-half tons per acre forage; millet, one and one-half to two tons. Potatoes, fifty to sixty sacks per acre.

Yuma, east of Akron, had a hailed district north of town, but reports corn from ten to thirty bushels per acre. Two thorough farmers south of town had forty-eight and fifty-four bushels respectively. Between them they raised 120 acres of corn. Wheat gave ten to twenty-

five bushels. One German farmer, on summer cultured ground, had seven acres of winter wheat which gave him 336 bushels of fine quality wheat. Twice the acreage of winter wheat was seeded this fall which had been put in in any previous year. One farmer who has seeded 365 acres writes that he has 100 acres which make the finest showing he ever saw for fall grain, and all of it going into the winter in good condition, although that section had no fall rain after September 15th. What is the explanation? He began preparing his seed bed last April, and retained all the moisture possible by tillage methods.

Wray reports a dry season, but no crop failure. Feed crops—cane and millet—gave one and one-half to three tons harvest, and corn fifteen to forty bushels per acre. E. L. Ambler, twenty miles north of Wray, had four acres of corn which gave him 240 bushels and which he sold for \$30 per acre. Wheat, fifteen to thirty bushels per acre. W. S. Callo-way, on sixty-eight acres of summer cultured ground, grew forty-two and one-half bushels of wheat per acre—thirty-two acres drilled in on corn stubble yielded twenty-three bushels; seventy-five acres fall plowed gave fifteen bushels, and fifty acres Volunteer produced twelve and one-half bushels per acre.

I found many farmers in this section with from 2,000 to 4,000 bushels of grain from this year's harvest. The wheat was the only grain for sale, corn, oats and barley being fed to hogs and cattle, some very fine herds of each being found on these farms. These farmers propose to show in the fat classes at the Western Livestock show as a proof of what they were able to do in 1907.

Thirty-five miles south of Idalia is Burlington. Part of the farming district north of that town was hailed out, and the portion which had a harvest had lessened yields. Wheat, five to twenty bushels per acre; corn, one and one-half to two tons fodder per acre, some fields giving fair yields of good, marketable grain.

Joe Bauer, three miles north of Burlington, raised twenty acres of cane that yielded two tons per acre after being cut tight to the ground on July 24th by hail. One acre of alfalfa that yielded two loads on a sixteen-foot rack after July 24th.

Arriba, west of Burlington, reports a very dry season, but fair harvest yields. The farming district has kept five threshing outfits busy all fall. Wheat ran five to eighteen and twenty bushels, corn from five to thirty bushels per acre. One farmer near Arriba claims he has sixty acres which is yielding thirty bushels over the entire field. Another neighbor claims thirty-five bushels as his yield of corn per acre.

Around Arriba and Bovina flax is becoming quite a crop on sod land. There is now 3,000 bushels of flax at Bovina ready for market. Oats ran from ten to nineteen bushels, emmer (speltz) fifteen to twenty, potatoes fifty to seventy-five bushels per acre in the Arriba-Bovina district, the Divide district on the Rock Island between Limon and east line of the state. Some careful farmers of this district the past season,

dry as it was, were able to obtain 150 bushels of fine quality, good marketable potatoes per acre.

While crop yields have been seriously cut down, the writer cannot find a single locality from Burlington to Denver where feed must be shipped in because of crop failure. This fact the public needs to know.

One farmer near Hugo, under date of December 9th, writes that he has just finished threshing 3,000 bushels of grain for himself. Durum wheat yielded fourteen bushels, his oats twenty to twenty-six bushels and his white flint corn is hustling forty bushels per acre. He writes for instructions for exhibiting feed and grain crops at Western Livestock show. Considering the season, farmers in Hugo district have an excellent showing in all feed and forage crops, cane, millet, etc., giving one and one-half to two or more tons per acre, while even pumpkins, melons, squash, etc., were grown of good size and quality.

Walter Eastman of Galatea had a quarter acre which yielded close to 2,000 melons, a field of corn with some stalks ten feet high and potatoes yielding sixty bushels per acre. Ramah sends her crop report for the year as follows: Millet, eight to ten bushels seed where threshed, one to two tons where stacked for feed; oats, ten to twenty-five bushels; wheat, five to eighteen bushels; potatoes, 2,000 to 4,000 pounds per acre. Short crop, but plenty to keep and to spare. Calhan, Elbert and Parker all report lessened yields on account of meagre rainfall, but better prices for nearly all farm produce. Wheat ran from four to twenty-seven bushels; oats, fifteen to fifty bushels; potatoes, 1,200 to 6,000 pounds per acre, while yield of corn and fodder was about the same as last year.

Dover district reports two distinctive hailstorms, but those outside the path of these storms report wheat seven to thirty bushels; oats, twelve to twenty bushels; corn, one to two tons forage per acre; corn, for grain, fifteen to thirty bushels per acre; potatoes, an indifferent crop to fifty bushels per acre; cane, one and one-half to three tons per acre. One farmer reports having raised four tons of squash in the Dover district weighing from five to forty pounds each.

In the eastern portion of Larimer and western portion of Weld county is an upland region, where considerable fall and spring wheat is grown. Yields of from five to thirty bushels are recorded. Near Windsor one farmer, W. T. Metcalf, had 330 acres of winter wheat, 140 acres of which was struck by hail, a total loss. He threshed from the rest 6,500 bushels of grain. He now has 500 acres in wheat going into the winter in good condition.

Near Loveland some wheat gave a yield of forty-two bushels, weighing sixty-two pounds per bushel, over a forty-acre field. Very few fields yielded less than fifteen bushels.

We have taken a hurried review of the entire field of eastern Colorado. While many new settlers arrived late and did not understand crop conditions and the dry year caused them to have crop failure in some one line, the experience of their neighbors, who did understand conditions, enabled them to get some feed crops to help tide them

through. While some farmers have suffered losses from hail, drouth, and other causes of crop failure, yet no crop section has suffered a total loss in this, the closest year eastern Colorado has known for some time.

This past season has taught the value of thorough tillage, the necessity for using drouth-resistant crops and the great advantage of marketing the bulk of the crop through some profitable form of live stock fed and finished on the farm.

It also shows the wisdom of holding over feed and seed from one year until the following year's crop is assured. This year also brings out the individuality of the farmer. Back of all systems and theories must be the resourceful, purposeful farmer, who mixes "brains with the soil." Such a man wins success wherever success be possible.

Colorado calls for eggs and poultry meats. The eastern Colorado farm can furnish both, easier and cheaper than any other section.

Nearly every railroad crossing eastern Colorado runs a "Jersey train," willing to stop wherever cream can be obtained for western use. Nineteen hundred and seven proves there is no year so dry but that feed can be grown for the dairy cows. Here is an urgent call for a feed consumer and a worthy revenue producer with a market almost at the door for her products.

Denver and Pueblo are in almost constant need of more hogs for their rapidly growing markets. The past few years have demonstrated that hogs in eastern Colorado have given quick and profitable returns for money invested in them. Those willing to wait longer for returns show that sheep, beef cattle and horses are quite profitable consumers of farm produce. The man with small capital must begin, if at all, in a small way. Experience teaches that here, as elsewhere, it is advisable to start with something, to plan to have capital enough to tide over a period of twenty to twenty-four months. In the meantime, the new settler should get the hog, hen and dairy cow busy, buying groceries and laying by for a "drier" day, as soon as possible.

While the writer continues to urge conservative action, he feels the time has passed for all doubtings of the sanity of the farmer who settles in eastern Colorado. The lesson of this past year was needed by the real estate man, the settler and the pessimist. The former will find henceforth that truth is stronger than fiction; the second one will find helpful suggestions in the lessons of the year, and the third has absolutely lost his argument, his case is gone. He is no longer needed nor desired.

CHAIRMAN BURRELL: The Chair is asked to announce that the exhibit of dry farming which is shown in this hall is the result of the work of Thomas Smith, of Nephi, Utah.

That concludes the regular program of this afternoon. What is the pleasure of the Congress.

MR. BOWMAN, of Idaho: I would like to ask that the committee which has just been appointed get to work immediately and work as rapidly as they possibly can. We need the money.

CHAIRMAN BURRELL: What is the pleasure of the Congress?

A motion to adjourn was then made and seconded.

MR. JOHN HENRY SMITH, of Utah: Before you vote on that motion, Mr. Chairman, fellow congressmen, ladies and gentlemen, I want to say that I trust that this matter will receive consideration at once, as has just been stated, and that every man that can will put his hand down in his pocket. I will start the proposition, if I have got ten dollars, by putting it down at once, because I believe this Congress has got to have the sinews of war if you are going to succeed. We can't do that except we have the proper membership.

My friends, while I am on my feet I want to commend you for this effort. I am a believer in the mixing of men together. We, the people of this grand land should love each other better and treat our fellow men better, and treat and love our country better. This is God's country. This, the American continent, is the grandest spot in the world. No more honest, no truer men can be found on the face of this footstool of Almighty God than are found in these mountain regions, delving in the hills, delving upon the farms, laying the foundations of that prosperity that means a race that every man should be proud to be a member of. And I trust that this farming community that is here today, coming from various sections of our land, will regard this as one of the sections that shall develop men in whose lives will be found the best elements that can be found in the race in all the world. (Applause.) We stand off in the distance and are afraid of each other. Some men turn away from me in horror because I am a Mormon. Some men turn away from another man because he is a Catholic, and another makes faces because a man is a Jew, or a Frenchman, or an Irishman, and we have our doubts, but when we come up face to face with each other, the American, the Englishman, the Jew and the Spaniard, and every other class of man, when we come to know each other, and work with each other, our manhood is sharpened, and we see in the race all the elements that make a man. I trust this body of men will work to that end—farmers all; yes, fruit-raisers all; yes, stock raisers all; yes, and all of the business elements that are worth loving, and that other men will love—that the spirit of the statesman shall be in the heart of every man who enters into this audience, that formulates laws for this body of men, that their children and children's children shall love this land and see that every man has his just share of the credit by the people of his own belief as well as every other man.

I did not realize or think of making a speech to you on this occasion, but we want your money, friends, (laughter) we want your money.

I don't believe the grangers are small fellows. My friend Grace gave you some ideas worthy of your consideration. These big fellows that can manage ten thousand acres can take care of themselves. But our small fellows, taking care of 160 acres, we must do the best we can to help make that farm so useful that the man who has charge of it will be counted among the Cincinnatuses and Washingtons of our country. We have been called from our farms to save our country, and we will

help save our country in the stability of the homes that we build, in the patriotism of the men, women and children who grow upon them, and in the development of every interest, for the development of every interest means the betterment of the race, and at your doors, my friends, lies the possibilities of the government in which we live, and its perpetuation—not in the world of the unsettled elements, nor in the world of men who earn their wage per day, but the man who has his farm and spends his time upon it, and works upon it, who loves his country, loves his religion and stands by it, loves his God, loves everything that is good among his kind, and does the best he can in the world for them.

Friends, I thank you. Mr. Chairman, I thank you. And so come forward. Let every man do his part, that this may be a success, and may extend and spread its mission till every arid acre of land in the republic shall be brought to use, and men to live on it who love their homes, love their country and love their God. (Applause.)

MR. W. S. PERSHING, of Colorado: It cost me over twenty dollars to get out here, but that little speech is worth that, and I will put up ten dollars with him today.

CHAIRMAN BURRELL: The Secretary will read some telegrams he has here.

SECRETARY ROOT: "Hon. Fisher Harris, President Dry Farming Congress, Salt Lake. Hearty greetings and cordial invitation to all to attend Sixteenth session Irrigation Congress and Interstate Exposition at Albuquerque, September 29th. Frank C. Goudy, President, Denver, Colorado."

"Bisbee, Arizona, January 24, 1908.

"Mayor and Board of Trade of Bisbee will lend hearty support to movement to have next Congress in Douglas.

"C. H. CAVENA, Mayor,

"C. E. BUXTON, President Board of Trade."

"Cheyenne, Wyoming, January 24, 1908.

"Harry B. Henderson, Salt Lake City.

"Your telegram notifying me of my election as President of the Trans-Missouri Dry Farming Congress for ensuing year received. Please convey to the Congress my sincere appreciation of the honor conferred and my hearty congratulations upon splendid results already achieved in this great work, and my pledges of hearty co-operation for greater things.

"B. B. BROOKS."

"Douglas, Arizona, January 24, 1908.

"G. J. McCabe, care Fisher Harris, Salt Lake.

"The people of Douglas wish you to extend the Congress cordial invitation to convene in Douglas next year and accept our hospitality. Citizens will do everything in their power to make Congress a success.

"THE BANK OF DOUGLAS,  
 "F. B. DORR, Editor Dispatch,  
 "GEO. H. KELLY, Editor International,  
 "SCOTT & THORTON,  
 "S. F. M'GUIRE,  
 "L. C. HANKS."

SECRETARY ROOT: Another from Douglas. They are doing business.

"Douglas, January 24, 1908.

"J. G. McCabe, care Dry Farming Congress, Salt Lake.

"The business men of Douglas extend a cordial invitation to the Dry Farming Congress to meet at this point next year. Please use best efforts in that direction. FIRST NATIONAL BANK OF DOUGLAS."

CHAIRMAN BURRELL: The Chair will state that the telegrams referring to the place for holding the next Congress will be referred to the Executive Committee, where all these communications have heretofore been referred.

What is the further pleasure of the Congress?

The chair will state that there are to be stereopticon views this evening in one of the addresses to illustrate the address and make it more impressive.

A motion to adjourn is in order.

MR. HERRINGTON, of Utah: I would like to hear when the question of the next meeting place will be taken up and decided.

CHAIRMAN BURRELL: That rests entirely with the Executive Committee. It is thought, however, it will be brought forward tomorrow afternoon.

On motion the Congress adjourned until eight o'clock this evening.

### EVENING SESSION.

The Congress was called to order at eight o'clock p. m. by Chairman Burrell.

CHAIRMAN BURRELL: The first number on the program this evening is "The Prickly Pear as a Dry Land Crop," by David Griffiths, of Washington. This paper will be read by Prof. Karl F. Kellerman, of Washington. Prof. Kellerman, ladies and gentlemen. (Applause.)

PROF. KARL F. KELLERMAN, Washington, D. C.: Ladies and Gentlemen: Before I begin reading this paper which Prof. Griffiths has sent to this meeting, I wish to explain that this is not the paper that



Prof. Griffiths would himself have given to you. He had a paper that was very carefully prepared and illustrated by many stereopticon views. On account of the serious illness of his wife at the last moment he was unable to attend, and therefore had to re-write this short outline of his paper which I shall read to you.

### PRICKLY PEAR AS A DRY LAND CROP.

(David Griffiths.)

The vigorous prosecution of the prickly pear question was not begun by the Department of Agriculture until about four years ago. Since that time investigations have been organized in several of the southwestern states, but the major portion of the work up to date has been conducted in the pear region at San Antonio, Texas. What I shall say to you today, therefore, will relate to those experiments, and has application to that stretch of territory extending from the gulf to Del Rio and from Austin to Brownsville, comprising fifty to seventy-five thousand square miles. The application to other regions will not be made by me at this time. It is necessary, first, to secure more data on these regions before we can speak positively of the value of this crop in other sections.

The people of Texas have known for fifty years how to utilize the native crop of prickly pear, which is very prolific in many sections, but it was necessary, when our investigations were begun, to determine, first, the value of the plant as food for stock from a scientific standpoint by chemical and digestion tests, as well as by actual feeding under controlled conditions. Second, it was most essential to determine the rate of growth of the plant, both under natural conditions and under cultivation.

The first investigations were conducted with a native crop three years ago. A carload of steers were fed under controlled conditions for the Department by Mr. T. A. Coleman at Encinal. Without going into the details, let it suffice for me to say that prickly pear was fed as a roughage (as it should always be fed) with cotton seed meal. The experiment justified such practices by ranchers of the section inasmuch as the increase in weight of animals costs only 3 1-2 cents per pound.

In a similar experiment at San Antonio with milk cows prickly pear as a roughage was alternated with sorghum hay in conjunction with a constant concentrate ration consisting of cotton seed meal and rice bran. Here we found that all the cows would eat of prickly pear produced a little better results than all they would eat of sorghum hay. Here 1 1-3 pounds of butter was made at a cost of 13 1-2 cents per day.

These experiments show conclusively that the prickly pear can be used in that region profitably in beef and butter production.

In the early history of pear feeding, which dates back to the Civil war, the plants were prepared for food by being singed with brush. This practice is still in vogue with many small ranchers, and the same custom prevails among the few people who feed cane cactus in south-

eastern Colorado. Early in the 80's a machine was invented by a Dr. Caruthers for chopping the pear so that it could be fed without injury. The original machine has subsequently been improved so that it is claimed now by the manufacturers, and also by the feeders, that eight men and four teams, with pear handy, can feed 1,500 head of cattle. The most useful pear machine, however, is the gasoline torch, which is a modified plumber's torch. By the use of this instrument one man can feed 400 cattle without difficulty. This is used simply to singe off the thorns, which burn very readily. The plants are singed where they grow and the cattle are then turned on to graze them without farther preparation or handling.

The next line of investigation demanded appeared to us to be upon the rate of growth of the plant. A peculiar condition exists in portions of southern Texas. Prickly pear originally grew abundantly in the vicinity of San Antonio and some of the other larger towns, but now there is practically none of it to be found. Dairymen have all but exterminated the plant in their search for winter succulence. It is in the vicinity of these towns that the demand exists now for such a feed. Experiments were, therefore, started in San Antonio.

Three years' growth has now been secured upon the experimental plantation at San Antonio. This is the first instance, in this country at least, where this plant has been grown under field conditions. Our practice has been to thoroughly prepare the ground and lay it off in six-foot rows. Stock for planting is secured from the surrounding pastures. The plants are cut up into single joints, and these joints, handled with a fork, are distributed about two feet apart in the rows. The cuttings are really not planted at all; they are simply laid upon the ground. They make really better plants in this way than when planted on edge. This method of planting can be pursued at any time of the year when the ground is moist. It is not prudent to plant in July or August, but at any other season the plants will grow readily. When the ground is dry, however, it is best to lay the field out in rows with a plow and partially cover the cutting in the furrow. This can be done by another furrow or by the use of a sulky cultivator.

The yield of prickly pear per acre is, of course, fundamental in all of these investigations. Its value depends upon the quantity of feed which it will produce under existing conditions. Thus far we have secured three years' growth. One of these seasons was very dry, the other exceptionally wet, and the second about an average season. We estimate, therefore, that the average growth for these three years will probably represent, quite closely, the average for a longer period. We believe now that it will be most advantageous to harvest this crop not more often than on alternate years. However, it will do no harm to allow the crop to stand three or four years longer before harvesting it. It will produce a large enough crop, however, to be harvested at eighteen to twenty-four months after planting. During the past three years an average annual growth of twenty-three tons per acre has been secured.

In the experiments mentioned above conducted at Encinal, we found that steers being fed for the market consumed about 75 pounds of pear per day. The milk cows at San Antonio consumed about 140 pounds. The average consumption would therefore probably be in the neighborhood of 100 pounds. These figures, taken in connection with the yield which we have secured during the past three years, would indicate that roughage for about 1 1-4 cows can be grown upon one acre of ground. In order to be conservative, suppose we estimate it at one cow per acre, which seems, from the returns, to be perfectly safe. Even this is better than is done with hay in the majority of the strictly agricultural sections of the United States, and this crop, you must remember, was grown under conditions where sorghum produced from one to two and a half tons of silage per acre per annum.

The crop is easily handled, is drouth-resistant and yields heavily. It does not seem clear how it can fail to become an important adjunct of the beef and butter production of southern Texas.

PROF. KELLERMAN: This is the end of the outline of the paper which Dr. Griffiths has prepared.

You are not going to get off quite so easily, however. I want to give you a little talk of my own on "Soil Bacteriology and Crop Production."

You have heard a great many of the speakers here refer to the necessity of knowing something of the bacteria in the soil, and speaking of the bacteriologist as the one to whom they look for explanations of many things in crop production.

There have been no explanations of any sort of just what the bacteriologist should do, or just what bacteria in the soil were supposed to do. I propose therefore, very briefly, to give you an outline of something of the work which we have been planning to do, and very briefly—more briefly still—a sketch of one or two of the things that soil bacteria do when they are in their best conditions.

It is rather a large subject—the relation of soil bacteriology to crop production—for me to try to cover thoroughly. I cannot give you any details. This will all be a general statement. Therefore, there will be exceptions. If any of you do notice that I say anything you have seen stated otherwise in print that will be the explanation for it. I am going to use a broad brush here and leave out all little details.

In the first place the various relations of bacteria—. Or, rather, I should begin, I suppose, with the moisture in the soil for its growth. You have heard a great deal about its growth. It is something that bacteria—which also are plants—require for their growth. Therefore you cannot have bacteria in soil with good conditions unless there is sufficient moisture there for them to grow. As to the number of bacteria in the soil, there are several millions in a teaspoonful of soil. That seems like a fabulous number, but they are there. We can count them by using special methods. I think you can appreciate when you have as many living things in the soil as that, they must perform very decided functions.

We assume, therefore, that unless bacteria and the proper kind of bacteria are present in the soil that it is not going to be a productive soil. In the east—to a less extent here—but in the east, where the soil is of comparatively a thin layer, we can take a deep subsoil, top it up with organic matter, and have the same organic elements present that would be present in the fertile soil. There are very few bacteria in the lower soil, however, and until bacteria assemble that soil remains a poor soil. That will show you some of the necessity for having bacteria in large numbers present. Then, as I said, this bacteria ought to be there in certain definite kinds. There is one point which has been investigated perhaps more than any of the others, and as that one point is of greatest interest to anyone who is growing crops, that is the one to which I shall confine myself. That is the question of nitrogen in the soil, and the relation that bacteria play to this nitrogen. The nitrogen cycle is something like this: The seed sprouts, or, of course, many seeds; the crop sprouts and begins to grow, and as it begins to form complex compounds especially such compounds as the protein of wheat, nitrogen must be used. This nitrogen can be used only when it is in the form of nitrates. The plant grows, matures, is harvested, and the stubble is turned under. At least we will suppose it is turned under for purposes of illutsartion here. That decays. That decay is brought about by bacteria. These highly organized compounds—for there are protein contents even in wheat stems—will be changed into simple compounds, and by different bacteria, through different grades of decomposition until ammonia and nitrates finally result again, and then the material is again in shape so that it is available for subsequent plants. That will show you, in a skeleton way, what nitrogen does in the soil.

Now all bacteria don't change these compounds back into nitrates. Some bacteria—and these are the undesirable ones—will change nitrates back into compounds, which plants cannot use. You can appreciate what would happen to a field if you got the wrong kind of bacteria growing in large numbers; you would destroy its fertility. This will happen when the conditions for the favorable bacteria are wanting, and when the conditions which are favorable only to the undesirable bacteria are brought about. This may be by bad cultural conditions, insufficient air supply, and sometimes—I don't suppose, however, you will be troubled here with that, although you may be by over irrigation—by having too much moisture. That, really, would be about the same thing as not having sufficient air supply. If you have too much moisture on your land of course there will be water in places where the air might be, down in the soil.

Yesterday, in Prof. Scofield's paper, you will remember he spoke about the necessity or desirability of cultivating at different depths in order to break up the hard-pan which might form a few inches below the surface, and spoke briefly there of the necessity of getting air into the lower layers on account of aiding nitrofication in the soil. This is the explanation for that.

I am going to give you briefly a little experiment carried on by a greenhouse, showing about what happened. Of course in the greenhouse we exaggerate conditions; you get conditions there that you will not get in the field. They are much more extreme than conditions in the field, but they will show a point, I think, more clearly than reference to a field condition. We packed the soil in a number of paraffined wire baskets, so that it was impossible to get any air supply except from the surface; and after one or two crops of clover had been grown on that soil clover refused to grow, and we could not get it to grow, no matter how many times we planted it. Then if we examine that soil we find that the bacterial contents of the soil has changed. The bacteria now, instead of being as they were in the soil originally, largely of the nitrific type, or the ones that change the materials into food which the plant can use to denitrific bacteria, which change the foods into things the plant cannot use. Then if we take this bad soil, as it now is, and dry it, pulverize it, stir it up, several ways we can manipulate it to change the conditions to some extent, let that stand a while to let the desired bacteria begin growing again, then we can grow clover in that soil again. This will show you, and in a very exaggerated way, what may happen if you get the wrong kind of cultural conditions in a field. I don't say we can tell you every time. No bacteriologist could go into a field at this stage of the investigations and say when conditions were favorable and when they were not. But we are gradually working towards that end.

There is another experiment that I want to give you very briefly that will show you a different kind of condition.

Ground that was to be planted to alfalfa was seeded on one-half of a field with seed inoculated with a pure culture of nitrific organism. You must have a nodule-forming organism in the soil before alfalfa will grow, or before it will grow and produce a satisfactory crop. On the half that was not inoculated with the pure culture we used soil from an old and productive alfalfa field. I should explain that this soil we are experimenting on is soil thoroughly cleared, and has been burned over. It was scrub oak soil. When this alfalfa crop grew, only half of it grew—the half that had been inoculated with soil. On examining bacteriologically the samples of the soil from the two halves of that field we found that the soil that had been inoculated with the old field soil had all the proper bacteria present, or, at least, judging from our present study of the bacteriological investigations, a great many at least of the necessary bacteria were present. The other half of the field showed a great many bacteria of the undesirable type, and none of the type that finally changes things into the plant food that is necessary. Evidently the bacteria that were necessary in this case had been brought in with that old soil from the old field.

This is not a case, however, of nodule formation. Sometimes in a field nodule-forming bacteria are lacking, as I told you a moment ago, but nodule-forming bacteria were present in both halves of this field, and it was merely the lack of that special type of organism, at least that seems

to be the only explanation for this great difference in fertility. By subsequent re-inoculation of the second half of the field with soil from the old field again, the second half was made a productive field.

Now, from what Dr. Widtsoe told me the other day, I think you have some of the conditions of that sort in some of the lines here. Generally speaking, however, I don't think that the introduction of special bacteria is the point to strive for, as we have decided from a few experiments to strive mainly for the best conditions where the desirable bacteria are present. In most soils the bacteria that you want are there, if you give them the proper show.

I have spoken of the nodule-forming bacteria. I just want, by way of parenthesis—I am not going to discuss that here tonight—that is a subject very distinct from soil bacteria proper—but I want to say that if any of you are interested in that there is a little bulletin issued by the Department recently I think will cover all of the questions you may want to ask about that, giving some plans that people have used in inoculation of the legumes. Inoculation is not the panacea for the troubles of growing legumes; it is merely one of the elements in growing them.

These examples, I think, will show you the necessity for keeping bacteria of a desirable type in soils, to show you just what the bacteriologist hopes to find out, what he may be able to do for farmers in the dry land region and in other regions.

I think I will confine myself to a little thing I have written out. If I keep talking as long as I wish to I don't know when I will be able to stop talking to you.

The soil bacteriologist must learn to recognize the unfertile conditions caused by undesirable bacterial growth, such as is represented by the portions of soil in which red clover was grown. You may have seen similar results in fields manured too heavily. The bacteriologist must point out what changes must be brought about to re-establish the normal bacteriological flora. The manner of making these changes can then be investigated in co-operation with the chemist, physicist, or agronomist. For his second duty the soil bacteriologist must determine if certain types of bacteria which could be of benefit in the soil are lacking, and where this is the case he must discover how the desired bacteria may be introduced. In the example quoted a moment ago the introduction of desirable bacteria was brought about by bringing in soil from a productive field. This, of course, is subject to the same mechanical difficulties and dangers attendant upon the inoculation of legumes by the use of old soil, and, of course, it would be much more convenient, as well as much safer, to depend upon the use of pure cultures for these special types of soil bacteria where their introduction is necessary to enhance the fertility of a soil for any given crop, just as we now depend, to a large extent, at least, upon the use of the pure cultures of nodal-forming bacteria to increase the productivity of legumes.

Here I want to interrupt myself to say wherever we can get conditions sufficiently known so that we can scientifically, in the laboratory,

improve conditions in the field, that we are in a fair way to handle and consider conditions which, were we in the field, and able to consider conditions in the field alone, might seem unintelligible.

I have used advisedly the words fertility in regard to a certain crop, for it is necessary to consider the fertility of a field as entirely relative. A field may be highly productive in respect to a certain crop, such as clover, but have a very low productivity for another crop, such as potatoes. In other words, the fertility of this field would be high with respect to clover and low with respect to potatoes. There is, therefore, a third possibility open to the soil bacteriologist; it is possible, even probable, that the conditions of optimum fertility for any crop is paralleled by a certain definite balance among the types of bacteria in the soil. To be able to recognize these different associations would make it possible for a man in the laboratory after a short laboratory examination and test to tell exactly what could be grown to the best advantage and what crops could not succeed, or to determine what method of cultivation must be used successfully to produce a given crop. This must necessarily be done in co-operation with the agronomist, provided it can be done at all, as it may sound visionary. We have found a curious parallel, however, in the sensitiveness of the nodule-forming bacteria of any species of legumes and the legume itself. For instance, in fields where clover would grow but poorly even after it had been inoculated, we have found that the extract of the soil moisture of that soil was injurious to the bacteria of the red clover, and conversely, in soil where red clover grew very well after it had been inoculated in that soil solution, the bacteria of the soil would grow very well. In this way, in a great many instances, we have been able to foretell results and to predict failures, and in a few instances have been able to outline methods of soil handling to make a crop a success.

This will give you some idea of that branch of science which has most recently come to the aid of the agronomist. The field is a big one, and the problems are very complex. Our progress, therefore, will probably be slow and tedious but I think it will be sure. To briefly recapitulate, there are certain hypotheses I wish to impress upon you.

1. Soils cannot be productive unless they support a well-balanced bacteria flora.

2. The proper balance of the bacterial flora of a once fertile field may be destroyed and the productivity of the field destroyed until the normal balance is re-established.

3. A field may never be properly fertile, due to the lack of a certain type of bacteria, until this special type is introduced into the soil.

Now I am not urging that every farmer should become a bacteriologist. This is merely a question of finding out more or different conditions. What we are after is an explanation of why some of these things happen that now seem unexplainable. After we find why they happen, whether bacteriologically or for any other reason, on a great number of different kinds of soils, then we will probably be able to formulate a

definite scheme for different kinds of soils; to vary the different kinds of soils, so that each kind will be successful.

So much is definite; and beginnings of more or less importance have been made under each head. Here are two possibilities of the future: The soil bacteriologist may learn to diagnose a soil sample and from his examination and laboratory tests determine whether a given crop would succeed or fail, or he may learn from his laboratory examination how a soil must be handled to keep it at its maximum point of crop production, not only for a few years but indefinitely.

As you have probably noted, I have discussed soil bacteriology as if it were the only essential for understanding and controlling crop production. I have purposely neglected such sciences as plant breeding, chemistry, and physics because all of you know that they are necessities to progressive agriculture. Soil bacteriology, on the other hand, is a new science in this country and my aim has been merely to show you something of its importance. I thank you for your attention. (Applause.)

CHAIRMAN BURRELL: I think the dry farmers will now understand why we should not eat dirt. (Laughter.)

Dr. Hyatt, Director of the United States Weather Bureau of this city, has prepared a paper which will go into the record, without exception.

#### PRECIPITATION DATA FOR WESTERN STATES.

(R. J. Hyatt, Section Director United States Weather Bureau,  
Salt Lake City, Utah.)

Mr. Chairman, Ladies and Gentlemen: The subject assigned to me calls for statistics of the precipitation in the Western states, and though it may appear rather dry data to many of the audience, it is a matter of considerable importance to the farmers located in the states engaged in dry farming, emigrants and other interested parties, to know something about the normal annual precipitation of each state. I have, therefore, collected the precipitation data for 16 of the Western states in which arid or dry farming is practised to a great extent. These data I will be unable to give in detail in the limited time allowed me this evening. I would be pleased, however, to have any of the members of the Dry Farming Congress or others interested in the matter, call at the local office of the United States Weather Bureau of the Department of Agriculture, in this city on the sixth floor of the Dooly block, for any further information desired on the subject. I will endeavor to state briefly the normal annual amounts of precipitation, and the highest and lowest average amounts at any station in Washington, Oregon, California, Idaho, Nevada, Utah, Arizona, Montana, Wyoming, Colorado, New Mexico, North Dakota, South Dakota, Nebraska, Kansas and Oklahoma.

The state of Washington in the Climatological Section Report of the United States Weather Bureau is divided into Western and Eastern divisions. The average normal annual precipitation for the entire state is 39.23 inches. The average annual precipitation for the western portion



ranges from 21.16 inches to 131.01 inches. The larger amount being along the immediate Pacific coast, and the smaller farther inland. The Eastern division of Washington varies in average annual precipitation from 6.63 inches to 28.73 inches. The greatest portion of the precipitation of the Pacific states occurs west of the mountains, which condense the moisture in the winds passing over them, accompanying the storms in their eastward passage. The greatest amount of precipitation occurs from the fall to spring, and the least amount during the summer, no precipitation occurring during some months of the year.

Oregon.—The state of Oregon is also divided into Western and Eastern divisions, showing wide variations in annual average precipitation. The annual normal precipitation for the state is 37.93 inches. The largest amount of average annual precipitation for the western portion of Oregon at any station is 133.72 inches, and the least average amount is 19.19 inches. For the eastern division the largest amount of average annual precipitation is 79.42 inches and the smallest is 8.63 inches.

California.—The normal annual precipitation is 26.15 inches. The average annual precipitation for the state of California varies from 78.08 inches to 1.79 inches. During several months of the year no precipitation occurs at many stations in this state.

Idaho.—The normal annual precipitation for the state of Idaho is 17.44 inches. The greatest average annual precipitation in the northern section is 38.55 inches, and the least is 13.90 inches. The largest average annual precipitation for the central section is 23.36 inches, and the smallest is 14.23 inches. For the southern section the greatest amount of annual average precipitation is 15.07 inches, and the least is 6.35 inches.

Nevada.—The normal annual precipitation for the state of Nevada is 10.10 inches. The largest amount of average annual precipitation is 24.90 inches, and the smallest is 5.26 inches.

Utah.—The normal annual precipitation for the state of Utah is 12.29 inches. The greatest annual average precipitation for the northern portion is 19.04 inches and the least is 5.97 inches. The largest annual average for the middle section is 15.31 inches and the least is 4.13 inches. For the southern section the largest amount of average precipitation is 20.70 inches, and the smallest is 5.18 inches.

Arizona.—The normal annual precipitation for Arizona is 11.82 inches. The largest average annual amount for the northern portion is 24.99 inches, and the least is 6.01 inches. The largest amount for the southern division is 23.60 inches and the smallest is 5.99 inches. For the western portion the greatest annual average is 7.38 inches, and the least is 2.60 inches.

Montana.—The annual normal precipitation for the state of Montana is 15.34 inches. The largest average for the eastern portion is 18.75 inches, and the smallest is 12.80 inches. For the western division of the state the largest annual average is 22.63 inches, and the least is 12.56 inches.

Wyoming.—The normal annual precipitation for the state of Wyoming is 14.31 inches. The greatest amount of average annual precipitation for the state is 18.68 inches, and the least is 10.04 inches.

Colorado.—The normal annual precipitation for the state of Colorado is 16.42 inches. The largest average annual precipitation for any station is 25.59 inches, and the smallest is 6.43 inches.

New Mexico.—The normal annual precipitation for New Mexico is 13.45 inches. The largest amount of average annual precipitation for any station is 18.79 inches, and the smallest is 3.91 inches.

North Dakota.—The normal annual precipitation for North Dakota is 17.79 inches. The greatest annual average amount for any station is 20.68 inches, and the least is 13.28 inches.

South Dakota.—The normal annual precipitation for South Dakota is 21.45 inches. The highest annual average for any station is 28.98 inches, and the smallest is 13.54 inches.

Nebraska.—The normal annual precipitation for the state of Nebraska is 24.42 inches. The greatest annual average precipitation for any station is 36.04 inches, and the least is 14.32 inches.

Kansas.—The annual normal precipitation for Kansas is 27.77 inches. The highest annual average precipitation for any station is 44.54 inches, and the lowest is 15.40 inches.

Oklahoma.—The annual normal precipitation for Oklahoma is 31.83 inches. The largest annual average for any station is 42.37 inches, and the smallest is 19.37 inches.

The variation from the normal annual precipitation for any state or locality is considerable. For the states and territories named the excess and deficiency range as follows, for the years 1901 to 1906, inclusive:

Washington, excess 3.52 inches, deficiency 7.66 inches.

Oregon, excess 6.91 inches, deficiency 12.22 inches.

California, excess 12.55 inches, deficiency 4.03 inches.

Idaho, excess 3.25 inches, deficiency 2.74 inches.

Nevada, excess 5.75 inches, deficiency 2.76 inches.

Utah, excess 7.30 inches, deficiency 1.63 inches.

Arizona, excess 14.85 inches, deficiency 2.00 inches.

Montana, excess 3.13 inches, deficiency 3.07 inches.

Wyoming, excess 3.51 inches, deficiency 2.85 inches.

Colorado, excess 3.29 inches, deficiency 1.83 inches.

New Mexico, excess 7.50 inches, deficiency 3.48 inches.

North Dakota, excess 2.74 inches, deficiency 0.91 inches.

South Dakota, excess 6.50 inches, deficiency 2.00 inches.

Nebraska, excess 8.04 inches, deficiency 0.46 inches.

Kansas, excess 7.73 inches, deficiency 3.98 inches.

Oklahoma, excess 8.71 inches, deficiency 8.17 inches.

These data show, in my opinion, that good crops can be raised with the proper cultivation, on most of the land in the states and territories

named, with the normal amount of natural precipitation, which occurs in the most favorable seasons for crops, during the fall, winter and spring months. With the new methods of arid farming for the conservation of the natural precipitation in the soil there is no doubt that the desert will some day be made to bloom and blossom like the rose.

CHAIRMAN BURRELL: We have with us this evening a personal representative from the head of the Department of the Weather Bureau Service, Dr. O. W. Roberts, of North Dakota, who will address us on the line of his work. The Doctor will come forward.

Dr. Roberts, ladies and gentlemen. (Applause.)

DR. ORRIS W. ROBERTS, North Dakota: Ladies and Gentlemen: Dr. Hyatt, who represents the local bureau here, was incapacitated tonight to read his paper, therefore it will be copied in the minutes of this Congress, and he extends a cordial invitation to each and every member of this Congress to visit the local office of the United States Weather Bureau, on the sixth floor of the Dooly Block. There you may ascertain any data in regard to rainfall, temperature, etc., of your various states, and also secure literature on that subject. Also he will demonstrate to you how the various forecasts are made and such matters as that. I regret very much that Mr. Hyatt cannot be here to invite you personally, but he extends the heartiest kind of an invitation to each and all of you to visit the weather bureau in the Dooly Block.

The presiding officer has called upon me for a few remarks, and as I came in the dual capacity of representing the United States Weather Bureau and the state of North Dakota, he has not limited me to any particular topic. I will, therefore, state as briefly as possible the relations between the work of the Weather Bureau and dry farming, and also outline the farming conditions in North Dakota.

Requests are very frequently received by the various directors of the climatological service of the Weather Bureau relative to crop conditions in their respective sections. For the benefit of the members of this Congress I will state that previous to January 1, 1906, weekly during the crop growing season, and monthly thereafter, reports of climate and crop conditions were received throughout the various states and territories, and these reports embodied in printed reports. Since the date mentioned, crop conditions have been eliminated and our entire attention devoted to climatic conditions.

In this connection I will state that the crop conditions are entirely in the Bureau of Statistics. The United States Weather Bureau makes no reference at all to crops in their respective publications. That is done for the purpose of not repeating, or, in other words, duplicating these statistics.

In the accomplishment of reforms a receptive mood in those affected is often the keynote of success. So long as the farmer reaps fair rewards for his labor he is not apt to realize the necessity for improved methods, but after he has robbed his soil of much of its fertility and reduced yields are experienced, he is then prepared to avail himself of them. Abnormal

climatic conditions also have their influence in turning his attention to better methods of soil culture.

You must not think that because we have not sent a large delegation from the state of North Dakota, we are not interested, for the subjects to be discussed by this Congress are of vital importance to us. The subject of improving the present methods of farming was forced upon our attention the past season by the deficiency in last year's precipitation as compared with the normal. I do not intend to convey the impression that we had a crop failure in North Dakota, for with the increased prices received, the net returns were greater than during previous years. But the farmers realize that with improved methods greater yields would have been obtained and their earnings correspondingly increased. They are, therefore, awaiting the report of this Congress prepared to utilize the results of its deliberations.

For some classes of farming in North Dakota the average annual precipitation, even though two-thirds of it occurs during the crop growing season (May to September inclusive), is not sufficient, unless more effective methods are used than at present obtain. The object of this Congress should be to place before the farmer of the semi-arid region such methods as will enable him to receive the maximum returns for his labor and materials. In this connection four great essential items are to be considered:

1. The fertility of the soil.
2. Climatic conditions.
3. Productions, and
4. Commercial advantages.

Throughout the greater part of this region the soil is fertile and commercial advantages are at hand, but the greatest productions can only be obtained when every possible advantage is taken of the climatic conditions. Thus the conservation of soil fertility, under which are embraced moisture and efficiency, is really the deciding factor in the success or failure of the farmers of this great area.

There are many matters relating to this subject upon which the average farmer will not take the time or trouble to inform himself. But the words "Surface cultivation" have a familiar sound to him, and when the functions of the dust blanket or dry mulch are explained, he readily grasps the idea. As I stated before, in order to reach him we must first have him in a receptive mood, then we must speak or write our ideas in language that he can understand. Bacteria or germs in the soil, which according to Prof. Beckwith of the North Dakota Agricultural College, were found in the almost incredible number of three hundred millions (300,000,000) per ounce in soil in the vicinity of the college, is a subject that is not so easily understood. But we can outline to the farmer the methods whereby these germs may be made to multiply or decrease as the needs may require, and how, by the use of fertilizers, such as lime, potash, phosphoric acid, etc., the best possible returns can be made, without the necessity of thoroughly understanding the chemical changes that must take place

in the soil in order to obtain the increased production. In other words, what we must do to obtain the best results is to outline in the simplest "a-b-c" language the most improved methods, and there is no doubt in my mind but that within a few years we will begin to receive large returns for our labors.

My interest in this subject dates back to 1884, at which time I was engaged in farming with my father in Iowa. I remember the season opened with but comparatively little moisture in the soil, and in order to conserve the moisture present, my father kept the harrow going until the corn was six inches high, or long after the usual time for cultivating with the plow. When we did begin plowing, we used very shallow shovels, made by a local blacksmith after my father's ideas. Our crop that year, as compared with those of our neighbors, is a matter of neighborhood history. My later years on the farm also taught me the necessity of other soil essentials, crop rotation and seed selection, all of which are factors in successful diversified farming.

I will not try to enter into a scientific discussion of the subject. That, by right, belongs to the experts in the Department of Agriculture, the directors of the various experiment stations, and others making research observations along those lines. My province is the accurate recording and tabulating of climatic data, for the benefit of the scientist, the observer, the experimenter and the farmer. I am instructed by the Chief of the United States Weather Bureau to inform you that no task that you may ask of us will be considered too great, for any subject, even though remotely allied to climatic conditions, has our most intense interest.

CHAIRMAN BURRELL: The next number will be "Climatic Conditions and Soil Moisture Conditions in the Great Plains Area," by Dr. L. J. Briggs, of Washington, D. C. I take pleasure in introducing Dr. Briggs. (Applause.)

## CLIMATIC AND SOIL MOISTURE CONDITIONS IN THE GREAT PLAINS AREA.

(Dr. L. J. Briggs, Washington, D. C.)

Ladies and Gentlemen: I shall break my talk tonight into two portions, one of which will outline to you briefly the ideas which we are trying to get at in connection with the investigation of the physical conditions of soil and climate in connection with crop production; the other will give you some of the results which we have obtained during the past year in connection with experimental farms being conducted under Prof. Chilcott's direction, in co-operation with the State Experiment Station in the Great Plains Area.

The Great Plains Area may be defined as that region lying on the east side of the Rocky Mountains below the 5,000-foot contour and extending eastward to the ninety-eighth meridian. This is essentially a region of dry farming. But as you have already seen, from discussions that have taken place during this Congress, it is a system of dry farming entirely different from the conditions here in Utah. It is essentially a region of summer rainfall instead of winter rainfall which you have here. Professor Chilcott has already outlined the work on crop rotation and cultivation methods which is being conducted under his direction in this area by the Department of Agriculture in co-operation with the Experiment Stations of the several states lying within this area.

The study of crop yields in relation to different systems of tillage does not alone furnish the information necessary to enable us to make substantial advances in dry farming. We must know in addition the exact conditions under which a given crop is produced. We must also know the yield of the other crops of the same grain produced under other known conditions. By comparing the yields and the conditions under which the different crops were produced, we can in some cases determine the factor or factors which were instrumental in giving a good yield or a poor yield of grain in any particular case.

Let us suppose now that we have found one factor which is largely instrumental in determining the yield of the crop. This factor may or may not be under our control. Let us assume that it is a controllable factor. To take a concrete case, suppose the humus content of the soil is the factor under consideration. If the humus content of the soil in a particular instance is sufficient to give maximum yields, we endeavor simply to maintain that favorable condition. If in another instance the humus content is so low as to give poor yields, we try to remedy the difficulty by the use of soiling crops, and so increase the humus content of the soil to the required amount. This illustrates the method of procedure with controllable factors. The main point however must again be emphasized. Working in this way we are no longer groping blindly in the

growing of crops, but with the knowledge of the conditions which determine maximum yields at our command, we proceed logically and intelligently to the production and maintenance of satisfactory yields.

In the case of uncontrollable factors, a knowledge of the influence of each factor is of no less importance. With this knowledge we are in a position to obtain an intelligent view of the situation, to make the most of existing conditions. We know what the conditions have been in the past. According to the thoroughness with which we know of these past conditions, we are able to forecast with intelligence what we may reasonably expect in the future. We are in a position, not to guess blindly, but to make a reasonable estimate based upon facts, regarding our chances of success—how many seasons out of ten we may expect profitable returns.

The writer is in charge of the investigation of the influence of physical conditions on crop yields in these experimental farms in the Great Plains. This includes the influence of climatic factors, such as rainfall, temperature, the dryness of the air, evaporation, etc. It includes also factors peculiar to the soil alone, such as the moisture content of the soil, its porosity, its temperature, its humus content and the nature and amount of the mineral substances in solution in the soil moisture. This part of the work then resolves itself into the answering of the following questions:

1. What are the physical conditions in the Great Plains, and to what extent is crop production in different parts of the area dependent upon the local conditions?

2. How can these conditions be modified so as to insure larger and surer returns?

3. In the case of adverse conditions not under our control, what systems of farming will give the best returns for a long term of years?

The agricultural productivity of any region is primarily determined by climatic and soil conditions. For example, the rainfall may be so scanty or the growing season so short, or the occurrence of frosts so frequent as to make agriculture on a productive soil impracticable. On the other hand, no matter how favorable the climatic conditions, if the soil is so compact as to prevent the free movement of air and water, or if it lacks one or more of the essential elements of plant food, crops cannot be successfully grown.

The climatic factors which are most important in determining crop production are temperature, rainfall, and evaporation. Now I am introducing there a matter which has not been given very much consideration, but one which I think—and I shall try to make you agree with me before I am through—that we must give consideration throughout these investigations in arid farming, namely, the influence of evaporation as it varies from place to place through the Trans-Missouri states. In considering these factors which I mentioned as applied to any given region, we have to consider also the nature of the crops grown. Thus, wheat and oats will stand much lower temperature than corn or the sorghums. On the

other hand, some regions are found in which the temperature is so high wheat does not thrive, although other crops give a maximum production under those conditions. For this reason, the crops must be selected with reference to their adaptation to the range in temperature of any particular region.

In the same way the rainfall of any given region may be sufficient for certain kinds of crops but totally inadequate for crops which have been developed in more humid regions, and require, in consequence, larger amounts of water for their development. Hence, the term "dry land crops," meaning those that have so adapted themselves as to be able to give a fair production with a very moderate rainfall.

I come now to the conditions more closely connected with our work in the Great Plains.

Much has been heard recently regarding the change of climate of the Great Plains, especial emphasis being placed on the increased rainfall. Many of these statements have doubtless been made in good faith based upon the conditions observed in some one locality. If one state has an exceptional rainfall for two years in succession, and a portion of another state has an unusually large precipitation for the two succeeding years, it is easy to see how the report of a changed climate and an increased precipitation may arise without any real foundation in fact for the area as a whole.

Thus we hear of the region where the precipitation has been high. As soon as the precipitation falls in that region they center it at some other region where the precipitation is high.

If I may have the slides now I will show the rainfall in the Great Plains for the past thirty years.

(Here the speaker illustrated his remarks by the use of the stereopticon.)



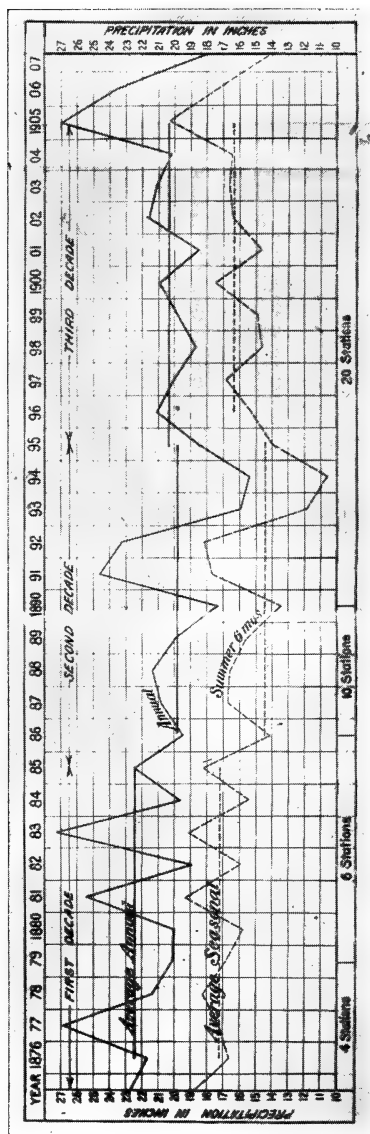


Diagram Showing the Precipitation in the Great Plains for the Past Thirty Years.

This slide shows the precipitation in the Great Plains as a whole for each year since the earliest available records, namely, about 1875. The records obtained in this diagram were compiled by Prof. Chilcott and myself from the records of the Weather Bureau. Now you will notice the first year shown on the diagram is the year 1877 and the last year the year 1907. There are records for two years more which do not appear to come out. The irregular lines, or horizontal lines, show the precipitation in inches, and the curve will show the variation from year to year in the total precipitation in the Great Plains. In the early part of the record we have only four states to go on. Later we had six, and later we had, of course, a great many more records. In the latter part—for the last twenty years—we feel that this record is very representative of the rainfall of the Great Plains, because these stations were so chosen as to be representative, geographically, both east and west and north and south. In other words, if we had a station in the eastern part of the area we had another one in the western part of the area, so that they were equal distance from the center. The station in the south and the station in the north would likewise correspond. The heavy, solid curve represents the annual precipitation for the Great Plains Area as a whole and in 1891 you will see the precipitation was especially high, an average of over 24 inches for the whole area. In 1905, which was a year of excessive rainfall, it averaged, for the Great Plains Area as a whole 27 inches; and in 1906, represented by this point, 23 inches. But for the year 1907 we have for the total precipitation of the area a little less than 18 inches.

Now I would like to call attention to the condition as it exists at the end of 1907. You will notice in running back over this curve there are only three cases, here, here and here, in other words, 1890, 1893 and 1894, where the precipitation is as low as it was during the year 1907. In other words, instead of having an increased rainfall we have arrived at a condition for a low precipitation, which has only been equaled three times in the history of the area. So that our situation at the present time corresponds with the situation here. That is, every year following a heavy precipitation—you see we had heavy precipitation in 1906, very heavy precipitation in 1902, with low precipitation in 1903. So the indications are that next year we will have a heavy rainfall like that, in which case the low rainfall of the past year will not be seriously felt. I mention this point simply for the purpose of showing that there is no foundation in fact for the statement which has been made so frequently and so widely spread, that the climate of the Great Plains, as far as precipitation is concerned, is permanently changed. There is another point from which I think we can get instruction from this diagram. This heavy horizontal line here represents the average precipitation for the first ten years; this horizontal line represents the average precipitation for the second ten years; and this for the third ten years. You will notice, then, if we divide the precipitation into ten-year periods and take the average for the periods that the precipitation during the past ten years, 1895 to 1905, exceeds the precipitation for the previous ten years, which includes the great

drouth of 1903 and 1904, by only half an inch. In other words, the precipitation during the past ten years, which has been the period of increased rainfall, and on which the claim is based, is greater than the precipitation for the preceding ten years, which included that of the drouth, by only one-half an inch.

Now, this lower curve represents the seasonal precipitation; that is, the precipitation for the six months, April to September. Of course, we must follow in a general way the precipitation for the whole year. The difference between the two curves would represent the precipitation falling during the remaining six months of the year, which averages, for the area, about five inches. The summer curve you will see follows that of the winter curve with this rather important exception, that during the summer months—during the time, in other words, when the precipitation is of utmost availability, we did actually get considerably more precipitation during the summer months than in the case of the preceding ten years. This shows the importance of differentiating between the seasonal precipitation and the total precipitation, which is of less value in considerations of this kind.

The next slide will show the conditions at Dodge City, Kansas, in the central part of Kansas, and is shown here for the purpose of illustrating the great fluctuations which occur at any single station. You see how much this goes up and down as compared with the average curve for the whole territory. Of course this shows at Dodge City as in all of the other cases, the great drouth of 1894 and 1895. It must show most of the great differences which are shown in the other curve. It also shows an extremely high precipitation in 1906, whereas the high precipitation for the area was in 1905. What is far more important for the Great Plains than the claim of an increased rainfall, which even if it existed could only be of a temporary character, is the fact that the settlement of the Great Plains from 1895 to 1905 has been made on a practically normal rainfall.

If I may have the first slide again, for a moment, please.

Far better this than an agricultural established during a series of wet years, which with even a normal rainfall would be fraught with adversity.

There is one point in that first slide I would like to call your attention to in this connection, namely, how uniform this line is as compared with that of the preceding year when we had these tremendous fluctuations, far more water than was absolutely necessary for carrying on the agriculture in that locality. Here are the averages of remarkably uniform conditions—remarkably favorable conditions for the agriculture of that region.

Evaporation is a factor of equal importance with precipitation in determining the agricultural productiveness of a region. By the term "evaporation" is meant the number of inches of water which vaporizes or evaporates from a clean water surface in a freely exposed open tank during a given period. Thus the annual evaporation is the total number of inches of water which evaporates during the year, just as the precipita-

tion is measured by the total number of inches of water falling into the tank as rain or snow during the year. Evaporation depends upon the temperature of the evaporating surface, the dryness of the air and upon the velocity of the wind. The hotter the day, the greater the evaporation; the dryer the day the greater the evaporation; the harder the wind blows the greater the evaporation.

The amount of evaporation from an open tank of water thus becomes a measure of the combined action of the different factors which determine the evaporation in that locality. The higher the evaporation from the tank, the greater is the demand made upon the crop and the soil for moisture.

Settlers looking into the possibilities of a new country inquire only regarding the rainfall. The evaporation is not considered. This is doubtless largely due to the unfortunate fact that evaporation data are not yet generally available. Such records would be of great value to the settler. In dry farming the most favorable region, other factors being equal, is obviously the one with the lowest evaporation. The demands upon the moisture in the soil are here the smallest and in times of scanty rainfall the settler has a proportionately better chance to mature a fair crop.

There is an oft-repeated adage that there are only two sure things in this world—death and taxes. To this list we may, however, add a third—evaporation. It is always with us. It is unceasing in its activities, relentless in its watchfulness, ready at any moment to remove the water from unprotected soils.

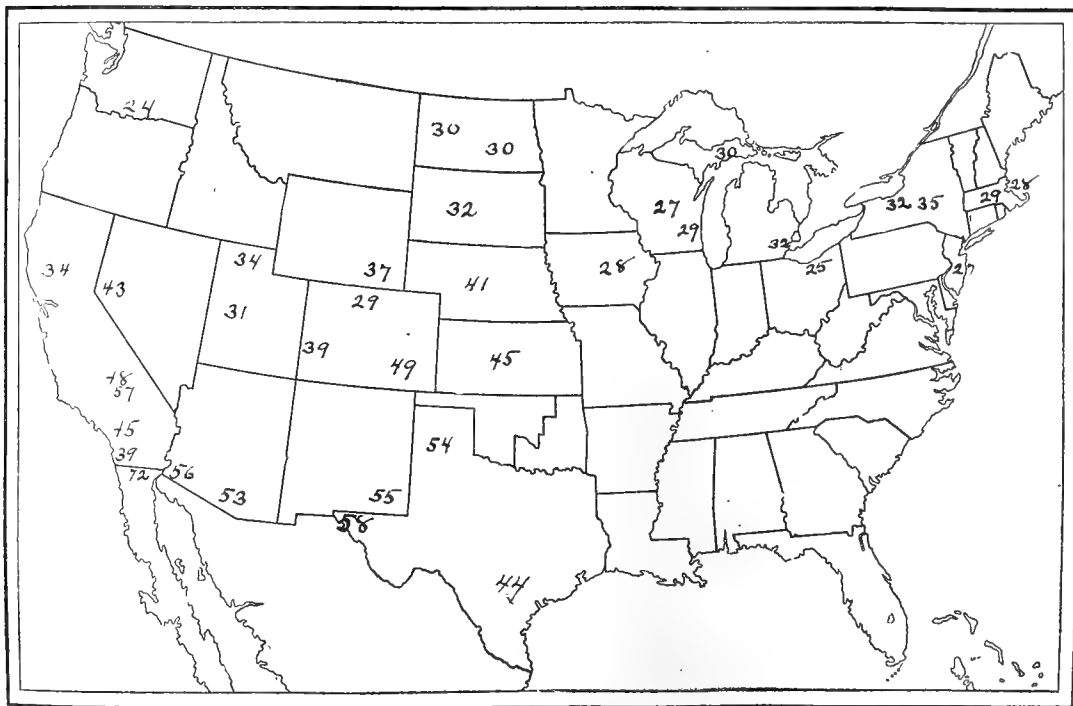
The next slide will give the evaporation at all the stations which I have been able to find in the United States. Determinations have been mostly made in the west. And the figures on this diagram represent the total evaporations from April to September inclusive; that is, the seasonal evaporation; the evaporation during the six summer months, from a freely exposed tank set in the soil. You will notice, for example, that here in New England the evaporation for the six months runs 28, 29, 27, 32 and 35 inches, while through northern Ohio, through Michigan and Wisconsin it is practically the same, in Iowa practically the same, and a little higher in North Dakota. These, by the way, represent two of the co-operative stations—this evaporation as we have measured it during the past year in North Dakota. Here is the evaporation at another one of the stations, South Dakota, 32 inches. You will notice that it is higher, for the same period. Here is an evaporation at North Platte, Nebraska, 41 inches, higher than at Hymore, South Dakota. The evaporation at Hayes, Kansas, 45 inches. These are all co-operative stations. The evaporation at Amarillo, Texas, during the same period is 54 inches.

In other words, with the same rainfall in North Dakota and at Amarillo, during the growing season, the man at Amarillo would be working under conditions which are practically twice as severe as the man in North Dakota. Under those conditions why are we justified in talking alone of precipitation? What does precipitation alone mean in connection with such figures as those? If we assume that the precipitation is in propor-





Evaporation Map of the United States.—Figures Give Total Evaporation April 1st to October 1st.







tion to the evaporation then the man at Amarillo, in order not to have to work harder to conserve the moisture than the man in North Dakota, would need practically twice the rainfall.

Thus up on the high plains, the Staked Plains of Texas, you will notice as you get down here in this well-recognized desert region the evaporation is very much higher. Here at El Paso it is 58 inches; in Arizona it is 53. At Yuma, Arizona, it is 56. Here is a high measurement in New Mexico, on the boundary between California and Lower California, 72 inches. This is a single measurement, made by Prof. Fortier, who addressed you the other morning. Here are the conditions in Utah. Here are the evaporation measurements made at your station at Logan, 34 inches. This figure represents the evaporation at the fort (Fort Douglas) out here, taken some years ago, 31 inches. This, of course, all refers to the six summer months. Now you will notice that the conditions here are very little higher than those in North Dakota—very little higher than those in North Dakota, and that they are nowhere near as severe in the arid regions as in Texas, or Kansas, or in Nebraska.

The settler then must realize that the annual rainfall is not the only factor to consider when he selects his homestead in some Trans-Missouri state. The greater the evaporation in any given locality, the harder must he work to conserve moisture sufficient to produce his crops. The character of the rainfall, the prevalence of hail, frost, hot winds, high winds, the physical properties of the soil of the locality, its depth, porosity, tendency to make and clod, and the amount of organic matter and plant food it contains are all factors which the prospective settler should consider.

We will now have the next slide, which will show some of the work which we have been doing during the past year in connection with co-operative stations of which I have been speaking. This represents the evaporation in detail at the eight stations, which are scattered through the Great Plains, to which I called your attention, during the past summer, and you will note, of course, that the highest evaporation is that at Amarillo, Texas—54 inches—for the six months. This measurement began the first of April. The vertical lines represent the different months, and the horizontal lines give the total evaporation for that point. In other words, during the month of April the evaporation at North Platte is something over eight inches, while at Hymore, for the same period, the evaporation was only four inches. You will notice that these lines are practically straight. That point would come out more clearly if the curtain were flat, but they are not entirely straight, as you will notice by the next slide. The lower curves here you see you have the evaporation for four stations instead of eight, as I said, represented here—Amarillo, in Texas, Hayes, Kansas; North Platte, Nebraska; Hymore, South Dakota. We have below the corresponding curves for precipitation during this same period of six months—during exactly the same time. While, as you will see, the evaporation at Amarillo is the highest the precipitation at Amarillo during this year was the lowest, and we will see the results of that condi-

tion on some of the slides I shall show you later. So that Amarillo, while having an evaporation of 54 inches had a precipitation, during that time, of something over 13 inches.

The next slide will show this condition in another way. Here we have the evaporation for the stations represented by months. This represents the evaporation for April, May, June, July, August and September. You will see that at Amarillo in April and May it is the same. It went up for June, still higher for July, then came down in August and September. Now as you go to Hayes, the next station north, you find practically the same thing, and at North Platte something similar to it, while at the stations way north the evaporations didn't reach their maximum until in August, instead of July, as in the first case.

This represents in tabular form the total evaporation for these six stations during these six months, showing the extreme conditions to which the crops were subjected at Amarillo as compared, for example, with Hayes, which had a comparatively high rainfall, and particularly the conditions at Hymore, for example, where the total evaporation was very much less and where the precipitation was just about the same.

The next slide represents the Amarillo farm on the Staked Plains of Texas, in the virgin state. This farm is, as are all of the farms which Prof. Chilcott has established whenever possible, located on virgin prairie sod. You will see the cattle on the horizon—quite a contrast to the mountains which you see about us here.

The next slide will show another view of this same farm. And the point I wish to bring out particularly is the instrument with which we are making the observations of which I have been speaking. Here is the evaporation tank in which the evaporation is measured daily. Here is the instrument shelter, which contains a thermometer—a maximum and minimum thermometer, and instruments for determining the humidity of the air, and so on. You will notice in this picture something of the precipitation in that southern region which I have spoken of. When it does rain it sometimes rains. There was a precipitation in this case of about two inches in two hours, and you can see the condition of the farm. The whole place is under water.

The next slide. These views are more to give you a general idea of the work than anything else. This represents a general view of the farm. In the foreground you see a stubble which has been listed out, as they say. It is a system of using a lister in cutting the grain and throwing the soil up into ridges by making furrows with this lister, which is a double mold board plow. We are looking across the furrows here, so that the furrow is not brought out. You see here a weed which has escaped the lister, being on top of the furrow.

The next slide is shown for the purpose of showing the effect in that locality of spring versus fall plowing on the germination. This plat in front was a fall-plowed plat; the plat immediately adjoining it was a spring-plowed plat. You see the grain is well up here, quite plain, whereas

there is no grain to be seen there at all, the line of demarcation being very clearly shown.

The next slide represents the soil moisture conditions which were observed in a moisture conservation plat of North Carolina, being our provision for the moisture conservation plats at Amarillo during the past year. This diagram shows the moisture conditions in three different plats, one of which was subsoiled, one of which was listed poorly, putting it in the ground with this double-mold-board plow. I don't know whether you know what it is or not. The furrows are thrown out and the corn planted in the bottom of the furrow and then the dirt gradually thrown in as the corn grows. This was good cultivation and this was poor cultivation. You will notice here that the subsoil farming in this particular case started out with more moisture and maintained better moisture supply for nearly two months during development, and the good cultivation was next as far as the amount of moisture was concerned, that the listed ground, poorly taken care of, had the lowest per cent of moisture. I can't tell you just what the moisture contents were. It will be shown at the end of the diagram. You will note, however, that the exceptionally dry weather of which I spoke at Amarillo, in spite of the best cultivating methods which were used, was too much for the corn, and the yield practically failed. This represents the acreage yield—only three bushels per acre. This lower curve here, the series of lines along the bottom here represents the rainfall at Amarillo during this period. This would be two inches up to this line, this would be four inches, six inches, eight inches, ten, and so on. You see during the first four months we had only eight inches of rain, up to this time, when we had a big rain, and then that came all at once, as was represented on the slide where you saw the very wet conditions. These rains here are of very little value. They come in such small quantities that they simply destroy the mulch that has been formed and necessitate another cultivation.

The next slide represents the moisture conditions under four other plats of the farm. This farm is given six different treatments—in this case spring plowing, fall plowing, listed corn, and last year's summer fallow. You will notice that in this case the fallowing, so far as moisture conservation was concerned, was of very little value. Here is a fallow that was maintained during the past year. The line is seen running through. The plats all start together, showing that the fall plowed during the preceding year showed very little difference between the different plats, and it seems, although it was cultivated and taken care of thoroughly during the whole season no doubt, that there was practically no gain in moisture.

The next slide represents the summer fallow. This represents the subsoiled farm, and this represents the listed corn with four cultivations. This was right when the corn was suffering most, before we had the heavy rain. You will see that there was a marked difference in favor of the subsoiling in the growth of the corn made, but the dry weather was a little too much for it even with that treatment.

The next slide shows another view of the poor listed against good listed, and here you see a much better development of the corn listed and taken good care of as compared with poor treatment.

The next slide shows moisture conditions in kaffir at Amarillo. A representing the spring plowed, B fall plowed and C listed. You will notice there is very little difference in the three in the moisture contents at Amarillo. The yields were rather light on account of dry weather, although much better than corn.

The next slide shows corresponding conditions for milo and the yields, although the moisture conditions of the three crops were not accelerated throughout the year.

The next slide represents the moisture conservation at North Platte. These figures represent part of the figures which Prof. Chilcote gave the other day. Here we have the spring plowed and fall plowed and fallowed. You will notice that the spring plowed and fall plowed and the full curves in this case also follow very closely together. There is very little differentiation there regarding the treatment, so far as moisture is concerned. But there is a point you must always keep in mind there. If we have a good crop it is using more moisture and it reduces the moisture contents of the soil. These figures show the fall plowed land as being better than the spring plowed, and the fallowed giving a better yield than either, but you will notice here that the fallow doesn't begin to justify the expense of maintaining the land idle during the whole season of cultivation.

The next slide represents corn in North Platte. You will notice that the conditions prevailing at North Platte last year, the summer fallowed land didn't begin to differentiate itself from the rest until at the close of the season. There was five per cent difference in the moisture at the close of the season. There is a point I wish to call attention to here, namely, that the yield of corn on the fallowed crop was 18 bushels, spring plowed 29 bushels, fall plowed 28 bushels. In other words, after having maintained a fallow for a whole year and plowing the preceding year, we got very much less yields than by continuous cropping. Of course it must be remembered that this is the result for a single season at this place.

A DELEGATE: What was the rainfall?

DR. BRIGGS: About 14 inches for the whole season.

In the next slide we have the condition of wheat at Hymore, South Dakota. The spring plowed land in this case leads in moisture contents and the fallow advances. Here you see apparently we didn't gain at all. That may have been a special condition due to some peculiarity in that plat. But it does not show any advantage from the beginning of spring over the fallowing of the preceding year so far as moisture contents is concerned. Thus you see this shows how the fallowed holds its moisture against less moisture on the plats where the crops are being grown. The plat in this case shows the lowest moisture contents. We didn't have the record in time to put them on this slide. The record was furnished by Prof. Chilcote for that station. For the spring and fall plowed land practically the same—about 29 bushels; for the summer fallowed 30 bushels;

for the listed in this case only 21 bushels, although they show the lower moisture contents, which might indicate it raised a big crop, but it is evident that the low yield or low moisture contents probably had something to do with the yield.

The next slide shows the form of moisture conservation experiments at Hymore. Now B was a plat which grew corn this year, which was fallowed last year, and starts high, as a fallowed plat should start, and gradually decreases as the crop develops. C, which was cropped last year, starts low, like the others, and does not gain very much during the whole season until at the end, where it has finished development. The yields in that case were 31 bushels for the spring plowed corn, 28 for the fall, whereas on the summer fallowed we got only 17 bushels. In other words, after summer fallowing the preceding year, taking two years to grow one crop of corn, we got 17 bushels, as against 30 bushels from spring and fall plowing—the same as at North Platte.

A DELEGATE: What was the rainfall?

DR. BRIGGS: The slide doesn't show it. I think it was about eighteen inches, but I can't tell you positively.

The next slide shows the conditions at Dickinson, in North Dakota, on the farm. We had a late season here and early frost this year, so that it was not possible to mature the corn. You will notice that the fallowed plat gave the lowest yield.

The next slide shows at Edgeley, further east in North Dakota, showing the moisture conditions of the different wheat plats, the spring plowed, fall plowed and fallowed. Here the fallowed plat starts high, as it should, and it is maintained at this point, and the new fallow, starting in this year, the first determination we have, maintains itself with the others, and shows an average gain here of 2, 4, 6 and 7 per cent at the end of the season. You will notice in this case that there is a more substantial gain over the spring and fall plowed than there is over the fallowed, the moisture running, from this point on, very similar.

The next slide shows the moisture conservation of oats at Edgeley. Here we have a similar condition, the fallow starting high, this being the plat we fallowed last year, sowing it to crop during the present season. This started high, showing a decided gain in moisture in this particular case all through the season. You will notice also this is one exception from all the rest, that fallowing in this particular case was justified, yielding twice as great as the spring plowed land, and almost twice as great as the fall plowed land.

This represents simply a portion of the moisture determinations which in turn represents a portion of the work which we are doing on these farms in connection with the investigations which I have just described.

I thank you very much. (Applause.)

CHAIRMAN BURRELL: This concludes the papers for the evening. The Chair will entertain a motion to adjourn.

PROF. CHILCOTT: I would like to announce that the Committee on Resolutions will meet at nine o'clock in the morning, at the Commercial Club rooms.

On motion duly seconded the Congress adjourned until nine o'clock tomorrow morning, January 25th, 1908.

## SATURDAY, JANUARY 25th, 1908.

### (Fourth Day.)

#### MORNING SESSION.

The Congress was called to order at ten o'clock a. m. by Hon. G. J. McCabe, of Tombstone, Arizona, presiding.

CHAIRMAN M'CABE: Ladies and Gentlemen: I feel it a great honor this morning to preside over the deliberations here today, and I have been requested by the President, Mr. Fisher Harris, to take charge of the chair. I assure you on behalf of Arizona that when I get home it will give me great pleasure to announce that this Congress has seen fit to give me the honor to preside at our last deliberations.

We have a program for today which I feel ought to be the most interesting of any day, according to the men who are to address you, and I feel and want to say right here that Mr. Thomas Smith, the gentleman who has been instrumental in having the exhibits before you, should have our appreciation for his endeavor, and I would like to say before this Congress adjourns I would like to see them vote Mr. Thomas Smith a vote of thanks for his industry in bringing about the exhibit.

I believe before starting in with our regular program there are a few letters on the table which we will call up.

SECRETARY ROOT: A telegram from Tucson, Arizona, to the President of the Congress: "The Tucson Chamber of Commerce extends greetings and cordially invites the Congress to hold its next session at Tucson." This is signed by H. V. Taylor, Secretary of the Tucson Chamber of Commerce.

I also have a report from the Credentials Committee:

"Up to closing time last night 553 delegates had been registered at the Registrar's Office, which is a very good showing. I am sorry to say, however, that but 122 out of this list responded to the membership call, eleven life members and one hundred and eleven yearly members, making \$221.00 collected. This is a nice start, but must not be the finish. We earnestly urge that the soliciting committee "get busy" again this morning, and also that those not solicited by the committee repair to the Registrar's office and become members before leaving the building. If you don't feel that you can afford a life membership, which is \$10.00, join for a year, which is \$1.00, and certainly no farmer present is so "dry" that he cannot afford to donate one dollar toward the maintenance of this Congress." (Applause.)

I have a communication from one of our delegates addressed to President Harris which I think well to read:

"It is with deep regret I am obliged to take my departure before the close of the session, and wish to thank the state of Utah and the city of Salt Lake for their kindness to me as a delegate. Your beautiful city, mining enterprises and dry farming productions are only second to your true western hospitality." Signed James Brunker, Akron, Colorado.

Thinking some of the delegates might be looking for a little sport before they return home someone has requested that I announce a basketball game at the Y. M. C. A. at eight o'clock this evening. You are all invited to attend.

We are informed that there is a large number of the Christmas edition of the Deseret Evening News that contains a great deal of information, statistics and general good reading for every man to have, and these are free to the delegates and can be secured by calling at the Bureau of Information, in the Temple block.

PROF. CHILCOTT: Your Committee on Resolutions recommend the adoption of the following resolution:

"Resolved, That the Trans-Missouri Dry Farming Congress in convention assembled extend to the Hon. James Wilson, Secretary of Agriculture, the thanks of the Congress for the great interest he has shown in the subject of dry land agriculture."

On motion duly seconded the resolution was adopted by the Congress.

PROF. CHILCOTT: The committee has also reported favorably upon the following resolution:

"Whereas, We realize the necessity of the thorough scientific investigation of dry farming conditions to determine the best systems of cultivation and crop rotation, the influence of conditions of soil and climate on crop yields, the best methods for conserving the soil moisture and maintaining the fertility of the soil, the relation of soil bacteria to crop production, the best varieties of grain and forage crops, and the development of more hardy varieties through seed selection, individual plant selection and seed introduction, and

"Whereas, We recognize that the growing of livestock is fundamental to a permanent agriculture for the dry lands, and that dairying and the selection of types of cattle particularly adapted to dry farming conditions, the raising of trees and shrubs and the growing of fruits are of fundamental importance in the building of permanent homes in the semi-arid west;

"Therefore, be it Resolved, That the Trans-Missouri Dry Farming Congress expresses its hearty appreciation and approval of the action of the Bureau of Plant Industry of the United States Department of Agriculture in establishing stations in the semi-arid west in co-operation with the several state Experiment Stations, for the scientific investigation of dry farming; and

"Be it Further Resolved, That the United States Weather Bureau be commended for the valuable assistance it is rendering to the interests of agriculture in general; and

"Be it Further Resolved, That the Bureau of Animal Industry and Forest Service be earnestly requested to lend their support to the development of the dairy and livestock interests and to the planting of trees and shrubs in the semi-arid regions; and

"Be it Further Resolved, That the Congress of the United States be respectfully urged to provide adequate means to establish stations for the above purpose in each representative part of the semi-arid west; and

"Be it Further Resolved, That a copy of these resolutions be sent to the Honorable Secretary of Agriculture, to the Chairmen of the Agriculture Committee of the Senate and the House of Representatives, and to the Chiefs of the Bureau of Plant Industry, the Bureau of Animal Industry and the Forest Service."

I move the adoption of the resolution.

The motion was duly seconded and being put to a vote was agreed to by the Congress.

PROF. CHILCOTT: Your Committee recommends the adoption of the following resolution:

"Whereas, The successful development of farming without irrigation depends primarily upon the establishment of scientific principles on which the farmer may rest his practices, and

"Whereas, Such scientific investigations cannot be carried on properly by private enterprise, and

"Whereas, The different localities in the Trans-Missouri states differ in their climatic and soil conditions, and therefore require that special attention be given to the conditions prevailing in each locality;

"Therefore, be it Resolved, That the Trans-Missouri Dry Farming Congress favors the establishment by state legislative action of experimental farms for the scientific study of farming without irrigation, such stations to be under the direction of the respective State Experiment Stations, and wherever practicable in co-operation with the United States Department of Agriculture."

I move the adoption of this resolution.

The motion was duly seconded, put to a vote and agreed to by the Congress.

PROF. CHILCOTT: The following resolution has been reported favorably by your Committee on Resolutions:

"Resolved, That the Executive Committee of the Trans-Missouri Dry Farming Congress be requested to give careful consideration to the question of the enlargement of the homestead area, and also to the question of some practical plan looking toward the final disposition of the purely grazing public lands and report the results of their deliberations to the next meeting of this Congress."

On motion of Prof. Chilcott, duly seconded and agreed to by the Congress, the resolution was adopted.



PROF. CHILCOTT: The following resolution has been reported favorably:

"Resolved, That we urge the United States Congress to pass legislation providing for 320 acre homesteads, as provided for by Senator Smoot's bill in the house, or other legislation which will bring our public lands into private ownership in a manner that will increase our number of homes and area of cultivated farms."

On motion of Prof. Chilcott, duly seconded and agreed to, the resolution was adopted.

PROF. CHILCOTT: The following resolution has been reported favorably:

"Whereas, In certain localities in the western states there yet remains unsurveyed large areas of lands which are arid and semi-arid, and which are desirable for homestead purposes, we therefore recommend that such lands be promptly surveyed in order that settlement may be effected thereon and uncertainty of obtaining title be thus removed from the minds of those desiring occupancy of said land."

On motion of Prof. Chilcott, duly seconded and agreed to, the resolution was adopted.

PROF. CHILCOTT: The following resolution has been reported favorably:

"Whereas, Such is the importance of home building upon the arid farms to more fully insure the permanency and highest development of this form of agriculture, and

"Realizing that water for domestic purposes and a limited supply for the irrigation of a small orchard and garden is a prime essential to successful home building, therefore,

"Be it Resolved, by this the Second Session of the Trans-Missouri Dry Farming Congress in open session, that we indorse the work of the Irrigation Investigations of the Office of Experiment Stations of the United States Department of Agriculture in collecting and making public practical information for the utilization of a limited water supply by means of winter irrigation, small storage reservoirs, wind mills and pumping plants."

On motion of Prof. Chilcott, duly seconded and agreed to, the resolution was adopted.

PROF. CHILCOTT: The following resolution has been favorably reported by your committee:

"Whereas, The preservation of the National forests is a matter of vast and vital importance to the people of the west, and

"Whereas, The Forestry Service of the Department of Agriculture has adopted vigorous and definite methods in protecting from destruction the forests of the west, both through dishonest methods and through the avaricious methods of the commercially inclined, be it hereby

"Resolved, That the Trans-Missouri Dry Farming Congress express its endorsement of the efforts of the Forestry Service to conserve the waters of the western states through forest preservation."

A motion to adopt the resolution was duly seconded.

MR. HARRINGTON, of Utah: I would like to have that resolution read again before that question is put.

PROF. CHILCOTT: This was carefully gone over in the committee room and you will notice that it is simply an endorsement of the preservation of the forest.

Prof. Chilcott then re-read the resolution.

MR. HARRINGTON, of Utah: I think, so far as that resolution is concerned, as it is outlined, that it is the general purport that it is the sense of this convention that we approve and ratify the preservation of the forests. I am interested in this question down in the southern part of San Pete County. We find there has been a lot too much of restrictive methods applied to the small cattle owners in getting permits to graze the high lands adjacent to their land. The declaring of the approval of the preservation of forests is certainly a part of this convention's work, but if there is too much restriction; if the arid farmer or semi-arid farmer has to go to so many different men to get permits to put his sheep on the high lands it makes too much restriction, whereas if there were a slight modification in that resolution, saying that we want that area no larger than necessary, and we also want the very lowest number of supervisors necessary to carry out the purposes of the Forestry Service, we would not have that objection to the resolution. They have got too many supervisors and too many restrictive rules. We find our cattle owners have to go to too many people. There are lands that lay for eight or nine months in the year and they are not used for anything. We want to have a right to go on there—especially on the alkali lands—to graze. While the forest reserve is a good idea we don't want that to extend too far nor to take lands that are too large. They are taking in in some places a sort of alkali land that won't grow any forest. We don't want them to take in too wide a scope. I haven't had time to frame an amendment, but it seems if the Committee on Resolutions have not one they ought to present a resolution that we don't want the forest area extended any wider than absolutely necessary, and we want just as few supervisors as we can get. For that reason, unless there is something else—(interrupted.)

MR. WM. MORFITT, Ontario, Oregon: Gentlemen, as the introducer of this resolution it devolves upon me to make a few remarks in regard to it. I myself am in the cattle business, but as a delegate to this Dry Farming Congress I am a dry farmer. (Applause.) Now then, the introduction of this resolution was to endorse the Forestry Service in regard to their actions with regard to the management of the ranges in connection with the stock, but we, as dry farmers, must know and must admit that the preservation of our forests is of infinite importance to the precipitation that falls upon our farm. Consequently in introducing this resolution I was careful to eliminate any part that might in any way endorse the action of the Forest Bureau in connection with the cattle or sheep industry. I know the feeling in Idaho and Utah and Oregon. I am an

Oregonian. We fought this out and tried this out for the past few years, and, gentlemen of the convention, you must admit it is absolutely necessary that our forests be protected for the arid farmer. If you will consider this resolution carefully you will find that the Forestry Department is endorsed no further in their efforts in the preservation of the forests than it is necessary for our work, (Applause.)

MR. MILNER, of Utah: I move as a substitute that the resolution be referred back to the committee and that the gentleman who has spoken have the privilege of amending the resolution. It is something we don't want to express ourselves on rashly.

MR. CLARK, of Idaho: I second the motion of Mr. Milner, Mr. Chairman.

CHAIRMAN M'CABE: The question is on the amendment to the resolution—that it be reported back to the committee.

The motion to amend the resolution was then put to a vote and the Chair declared that the same did not prevail.

CHAIRMAN M'CABE: The question now is on the adoption of the resolution.

The motion to adopt the resolution was then put to a vote.

CHAIRMAN M'CABE: The motion prevails, almost unanimously.

PROF. CHILCOTT: Mr. Chairman, we have one more resolution to report, which has been acted on favorably by your committee:

"Whereas, It is a proper function of the Trans-Missouri Dry Farming Congress to disseminate all possible information relative to the actual operation of scientific farming methods in arid districts, and

"Whereas, A campaign of education in behalf of the utilization of so-called dry farming methods should be both theoretical and practical, be it hereby

"Resolved, That the Trans-Missouri Dry Farming Congress shall authorize its Executive Committee to establish an organized and systematic bureau of information which shall assemble all possible data relating to experimentation of operative farming under dry farming methods; accurate information relative to the districts where scientific soil culture can be utilized and the climatic and soil conditions in such districts; comparative statements relative to agriculture in the west and which may be considered of educational importance, and that all such information shall be published at stated times in bulletin form, this bulletin to take the form of a magazine or pamphlet according as the experience of the Committee may suggest; Provided, it shall be necessary, prior to the publication of any matter referred to in this resolution or any other printed statements, statistics or publications regarding the dry farming movement, be unanimously passed upon by a committee to be appointed by the Chairman of the Executive Committee, said committee to consist of one scientist, one practical farmer and one business man, not of necessity to be members of the Executive Committee."

I move the adoption of this resolution.

The motion was duly agreed to by the Congress.

CHAIRMAN M'CABE: I believe that finishes all of the business on the table at the present time.

The first thing on the program this morning is "Dairying Under Dry Farming Conditions," by Prof. Ed H. Webster, Chief of Dairy Division, Bureau of Animal Industry, United States Department of Agriculture, Washington, D. C. I take pleasure in introducing Mr. Webster. (Applause.)

### DAIRYING UNDER DRY FARMING CONDITIONS.

(By Prof. E. H. Webster, Washington, D. C.)

Mr. Chairman, Ladies and Gentlemen: I came out here more as a listener than as a talker. I have been trying to find out some of the difficulties or problems on which you were to deliberate and to try to discover, if I could, wherein we might be of use from the standpoint of the Bureau of Animal Industry in the development of this semi-arid country. I feel certain that much assistance can be given in the development of this country by the introduction on a more extended scale of livestock on the farm.

In speaking of dairying I am always glad that men are not all of the same ideas. That is, we don't want all to be wheat growers, or lawyers, or doctors, or anything like that. Each must select for himself what profession he will follow. As a science, as a profession, a vocation or an avocation develops, by constant investigation and study there are created many branches of these lines which in themselves become distinctive enough to be recognized as separate divisions of scientific, literary and industrial pursuit.

Thus we have the mechanical, the electrical, the civil and the irrigation engineer. We have, in agriculture, the agronomist, the horticulturist, the cerealist, the animal husbandman, the dairyman, and many others—all specialists in the various lines of agricultural research.

Among those who put agricultural science into practical application, or, in other words, the farmers, we have similar classifications, perhaps less distinct and sometimes varying as to location and climatic conditions, as cotton farmers, corn farmers, wheat farmers, fruit farmers, beef farmers, dairy farmers, etc.

This seems to be an age of specialization, and those who attain the highest degree of efficiency are those who adopt some line of work and make it a life proposition. The selection of such work depends upon the individual's personal inclination and on the environment with which he is surrounded. Many selections must be made within a limited sphere, owing to these conditions. The work of the farmer is confined along certain lines more definitely, owing to climatic and soil conditions which cannot in themselves be changed or even modified to any great extent. The owner of a farm must adapt himself to the surroundings in which he is placed or move to another part of the country, thus from location alone we have the various types of farming which give different parts of our country distinctive agricultural characters.

These types are fixed largely, if not almost wholly, by the kind of crops that can be grown upon the soil. Every well-informed farmer knows that constant cropping removes certain elements of fertility, and that if the cropping is continued long enough the ability of the soil to produce is finally diminished to a point where it becomes unprofitable. Fortunately the demands made upon the farmer are not confined to the cereals, to hay, to cotton, tobacco, or fruit. These things form only a portion of the farm products required by a people. Our tables must be supplied with meat, and all the various products of the abattoir—with butter, cheese and milk, and our necessities require the wool for clothing, leather for shoes and gloves and multitudes of other products which have their derivation in the great livestock industry of our country. The production of these things requires the raising of crops to feed livestock, and the Creator in his infinite wisdom devised or planned the works of nature so that there would be compensation or equilibrium established between the product of the soil and the needs of the animal kingdom with which the earth is populated so that neither soil exhaustion on the one hand nor starvation on the other would occur. Man in his finite wisdom has often disregarded the laws of nature and attempted to indefinitely crop the soil without replacing the fertility or to maintain animal life with too scant a supply of the necessary forage for its existence. It matters not how much one may wish to confine his operations to a special line, such as wheat growing or cattle raising, he must provide alike food for his crops and for his stock. Thus any system of farming which neglects either of these great principles must have for its end ultimate failure. Let not the dry land farmers fail to remember this and in working out systems of cropping adapted to arid or semi-arid conditions fail to include in the scheme some branch of livestock industry.

What line or class of livestock will be best adapted to the condition will depend on many things. It may be stated that within certain limits livestock can be adapted to almost any condition of climate or other environment. The many breeds and the many purposes for which they are grown make the selection one largely of preference or individual liking in the matter. The range of selection may be much wider than in the case of the money crop that can be profitably grown on the soil. It is not my purpose to discuss livestock in general but dairying in particular, and its adaptability to dry land farming. This rather long preamble has been given to show that some form of livestock must accompany dry farming and that livestock growing is fundamental to successful farming under any condition of latitude, longitude, elevation or climate.

In discussing this question it is assumed that the farmer is a home builder. That he is engaged in farming, first because he loves it, and second, because from the soil he can derive an income that will keep him in comfort and happiness, that will enable him to educate his children and add to the community in which he lives his due portion of influence for all that is good and noble in man. His allotment of land will be no larger than he can farm with the greatest degree of skill and in-

telligence, and yet large enough that the income will meet all the needs and many of the luxuries of life, which are certainly due the man on the farm. This means intensive—not extensive—farming. It means growing the most per acre possible and turning it to the best possible account. A hundred such farmers on a given area are worth a thousand times more to the community, the state and the nation than if the same area was owned by ten men engaged in farming on an extensive scale. (Applause.) It is to such farmers as are inclined, either through love for the business or a desire for the advantages which it brings them, that dairying is recommended.

Now more to the point for the dry land farmer. Most of the crops adapted to these conditions, as indeed to conditions existing everywhere, bring in an income but once a year. Sometimes the work of a year may be swept away in a moment by flood, or hail, or fire, and sometimes the heavens fail to give forth the necessary rain for dry farming even, and the crops are a failure. To the farmer in seasons like this comes the pinch of hard times. Bills must go over; but the family must be clothed and fed and the children sent to school. With an empty granary and no other source of income this is sometimes impossible. Seldom, however, is there a year when feed of some kind cannot be raised for a bunch of dairy cows. Many times grain crops that may be utter failures from the standpoint of the grain they yield may still be turned into hay or fodder or silage—excellent food for the stock—and total loss avoided. The farmer who keeps cows will plant forage crops which are reasonably sure and plan to make silage and hay that will carry him over the season. Much roughage that would otherwise be lost may thus be turned to good account.

The one great advantage of the dairy cow over other livestock is the fact that she pays dividends every day in the year in a commodity that is convertible into cash at the nearest railway station or at the nearby factory for the making of butter and cheese. It may be said that one of the greatest drawbacks to farming is the lack of ready cash every day in the year. This condition never exists on a farm where there is a dairy herd.

Speaking more particularly of the Great Plains country east of the Rockies, there have been but one or two years in the last twenty or twenty-five when there could not have been enough feed raised on the average farm to support a herd of from fifteen to twenty cows in fair shape. But there have been many years when wheat, corn or other cereals on which these people depend have been utter failures. That great region has since the early eighties been twice populated and depopulated, and now, for the third time, the people are again possessing themselves of the land. If the third exodus does not sometime take place it will be because the present generation is wiser than their predecessors and because they practice improved methods of farming, which will include dairying as a component part.

The kind of crops that may be raised for the dairy herd will be left to the agronomist making a special study of these conditions in the semi-

arid and arid country. For the feeding of a dairy cow profitably some grain is needed, but the amount necessary will depend very materially on the nature of the forage crops that may be grown. Wherever alfalfa, peas, or any of the legumes can be grown the problem is comparatively simple, but where these cannot be grown the dry farmer can still hope to milk with some degree of success. It is not expected that under dry farming conditions as they exist at present a dairy herd can be maintained that will yield as great a revenue per cow as that obtained in the more favored sections of the East. On the other hand, the expense of maintaining the cow will be very much less, so that perhaps the net profits will not compare quite so unfavorably. If under conditions as they exist in the dry farming region it is proven impossible to grow the protein-producing foods the dairyman will soon learn that it will be profitable to buy protein to supplement the carbonaceous foods, such as sorghums, kaffir corn, milo, maize, oats, wheat or other crops that may be successfully grown. Such foods would include bran, brewers' grains, oil meal, cotton seed meal, byproducts of the beet sugar factories and from flour and cereal mills. The cost of these will seem at first thought to be prohibitive, but the man who will study economical production as he studies economical grain production will find that the addition of such foods even at a seeming high cost will pay. The great problem will be, however, to grow these foods on the farm, which have high protein content. The nearer the farm can completely sustain the dairy herd the more profitable will be the work of dairying.

One of the most important problems for the farmer who will take up dairying as a part of his farming operations, will be the selection of the dairy herd. This question puzzles many men in the dairy sections of the east. It should not, for if the same degree of intelligence be put into it that is put into other farming operations the way will seem clear. The unit of the herd is the individual cow. Cows differ in their ability to produce milk just as different farms differ in their ability to produce profitable crops of wheat, because of the difference in the nature of the soil, moisture, temperature, etc. Cows differ in their ability to produce milk just as farms differ in their ability to produce wheat because of the ability or lack of ability of the man managing them. The average cow, if given a fair chance, will produce a fair quantity of milk; a better cow will give more.

The dry land dairyman must first study the necessities of his herd and then select those individuals that under similar conditions will produce the most for the food given. That degree of investigation made necessary to success in dry farming which will in a few years place the farmers of the semi-arid regions years in advance of the farmer of other sections, will, if turned to the production of milk, bring just as good success in that line.

It would be foolhardy, as a general proposition, to bring onto the farms of the west the highly developed and highly bred dairy types of cattle common to many sections of the east. The only sane method of

procedure is to take the cattle already acclimated in the region and by careful selection and breeding develop a native dairy breed that can exist under conditions of scant pasturage and the dry climate of the west. Part of the work of development of the dry regions will be the breeding of such a race of cattle, just as it is necessary to breed up a strain of wheat, oats or corn adapted to the conditions as they exist.

Breeds that have been brought to perfection in the Isle of Jersey, in England, Scotland or Holland, where conditions are entirely different from those west of the 98th meridian, may, when transplanted, do fairly well, but before they can do their best they will have, by successive generations of breeding, to become modified in many ways so that they will entirely fit the conditions in which they are placed. It is true that animal life has a wonderful range of adaptability and can adjust itself to almost any conditions, but it is also true that such change may materially modify such functions as giving milk, unless the environments in the new location are made similar to the old. For this reason it is believed to be better wisdom to take cows of native stock, selected because of their better milk-producing qualities and to purchase bulls of accredited record from dairy breeds, and to breed up in the western dry farming region a strain of dairy cows that can through long being accustomed to the conditions be the fittest and best for the dry land dairy farmer.

As to the actual returns from dairy farming under these conditions we can give you no authentic figures at the present time. It is hoped that by the time the Congress meets another year there will be gathered considerable data on the income of farmers keeping a dairy herd under dry farming conditions. There are, on the eastern slope of the Rocky Mountains, many men engaged in supplementing the income from their farming operations with a dairy herd. That it pays these farmers there is no doubt. It has enabled them to weather many severe trials by drouth and partial crop failures. It may be said with safety that the net income from twenty good dairy cows will equal that from 100 cows under range conditions. It will take from one to two thousand acres to maintain 100 head under range conditions, while twenty dairy cows in the same territory can subsist on from 160 to 320 acres. This means that such locality can furnish a living for from five to six families who devote their energies to dairying where but one can subsist under range conditions.

More cattle will be kept on the same area. A portion of the land will be devoted to raising forage crops and a portion to wheat or other grain. The income to the community will be several times greater. The social and educational advantages will be many times more desirable and the tendency will be the eventual subjugation of the desert.

It is not a question of what any man's opinion may be in this matter. The people are clamoring for the land. The large holdings will eventually be divided, and the conditions under which success will be attained will be those surrounding the small farmer. He cannot live by grain alone, and to attempt to grow cattle under range conditions on small areas will be disastrous. There must be a combination of grain and stock growing.



The cow must yield more than her offspring. The wise farmer will find that the income derived from her milk will be more than that from the calf. He will find that type that will at least bring in a double income from calf and milk. Under dry farming conditions only those who have had exceptional training as dairymen and are prepared to furnish the necessary food for high class special purpose cows can succeed with that class of animals. I do not pose as an advocate of dual purpose stock, but under conditions as they exist in the regions under consideration it is morally certain that the dual purpose type is the one that will give the greatest returns to the farmer, and that for those who become specially interested in the milk yield there is a great field for developing a breed of dairy cattle adapted to those conditions.

While the dry land farmer is experimenting in and investigating the multitudes of problems that are still unsolved in the production of crops he can with a herd of good cows insure a steady daily income that will enable him to keep himself and his family in comfort and provide those things which to us are necessities and to our fathers were luxuries. (Applause.)

CHAIRMAN M'CABE: The next number will be "Relation of Dry Farming to the Livestock Industry," by Prof. W. C. Barnes, Inspector of Grazing, Forest Service, United States Department of Agriculture, Washington, D. C. Ladies and gentlemen, I take pleasure in introducing Prof. Barnes. (Applause.)

## RELATION OF DRY FARMING TO THE LIVESTOCK INDUSTRY.

(Prof. Will C. Barnes, Washington, D. C.)

Mr. Chairman, Ladies and Gentlemen: Some are born great, others achieve greatness, still others have it thrust upon them. I have been a cattle man in New Mexico and Arizona for the last twenty-seven years, and this is the first time I was ever called "professor." I don't know who loaded that word onto me, but I am afraid it is the hat I am wearing—one I picked up in Washington, because when I was down in Colorado the other day to address some stock men on the questions of the forestry service work I was passing a bunch of them, going to the meeting, and they sized me up and they said, "Just look at that hat! Isn't that a fine thing to come out here to tell us how to raise cattle?" I couldn't afford another one, but I have made up my mind that when I come out west again I am going to stick to the soft hat. I don't know whether that is responsible for it or not, but I am afraid if I go out to New Mexico and my friends there find that I am classed as a professor it will cost me my standing. (Laughter.)

I have been given a subject which is very close to me in many of its features—"Relation of Dry Farming to the Stock Man." There is no one cause that has put the stock business in the hole so many times as has the impossibility of taking care of the cattle and sheep after we got them raised. We may have a good summer and the cattle and sheep and horses

do very well, but there comes a winter and we lose. The ordinary western stock man simply depends upon the grass that he grows and has no other resources, and ordinarily runs his stock in the country and on the range which does not admit of irrigation, therefore anything that is to make a crop for him to take care of his stock ought to receive from him not only his support but his deepest interest, and I think as a general matter it does. I do not know of anything that has attracted more attention in Arizona and New Mexico in the last five years than this question of dry farming. The first meeting, held in Denver last year, I was a delegate from New Mexico, and you will remember it was so largely attended that it was necessary to abandon our quarters and hold our meetings in the Baptist Church, which a good many of us considered quite a joke for a dry farmer. (Laughter.) The state of Texas is probably the pioneer down there—the stock men of the state of Texas, especially up in the Panhandle—in developing this dry farming idea. After Texas got over their fight on the question of free grass and leasing their great ranges in the west, they decided to lease the land in small bodies to the little stock men, and men could lease there a section and two, three or four sections. He did all right in summer, but he couldn't do so well in winter. Once in a while a winter would come in and he would start in the winter with five hundred or a thousand cattle and in the spring he would not have any, and some began to study the proposition of farming. It seemed ridiculous. There is not a stream in that country on the surface, and the water is from 200 to 500 feet down.

I met a man down there some years ago, from New Mexico. He had a few barrels in his wagon, driving across the prairies. I was down in that country looking at the country just as a stock man. I met this man with his water barrels and said, "What are you doing down here?" He said, "Trying to farm a little." "Where did you get that water?" "Down here to a railroad well about 15 miles." I said, "Do you haul water that far?" "Pretty near that far," he said. I said, "Why in the world don't you drill a well?" "Partner," he said, "if you ever got a well in this country you would have to dig just about as far down as it is this way." (Laughter.) He was hauling water to meet the demands of his family, and hauling it pretty near fifteen miles.

Now those Texas fellows, as I say, they began farming a little in their low places, and they raised a very good crop of kaffir corn, sorghum and that sort of things, and they gradually discovered it was rotation rather than irrigation that was going to give them their crops. They stick to kaffir corn. They call themselves kaffir corns. They invented a new word. One fellow called them kaffir-corners. That was his description of dry farmers. I have seen crops raised on that dry land without irrigation that were astonishing—four or five tons of kaffir corn and sorghum to the acre, with heavy tops; and they got to raising good water-melons. I have seen as good watermelons down in the prairies of the Staked Plains country as anywhere, and they never had a drop of water.

They have satisfied themselves down there that there is practically nothing that cannot be raised under the proper system of dry farming.

The town of Amarillo several years ago was a hamlet of five hundred to two thousand people. The year I met our friend hauling water I went out and looked at some land for a stock ranch. The man offered it to us at ten dollars an acre. We turned it down; thought it wasn't worth it—didn't think it was worth it to raise cattle on and we were sure it wasn't worth it for anything else. Today, however, that land is selling from \$15 to \$35 an acre—the same identical land we turned down, because we only thought it was fit for stock raising. That whole country is dotted with grain elevators. I was astonished to go in there and find where two years ago they had one elevator now they have got three. Amarillo has grown up to be a city of 15,000 and growing every day. I said to a man who was building grain elevators, "Don't you think you are taking quite a chance in this proposition?" He says, "I will admit at first we thought we were, but we built one elevator and filled it, built another and filled that, and the third is full this year and we have to build some more." I found that all over this Staked Plains area they have built elevators, and, as he said, they are filling them. To me it was remarkable that in that short space of time so much should have been accomplished under this hitherto unknown system or method or science, whatever you are a mind to call it, of raising crops on land without the use of irrigation. They have not as much water down there as you have here. Probably 18 1-2 inches would be the average, taking in my own territory of New Mexico.

When the people of the Panhandle of Texas got that pretty well located they began looking over the line into New Mexico. It was just the same kind of country. The eastern part of New Mexico, the southeastern corner, is simply an extension of the Staked Plains. In fact these Texans never got over the fact that they didn't get it when they got it from the Mexican Government, and they looked with longing eyes on that country, and they said, "Here What's the difference any way? It is only an imaginary line between us. If we can farm Texas we can do the same in New Mexico." They took the country by storm. I remember a few years ago we thought that that was scarcely fit for cattle range, and wasn't worth looking after. Today the land is held at \$15 an acre. Dry farmers have gone out on the plains, where there is no irrigation water and have done well. Around Las Vegas, New Mexico, where I have made my home for several years, there is a grant that belongs to the city—a grant of 500,000 acres. I think ten years ago a man could have gone in there to those trustees and said, "Gentlemen, I want to buy this 500,000 acres, and I will give you a dollar an acre for it," and they would never have let him get out of their sight till they got the money, because they thought it was all it was worth. A Methodist minister came in there from back east, and he was a pretty good man for the east and a minister. He looked around and said, "Why don't you farm this land?" They said, "You can't farm it; it is just sheep land and nothing else; it is not even

good cattle land; there is no water on it." He found out that the average rainfall was about 19 inches. Sometimes it was more, but the average for ten or twelve years was about 19 inches. He went to the company and said, "What will you take for 50,000 acres of this land and give me a year to pay for it?" They said, "\$1.25 per acre"—thought they had struck something easy. He went back to Chicago and got together some men who had experience in the Panhandle of Texas, who thought they would try it, and in six months they had sold every acre of that land to dry farmers from the east, or men that came out to undertake to do the dry farming. The first thing they did they got Professor Kellerman there and he said, "Yes, you can farm here." They gave him three thousand acres and he put a crop in there and raised wheat six feet high, and the second year they raised oats, the like of which I never saw anywhere in the west, and then they raised corn. They started in asking six dollars an acre for it, and it was scooped right up. They used to run a car in there every week, a private car, with 25 or 30 in the car, take them out on that prairie in autos, whirled them over the land, and they came back and signed up for anything they wished—twenty acres or a thousand acres. After that was gone he went and said he would take 100,000 if they would let him have it and they offered—. I believe, though, he had an option on it. They sold that land inside of two years. They experimented first because they wanted to have something to show the people they brought out there. Today every acre of that land is going at the rate of all the way from eight to fifteen and sixteen dollars an acre. When these people first came out to see the land, I asked them, "What in the world do you come way out here for? Do you suppose our people living here all of their lives would let this land lay idle if it was good for anything at all?" He says, "It looks as if you had." We tried to find out the incentive. They were mostly people who came from the east. One man said, "I am living on land in Ohio that is worth \$125 an acre and the climate is kind of hard on me; I don't enjoy very good health there and this is fine climate." "Yes," I said, "we have got lots of climate." (Laughter.) He says, "This land is worth only ten dollars an acre, and I can sell out and buy all I need out here." He says, "My brother came out here last year and he has done just as well as I did in Ohio."

There is no use talking about it, these people made good. In the southeastern part of New Mexico, the Staked Plains, they have practically driven out the cattle men and sheep men from that whole country. I know fifty cattle men and sheep men who have sold their outfits in the last few years simply because the increased number of settlers is so great that the range is practically closed up. Last year there were 480,000 acres taken up all in 160 and 320 acre tracts, and it is simply astonishing the number of settlers there are in that country. Take the San Jose valley; ten years ago it was a sheep range, growing nothing but sagebrush—a rolling country which had been held by the sheep men from time immemorial. When they got in there everybody said, "There is where you will die sure—you will starve to death." I went down three years ago

into that country to investigate. I have a habit of writing newspaper articles and I wrote a story about it, and said I saw land that was raising 60 bushels of corn to the acre. Some fellow called me down on it, said he didn't believe it. The editor says, "It's up to you to make good on this thing; you wrote it and you have to make good." I wrote to the fellow and said, "Here, you have got to help me out or I am going to come out and expose you. You told me there was 60 bushels of corn to the acre on that forty-acre tract down there, and you have got to get me some evidence or I am going to come down there and expose you." They hustled around and signed up a lot of affidavits. The result was that an actual measurement of that 40 acres showed 58 bushels of corn to the acre. I made good to the newspaper any how, and the man wrote back and said, "Oh, well, ——" We found out afterwards this man was a sheep man in there, and he wasn't very much in favor of the thing anyhow. He says, "This is just one year." I said, "That is true, maybe this won't hold good year after year, but it is sure there today." This was three years ago I wrote this article, and they have made good every year and the prospects for next year were never better. This San Jose Valley is a tract of land with probably half a million acres in it. They have four or five steam plows and do things by the wholesale. They start in at one end of the valley and go clear across and plow up for everybody. The result is they handle the crops very cheaply.

One thing struck me, too, in looking at these men. They are not the type of men that came into western Kansas and starved out. They are men of property, nearly all of them, and nearly all of them have brought their cattle and horses from the east. One day in the city of Santa Fe I saw fifteen such outfits come down there and start over that valley—all from one little neighborhood in Iowa. They brought money with them, and brought property to build their homes and make themselves comfortable, and I do not think they are going to be starved out. There is no questioning there will be years when they will lose their crops, but if I remember rightly back in Ohio and Indiana and the eastern states they have their years as well when they lose their crops. So undoubtedly they will, some of them, have their set-backs, but taking the years as they come and go, year after year, they are going to wipe the desert out by this system, and there is no doubt about it. Every acre they put in cultivation stirs up the ground and makes them more able to cope with it. Just as they did in western Kansas, when the first men starved out, new men came in there and struck things right, and out from Hutchinson to the west nobody would believe that the whole country was a cattle country at one time. The second crop of men that come profit by the experience of the first men, and if they should have good years they will get a start, and after once getting a start I don't think anything in the world will shake them out. They never have been.

Now then of course you ask me where the stock men come in on this. It is true that some sheep men and cattle men have been very hostile toward this move because they have lost their ranges, but notwith-

standing, taking the good of the country as a starting point, it is better for New Mexico, and better for any country to have a hundred settlers with a hundred head of cattle that they can take care of than ten men with ten thousand sheep. (Applause.) They are better taxpayers. In fact they have got something to pay taxes on. And while the big herds are gone, especially in the southeastern part of New Mexico, in their place have come a lot of little fellows, that are going to build the country up and raise their children and build up little towns. It is astonishing the number of little towns and postoffices that have started up. The post-offices have been established so fast that we in New Mexico can't keep track of them. Every day in the year there is one established somewhere. Standing on the rear platform of the train, coming through a country that was one day a great buffalo ranch, and only ten years ago was nothing but a sheep and cattle range, just as far as the eye could see there is nothing but settlers' houses. Every quarter today has a house on it, just as far as you can see, and they are there to stay, and I don't think anything is going to shake them loose. There is a great deal of fear that some of them will be overconfident and won't use Mr. Campbell's methods. That is one thing they are going to suffer from. I don't suppose there is any subject on which there is more ignorance than the dry farming plan. These people down there see what has been done, and instead of studying it they go ahead and plow the ground and put in a crop. As I say, they have had several years of rain, which has helped them marvelously. But there is a great amount of ignorance on the subject which the men down there are trying to overcome. They are about the same as the Irishman who went to work one morning and the next morning Pat didn't show up for work. The boss asked him why he didn't come to work, and he said, "Sure, yisterday was Lincoln's birthday and Oi stayed at home and celebrated." The other fellow said, "Why did you celebrate Lincoln's birthday?" "Sure, it is because William Jennings Bryan lives there." (Laughter.)

That's about the way with a lot of those dry farmers. They have some ideas of it, but at the bottom they don't really know the true theories underlying it. In New Mexico especially the Santa Fe and Rock Island railroads have had Campbell out there lecturing. They started model farms all over that country, which he looks after to show the state an example and educate the people in the methods of Campbell farming. At any rate it is due to the people coming in there that they should be educated, that they may know it is not all pie and cake—that they must work—that the ground must be thoroughly and repeatedly turned over and worked and that now and then they are going to have a dry year which will strain them to pull through. But it seems to me they probably will be successful on the average down there. They have been as successful, on the average, as the ordinary farmer east of the Mississippi River.

Gentlemen, that is all I have to say. (Applause.)

CHAIRMAN M'CABE: The next on the program will be a talk by W. S. Pershing, of Limon, Colorado, on the subject of "Farming in Arid Eastern Colorado." (Applause.)

**FARMING IN ARID EASTERN COLORADO.**

(W. S. Pershing, Limon, Colorado.)

Mr. Chairman, Ladies and Gentlemen of the Convention: This time I am quite sure there is no professor to talk to you. If you were to go into the United States Land Office in Colorado and inquire who had spent the most money and most time experimenting in dry farming in eastern Colorado they would perhaps give you my name, but if you were to inquire if they ever heard me make a speech or read a paper in public they would say no.

My experience commenced as a dry farmer in Pennsylvania during the war, when we had a very severe drouth in 1864, and the oats was so short I had to carry rye straw to bind the short oats with. My next experience commenced in Nebraska forty years ago last June and we had both drouth and grasshoppers to contend with. I was hired to plant the first trees in Blair, Nebraska, 39 years ago, and tree-planting was followed up until at the present time it looks like a forest, not only in the town but for miles out on the plains, and cottonwood switches that I once carried under my arms have been sawed up and converted into the frames of large houses, barns and corn cribs and ash trees into flooring and finishing lumber, and it is high time that the people of the present time figure more largely on the planting of trees. It was repeated over and over by people who were honest in what they said, that crops could never be raised except in the counties bordering on the Missouri River, and land that was over 25 to 40 miles from the Missouri River was not worth homesteading. If anyone had ventured the assertion that land near Hastings or Columbus, Nebraska, that is worth \$50 to \$100 per acre would be worth \$10 per acre I am afraid the poor fellow would have been rushed to the asylum or pronounced a harmless liar because he exaggerated so largely no one would believe him.

In 1869 a Swedish man named Mons Johnson, who had formerly driven over the plains to Salt Lake with oxen, but returned with some workmen over the Union Pacific to Omaha to work, took up an 80-acre homestead beside my father and because he was known as a whole-souled Mormon we at first watched him with suspicion, but, he proved to be the best neighbor we ever had. (Applause.) His first team was a little mule and a very large cow (Laughter) and I had the pleasure of riding with him to Omaha. He was very poor and used to walk eighteen miles to get his plow lay sharpened ten cents cheaper, and get five cents a dozen more for eggs. (Laughter.) I went with him one trip to the blacksmith shop, and the blacksmith held up the plow share and said, "Which side do you want sharpened, mister? Both edges are the same thickness." (Laughter.) Mr. Johnson died about eighteen years afterwards, worth \$50,000 (applause) and his son has been president of the Kennard Nebraska Bank over ten years.

In later years we had great confidence in deep fall plowing, although one year this same Swedish neighbor plowed extra deep and did not get

half a crop the year following, but the second and third years following he had wonderfully large crops.

I have been experimenting on the semi-arid plains east and southeast of Denver for the past 22 years, and although noted for having spent more money and time on soils and crops than any other man in eastern Colorado, I am here to learn more, and have put up \$10 to learn still more (applause) and have ten children I want to have help the good work still go on after I am gone. (Applause.)

There has been some difference of opinion among the several speakers regarding summer fallowing, and rotating with corn or other crops. This is a hard problem to solve, and varies in different localities and on different soils and in different seasons. One year on summer fallowing I had one-third more wheat than on my stock ground, while another year I had 32 bushels of spring wheat per acre on corn stock land that I had put in with a press drill and only harrowed once and only had 23 bushels per acre on my fall plowing. But I believe the reason for this was the corn ground was plowed the spring before deep and was in good condition and cultivated shallow but kept clean, thus retaining the moisture, while the fall plowing had been done while the ground was dry and not in best condition. The fall season kept dry and there was not a large amount of moisture to be conserved. And I believe we want to watch sharply to have our land in right condition and when we catch it that way to crowd the work with all possible haste.

In our vicinity we believe in putting in White Australian corn (like the sample on the farther end of the table) which has a small stock and large ear or ears. Although the stock is often not over three to five feet high it will yield from one to three ears of corn from seven to twelve inches long. Keep the ground clean by shallow cultivation and seed the land the following spring to Durum wheat.

I would say right here that we have tried the larger varieties of corn with large stocks and have not had the success in rotation with wheat, but by using the small stock corn that has the large ears we can keep the land clean and also if the ground should crack open in the fall we can go through that ground on account of the smallness of the corn and give it a light cultivation.

I would also say here that I heartily agree with some of the former speakers, that we should select one variety of spring and one variety of fall wheat for a whole neighborhood, or perhaps a whole state. We have found that by having several varieties and not many thousands bushels of a kind the large shippers do not call on us. In our vicinity the Durum is the best variety and Denver mills are using this variety to mix with or blend their softer wheat. The Turkey Red is becoming the standard winter wheat. One of my neighbors had 32 bushels per acre of the latter variety in 1906 and 28 1-2 in 1907. Thirty-two bushels per acre of Durum in 1906 and 28 in 1907 was about our best yield. Here is a problem some of our scientific men might figure on. In 1904 we had a very dry season in June and the fore part of July. I had about 12 acres of potatoes, well



cultivated and clean. When the potatoes were about as large as hen eggs we had a heavy shower. A few days afterwards I was passing through the patch and although the soil was only medium heavy the ground was cracking open badly. I spoke to my son about cultivating once more, and although a good boy, like some others, knows more than his father, he protested against the cultivating any more, saying the potatoes were the cleanest we ever had. Besides, he said, it was against my religion to plow potatoes after they were as large as hen eggs. I finally persuaded him to start the cultivator over the patch, cautioning the boys to not cultivate deep or too close to the potatoes. They only cultivated about half of the patch, and went to cutting alfalfa and never returned to finish. I plowed out these same potatoes myself with a lister, commencing on the side cultivated. The ground was mellow and moist and the potatoes turned about 225 bushels per acre, until I came to where the land was not cultivated, and I had to put the clevis to the top of the beam and stand on the beam to plow the balance out, and the soil turned up in large chunks and the yield from that was only about 160 bushels per acre, of a poorer quality. It would have paid me \$150 per day to the team to finish cultivating. (Applause.) This same land was put to wheat the following year, and although the crop was not kept separate the yield was much larger on the part that received the late cultivation. Since that time I and my neighbors believe in cultivating either corn or potatoes even after the crop is matured, if the land shows signs of cracking, in order to conserve the moisture.

Another problem I do not understand. We can raise watermelons weighing 20 to 40 pounds without irrigation, and they are about 92 per cent water.

Grain for seed similar to what is on the far end of the table that has been raised for a number of years can be had of Henry Swan, Hugo, Colorado.

Let me tell you about Henry Swan. This gentleman is over 35 years old. He has been raised from childhood a cattleman—cowboy, as the boys call him. About five years ago he took a notion he wanted to raise some feed for some calves and he had such great success in the raising of corn, barley and some kaffir corn that he has continued farming, and this past season he had some 270 acres of crops, and he is now one of the most successful and scientific farmers we have in the neighborhood.

I would like to say a few words about Prof. W. H. Campbell. Not one in a thousand that talk Campbell system is following it to the letter, but partially following same is showing good results. He has been criticised for using ancient theories, but he has been the right man in the right place for the good of a large number of people in the semi-arid regions, inasmuch as he has brought it before the people, and kept it before the people until thousands of people have partially followed his teaching, and suggestions with wonderful good results, and although some of his theo-

ries may not be best adapted for the western slope, the most of them are. Mr. Campbell has been the means of doing much good in the semi-arid country on the eastern slope.

I thank you. (Applause.)

CHAIRMAN M'CABE: The next is "My Experience as a Dry Farmer," by Hon. George L. Farrell, of Smithfield, Utah. (Applause.)

### MY EXPERIENCE AS A DRY FARMER.

(Hon. Geo. L. Farrell, Smithfield, Utah.)

Mr. Chairman, Gentlemen and Ladies of the Convention: The time is far spent, and I do not think I will have near time enough to explain the practical part of dry farming. The Honorable Fisher Harris wrote me and asked me the name of the paper that I would present. I told him I had no paper, that mine was the practical part of dry farming.

I commenced the occupation of dry farming, took up my land on the west side of Cache Valley 44 years ago, and when I commenced operations my neighbors told me that I certainly had gone crazy to think that I would ever raise grain on that dry bench. But I persisted in laboring to the best of my ability, getting the best team that I was able to purchase and the best plows, harrows, etc. I commenced farming in the usual way, by plowing my land, as I had always done, not over three inches deep, and I worked it over as best I could, and sowed my grain, which came up and at the first start did well, until the hot dry summer wind came along and I lost my crop. The neighbors said, "It is no use. You will never raise grain on that land." The next season I plowed it about an inch deeper than we had usually done. I succeeded in getting the grain headed out and then I lost my crop. And the next year I lost my crop, and I began to think myself I was a little daffed. (Laughter.) But I always hate to be overcome, and the harder the proposition the harder I work, as a general thing, and I was determined that I would continue to try, if I went broke—I didn't have much to lose either. (Laughter.) I bought me a larger team and larger plow, and I started in with the intention of plowing it about five or six inches deep, if possible, and I started to plow on a new piece of land, and I went two or three rounds and did finely, but the third or fourth round I run my plow into a big bunch of wheat grass and the team could not pull it out and gave a jerk and broke my beam. Well, I didn't know what to think, and I sat down on the beam of the plow and made up my mind I would go to Logan to a Mr. Carlisle who was head carpenter in the shops there, and would get him to put a beam in two inches wider and deeper, that my team could not break. I got my plow into the wagon and went to Logan and told him what I wanted. He says, "I have got a piece of timber that is just right, a piece of tough red pine." He says, "If I were you I would have it made six inches longer; it would be better for you and better for your team." But he happened to get the beam a little too high, and I hitched onto the plow and I run about thirty feet and it went

in about nine inches, and the team couldn't pull it. (Laughter.) I sat down on the beam and began to study what next I should do. It came into my mind that I could go to work and bolt a piece on the other side of the beam and put the clevis to that and I would plow then. A man came riding up behind me and he says, "What's the matter here? I have seen you sitting on that plow ever since I came up from the river," which was over two miles. "Well," I said, "I got Carlisle to put that beam in yesterday and I have run thirty feet and here I am—the mold board is out of sight." I says, "I can't go back and have another beam put in." He says, "Peterson down here has some cattle, and he has got a good big team running on the prairie, and if you will ask him I am satisfied he will let you have that team." I went down and saw him, and he says, "Yes, you can have the team and welcome, but I want you to feed it well." I said "All right; how much will you charge me?" He says, "Not a cent." I says, "Not a cent? I won't take it that way." He says, "If you are determined to pay I will charge you two bits a day." And so I put on four horses instead of two, and began to raise the plow out a little, and I went about eight inches deep and broke a hundred acres, and I worked it over thoroughly, and harrowed it and sowed it the first of September. I got a nephew of mine to sow it. He came to me one Saturday evening, and he says, "Uncle, I have sowed all that grain but four bushels, and I have got eight acres of land to sow." He said, "Can you get some more of that kind?" I said, "No, sir; I got all the man had, and it is the best wheat I could get. I want you to spread that four bushels on the eight acres." The previous sowing was done at a bushel and a peck to the acre. I said, "Do you think you can sow the four bushels over the eight acres?" He says, "If you say so I can." I said, "All right, I don't want to mix the grain." So he sowed the four bushels on the eight acres—half a bushel to the acre, and in the spring that wheat came up finely—came up early in the fall and did well, and the next season that eight acres made seven bushels to the acre more than where we sowed a bushel and a peck to the acre, and since that time I haven't sowed but from 35 to 40 pounds to the acre, and if you will come over to my office at any time I will show the contracts with men I rent my farm to and every one is compelled to sow no more than forty pounds to the acre. Four years ago I had a man on the farm who was running it. He was afraid to run my thresher. He said, "I would rather you would hire a thresher and I will pay for it; I want you to look for a good thresher." I told him all right, so I was traveling from Colingston to my place and saw a man threshing at a farm house about fifty rods from the road. I found it was a very nice thresher, sacked the grain and weighed it, and when the two-bushel sack was full cut it off and it run from that sack into another, and I asked him what he charged per hundred bushels, and he said just according to the amount he threshed at each place. He said, "If a man has five hundred bushels I charge him eight bushels on the hundred; if he has a thousand or more I charge him seven bushels." I said to him, "You are hard on the poor man, aren't you?" "Oh, no," he says,

"If I have to move twice in a day it costs me that; I can't do so much work." I said, "I would like to get you to thresh on my farm for me." He said, "How much have you?" I said, "I think we will have ten or eleven thousand bushels." "Why," says he, "you are just the man I have been hunting. We will come right after dinner." We started down. He settled up with the man and I waited for him and took him back with me. I started him down and told him where to go into the field to thresh. When we got down we went through the field to the machine. Of course when I cut that with the header we stacked it into stacks in the center of the field. As we walked through the dead furrow he looked at the stubble, and he said, "How much do you think this will yield to the acre?" I said, "I think it will go over thirty bushels." He says, "No, I have threshed all the way from Brigham City to this place, and I have threshed in places where the stubble is twice as thick as this is, and," he says, "thirty bushels is the highest I have threshed." "You know," I said, "I don't raise wheat for the stubble." "What do you raise it for?" he said. I said, "For the heads." (Laughter.) "Why," says he, "there is not stubble enough here to make the heads." "Well," I said, "we will see after a while." We continued to walk through the field and walked to the machine and he went and put his fingers in the sack where the wheat was running, and he said, "I declare, this is running through faster than I have threshed yet." And he took a handful out and said, "It is beautiful wheat." I said, "I guess you will find it will go thirty bushels or more to the acre." I went to the stack and took a head out and said, "I will show you what I mean by raising wheat for the head." On the one side of the head of wheat there are three rows of kernels, one on each corner and one down the center and the same on the other side. I said to him, "Scratch out that center row, then turn it over and count the kernels in that head." He did so and he counted 26 kernels. "Now," I said, "if I should do as you do in Box Elder County, sow a bushel and a half to the acre, there would not be a thing in the center row." I said, "You count the heads on an acre of land and see how many bushels of wheat it will make." He said, "I never thought of such a thing. That beats anything I ever dreamed of. I am going to tell all my customers what you are doing when I come back."

I thought last night I would tell the Honorable John R. Barnes, of Kaysville, if I could see him after the meeting, that I will take pleasure in telling him today that instead of their sowing a bushel and a peck if he would have that cut down to a peck he would have raised more wheat on the acre than he did.

As I told you, since that time we never sow but from 35 to 40 pounds to the acre. When we got through threshing that 110 acres it made 40 bushels and 8 pounds to the acre. He said, "I never was so surprised in all my labors of threshing among the people." If you sow the wheat too thick it comes up so thick that it draws all of the substance and moisture

out of the ground until there is not moisture enough to support it, and it fails to fill out—doesn't mature.

Now I will relate another experience. I sowed, one year, 100 acres of rye—fall rye or winter rye. A man by the name of Sorensen who lived, neighbor to me wanted to buy some rye for seed—fifteen bushels, and he came to me to know if I could spare him that. I said, "Yes." He said, "Will you take work for it?" I said, "Yes, I would rather have work than money. Can you sow rye?" "Yes," he said, "I have sowed a thousand acres in Denmark." I said, "I want you to sow this hundred acres. How much can you sow in a day?" "Twenty acres." "All right, sir; if you will come to work for me five days I will board you and pay you three bushels a day, and that will be fifteen bushels." "All right, sir," he said. So he came. I told my boys to haul out a half a bushel to the acre. That was fifty bushels to the hundred acres. He came along and he says, "How much do you expect to sow to the acre?" I said, "Just half a bushel." He says: "You don't know anything about raising rye." I said, "No, I don't profess to know a great deal." He said, "We sow three bushels to the acre in Denmark." I said: "Look here, you are not in Denmark now." (Laughter.) "You are in Utah—Cache Valley—the richest valley in the country and one of the richest valleys in the state or in any country that I ever lived in, but I don't want you to sow but half a bushel. Can you do that?" "Oh, yes; I can sow a peck, if you want me to." I said, "I want a half bushel sowed, no more, no less." He went to work and sowed it and I paid him the fifteen bushels, and he went home and sowed fifteen bushels on the five acres—three bushels to the acre. After a while the rye came up. I was riding along past his place and his rye was up. He said, "What do you think of that for a crop? Don't that look nice?" His rye was up about six inches high. I said, "Yes." Mine was up, a little spear here and another five inches off, but in the spring mine began to stool out nice, and it grew up to my breast, with heads on it nearly seven inches long, so heavy that they bowed over, and his grew up about this high, with little heads on, about an inch and a quarter long. When I threshed mine it made 27 bushels to the acre. When he threshed his he just got 20 bushels from the five acres—just five bushels more than he seeded. (Laughter.) One grain of mine would have made a dozen of his. He learned something. He learned he was living in Utah and not in Denmark. (Laughter.)

Now all these things I tell you because I want the people to understand the best way of raising grain without water. Three years ago I delivered a lecture in the Agricultural College on dry farming, raising grain, lucerne, etc. Pretty soon I got a letter from one of the professors, the Hon. Charles J. Bran, from Washington, from the Department of Plant Life, stating that he had read my lecture copied in one of their papers. He said, "I would like you to write me as much in detail as possible, how to raise alfalfa, how to prepare the land, how much seed you sow per acre, what time of the year you sow it, and what time you prepare the land—tell me everything you can think of." I wrote him some ten or twelve

pages, explaining everything about it. He wrote back that he never was so interested. He said, "I am coming out next season to see your farm and talk with you." He came out that year and has come out every year since and brought his companions with him. He came to look at my place. He says, as we came along, "We want to talk of dry farming all the way. I will ask questions and you can answer them." We did so. When we got to the farm I said, "Here is the beginning of my farm." He said, "I would like to have you drive us right through." We turned in along the bottom and drove through the farm. My farm is fenced all around now, and then division fences, so that while I am summer fallowing here my stock is running on that to eat up the voluntary grain, which they do and do well. And we rode up through the field, and got up about half way and he says, "I wish you would let me get out." I stopped the team and he got out. He walked into the grain. It took him up about this high. He said, "I never saw the like of this in my life, never, dry farming." He came out again and said, "I wish you would go in there and I will take your picture." He was a shorter man than I am. I walked in and it took me just even here. He said, "The heads on your grain are larger and plumper and nicer than where we have plenty of rain all through the season. How long have you been at this work?" I told him I commenced in 1864. "Well," he says, "you are a wonder. Now, I would like to go into your alfalfa." We drove up into the alfalfa, which was already cut and in the shock, and we walked out into the field, and on the south of that is a row of box elders I planted some 12 or 13 years ago. He said, "I suppose you have plenty of water for them." I said, "No, no water." "Well, how do you manage it?" I said, "When I planted them I dug the holes down till I got the moisture; if I got down to moisture in two feet I stopped; if I had to go three feet I went three feet, and I planted my trees, which were ten feet long and about an inch thick and trimmed all of the limbs off and set them down." My neighbors told me I would kill the trees by digging so deep, but I said, "You see they are not dead yet and never will die; I put them down to moisture and they have been in moisture ever since, and they are doing well." I fenced them in and made a calf pasture, and the calves run around them, and now they are standing about twenty-five feet high. I have plenty of timber now to last me for fire wood. I thought I would tell you about this so that you will all know how to raise timber. Box elders are adapted to this country, and they will grow on dry farms if you put them in right.

Now as to the question of a man starting to dry farm, I consider this bill that is gotten up by the Hon. Reed Smoot for half a section of land the right thing. A man doesn't want less than 300 acres—if he can get it. If he doesn't know how to farm but one hundred at a time for the time being, I should advise a man, if he had to buy a dry farm, not to buy less than 300 acres, and if he doesn't know how to manage but one hundred he will learn gradually until finally he can manage the whole thing without trouble. (Applause.) One of our speakers last night from Nephi told us that a man should not have more than a quarter section, that that

would be plenty. But I advise a man to take no less than 300 acres, and if he can get 320 by filing on it, and if this law passes it will be just right for the dry farmer, and as he gradually learns dry farming in three years from the time he started he can manage 300 acres just as easy as he could 100 in the start. Last year I had in 800 acres of ground—815 acres—and all the hands that worked that land were four for the 815 acres. I think part of the season there was one little boy added to the number—three men and a young man about 17 and then a little boy helped part of that time. And we had over 20,000 bushels of wheat, or bushels of grain altogether. We had some barley and some oats planted. We got four cents per bushel more than the regular price for our wheat and sold it to a gentleman in Salt Lake.

Now I don't back down in telling people who have irrigated their farms, if you will quit irrigating I will promise you to raise more wheat and better wheat than you possibly can with irrigation. (Applause.) I can raise more wheat and better wheat than you can with a great deal less labor on my dry farm than you can on your irrigated farm.

Thoms Lisher, of Wellsville, told us just how he got along. He told us about manuring his land, and about the cost, and had it all on paper, and showed that he had cleared some \$14.00 per acre, and he raised a little over 50 bushels of irrigated wheat on a piece of land, I think of 40 acres—I think that is the quantity of acres, and he told how much time he had taken, and the cost of plowing, harrowing, etc., and hauling manure, and he hauled the manure for one dollar per load, and distributed it on the land. I told him that on 110 acres that same year—this was this same season—we had 40 bushels and 8 pounds on that 110 acres. I told him we had raised 40 bushels and 8 pounds on that piece of land, and that had been farmed for the last 40 years. It was the first piece I had broken, 40 years ago, and it had never had any manure, and it raised more that year than it ever had before, but we only crop it every other year. We summer fallow, one year and crop the next, and if we possibly can we plow it in the fall, and as a general thing we cut our stubble as high as possible, say two feet high, then we turn that under and there is food in that stubble to make grain. And as soon as the fall rains and spring rains come it falls upon that ground and it goes down and the next spring as soon as it is dry enough to work we put our discs to work and we work that over on top and that conserves the moisture in the ground below, and we continue to work it all summer to keep the weeds down. We don't let weeds grow on the summer fallow. We keep it as clean as possible. Just before sowing we put our leveler on and level it all off smooth—

MR. WHITE, of Beaver, Utah: One question I would like to ask right here. Do you find it injurious to pasture your summer fallowed land?

MR. FARRELL: No, sir; not if you don't put cattle on when it is wet.

A DELEGATE: What was the question?

MR. FARRELL: He wants to know if we find it injurious to pasture our summer fallowed land. Not unless you put stock on when it is too wet. We never allow ours to do that. Put them on when the land is dry and it does not hurt then.

MR. WHITE: You stated that in planting your box elder trees you dug down to where the ground was wet. Does that mean the surface water that raises?

MR. FARRELL: No, but we dug down to where the ground was moist.

MR. WHITE: Do you think where there is no surface water which comes close to the surface of the ground that you could raise trees the same as you do?

MR. FARRELL: I think you could raise trees better if the water was close to the top of the ground.

MR. WHITE: Where it is not close to the top; where the water is, say 20 feet from the ground?

MR. FARRELL: If you put trees down to where the ground is moist—sink down and get down from the top—dig down to where the ground is moist and plant your trees you will come out all right.

MR. ALLEN, from Utah: I would like to ask the gentleman if he knows the depth of the surface water where this grove is?

MR. FARRELL: I have made two or three flowing wells on my farm so we can have water for our stock, one drilled in the pasture, and we went down, I think the shortest distance was 170 feet (laughter) and we went down from that to 470 feet before we got water, and then we only got about a gallon, I think, in about fifteen minutes.

MR. WHITE: Isn't the surface water closer to the ground than that?

MR. FARRELL: Didn't find any closer than that. (Laughter.)

MR. JONES, from Utah: I would like to ask the gentleman which he considers the best for seeding—a seed drill or hand sowing?

MR. FARRELL: Oh, a drill, by all means. A press drill—the Superior Press drill I find to be the best.

MR. WHITE: Thank you.

MR. DALTON: I would like to ask Mr. Farrell what depth he plowed in the fall of the year, as considered to be the best depth for plowing?

MR. FARRELL: We don't plow less than eight inches deep on the stubble ground, and then once in three years we try to subsoil six inches deeper. I haven't got to that yet. I will explain that.

I had one field of wheat a few years ago—224 acres in it. This was on a section that I bought of the railroad, and I ran a fence down through the center, leaving a large field on each side half a mile long and half a mile wide. In the summer, just as the grain was turning ripe, I and one of my hands were walking through to look at it, and when we got pretty near the south end of the furrow—the dead furrow, I looked off to the southeast and I saw a patch of grain where the



wheat was about eight inches taller than the other, and perfectly green, while the other was turning ripe, and I said to him, "Let's go over to see what is the matter over there where that green spot of wheat is," and we found that the squirrels or some little underground fellows had been working there and they had rooted the ground up, and I said, "Now, they have been subsoiling here, and the moisture has gone down in that ground and it has kept that wheat growing, and you see how much larger the heads are and they are much greener, and the straw is much stouter, and heavier." I said, "Now, I am going to send and get me a subsoiler, and we will subsoil all over." When we summer fallowed that ground we subsoiled the whole thing.

A DELEGATE: How soon does subsoiling need to be repeated?

MR. FARRELL: I just told you that we calculated, if possible, to subsoil once in three years. That is often enough. So I had two teams, one on the sulky plow and one on the subsoiler, and I had a boy hired to run the subsoiler after the plow. That is—my boy took sick after a week's work, and a Dutchman I had with me said, "If you will let me pick my teams to suit myself I will run both." So he took the lively horses and put on the subsoiler and put the lazy ones on the plow. He sat on the plow and had a line tied to the other team and to his plow seat, and he plowed up the whole balance of that 224 acres. Of course he had to get off of his plow when he turned every corner, but he didn't have many turns so he didn't have to get off very often. The furrows were half a mile long.

CHAIRMAN M'CABE: Now it is a quarter past twelve and it is past our closing time. I am going to leave it to the audience which they would rather do, adjourn for the lunch hour now or have this talk continued the first thing after lunch.

A DELEGATE: Have it finished after we go to lunch.

MR. RIEPE: I would like to ask Mr. Farrell how much more subject matter he has to present. Maybe he hasn't but five or six minutes more.

MR. FARRELL: I am not half through yet.

On motion duly seconded the convention adjourned until two o'clock p. m.

#### AFTERNOON SESSION.

The Congress was called to order at 2:20 p. m. by Chairman McCabe.

CHAIRMAN M'CABE: Owing to the fact that this Congress had a little work to do we have delayed taking up this meeting almost twenty-five minutes, so we will have to have your undivided attention to get through with the program we have before us at the present time, so if you gentlemen in the rear will kindly come up to the front you will find plenty of seats here.

MR. ROBERTS, of North Dakota: The Committee on Resolutions has some very important matters to bring before the house, as well as

the Executive Committee. I would move that the program be postponed for a short time until these committees can report. I put that as a motion before the house, that we postpone action on the regular program until such time as the Committee on Resolutions can present resolutions to be acted upon.

The motion was duly seconded.

MR. ROBERTS: I move that the regular program be postponed for a short time until some matters that have been reported by the Resolutions Committee be put before the house for action.

MR. RIEPE: Is the Committee on Resolutions ready to report?

MR. ROBERTS: It is ready to report.

MR. RIEPE: I understand there are some resolutions that have not been acted upon by the committee. I thought it was not ready to report.

CHAIRMAN M'CABE: The motion before the house is that the regular program be suspended for a short time until we can act upon some resolutions and papers now on the table.

MR. RIEPE: I don't think that the Committee on Resolutions is ready to report, and if that is the case I would suggest the continuance of the program until they are ready to report.

PROF. CHILCOTT: May I state that there is one resolution that has been approved by the committee and on which we can take action now. There are some resolutions that are not ready to be reported, but I think it would expedite the business of the Congress if we could get this resolution before the body at the present time. The committee can then meet and take up what has been considered.

The question was called for.

The motion was then agreed to.

PROF. CHILCOTT: Your Committee on Resolutions wishes to introduce this as a committee resolution:

"Whereas, The final solution of the arid farm question rests upon the establishment of homes upon these lands, and

"Whereas, The establishment of these homes depends entirely upon the possibility of procuring water for domestic purposes, and

Further, That it is impossible for the small holder to investigate these possibilities for himself, we believe that the burden of this investigation should be borne by the states, and as this is entirely an agricultural question, we further believe that the funds appropriated by the states should be placed in the hands of the experts in charge of this work;

"Therefore, be it Resolved, By the Second Session of the Trans-Missouri Dry Farming Congress that we commend the recent act of the Utah Legislature in appropriating money for this purpose to the consideration of the states in the arid regions, and recommend that further appropriations be placed in the hands of State Experiment Stations, which shall determine upon the location of the wells, and shall superintend the construction of the same."

I move the adoption of this committee report.

The motion was then duly seconded.

PROF. CHILCOTT: I wish to say that this has grown out of discussions that I have had with various Utah farmers after the talk that was given—the very able talk that was given by Mr. Grace, I believe, one of your farmers here, in which he developed the idea that the absence of water, while he didn't dwell on it particularly, it was shown all through that the absence of water for domestic purposes was the great barrier to home building on these arid lands. It struck me that there was no problem of such vital interest to the home builders of Utah and other arid states as providing some means of getting water. You can't afford to let anything go undone that may provide water for domestic purposes. Now there is no class of men in any state that is so well provided with the requisite knowledge to locate these wells and supervise their construction as these men interested along the lines of agricultural experimentation, and it is for that reason it seemed to me such a resolution should be introduced here. Therefore it has been worked up and has received the approval of the committee, and I hope that it may be unanimously adopted by this Congress. (Applause.)

The motion was put to a vote and agreed to.

SECRETARY ROOT: There has come to us since the last announcement of the program two papers—one in particular from Prof. Forbes, of the Tuscon, Arizona, University Experiment Station. I think perhaps it is rather long to be read. We are hardly prepared to take care of it now. I will turn it over to the Chair and ask what shall be done with it.

CHAIRMAN M'CABE: I will leave to the members of the Congress their wishes in regard to Prof. Forbes' letter.

It was moved and seconded that the letter be put in the record, which motion was agreed to. The letter follows:

Tucson, Arizona, Jan. 19, 1908.

Dr. L. J. Briggs, Salt Lake City, Utah.

Dear Doctor Briggs:—Mr. Swingle kindly conveyed your suggestion that I should be present at the Trans-Missouri Dry Farming Congress in order to reiterate certain ideas which we hold down here concerning long-term leases of public lands in order that they may be made use of by stock men, dry farmers, or anyone else, under such conditions of tenure as will lead to their maximum development.

I am very sorry that in all probability I shall not be able to come; but would say that the ideas advanced from this station on previous occasions, and which are held by a dominant element among our stockmen, are expressed in the printed pages enclosed herewith. If you sympathize with these ideas, or if in the interests of full discussion you know someone who does, you might place them in the proper hands.

Thanking you for your message, and hoping that the Congress will be of importance and value to all concerned, I am,

Very truly yours,

R. H. FORBES, Director.

## THE STOCKMAN'S HOMESTEAD AND GRAZING RANGE ADMINISTRATION IN THE WEST.

(R. H. Forbes.)

The industrial condition which governs throughout more than 400,000,000 acres of western public grazing lands has been described many times recently in articles discussing the question of the proper disposal of these lands. In general, the situation is everywhere the same—temporary occupation without ownership or legal possessory rights, by stockmen, of that public domain whose purpose is to provide room and opportunity as long and as fully as possible for the nation's rapidly expanding population.

Mindful of such an important utility for our public lands, any damage to this national asset must be considered, virtually, as a sacrifice of national territory, inasmuch as its impairment means the loss of so much foothold and working room for prospective settlers. Yet exactly this has been the result of the misfit application of existing land laws to western conditions. These laws, virtually inoperative in a grazing country, have necessarily been supplemented by the unwritten law of the range, framed and enforced by those strong enough to take and hold possession for a brief term of years.

### Effects of Overgrazing.

The result of such occupation is, usually, that excessive numbers of animals are put upon this free pasture, the profits are run up as quickly as possible while yet the range remains free and then, when the grass is gone, when the plains and hillsides are converted into gullied barrens, and oftentimes, when the profits of the first years are cancelled by the losses of later ones, the nation's ruined estate is abandoned to the tender mercies of the next and more ruthless occupant who may still find something convertible thereon.

The effect of this unregulated and destructive tenure varies greatly with those conditions of soil, topography, rainfall, heat and frost which affect the endurance of a grazing country. More favored districts in more northerly, humid, or elevated situations still retain an important fraction of their primeval value; but in portions of the southwest, where the soils are sandy and easily washed, where the rainfall is light and often untimely, where the hot dry climate causes enormous evaporation, and where, consequently, the effects of unregulated grazing are most destructive, many great areas of formerly grassy country may be safely stated to be capable of supporting not one-tenth of the stock that once ranged there.

### Approximate Losses.

It may be assumed, probably without exaggerating the loss, that the public grazing ranges of the west now average not more than half of their original value—lands, too, which can never be irrigated and for

which there is no possible use but as grazing territory. Differently stated, this means that the United States, for want of proper laws to govern its public domain, has suffered a loss equal in effective value to, say, 200,000,000 acres of grazing lands—an area greater than the state of Texas or equal to a strip of territory 230 miles wide extending from the Rio Grande to the Canadian boundary. It is evident that only the wreckage of western grazing values remains to be legislated for and that the problems of the now depleted range are largely those of reconstruction for a failing country, occupied by more or less conflicting interests—by cattle, sheep, and goats, by large companies and by small individuals.

There are few remaining to defend the old order of "free grass for all;" for this regime, satisfactory enough when there was grass for all has, with the failure of the ranges, demonstrated its own ruinousness.

### **The Nature of the Problem.**

The problem confronting range interests at this time is to devise land laws which shall enable a maximum population to support itself in a pastoral country; and to make these laws so flexible as to apply to all grades, both best and poorest, of grazing lands, harmonize all kinds of stock interests thereon, and provide for the often unexpected development, through irrigation, of agricultural lands within formerly purely grazing districts.

The existing conditions are those of a country reduced by overgrazing and bad management to a fraction of its possible value, and requiring to be fenced, reseeded, repaired and protected in order to even partly restore that value.

### **Unsatisfactory Remedies Proposed.**

Practically the only proposals thus far made to remedy existing conditions are to lease the public lands in blocks at stated rents, or to issue permits to individuals to run stated numbers of animals upon specified portions of the public range.

The unsatisfactory nature of these proposals is attested, in part, by their repeated rejection by one or another faction of those concerned, and for reasons quite evident when the merits of the measures are considered. Lease or fence laws permitting the control of large bodies of land on the basis of competitive bids are usually favored by the wealthier and better tablished stock raisers who would be at an advantage under such laws, and are earnestly opposed by the small men who would be exterminated through their operation. Horizontal lease laws have been proposed providing for the leasing of all grazing lands at the same rate per acre of rental. When it is considered that different grazing districts may easily require all the way from 3 to 60 acres to support a single cow, the unjust discrimination against the more desert ranges, of a horizontal rate-per-acre lease law is too evident to require discussion.

The leasing idea, nevertheless, has a good foundation in the fact that it recognizes that in order to place the grazing industries on a stable basis,

stockmen, like farmers, must have control of the land upon which they operate; but methods have not yet been proposed for an open and equitable division of grazing lands among applicants therefor.

The permit system, also, in one form or another, has many advocates—possibly largely for the reason that this method has been put into practice on forest and Indian reserves and its results are known to those who would expect to take advantage of it. The permit system, however, is practically no better than free range with a tax added to the stockman's expenses and a more or less unsuccessful attempt on the part of the government to regulate the number of animals in a specified district. As under the free regime the stockman is not protected by assurance of permanent or long continued tenure of his range, he, consequently, desires to get the whole value out of his concession while it lasts and often yields to the temptation to place more animals upon his territory than his permit calls for. The destructive effects of the permit system as they are to be seen on certain Arizona reservations are not reassuring as to the good results of this method in practice.

#### Australian Experience and Results.

It is doubtful, in brief, that a satisfactory method of disposal for western grazing ranges and their use as such has been devised and we naturally turn at this time to Australia for suggestions. This country, which is and always has been, more a pastoral than an agricultural region, for the last 75 years has been making and remodeling her laws relating to the disposal of Crown lands to settlers. The fruits of this long experience are of unusual significance to us at the present time. As they now stand the land laws of various of the Australian states present the following sensible features: First, grazing lands are divided according to their capacity to carry stock into as many as four classes and settlers are permitted to occupy smaller or greater allotments of territory according to its quality. Second, these lands are occupied under long tenure leases, with renewal privileges, which give practically permanent control to the stockmen. In addition to the motive thus created to improve their leaseholds, they are also usually required by law to fence and otherwise improve their holdings. Third, the classification of lands and their allotment to settlers is done by Boards of Commissioners acting for the government with a view to correct judgment and equitable division of the public lands.

These are the leading features of those laws which have resulted from the better part of a century of Anglo-Saxon experience in a pastoral country.

The operation of these laws with reference to the development of pastoral industry is stated to be highly satisfactory. Vast areas of semi-desert lands, divided into comparatively small holdings, are legally occupied for long terms by stockmen who, prompted both by law and their own best interests, improve their holdings. Thus it is that in Australia an immense pastoral country has been fenced, substantial improvements are installed, provision is made against famine in dry years, animal pests

are exterminated, poisonous plants are eradicated and an era of improvement has apparently been inaugurated directly due to a recognition of the fact that the Anglo-Saxon must have proprietary interest in land if he is to be expected to improve its condition.

In unhappy contrast to the upbuilding of pastoral Australia is the reverse process everywhere evident in our own western states. The spoilation which has resulted, inevitably, from the lack of laws having for their object a saving administration of the range country, has resulted in a gradual but sure decline of its carrying capacity. In some districts, especially where, under stress of overgrazing, the soil is easily eroded by rainfall, this damage can never be repaired; in others, restriction of grazing, reseeding, and other remedial measures may effect a large measure of restoration.

As to what these remedial measures shall be in the United States there is of course great difference of opinion, influenced in part by the interests of those concerned and in part by ignorance of the problem itself.

#### **Principles on Which Sound Grazing Land Laws Must Rest.**

Successful grazing range laws must of necessity rest upon two kinds of knowledge—knowledge of the range itself—the forages that it bears, their habits of growth and reproduction, their food value for animals, the classification of grazing country into different grades, and the carrying capacity and endurance of these different kinds of range. This is a subject the study of which within the past few years has been vigorously entered upon by various economic botanists, especially by certain of the State Experiment Stations and by the United States Department of Agriculture.

The second sort of knowledge required is that derived from legislative experience in dealing with purely grazing lands elsewhere. The results of such experience are to be found in Australia probably more than in any other modern country.

Australian experience, considered together with the traditions of our own land laws points to the practicability in the United States of the stockman's homestead or long term leasehold in pastoral districts. The homestead idea, long-tried and well approved in this country is, briefly, that a settler shall be granted enough territory to afford him a living—enough and no more.

#### **The Meaning of the Homestead.**

As applied to the Mississippi Valley a homestead meant 160 acres of land, this area being found in the average instance sufficient for a farming family. But when the tide of immigration pushed west of the 100th meridian into the semi-arid regions it was found either that 160 acres with water was worth a great deal more or that 160 acres without water was worth vastly less than that same area back in the Mississippi Valley.

The far greater value of irrigated lands has been recognized and provided for under the terms of the Newlands Act, and, according to the productive capacity of the lands developed by the Reclamation Service,

the settler will be granted a greater or less portion adequate for his support.

Continuing the application of the idea, why should we not apportion grazing ranges on precisely the same principle, granting a sufficient acreage for a sufficient time to afford the small stockman the necessary territory to support the herd whose increase shall give him a living income, and protecting him in his tenure for a sufficient length of time to create an incentive for the maintenance and improvement of his range.

In Australia, from 1,280 to 40,000 acres of grazing lands, according to quality, are thus leased, at rates proportionate to value, for terms of from fourteen to forty-two years. Many benefits are experienced under these provisions. Sheep and cattle wars are rendered impossible since each interest is confined to its own territory. Co-operative arrangements are entered into extensively where co-operation permits of more economical management of large adjoining leaseholds. Grazing leaseholds are operated in connection with cultivated farms; and humane methods of handling stock are rendered possible.

#### Some Suggestions.

The operation of the grazing leasehold plan implies the creation of a suitable means for classifying grazing lands according to their productive capacity, and designating the various areas in different districts which will support, without destruction of the range, the income producing herd of the small stockman.

Proper provisions for residence upon and improvement of holdings should be made, insuring good faith of occupants and varying with conditions in different districts.

Co-operation should be recognized and provided for in districts where the sparseness of the range, the scarcity of water, and the comparative costliness of fencing makes it advisable for neighbors to act jointly.

Provision should be made for the renewal of a long tenure lease by the original holder provided the land remains purely grazing country; but in case of possible artesian or irrigation development provision should also be made for throwing the leasehold open to more intensive culture.

On these and other concurrent lines, as seems to have been demonstrated by the Anglo-Saxon sheep and cattlemen of Australia, it should be possible to fulfill the purpose of our public domain and place upon it a maximum number of American citizens secure in their rights to sufficient territory to secure a living for themselves.

MR. RIEPE: Mr. Chairman, I move that the program be continued so that we can hear Mr. Farrell.

The motion was duly seconded.

CHAIRMAN M'CABE: It is moved and seconded that the program be continued. Are you ready for the question?

SECRETARY ROOT: Is it time for remarks on this question?

CHAIRMAN M'CABE: Yes, sir; it is time right now.

SECRETARY ROOT: I would like to state that the report of the committee was absolutely set for 2:30, to report on the place of our



next meeting, and technically we have got to follow the clock on that. I mention that for the good of the Congress.

The motion to continue the program was then agreed to.

CHAIRMAN M'CABE: Mr. Farrell, it is up to you.

MR. FARRELL: Mr. Chairman and Gentlemen: Now I would suggest before commencing that you will not interrupt me while I am talking upon the subject and ask three or four questions, because it confuses me, so I can't tell you those things that will be beneficial to you. I don't want it said about me after I get through that I am like the Methodist preacher I once heard of who kept telling the people while he was preaching to come to Jesus, but he forgot to tell them the road. (Laughter.) I want to tell you the road to dry farming, and I don't want you to interfere with me until I get through with one subject, then you can ask questions.

MR. NOWELL, from Wyoming: I have kept quiet through this whole meeting. I have come here almost for the purpose of hearing the reports of the Resolution and Executive Committees, and I have to go away at four o'clock, and a large number of others have to go at four o'clock. While I would be very much pleased to listen to the gentleman's remarks and hope that I may remain long enough to hear him, I do think that we have business that has been set for this hour, which a large number of these people have come to listen to, and that is the report of the Executive Committee, which was made a special order at half past two o'clock, and with all due respect to the speaker, and to those who wish the program to be continued, I would like to make a motion that we hear this report or present a resolution that we adhere to the plan of hearing this report at half past two, which is the plan now. A great many of us have to go away and I wish we could—

A DELEGATE: I second that motion.

CHAIRMAN M'CABE: It has been regularly moved and seconded that the hour being half past two, the time set for hearing the report of the Executive Committee, that we proceed to hear the report. Are you ready for the question?

The question was called for, and the motion agreed to.

CHAIRMAN M'CABE: Gentlemen, while we are waiting, I will say that here is a rather long letter from Silas C. Mason, from the Department of Agriculture. You can see that it is rather lengthy, too long to read in the limited time we have. What is the wish of the Congress in regard to this letter. Would you like to hear it read or shall it be placed on file?

MR. RIEPE: I move that it be placed on file and printed afterwards for general circulation.

The motion was duly seconded.

MR. HARRINGTON, of Utah: What does that mean, placing it on file?

CHAIRMAN M'CABE: It will be placed on file to go into the official proceedings.

The motion was agreed to.

### DRY LAND ARBORICULTURE.

(By Silas C. Mason, Arboriculturist, Plant Life History Investigations, Bureau of Plant Industry, Department of Agriculture.)

#### Outline of Work of Arboriculturist.

With the establishment of the office of Dry Land Arboriculturist as a part of the work of the Bureau of Plant Industry a year ago, it was frankly admitted that the title was not one easily susceptible of definition. While the work was intended to be an accompaniment of dry land agriculture it must avoid the field of the forester on the one hand and that of the old line horticulturist and pomologist on the other. It was scarcely anticipated that this work would be directed to the cultivation of tree crops wholly without irrigation, but the expectation was that the chief study would be devoted to such trees and shrubs as would produce valuable products, either of fruits or for other economic purposes aside from forest products, with the minimum use of water. Thus far the work has been undertaken only with plants possible of culture in the arid southwestern region where the rainfall is light and canal or artesian water must be used with great economy and where the climate is so warm that plants of the warm temperate and semi-tropical regions may be grown. It is, however, by no means the intention that the work shall be confined to these regions, as there are many possibilities for the development of dry land arboreal crops in the plains region of the great west and southwest.

#### Structure of Desert Plants.

That no tree or woody plant can survive except it receives some supply of water is a question which needs no discussion. As one leaves the Mississippi Valley region on the east and passes out into the semi-arid and arid plains there is a notable change in the character of the vegetation. Plants of the same species may be found so changed in their habits of growth as to be scarcely recognizable. Plants of the same families and genera become developed into strange new species, having a special adaptation to the conditions found in the land of little rain.

#### Suppression of the Leaf System.

One of the most common changes observed in native plants is the suppression of the leaf system.

Families of plants, some of whose members possess broad and delicately constructed leaves are found to be equipped with leaves greatly reduced in size and changed in character to a thick, leathery structure, or perhaps covered with a dense hairiness or pubescence. All of these characteristics are very evidently a defense against the too rapid transpiration of such moisture as the plants may receive from the soil through the roots. Few whose lives have been spent in the eastern states, favored with an abundance of rain, have any realization of the desiccating

power of some of the winds which sweep over the prairie and desert regions. Even in the Kaw Valley of central Kansas I have seen a March wind so drying in its nature that young leaves upon lilac, elm and mulberry trees just showing the fresh tender green which indicated the advent of spring were rolled up, dried and strewn upon the ground in handfuls, for all the world like dried tea leaves. Centuries of adaptation to climatic conditions where such winds are liable to prevail cannot but develop, generation after generation, individuals having characteristics which enable them to resist to the greatest degree possible these drying influences. There are two main types along which these developments take place—in one case, many leaves are retained upon the plants but these either possessed of a pubescent, or a resinous or varnished coating, or of a tough, leathery structure and a peculiarly arranged system of cells, which enables them to resist to the utmost the transpiration of the precious particles of water.

In the other type of plants, the leaf system becomes almost wanting. The leaves are few, greatly reduced in size, even to mere scales barely indicating the position at which normal leaves would have occurred, and the work of assimilation is performed by means of a greatly developed addition to the chylorophyll cells in the stems themselves. Of course, familiar examples of these types are met with in the cacti and more especially the prickly pears. Examples much less familiar are found in many trees and shrubs of the order Leguminosae, notably species of the Palo Verde and still more strikingly in the genus *Dalea*. In the Palo Verde we have a much-branched tree, whose entire trunk, branches and twigs are of a vivid green color. It is armed, as most desert plants must be, with innumerable spines, which represent the suppression of tiny twigs and branches. The compound leaves are very slender, the leaflets reduced to less than a quarter of an inch in length, oftentimes so small as to require close inspection to detect them. In the *Dalea*, notably *Dalea spinosa*, we have a much-branched, low tree of a dull lead or smoke color, armed with a remarkable system of spines or thorns, and with its leaf system so reduced as to be very difficult to detect at all. Yet each of these trees is capable of producing in a very short time a dense covering of blossoms, making them objects of beauty well worth a long journey to see. Pods are set and seeds developed in a remarkably short time, and apparently the remainder of the summer spent in simple resistance to the fierce heat of the region.

The familiar milkweed, or *Asclepias*, has a representative in the Colorado desert, which produces numerous rush like, shining green stems, so nearly devoid of leaves that they are only detected in narrow scale like forms at the nodes. Several members of the Labiatae, nearly related genera to *Salvia*, possess a similar system of almost naked green stems.

#### Drouth Resistant Root Systems.

With this brief mention of the drouth resistant provisions of the stems of plants, we should consider the arrangement of the roots. Actual desert

conditions as to soil moisture may be real or only apparent. In most cases the desert receives only the scant supply of moisture, which falls from the clouds. This may, as in the case of the region along the Colorado about Yuma and Needles, not average more than 2 1-2 inches annually, or in the region about Casa Grande and Phoenix in southwest Arizona may rise to an average of 7 or 8 1-2 inches. Still more favored zones may receive a precipitation of 12 to 15 inches, like the western portion of Kansas, eastern Colorado and the Panhandle country of Texas, and so on up to the section where general farming becomes possible.

Can any kind of vegetation maintain a permanent existence in a region of 2 1-2 inches of rainfall? The traveler on any of the mesa or upland regions of southwestern California or Arizona must at once answer yes, because he knows that the desert is clothed with herbage of its own kind, and that among this herbage is a considerable community of animal life which subsists upon it. These are the true desert or dry-land plants, having their tops and root systems so constructed as to enable them to maintain an existence upon the minimum of moisture. Another class of plants not less truly of the desert will be found along the washes where the occasional rainfall from the mountains discharges a sheet of water over the sand toward the desert for a brief time. Here tiny plants of great beauty will spring up, produce perhaps a single blossom on the top of a stalk of not more than two inches in height, perfect their seed, and die as the moisture evaporates, but in their brief day they have performed the important function of all plant life—produced seed for another generation. During more favorable seasons when the rainfall and scant flow of water is increased these same plants may grow to great size and luxuriance, producing myriads of blossoms and seed. Such is the wonderful adaptation of desert plant life to conditions.

#### **Submerged Rivers (Underground.)**

But every desert traveler knows that there are limited stretches of country clothed with vegetation of a much more permanent character, whose growth seems to be out of proportion to the recorded rainfall of the district. For instance, along the so-called "Santa Cruz River," from the Mexican boundary line down past Tucson, and then through a gap in the mountains out into the wide plain in the neighborhood of Casa Grande there are more or less continuous groves of mesquite. A careful survey of this so-called river course shows that at times the floods from the mountains cut deep channels into the loose friable soil, making veritable river courses of a primitive character, but that as the grade is reduced farther along, this channel entirely disappears, and the flood waters simply spread out over a wide area scarcely defined by any channel at all. Where these channels are cut, as in the Indian Reservation at Mission San Xavier del Bac, springs may be found oozing out of these banks in sufficient numbers to furnish a flow of water for small irrigation canals. This water may be all taken out leaving the main channel simply a dry bed of gravel, as is found along the main wagon road between the Mission and

Tucson, but a little farther down other springs may again supply the channel with water, so that gardens and small ranches may be irrigated, as will be found to be the case near the city of Tucson. A third small canal system is taken out a few miles below Tucson, supplying a few ranches, and then the water disappears altogether only to be discovered by the digging of wells. However, the wide strip of mesquite trees persists, and the experienced plainsman knows that wherever these mesquite trees are found water may be had for the digging. In some of the newly eroded channels near Tucson, I photographed the banks where masses of mesquite roots were hanging like ropes from trees still growing upon the top of the bank, and ready to be dislodged by the next heavy flood which should erode the soil from under them. The secret of their existence was revealed. They have been able to send roots down through the mellow soil and gravel, in some instances, 20 or 30 feet, to the layer of permanent water. The Santa Cruz River, then, is a real river, but running, as the old plainsman declared to be the case regarding the headwaters of the Saline River in western Kansas "bottom side up"—sand and gravel above and water below. While these mesquite trees are true desert trees, on the other hand they are adapting themselves to peculiar conditions, but still securing a fairly abundant supply of moisture. They are not the true drouth resistant trees.

#### The True Desert Plants.

Passing from the mesquite belt of the valley toward the high ground on either side one soon comes into a zone of that much abused shrub, variously known as greasewood, creosote bush, and botanically as *Covellia* or *Larrea*. Whenever this is reached we know that the area where trees may penetrate to a subterranean source of water has passed, and that we are now in a community of plant life where they must subsist on the moisture afforded by the local rainfall. Yet these creosote bushes will be found growing in considerable luxuriance, and with them associated other species, all apparently able to thrive in their environments and maintain a vigorous existence. The investigations of Dr. Cannon, of the Desert Laboratory of the Carnegie Institute, at Tucson, Ariz., have shown that the root systems of the creosote bush and also of the Giant Cactus, which grows upon still higher ground, consist of frequent branching superficial roots radiating at a depth of only a few inches below the surface of the soil, and prepared to appropriate very quickly the rain that penetrates the soil.

The traveler cannot avoid the thought that if species of economic value for the production of fruit or other products could be found equally well adapted to these conditions these vast stretches of mesa might be made to yield fair revenues for the support of mankind.

Have we any cultivated plants of economic importance able to exist under similar conditions, having a branch and leaf system able to resist the burning heat and evaporation of the desert atmosphere and a root system able to appropriate the scant moisture that falls upon the ground,

and so maintain a permanent existence? The most conclusive answer to this question will be found by going to the desert region of the Sahara, in Tunis, where Mr. Kearney, one of the explorers for the Department of Agriculture, has studied a remarkable industry in the growth of olives for the production of oil. Not only this, but his observations have been confirmed by ancient historical documents, showing that in that desert region in the palmy days of the Roman Empire there existed a vast Moorish civilization. Populous well-built cities, some of whose names even are not now known, are evidenced by vast ruins; temples of magnificent proportions are still grand in their desolation; the ruins of the second largest coliseum in the world are found there; and the explanation of it all is afforded by the frequent occurrence of ruins of great stone oil mills, with the stones for the grinding of the olives and the vats for the receiving of the oil. A careful historian has recorded even the details of the industry, telling how the olives were ground and pressed, how the oil was refined and clarified, how it was transported in huge vessels of bullock skins upon carts drawn by bullocks, and even how the tanned leather was sewn into hose pipes and how an ingenious artisan had constructed a pump by which the oil was lifted from the stone tanks and forced into these skin receptacles. A Roman general, whose name I cannot recall, having become offended at the remissness of some little village of this region, whose very place upon the map is now lost, levied a fine upon them of 30,000 gallons of olive oil, and as was the habit of Roman generals, collected it. With the overrunning of the country by the Arabs in all probability the greater extent of this magnificent industry was destroyed, to be revived in modern times by their descendants.

Must we suppose this country enjoyed a greater rainfall than at present? There is no evidence to support this conclusion. Remains of reservoirs, canals and aqueducts for the most careful economizing of the water afforded by the country still exist, but of no greater capacity than would be required to handle the rainfall of the present day. A good many of these ancient olive trees seem to have survived, and the industry under French management is today being expanded and developed to its utmost, so that the port of Sfax, on the Mediterranean, is again becoming an important export point for this oil production. The carefully kept statistics of the French show the rainfall during recent years to have ranged from about 6 1-2 inches to 15 inches, with an average of 8 1-2 inches.

One who has seen the prosperous olive orchards in the irrigated regions of California must not imagine that this series of orchards is managed in a similar way. In California olive groves the planting distance is from 21 to 24 feet. In Tunis groves it is 60 to 80 feet.

#### **Recent Methods of Dry-Land Farming.**

Concerning the subject of the most recent developments in the methods of dry-land farming, the best of which are supposed to be embodied in the so-called "Campbell" system of soil culture, if we may judge Mr. Campbell's ancestry correctly by his name, while his forbears were still

in the fastness of the Scottish highlands and while England was being invaded by the Roman legions, the cultivators of these olive orchards in Tunis were practicing a refinement of dry land soil culture which has scarcely been excelled with all of our agricultural developments. They probably did not possess the steel discs nor the subsurface packers, but they understood a method which accomplished the same purpose and their camel-drawn plow kept the soil between these scattering olive trees in perfect tilth, economizing every drop of rainfall; first, by preventing its running off from the soil, and, second, by the dust mulch.

### The Chemlali Olive.

Of several varieties grown the most important is known as the Chemlali, having rigid branches producing many small twigs, and a peculiarly stiff and resistant leaf system. The fruit is small, oval and very rich in oil, for the production of which it is alone adapted. This is doubtless a seedling of desert origin which through centuries of culture has evinced its superiority under these trying situations.

### Olive Orchards in the United States.

Have we anything in olive culture analogous to this in the United States? A few months ago as far as knowledge possessed in the Department of Agriculture is concerned, we should have been obliged to answer no, but just about a year ago while visiting the Indian Agency, at Sacaton, Arizona, I learned of an olive plantation which had been made near Casa Grande station on a once prosperous branch of the Florence Canal. Visiting the place, I found that 14 years ago an area of about 20 acres had been planted to various fruits, including grape vines, peaches, apricots, figs, and about five acres of olives. For seven years past the failure of the Florence Canal had cut off the supply of water. The average rainfall of the region amounts to about 8 1-2 inches, practically the same as that of the olive district in Tunis. Instead of growing particular varieties of olives adapted to the dry land conditions this ground had been set to the ordinary types of olives grown in the French and Italian districts. They had been set 24 feet apart each way in a granitic sandy soil having a considerable basis of red clay. When visited it was evident that the trees had been badly overrun by stock, and strange as it may seem to an eastern man, the stock had browsed upon this olive grove very greedily, but wherever the branching of the trees had formed a sufficient hedge around the outside of the stool to allow the central shoots to grow untouched, they had reached a height in many cases of 12 to 15 feet, and in some few of 18 to 20 feet. The foliage was green and luxuriant, making the grove visible across the desert a mile away. An examination of the root system showed that these trees were true dry land trees, possessing no tap root, nor system of roots penetrating to a great depth, but gathering their sole supply of moisture from the soil at a depth of from two or three to twelve inches. At a distance of 12 feet from the trees on the 24-foot squares, and even to the halfway distance on the diagonal, the

earth was found to be occupied with fine feeding roots, the majority of them being in a stratum of from four to eight inches below the surface. A system of rather round, smooth roots, not exceeding two inches in diameter at the base of the tree, and reducing rapidly in size as they put out numerous branches, occupied the soil quite evenly in all directions from the trees, only a few small laterals penetrating to a depth of more than 14 inches. From these branched a very profuse number of fine feeding roots, terminating in little spongioles, were prepared to appropriate every particle of moisture as soon as a slight rain should fall.

#### **Olives at Palm Springs.**

In the neighborhood of Palm Springs, in the upper end of the Colorado desert, I found a considerably larger plantation of about the same age, which had been planted in the palmy days of the Whitewater Canal system and the development of the so-called "Palmdale" settlement. Here again for seven years the trees had been without water, and this in a soil much more friable and less retentive of moisture, lacking almost wholly the clay element found in the soil at Casa Grande. The planting distance had been 20 feet instead of 24. The average rainfall for the region is only 4 1-2 inches, the summer heat frequently reaches 116 to 122 degrees, with the evaporation intense, the relative atmospheric humidity often being as low as 6 to 10 per cent. Yet under all these adverse conditions a large majority of these olive trees had lived and even made quite a little growth, some of them reaching a height of seven or eight feet, though the majority were only three to six feet in height. They were very bushy and compact in habit, and carried their branches very close to the ground. The dense canopy of shining dark green leaves effectually shielded the branches and trunk from the fierce heat of the summer sun. I could not learn that these trees had ever borne any fruit, but it seems indeed remarkable that they should have been able to maintain an existence and make growth under these adverse conditions. They were actually competing on their own ground with the creosote bush and various other species of desert shrubs.

#### **Possibility of the Olive Industry in the United States.**

With these examples of successful growth of the olive as a tree, although even at Casa Grande the fruiting had been quite limited, we feel that we have strong ground for the belief that the Chemlali variety of olive grown in Tunis, which has been imported by the Department of Agriculture and is already giving much promise in an experimental way in this country, may be grown over large areas of land in southwestern Texas, and southern Arizona and California if the Arab methods of cultivation, wide planting and careful interculture are followed out. The culture would be limited to regions affording a suitable soil, the necessary rainfall and a minimum temperature above that fatal to olive growth.



### Pistache Culture.

The highest price nut to be found in American markets (retailing for as much as \$1.50 per pound) is the green pistache, used for coloring ice creams and other confections, and sometimes eaten as other nuts. Little was known of the origin or specific identity of this until the matter was taken up by the Agricultural Department explorers and the genus, involved in considerable botanical confusion, revised and monographed by Dr. Walter T. Swingle, in charge of the Laboratory of Plant Life History.

The pistache seems to be a considerably drouth resistant tree, and one capable of enduring more cold than the olive or the citrus fruits. It belongs to the great order Anacardiaceae, along with the sumach, and besides the cultivated variety producing the edible nut, comprises a number of other species, natives of southern and central Asia.

A fact long known botanically, but the importance of which had escaped attention, is that a species of pistache grows wild in southern Texas, along some of the tributaries of the Rio Grande. The possibilities of using this as a stock for the nut bearing varieties are being investigated by the Department. A large number of seedlings of several species useful for stocks have been grown at the Plant Introduction Garden at Chico, California, and disseminated among ranchmen over quite a wide area of the southwest, with a view of having them budded to choice nut producing varieties as soon as the proper time arrives.

### Varieties of the Zizyphus, etc.

A fruit which is in no wise related to the true date is sometimes to be found in the Chinese stalls in San Francisco, and other Pacific coast towns, under the name of the Chinese date. This is a cultivated type of a species of the *Zizyphus*, closely allied to the Jujube, from which the celebrated Jujube Paste is manufactured, and has been developed to a high condition of perfection in China since remote times. The occurrence of three species of wild *Zizyphus* in the arid regions of southern California, Arizona and Texas leads to the belief that this very delicious fruit may be successfully grown in the arid regions of the southwest. Seeds of one of these wild species discovered growing in abundance in the canons of the San Jacinto range have been collected for the purpose of growing nursery stocks, and our agricultural explorers are in quest of the choice varieties in the hill country of China.

A leguminous tree, closely allied to the mesquit trees, so familiar to all frequenters of the arid southwestern valleys is the Carob, *Ceratonia siliqua*, the tree bearing the strange food product called St. John's Bread, the glutinous sugary pods of which are now imported in considerable quantities and sold in several localities in the United States where grocers must cater to the wants of Poles and Russian Mennonites, who use them on the occasion of certain religious festivals. These pods, though affording a very coarse and innutritious food for human beings, are very nutritious and highly valued as a food for stock and are produced in large quantities in many Mediterranean sections, but especially on the

Island of Corsica. They become a valuable concentrated forage for cavalry horses, and are utilized in great quantities for that purpose. Many tons of them are also shipped to Great Britain, where they are used in the preparation of certain brands of stock food. There seems to be little doubt that they may be grown in a profitable way and utilized in a similar manner over a very considerable area of our warmer southwestern country. The fact of their affinity with the well-known mesquite and screw bean, which have been such valuable stock foods, and also consumed as food by the Indians in the arid regions, would lead us to hope for an important development in the Carob growing industry.

#### **Cultivation of Native Drouth Resistant Plants.**

Nor should it be supposed that the arboricultural investigations are confined alone to imported plants. The arid regions of the United States are not, as many suppose, bare of vegetation, but even in the driest situations many plants are growing, even shrubs and trees, which, except for a few primitive uses that the Indians make of them, are not known to possess much value. A careful study of these, however, is revealing many interesting possibilities, a few of which it may be worth while to mention in this paper.

#### **The Yucca Plant.**

Frequenters of the higher desert regions are familiar with the stretches of yucca growth, even attaining to the dignity of forests in some instances. Dwellers of the more northern regions, where yucca plants are found, are familiar with them only as producing dry, capsular seed vessels, as remote as possible from affording any valuable product. Those familiar with the yucca farther south and extending over into Mexico know that there are two classes of the fruits—the capsular fruited species having the more northern and eastern range, but in the extreme southwest a few species growing which have fruits of the baccate or berry-like nature, crudely resembling the banana. It is only known to a few desert frequenters that with some of these species the types are quite variable, some of the fruits being large and of an edible quality. In Old Mexico a good many of these types are known, varieties occasionally producing fruits of such desirable quality as to make them well worth cultivation. These are being sought for by the Department explorers, and the possibilities of their culture in the regions occupied by the ordinary baccate fruited types are being investigated.

It is too much to predict that we shall have the equivalent of the tropical banana, which are consumed in such quantities, produced upon these arid yucca bearing deserts, but it is not at all beyond possibility that large quantities of valuable food product may yet be secured from these sources.

#### **Genus Prunus.**

Another interesting field is found in the new and varied types of the genus Prunus, represented by the wild plums and cherries. Some of these

are found growing in conditions showing not only extreme drouth resistance, but, more difficult to attain, resistance to large quantities of alkali in the soil. Interesting possibilities at once arise as to using these as stocks for almonds and apricots, which are already known to be considerably more at home in the arid sections than the peach. A number of these wild types are more nearly allied to the old world *Amygdalus*, which has given us through long years of selection and cultivation the peach, apricot, almond and nectarine. It is a fact known only to a few close observers of desert flora that some of these species, natives of the southwest, produce edible fruits of a greatly variable character, and, in a few instances, of fine quality, having a flavor and aroma all their own. To the arboriculturist these facts at once suggest the possibilities of producing many interesting hybrids with the old world types of *Amygdalus*, from which floras they have been separated, perhaps since early Tertiary times, geologically speaking.

#### In Conclusion.

The dry-land arboriculturist and agriculturist must be constantly on the alert for every hint which nature can give them as to the possibilities which may lie hidden in these vast regions between the fertile Mississippi Valley and the Pacific Slope.

In the foregoing paper I have briefly sketched a few of these possibilities as they occurred to me.

MR. BOWMAN, of Idaho: Prior to the report of the Executive Committee I desire to make a statement on behalf of Idaho. To those gentlemen who pledged me their efforts and votes for the coming Congress at Idaho Falls, I desire to thank you. The movement has grown to such great and glorious importance that at the present time I do not feel that Idaho Falls could properly house and feed you. For that reason, at this time Idaho Falls will not be a candidate for the next Congress. (Applause.) But I wish to assure you this, that it will only be a short time until we will come and we will ask you to meet with us at Idaho Falls, and whenever we do you can rest assured that you will be more royally treated than you ever were in your lives. (Applause.)

MR. HENDERSON, from Wyoming: Gentlemen of the Convention: Being a representative of Wyoming, I appreciate very much the remarks of the Chairman of the Executive Committee, Mr. Bowman. It takes a big city to have the heart to say that we withdraw, and, gentlemen, it takes a larger man to say "We withdraw," and in Mr. Bowman the town of Idaho Falls has a big man, and some day we hope to see him face the people of a greater congress than the Trans-Missouri Dry Farming Congress. (Applause.)

CHAIRMAN M'CABE: I believe the Committee is now ready to report. We will have the report read.

MR. HENDERSON: Mr. Chairman, there was one matter I forgot in making my little talk. I went down to Mr. Bowman and the people of Idaho and told them that when the time comes that Idaho is willing, and

the city of Idaho Falls wishes the Dry Farming Congress you can expect Wyoming to be right at your back. Wyoming runs right down against the Teton Basin, and the Snake River, which is the beautiful stream that irrigates the valley in which our friend Mr. Bowman lives, has its source in the state of Wyoming. That is the reason the valley down there is so good, (laughter) and we expect to be at the meeting, wherever it may be, to help, and to cast our vote for Idaho Falls when she is ready to entertain this convention. (Applause.)

CHAIRMAN M' CABE: Gentlemen, as I am somewhat interested in the report of this Executive Committee, I would ask to have Mr. Bowman take the chair, if he pleases.

Mr. F. C. Bowman, of Idaho Falls, Idaho, then assumed the chairmanship of the Congress.

CHAIRMAN BOWMAN: The Secretary will read the report of the Executive Committee.

The Secretary then read the report, as follows:

Report of the Executive Committee of the Third Trans-Missouri Dry Farming Congress.

Your Committee beg leave to submit the following report:

Finance.—We have devised three methods of raising funds, for carrying on the work of the Congress. These are as follows:

1. Membership fees.
2. Popular subscription.
3. The publication of a treatise on dry farming. This is to be prepared and issued under direction of the Executive Committee, and from the proceeds of the sale of this book the Committee expects to realize the sum of \$5,000.00.

Place of Meeting.—Your Committee recommends that Cheyenne, Wyoming, be selected as the place for holding the Third Session of the Trans-Missouri Dry Farming Congress, and that the date of meeting be decided upon by the Executive Committee later and advertised.

Permanent Secretary.—Mr. Fisher Harris, of Salt Lake City, was elected Permanent Secretary of the Third Trans-Missouri Dry Farming Congress at a salary to be fixed by the Executive Committee. (Applause.)

The Secretary was authorized to employ an assistant who shall, under the direction of the Secretary, create a bureau of statistical information on dry farming and perform such other duties as shall be assigned to him by the Secretary. Remuneration for such service to be fixed by the Secretary, subject to the approval of the Executive Committee.

Membership.—The following members were elected by the Executive Committee under the provisions of Section 7 of the Constitution: H. J. Evans, of Garden City, Kansas, in place of E. M. TenEyck; J. M. Patterson, of The Dalles, Oregon, in place of W. J. Kerr.

Respectfully submitted,

F. C. BOWMAN, Chairman.

SAMUEL H. LEA, Secretary.

SECRETARY ROOT: Another report from the Executive Committee. Minority report of the Executive Committee of the Trans-Missouri Dry Farming Congress:

The undersigned begs leave to submit and recommend the following change in the majority report:

Place of Meeting.—To substitute the words "Douglas, Arizona," in place of "Cheyenne, Wyoming."

Respectfully submitted,

GEORGE J. M'CABE.

CHAIRMAN BOWMAN: Gentlemen, you have heard the reading of the report of the Executive Committee. What is your pleasure?

MR. BUFFUM, of Wyoming: I move the adoption of the majority report of the Executive Committee, as read:

MR. COOK, of Cheyenne, Wyo.: I second the motion.

CHAIRMAN BOWMAN: It has been moved and seconded that the majority report of the Executive Committee be approved. Are there any remarks?

MR. FRED J. KIESEL, of Utah: I wish to substitute a name in place of Cheyenne. I have another place in view that I know can well take care of the next Trans-Missouri Dry Farming Congress. I have a city in mind and I am sure that I will be backed by the whole delegation when I name the place—Ontario, Oregon. This is a place situated nearly in the middle of Snake River. I am truly sorry to hear our chairman take back the name of Idaho Falls, because I am satisfied from what I know of that country that they could have very well taken care of and maintained the Congress. Still, to maintain the honor and glory of the Snake River, I will say, Ontario, Oregon, and invite the Congress there the same as my friend Cleveland has done with the Irrigation Congress. I know there was a time and a day when it was said that we could not have an irrigation congress and make a success of it at all. I believe all will admit that this time we did make a tremendous success of it.

Now, then, I propose Ontario, Oregon, advisedly. I know we can take care of the Congress there and do justice to the cause in a section tremendously interested in the movement of dry farming, because there are people of Oregon who have come some five or six hundred miles to attend this Congress. That is because they are interested in it. It needs it more. Now, Cheyenne is naturally a dry farming country. They have got springs and have a lot of water to farm it. That is a natural dry farming country. The people down there understand it. I want this Congress to go to a place where none of these conditions exist. For this reason, I ask you, gentlemen, to second my motion to take the Congress to Ontario, and I will ask you to come there, and I promise you a Congress equal to any.

MR. GEORGE J. M'CABE, of Arizona: I feel that no one here feels remorse more than I do today. I feel that my constituents at home have made a mistake in choosing a farmer to come to this Congress instead

of an orator, and I am very sorry that when I go home I will have to tell my people that from this time on it will require someone that is able to get up before an audience and make a talk, and that is not me.

Now in regard to Arizona, gentlemen, I am appealing to you honest men to bring the next Congress to Arizona. Why? Is it because we have any experimental stations? No. Is it because we have any irrigation? No. Is it because we can get any water to irrigate? No. Arizona has a thousand qualifications that I wish I were able to put before you in the right light today. There are two which seem to be paramount. One is that anyone coming to Arizona and staying thirty days will never leave, and anyone coming there and staying ten days and leaving is sure to come back. The other qualification which I have in mind is that anyone drinking water from the Hassayampa River will never tell the truth thereafter. I am sorry that I have to admit that I have imbibed freely. (Laughter and applause.) But, gentlemen, I hope you will believe me today in part—yes, in whole, for I am going to try to confine myself to the truth, and if you have any doubt in regard to what I say in regard to Arizona, wire and find out and see how many people will tell you that McCabe does try to tell you the truth even if he has drunk water from the Hassayampa River.

In regard to Douglas. Douglas is a town you have heard of repeatedly here in this convention. You have heard read telegram after telegram inviting you people to Douglas. Why? Do they want you there for any particular reason, or why are they sending on telegrams from every Board of Trade throughout the county? There are four telegrams here from different mayors throughout my county. Why are these people so anxious to have you there? Is it necessary that Douglas should have the advertising? No, sir. I will tell you why it is. There are only a few of us farmers down there that have been trying to exist for a number of years in our weak way, and it is almost impossible for us to get along. I have been talking to these people for a number of years, and telling what was in view if they would come to our rescue, and when I left there I told some of these people that perhaps in six weeks, or six months, or six years they would awaken to appreciate the effect of a Congress in their city. In coming through Benson—there is an industrial school at Benson—the Superintendent told me in coming through Benson—patted me on the shoulder and he said, "God bless you, Mack; I hope you will win out." He says, "I want you to tell these people of the Congress for me if you will, that I and my boys went out here on this land and cut six hundred tons of hay." He said, "Four hundred tons of it sold for \$15 and the other 200 at \$20."

Now that is the kind of land that I am before you with, gentlemen, trying to draw your attention to, and asking you for your assistance. Our county is 82 miles east and west and 75 miles north and south. We have one small river, the San Pedro River, running northeast and southwest across one quarter. About four years ago we thought it advisable to

take up with the Agricultural Department to see if there was any available water so that we could dam this river for irrigation. We sent to the Agricultural Department and they sent back a surveyor and made surveys and were trying to find out the possibilities of storing water, and he found it was of such little consequence when he came to look it over that he reported back and said, "I find that Cochise County can store no water by a dam site." (Long applause.) Right there I found that it was absolutely unnecessary to try to get any water for irrigation.

Now then, we are here trying to adopt the next best method of farming, which we believe is dry farming. Our county, as I told you, has something like four million acres. Two million acres of this is unoccupied government land, surveyed, and open for location. It is land that needs absolutely no clearing whatever.

In regard to the place we are inviting you to come, I want to say one thing in regard to Douglas. Six years ago Douglas wasn't known. It was merely an arid piece of land, occupied by coyotes, jack rabbits and prairie dogs. Today there is a city there of 18,000 people. Right here I might as well say that there is a hotel there that stands second to none west of the Mississippi river. Douglas, all told, has either six or eight hotels. If you come to Douglas I assure you that we will show you the largest train of cars hauled in the world; we will show you the largest plant of machinery in the United States, a smelting plant; we will show you the largest power plant in the United States; we will show you a city that has its streets paved, cement sidewalks, and an electric power plant that stands second to none for the size of the city; and it has its electric cars and a great many other things which I could go on and enumerate that might be of interest to you. But I feel and I am sure that you gentlemen as farmers can appreciate my standing before you and asking you to come to a place of this kind. If we should go up a little farther north from our country I could show you some very fine orange groves, the largest dam in the world, the largest artificial reservoir in the world and a great many other things that might be of interest. But I feel that there is not one of you here but what the name Arizona alone should appeal to you, and furthermore I feel that everyone of you would be only too glad to step across into a foreign country.

Now, gentlemen, I am not here trying to antagonize anybody. I have not asked one person to assist me in pulling this Congress to Douglas, Arizona, for the simple reason that as a wire-puller I know naught. That is a lesson that I have never learned, and my hair is too gray now to jump out and button-hole a fellow and try to pull wires. I don't know anything about it and I don't want to. I am before you with the plain facts as they exist in my county. I have been there for something over fifteen years, and if there is anyone that could appreciate a climate I should think they surely would appreciate it in fifteen years, and I can say conscientiously that so far as Arizona climate is concerned it is superior to anything I have ever seen, and I have been around. I have made my circle and have come back to Arizona. I know I cannot interest

you in the least, for I have not the ability to (laughter) interest you, I should say, therefore, I am making my appeal as a practical farmer, to say we earnestly invite you to try to come to Douglas, Arizona. (Applause.)

SECRETARY ROOT: Registrar's Office, 3 p. m. Five hundred and fifty-eight delegates registered at this hour. Of this number 194 have taken out yearly membership and 14 life membership, making \$334.00 taken in for membership.

Membership cards are ready for all now, and those who have not received membership cards are requested to call at Registrar's Office and get them. More cash is wanted and we urge all who have not joined to go to the office and take out membership card at once.

CHAIRMAN BOWMAN: Are there any further remarks on the motion before the house? The question is upon the adoption of the majority report of the Executive Committee. All in favor of that motion will signify by saying aye.

MR. MILNER: Mr. Chairman, are we not to vote on the amendment?

CHAIRMAN BOWMAN: There is no second to the motion.

A DELEGATE: I second the motion of the gentleman.

MR. MILNER: I simply asked if the minority report is before the house?

CHAIRMAN BOWMAN: Do you move the adoption of the minority report?

MR. MILNER: I think as it now stands, in order to get it before the house, I will second the motion of the gentleman from Arizona.

CHAIRMAN BOWMAN: Then, gentlemen, the motion before the house is the adoption of the minority report of the Executive Committee. The question really is on the place of our next meeting. The majority report recommends Cheyenne, Wyoming, and the minority report recommends Douglas, Arizona. The vote now is on the minority report—the adoption of the minority report. Are you ready for the question?

The question was called for.

CHAIRMAN BOWMAN: All in favor of adopting the minority report will signify by saying aye.

A DELEGATE: Mr. Chairman, I arise to a point of order. Where any important transaction comes before this Congress under our constitution we vote by states. You can't get at any legal idea of the wish of this Congress by an aye and nay vote. Voting on this report should be by states. Some states are represented and some states are not. Some states have one vote and some have 150. I merely call attention to the fact that under our constitution voting on a question of this kind it is necessary to vote by states.

CHAIRMAN BOWMAN: The gentleman is in order. However, I think it is a fact that if there is no question as to which way the vote is going it would not be illegal to vote as we did, and it would save time. The secretary will call the roll.

MR. HENDERSON: I move the suspension of the rules and that we vote by a viva voce vote without the necessity of calling the roll.



CHAIRMAN BOWMAN: I will read the Article of the Constitution and you will see that it won't take long to call the roll.

The chairman then read Article VI of the Constitution.

CHAIRMAN BOWMAN: While the Secretary is calling the roll I would suggest that the various delegations get together.

A DELEGATE: I move that we continue the program.

MR. M'CABE: I cannot understand the idea of that. I believe there is no one in the audience but who is ready to vote. They know how they want to vote. I can't see any object in delaying this. We might as well have the vote now as later on. There is a great deal of wire-pulling going on, and that is what I am trying to get away from.

CHAIRMAN BOWMAN: We are voting on the adoption of the minority report, which includes the entire report of the committee except by adopting the minority report we put the next Congress at Douglas, Arizona.

MR. PAXMAN, of Utah: It appears to me we cannot do business unless we have our delegates together so as to vote intelligently, so I move you that we take a ten minutes' recess.

The motion was duly seconded and agreed to.

The Congress then took a recess of ten minutes, after which the Congress was called to order and the Secretary was asked to call the roll on the adoption of the minority report of the Executive Committee.

The Congress then proceeded to vote by states on the question of the adoption of the minority report, the vote standing 22 in the affirmative and 57 in the negative.

MR. M'CABE, from Arizona: In behalf of Arizona, I want to say to those voting for this next Congress for 1908 to go to Arizona, in behalf of my constituents at home, I want to assure you that we appreciate your efforts very much.

Now, Mr. Chairman, I move you that we make this a unanimous vote to go to Wyoming; that we unanimously adopt the majority report of the Executive Committee. (Applause.)

The motion was duly seconded.

CHAIRMAN BOWMAN: It is now moved and seconded that the majority report of the Executive Committee be unanimously adopted. All in favor of that motion will signify it by saying aye.

The motion was unanimously agreed to.

MR. HENDERSON, of Wyoming: Gentlemen of the Convention: I wish to express to you the appreciation of the Mayor of the City of Cheyenne and the people of the State of Wyoming for your support of the City of Cheyenne as the next convention city of the Trans-Missouri Dry Farming Congress. We thank you very much and we assure you, gentlemen, that our hospitality is as boundless as the prairies on which we are built, and when you come there we will extend to you the glad hand, and we will endeavor to make the next Congress as good as the second one, and if we can we are going to strive to make it a better one, (applause) and we hope to have you each and all there, and when you

come we trust that when you go away the memories you will carry away with you may be as delightful as your anticipations and good wishes for the success of that Congress are at this time. (Applause.)

Chairman McCabe here resumed the chair.

CHAIRMAN M'CABE: If there is nothing else before the Congress we will proceed with the regular program. I believe, however, there is one resolution, which the Secretary will read.

The Secretary then read the resolution, as follows:

"Whereas, It has been demonstrated that our so-called arid country is susceptible of a high state of cultivation, under proper well-known methods, and

"Whereas, It is granted that irrigation is salutary and an efficient reinforcement to dry farming,

"Therefore, Be It Resolved, That the second session of the Trans-Missouri Dry Farming Congress hereby goes on record as highly endorsing and commending the work which has been done by the National Irrigation Congress and pledges its support in the continuation of its laudable efforts."

On motion the resolution was adopted.

MR. LIVINGSTON, of Utah: Is there any other report from the Committee on Resolutions except what has already been read by the Secretary and passed upon by the Congress?

CHAIRMAN M'CABE: There is none on the table, no, sir.

MR. GLEASON, of Utah: I move the continuation of the program.

MR. M'CABE: We are going to continue without a motion. Just withdraw your motion and we will go ahead.

MR. FARRELL: In continuing my address, I wish to say that three or four persons met me this afternoon as I was coming to the meeting and stated that they thought perhaps there was plenty of water close to the surface of the ground causing the grain and alfalfa to do so well. I will relate a circumstance that happened some four years ago. Several gentlemen came up. They wanted to visit my farm and see the grain, hay, etc., growing, and they thought that there must be a big seepage from the mountain west of me. I said, "All right, our next trip will be over here on top of the mountain, as I have forty acres of grain growing there." So we went past the house and ordered dinner as we went by, and went up on top of the mountain. I said, "Now, you are on top, you can see both ways, and the grain reached over both ways. I would like one of you to walk out into that grain thirty feet." He walked out into the grain and it took him about to his breast. "I declare," he says, "this is just as good, and the heads are just as heavy and as plump as the other down on the bottom." I says, "There is no seepage here, only what comes from above, consequently it is the work that we put on the ground that brings the good results." He said, "What is that work?" "We plow our land deep, cultivate it well and keep the weeds down, keep the water, and snow, the melting snow, keep the moisture in the ground by our surface cultivation. We cultivate it continuously, and sow it early so that we will

get a good root in the ground and by plowing late in the fall." I want to tell you in cultivating it in the spring you see you have that winter's supply of water held there through the summer, then you sow it early in the fall and it has plenty of moisture to bring it up.

I want to relate right here another little circumstance. My son is present here and was present at that time. I ordered a new drill and we had our grain bought and I hauled the drill onto the ground where we were going to sow wheat, and the young man that was sent over to put up the drill from the wagon department, he says, "Are you going to sow wheat right here?" I told him, yes. He says, "It will never grow; it will sprout and grow up and die." We told him to take the rod that went through the drill to regulate the amount of seed, and stick it into the ground four inches and let it remain there a few minutes. He did so. "Now, pull it up and see how it looks." There was about two inches at the top that was perfectly dry, and two inches at the lower end covered with little particles of soil or a kind of sweat. I said, "We sow the grain down four inches into that moisture, and this mulch we have on top of the ground acts as a protector, and it will sprout that grain and bring it up in ten days." I met him about two weeks afterwards and he said, "I went and put up a drill over at Cache Junction the other day and I got a good look at your grain." He said, "I could see the grain up for eighty rods over the field; beautiful. I was surprised." If you keep the ground well worked up, keep the weeds down, and that keeps the moisture in, then you see it has had one winter's moisture, then after it grows it gets the next winter's moisture, so that one crop has two years' moisture, and the sun will continually bring it up until the grain is perfectly matured. Now the ground on top of the mountain averaged between 30 and 33 bushels per acre last year. You know where that mountain is, between Cache Valley and Box Elder County, and we sow grain there every year. I got about two sections of railroad land, and it goes clear over the mountain onto the other side. I wanted to make a well for culinary purposes, and I wanted to drill a well close to the house, which is up in the valley, and the man that run it said, "I would advise you to go down near the barn, because it will save you perhaps a hundred feet." So we went down there. I told him to go down until he got plenty of water. He continued to go down and went down 350 feet to the water, and the water came up within fifteen feet of the top. I said, "Go on down." He went down 470 feet, but we could not get it an inch higher. I said, "You can quit now and we will put a pump on there." We have got a pump on there, and during our threshing and heading we never can pump that dry. We have always got plenty of water, and the finest kind of water. But we had to go 470 feet to get it up as high as that.

Now, in cultivating your soil don't forget to plow it deep—not less than eight or nine inches, then if you want to subsoil that will leave the soil dropping in the bottom of the furrow so that you are not turning that subsoil dirt on top that has not been sterilized, and that

won't produce like the top soil, but you get plenty of room for the moisture to settle, and it will take the sun twice as long to bring that lower six inches up as it will the first six inches.

Now then, some have asked me about planting and sowing and preparing the ground for lucerne. If you possibly can, always plow it in the fall of the year, and let it remain rough, and the next spring, as early as possible, go onto it with your disc and your harrows and work it over real nice, and sow about ten pounds of lucerne seed and a half bushel of oats with that seed, and in the fall you will have a good crop of hay, of oats and lucerne for your teams. Some think that the oats will take too much substance out of the ground, but they will be so thin it won't make any difference, and there will be plenty on top to shade that lucerne and act as a nurse crop, and you will have a fine feed in that oats, and it will be just about in the milk when it will make most beautiful hay.

Some have asked me to tell about planting potatoes and preparing the ground for them. I want to relate a circumstance that will perhaps make it a little more plain. In delivering a lecture in one of our northern states a couple of years ago on the subject of dry farming, when I got through telling them about planting wheat and raising it and threshing, etc., and planting lucerne and so forth, one gentleman got up. I told them they might ask some questions if they wished to and I would answer them to the best of my ability, and one gentleman got up and says, "I have been farming ever since I was knee high, and no man can tell me how to plant wheat or anything else in the ground." The bishop of the ward sat next to me. He says, while he was talking, "He is always abusing everything that is good, and I want you to give him a rap, if you can." After he sat down I said, "Are you through?" "Yes, sir." I said, "I have met lots of men who talked just like you and they haven't learned to plant potatoes scientifically." He said, "I could tell you how to plant potatoes." I said, "All right, come up; I am always ready to learn from anybody, whether they are young or old." The bishop called him up. He got up and told us how he planted potatoes. He said, "I haul out ten or twelve loads of manure to the acre in the fall, and plow that ground not less than eight inches deep; plow it in the fall and leave it rough until spring. As soon as spring comes and the ground is dry enough I cut my potatoes. I pick the very best I can get—the largest and smoothest, and cut them in two lengthwise, and make two seeds out of each potato, and then I take my team and plow a furrow up and down on the other side and have my boys drop the potatoes in these furrows, then I follow with a plow and cover them over, drop the potatoes and cover them over with the plow, then when they are all done I harrow them over nice and smooth, and when they get up about 3 1-2 or 4 inches I and all my boys get in there with the hoe and straddle the row and cut the weeds out, then," he says, "we take a cultivator and cultivate the middle, and we cultivate them two or three times until they get about eight or ten inches high, then we take our mold board plow and run one furrow down and throw the dirt to the right, turn it back and throw the dirt to the left, and hill them up in

this way, then we water them about once in ten days, generally give them four or five waterings through the season, and we raise as high as 200 bushels to the acre." Then he quit. Then I got up. I said, "Now, gentlemen, I thought that was just about the way. Now, I will tell you how to raise potatoes. This gentleman commences just right. He hauls out ten or twelve loads of manure to the acre in the fall and plows it in eight inches deep. That is just right. Leave it rough till spring, and from that time on he is radically wrong. In the spring of the year, as soon as the ground gets dry enough, take your disc and disc it crosswise, then harrow lengthwise, and work it over until it is perfectly fine and nice, but don't plow the furrows with your mold board plow. Take a shovel plow and if it is a long one, which mine is—I have one 14 inches long and 14 inches wide at the top—you take a gunny sack and roll it up until it is three inches wide and wrap that around the plow six inches from the point, put a piece of wire once around it and twist it good and tight and keep it there, and bring the wire up around the sandboard of the plow so it will not slip down and slip up, because the plow is wider, then run your furrows two and a half feet apart, six inches deep, then in place of cutting your potatoes through and making two sets of it, cut the nose end off, where so many eyes are, and cut them so you will have two eyes on a set, and drop your potatoes in the ground two inches apart in the way that the eye will be down." One man said, "Hold on, please; tell us the reason for putting the eye down." I said, "I suppose you never knew anything to come up out of the ground until it took root, and if you put the eye up the roots have to go clear around that potato and into the ground. If the eye is down it will take root immediately and then the sprout comes right up and they will come up several days quicker that way." They were satisfied. "Then when you get them all planted in this wise take your leveler and level the ground off nice, and just as soon as ever the first leaves appear starting out of the ground take your harrow, with a boy and a span of horses, and harrow them lengthwise, and when you get through at the other corner leave the harrow there and in a week's time set the boy on again and harrow it crosswise."

MR. CHILCOTT: Mr. Chairman, I desire to interrupt the speaker on account of a peculiar condition here that the Executive Committee is in. It offers a resolution, and it cannot proceed with its other work until it knows whether this resolution will receive the sanction of this Congress. If it does then they can proceed with their work, and if it does not they are at a standstill, so I am going to ask the present speaker to allow me to introduce a resolution which will take but a moment. I am very sorry to have to interrupt the speaker in this way. Do I get recognition from the Chair for the reporting of this resolution?

CHAIRMAN M'CABE: Go ahead.

PROF. CHILCOTT: This resolution originated in the Executive Committee, was reported to the Committee on Resolutions and has been approved by that committee.

"Be It Resolved, That Article II of the Constitution be modified to read as follows: The officers of the Congress shall consist of a President, three Vice-Presidents, a Secretary, a Treasurer and an Executive Committee of one member from each Trans-Missouri state or territory and the District of Columbia. The President and the three Vice-Presidents of the Congress shall be named by the convention in session. The Secretary and the Treasurer shall be elected by the Executive Committee, shall be required to give guarantee company bonds in the amount determined by the committee, and the accounts shall be annually audited. The Executive Committee shall be selected by the delegation of their respective states and territories. The President and Secretary shall be ex-officio members of the Executive Committee."

I move the adoption of the report by the Congress.

The motion was duly seconded, and being put to a vote was agreed to.

PROF. CHILCOTT: Another short resolution. "Resolved, That it is the sense of this Congress that a vote of thanks be extended to the Utah Agricultural College for the excellent exhibit and decoration displayed in this assembly hall."

I move the adoption of the resolution.

The motion was duly seconded and agreed to.

PROF. CHILCOTT: I thank you, Mr. Farrell, for the courtesy in allowing me to make the report.

MR. FARRELL: After harrowing it lengthwise leave your harrow in the corner where you finish and in the next following week harrow that lengthwise again, and continue to do so, first lengthwise and then crosswise until your potatoes are large enough to have a team commence breaking, then you can put your harrow away and bring out your cultivator, and cultivate the rows good and deep, five or six inches deep, in the middle of them. Then after a while, when the potatoes get about eight inches high, take your cultivator, take that cloth off and run that cultivator the whole length of your field and hill them up——"

A DELEGATE: You mean the shovel plow?

MR. FARRELL: The shovel plow, I should say, and run up each row one way and down the other until you have finished it all; then if you have water don't water them but once, just as they are coming into bloom, and that will cover the ground, and they won't need any more moisture, and if you will do this and your ground is in good trim, instead of raising 200 bushels you will raise from 700 to 1,000 bushels per acre. (Applause.)

Now, there was one old Danishman in that meeting, and he moved down there the next year, and he bought a city lot, and it was in pretty good cultivation, and he planted a quarter of an acre much in the way I told him, and attended to it in that way. He only had one horse, he plowed it with one horse, and attended to it just in this wise, and James Campbell, who keeps a store there, will tell you that he has sold from that quarter of an acre of the best potatoes he has got, 217 bushels of potatoes from that quarter acre, planted and attended to in this wise. This old

gentleman, after I got through telling about this, said, "Do you harrow the potatoes after they are dug?" "Why, certainly," I said. "We have a machine in our country where we raise potatoes and have them come along with the wagon and they shovel them out with the scoop shovel into a bin and a boy turns it and the large potatoes drop in one sack and the small ones in the other. That is the way we harrow them after they are dug." You will find if you plant your potatoes in this wise they won't be lumpy. If you water them after they are set they will have some lumps. Now that is the way to raise potatoes.

Now then, there are lots of people that will ask lots of questions after this meeting is over. When you go home they will want to know many things. Many people will come to me. I have had them here. I scarcely had time to go and eat my lunch after the first meeting, and I am willing to go without a meal in order to tell people what I know about dry farming in all its parts, but wherever I go they have told me, "Why don't you publish a book?" I did so, and I have a book which can be bought at the Desert Book Store. Many people say, "You ought to charge a dollar for that book." I said, "No, we want the people to know and two bits is all we ask for it." You can get it for that, for two bits, which, if I knew just one-half as much as I tell the people in that when I first commenced it would have saved me several thousands of dollars in loss of my crops. You can go home, if you take one of these books, put it in your bookcase, and when you want to raise wheat, oats, barley, potatoes or trees for fire wood. Every farmer, and dry farmers especially, ought to have one corner in his farm in trees, say two or three acres, and in a few years you will have plenty of timber to make your fire wood without suffering from the coal famine like we did a year ago. I have plenty of wood on my farm today that I can commence taking now. Say where there are three or four trees growing up I can take two of them and leave the rest, and that way I will have plenty for years for fire wood, and the next year go out and get another one and have plenty of wood for another year, etc. If you will plant black elders you will find when they get big enough for fire wood just cut every other tree, and after they get big enough to make a stick of stove-wood cut them off and then they will spread out and grow ten feet high, and in three or four years they will make three or four times the timber, and you will have all of the fire wood you want. It is a hardy wood, and makes a good singletree or double tree, and fence posts, a good post, and it lasts well in the ground, and you will have plenty of fire wood and fence posts right at home without having to send off and buy posts at twenty or twenty-five cents apiece. Just black elders. Remember that. Plant them deep. When you plant them out dig the holes big enough and deep enough until you have moisture, and work that ground over nicely and plant them and then you can let them go and they will do all right.

MR. HOLDAWAY, of Utah: What process do you take your seeds through to get them to germinate—the black elders?

MR. FARRELL: Just go to work in the first place and put it into a bowl over some warm water, boiling hot, and let it stay there over night, and the next morning drain it off, let it lay over day and the next night you will find sprouts starting, and you can take it and plant it in the ground where you have got it already made nice and moist, and you will find it will be up in a short time.

MR. HOLDAWAY: I haven't noticed you referring to the use of a leveler on your ground. Do you use one?

MR. FARRELL: Yes, sir; after you plow your ground, before you sow it, you make your leveler 14 or 16 feet long out of two-inch plank. That is what I made mine of, and then three feet from the front you put a piece across about two by four, and cut half of the end of that out and put one end through and make a pole two inches square and put it through and put a pin in on each end, and six feet from the hind end; at the same end put some cross bars, and put some screws into them so that you can take them out again when you have done your leveling, and get the boy to ride on that and go cross-wise and every lump that it comes to it will level that off and drop it into the holes or dead furrows in the ground. You see it is 16 feet long and when it comes to the hollows it will gradually leave that dirt in the holes and that ground will be perfectly level. When the fall comes and you want to put the leveler away take the screws out and put it all up overhead in your shed until next season and it will keep perfectly straight and nice and dry.

MR. HOLDAWAY: How wide is the leveler?

MR. FARRELL: Ten feet long. Put two good span of horses on it if there is a heavy person on it, and it will be all they want to take.

MR. HOLDAWAY: Have you ever dug any surface wells on your ground to know the depth to the surface water?

MR. FARRELL: We dug a well right up where my house stands. There is a small spring, and I dug a well and from that spring there is water comes into the well underground about 12 feet deep, but I have dug wells below that. One of my neighbors had no water at all; he had no spring near his place, and I let him dig a well on my place, and he went some 30 feet deep, some 35 years ago, but he could not get any water, and he filled it up, and he had to come up to my place to get water. I found a man in Logan who was boring for water and I took him over onto my farm and he went down onto the bottom and went down 170 feet and he got water, then this neighbor of mine asked me if I would not let him go into the stream I had down through the center of my farm and make a well, and I told him, certainly, and he went down there and got a well there at 185 feet, and then he bought another piece of land above mine half a mile and he made a well there and got water there, so he left the well and I paid him for the pipe he put in it, and that makes me a good well for my horses and cattle to water when we are plowing or harrowing or threshing.

MR. HOLDAWAY: I understand from this your wells are piped instead of being dug down?



MR. FARRELL: They are piped down; yes, sir.

MR. HOLDAWAY: I thought perhaps you had considerable surface water or water somewhere near the surface, and wondered if you have ever dug down an open well?

MR. FARRELL: You will remember I told you he dug down some thirty feet but got no water. It was perfectly dry, and he filled it up. After I had got a well at 170 feet he went down in the stream half way across my farm and he went down 185 feet. It has a very slow flow there. It would take two or three minutes for one foot of water to run out. Still we have a long trough there and it makes water enough to water our stock.

If there are any other questions you wish to ask that I can answer you I am willing to do the best I can.

MR. BENNION: I would like to ask what is the acreage of this farm, and what it averages?

MR. FARRELL: The acreage of my farm is altogether 1,740 acres, and it runs from the mountain into Box Elder County, and I rent that farm. I have a good house, barn, stables, granary, and I rent that farm. There is 480 acres in that farm I rent to one man. He has 170 acres of that in this year in summer fallow, and sowed this last fall. That has averaged from 30 to 45 bushels to the acre. Then the farm on the east side of the mountain, there is nearly 1,300 acres in that altogether, and that will go 32 or 33 in fall grain, to 45 and a little over 45, we have had, but generally it will average about 33.

MR. TOLTON, of Utah: Do you crop every year?

MR. FARRELL: We never crop every year, only every other year.

MR. TOLTON: How about the next year?

MR. FARRELL: We summer fallow one year, as I told you. I have got my maximum elevation fence down the center and a road beside of it, and we travel down that road and summer fallow on one side of the fence this year and raise grain on the other side, and the next year we summer fallow that and raise grain on the other.

MR. TOLTON: All winter wheat?

MR. FARRELL: Winter wheat, oats and barley.

MR. DALTON, of Utah: I would like to ask Mr. Farrell if I understood him to say he raised 800 bushels of potatoes without irrigation or whether he did that under irrigation, and I would like to ask while I am on my feet if he has ever raised corn in dry-land farming?

MR. FARRELL: I broke up, one season, 100 acres down on the bottom about half a mile or nearly so from my house. Some of you know where my house stands on the farm, right alongside the county road. I broke 100 acres, plowed it up, good and deep. It was grass. I turned it over and worked it good, and I sowed that broadcast to corn. I sowed two bushels to the acre and it came up real nice, grew up eight and in some places ten feet high and had corn on about from four to six inches long, two or three ears of corn on a stalk and in the fall I wanted to have it cut before it was dead—wanted to cut it green, and I went and asked a man what he would charge me an acre to cut it, and

shock it per acre, and he said six dollars. My son was on the farm then. He was about fourteen. He said, "Papa, don't you give it." He says, "I believe I can cut it with the binder." I had a wire binder at the time. "All right," I said, "you can try." So he tried it with the binder and cut it first rate, but the corn was so heavy that it would not bind, it came down so fast. After a while he went to the willow fence and pulled out a willow and cut a fork on it about six inches long, and he got it so that he could reach over the elevator box and he kept pushing the butts down as he drove along, and he cut the hundred acres that way and bound it up good with wire, and I had the little ones, the boys and girls, go in the field about every other day and turn these bundles over and they cured splendidly, and I filled my barn, 186 feet long and 20 feet wide, over the horses, and had the finest food I ever had. But since that time the boys find it much less work in plowing and sowing wheat than they would in planting corn, because if you plant corn in that land it will need plowing and working and cultivating so much, and they don't like so much work. It is less work to raise wheat. They would rather raise the wheat and buy their corn.

MR. HALL, of Weber County, Utah: Will you explain what your motive power is on the farm?

MR. FARRELL: Our motive power is altogether horses and mares. (Laughter.) Now I had several men ask me to get a steam plow, but I found on inquiry that if I had my farm to break now I would get a steam plow to do it with. I would not think of breaking it up with horses. But inasmuch as my farm is broken up and in good cultivation, I use horses and mares and the colts I raise from those mares—I have something like 25 mares and we have got a number of thoroughbred jacks there, and we are raising colts, and the colts that come from these mares we expect to pay all our hired help without any trouble. If I had a steam engine it would cost us \$75 or \$80 a month for an engineer, and \$50 or \$60 for hands to do the rest of the work; it would take a team to haul water, and another to haul coal, and consequently we find that instead of hiring all that work we can do our own plowing and sowing and the mares are raising colts, and we are paying for our hired help in that way.

A DELEGATE from Wyoming: I am requested to ask Mr. Farrell what kind of fall wheat he recommends for dry farming, and also what experience he has had with *Bromus Inermis* on dry farming?

MR. FARRELL: I have tried a great many kinds of fall wheat and spring wheat. But now I never raise spring wheat, for this reason: Sometimes we have an early fall and the ground freezes up before we get our wheat all sowed, and then we use spring wheat in the spring—work it over and sow spring wheat on ground that is worked in the fall, plowed over in the fall. You can raise splendid spring wheat. A few years ago I had enough to sow—good spring wheat enough to sow two acres, and we broke up a piece of old lucerne that had been in for many years and sowed it, worked it over right good and sowed it and got 69

bushels of this wheat. We took four bundles of that wheat to the fair, and four bundles of barley and four bundles of oats, and took a prize for all of them. My fall wheat, as I said, I have raised a great many kinds, but I have come to the conclusion on my farm there is none equal to the Gold Coin. It is a splendid wheat. Millers up there say it is No. 1 milling wheat. Loftus wheat is a good wheat, but it grows tall and it has a very small straw and it will fall over, and if you have a rain and a little wind it will fall over. But the Gold Coin has a good stiff straw and stands up, and if you will notice nearly every kind of wheat one inch from the top of the head it tapers off and comes to a sharp point, while the Gold Coin looks as if it had been cut off where it begins to taper, and it is as large at the head as anywhere, and has good plump kernels at the head, just as plump as it is in the middle or anywhere. It yields fine and it don't smut bad. If you vitriol it you use about one pound of vitriol to six bushels of wheat. I told you how I vitriol. In front of my granary I have a porch where I keep my fanning mill and so forth, sacks and anything I want to use, and about 12 feet from that porch I put a barrel and mix my vitriol in it and I make a trough of two inch plank—take a plank 14 inches wide and two inches thick and one on the sides one inch by six. That makes a trough four inches deep. I put one end on the barrel and the other end on the porch, reaching higher than the barrel, and I get out a bushel and a half of wheat out of the granary, run it through the fanning mill, clean it and sack it and put it in the barrel with the vitriol, and while that is there I go and get another sack and clean that, and by the time I have got that clean the other sack has got enough, and I take it out and put the other sack in the barrel and carry that up to the head of the trough, turn the sack upside down, and then every particle, as the moisture runs through, touches every side of your grain, and what surplus vitriol there is runs back into this trough into the barrel, and I continue that until I fill that trough full of sacks, letting it remain in the trough until tomorrow morning, then it is dry enough to sow, and I take that out before breakfast and put it into the wagon, and fill up that trough again in the same way, and that remains until the next morning, and I continue to do that just as long as I am sowing wheat. We have always got one lot ahead, and there is enough in the trough to do us one day, and we are never troubled about smutty wheat. We use one pound to six bushels of wheat.

PROF CHILCOTT: The Resolution Committee would like to report.

CHAIRMAN M'CABE: I would just say, I believe that Mr. Farrell is just about through, perhaps.

DELEGATE from Wyoming: I put a question before, and the speaker was interrupted before he got to it. I would like to have an answer from Mr. Farrell on that subject.

MR. FARRELL: If you will kindly wait until this proposition is put before the meeting I will answer you afterwards.

MR. HARRINGTON, of Utah: I think it advisable that we let Mr. Farrell finish and let this question be asked. I think that the book that Mr. Farrell has published gives us a great many details. Let him finish and then we can take this thing up orderly. It is like the Statute of Limitations—the more you interrupt it the longer it runs.

MR. FARRELL: Now, in relation to this Brome Grass. Several years ago I was called to go to Canada. While I was there I saw a field of about one hundred acres of this brome grass. I had never seen the grass before, and I went to the farm house and I said to the gentleman, "What is the name of this grass you have got here?" He said it was brome grass. Some call it brome grass and others *Bromus Inermis*. It is the same as *Bromus Inermis*. Said I, "Where did you get the seed?" He says, "I got it back east. I was back east two or three years ago," he said, "and I got it there and brought it out and sowed it on my ground." Says I, "I wish you would give me the address and I will send and buy some; I want to plant a little to see how it will do on my farm." He said, "I have got about a peck left, I will give it to you." I said, "Thank you." And he gave it to me. I brought it down and told my man to plow up a little piece of land, and we would sow this brome grass. This was in the fall, and I had forgotten to ask the gentleman what time of the year they sowed it, consequently I told him, "Now, plow it up and we will sow it now," and he did so, and of course the road as it went along didn't go very straight, and he followed the road right along, and sowed it on that piece of ground. It was very rich land, and the next spring it only came up a spear here and another four or five feet and I thought perhaps the seed wasn't very good, and I said, "I am not going to let that remain here and lose that ground. We will plow it up now, and," I said, "we will make a straight line and will put a wire fence up and I will plant two rows of onions—it will be splendid for raising onions." So we plowed it up and put in onions, and there was about a little over half an acre of it, and we raised 127 sacks of onions off of that piece of ground that season. In about two months after we had a good rain and that grass came up just as thick as could be. I said; "I am awful sorry I didn't leave that grass; we could have had a nice patch, and I could have saved seed enough to have had all I wanted in a year or two." In the spring, after the hay was all fed out, along through the summer I used to turn my buggy horse in there and she would reach over the fence, and there was plenty of timothy in the stack there. She wouldn't touch the timothy but reached over the fence and got that brome grass and ate it down close to the roots. I said to my man, "That is the best kind of stock food; she will leave everything for that," and therefore now I have got a piece of ground plowed up on the side of the mountain, on top of the mountain where I am going to sow brome grass. It wants dry ground, and it wants to be sowed early in the spring, and not in the fall, and I would advise those that have dry farms on their high ground to sow this brome grass, because it is a dry farm grass. The other day I put a few trees, black elders and poplars into this piece of ground, and

it is four or five years ago since I got that seed, but I put some trees in there, and I plowed along side of these trees, and there was some brome grass roots there come up in great bunches, two feet long and eight or nine inches wide and six inches deep. I said, "I wonder what that is I plowed up with roots that long." My boy said, "That is that brome grass." I said, "That is just the kind of grass for dry farming; such roots as that will produce the finest kind of food." My advice is to plant the brome grass on the side of the mountain, and you will have a good pasture." (Applause.)

PROF. CHILCOTT: Your Resolution Committee would like to report the following resolution:

"Be It Resolved, That Article VI of the Constitution be amended to read as follows:

"Each state and territory represented in the Congress shall be entitled to twenty votes; but no delegate shall represent more than one state or territory."

This resolution was framed by the Executive Committee, and was approved by your Committee on Resolutions. I move its adoption by the Congress.

The motion was duly seconded, and being put to a vote was agreed to.

PROF. CHILCOTT: Your Committee on Resolutions recommends the adoption of the following resolution:

"Resolved, That this Congress heartily commends the work of our several agricultural institutions in teaching farmers the science and art of their vocation, and we urge the necessity of including agriculture in the course of study provided for the public schools."

(Applause.)

I move the adoption of the resolution.

The motion was duly seconded.

MR. HARRINGTON, of Utah: I am heartily in favor of the spirit and purpose of this resolution. We must take hold of the idea that our various agricultural schools and even the universities and the higher part of our public school system shall teach agriculture and those matters pertaining to horticulture, as well as they do the so-called branches of learning. In my experience in this country, and various parts of the state, from my observation, I am free to say I would rather have a son of mine to be able to take hold and harness up a team of horses, and hitch them up, and to know when to plow and to harrow and to do these various things rather than to have him to be able to parse a sentence in grammar or do some arithmetical problem, or to be versed in any of the various branches of learning. I don't care to find any fault with the studies in our

curriculum, but I say to you that the young man who is able to do something, and to be practical in his work, is the best citizen of all. (Applause.) For that reason, my fellow citizens and delegates, I favor that resolution, and I think the more we think of that the better we think of it. It is one of the best propositions that has been before this Congress. It is a step forward. It tends to help the farmer, and the gardener, and the stock raiser, and it will give an impetus to them and make their vocation more honorable than it is looked upon, and I think it is a very wise resolution.

A DELEGATE: Let me ask Mr. Harrington a question. You don't mean to eliminate the branches of learning that you spoke of? I think a good substitute would be to eliminate football instead of grammar and arithmetic.

MR. HARRINGTON, of Utah: That is all right as far as it goes. But if I eliminate football and baseball I want to substitute the wielding of the ax.

MR. FARRELL: I wish to thank you all for listening to me, and I hope you are satisfied.

I want to say, in relation to this matter that is before you now. A school teacher met me some days ago and said, "What do you mean by dry farming?" I said, "Farming without irrigation." "Without water at all?" I said, "Yes." "How do you do that?" "Plow the ground deep enough to conserve the moisture."

Now I have fourteen daughters, and I haven't one that is not big enough but what knows how to hitch a horse, and knows all there is to know about it, and when I want them to work they can do it, and if they want to work in the store they can do it, and if they want to take minutes of any meeting they can do it just as well as anyone.

Mr. Chilcott's motion to adopt the resolution last read was then put to a vote and declared carried.

CHAIRMAN M'CABE: Inasmuch as the Committee has seen fit to eliminate the program for this evening, I believe that almost winds up the business of this convention.

In behalf of our Secretary, I wish to say that if anyone has any lecture or would like to write any article, or send him any kodak pictures, or photographs, or anything pertaining to dry farming I believe he would appreciate it very much, and he has requested me to make this announcement, and it will appear in the proceedings of this meeting.

In behalf of the Chair, I want to thank the audience for the courtesies extended me while here from Arizona.

Now, I believe that Mr. Smith is going to wind the meeting up with a few nice remarks. (Applause.)

MR. JOHN HENRY SMITH, of Utah: Ladies and Gentlemen—

Friends, we are drawing to the close of one of the most remarkable congresses that has ever been held in this western land. It has a mission. It has a mission to every citizen of the arid sections of the United States and will be a boon if the results of its efforts shall be carried out to every section of this land we all love so much. Now then, my friends, in order that this work shall be what we design it to be when we leave here, it shall be the dream of ourselves, our wives and our children that the improvement of this western land lies nearer to our hearts than any other proposition, looking to the development of our country, except our own personal liberties. What is meant by improvement? We mean the improvement of its citizenship so that this western country shall present to the world a class of men in whose minds the gospel of strength, and power and determination is fully developed; that their children and children's children, as they come to gaze upon the mountain sides and look down into the valleys shall say of it, "Thank God for this land, the home of good parentage, a spot selected by Divine Providence, upon which the principles of liberty shall grow and extend till the sons of the soil shall present the grandest citizenship of any nation in all the world.

My friends, it is not my thought to detain you but for a few moments. I trust that the members of this Congress as they go from this meeting shall resolve that the best interests of agriculture shall be maintained, that our mining interests and smelter interests, and every other interest that means the betterment of the men of our land, and the employment of our fellowmen shall be guarded with fairness and justice, that conservative methods shall be adopted, looking to the best results and the preservation of the rights of every man, and the preservation of those rights most absolutely and most thoroughly.

My friends, I desire to say to you that the Trans-Mississippi Commercial Congress will be held at San Francisco in November, and that body of men are interested with you in the accomplishment of this same specific purpose, the development of this glorious west of ours. Some time in October that great Irrigation Congress that has done so much, of whom Mr. Coswell has been such a wonderful worker, will hold its session at Albuquerque, N. M., and there will be found a body of men in line with yourselves, actuated by the same ultimate object, having in mind the accomplishment of the same purposes, the upbuilding of the land, uplifting of our citizenship, placing them alongside of the best and purest men in the world.

I thank you for your consideration, and for your kindness to myself personally. I thank you for your efforts in seeking to provide some means, and trust that no man shall leave this city until he shall have discharged his full duty in that respect, that every man will see to it that he adds his dollar.

We owe a great debt of gratitude to the Commercial Club of Salt Lake, and to our former president for his efforts in this work, and I trust that every man, when he goes to his home, whether it be in the confines of Utah or in any of the adjacent states, shall say, "I learned lessons worthy of my consideration and I will follow them to the best of my ability for the furtherance of every purpose that means the good of mankind and the uplifting of this western land to the highest possible limit."

Thank you, gentlemen. Wishing you well, go to your homes in peace; live for the best of mankind; cultivate every element of true manhood put in your ways of life, that your children may honor you as heroes worthy the respect of the best the world has ever seen. (Applause.)

CHAIRMAN M'CABE: If there is nothing else to come before this Congress I believe a motion to adjourn would be in order.

MR. BURRELL: I move you that this Congress do now adjourn sine die.

The motion was duly seconded and being put to a vote was agreed to.



# CONSTITUTION OF THE TRANS-MISSOURI DRY FARMING CONGRESS.

As amended at the Second Session, Salt Lake City, Utah, Jan. 22-25, 1908.

## ARTICLE I.

This Congress shall be known as the Trans-Missouri Dry-Farming Congress and shall hold annual sessions at such time and place as shall be recommended by the executive committee, subject to the approval of the Congress then in session. The selection of place of future meeting shall be made a special order during the closing session of the Congress. A majority vote of the Congress shall be necessary to approve the action of the Executive Committee.

## ARTICLE II.

The officers of the Congress shall consist of a President, three Vice-Presidents, a Secretary, a Treasurer and an Executive Committee of one member from each Trans-Missouri state or territory and the District of Columbia. The President and the three Vice-Presidents of the Congress shall be named by the convention in session. The Secretary and the Treasurer shall be elected by the Executive Committee, shall be required to give guarantee company bond in the amount determined by the committee, and the accounts shall be annually audited. The Executive Committee shall be selected by the delegation of their respective states and territories. The President and Secretary shall be ex-officio members of the Executive Committee.

## ARTICLE III.

The Executive Committee shall select its Chairman and Secretary and appoint such assistants to the Secretary as may be deemed wise and prudent, and shall also appoint all committees.

The Executive Committee shall have charge of the interests of the Congress between its sessions, arrange the preliminaries for its meetings and take such steps as they may deem necessary and proper to bring its or the Congress's recommendations to the Congress of the United States or the Legislatures of the various states and urge their adoption.

The Executive Committee shall elect its treasurer, who shall have charge of its funds and no indebtedness shall be incurred unless the funds are in hand to meet it.

The necessary funds for defraying the expenses incurred by the Executive Committee shall be provided as follows:

The Executive Committee is authorized to secure funds from such sources as the Executive Committee may find expedient.

## CONSTITUTION

## ARTICLE IV.

The length of each session shall be determined by the Executive Committee and the selection of officers and committees as provided in section 3 shall take place during the first session of the second day of the Congress.

## ARTICLE V.

The membership of this Congress shall be:

The Governor of each state and territory may appoint ten and not more than twenty delegates.

The Mayor of each city, five and not more than ten delegates.

The County Commissioners of each county, five and not more than ten delegates.

National and State Agricultural Associations, not more than five delegates each.

Railroad Companies, not more than four delegates each.

Chambers of Commerce, Commercial Clubs and other commercial bodies, two delegates each.

United States Senators and Congressmen, Governors of states, officers of State Agricultural Colleges, officers of State Universities engaged in agricultural work, officers of the United States and state experiment stations, State Engineers and members of State Land Boards, by virtue of their position, will be entitled to membership in the Congress.

## ARTICLE VI.

Each state and territory represented in the Congress shall be entitled to twenty votes; but no delegate shall represent more than one state or territory.

## ARTICLE VII.

The Executive Committee shall have power to fill vacancies among its members and shall make its own by-laws and rules of procedure.

## ARTICLE VIII.

This Constitution may be amended by a two-thirds vote of the delegates of any Congress in session assembled.

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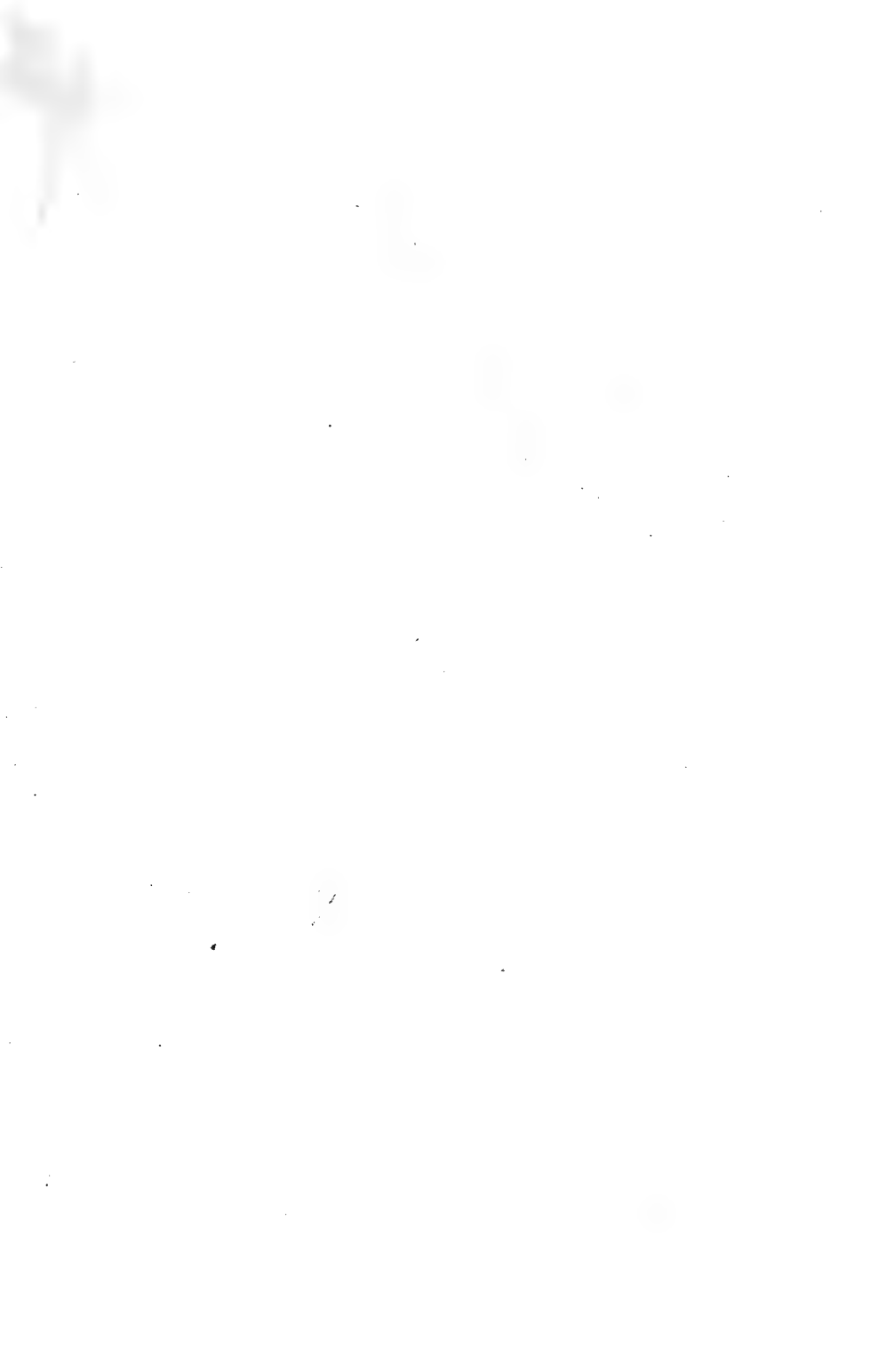
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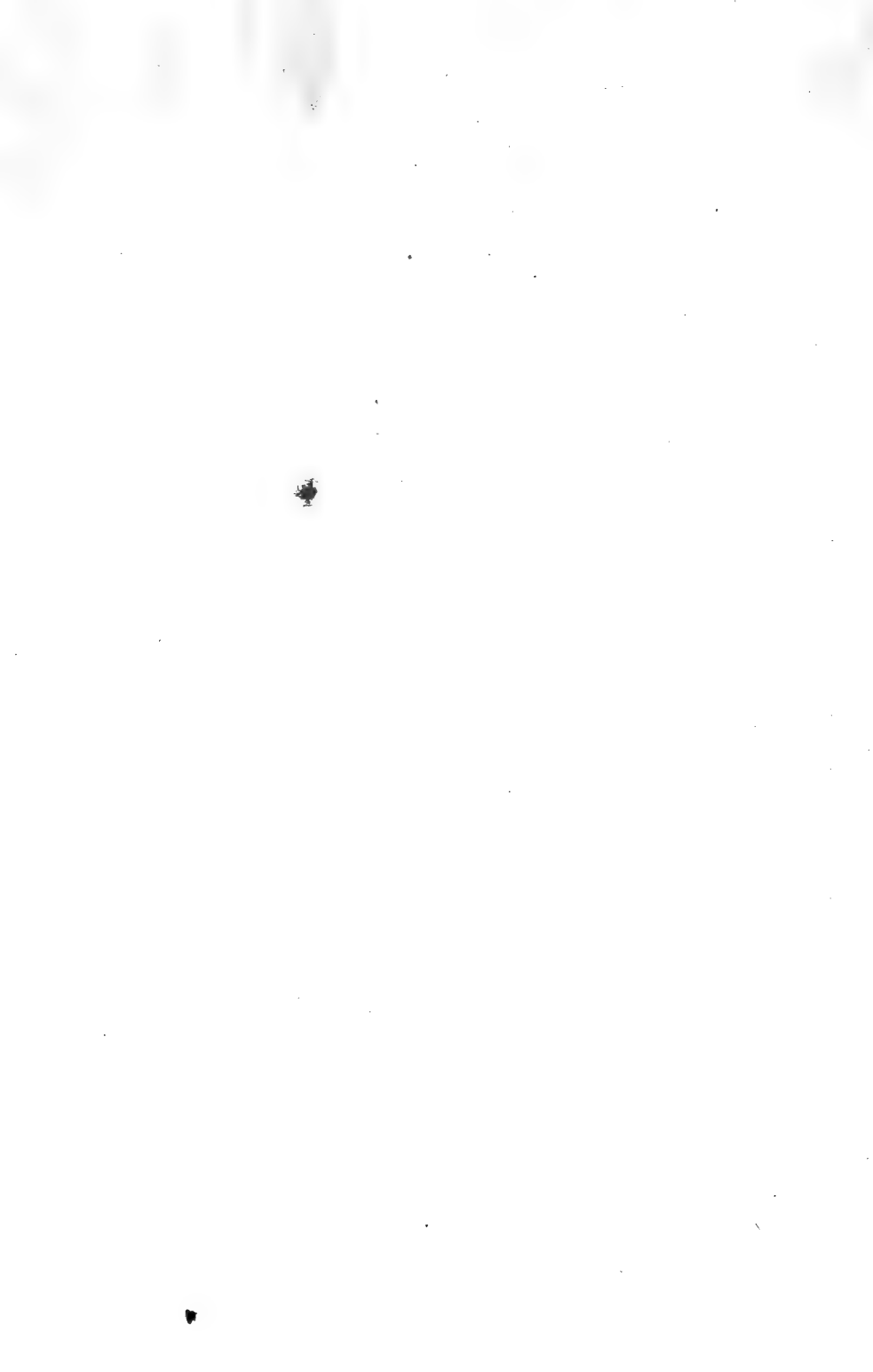
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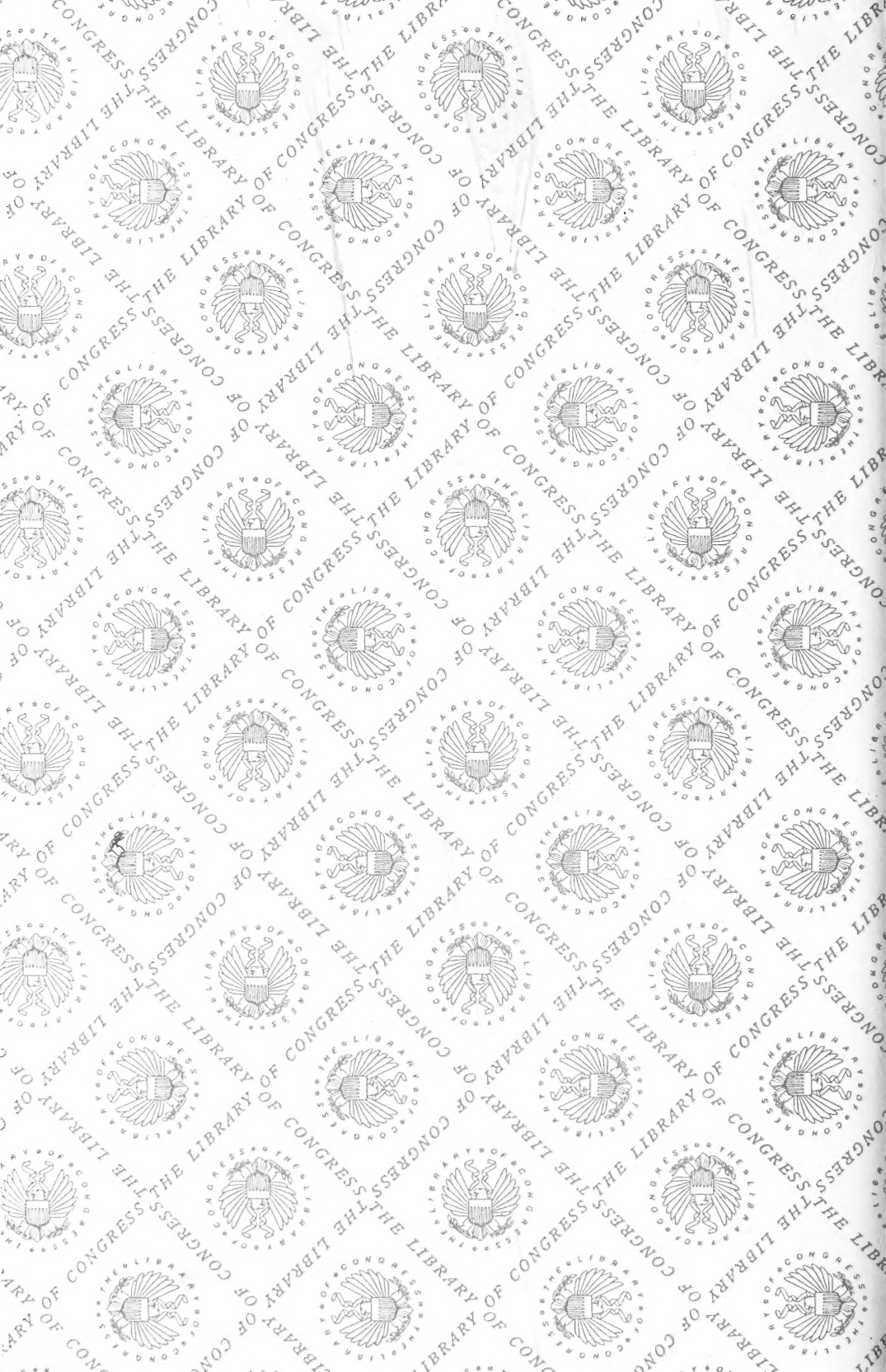


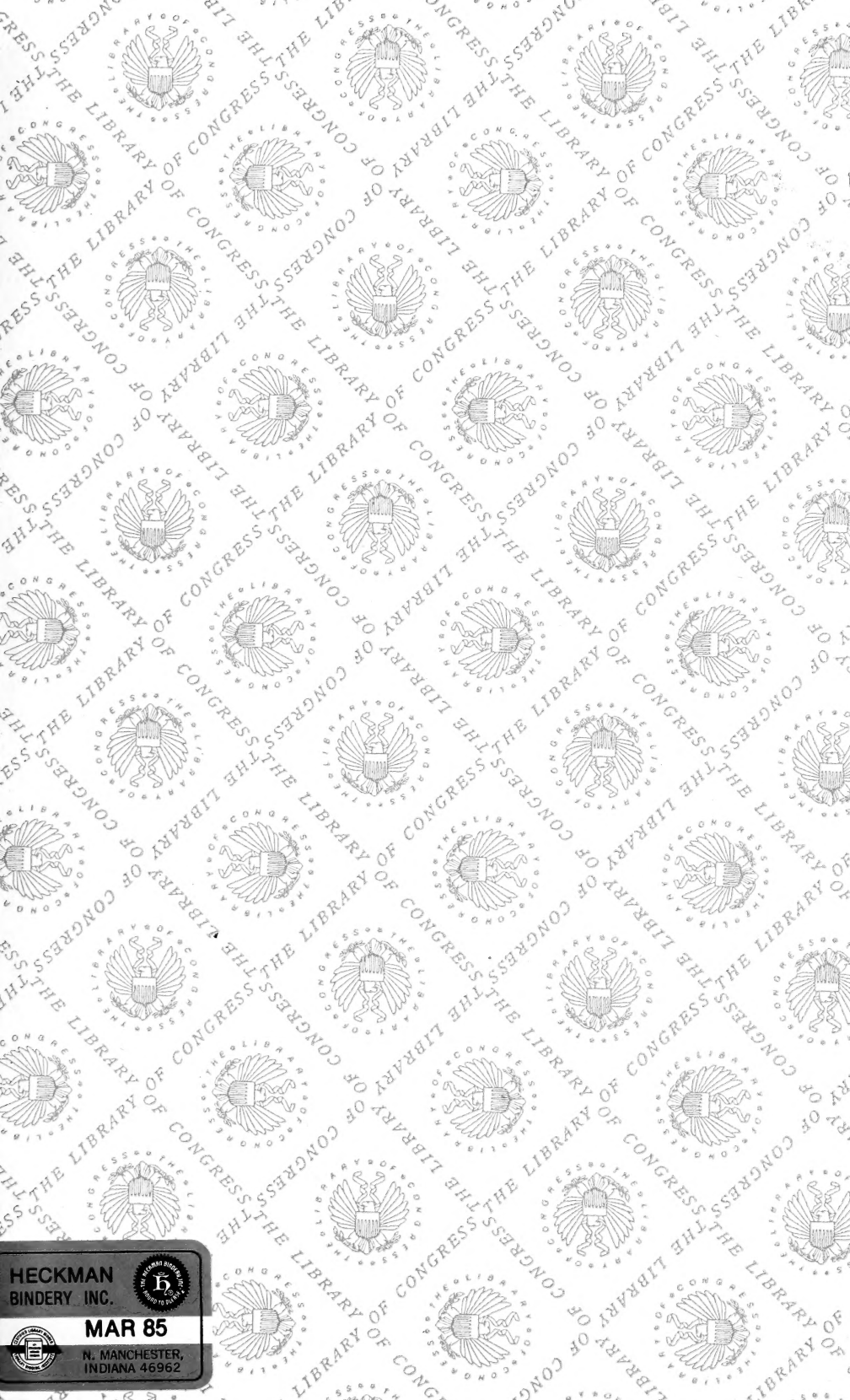
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