acres and they are only irrigating three thousand the duty applies to the four thousand acres all the time.

MR. RAY: That was just my question. I didn't put it intelligently then or you would have understood it.

Q Now, as I understand Mr. Wentz, the tables that you refer to in parts 22 of your report, or part 8 of your report have no application in any way to this table that you have placed upon the blackboard?

A No, those tables have no --

Q You merely stated in these tables that that was the quantity of water that you had distrbuted to the various users?

A Yes, based on those areas.

Q Based on those area, and in your opinion it was sufficient water?

A Yes.

Q But it has no connection or application to the tables placed upon the board? A: No.

Q The table that you have placed upon the blackboard, if you know, you may state whether or not it gives a greater duty than the tables referred to in part 8, or whether it gives a less duty -- I think, however, the duties are given in all these tables and show for themselves -- let me ask you one more question first, Mr. Wentz, I take it that in the preparation of this table which is placed upon the blackbpard, you have -- in making this table you have used what experience you have had in irrigation and in the distribution of the water of the Provo River, and your knowledge of the soil and such like that you have heretofore stated?

A Yes, and my conclusions reached by the distribution of last year, at the conclusion of last year.

Q Now, you may answer the other question if you can?

A The distribution last year was made on the gross duty, and we have not the measurements of the inflow. Generally speaking

the distribution of last year, for say July, from July 1st to the 6th was on a 60 acre duty on the main system. In this table I have used a 63 acre duty net at the place of delivery, which, in my opinion on some of the systems, on the main system, would be a greater amount of water than the amount supplied last year. The systems with a heavy inflow it would be a less amount.

Q In other words, this table on the blackboard gives a greater quantity of water at the land than was actually distributed during 1915 at the head of the canal during the month of July?

MR. RAY: I submit the witness has just answered that by saying "in some cases more and where theye was an inflow less".

MR. JACOB EVANS: I was trying to findout what the facts were. Will you read my question.

THE COURT: I didn't understand the substance of the answer to be as you put it.

MR. JACOB EVANS: That was just the point I wanted to arrive at.

THE COURT: I didn't understand it just that way. Read the question, Mr. Davis.

(Question read)

A No, the table on the blackboard gives a 63 acre duty at the land. The amount distributed at the head of the canal was a 60 acre duty, a greater amount, in the fore part of July, 1915.

Q So that there is a difference then of three per cent there that was allowed for loss in transit.

A Well, we didn't make any allowances at all. If we had had the information on the losses and inflow, we would have made the distribution equally at the land.

Q I will ask you to state whether or not there was any lands irrigated under the Provo River system between the, what is

known as the Wright Ranch near the head of Provo Canyon and the Midway lower dam in Wasatch County?

A Yes.

Q Do you know whether those lands are covered by any decree?

A They are not covered by any decree.

Q Their right to the use of water has never been adjudicated, and determined then? A No.

Q For about how long a stretch along the river there does that condition exist?

A About twelve miles, that is from the Wright Ranch to the Wasatch Dam. There are some miner users up near the Wasatch dam that have not had --

Q Midway dam, Midway lower dam.

A There are some rights above the Midway lower dam that have not had their right adjudicated.

Q But I am speaking about the particular block of ground, if such exist, for a short distance of some six or seven miles along there where they have never been made parties to any suit, they include Mr. Allen and number of others?

A That is from the Wright Ranch to the Midway lower dam, eight miles.

Q Where there has been no adjudication whatever?

A Yes.

Q Now, is there any other land beside that particular block that has never had their rights adjudicated and which are taking water from Provo River system, and if so, where?

A Yes, there is approximately three hundred acres.water from the waters of Deer Creek by a small ditch brought over from Deer Creek into the Provo Valley by Mr. Wilford A. Van Wagonen.

Q Are there any other lands in that condition?

A Then there are some lands below the Wasatch dam, Mr. Ford and Johnsons. There is a Mr. Bradshaw at Mamas with 60 acres, and there is the Stewart Ranch Company that have never hadany

adjudication. Then there is the Timpanogos Irrigation Company with about two thousand acres. The Extension Irrigation Company with about eight hundred acres and the Sage Brush Company with some like five hundred acres, if I remember right; and the Spring Creek Irrigation Company are not covered by either of the decrees.

Q That is in Wasatch County? A. Yes.

Q That also, I take it, includes the plaintiff Provo Reservoir Company?

A And the plaintiff Provo Reservoir Company and the Sego Irrigation Company and some other individual users.

MR. WILLIS: At this time, your honor, I just have one question. However, I would like to reserve the right to cross question as to this table in case it is applied to the conditions in the valley above, otherwise, I don't know that I care to go into it.

THE WITNESS: I will say now this table has no reference whatever and is not intended to cover any conditions above the mouth of Provo Canyon. The conditions and requirements are different and the results are different in every respect.

CROSS EXAMINATION by Mr. Willis:

Q You testified, Mr. Wentz, that there were a number of dams in the Provo River where the water was dried up or dammed off entirely. I will call your attention to the Midway upper dam, do you say that the water is at any period of the year completely dammed off?

A Yes.

Q Isn't it a fact there is cobble rock in the bed of the river there and there is water springing up below the dam in that case?

A No, the ground water there is about twelve feet down. We

had had a tight dirt dam in there. Of course we-get some return, small seepage maybe through the dam in the rock, but it does not amount to anything? It is a dam made of straw and dirt. hedged in so that it is absolutely tight, as tight as dirt can make it.

Q It is on a loose rock bottom? A. Yes.

Q Cobble rock bottom, that is what it is there, isn't it?

A Yes, it is a loose cobble rock, river rock bottom.

Q Now, it is not the same in character as to the Midway lower dam that is in the same kind of gravel or rock bottom and that it is impossible to dam the water off absolutely?

A There is an underflow through the cobble rock. When I say a tight dirt dam and dammed off absolutely tight, I mean every particle of water that is on the surface of that river bed is diverted. What goes underneath -- the whole valley is moving, for that matter.

Q I just want to understand if that was not the condition that you dammed if off in so far as you were able to do it considering the conditions that exist there? and nature of the bottom of the river where the dam is placed?

A We dammed off on the surface the water that was on the surface. We didn,t dam off anything below the surface.

Q And there is water right underneath, or there is water coming up below those dams in each of those cases whenever that attempt is made to dry it off dry, is it not?

A In 1914 with a tight dirt dam in at the upper Midway dam in July , and diversions out between the two dams, and a stream out at the lower Midway dam through the Island pitch, we still had at one time there 17.6 second feet of water going by the dam.

Q Now, for what period --

A All these diversions I speak of and this 17.6 feet of water rising in the river bed between the two dams.

Q Now, what years do you say that so far as your knowledge is concerned that dry dams have been put in the Provo River at the Midway upper dam and at the head of the Island Ditch?

A I could only say of the two years.

Q 1914?

A And '15, yes.

Q You don't know anything about the conditions prior?

A No, only by hearsay.

CROSS EXAMINATION by Mr. Coleman;

Q Mr. Wentz, did you conduct any experiments as to the duty of water on Provo City land to determine your table ?

A No, not on the Provo City Land.

Q Did you conduct any experiments on soil tests on Provo City land?

A Yes, I have one soil test.

Q One soil test, where was that taken?

MR. A. L. BOOTH: Are you referring to the city lots or the acreage when you say Provo City land?

MR. COLEMAN: Any of them.

MR. A. L. BOOTH: He has them divided there.

Q What scild test did you conduct on Provo City acreage?

A I took one soil sample from the loose porous soils on the west side of the city from the Eph Smith property.

Q That is the only sample you took on the entire Provo Acreage?

A Yes.

Q On Provo City lots what soil tests did you make?

A I haven't made any soil tests on the city lots.

Q Haven,t taken any borings anywhere?

A No sir.

Q Then your duty recommended there is merely your opinion not based on any experiment or measurement?

A No, it is not an opinion strickly. The soils, I compare them

with other soils that I know that are similar and by the experience of last year.

Q You have not quite answered my question.

MR. JACOB EVANS: Let him conclude his answer.

A By the experience of last year greoing through the season with the quantities of water that we did.

Q Did you distribute any particular quantity on any particular tract of land to determine its duty, amount required?

A No, not within the city.

Q Merely made a general distribution, did you not?

A The conditions last year, the question was really for me to decide what quantity to use and what was the least quantity because I was facing the time when we would have to cut into the Factory Race, and I did not know what period that would be, or what time we ought to stop raising the duty. I first thought I would keep experimenting tests on two tracts of land, one a light loose soil and another a clay. This would have been a good test, but it would only have give me the facts upon those two particular tracts. Then knowing that the conditions every day -- in communication with the water masters every day, or every few days, I thought it would be better having the whole are in mind and receiving word from them and know how they were getting along, that that would be x more valuable to me than a test on a single tract, and I found that more satisfactory. Whenever a man was short and suffering why, you are always going to hear from him. Sometimes you don't hear from him for a couple of weeks and he is getting along all right. That is the assumption, that is always true in every case with water.

Q Well, merely because -- you were absent from the county great portion of the time, were you not?

A I spent most of my time in this valley last year. I was away a few days, but until the last of August, I don't think I was

away more than two days at a time.

Q That is what I want to get at, Mr. Wentz, is whether you made any experiments or measurements on any tracts of land and observed the crops matured thereby, their condition, or whether you had done anything of that kind to base your opinion on?

A Well, as I say --

Q You state you have not.

A I never followed those through all the way because I thought the larger area, having the whole thing in view, and all the crops and diversified soils would be much better to me than just one sample on any particular field.

Q Then under what conditions normally would you base this table?

MR. WILLIS: Based on normal conditions.

MR. COLEMAN: What do you call the normal condition and average year?

MR. WILLIS: Average of the weather conditions and soil.

Q Taking all conditions into consideration that you have knowledge of, Mr. Wentz, there are times when there is draught winds things of that kind existing?

A This table in my judgment provides -- as a margin of safety for all things. Now, there was no year in the world we ciuld get worse than last year. We went into the dry season dry, through the first part of June up until about the 7th, we had a rainy cold period, and people were not watering, we could not get them to water. When the river went down to low water they all wanted to water the same day, and we could not water them over for a week or ten days, and some of them two weeks, so we went into our dry condition in the worst condition that we could go, was last year. Take a year like this year we are dry, but we have a supply and the people are

Q keeping their lands up full of water, moisture, but last year, as I say, we went into our dry low river dry, and it was probably the 20th day of July or the 10th day of July before

we were fairly well up, caught up with our irrigation.

MR. THOMAS: I want to ask counsel, do you expect to have Mr. Wentz on again?

MR. JACOB EVANS: I expect he will be here.

MR. THOMAS: I am asking you if you concluded your testimony in chief so far as Mr. Wentz is concerned?

MR. JACOB EVANS: We think we have, with the exception possibly using him for Wasatch County, I don't know whether we will or not.

MR. A. C. HATCH: And Summit County possibly.

MR. JACOB EVANS: And Summit County, I don't know as to that.

CROSS EXAMINATION by Mr. Thomas;

Q What do you regard as the margin of safety with reference to the duty of water per acre?

A Supply the land for the worst year that is possible, being safe on the worst year, or an amount of water that will irrigate all the lands properly on the lowe year.

Q Now, with these figures that we have before us what would you say would be the margin of safety there?

A On an average year.

Q Take all these figures for instance, are these based upon a margin of safety?

A Yes, these will provide for the worst years that we have.

Q Then so far as your judgment leads you, you would say that the duty which you have fixed here is enough to meet any demand or condition which your experience has developed?

A Yes.

Q Now, you have been careful to say that you did not want this understood as a duty, but that you did regard it as a sufficiency to mature the crops that are raised in this valley? A. Yes.

Q That is as I understood it? A. Yes.

Q Now, have you had anything else to guide you in arriving at this conclusion than just the experience you have indicated here on the witness stand?

A My experience and what I have read and experiments elsewhere.

Q You refer to your own experience as a personal irrigator, that is, upon the lands up here on the Provo Bench?

A Yes sir.

Q On your own property there? A. Yes sir.

Q Now, were those experiments conducted under your own system of distribution, or upon prior distributions of water?

A What do you mean by distribution?

Q I am referring to the period now that you have had charge of the distribution of the water from the river, do you take your experiments to that period 1913, '14 and '15?

A No, I have noticed those for a number of years, about the quantity that it takes to cover land and the amounts that land can be covered with. In my opinion that is the only question in duty is to get the land covered properly. It is not a question entirely of what the land will hold, whether it will hold one inch or whether it ~~max~~ will hold two inches, The loss factor in there is as big a factor as the capacity of the soil.

Q Isn't this also a factor in determining the duty of water as to the amount of water that a particular plant that is being raised requires?

A Yes, that is a factor, but the loss factor on our low duty soils is a heavy factor.

Q But isn't that an essential factor as to the amount of water that the plant requires?

A The total amount during the season?

Q No, I am asking you if that is not an essential factor to determine the amount of water that a particular plant that

is being raised requires?

A No, not entirely.

Q I don't say entirely, I am asking you if it is not an essential factor?

A No, the conditions -- it ~~ex~~ is one of the factors, but the conditions of loss both by percolation and evaporation are so much greater than the difference in the requirements of the different plants. Our greatest plant consumption throughout the year that I know of in this vicinity is nine tons of alfalfa to the acre, makes about ten and a half inches of water that plant would use in producing the nine and a half tons, but it is not -- it is only a small amount in comparison to where there are only 8 tons produced os six tons, the difference is not so great.

Q But still the amount of water that a plant requires, or a particular plant requires is an essential factor, nevertheless in determining the amount of water that is required upon a particular tract of land?

A It is one of the factoss, yes.

Q Isn't it an essential factor, you don't irrigate land, do you, for the sole purpose of finding out how much is wasted?

A Well, the essential factor is to keep the soil to proper moisture so those plants can develop.

Q For the purpose of developing the plants?

A Yes.

Q Now then, upon what have you based your experience to determine how much water the various plants that are raised here require?

A I have not make any experiment on what plants require or they consume.

Q During the time that you were conducting or irrigating your land and prior to 1913, were there times when you had a shortage of water under your system, the Provo Bench?

A Yes, there were times in 1905. We had a shortage eleven years ago.

Q During that period did you receive the quantity in acre feet that you have said here was sufficient to mature your crops?

A I don't know.

Q During the years that you did mature your crops areyou able to say that you received only the acre feet which you have indicated here to be a sufficiency?

A No.

Q Can you say that during those years when you did mature crops that you didn't have more water than you have herein indicated to be a sufficient amount? A. No.

Q Have you any data at all upon that line that would give us any information in determining what was required to mature crops before you began to distribute water?

A No, I have not.

Q Did the farmers and water users under the Provo Bench Canal where your land is located express satisfaction that the amount which you have herein indicated would be enough to mature thrie crops?

A No.

Q Do those men there who do irrigate their lands and mature crops say that the amount which you have indicated in acre feet is xxxx sufficient to mature crops?

A No, I haven't heard them say that it is sufficient.

Q Have you heard them say that it is not sufficient?

A I have not talked with any of them since the table was put on the black board relative to the quantity, and prior to that

7 I have never told anyone except Monday Mr. Ray asked me what duty I thought was proper, and I told him the first column here that I thought 55, between 55 and 60. Prior to that time I have never given any information, because I have not been asked what the proper quantities of water were.

Q You did have charge of the distribution of this water during the last irrigating season? A. Yes sir.

Q And was this the basis upon which you acted last season?

A No, the basis that we acted on last season is as I have outlined. We first went to the 60 acre gross duty or 50 on one morning distribution, then the 60 and then the 65, and when we came to the 70 acre duty, gross duty, we stopped there and maintained the main system on the 70 acre duty.

Q That is substantially as you have given here or are you now speaking -- probably I misunderstand you -- when you refer to your gross duty which you followed last year, you refer to the entire system?

A I refer to the main system as outlined in the table.

Q Now, referring to the Provo Bench system as you have outlined in the table, you have indicated that there was a total of 4.38 acre feet furnished, or that is not a fair statement; you have indicated there is an acre feet of 4.38, that would be sufficient --

MR. RAY: That is Provo City acreage.

MR. THOMAS: That is also the Provo Bench acreage, Mr. Ray.

MR. RAY: Oh yes.

Q Now, can you say what you delivered in acre feet under that system last year?

A No, I have not figured those systems up in acre feet. They are submitted in the report as the observations were made and discharged at the different times, but have not been figured into acre feet for the season.

Q But would you say approximately, or let me put it this way affirmatively, wouldn't you say approximately the acre feet furnished last year on the Provo Bench system was in excess of 4.38?

A I would not say either way on it without figuring it.

Q What have you done, or what did you do, Mr. Wentz, in trying to determine the character and class of lands under each particular tract to determine whether there was good or bad or indifferent piece of land with refernence to the amount of water that it would require?

A My acquaintance with the lands and going over them and seeing them, I made the determination as units. There are bad pieces in lots of the tracts, as I have indicated, for instance in the city tract and north end of the river bottom tract, and number of them have extremely low duty soils that are porous. I give my judgment on these as I have indicated by the coefficient, taking them each as a unit. I haven't a soil survey showing the are of the lands on each of these good soils and poor soils. We haven't that information. I am submitting this merely as my estimate of the difference in those different systems.

Q And because of the lack of information you regard even this table as somewhat inaccurate and inafficient so far as absolute determination is concerned, do you not?

A Well, the absolute determination of course would have to be made on a soil survey, taking ever acre and tabulating them up. It is based on what I know of these systems and the lands under each system.

Q But even in the various systems, there is a very wide divergence, is there not?Mr. Wentz, in the character of the soils and crops raised.

A There is a wide divergence in the Provo City soil, for instance, not in the crops raised. The farming is all diversified farming. Now, the Provo City, all we have in town here, for instance, a loose, very loose gravelly loam, shallow and underlaid with porous round river rock. The water runs right off . In the northern part of the system immediately across the road south from the ice plant is one of the most

beautiful soils that I have ever seen. In fact, it is a long ways ahead of the Fort Field and even ahead of the soils on the Lake Bottoms; very light loam, rich in humus and deep. The depth, as far as I could see by the channel there, why, it is at least ten feet deep, sufficient depth. We have those extremes, even, as I say, in the city from bad to the very best.

Q What did you do to determine the amount of these very good tracts and the acregge of the very poorest tracts of land in Provo City for example?

A I have not done anything on determining those.

Q Upon what test did you base your determination of acre duty of water in Provo City for example?

A As I say, on the summing them up as units, and their comparison by a coefficient from all the knowledge that I know of them and going over them and making the distribution according th those coefficients.

Q In determining then the land or in arriving at a coefficient did you determine upon the maximum amount of water that would be required for the poorest soil?

A The poorest soil as a unit, yes, is marked the 115 in the coefficient.

Q And did you, for instance, in determining the portion of water in Provo City, did you determine the good lands, which you have indicated as near the ice plant as being one part or one unit and the remainder of the city would be particular porous and underlaid with cobblerock and the like, as another unit and determine the duty of water for the poorest unit?

A No, neither for the poorest unit or the best, but as a whole unit over the city.

Q How did you arrive then at that average?

A By comparison with the other system. It would not make any difference what coefficient I would have taken, whether it would

have been ten or one thousand. The coefficients were taken just as comparison to use my knowledge that I have in making up that table.

Q That is true, now, when you apply the water to this better land the duty of water would of necessity be very high, or much higher than the duty of water over on the more rocky land that would be evident?

A Yes, very evident.

Q Then, you did attempt to strike an average then between the very low duty and the very high duty lands, that was your object, was it not?

A The object was based -- the duty was based on the system as a unit.

Q That is true.

A Taking it all as a unit.

Q But in trying to get the whole of it as a unit you did have to take into consideration the high duty tract and the low duty tract, didn't you? Do you understand my question?

A No, I don't understand.

MR. RAY: Mr. Thomas, I suggest if you talk about the duty instead of coefficient. He arrived at the coefficient arbitarily, now, how did you arrive at the duty, that is the question.

MR. THOMAS: That is what I am trying to find out. He arrived at the coefficient in a purely arbitrary way for the purpose of comparison, that is understood, but by reason of that coefficient, as I understant, Mr. Wentz he fixes a sufficiendy or duty of water say for the whole of this unit Provo City. Now, that was based upon some investigation, some knowledge of the use of the duty of water to the high lands and to the low lands, to the good lands and poor lands; that is true, isn't it?

A Yes sir.

Q Now then, what would you deem to ~~hv~~ have been a duty of water upon this particular porous land.

A I don't believe I understood your question before, that I said yes to.

Q You might make your statement.

A I will try and make that clear. The quantity of water, the total quantity that we used last year is sufficient for the approximately fourteen thousand acres, but as I say, I believe those canals that were losing ought to, in order to be sufficient -- a sufficient amount supplied to them, those losses in transmission made up. I have the total quantity, or approximate total quantity that is sufficient for the whole area. To divide that equally to all the systems wouldn't be right, because there is a difference in the system as indicated by the coefficients. Then this quantity is divided according to the coefficients to get the proper distribution to each particular unit.

Q Now, I understand that. Now then, going to the Provo City, for instance, did you take into consideration in arriving at these figures, or to aid you in arriving at those figures, the loss of water that would occur in transmission under that system?

A Yes, I figured these quantities at the land, or at every quarter section of land that they should be delivered there.

Q Are you able now to state what the loss in transmission would be in Provo City, under the Provo City system?

A No, only in a part of it that we have made measurements on in 1914.

Q So that taking these statements, or these figures, these coefficients as a guide, and this acre duty that you have worked out here as a basis, you are not now prepared to say that that amount of water would be sufficient for Provo City at the point of its diversion, having in mind its system of transmission?

A No, I wouldn't say what those quantities would be at any of the points of diversion, because I don't know the losses in transmission.

Q The same answer would be true, would it not, with reference to the Provo Bench?

A Yes.

Q And the same answer would be true practically to all of those canal systems which you have indicated there?

A Yes.

Q You are familiar with the amount of water which was credited to Provo City and the various claimants under the Morse and Chidester decrees, were you not?

A Yes sir.

Q Now, in one of your tables, I have forgotten which one now, Mr. Wentz, you could aid me in this, you refer to and show the duty of water under the various systems.

MR. JACOB EVANS: I think that is part two.

MR. THOMAS: I believe it is.

THE WITNESS: You mean in 1914 or '15?

MR. THOMAS: 1915, it was the one we last used.

THE WITNESS: Page 5.

Q Now, having in mind the amount of water that was decreed to these various parties under the Chidestxer decree and the former Morse decree, would you say that this acre duty as you have marked here was excessive, having in mind the present system of transmission?

A You mean for Provo City?

Q I will take Provo City for example.

A Yes.

Q Now, upon what do you base that statement? since you have made no investigation as to the loss in transmission?

A The Provo City canals are old canals. The losses in transmission I don't think would exceed ten or fifteen per cent.

They may on the Upper East Union or the East Union, the losses to the extreme end may be greater than that, but in the Factory Race there is an increase in flow, and the City race. I made some measurements a number of years ago and it was a very light decrease in the City race; and the Tanner race, I don't think the losses would be heavy in that. If those were new canals, absolutely new, why, the losses would probably be excessive, but they are all old canals.

Q So then, without any investigation in recent years, and without any other knowledge of facts than you have here stated, you want us to understand that the duty here is excessive or low from Provo City?

A Yes, in my judgment it is low.

Q And referring now to Provo Bench Canal, as you have indicated it, what would you say as to that?

A I would say the duties are the same at the lands as I have indicated on the blackboard. Wherein they differ why be merely a difference in the two tables.

Q Have you made -- let me ask a general question here -- have you made any investigation of any of these canals that you have outlined upon this table which you have marked Table 7 in part 2 of your report to determine the loss of water in transmission?

A Only the Provo Bench Canal and part of the Provo City system.

Q Then upon what did you base your action in distributing this water that you have had charge of during the past year; did you regard the former decrees since you did not regard, did not make any investigation to determine the loss of water in transmission, what was your basis of distribution ?

A Read that, there is two or three questions in it.

Q All right, I will reframe it.

A I will answer it just the way she is.

(Question read)

A Now, stopping there, I will answer that far. No, we did not regard the former decrees in any way, disregarded them entirely

Q Let me ask you, you disregarded them entirely?

A Yes.

Q Now, can you advise as to what authority you had for disregarding them entirely?

A Yes.

Q I would be pleased to learn.

MR. JACOB EVANS: What part of your report are you referring to now?

A Part 8.

MR. JACOB EVANS: What page?

A Page 2. The stipulation entered into between the parties in this case in the spring of 1915 reserve to the different rights 299.33 second feet and as shown in the testimony, in my testimony of yesterday, there was reserved of this amount to the defendants in the Utah Valley below the mouth of Provo Canyon, 288.4 second feet. This 288.4 second feet was designated by the defendants and the plaintiff in this cause as the amiunt reserved for the defendants, and upon this reservation the commissioner considered this was sufficient for all the needs of those defendants, for this land as indicated was sufficient for the use of all the defendants. It would be absurd to consider this amount as divided on a 37 acre duty to one defendant and on a hundred or ~~an~~ hundred and five acre duty to another defendant with exactly the same classes of land. If the one party needed a 37 acre duty, then the other party that would necessarily have been raised to a hundred and hundred and five acre duty also needed a 37 acre duty, and the amount would necessarily need to have been five or six or even seven hundred second feet in this distribution of 1915 in order to give all of the parties a sufficient amount at the 288.4 second feet, and not allowing

an extremely low duty such as 18, 20, 30 or 37 second feet. We disregarded the distribution as outlined in the table, tabulation portions in the Morse decree, and made the distribution equal to each party covering this amount.

Q Now, Mr. Wentz, you then assumed somewhat judicial powers, did you not, when you undertook to do that?

A No.

Q You regarded then the power you exercised in setting aside the decree of this court as purely or entirely within your authority as commissioner?

A No, not at all, the decrees were set aside by the stipulation.

Q And when were you adivsed that the decrees were set aside by the stipulation?

A By the stipulation itself.

Q What authority have you had to make that statement?

A I had the --

MR. JACOB EVANS: Just a moment, read the stipulation It speaks for itself.

MR. A. C. HATCH: Object to that as not a proper question.

MR. THOMAS: I think it is a proper question. Mr. Wentz has exercised extra judicial power, it seems to me.

MR. A. C. HATCH: He followed the stipulation.

MR. THOMAS: I don't think he did. If you want to argue that we will let the witness retire and take that up.

THE COURT: Gentlemen, I don't think that is before the court now, there is a question asked and if it is objected to I will take up the objection. I don't understand the question myself, possibly Mr. Wentz does, or the counsel who objects to it. Now read the question.

(Question read)

MR. A. C. HATCH: My objection to that, if the court please, is that the witness has just stated that his authority

was the stipulation itself. Then the question is what authority have you for making that assertion.

THE COURT: Yes, that is the question.

MR. A. C. HATCH: It is asking the witness unnecessarily, I take it.

THE COURT: I don't understand what you are asking, what authority he has for his testimony.

MR. THOMAS: The question may be somewhat obscure, we are not asking the witness, because that is farthest from my mind -- we have the statements, he did state it yesterday, but we take that phase of it up a little later.

MR. A. C. HATCH: I don't so un derstand the witness.

THE COUT: Nevermind, it is not necessary to argue what he has said. The court remembers what Mr. Wentz said.

Q Now, Mr. Wentz, you made the statement here several times that the amount of water which you have herein indicated was sufficient to mature crops -- that is, I take it from that that you mx mean any crops which might be raised or cultivated upon the lands; do I understand that to be your statement?

A That is based on the crops raised, generally raised in this section of country. Now, for instance, wheat, mx a man had a 20 acres and planted that all to wheat one year, this would be more than sufficient twice more than sufficient, or nearly twice, or on account of not being able to use that water after the wheat crop was off. If the reserve were true, say that each farm was planted to alfalfa on a loose porous land or a whole system, say the Provo Bench area of 4333 acres was all planted to alfalfa, every ac re of it, this amount would not be sufficient, but we have not-- there is no possibility of that being done, and it is based on the generalfarming throughout the country, and diversified crops. One man may be at the end of a system with a ten acre mxpx

tract, plant all of his tract to alfalfa in direct reverse to the one that planted all to wheat, but those conditions I cannot see how we can provide for, and they generally provide for those things amongst themselves by exchanging water one with the other to meet those conditions, and where we run with a margin of safety to supply the whole unit with the proper amount of water is as near as we can get to the actual quantity.

Q You have referred again to the margin of safety, could you put that margin in percent.

A That depends on the year. A year where we have lots of rain, why, there isn't so much water used. Where we have small amount of rain, great deal of water is used, but the table is intended to, and in my judgment is sufficient for the first year.

Q But now will you answer the question, or could you put that margin of safety that you have referred to in percent, having in mind the general conditions as they exist here in this valley , rain conditions, in fact all matters of climatology and also the various conditions of the soil?

MR. A. L. BOOTH: Do you intend that margin for a dry year or wet year?

MR. THOMAS: Let the witness determine it himself.

A No, that depends entirely on the season.

Q I have said taking all those things into consideration matters of climatology as well as matters of soil, can you tell me in per cent what those figures would be?

A The soil condition does not enter into that, the soil conditions will remain just the same, but the difference above a low year that will be required will depend entirely on the season.

Q That I understand it depends upon various conditions Now, I

have asked you again, I will ask you now, taking all those things into consideration ~~wh~~ can you put that margin of safety into per cent, whether it be ten per cent or twenty per cent or thirty per cent margin?

A No, that is a factor that changes according to the particular conditions existing at that time.

Q Have you taken into consideration in estimating the acre duty here as to the amount of water, for instance, that will be necessary to mature a particular crop, sap alfalfa?

A Yes, as I explained a moment ago.

Q And have you taken into consideration that up to a certain amount or certain quantity of water used a certain crop would be raised in tonnage with increasing that acre feet? you would thus increase the tonnage; that have y a taken those things into consideration?

A Yes, and still increasing the acre feet the crop production would decrease.

Q Beyond a point of safety?

A Yes.

Q Now, have you discussed that in your figures?

A Yes, I take those -- all those conditions under -- include them in the table. The table is based on the amount that it requires to make an irrigation, make an application on and saturate that soil, and the time that soil will stay at proper ~~margin~~ moisture content by the growth of crops. Putting a large amount of water on in an application does not leave you any more water in the soil than a small amount provided you get the application over, whether it be on a two foot soil, or a soil that is two feet deep and loose and sandy, if you put two inches on or if you put twenty feet on you have got just as much water left twenty-four hours after the irrigation in either case. The quantity doesn't make any dif-

ference. It is only the capacity of the soil to hold that water.

Q Are you familiar at all with the investigations or experiments that were conducted by Mr. George Swan with reference to the duty of water in Provo City?

A No sir.

Q Referring to your table there, Mr. Wentz, I note that in column 2 and in column 3, for instance, during the hottest season of the year, you have increased the duty of water, is that in consonance with the general reported fact s from various agricultural stations, and from experienced men in that regard?

A The crop consumption is heaviest about the first part of July until the 15th of July, but the increased amount in the first column or lower duties is because of the difficulty in making the application, so great a loss of water by deep percolation.

Q Isn't it true there is less irrigation in comparison at the earlier season than there is in the later season, In other words, isn't there more water consumed by irrigation in the periods designated in columns 2 and 3 than in column 1?

A More water consumed by the plants.

Q In irrigation more water applied to the land?

A No, the first irrigation is the heavier irrigation, and as you go into the summer your irrigations are lighter, your applications are lighter.

RECESS.

Q Referring again to your columns 1 and 2, taking any one of those columns which total ~~3x~~ 4.38 acre feet, take the first one there, Provo City acreage, virtually 60 per cent of the water would be applied during the first two applications, would it not, Mr. Wentz?

A I don't understand your question.

Q Well, allowing 4.38 acre feet for the entire irrigation season, wouldn't you apply under those figures practically 60 per cent of your acre feet during the first two irrigations?

A During the first two periods, you mean?

Q Yes, if I said irrigation, I meant as indicated by those columns.

A In the first two periods the total would be 2.37, a little more than half of the total.

Q So far as the application there is concerned then, that would lower the duty to about one second foot to every forty-five acres, would it not?

A No, it wouldn't lower the duty any lower than is shown.

Q Would you say that the duty of water per acre would be the same throughout the entire season, having in mind these applications?

A No, if I had said that the table would have been from May 10th to October 1st, just one column with the duty on.

Q And during the earlier periods, say during the first two periods which you have indicated so as to get the greatest efficiency, you have to lower the duty of water, do you not?

A The duty is lower at that season of the year than it is later in the year.

Q And that is the period when the water is most needed?

A Yes.

Q Now, on those figures that would reduce the duty to about 45, wouldn't it, as against the figures you have given?

A No, it wouldn't reduce the duty at all.

Q Are you familiar, Mr. Wentz, with the report of Herbert Wing, the acting state engineer of Idaho, issued in 1913 and 1914, and having specially in mind that part under the investigation of Mr. Don Bark?

A I am familiar with Mr. Bark's investigation there and his

final conclusions on the duty of water on those tracts in Idaho.

Q D° you recall his descriptions of those tracts as being gravel and very gravelly, medium clay loam and sandy and very sandy, uniform clay loam and the like?

A Yes sir.

Q Would you regard such a description as he has given of xxy very gravelly soil as applicable to soil here in Provo being very gravelly?

A Not in Provo. The soil as I interpret his very gravelly is the same as the soil we have neat the mouth of Provo Canyon on the upper end of the East River Bottoms Company. The soil of Provo is a gravelly loam, that is, it is a loam with some gravel in it.

Q Then you wouldn't xl call it in any version gravelly, it would be still called gravelly then, would it?

A The provo areas?

Q Yes.

A The Provo area in the city here that I designate as gravelly loam is a loam with a little gravel in it .

Q Do you regard the investigations of Mr. Don Bark as authoritive?

A Yes, his conclusions.

Q Would you say that there is any soil here in this valley that is similar to the soils which he designated in his report to which xx xxxxx I have referred?

A As very gravelly?

Q Medium clay loam, uniform clay loam, very sandy an impervious clay loam?

A Yes.

Q Have we any such soils here?

A Yes, we have such soils.

Q And within this district? A. Yes.

Q Would you say then that the conclusions which he reached on soils in Idaho similiar to the soils here were correct?

A Yes, that is, I say his conclusions. Don't understand me now to mean that some of those tests that I say would apply here, but I say the conclusions of his report that two acre feet for medium good soil was ~~xxxx~~ sufficient for a season and that for the very heavy soils that four acre feet were sufficient.

Q Do you recall his finding that so far as alfalfa was concerned on medium clay loam that 4.49 feet would be required, and on gravelly soil as high as 11.2 feet?

A I don't recall those two tests.

Q I refer you to page 87 of the Tenth Biennial Report of the State Engineer to the Governor of Idaho, Herbert Wing, Acting State Engineer, and the page 87 referred to that part that was prepared by Mr. Don Bark, and I direct your attention to the figures on the lower part part of page 87 under the sub heading "Alfalfa Etc.,1910", those figures are as I have just indicated them, are they not?

A 4.49 acre feet.

Q Now running your thumb just lower there in the column you will find another figure that I gave .

A 1.3 acre feet producing 3.3 tons. 1.87 acre feet producing 3.56 tons. 2.1 acre feet producing 4.74 tons. Very gravelly. 11.2 acre feet production 4.2 tons; 6.92 acre feet 3.78 tons. 8.4 acre feet 4.85 tons. 12.98 acre feet 4.6 tons.

Q Those are the figures which I covered, like I covered down below there, would you say the soil here in Provo with its light surface and its deep sub stratum of gravel was not a very gravelly soil?

A Yes, this is not a very gravelly soil. The Provo area within the Provo City area is a gravelly loam as I have designated it.

Q You think then you have given as much water to this soil as

was found necessary to similar soils in the state of Idaho, as given by that report?

A I have given more.

Q In what particular?

A The average as the total for the season that I have designated in the table, the least is 2.96 acre feet. The greatest amount for the season except the city lots is 4.85 acre feet. Mr. Bark in his conclusions on investigations of the duty of water ~~xx~~ in Idaho finds that on the medium soils that two acre feet is sufficient and on the extremely light and pourous soils the extremes that four acre feet is sufficient.

Q Have you been able to -- were you through?

A No, not quite.

Q Pardon me, go ahead and finish.

A In no one of the units in the Provo Area that I have designated does it come under the class that Mr. Bark designates as requiring as much as four acre ~~fxt~~ feet.

Q What can you say of your own knowledge, Mr. Wentz, as to the productivity of this soil giving the same conclusions in tons for provo that Mr. Bark for his Idaho investigation.

A I don't understand your question.

Q Let me reframe it then. Can you say what this land did produce or will produce in tons per acre as Mr. Bark did in that report?

A No, I haven't kept any of that data, production of crops.

Q You have absolutely no data to support your conclusion as Mr. Bark furnished by his conclusions?

A No, the amount of water and the amount of production are not always in direct ratio. Fertility of the land, class of the land and the cultivation of the land, many things come in as factors of production. For instance, in the growth of trees, a peach tree that is irrigated often and not cultivated in the Provo area will make from three inches to ~~xxxx~~ seven in-

ches of new growth. One that is watered properly with proper amounts at periods of two weeks and properly cultivated will make from five to seven few of new growth against the three to seven inches of growth on the land that is not cultivated. The growth factor and production is not in direct ratio to the amount of water applied.

Q Don't you suppose that Mr. Bark took those same factors into consideration that you are now announcing.

MR. THURMAN: We object to that, don't know what Mr. Bark --

THE COURT: Objection sustained.

Q Isn't it to be presumed these governmental reports are based upon similar factors as you have here in indicated? Never-mind what about this wasting time.

THE COURT: If anyone objects to it, the objection will be sustained.

MR. THURMAN: I object to it.

THE COURT: The objection is sustained.

MR. THOMAS: Let them make their objections then.

Q Don't those reports that you have just -- you have in your hand, show that the maximum amount of water was used during the periods which you have designated as your 2 and 3 in your column there, referring to pages 103 and 109.

A On page 103 for the fields of grain, the amount used in May was 13 thirteen hundredths of an acre foot. The amount in June was 68/100 of an acre foot per acre. The amount in July was 56/100 of an acre.foot per acre, and in August there was 9/100 of a foot per acre, and in September the first to the 15th there was nothing used. The total for the whole season was 1.49 acre feet per acre.

Q What proportion of that was used in the months that I have indicated?

A In May there was -- I omitted one in April, there was .009

of practically 1/100 of a foot feet per acre used. About an eighth of an inch. The percent in April was 66/100 of one per cent. May 9.28 per cent; June 5.92 per cent; July 38.1 per cent; August 6.05 per cent. The greatest consumption was in the month of June, being 45.9 per cent, practically the same basis as I have used.

Q Give the figues of July and August.

A July is 38.1 per cent; August 6.05 per cent.

Q I direct your attention to page 109 of this samereport, showing the depth, the summary depth of water in feet applied during the periods indicated?

A Do you wish those read into the record?

Q Yes, and compare them with your own.

MR. THURMAN: I don't know what it is, but we will object to it unless there is some correllation..

MR. THOMAS: Heneed not read it now.

Q Just read those figures, Mr. Wentz.

THE COURT: Do I understand you have objected to it?

MR THURMAN: Yes sir.

M . THOMAS: You may submit it to Judge Thurman, and if he objects I will pass upon it.

MR. THURMAN: I object unless there is some correllation of soils and land.

MR. THOMAS: Very well, I will take it up some other time. That will be all on that matter then.

Q Mr. Wentz, taking your estimates there as the basis of water duty, are you able to say what per cent of the water would be used in the respective months beginning with May and following through June to September?

A No, not without making a claculation for each month in percentage instead of acre duty.

Q Would you say that a larger per cent would be used in June and July and August than in April and May?

A In July than in April and May, oh yes.

THE COURT: Let me aall your attention, I don't knew whether you noticed it, as I understand it there was no reference made to what was used in April in this table, is there?

THE WITNESS: Yes, the column five provides for the month of April, so much of column 4 as my be necessary for the time October 1st to May 10th.

MR. THOMAS: Then therewas reference made onetime by the witness to the early irrigation of March.

THE COURT: That is a non irrigation season.

MR. THOMAS: Yes, generally would be so.

Q Am I to understand then from you that a heavier per cent of the water is need, say for July than for any other month?

A No.

Q Would you say a greater per cent was needed in June?

A The greater per cent is needed from May 10th to June 20th, as the table shows.

MR. RAY: Now, your honor please, I would like to have that cleared up as to what is the basis of his comparison as to per cent; whether Mr. Thomas means to compare the month of May with the rest of the year, or any other one of these designated periods?

MR. THOMAS: Obviously we are discussing the designated periods, during the irrigation season.

MR. RAY: Than any other one period, you mean?

MR. THOMAS: Yes, during the irrigation period. Some periods are obviously such as to require more water.

MR. A. L. BOOTH: He has not the month of May separated there. He starts with May 10th.

MR. THURMAN: That is part of May, isn't it?

MR. A. L. BOOTH: Yes, that is two-thirds, but you asked about May.

MR. THOMAS:: I am asking still about May.

MR. A. L. BOOTH: Object to it as not cross examination.

THE COURT: Object to what?

MR. A. L. BOOTH: To his asking about the month of May.

THE COURT: Ask a question, then you may object to it! I think the last question has been answered.

MR. THOMAS: I think it has.

THE COURT: Ask your next question.

MR. THOMAS: He doesn't know what he is objecting to.

MR. A. L. BOOTH: No, I don't because we don't know --

THE COURT: Gentlemen, the court will require you gentlemen to address yourselves to the court, there is nothing before the court. The court has directed the counsel to ask his next question. You may proceed, Mr. Thomas.

Q Would you say, Mr. Wentz, that the investigations made as recorded on page 109 of Mr. Bark's report were made under conditions similar to those existing here in this valley?

MR RAY: Object to that, your honor please, as calling for hearday.

THE COURT: Objection is sustained.

MR. THOMAS: Exception.

Q Upon what did you base, or let me put it this way, what did you include in municipal uses of water when you answered Mr. Evans with reference to the amount of water that would be required here in Provo City.

A I have segregated the amount to Provo City in the amount of land actually irrigated within the city on the lots in the several blocks and the amount designated as the Provo City Water Works includes the amount to the Water Works system for culinary use, stock watering and sprinkling of streets and lawns, and such uses that are not covered by the irrigation

system within the city by ditches.

Q Have you made any other calculation than that that you have given to Mr. Evans on direct examination, that it would take one second foot to each 1850 inhabitants for all municipal purposes; that is, have you designated, divided and subdivided the various uses that water is put to in a municipality?

A No, I have not made a subdivision.

Q Upon what did you base your estimate?

A That is based upon the amount usually awarded to cities at the maximum requirement based on reports.

Q Do you know how many miles of streets there are in Provo?

A No.

Q Do you know how many miles of sewer there are here?

A No.

Q Do you know how many drinking fountains there are?

A No.

Q Do you know how many public horse troughts there are?

A No.

Q Do you know how many square yards of lawn that require sprinklng in this city?

A No.

Q How many or what requirements there are made upon the city for the use of water in the city cemetery?

A No.

Q Nor in the schools?

MR. A. C. HATCH: Isn't the cemetery in the acreage?

MR. THOMAS: That may be, but I think not.

MR. JACOB EVANS: It is under the pipe line I think.

Q Do you know what is required by the hospital, Provo Hospital, State Mental Hospital from Provo City in water?

A No.

Q Do you know whether or not Provo City is required to furnish water to any non resident adjacent to the city?

A No, I don't.

Q Do you know what water is required as a fire protector, which you generally call a fire reserve for a city of this size?

A No, I have not sdgregated this amount as I state, but cover everything. The amount is sufficient as designated by , as given in the report as a maximum amount per capita for cities of 350 gallons for each person every twenty-four hours.

Q Now, you have in mind the reports that have been published from time to time as to the water requirements in the large cities, have you not, more thickly populated centers?

A yes.

Q Have you taken into consideration the civic conditions that are existing in the various cities from which you have taken your report and compared with this city?

A It has been sometime since I went into that matter, and looked it up, I think four or five years ago. As I remember at the time I made up this table I established that from my recollection of the maximum amount that would be required for a city of this class.

Q Purely a matter of memory then? upon which you made your estimate?

A Well, yes, it is a matter of memory, it is a matter of knowledge it is not exactly memory.

Q And have you made any particular investigation as to the conditions in this city here as to its requirements for municipal purposes?

A No.

Q You haven't made any investigation as to that or taken into consideration the peculiar conditions of this city in making your statement one second foot would be sufficient for 1850 people?

A I don't know of any peculiar --

Q Just answer the question yes or no, Mr. Wentz, and make your statement afterwards.

A I don't understand the question as stated.

Q Just read i t again.

A What you mean by peculiar.

Q Well, local conditions then?

A I don't know of any peculiar local conditions.

Q Now, will you answer the question.

MR. A. C. HATCH: If the court please, I submit that he has answered the question. He was asked if he had taken into consideration the peculiar local donditions of this city in making this computation, he said he doesn't know of any peculiar local conditions existing.

MR. THOMAS: That may be deemed an answer, I don't think it is.

THE COURT: You may have it answered further, if you desire .

Q Can you make any further answer to thequestion?

THE COURT: It is in substance no. He has not of course if he doesn't know of any he could not take them into consideration.

A No, I cannot make any further answer to the question.

Q Mr. Wentz; in making your calculations did you take into consideration the waters that came from what are designated as the East drain or East drains here in this city -- I think that I have given them the proper name?

A The water that come from the East drain or anywhere else don't make any difference with the duty t able, no consideration of the source of supply at all.

MR. CORFMAN: I just want to ask one or two questions.

CROSS EXAMINATION by Mr. Corfman:

Q I see in your report that you designate the Factory race upon which the mills are situated as being constant 19.30 second feet, except in time of scarcity. What do you mean by that designation, time of scarcity?

A What part are yourreading from?

Q My copy is not paged. It is your report of 1915, part 8, page not designated in my copy?

MR. RAY: Page 6.

A I followed the outline of the preferred right use as defined in our statute, Section 1288 X 27 that use for agricultural purposes and for domestic purposes have preference over use for all other purposes and that a factory race is subject and is seconday to domestic and also to agricultural rights.

Q That is, you treated it as such?

A Yes, and treated it as so.

Q You treated it as such? A. Yes.

Q And you did during the season of 1915 in times of scarcity take from that 19.30 second feet portion of the water that the mills would have had, and applied it for purposes of irrigation? A. Yes sir.

Q And for how long a period?

A It was taken for a period in August.

Q About how long?

A Well, we were short on the Factory race in July, but the amount was sufficient August third, and I don't remember the deficiency, how long it existed through August.

Q And how much did you take?

A August 4th the amount was 39.4 second feet;

August 5th 27.72 second feet;

August 6th 35.14 second feet;

August 7th 32.48 second feet;

August 10th 23.45 second feet; in the morning... in the

33.25 second feet.

August 11th 29.68 second feet;

August 16th, 30.24 second feet;

August 18th, 31.5 second feet;

August 25th, 31.5 second feet. That is all the measurements I have for the month of August.

Q Did you distribute that water to the irrigation rights under the Provo City system, or did you distribute it pro rata among the several users in Utah County Valley?

A The amount, as I have stated, when we reached the 70 acre duty, we held the canals there and the deficiency was borne by the Factory Race whenever it occurred.

Q And pro rated among the other water users?

A No, I didn't take anything from the Factory Race, the Factory Race bore the deficiency. The amount of 70 acre duty to the other canals was given and they were held there, whatever deficiency there was was borne by the Factory race.

Q That was given to the other water users pro rata?

A No, it wasn't giving it to anybody.

Q Well, they had it then?

A How is that?

Q They had it?

A They had 70 acre duty, the main system.

Q Now, in turning the water to provo City, did you supervise and control it in the distribution after that, before it was applied?

A No, only delivered the water at their headgate. There is a brick yard at Provo. The distribution through the city was made by the city water master.

Q Now, going to the Upper East union canal, do you know the length of the canal?

A No, I don't.

Q Approximately .

A Four miles.

Q It heads at the mouth of Provo Canyon?

A Did you say the Upper East Union?

Q Upper East Union, you misunderstood me.

A Yes, the Upper East Union is nearly nine miles long.

Q And dddyou have any complaint from the water users under the Upper East Union Canal system in 1915?

A Yes.

Q As to scarcity? A. Yes sir.

Q And were you advised that there were crop failures under that system during 1915?

A I knew they were suffering on the lower end in 1915, and investigated and found the cause. It was internal distribution, not the quantity of water at the head.

Q What do you mean by internal distribution being the cause?

A On the first complaint I went over the upper end of the canal and there were a number of gates that were leaking just a small stream. In fact, every gate I noticed along was leaking a small stream and there was about a foot and a a half, one and a half second feet going over the spillway which is located about a mile below their rating station. I reported this to their water master and told him to stop those leaks and take care of his water and if he found after doing that and getting along that he was not irrigating his crops, or did not have sufficient to irrigate his crops, that I would make the amount up until he did have sufficient. The second complaint was about two or three weeks later and he told me that he was not getting along on the lower end, that he was still short. I investigated conditions on the canal. He was diverting one stream about a mile and a half north of Provo and the other was going to the lower end of the stream. There was approximately twelve and a half second feet a total in the canal. Of this amount 60 per cent was diverted out of the opening and smaller

stream of 40 per cent was allowed in the canal to carry it to the lower end; or the land at the upper end right adjacent to the canal with no losses was being given one and a half times of the amount of water going to the lower end with its ~~xxf~~ occurring transmission losses. I reported this to the company and advised them to put in weirs, put in two weirs so that the water master could make a division of that water, and when taking out the stream at the upper end he could divide it so as to give to the people on the lower end of the system their share of the water. I gave them an estimate and found the -- got an estimate from the Beebee Lumber Company what they would make the weirs up for, and told them if they would order the weirs, put them on the ground that I would help them install them. This was not done, and I could do nothing more , and felt -- and did not feel like giving them any more water at the head until they instituted some proper system of distribution.

Q You are not then prepared to say what the results would have been if those weirs had been installed?

A If those weirs had been installed and the proper distribution made in the system and those people were still short, I would have turned them enough water to make up the deficiency.

CROSS EXAMINATION By Mr. John E. Booth.

Q Mr. Wentz, have you made any calculations from the table and in connection there with what amount of water would be required to supply say the first colum on the acreage that you have estimated? A. No.

Q Can you do that?

A I can do it on the acreage that I have used the ~~xxx~~ 13,810, but I cannot say how close that acreage is, it is submitted by different parties in the case.

Q Have you that calculation that you can give me?

A No, I haven't made it, I can make it for you.

Q And soon, or I would be glad to get that, I want to get some idea what amount of water in the river would be required to supply those estimates you have on your table?

A I could not make it on account of the different ranges of duty. It would take some time to make it because there would have to be a calculation for each area.

Q Could you give it approximately?

A No sir.

Q So that you don't know whether the water that was in Provo River in 1915 would supply the amounts that are used in the tables for acreages as you have it there?

A I have not figured the quantity, I cannot say one way or the other what this quantity is, I cannot express an opinion that I don't know anything about.

Q You have so many acre feet.

A Yes.

Q And I didn't know but you might have calculated the amount of water that would be required to supply that much acre feet under the several columns that you have there.

THE COURT: For that to be of any value you would require the acreage.

MR. JOHN E. BOOTH: I understand he has an acreage he can use.

THE COURT: How much acreage?

THE WITNESS: 13,810, that would necessitate calculation on each one of those, take some time.

Q I see it would, I didn't know but you had it.

A No.

Q The reason of it is in order to make it applicable. If I knew what amount of water that would supply those demands here I would then know at once whether I was satisfied. I haven't any cross examination on that branch without a little

more information with regard to that point. Can you let us have those figures later?

A Yes, I can figure them for you on the acreage as used in the report.

Q That would be satisfactory. One other question. Did you take into calculation at all, take the East River Bottoms, you have 110 of a coefficient there.

A Yes.

Q You recognize the place, the upper place of Peter Boyce, do you, you know where that land is?

A Yes.

Q And Ferguson's? A. Yes sir.

Q That is land that would require about the most, isn't it, of any of that division?

A The land above the south line of Ben Richmond's, from there up requires the most.

Q Now, take it there, you require a vast amount of water there?

A Yes.

Q To supply? A. Yes.

Q Now, did you calculate or take into consideration the fact that that great loss rises, say half a mile or little below, little more than that below and is again used by other irrigators?

A No, I have not figured any of those quantities in.

Q Well, do you recognize that as being the fact?

A There is a point a line somewhere crossing the river bottom-s below which we get a return and above which we lose. It is lost, and I have never been able to determine where that line is.

Q Have you been through my place there?

A No.

Q Have not examined the crops there?

A No sir.

Q That are on mine? A. No sir.

Q' I thought perhaps you had taken that into calculation. I wanted to know what was the result of it if you had.

A No.

MR. JOHN E. BOOTH: I believe that is all the cross examination I have.

CROSS EXAMINATION by Mr. Huffaker;

Q Mr. Wentz, on your direct examination did I understand you to say that you didn't know whether or not there would be any loss in transmitting the water from the reservoirs down to the plaintiff's point of diversion?

A I don't know what the quantity of loss is.

Q There would be a loss by evaporation and seepage, however?

A Yes, undoubtedly some loss from evaporation.

Q And then with the reservoirs up there, wouldn't the construction of those reservoirs interfere with the intermediate flow.

A You mean by the intermediate flow the flow between the high water and the low water?

Q Yes.

A Well, if they were storing water at that time in the reservoirs the intermediate flow would be less.

Q The reservoirs according to your opinion should be filled during the high water then?

A Yes, they should be filled at times when the water is not appropriated by the whole users for irrigation direct from the river.

Q And wouldn't it interfere in other ways -- now, for instance, supposing there were only a half a second foot of water running in into that lake of 50 acres there if the reservoir were not there, that half a foot of water would go directly down into the main river, but by the reservoir being there, and spreading that over the area of 50 acres, it is likely that the greater portion or all of it might be lost in evaporation

isn't it?

A No, I will explain that in my own way, ,if you will allow me.

Q That is all right.

A I was under that same impression, that the water flowing into the lakes at the head of the river, the surface flow, visible flow, should be counted as a part of the natural flow and if the lakes were not there it would go on down the river. On investigation of Wall Lake -- and I may say before that the strata of that country dips towards the Weber, and the whole lake district, the strata or bedding planes are all dipping away from this water shed, and they are not broken , so that any water that falls -- goes into the earth, instead of going to the Provo Shed, follows the plane the opposite way, follows the dip of the planes towards the Weber. This might not be true if the vertical seams in the -- through the section were open. The height of water above the opening of those seams below the lakes would force that water back through the vertical seams into the Utah -- the Provo River section, but I examined the vertical seams all over the section of the country in which I travels, and with one exception I found them all closed, they are closed at both ends as far as you can follow them, so that the sub-surface water follows, must follow the bedding plane. It is true that there is some water following those planes now when they pierce the sub-surface side of those lakes they may be discharging quantities of water into the lakes and in the form of springs and seeps, but on the other end the bedding planes on the opposite side of the lake may be carrying that same amount or a gr-eater amount through to the Weber watershed. To determine this fact we made a test on the Wall Lake with the outlet valve closed. On August 27th, at 6:40 P. M. The gate in the outlet pipe was closed tight and no water allowed to escape. Three wood hubs were

then set around the shore line of the reservoir as follows; one in the southwest corner, one in the northwest corner and on the east side. These three hubs were set so as to have a check against any wind or wave action and was very carefully set flush with the water surface while the reservoir was comparatively calm. On August 29th at 4:40 P. M. after these hubs had been allowed to remain undisturbed for forty-six hours, they were observed with these results. At the hub set in the northwest corner the water surface was found to be 2/100 of a foot or one-quarter inche below the top of the hub. At the one in the southwest corner the water surface was founf to be three and a half hundredths of a foot or seven-sixteenths of an inch below the top of the hub. At the one in the east side, the water surface was found to be three and a half inches of a foot or seven-sixteenths inches below the top of the hub. Taking the average drought of ~~300~~ three hundredths or three eighths of an inch from the surface area of fifty acres equals 1.74 acre feet loss in 46 hours, or is equal to forty-five hundredths feet flowing continually. There was no visible inflow to this reservoir at the time this experiment was made. ~~Exam~~ Some similar observations were made on Tiral Lake with the same result. These lakes actually lost more than the inflow. The outlets are lower than they were originally and the surface area is relatively smaller, therefore when these lakes are down and losing this quantity of water they are even losing less than they were originall. I think that answers your question.

Q Well, as I understand you Mr. Wentz, the water is going off into a different water shed because of the strata of the rock; how would you account for this loss, where does it go to?

A It follows the bedding planes undoubtedly to the Weber River.

Q Then there mightbe a half a second foot of water running into

one of those lakes? and because of the reservoirs being there it might go off into the Weber where otherwise it would go down the Provo, isn't that true?

A No, you have the wrong idea. These lakes are losing this half a second foot approximately when they are even down below their old natural surface.

Q Don't they lose more when they are covering more space when they are filled up well?

A Yes, they undoubedly lose more, but that is storage water. Didn't make any difference if they lost it all, the Provo River at the stage of the year wouldn't be any different. Say on June 1st if those reservoirs lost all their storage in one day and it went the other way it wouldn't make any

S difference to the Provo, because on that day of June 1st the overflow from that lake would have been gone.

Q So you don't think that these reservoirs would make any difference with the surface water?

A Make a difference exactly, the difference of the water they store, the amount of water that they store at the head of the lake, there is that much less water going into Utah Lake in acre feet.

Q Is there any way of determining the exact or approximate amount of water going into those reservoirs either surface flow or percolating?

A At what stage do you mean?

Q Well, take it during, in the intermediate or after the low -- during the low water?

A We have -- at least Mr. Pratt made the measurements of the visible surface inflow to those lakes and that amount was deducted from the amount turned from the lakesand counted as natural flow from the Provo. For instance, if we found they were -- there was three second feet surface flow going into the lake, and wated to deliver fifty second feet to the Provo

Reservoir Company, why we would turn from the reservoirs the 53 second feet and allow the three second feet to go to the old users.

Q But you only measured the surface flow to deduct that amount?

A Yes.

Q Isn't it a matter of fact there is a sub-surface flow there coming from the big snow banks above?

A Yes, but it is a fact that there is a sub-surface flow going out the opposite side of the lake as I have explained by this test to the Weber water shed.

Q But you cannot determine the amount, of course of the sub-surface flow into the lakes, could you?

A We would determine the difference between the sub-surface inflow and the sub-surface outflow by measuring the surface inflow and keeping the gate valve closed.

Q Well, did you make a test to determine that?

A No.

Q Now, there is one other question, I didn't understand Mr. Wentz just what you meant, you said it didn't make any difference in irrigating whether you put two inches of water on or ten feet.

A I will illustrate that with this map. This is a cylinder approximately five feet in depth, and it is in exactly the same condition as the soil. The opening or the outlets from the soil are in the bottom to the sur-surface. In filling this cylinder it will hold just so much water, takes five gallons or ten gallons or fifteen gallons of water, take up two inches in soil. You can pour into that soil just as much as you want to and as fast as you pour it in it goes out. It will hold just so much of it, will only hold two inches. You can put on as much as you want to and it will still hold the two inches, whether it be one day or whether you keep it on for ten days or two months.

Q You are assuming it is thoroughly saturated?

A No, it never gets saturated. It produces from 40 to 60 per cent of saturation. It cannot be saturated unless it has an impervious place there to hold that water from escaping. The water is moving through the soil and most of our Provo soils here in the Provo area are coarser as you go down and the outlet openings are a great deal -- have a great deal better capacity for carrying off the water than the inlet openings.

5:00 P.M., Recess to 9:30 A.M., June 9, 1916.

T. F. WENTZ - - - -

CROSS EXAMINATION by Mr. Ray.

Q Mr. Wentz, directing your attention a little more in detail to the soil conditions on provo Bench. Provo Bench is a river delta, is it not?

A A lake delta.

Q The sub-soils you have divided into three classes, the top soil you have divided into three classes, have you not?

A Yes.

Q What is the subsoil of the Provo Bench?

A It is porous coarse gray sand with gravel and sand up to two to three inches in diameter, and some boulders up as large -- I have seen some as large as two feet in diameter.

Q The break between the upper soil and the sub-soil in the central part of Provo Bench is very clear, is it not?

A Yes.

Q And after you pass through the upper soil, you pass into a layer of very coarse material?

A Pass into the sand and gravel.

Q Now in that coarse material there is very little capilarity is there not?

A Very little.

Q So that the water passing through the upper soil is taken almost entirely by gravity to the bottom of the layer of coarse material?

A It is taken to the ground water plane which is 50 or 60 feet in depth. That porous soil only holds naturally about one and a half per cent of water, that is about 3/8 of an inch in depth in each foot; at its saturation only holds 26/100 of a foot, and the amount that it will take up as capilary water on a 11 inch column with a bottom standing in water will only take up eight hundredths of a foot.

Q So that that class of soil, Mr. Wentz, underlaid with the formation that it is underlaid with is rather unusual as to the amount of water necessary to properly irrigate it?

A Well, it is not unusual, I don't understand exactly what you mean by unusual.

Q I merely use it comparatively as compared with soils underlying with clay, for instance where the clay sub stratum is close to the surface?

A Yes, you can only put -- with your clay you get some return water by capilarity and with this soil you can only store two inches in this two feet of soil. It will only hold two inches if you put five inches on you will lose three and the two remain there.

Q Now, have you ever made an actual soil survey of Provo Bench?

A No.

Q You stated that the soil on top varied from one and a half to two feet in the middle section, or three feet?

A Yes.

Q That was just a general average, was it not, which you made, Mr. Wentz?

A Yes sir.

Q As a matter of fact, there are many tracts in which it is not a foot and a half, or some, at least?

A There may be some fields that are less than that. I think the general average is about two feet.

Q You have never madeany survey, accurate survey of the acreage coming within the class through the middle of the Bench which you designate as requiring the lowest duty, have you?

A No.

Q Or that on the north where you have a clay loam requiring a less duty? A. No.

Q Or that on the south requiring a duty again less than the middle section?

A No, I have not, that would be almost impossible over this extremely porous soil; and the clay loamsand clay types, it is ~~blend~~ blending, it doesn't change on any definite line, but blends from one type to the other.

Q Now, Mr. Wentz, you were asked by Mr. Thomas, and I think by counsel for the plaintiff in respect to your table here, as to why you place a higher duty in the early part of the season. Calling your attention again to that, what is the effect of winter frost upon the porosity of the soil?

A The soil after the winter is loose and is uniformily moist and conducts the waterfrom the surface, that is applied on the surface, very quickly to the sub soil in that condition. A soil that is dry, that is perfectly dry, won't conduct any water to the gravel below. For example, I had an experiment on a tract of land about three acres, sandy loam, water in furrowing, they were about twenty-five ~~rold~~ rods long. The water was turned in each furrow and it went down those furrows just like it would go down a timber flume. Soil was absolutely dry. Letting that water run for an hour, orpossibly a little

longer than an hour, the water begin to percolate under the soil, after the soil was so it would conduct the water, and in stead of the water going off the lower end of the tract it begin to go into the soil and gradually the water came back from the lower end, and after a time, wasn't more than half or two thirds the way down the tract.

Q Your conclusion from that is that moist soil is a better conductor of water to the porous substratum than dry soil is?

A A great deal better. In orchards where there are trees, say twenty feet apart, on only two furrows on each side of a tree, and the water is applied in those two furrows constantly every, say fourteen days apart, the land between the furrows and near the center of the strip becomes very dry, because the lateral motion of the water only extends about a foot from the furrow and the water is all applied underneath the furrows. It is moist. As soon as the water is applied in these furrows instead of going laterally.

Q Now, in addition to the frost bringing the soil into condition of porosity, plowing and cultivation have the same effect, do they not?

A No, plowing only for the amount that is cultivated, say one or two or four inches deep.

Q But to that extent it adds to it, does it not?

A Yes, it adds.

Q So that a high duty is placed upon your table early in the season for the purpose of packing the soil and reducing the transmission loss?

A A low duty?

Q A low duty, I mean.

A Yes, and for the purpose of making the irrigation. It is impossible to make those irrigations with light applications in the early part of the season when the soil will conduct the

water rapidly to the sub-soil .

Q Now, what crops, if you know, are grown on Provo Bench in the main?

A On the porous soils in the center part of the bench, alfalfa, orchards, grain and some garden truck. On the heavier soils, on the south end in addition to those crops, there are some beats grown. On the north end of the bench on the heavier type of soil there is in addition to those crops, quite a large area of beets.

Q Now, the middle soil there, middle section is not well adapted to grain as a crop, is it?

A Well, it is not adapted to anything particularly, excepting fruit, that is its main --

Q And it is largely devoted to fruit, is it not?

A Yes, I suppose as much as thirty per cent to fruit.

Q And fruit requires, as a matter of fact, a very large amount of water in the latter part of the irrigation season when the fruit is making, does it not, and ripening?

A In clean cultivation and at the time of the harvesting of the crop of fruit, peaches especially must be watered, those two irrigations near the first and tenth of September. Usually those orchards go the fourteen days, but those two applications must be made together.

Q And they must be relatively large applications, must they not, Mr. Wentz?

A No, not necessarily, the large applications don't leave any more water in the soil than the small applications. Q. That perhaps is a complete answer, but there must be an irrigation which completely saturates the soil there to the extent that is able to take up water?

A Yes, and they should cover the whole surface area instead of in furrows.

Q That keeps thefruit from dropping, does it not?

A Yes, and fills the fruit out.

Q With its joices. You stated you were familiar with the old Morse and Chidester decrees? A. Yes.

Q The quantity of water which you have indicated as a proper quantity of water for the provo bench is a quantity in excess of that awarded under either of those decrees under a mean river, is it not? A Yes.

Q Do you know from any observation or investigation what percentage of grain the farmers on Provo bench have put in merely because of the scarcity of water under the Morse and Chidester decree?

A No, I could not say the percentage there, the quantity under those old degrees was so uncertain to the Provo bench.

Q And so inadequate, was it not? A. Yes.

Q So that, as a matter of fact, if that -- if the Provo Bench had that quantity of water to which it was entitled it might increase the area of its profitable crops and decrease the area of its less profitable crops?

MR. A. C. HATCH: Object to the question as assuming that the witness knows definitely and conclusively the quantity of water to which the Provo bench is entitled.

THE COURT: I think it is subject to that objection.

MR. RAY: I didn't want to become subject to that objection. I am merely having him assume a high hypothesis there without determining anything, if they have more water under any circumstances.

THE COURT: With that modification you may answer the question.

MR. RAY: That is the purpose.

THE WITNESS: Repeat the question.

Q I will reframe it in order to come within the objection. Assuming the Provo Bench irrigatoss should have a quantity of water in excessof the quantity which has been available to them under the Morse and Chidester decrees, might it not result in increas-

ing their area of profitable crops, fruit, vegetables and berries and decreasing the less profitable crops, such as grain?

A Yes.

Q Now, Mr. Wentz, turning to your report 8 I think it is -- np, report 2 page 5, you have made there, and there has been read into the record a table showing the duty of water under the so-called Morse decree, what acreages did you use in arriving at that duty?

A The acreages shown in the table and for this particular canal 4,333.

Q And that is true as to each canal indicated in the table that you use the acreage specified there which is the same acreage as that contained in your report of 1915, and used in the distribution of your waters for 1915?

A Practically the same on all the main systems. One or two of the minor ditches are changed.

Q What was the condition of Provo Bench as the fruit crop last year?

A Therewas no fruit crop.

Q Because of what?

A Because of frost.

Q It takes a less quantity of water, does it not to mature -- to keep trees alive than it does to properly irrigate them for the maturing of a fruit crop? A. Yes.

Q So that if in 1915 the fruit had not been destroyed by frost there would have been a greater quantity of water required for the fruit trees than that actually applied to them?

A Yes.

Q And you have taken that into consideration and stated it to the court upon your direct examination?

A Yes sir.

Q Now, taking the allowance which you have made under column 4 of this table to the Provo Bench; that in your opinion then

must give a greater quantity of water to the Provo Bench Irrigators than that turned to them in 1915?

A Yes.

Q And that because it is your desire to meet normal conditions, one reason, I mean normal crop conditions there?

A I don't like that word desire that you have in that question.

Q I mean that is the result of your purpose?

A The purpose is to deliver the necessary amount for those farms.

Q Now, when you fix your duty as you do there, as a matter of fact, you mean by a factor of safety a quantity of water which will properly irrigate those farms under a year of mimimum precipitation, do you not?

A Yes.

Q And you have fixed your table to meet that condition?

A Yes.

Q Now, you say in column 2 of your table there, Mr. Wentz, that the duty is 63 up to the 20th day of July?

A Yes.

Q Upon each quarter section, as I understood your direct testimony you made your change of duty on that date, becsuse in your opinion that was the last irrigation of grain, and the water which had been used for the grain prior to that might then be devoted to the fruit and other crops to be matured?

A That is one of the main factors why the change was made.

Q Assume there were a materially less quantity of grain upon the Bench than that which you have figured, would you then extend the 63 acre duty beyond the 20th of July?

A Well, that is problemmatical, it is a diversified crop area and must be so on account of the soils.

Q Assume, Mr. Wentz, that instead of the last irrigation of grain being the 20th of July, it should appear that the farmers on provo Bench because of the soil conditions, actually irrigated

up to the first day of August on their grain, would you then extend the 63 acre duty period to the first day of August?

A If that were uniformly so that they irrigated their grain over the whole area up to the first day of August, why that duty ought to be extended, but my experience is it does not go beyond July 20th.

Q Well, you have given your experience on that, but assume that you should conclude from further investigation they did irrigate up to July 20th quite uniformly up on their grain-- I mean up to August 1st, then in your opinion they should have the duty of water until the time when they ceased to irrigate their grain crops?

A Yes.

Q There is practically no seepage into the canal of the Provo Bench Canal Company, is there?

A No.

Q When do they first irrigate their grain?

A From the 20th day of May to the first of June.

Q Now, on the thinner soils along the bench, how often after the first irrigation has it been their custom, if you know, to again irrigate, how frequently do they irrigate?

A Their grain?

Q Their grain?

A Every two weeks.

Q And they irrigate some fruit in May and June, do they not, quite a good deal of it in some seasons?

A Yes, in June first irrigation on fruit, even in clean cultivation is in June, latter part of June.

Q Are there not some irrigations in May depending upon the crop?

A Yes, where it is lucern and clover between the trees, why they water as early as April the 20th.

Q And there are a great many orchards on the bench where that is

the condition, are there not?

A Yes.

Q And the lucern under those conditions or the clover, require for their proper maturing early watering?

A Yes.

Q The water coming from the reservoir up at the Union Reservoir system travels about sixty-six miles, does it not?

A Yes.

Q Goes over a great many water falls-- I don't mean large falls.

A It goes over some, I don't remember the number, there are falls about possibly fifteen or twenty feet in height.

Q And in that distance it drops down from ten thousand feet to about four thousand feet? A. Yes.

Q And has a very rapid and agitated current good part of the way, has it not?

A Yes, down to fiftsen miles above Heber, very rapid descent.

Q And above those currents there is an almost constant mist of water, is there not?

A There is a constant evaporation there.

Q There is an apparent mist good part of the way, is there not, on warm days from the agitation of the water -- I don't mean heavy clouds of vapor?

A Yes, there is a mist there.

Q And that adds to the evaporation?

A Yes.

Q You have made no determinations to determine how long it takes a given quantity of water to move from one of these lakes to the mouth of Provo Canyon, have you?

A It moves from the lakes to the Wasatch dam in thirty-six hours and about one day from the Wasatch dam to the mouth of Provo Canyon.

Q So that it would be about sixty hours coming down?

A Yes.

Q And you have made no determination as to what the percentage of evaporation would be in that period?

A No.

Q Or what practical loss there might be by seepage?

A No.

Q Now, after you get into the canyon the river, while it may have loose river rock in it, moves through a practically impervious rock bed, does it not?

A The bottom of the river is practically impervious, and the communication between the river and the sub-sruface water are entirely independent.

Q Do you know of any faults in the canyon which produce losses in water?

A No, the only place that I thought there would be losses in that river bed was between the Utah Power & Light dam and the hear works of the Provo Reservoir Company. I made a measurement of that and found a substantial gain.

Q You might have a gain and a loss at the same time, might you not?

A Yes.

Q That is, you might gain through the inflow through the sub-surface and surface inflow 40 second feet and might be losing beneath the river 20 second feet and your total river would show a gain of 20?

A Yes.

Q But you have made no determination on that?

A No.

Q Have you ever made any determination as to the outflow of the reservoirs which you described yesterday and which are set forth more particularly in part 9 of your 1915 report. I don't mean the reservoir outflow, but the natural outflow during the entire season?

A No, we have not. We were under a rather misleading statement there on account of the facts that were determined before. These

wenty.
River Bed
in Canyon
unpervious

p. 265
made no
determination
no -

Thought only
losses would be
between Power
dam & Hoslets

Found a gain
there -

losses of the inflow, losses of the surface inflow into these lakes was counted as natural flow. Now, on the Washington Lake with it running a constant inflow of 75/100 of a second foot, it kept receding all the time and Trial Lake with its outlet valve closed and with the flow coming from Star Lake and down the ravines the lake continues to recede.

Q And those measurements, Mr. Wentz, were made, were they not, in the very latter part of the season?

A They were made in August.

Q Made in August when the subsurface inflow there might be very much less than it would have been during the earlier part of the irrigation season?

A Yes, it may be less.

Q Have you ever determined prior to the installation of the dams and such how much water actually went out through these lakes during the irrigation season and as a visible surface

6 outflow went into the Provo River, personally determined that?

A No, I haven't that information.

Q That would be a quantity of water, if it were determined, which would find its way into the Provo River as it came down these different --

A Yes, if there was an outflow there in the latter part of the season it would naturally flow to Provo River.

Q That is entirely independent of your Weber River drainage? Now, wherever the river recedes to the 300 second foot river, for instance, at the mouth of Provo Canyon, are there then at least some tight dams in Provo Valley?

A Yes, and practically all the time.

Q There would not be a tight dam at 1500 second feet, would there?

A I understood you to say at the 300 second foot actual stage.

Q I know, but you said practically all the time, you mean practically all the time at that point and below ?

A At that point and below all the natural flow is stopped up

in the Wasatch Valley, when we get that low, and as high as I stated yesterday, 422.

Q So that irrespective of that overflow, natural overflow of the Trial Lake and Union Lake system, if there were a tight dam at Midway that water during that period would not be available, would it, to the users in Utah County except as it came back by subterranean channels from the farms in Provo Valley?

A No, it would not be available to Utah County.

Q You have a made a colum 6 there, column 5, that includes two possible periods of irrigation, does it not, the late fall and early spring? A. Yes.

Q You recognize by that column that after the grain is off in Provo -- in the Utah Valley on Provo Bench, that they sometimes irrigate that ground, do you not, in the fall?

A Yes, they irrigate in the fall, and sometimes they irrigate it as late as November first. We were irrigating last year practically over the whole system on the first of November.

Q And that is beneficial irrigation, is it not?

A Yes.

Q And has been carried on for many, many years to your knowledge, by Provo Bench? A. Yes.

Q Your distribution of 1915, Mr. Wentz, was a distribution upon your idea of necessities, was it, that is to the extent that you had lattitude to give necessities?

A Yes, I can explain that fully and I tried it two or three times, but have not succeeded very well.

Q Let me limit the purpose of my question and then it may not require so much explanation, in view of your former explanations. Section 16 of the decree of Judge Morse -- Section 15 provides: "That all the rights fixed, declared and decreed herein are founded upon appropriation of water necessary for some beneficial use, and that all such rights hereby fixed, declared and decreed are subject in their exercise to the con-

ditions that they are required and necessary for some beneficial use and that all such rights are expressly subject to the limitations and conditions that such waters are used for some beneficial purpose, and are used economically." Now, did you have that in mind in your operation as commissioner last year?

A Yes, this paragraph fixed the extent of the appropriation.

Q This particular paragraph?

A Yes.

Q Subject to the limitations which I have just read, did it not?

A Subject to limit of beneficial use.

Q And you had that in mind, did you?

A Yes.

Q Now, when you said yesterday that you didnt disregarded the Morse decree, you meant that you followed the stipulation under which you work to the extent that it modified the Morse decree and abrogate it, did you not, Mr. Wentz?

A Disregarded the tablulation inthe Morse decree entirely.

Q The quantity was the quantiy in the Morse decree, the distributees were the distributees of the Morse decree with the exception of the later appropriators, were they not?

A Yes.

Q And then the stipulation you understood to remand you to Section 15 of the decree as to necessary beneficial and economically uses?

A Yes.

MR. THOMAS: May I ask a question here, your honor. Referring to the last question propounded by Mr. Ray, Mr. Wentz, did you pay any attention at all to the tabulations as they were given in paragraph 5 of the Morse decree -- I have it right here?

A No.

MR. THOMAS: Did you assume that these tabulations

were based upon no established fact?

A I don't understand that.

MR. THOMAS: Let me say then, did you assume that the court in finding the result as set out in paragraph 5 of the court's decree that the court had no sufficient evidence to support that finding, that conclusion?

A Yes, I don't think there was sufficient evidence to support that .

MR. THOMAS: Then you think when the court rendered that decision as given in paragraph 5, that the court was wrong?

MR. RAY: I object to that as calling for a conclusion of the witness.

MR. THOMAS: He said he doesn't think there was sufficient facts to justify it, and trying very hard to establish that the decree was lived up to.

MR. RAY: Oh no.

MR. THOMAS: Then I misunderstood you.

THE COURT: The objection is sustained.

MR. THOMAS: Did you regard the findings and the tablations as they were stated in paragraph 5 as wholly wrong?

A Yes

Q Did you regard them as having any validity so far as your operation was concerned?

MR. THURMAN: Object to that, calls for his conclusion as to a decree of the court.

THE COURT: What is the object of it, if there is any particular object in it --

MR. THOMAS: I am trying to find out upon what ground Mr. Wentz acted when he undertook to set aside a decree of established right.

THE COURT: That is apparent, but what is the object

of it. How can it assist you any?

MR. THOMAS: I think it would assist us in establishing some bias, at least, in some of the actions of Mr. Wentz.

THE COURT: Objection is sustained.

MR. THOMAS: Note an exception.

THE WITNESS: If you will permit me I can clear that point up.

MR. JACOB EVANS: That is exactly what I was going to suggest to the court. I think the stipulations clearly fix that, and if Mr. Wentz is permitted to explain that I think it will be clear to everybody's mind why he made the distribution under the stipulation and not according to the decree of the court.

MR. RAY: I don't think that is material at all. Mr. Wentzhas once described it and it seems a waste of time.

THE COURT: It seems so to me. Here is a stipulation and here are two decrees, and operating under the two decrees and stipulation Mr. Wentz has made his assumed best division of this water pending the trial of this case that he could; whether he was accurate in all that he did or whether he made mistakes is not material to us now. It won't in any way aid the court in determining the rights of the several parties. I don't think it is material matter at all. While It would be interesting as suggested.

MR. THOMAS: The court has already ruled.

MR. JACOB EVANS: I don't want to prolong this matter at all, but just a very short statement -- no, I guess I will make no statement at all. I was going to say that was our understanding, all of us, at that time, that the water was going to be distributed exactly as Mr. Went z distributed under the decree -- that is under the stipulation, that was the express understanding of thestipulation.

MR. THOMAS: To reply to that would be only to indulge

in argument.

THE COURT: Any further questions?

MR. THOMAS: Not from us.

MR. BAGLEY: I would like to examine the witness briefly.

CROSS EXAMINATION by Mr. Bagley.

Q Mr. Wentz, does the ground waterhave any effect upon the quantity of water that is required to irrigate a tract of land?

A That depends entirely upon the soil. If the soil is a clay and uniform or if it is sand and uniform and is not cut by stratas of gravel or sand the soil will conduct by capilarity from the ground water plane to the surface. If this soil is cut by strata of coarse sand or gravel there won't be any water coming from the ground water plane to the surface soil. A very plain illustration of that. I noticed last summer on Spring Creek immediately west of provo there was some grass one foot above the ground water plane that was dying for want of water. The soil was very shallow, about six to eight inches and below that that the ground water plane was in was small river rocks and gravel, and there was no way that this water could get to the soil even in so short a distance. In the deeper soils and uniform soils why it is available for the plants at the surface.

Q What is the character of the soil in the First Ward Pasture, that is the sub-soil, is it underlaid with a strata of gravel?

A In some places that I have noticed there, the only observations I have had where the ditches are cut, and the Factory Race.

Q Is that a coarse gravel or fine gravel?

A It is relatively coarse.

Q Do you think that the First Ward Pasture soil construction is

such that no benefit accures through ground water?

A Some parts of it, yes, and the lower part, why, it is amply

Q supplied from below.

Q Do you know about what the ~~pth~~ depth from the surface to the ground water is in the First Ward pasture?

A Well, it varies from the upper end, it is down about ten feet; down towards the lower end it is right at the surface.

Q Do you think there is that much difference between the lower part and the upper part of the pasture, ten feet?

A Yes, the Factory Race -- no, there isn't that much difference. I was thinking of the Factory Race in the cut north of the road, the Factory Race is about four feet below the surface.

Q Have you made any investigation to determine that fact?

A No.

Q Do you know of any having been made?

A No.

Q Have you ever seen the water, the result of the investigation of ground water made by the government in this section?

A Yes.

Q And have you noticed that plat?

A Yes.

Q Of the ground water?

A That is not always the same, that is the trouble, it changes. Ground water is not the same. Take for instance under the city here, the ground water plane is a great deal lower now than it is later in the season.

Q Well, don't the lake in this valley have some effect upon the ground water conditions in sections immediately surrounding the lake?

A Oh, immediately adjoining the lake, then a few hundred feet it has a light effect, farther back has no effect whatever. The ground water plane slopes practically the same slope as the

the surface, even on hilly country the ground water plane follows the contour of the surface.

Q Yes, but in the First Ward Pasture section the ground water plane is almost horizontal, isn't it?

A I don't know, it would be nearly horizontal because the pasture is nearly horizontal. There is probably just the same drop in that ground water plane as there is in the surface.

Q Well, if ground water planes are continually shifting, is it your conclusions that surveys for the purpose of determining ground water donditions are useless because of the shifting conditions?

A No, they are a source of information that they give for that particular season of the year. The shifting is from one part of the season to the other.

Q But it is not of much importance in a generaly way, is it?

A No, except --

Q Slight variation during the season?

A It is not of any importance in the way that you speak in this Valley, but does become important in the Wasatch County.

Q If, as a matter of fact, the ground water in the First Ward Pasture was only three to nothing from the surface, three feet to nothing from the surface, and the ground water on the Provo Bench and on the East Bench in the section where the Timpanogos Canal Company is from twenty to thirty feet under the surface , would that make any difference in the quantity of water which would be required to irrigate the land?

A Where the gravel strata is above this ground water plane in the First Ward Pasture between that and the surface it would not make any difference. If the ground water plane was only two inches below it, or whether it was two thousand feet below it wouldn't make any difference at all.

Q Well, you didn't make any answer, you mean to say then it would not make any difference at all whether it was three feet or a

thousand feet?

A Not if there is a strata of sand and gravel that won't conduct the water to the surface.

Q Now, you have undertaken to classify this soil, what do you say with respect to the conditions regarding which I have asked you, do you say that there is this strata of gravel which makes it of no consequence, or is the strata of gravel absent so that it is of consequence?

A In some parts of the First Ward Pasture the gravel can be seen, other parts it is not, and I don't know the areas of those different parts.

Q How do you determine this coefficient, that is the relative coefficient if you don't have this acquaintance with the soil conditions?

A I don't have it in detail. I determined the coefficient by the knowledge I have of all the system, and only to that extent.

Q If you don't know enough about the soil to know whether the ground water has any effect upon the amount of water required for irrigation, how can you determine therelative value of these coefficients?

A I have determined them just as I stated from the knowledge that I have and observations.

Q Then you acknowledge, however, your knowledge upon which these are based is not complete, but only -- I ~~mi~~ won't call it smattering because it is probably beyond that, but it is far from being complete.

A Yes, I have no detail surveys of the areas.

Q And it is a general survey by observation rather than by any local tests or measurements or anything of that kind?

A Just different observations I have been able to make.

Q You might be mistaken in these areas?

A How is that?

Q You might have drawn wrong conclusions because of the briefness or limited character of your investigations?

A Yes, they may be slightly in error. They are only to the extent of the knowledge I have.

Q You might err five or ten per cent?

MR. A. C. HATCH: I ask the witness be allowed to complete his answer.

MR. BAGLEY: Probably I am applying them too rapidly, I don't intend to.

MR. A. C. HATCH: He was interrupted by counsel.

THE COURT: Yes, you may ask the next question. I take it the answer is now interrupted so that he wouldn't add to it.

A No, I don't think I could be in error that much, I could not say I am in error at all, when I have given you the coefficients to the best of my knowledge.

Q And you are willing to acknowledge that your knowledge is very incomplete in respect to these details?

A I have no knowledge of the detail surveys over the different areas of the tract.

Q If upon an actual survey and measurement and investigation such as you would consider to be complete, the results were different then you would acknowledge yourself in error, wouldn't you?

A Certainly.

RE-CROSS EXAMINATION by Mr. John E. Booth.

Q Mr. Wentz, did you get the information I suggested to you yesterday? A. Yes.

Q We glad if you would give us that at this point?

A Using the areas --

MR. JACOB EVANS: What report are you using?Mr. Wentz?

A Given on page 9 of part 8 of the 1915 report, and assuming that

the population of Provo City is ten thousand people, the amount of water to the water works would be 5.35 second feet.

MR. RAY: I understood that the total was what was being asked for, we don't care which it is.

MR. JACOB*EVANS: He can give the detail if he has it.

MR. JOHN E. BOOTH: What I ask for was total. If he has details I have no objection, of course.

A I would have to give you this information in order to give you the total and you may have the acreage as the total if you desire. Do you desire it all in detail?

Q I am not particular for it, perhaps some of the others would prefer it.

A And assuming there are six hundred acres irrigated in the Provo City lots or one half of the acre, be 12 second feet. Timpanogos Canal Company 14.12 second feet.

MR. RAY: That is in column 1?

MR. BAGLEY: That is the total of acre feet under this schedule.

THE WITNESS: That is second feet.

MR. RAY: Perhaps your honor, I have not gotten this and want to get it to make up the schedule as I go. That is for what period?

A That is for the first column to June 20th.

Provo Bench 76.02 second feet;

West Union, Smith and Carter Ditches 33.33 second feet;

East River Bottoms Water Company 9.61 second feet;

Barton and Young Ditch 1.08 second feet;

Park and Nuttall Ditch 2 second feet;

Upper east Union 13.37 second feet;

Faucett Field 2.1 second feet;

Provo City acreage 43.05 second feet;

Young, Dixon and Baum Ditch combined 2.1 second feet;

Little Dry Creek 8.43 second feet;

Lake Bottoms 15.9 second feet;

Fort Field 7.18 second feet;

Spring Creek Users 5.52 second feet;

First Ward Pasture from the Factory Race 2.5 second feet;

Total 253.66 second feet delivered at the limits of each quarter section of land, and without any allowance made for losses in transmission.

Q What was that total?

A 253.66.

MR. RAY: That is the net duty at the land or net total to supply the duty at the land.

A At the limits of each quarter section.

MR. BAGLEY: Don't include any water for the plaintiff?

A No.

MR. THOMAS: You have given all these ditches that you have on the plat?

A Yes.

Q Now, Mr. Wentz. one other question. Do you desire all these figures should come for every one of these columns?

A I have not figured only the first column, that is all you asked for.

Q That is all I was particular about, to get now the idea, I wanted from this, I am not particular at all about going into the other. There is another question, however, I wanted to ask. Taking those small figures to the right and little above as if they were exponants, take any one of them, 1.53, is that on the West Union Canal?

A 1.43.

Q That is one foot and 43/100 acre feet?

A For each acre of land.

Q For the entire season?

A No.

Q That is what I want to get, that is the amount for that period?

A Yes.

Q That is satisfactory then, that is all.

CROSS EXAMINATION by Mr. Wahlquist.

Q Mr. Wentz, can you say during what period of the year the reservoirs at the head of the canyon are filled?

A Last year the gates were closed on the first of April. This year the gates were closed on the -- Wall Lake on the 7th day of April, the Washington Lake gates were closed last fall late in the fall. The Trial Lake gates are not closed now.

Q Is it to be presumed that the Trial Lake gates will be closed at all this season?

A We expect to close the Trial Lake gates in about two weeks. The Trial Lake fills up very quickly and usually has a large supply, that is the only reason it is not closed at this time.

Q That would be about June 24th that you would close that, or June 20th, we will say?

A Well, it may be earlier than that.

Q And about what time is the water in the lakes, reservoirs, released for irrigation?

A In 1914 it was released on the 17th day of July, and in 1915 is was released on the 4th day of July.

Q Now, if, as you believe, the sub surface drainage or underflow of those lakes is towards the Weber, are you not increasing that underflow when you raise the water level up as much as twenty-five feet above the normal level of the lakes?

A Possibly, yes.

Q Isn't it almost certain wouldn't the weight of twenty-five feet of water increased pressure tend to increase the underflow?

A Well rather than the weight it would be the number of seams through the rock that would discharge that extra amount of water.

Q That is, by raising the water there may be other crevices that would carry water?

A Those bedding planes there are only two ro four feet in thickness. You get another seam on an average about every three feet

Q The Washington Lake you stated normal size was fifty acres, and when it raised to a level twenty-five feet above above the surface was approximately one hundred twenty five acres, or nearly 150 per cent larger surface when the lake is at 25 foot level wouldn't evaporation be increased in proportion?

A Yes, directly.

Q Now then, Mr. Wentz, as I understood you to answer the other counsel, so long as there is any natural flow from any of those reservoirs, it was towards the Provo River?

A Yes.

Q Then isn't all this increase lost by percolation towards the Weber and by ~~exp~~ evaporation taken from water which except for the existence of the reservoirs would be going down the river and available for use as high water above the Wasatch Canal ~~then~~ dam during the entire period upuntil the time the reservoir waters are released?

A That amount that is lost by evaporation and seepage on the extra surface and the extra height of water, storage water, during the flood water season is water that would go through the river and into the Utah Lake. Our flow in Wasatch County during our high water is a great deal more than the capacity of the canals.

Q It would be going down the river up until such time as the time that it is released from the reservoirs, wouldn't it, that is, prior to that time during May or June of the year, it would be going down the river if not in the reservoirs?

A Yes.

Q And if needed for irrigation above the Wasatch Dam it would be available for use for irrigation when it was going down the

river, would it not?

A Yes.

Q Now, with regard to porosity, you say that the frost increases that, that would be true that the frost will increase the porosity of the soil just as far down as the frost extends during the winter?

A No. I will say yes to that first. Porosity is not as big a factor as a uniformly moist soil. The moisture of the soil is a greater factor in conducting that water from the surface to the sub-surface than the looseness of the soil.

Q Now, however, just as deep as the frost extends in the soil it disturbs the condition and tends to increase the porosity in the early spring, does it not?

A Yes.

MR. CORFMAN: May it please the court, like to ask a few questions in connection with the rights of the First Ward pasture.

RE-CROSS EXAMINATION by Mr. Corfman.

Q You are familiar with the lands of the First Ward Pasture?

A Yes sir.

Q And what kind of crops are grown on these lands?

A It is pasture lands entirely.

Q And is it not true that frequent applications and larger quantities of water are necessary to successfully grow the grasses there than on lands generally throughout the Provo River system?

A Pasture land requires more water. This land requires more. Any pasture land than it would if it was uncultivated land, that is tillable , but the land in the First Ward Pasture is a better class of soil than the average soils on the Provo River system and holds a greater amount of water and holds it better than the average soils.

Q These lands are used exclusively for pasture, are they not?

A Yes sir.

Q And it requires more frequent application of water and greater quantity in order to make a good growth of grass?

A It requires frequent applications and greater quantity to grow grasses on that land than it would cultivated crops.

Q During the season of 1915, is it not a fact that the water applied to the lands in the First Ward Pasture was taken largely from the Mill Race after the water had been used for power purposes?

A They can take the water for the First Ward Pasture after it has been used by all the power rights except the Smoot Lumber Company.

Q And they do that in practice?

A Except the Smoot Lumber Company water that goes through the Smoot Lumber Company mill is not available for the First Ward pasture for irrigation. The tail race is below the ground.

Q And during the season of 1915 they did take the water from the Mill race after it passed through the wheels of the manufactories?

A Yes, that is done I think every year.

Q And there wasn't any limitation as to the quantity they took made by yourself on account of the water being there and not utilized elsewhere?

A No, no limit at all on it.

Q They used the water as they found it?

A Yes.

Q Without any limitation on your part?

A Yes sir.

Q And that has been the practice as long as you have known that pasture?

A Yes sir.

Q Isn,t it a fact that the grasses almost to the water edge, class of grasses that are grown there would die out if they were not irrigated?

A Yes, there is some area of that that needs irrigation all the time.

Q I wanted to ask you further Mr. Wentz, in regard to the circular notes that you mentioned that you sent out before you proceeded in 1915 to distribute the water as you testified that you did distribute it; to whom did you send your notice, to what officer of the First Ward Pasture Company?

A There was no notice sent to the First Ward Pasture.

Q Was there any notice sent to the defendant, the Provo Woolen Mill? A. No.

Q Was there any notice sent to the defendant, the J. Ward & Sons?

A No, those interests are outside of the notice. The notice was asking only for areas.

Q It was not meant for any mill owners?

A No.

Q Was it sent to the Upper East Union Irrigation Company?

A Yes, I addressed to the Upper East Union Company.

Q To the company or some of the officers?

A Upper East Union Irrigation Company.

Q Was it sent to the Little Dry Creek Irrigation Company?

A Yes, it was sent to all the companies that are addressed in the letter.

Q And you addressed them to the companies and not to any particular officer?

A I addressed them to the company and sent them to the secretary of the company of the president. I think in one or two cases they were sent to the president of the company.

MR. CORFMAN: Now, may it please the court with permission of counsel, I would like the privilege of recalling Mr. Wentz for further cross examination in behalf of the Utah

Power & Light Company after consultation with the associate counsel.

THE COURT: Very well, any redirect at this time?

MR. JACOB EVANS: Just a question.

RE-DIRECT EXAMINATION by Mr. Jacob Evans.

Q The water that is used ny the machine interests and the first Ward Pasture Company and the other parties mentioned by Mr. Corfman is all distributed by Provo City, is it not?

A Yes, the changes are made by the city.

Q You merely distribute the water for those parties to provo City and Provo City attends to the distribution of that water among these other parties?

A Yes.

Q And is that the reason why you did not send them notices concenring it?

A No, this letter that he speaks of was asking for irrigated areas. Letter was sent to the city and mill interests have no irrigated areas.

Q You said, Mr. Wentz, that the first Ward pasture could use the water that was used by the mill interests except the water used by the Smoot Lumber Company, that its mill race was below the First Ward pasture?

A Yes.

Q Doesn't the tailrace of the Smoot Lumber Company come out just below the old Rio Grande depot?

A Yes.

Q How far is that from the First Ward pasture?

A It goes through the northwest corner of the First Ward Pasture, joins the Factory Race at the northwest corner of the pasture and is about four feet, I think, below the irrigation distributing system of the First Ward pasture, four feet lower in elevation.

Q

Q Would there be anything to prevent the putting in of a dam there raising the water up and taking it out?

A Yes, the water from the Smoot Lumber Company wheels has no fall until it enters the First Ward pasture corner, near the First Ward Pasture corner. A dam in there would back up on the Smoot Lumber Company wheel.

Q How far would it have to flow before it could be taken out in the pasture?

A Well, I couldn't say, I haven't the grade of that country.

Q You don't mean to say, do you now, definitely, that none of that water could be used if a dam were put in to raise the water up so that it could be taken out and used on some portions of that pasture.

A Maybe towards the lower end some of it could be watered from tail race.

Q What is the water used for after it leaves the mill race, after it leaves the Smoot Lumber Company?

A It is not used, it goes to Utah Lake.

Q What quantity does it amount to about that goes through the wheels of the Smoot Lumber Company, if you know.

A I don't know what they use through that wheel.

Q Mr. Wentz, you were asked concerning the east drain, does that flow through the First Ward pasture?

A Yes, that irrigates part of the First Ward Pasture.

Q Was that counted as any part of your distribution of the water of Provo River? A. No.

Q Do you know about how much water there is in the East Drain?

A No.

MR. THOMAS: He stated yesterday he didn't know anything about that, I asked him especially about that.

Q Now, you were asked concerning your knowledge about the subsoil in Provo City. You said, if I remember correctly, you had but little technical knowledge, but have a general

knowledge, I will ask you Mr. Wentz, if you saw the drains that were opened here in Provo City or the sewer at the time they were laying the sewer pipe?

A Yes, I saw the trench for water works and drain, holes for the telephone poles, saw a great number of them, saw the trench that was made last year for the sub line of the telephone down Center Street.

Q And what did those excavations consist of in so far as they applied to the sewer, what was the extent of them that you saw?

A So far as applied to the soil?

Q What was the extent of the excavation, how many streets did it cover?

A Well, I seen it on a number of streets.

Q Covered practically the entire city, didn't it?

A I guess I seen practically all the soils in Provo at different times by trenches.

Q What depth have you seen them?

A About four feet, some of them as deep as nine feet. The sewer went as deep as nine feet.

Q Did you notice whether in some of these sewer openings whether or not there was streams of water running in them?

A Yes, the ground water in a great deal of the sewer work in the southern part of town was above the lower line of the sewer grade line.

Q What would you say of these telephone post holes or sewer trenches and the other excavations that you have spoken of did they contribute to your information as to the character of the soils in the community of provo City?

A Yes.

Q And in the city itself? A. Yes.

Q Do you know whether the cemetery is irrigated from the water works system?

A By the sprinkling system, the water works system.

Q I take it, Mr. Wentz, you have seen graves dug in the cemetery and know the character of the soil in that vicinity, do you?

A Yes.

Q Mr. Ray asked you concerning the use of the water with respect to people planting more wheat and grain crops which were less profitable than fruit crops on account of the lack of water, as I understood it; now, when did you have your last fruit crop on the Bench, Mr. Wentz, full crop of fruit?

A 1913.

Q What was the esult of the marketing of that crop?

MR. RAY: I object to that as irrelevant and immaterial.

THE COURT: Do you claim anything for your examination, profitableness of the crop?

MR. RAY: I know, if your honor please it was not objected to and the rule might ordinarily be they would be permitted to go into it, but the purpose of that examination was not the litigation and determination by this court of what crop a farmer might desire, should plant, but as to the relative necessities and what he might be permitted to plant. We cannot litigate here the relative profits. That was merely a method of characterizing crops, not a method of determining profit.

THE COURT: You assumed at the time one crop was more profitable than the other and based your examination on that. The court wondered at the time whether there was anything to base the assumption on, the court did not take notice of the fact, had no knowledge of the fact. In fact, my opinion seemed to be contrary to that view, and if you don't claim anything for your assumption that the wheat crop is more profitable --

MR. RAY: May or may not be, I don't know, and nobody could determine the fact as to that, your honor, and this would

not determine the fact.

THE COURT: Gou claim nothing for your assumption then?

MR. RAY: No.

THE COURT: Then you need not examine on that.

Q You may state, Mr. Wentz, whether or not it requires any more water to irrigate fruit lands, such as peaches, apples, pears and tree crops, than would be required to irrigate wheat crops acre for acre?

A During the latter season it would require more for the fruit crops, especially where they have a cover crop such as lucern or clover.

Q Suppose they have no cover crop?

A Clean cultivation?

Q Yes.

A Well, there wouldn't be a very great difference between the two crops, the wheat crop would be earlier irrigation, land applied earlier and fruit crop --

Q Be a later?

A Be a later.

Q During the same period of time, Mr. Wentz, where the trees, where the land is cultivated between the trees, you may state whether or not it wouldn't take less water to irrigate those trees than it would to irrigate a wheat crop where the land is entirely covered with a grain crop?

A During the first period up to the ending of the wheat crop, why, the wheat crop ,would require a greatdeal more than the orchard, but the fruit crop greatestrequirements is from September 1st to September 10th.

Q I understand, but now if the land was cultivated between the trees wouldn't you run the ditch along on either side of the trees wouldn't you run the ditch along on either side of the tree without flooding the whole area of land and get all the benefit that would be necessary for the production of the

fruit crop?

A Not on the porous soils, where those porous soils are water in furrows, it is just -- those furrows just as good a conductor as a pipe line would be to the sub-surface. You have to flood those areas on those porous soils, make a light flooding over the areas. Over the deep and uniform soils a few furrows is a gread deal better, out down your evaporation losses and practically store all your water im the soil.

Q Now, this table which you have placed upon the blackboard and get the totals which you have given to Judge Booth, you say gives a greater quantity of water than was actually distributed by you to the various canal companies during the year 1915?

MR. RAY: I object to that assumption, your honor please. That is not the testimony of the witness, the testimony of the witness it gives a greater quantity to the Provo Bench than it did during the year 1915.

MR. JACOB EVANS: Then we will confine it to the Provo Bench.

THE WITNESS: Read the question, please.

(Question read)

A The losses in that system are -- distributing system are approximately ten per cent, and the difference in the quantity last year and the difference shown by the table is but a comparison of the two tables.

Q Now, as a matter of fact, in making your totals for the table which you have placed upon the blackboard, you had to assume what the loss in transit would ben did you not, Mr. Wentz, from the intake of the canals to the quarter sections?

A No.

Q How did you determine?

A Doesn't make any difference what the transmission losses are, whether 50 per cent, 75 per cent or 100 per cent or whether the inflow is one and a half, two or three times the amount, doesn't

affect the table.

Q I understand it doesn't affect this table, I don't think you understand me, you have given certain totals here of the water, first column No. 1 would show making a total of 253.66 second feet all told.

A Yes, that is at the -- delivered at the limits of each quarter section of the land.

Q But the fact that you get a total of 253.66 second feet delivered at the land would have no application or no bearing upon your actual distribution of water in 1895, would it?

A No.

Q None at all? A. No.

Q Now, in 1915, you made an actual distribution?

A Yes.

Q As shown by the tables?

A As shown by the table in part 8, page 16.

Q And the distribution that you made was measured at the various measuring devices of the various companies as they are now constructed? A. Yes.

Q Which is a short distance from the intake of the head of most of the canals?

A No, on the Provo Bench system it is a mile and a half or more away. Provo City system the intake is at the mouth of the canyon, and the rating stations are just north of the city, five miles away. The Upper East Union, it is probably two and a half or three miles away.

Q And as I remember your testimony you stated that the actual distribution which you made in 1915 measured at those various places was sufficient to produce the crops under these various canals?

A No, there was -- those canals that had the transmission loss such as the Provo Bench and Timpanogog were a little deficient, but I think, as I say, with the transmission losses made up would

make that deficiency. Of course their fruit crop was off last year. Take a normal year when their fruit crop was on in order to supply sufficient water to those people to properly irrigate their lands, this deficiency should be made up to them and water delivered at their farms.

Q Yes, but you stated, did you not, on your direct examination, that what you distributed in 1915 was sufficient for the propduction of the crops?

A Of that year.

Q Of that year, yes.

A That is an abnormal year, though.

Q You say it was an abnormal year with respect to the crops, because there were no crops of fruit on Provo Bench?

A Yes, over the whole district there was no crops of fruit.

Q Isn't that true this year?

A Yes.

Q Hasn't it been true number of years past?

A True this year, last year. There was a good crop in 1913 and number of years previous. It is an unusual thing to freeze.

Q It has been the usual thing for the past two years, hasn't it?

A No --

Q Particularly in 1914, '15 and '16?

A It has been the case in those three years, but it is an unusal condition.

Q You stated to Mr. Ray that in the preparation of this table, that you allowed a little surplus for an extraordinarily dry year where there was no precipitation, as I remember it?

A Well, I made have conveyed that idea, but this table will take care of the bad years, and whatever the conditions are for the change in season, little wetter or little dryer, we cannot provide for those condition.

Q In 1915 there was no rain at all, I understand it?

A No, we went eightyseven days without rain.

Q And it was during the irrigation season ?

A Yes.

Q Now, with respect to the waters of the reservoir being turned out of the reservoir and going over waterfalls and mists of the water being lost by reason of that, I take it the natural waters of the river run over the same waterfalls, do they not?

A Yes.

Q And those mists occur whether the Provo Reservoir water is turned into the river or not, don't they?

A Yes, the mists occur with ~~meet~~ both kinds of water.

Q And evaporation occurs with both kinds of water?

A Yes sir.

Q And the losses occur with both kinds of water?

A Yes.

Q Running down the same natural channel?

A Yes.

MR. RAY: We don't contend the Provo Reservoir water is peculiarly wild, anything of that sort.

MR. THURMAN: May I ask one question. Mr. Wentz, in 1915, if I get the total right, you distributed 288.4 to the system, that is, to the defendant?

A The defendants in the Utah Valley.

MR. THURMAN: That is right, is it?

A Yes sir.

MR. THURMAN: And your table worked out as you worked it this morning made 253.66 cubic feet necessary at the limit of the quarter section?

A The amount of 288 was the gross duty taken at the measuring stations of the canals. The amount 253.66 is delivered at the limits of each quarter section of land.

MR. THURMAN: The difference between the two is the loss in transmission, is that the idea?

A No, I don't know what the loss in transmission is. The 288.4 was designated by the stipulation as the amount to be measured to the companies, the defendant companies in the Utah Valley. It has no significance whatever to the 253.66.

MR. THURMAN: Well, did you assume -- is there any assumption that that would be the amount of the losses from the measuring points down to the limits of Provo City, the difference between these two figures?

A No, no bearing at all.

Q In making up your total of that as shown by column 1 of the table, did you, or did you not take into consideration the machine interests along the Factory Race?

A I didn't take that into consideration.

Q That would add then to the total of 253.66 to this table 19.30 second feet?

A Yes, that 19.30 is only an assumed amount.

Q Yes, I understand.

A That may be more or may be less, I don't know, it is only an assumption.

Q And you have reduced the municipal rights from 24 second feet to 5.35 second feet in this table?

A Reduced it to 17.35.

MR. RAY: What was the provo City lots, if I may get it?

A I assumed 600 acres.

MR. RAY: What was the second feet there, I didn't get that, twelve something.

A Twelve.

MR. THURMAN: I would like to ask the witness in another form the same question, your honor please. I either don't understand these numbers or the witness misunderstood me.

DIRECT EXAMINTION by Mr. Thurman.

Q Going back again Mr. Wentz in 1915 you distributed 288.4 to the defendants in Utah Valley?

A Yes.

Q Under a stipulation. Now, you say that with the exception of some deficiencies to the Provo Bench and Timpanogos, that was enough in your judgment? A. Yes.

Q Is that right? A. Yes sir.

Q Now you say --

A A deficiency to the Upper East Union. They were deficient and I think there would be some possibly heavy losses in that canal on account of its long run.

Q Very well those three canals you say there is a deficiency. Now, in your calculation this morning you find as necessary delivered at the limits of the quarter section 253.66?

A Yes the 253.66 does not include the Factory Race, that is not included in the 253.66.

Q Then, do I understand that by adding the Factory Race you would make up practically the --

A Add the Factory race to the 253.66 and you get the total of column 1.

THE COURT: 272.96 would be the amount?

A Yes.

Q 272.96? A. Yes.

Q Very well, then we will take 272.96 and take the difference between that and 288.4, the amount you actually distributed, and I will ask if the difference is not intended, or does not account for the loss in transmission between the points where you measured last year and points where you say it should be measured?

A No, there is no relation between the two. Those losses in addition to the 272.96 evidently would make it up to the 288.4.

Q That is what I say what losses do you have in mind?

A Losses in transmission.

Q That is exactly the point.

MR. JACOB EVANS: Lost 17.30 and five second feet out of the Provo pipe line too, didn't you? You figured the Provo municipal rights as 24 when you distributed?

A Yes.

MR. JACOB EVANS: And reduced that in this table to 5.37?

A Reduced it to 17.35. The 24 second feet includes the water works system.

Q In any event there must be, whether you so intended it or not, the difference between what you distributed last year at the head gates or measuring points, and what you say is necessary now delivered at the quarter section should account for some loss in transmission? A. Yes.

RE-CROSS EXAMINATION by Mr. Thomas.

Q You made a statement, at least I understood you to say that the water after it left the partixx or passed the Smoot mill, passed down through the race, passed directly into the lake?

A Yes.

Q Did you mean by that that no further use was made of it?

A Yes.

Q Isn't it true that water mingled with other waters, it helps to flush the sewerage of Provo City?

A No, the sewer line --

Q Or carry sewerage rather?

A Yes, the sewer discharges into the Factory Race near the northwest corner of the pasture.

RE-CROSS EXAMINATION by Mr. John E. Booth.

Q Mr. Wentz, is there not quite a number of city lots and quite a

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Q Or carry sewerage rather?

A Yes, the sewer discharges into the Factory Race near the northwest corner of the pasture.

RE-CROSS EXAMINATION by Mr. John E. Booth.

Q Mr. Wentz, is there not quite a number of city lots and quite a

number of acres of land that are watered from the waters of the Factory Race after it runs through the factory, southwest part of the city, is there any lots, and south field?

A Some of the area is watered from the Factory Race, but there can be no land watered from the Factory Race after it leaves the Smoot Lumber Company.

Q No, but between the Smoot Lumber Company and factory itself, woollen mills.

A Yes, there is some diversion.

Q You take that into consideration at all when making your calculation this morning?

A No, there is no relation there, where the water comes from doesn't make any difference, whether it comes out of the Factory Race or whether you carry it over there in a bucket.

Q Then did you make any calculations of using it double in your 288 feet last year?

A No, I didn't make any calculations on that.

Q So that the fact would be that the city last year received their amount at their head gates and then used including the factory water, and then used it again, didn't they, and for these lots in the southeast part of southwest part and south field?

MR. THOMAS: Object to that as improper re-direct, and assuming facts not presented to the court.

MR. JOHN E. BOOTH: It just happens I am not asking any direct question, had none in the beginning.

THE COURT: Objection overruled on the ground it is not proper redirect. This is cross examination.

MR. THOMAS: I withdraw the objection.

Q Isn't it a fact, Mr. Wentz?

A Read the question.

(Question read)

A The amount of water as shown by the report was delivered to

Provo City and the Factory Race at their stations near the Brick yard north of the town. They made their distribution themselves, taking their amount through the East Union, Tanner Race, City Creek, and diversions from the Factory Rade were also made by themselves.

Q Well, the conditions would be better for the city than if they didn't exist, would they not?

THE COURT: I don't understand the question so I wouldn't understand the answer.

MR. JOHN E. BOOTH: If the city gets a certain amount of water for their rights including the Factory Race, Factory Race separate from the irrigation, now then use that Factory Race water for irrigation and get their amounts according to the lands, the same as other peopld, then they have an advantage.

THE COURT: I see.

MR. JOHN E. BOOTH: That is as I see it, at least. Of course, I don't pretend to see everything as everybody does, but I just happened to see it that way.

Q Now, am I correct in my conclusion?

MR. RAY: I object to that as calling for a conclusion of the witness upon a matter which the court will conclude whether they have an advantage. The question answers itself.

MR. JOHN E. BOOTH: I withdraw the question as the court answered it.

RE-CROSS EXAMINATION by Mr. Ray:

Q Mr. Wentz, you have made actual determination of loss in transit upon the distributing system of the provo Bench, haven't you, in the past?

A Yes sir.

Q And you have taken into consideration those losses in fixing the duty which you have put upon your table upon the board,

haven't you, that is, that experience?

A Yes.

RE-CROSS EXAMINATION by Mr. Coffman.

Q Mr. Wentz, the 24 feet that you designate as a municipal right during the season of 1915, did you consider that amount as being continuous in the water works system in the city?

A No, there was 8 second feet in the water works and 16 for irrigation of lots. Part of the time there was only five second feet in the water works. Five, I think was the minimum and 8 about the maximum.

MR. RAY: I take it as commission of the court anyone may recall Mr. Wentz for his own purposes.

THE COURT: Any time.

IRWIN JACOB recalled.

DIRECT EXAMINATION by Mr. A. C. Hatch.

Q Mr. Jacobs, have you obtained the data that I asked you for yesterday, with regard to the capacity of the several reservoirs at the head of the river?

A Yes.

Q And the number of acres of land irrigated under the Provo Reservoir system, have you the capacity of the reservoirs for the several years?

A I have for the past two years.

Q You may state it into the record.

MR. RAY: Now, Judge, for the purpose of avoiding cross examination, I think it is important we have what that capacity includes, for instance, whether it is between the outlet and supply dam. Is that what he figures as capacity,

lower outlet and supply over the dam.

Q I understand the capacity of a reservoir is the amount of water that is actually impounded, am I right?

A Capacity as I haveit here is the actual amount of water in acre feet discharged over the reservoirs and measured at the junction of the two streams, about quarter of a mile below one and half a mile below the other.

Q That is then the amount of water that was stre stored in the reservoirs for the two years?

A Yes.

Q And remained in the reservoirs and was discharged from the reservoirs? A. Yes.

Q You may give us for 1914 first.

A During 1914 under the Union Reservoir system including the Washington, Trial and Wall Lake reservoirs was 4600 acre feet stored, and the Provo Reservoir, independent reservoir system including the Lost Lakes, North Fork Lakes, Haystack Lakes, there was stored 490 acre feet. During 1915 the Union reservoir system ~~xorxthex500x~~ 4500 acre feet stored and in the Provo Reservoir independent of the lake system 395 acre feet.

Q Do you know whether or not the quantity stored was to the full capacity of the several reservoirs?

A In 1914 it was. In 1915 it was to the full capacity of Washington and Trial Lakes but not Wall.

Q Have you the acreage that was irrigated from the Provo Reservoir system in 1914?

A Yes.

Q What was the total number of acres irrigated?

A 4,786.

Q And the quantity of water used in the irrigation of it, have you that in acre feet?

A I have not in acre feet.

Q Do you know the number of, or do you know the duty of water

used upon this land?

A The duty--

Q As used?

A In lowwater about 110 acres to the second foot and high water about 70 acres.

Q What period was covered by what you term the high water, what month?

A APproximately to the first of July.

Q And beginning about what time?

A Beginning about fifteenth first of April.

Q What period was covered by the low water?

A From the first of July until the first of October.

Q First of october. Did that end your irrigation period?

A Fifteenth of September ends our period covered by contract, but the system is operated longer, as desired.

Q Now, referring to the Blue Cliff Canal -- didn't you give me the 1915 irrigation?

A No.

Q I wish you would do so.

A In 1915 total acreage irrigated was 6,170.

Q What was the duty of water as used upon the lands in 1915?

A The duty varied considerably during the high water stage.

Q State how it was?

A It varied between -- well, approximately a second foot for 75 acres with the exception of a period in May when it was extreme cold weather there was very little run off and duty went way up at that time. During the low water season we operated on a duty of about 145 acres to the second foot.

Q Now, can you say as to what -- whether or not the crops produced under that duty was average crops with those produced on other lands on the provo bench during 1914?

A Yes, they were average.

Q And during 1915?

A

A During 1915 I would say the grain crops and early crops were average. The fruit crops were average. Some alfalfa suffered on account of insufficient supply of water.

Q Was that suffering during the forepart of the season in May, or later in the season?

A That was late in the season, principally during the latter part of July and August.

Q What was the number of acres of increase last year over 1914?

A 1384.

Q What is your acreage that is being irrigated under your system this year?

A I haven't got that.

MR. RAY: 1916 area.

Q You say you haven,t got that?

A It is practically the same as px last year area.

Q What is the present capacity if you know, of your canal where it runs out onto the Provo Bench?

A You mean the canal or the conduit, you mean the amount of water we can deliver to the bench?

Q Yes.

A Appoximately 135 second feet.

Q And what quantity is flowing in your canal this year?

A 115, aboubnow.

Q What is the greatest quantity you have had this season?

A Between 125 and 130.

Q There is plenty of water in the river at this time, so that you take all that you want for the users under your canals?

A Yes.

Q And what is the duty that you are now putting upon the lands under your system?

A You mean gross duty or net duty?

Q Net duty?

A Second foot for about 60 to 65 acres.

Q By net duty you mean delivered upon the land, do you not?

A Yes, I mean delivered at the head gates of our different lateral systems where we are measuring the water to the users.

Q Have you an excess of water at this time, that is, have you any unused water in your canal?

A We have water that we are supplying to individuals on the end of our canal system who are not regular water subscribers.

Q It is all being applied upon lands under the system?

A Yes.

Q Now, where you deliver the water, the duty of which you have given as 60 to 65 acres at the head of the laterals, is there a loss between the head of those laterals and the place or places where the water is actually used upon the land?

A Yes, there is.

Q What is the length of the longest of these laterals from its head to where the water is applied?

A About two miles.

Q Do you know the net duty of the water -- by net duty I mean the water actually applied upon the lands under any of the laterals?

A Yes, in some cases, not general.

Q Where are they?

A On Provo Bench.

Q Whereabouts with relation to the lands of the Provo Bench Canal Company?

A Some of the tracts are surrounded by tracts watered from the Provo Bench Canal Company, and others are above.

Q Cah you give the duty as applied upon any of those tracts in 1914, the net duty?

A Yes, for certain irrigations, but not throughout the season. I made the individual determinations that took two or three irrigations, consecutive irrigations, but did not extend my observations over the season.

Q At what time of the year were those made?

A They ranged from August 6th to August 25th.

Q I wish you would give us those matters, the whole of the data that you have in relation to the experiments made by you, naming the particular tracts of land so that it can be identified, if you can do so.

A The first experiment was on what is known as the Hanson tract.

Q What was the kind of land?

A It was a gravelly loam, the tract is on the north central part of Provo Bench and about a mile due west from the mouth of Provo Canyon.

Q What kind of a crop was raised?

A It was mixed garden and alfalfa crops.

Q Proceed, Mr. Jacobs and give us all the data as to each of the tracts which you have?

A The period between irrigations of the Hanson tract was six days, the area irrigated was 3.95 acres, the depth of water applied was in feet.107.

Q The kind of land?

A Kind of land was gravelly loam.

Q Proceed.

A The duty of the water figuring the six day period amounts to a second foot of 111 acres. The second experiment on the Hanson tract on August 18th--

THE COURT: pardon me, you didn,t give me the date of the first.

A August 6th. On the same tract August 18th the amount of water applied was .159.

Q The duty.

A Seventy-five acres per second foot. On August 6, 1914, performed an experiment on the Denman tract which is situated along canyon road about a mile west from the mouth of the Canyon.

Q That is on the provo Bench?

A Yes, northern central part of the Provo Bench.

Q What date?

A August 6, 1914. This is a gravelly loam soil similar to the Hanson, and the crop peach orchard, rows one rod apart and six furrows to the row. The are x irrigated was 9.86 acres. The depth of water applied was .155, the duty was 77 acres to the second foot. Number 4 --

Q Mr. Jacobs, you are not giving us the quantity or volume of the stream used and the time of irrigation, I wish you would do that.

A Do you wish that.

Q All the data which you have.

A I will go back to No, 1 then. The Hanson tract, first application the volume of the stream used was 2.28 second feet. The hours the water was used was two hours and ten minutes.

MR. THOMAS: Mr. jacobs, if you would use the same form Mr. Wentz has used and give it to us in columns we could get it.

A I can put the tabulation on the board.

Q No, you need not do that.

A I will follow the same order throughout. The Hanson tract No. 2, volume of stream used 2.1 second feet; time of irrigation three hours ten minutes; area irrigated -- I gave that.

The Denman, first irrigation, volume of the stream used 3.69 second feet; hours time was five hours and ten minutes. Now, the No. 4 --

Q Did you give us the area?

MR. THURMAN: Yes.

A No. 4 is the second irrigation on the Denman tract.

Q The same land?

A The same land, date August 18th, the same period, six day period between irrigations. Volume of stream used was 3.38 second feet; the time was five hours and forty minutes; the

area irrigated 9.86 acres; depth applied in feet .162; duty is 78 acres to the second foot.

No. 5 experiments was made on August 7, 1914, J. F. Tresher tract located about the west central part of Provo Bench on the brink near the -- or on the east of the brink a short ways. The soil is a very sandy loam.

Q Kind of crops?

A Kind of crops was an orchard with crops between. The period between irrigations was ten days, the volume of the stream used was 2.28 second feet; time was nine hours and fifty minutes; area irrigated 7.46 acres; depth of water applied; .252 feet; duty 79 acres.

The Crandall tract No. 6 irrigated August 10, 1914, gravelly clay loam, situated on the north central, northeastern part of Provo Bench, the crop is alfalfa, this tract had not been watered for twelve days before the experiment.

MR. RAY: Now, your honor please, I desire to ask a question. Do you know of your own knowledge when that had been last watered?

A No.

MR. RAY: I move to strike out the answer when it was last watered onthe ground it is hearsay.

THE COURT: That may go out.

A Period of irrigation was eight and one half days; volume of stream used 3.18.

Q That is the period between irrigations?

A Yes.

MR. THOMAS: Not period of but period between?

A Period between irrigations. Volume 3.18 second feet; time 8 hours and 55 minutes. The area irrigated 7.79 acres depth of wat er applied .304 feet; duty 55 acres to the second foot.

No. 7 is the Crandall or same tract as No. 6, date of experiment August 19, 1914; the same data applies to this as

the other except the volume of the stream was 2.49 second feet. The hours of water used eight hours fifteen minutes; area irrigated 8.67; depth of water applied .197; duty 85 acres to the second foot.

12:00 Noon, Recess to 2:00 P.M.

MR. THOMAS: May it please the court, in the cross fire this morning I made a remark that one of my brothers whom I respect highly -- might have had a little too much emphasis, might have been taken as too abrupt a remark to be properly addressed to the court, and I wish to assure the court and my brother that what I said was not with any intent to offend or cause offense.

THE COURT: What was the name of the last tract you gave.

MR. COLEMAN: Crandall tract.

THE COURT: You had finished that.

MR. A. C. HATCH: If the court please, I have what purports to be a true plat of the several canals using water from the Provo River, including the intake and portion of the Provo Reservoir canals prepared by Mr. Searles several years ago for the Utah Light & Power Company, and it appears to me that it would be of advantage to the court and to all parties litigant in Utah Valley if it be introduced and so that it may be referred to in the testimony as to locations of lands.

MR. RAY: No objection subject to our right to verify it.

THE COURT: It will be used only for the purpose of illustration, I take it, anyhow.

MR. A. C. HATCH: I cannot verify it because Mr.

Searles, the one who prepared it, is dead.

MR. RAY: We can examine it later.

MR. A. C. HATCH: It is marked plaintiff's Exhibit 47.

IRWIN JACOB - - - - -

DIRECT EXAMINATION by Mr. A. C. Hatch continued.

Q You may proceed, Mr. Jacobs.

A The Barney Biglow tract experiment taken August 11, 1914, soil, gravelly clay loam. This tract is located about the east central part of Provo Bench, about half or three-quarters of a mile from the east brink of the Bench. The crop on the tract was orchard trees, alfalfa between. Period between irrigations 8 3/8 days. The volume of the stream in second feet is 3.96, the time of irrigation was eight hours and forty-five minutes, the area irrigated was 9.60 acres, the depth of water applied was three-tenths of a foot, the duty 56 acres to the second foot.

The James Lovelace tract irrigated on August 11, 1914--

MR. COLEMAN: Is this a new experiment?

A Yes, this is No. 9. Gravelly clay loam, 16 inches deep; crop on the tract, alfalfa and orchard.

Q When you say alfalfa and orchard, is that both together, or alfalfa between the rows of orchard?

A No, this particular tract the alfalfa was separate tract from the orchard, but the irrigation was over the total area. Period between irrigation seven and seven-twelfths days; volume of the stream 7.86 second feet; time of irrigation two hours even; area irrigated 4.54 acres depth of water applied .287 feet, duty 53 acres to the second foot.

Experiment No. 10, Newell Knight tract --

Q Now, just a moment, with the Lovelace land was the alfalfa between, or were they separate tracts?

MR. RAY: He just testified they were separate.

MR. COLEMAN: Separate tracts he said.

A In explanation of the Lovelace tract, I suppose it will be necessary -- the tract is a long strip of land, 250 feet wide and 1538 feet long. The upper portion, that is the east portion, I should say, of this tract is in orchard, has alfalfa between the rows. The west portion is alfalfa straight. The tract lies with the long dimensions north and south. In the irrigation of this tract two separate stages were taken, the tract being over fifteen hundred feet long. It was observed the time necessary for irrigation for the first 750 feet, and the figures that I am giving you are based on the time consumed in irrigating the upper part of the tract. The figures corresponding to the lower half or the south half of the piece are as follows. Time of irrigation on the second part was three hours, the same size stream was used 7.86 second feet, the depth of water applied was .655 feet.

M. RAY: The duty was what?

A I have not figured a duty on that. The duty was 23 acres to the second foot.

Q Now, do I understand that the water was diverted and put upon the second tract by itself, or did it simply receive the water that ran from the first tract?

A It received the water that run from the first tract after the first tract, 750 feet long was being thoroughly irrigated. The time was taken from this then to finish the irrigation of the whole area, and the total quantity of water additional was figured on the second tract. This water was run over the first tract.

Q But the second tract did not, in fact, receive the full quantity of water that was turned on?

A No, it didn't, but it was -- in experimenting it was charged

in that way.

Q You don't have any data as to the water actually absorbed or put upon the second tract?

A No.

Q And assuming that all of the water that was turned on the upper part of the tract reached the lower tract or the second tract, it would have received the quantity that you have used? A. Yes.

Q And in that case the duty would be the 23 acres of a second foot? A. Yes.

MR. RAY: May we have the area of this second tract or did the first area given include both tracts?

A The area of the second tract was 2.98 acres. The area given of the first tract did not include that.

MR. COLEMAN: You gave the area, I understand as 4.54 acres, was that of the first tract?

A That was all the upper part of the tract, yes.

MR. COLEMAN: The entire area of the upper part?

A Yes.

Q The land was the same width for its entire length, was it?

A Yes.

Q Proceed, Mr. Jacobs.

A No. 10, Newell Knight tract, date of experiment August 18,1914 soil sandy loam, Newell Knight tract is located about the central part of Provo Bench, along the State road running north across the Bench. Crop on the tract was berries and orchard. Period between irrigation 14 16/24 days.

MR. COLEMAN: Mr. Jacobs, by way of explanation, you say you conducted this experiment on August 18th, how do you know the period of irrigation then?

A Well, the period of this irrigation Newell Knight piece I don't know only --

MR. COLEMAN: Just from hearsay?

A From hearsay.

MR. COLEMAN: As a matter of fact you don't know how longprior that it was irrigated?

A The other tract I do personally know of.

MR. COLEMAN: But this one you don't?

A Not the Newell Knight piece, that was an experiment performed by Mr. Deming and myself. Mr. Deming might have that information I didn't know it from my own knowledge.

Q From whom did you obtain the information, as to the period?

A From the irrigator, man that was irrigating the piece.

Q Proceed?

A Volume of the stream was 4.39 second feet; the hours water used was one hour and 20 minutes; area irrigated 1.9 acres; depth of water applied .45 feet; duty 65 acres to the second foot.

No. 11 was another tract of Newell Knight land, experiment performed on August 18, 1914, soil, sandy loam, crop orchard, period between irrigations 7 1/3 days.

MR. RAY: Is that again a matter of hearsay?

A Yes, that is secondary.

MR. RAY: Move to strike it, if your honor please?

THE COURT: That may go out. I understood the witness to say a whole ago that he knew of his own knowledge the other tract.

THE WITNESS: Except the Knight tract.

THE COURT: Very well.

MR. A. C. HATCH: Just the period irrigated goes out.

THE COURT: Yes, he said he didn't know it of his own knowledge.

A Volume of the stream 4.15 second feet; hours of water used three hours even; area irrigated 4.69 acres, depth of water applied .221 feet; duty 66 acres to the second foot.

No. 12 was also a Newell Knight tract, date of irrigation August 25, 1914; soil of tract, sandy loam; crop on tract is raspberries and potatoes; period between irrigation seven and a third days.

MR. RAY: Is that a matter of your own knowledge?

A No.

MR. RAY: Move to strike it.

THE COURT: It may go out.

Q Is that the same tract you irrigated on the 18th?

A It is part of the same tract, but part of the experiment was on some additional land.

Q As to a part of it you know the time?

A Yes.

MR. A. C. HATCH: We ask that that he knows may remain, and what he don't know go out.

THE COURT: He may testify to what he knows.

Q proceed, Mr. Jacobs.

A The volume was 4.1 second feet; time one hour and forty minutes; area irrigated 1.71 acres; depth of water applied .45 feet; duty 33 acres to the second foot.

No. 13 Will Downs tract, irrigated on August 22, 1914; soil, gravelly loam. This tract is located on what we would call the east central part of Provo Bench, crop on the tract, strawberries and peaches. Period between irrigations six days; volume of stream in second feet 3.31; time one hour and thirty minutes; area irrigated 2.35 acres; depth of water applied .176 feet; duty 68 acres to the second foot.

No. 14 W. A. Marriott tract. Date of irrigation August 22, 1914. Soil of the tract is gravelly loam; crop on tract peach trees with alfalfa between; period between irrigation twelve days, volume of stream in second feet 3.97; hours of water used four and one-half; area irrigated 4.08 acres; depth of water applied .348 feet; duty 68 acres to the second foot

That is all I have.

Q Will you mark on the plaintiff's Exhibit 47 on the Board the approximate point, location of the several tracts of land upon which these experiments were made?

A Want them individually or collectively. They were witnin --

Q Have you a colored pencil with which you can indicate individually each tract separate?

A Yes.

Q Mark them with the number 1 to 14 inclusive

A The Hanson tract No 1 --

Q These were all irrigated with water from the Provo Reservoir Company's canal?

A Most of them with the exception of the Lovelace tract.

MR. COLEMAN: What number is that, No. 9?

MR. RAY: 9 and 10.

Q Proceed and indicate where they are located on the map?

A No. 1. No. 2 is the same. No. 3 --

Q Have you a colored pencil there?

A No, I have not.

Q Get one if you can.

MR. BAGLEY: How would it be to have the witness suggest which quarter section. This is all in Township 6 Range 3 East, if he will refer to the quarter section.

MR. A. C. HATCH: He can mark it in less time.

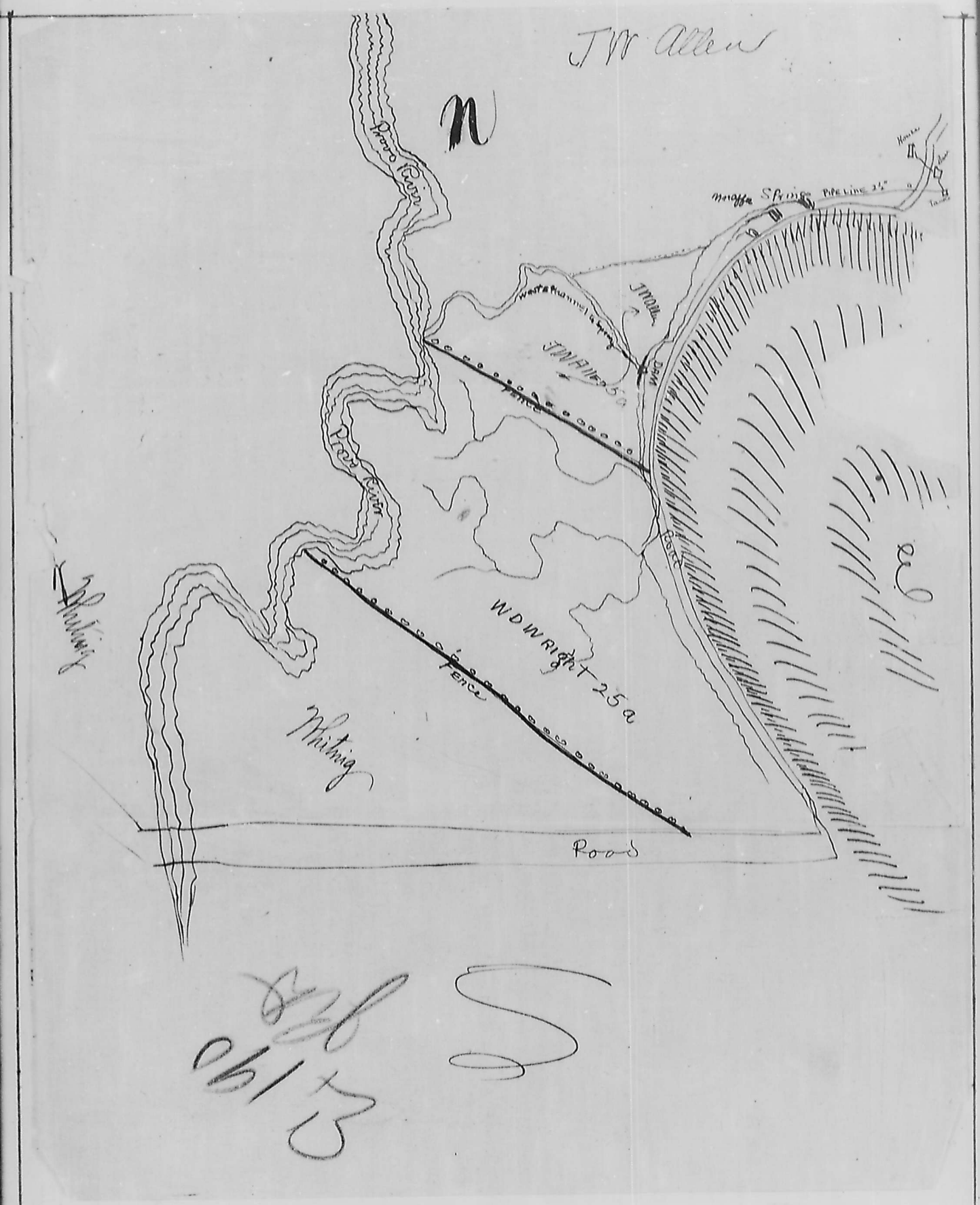
A Some of these will be approximated, as I cannot absolutely locate them.

Q Does it show what section they are in?

A For instance, the Denman tract, I don't know whether it is the south part of Section 9 or north part of Section 16.

Q We will understand then that it is only the approximate location?

A This is Nos. 3 and 4. No. 6 and No. 7, No. 8 and No. 9, 10, 11 and 12.


J W Allen
N
Provo River
Provo River
Spring
Pipe Line
Fence
Fence
Road
Road
W D Wright 25a
Whiting
Whiting

MR. THURMAN: Just a moment, where is the state road you spoke of?

A The state road goes through about this way.

Q Where is that.

A It is not shown -- well, it is shown starting here.

MR. RAY: What section, so the record will show.

A Well, it is shown in Section 32, just a short section of the road, possibly 10, 11 and 12 should be over a little farther towards the center part of 15. I should have said also the W. A. Marriott tract was irrigated from the Provo Bench Canal, and I have no information of my own knowledge concerning the period between irrigations, as stated here.

Q Have ~~xxx~~ you them all marked?

A Yes.

Q Mr. Jacobs, do you have any knowledge of the Maple Spring in Provo Canyon, where it is located? What is known as the Maple Spring?

A I know of no spring under that name.

Q Do you know of a spring that was formerly flowing into the Blue Cliff Canal that is now diverted into the City water pipe?

A Yes.

Q Where is that spring located?

A It is located about three-quarters of a mile up the canyon from ~~xxx~~ the Heiselt place.

Q And with relation to the Blue Cliff Canal, is it on the mountain side above or below that canal?

A It was above.

Q So that it would find its way down to the canal?

A Yes.

Q Do you know whether or not that was was distributed to the Provo Reservoir Company, as a part of its water at any time?

A Yes.

Q When was it?

A During 1912.

Q And after that what was done with it, if you know?

A I don't know of anything.

Q In 1913, '14 and '15, have you any knowledge of it?

A I think during 1913 --

MR. RAY: We object, your honor please, what the witness thinks, if he doesn't know what was done with it.

A Well, during 1913 it was distributed to the Provo Reservoir in connection with this water, during part of the season, I don't know whether it was distributed all season or not.

Q Who made the ~~st~~ distribution in 1912?

A Mr. Farrar.

Q Who in 1913 made such distribution of it as you have knowledge of?

A Mr. Wentz and also Mr. Farrar.

Q Are you acquainted with the other springs that are in that vicinity?

A Yes.

Q What are known as the Pony Steels Springs? and Blue Cliff Springs? A. Yes.

Q Have you at any time made a measurement or an estimate of the quantity of waterflowing from the several springs, Pony Steele Springs and Blue Cliff springs excluding the Maple Springs?

A I have.

Q What ~~xxx~~ quantity of water did you find the aggregate to be?

A The aggregate of the Blue Cliff and Pony Steele together?

Q Yes.

MR. RAY: Is the Blue Cliff Springs the one you refer to as the Maple Springs, Judge?

MR. A. C. HATCH: No, as I understand the facts to be, there are several small springs that found their way into the Blue Cliff Canal and have been distributed to the Provo Reservoir Company as part of the original appropriation of

water.

MR. THOMAS: For information, Judge, part of the Blue Cliff claim?

MR. A. C. HATCH: Yes.

MR. THOMAS: Included in what was appropriated as the Blue Cliff right?

MR. A. C. HATCH: Yes, exclusive of its rights as awarded to it from the Provo River proper.

MR. THOMAS: You misunderstood my question. I asked if they were included in that, that is, in addition to what was included in the Blue Cliff right.

MR. A C. HATCH: The Provo River water.

MR. RAY: I understand that is simple the contention of counse. Counsel is not asserting that as a fact. That is one of the things the court will have to determine.

MR. A. C. HATCH: That is why we are offering this proof. It is what we claim.

MR. THOMAS: I understand, thank you.

A The four springs or five springs measured by me totaled .414 second feet. There were two --

Q Now, will you give the quantity of each, naming it?

A I have them listed according to numbers, No. 1 --

MR. COLEMAN: Which is No. 1?

A Beginning at the southwest point, that is at the point on the Blue Cliff Canal at the southwestern extremity of the spring area. No. 1 .083 second feet; No. 2, .064 second feet; No. 3, .073 second feet. No. 4 --

Q The Pony Steele Springs give that separate.

A The first three are what are known as the Pony Steele Springs.

Q That is the three you have given?

A Yes, the fourth one is --

Q What is the aggregate of those three?

A .225 second feet.

Q What is the fourth one?

A The fourth one is a spring which has been held jointly by the Blue Cliff and Heiselt.

Q Hyrum Heiselt?

A Yes, one half each. Counting one half of that spring which totals .183 the Blue Cliff right would be .091.

MR. COLEMAN: What is the name of that spring?

A I never heard any name.

Q Now, the other springs, where are they located?

A The other springs are the Blue Cliff springs.

Q Where are they located?

A Located from a half to three-quarters of a mile up the canyon from Heiselt's place.

Q What is the quantity of water?

A There is only one spring that we were able to measure. That discharged that .098 second feet. Two other small springs so scattered it was impossible to measure them, and the upper spring of what is known as the Blue Cliff spring was in the city pipe line and it was impossible to measure that.

Q Mr. Jacobs, going back to the irrigation experiments made by you, I will ask you if you are acquainted generally with the soil on the Provo Bench under the several canals conveying water upon the Bench?

A Yes.

Q What have you to say as to whether or not the lands upon which you made these expriments are the same kinds of lands, that is, generally the same, as the other lands upon the Bench?

A I should say they are generally similar.

Q And did you direct the placing of the water upon those tracts, and length of time, or was it done as the farmers chose to do it themselves making the experiments?

A These experiments were simply the results of the farmers' irrigation as they did it themselves as was their habit of doing.

Q You made the measurement of the water to the lands?

A Yes I measured the land and the water applied and the time.

Q And kept the time of the application?

A Yes, the farmers did their own irrigating.

Q There seems to be an impression that the reason the water that goes into the city pipe was not measured was because it was so scattered that you could not measure it, what was the fact in regard to that.

A I don't know, I have not been up to the intake of the city pipe since it was put in.

Q You didn't make any measurement there of any springs running into the city pipe?

A No.

Q Do you know what year it was put into the city pipe?

A I do not.

Q Known as the Maple Springs?

A About a year ago, I think.

CROSS EXAMINATION by Mr. Willis:

Q Calling attention to these tracts that were irrigated, Mr. Jacobs, they average or they run from 23 to 66 acre duty.

MR. RAY: No. 111.

THE WITNESS: It is 111.

Q So they had two irrigations, the same land used, there was two irrigations under your supervision of each of these tracts, was there, about that time?

A Most of them.

Q And what was the result as to that being the quantity required, what did you determine as to that?

A The only determination I made on that was general observation of the crop condition.

Q What was the conclusion from your general knowledge?

A Well, in no case did I see any indications of crops suffering

Q And you felt that that was the quantity of water that was required at that prticular time to irrigate these several tracts?

A No, I rather felt that that quantity was sufficient.

Q Was any of it wasted in irrigation?

A Yes sir.

Q Was there a waste in each dase on the first application?

A I woundn't say any -- you mean experiment No. 1?

Q Either of the tracts, I am speaking generally, if there was any difference as to No. 1, or any of the other numbers, please state?

A Yes, there was quite a difference. I wouldn't say the water was generally wasted in certain cases. It was, for instance, in the Lovelace tract where the water was run over fifteen hundred feet with one regulation. Undoubtedly a large portion of that water applied during the last part of the irrigation waswasted. That is an extreme condition.

Q Did you irrigate the Lovelace tract the second time?

A No.

Q Just one irrigation?

A Just one irrigation.

Q Why did you select these particular tracts as an experiment, Mr. Jacobs?

A These tracts were selected, the Lovelace tract and the Newell Knight tract and Marriott tract were selected during -- that is, they were selected by Mr. Deming.

Q Then you don't know of your own knowledge why these particular tracts were selected?

A I don't, they were selected in connection with the case at the time that protest was made by the Provo Reservoir Company against the actions of the commissioner.

Q Were you working under the direction of Mr. Deming at that time?

A No, I was not, I was working in connection with him.

Q Then was Mr. Deming in the employ of the Provo Reservoir Company?

Q Mr. Deming was court commissioner at that time, distributing the water of provo River.

Q And you were there in the interest of the provo Reservoir Company to determine the results for their information, were you?

A Yes.

Q Now, what tracts did you irrigate a second time? Give us one that you irrigated a second time?

A Tract No. 1, Hanson tract.

Q In the first application was any water wasted in that?

A No, I wouldn't say there was any water wasted.

Q Then the same conditions prevailed as to the second tract, or the second application?

A Yes.

Q Did you in any way have the supervision of that or were you just there to determine the result, Mr. Jacobs?

A Thatis all I just determined the results. They irrigated the land as they werein the habit of doing.

Q Now, who distributed the water that was distributed from the Provo Reservoir Company's system?

A It was done under my general direction and immediate direction of Mr. McCune

Q Did you have any special instructions as to the duty of water that was to be delivered to them at that time, that is the quantity taking into consideration the duty?

A No, he was in another complicated distributing system and we simply took the quantity of water that would naturally come to him under the natural regulation of the system.

Q You say this was during the month of August?

A Yes.

Q And in that same year 1915, I understand you these experiments were made in the year 1915.

A 1914.

Q Then for 1914 you state that during the low water period the

average duty under the Provo Reservoir system was 110 acres?

A Yes.

Q Now, why did you make a difference in that duty in these particular tracts between that and the other users under the Provo water system?

A Well, all the tracts were not irrigated from -- that is, all the tract was not irrigated every six days, man might have twenty acres and only irrigate part of it this time and part next.

Q Now, during the year 1914, during the low water period, you delivered, as I understand you, water on a duty of 110 acres out of the provo Reservoir system?

A That would be about the general average.

Q I mean approximately?

A Approximately.

Q Did you delivere that water, or measure it out to the different users along the system? A. Yes.

Q Was that a part of your duty?

A Yes, I measured the water, rated the flume and gave Mr. McCune, who distributed the water under me a tabulation, showing the amount to turn to each gate and then I would check him up on that.

Q Now, as a matter of fact do you know anything about this other than the measurements of the water at the several laterals along the system, what was done, the use of it, or how it was used, of your own knowledge?

A Yes.

Q Do you know as to all the tracts of land?

A No, I don't.

Q How many of those tracts of land during the time that the duty was approximately 110 acres did you visit and inspect?

A Why, I visited the majority of them.

Q How often during that period?

A I can't say, probably some I only visited once during the season. I am speaking of the whole area now.

Q I am speaking of that same thing in a general way.

A Yes.

Q Now, you testified that they raised average crops under a 110 acre duty, didn't you? A. Yes.

Q Now, can you say this, how many of those several tracts did you visit that you can of your own knowledge that they raised average crops, that is, what percentage of the land?

A I could not figure the percentage.

Q Would it be twenty-five per cent?

A Oh yes, it would be a majority. In connection with my duties I more or less was closely connected with the tract, that is, I would observe them as I went about my duties of distribution during the season, but as to just the percentage of tracts that I probably missed, I cannot say.

Q Can you say of your own knowledge that any of the tracts of land were irrigated under a duty of 110 acre duty; how do you know but what that water was applied on a less quantity. Do you know of your own knowledge that it was not?

A Taking the whole quantity of water, I do not.

Q And the same thing can be said as to the year 1915 on 145 acre duty, can it? A. Yes.

Q You could not say that any crops were raised under the Provo Reservoir system for either the year 1914 or 1915 on 140 acre duty, could you other than that quantity or those quanties were delivered to the users?

A No, I could not.

MR. A. CHATCH: If the court please, I don't understand he has said anything of that kind at any time during his testimony. I therefore cannot understand what counsel is trying to get at.

MR. WILLIS: Is the court please, he has testified

in direct that during the high water period in 1914 the 70 acre duty was the standard on the Provo Reservoir system, and the 110 acre duty in the low water season. Now, the question is this -- and he also testified that average crops were raised there. The question is this, what we want to dererminе is is he knows of his own knowledge just what duty was used. He may know what was delivered but as to the duty and use in order to produce thosecrops, is what we are trying to determine.

THE COURT: yes, I remember his evidence substantially as you have stated it, although, as I remember it in the year 1915 he said the grain crop was an average crop. The later crops suffered somewhat materially for the want of water. That is 145 --

MR. WILLIS: That is as I understand.

THE COURT: The grain crop was an averagecrop as I understand it.

MR. WILLIS: That is all anyway.

CROSS EXAMINATION by Mr. Coleman;

Q Mr. jacobs, whatdo you mean by 110 acre duty, is that based on the actual acregge or on shares of water in the Provo Reservoir Company?

A That is based on shares of water.

Q So that if a man owned five acres of land and owned fifteen shares of water in your company you would turn him the fifteen shares of water amounting to fifteen shares?

A Yes.

Q You would turn him if he owned fifteen shares, you would turn him what ~~xxx~~ that quantity -- the quantity of water sufficient for the fifteen shares?

A Yes, irrespestive of the land.

Q So that a man might own fifteen shares of water and only irrigate five acres of land?

A He might, yes.

Q So all you base your judgment on then is the number of shares owned under the respective laterals?

A Yes, and also the fact that if a man does not irrigate the number of acres he has shares for he very readily lets you know about it.

Q Aren't there a number of people on Provo Bench who are using fifteen shares of the Provo Reservoir Company's water on four and five acres of land?

A I don't know of any cases.

Q You don't know of any cases?

THE COURT: Let me ask, so I may understand the effect of this evidence. Is one share supposed to represent water enough for one acre, is that the idea?

A Yes, that's the idea.

THE COURT: That is the plan, now you may proceed.

Q So you don't know how many acres these shares irrigate, actually irrigate?

A Not by measurement.

Q A person can buy extra shares, could irrigate his land if he wishes to, can he not, irrexpective of the number of acres he has? A. Yes.

Q Your company is glad to get the money, you are not particular about the acreage. Now, if you say that hundred acre duty is sufficient why did you call upon Commissioner Deming in 1914 and complain because you were not put on a 70 acre duty?

A I didn't know that I called on Commissioner Deming.

Q Didn't you call on him?

A For a 70 acre duty? or any specific duty.

Q Didn't you complain because Mr. Deming had not turned you sufficient water for your irrigation system in 1914, don't you recall that?

A At whattime?

Q It was along in the summer, I don't remember just what particular time.

A I remember during the summer of '14 we were operating on something over a hundred acre duty instead of a 70 acre duty.

Q But you wanted to be put on a 70 acre duty, didn,t you, and asked Commissioner Deming to put you on that duty?

A I don't know of any request.

Q Don't know of any. Why is it Mr. Jacobs, that you are putting hundred and hundred and fifteen and twenty second feet of water in your canal, when you are only irrigating, as you state forty-eight hundred or five thousand acres?

A We figure this time of the year that 70 acre duty is not too much.

Q Well, at any time of the year isn't it a fact you put hundred second feet or more in your canal when you are only irrigating forty-eight hundred acres of land, forty-eight hundred shares?

A Not during the summer, low water period.

Q So your testimony as to the duty of water is purely based on the shares of water in your irrigation company?

A Yes.

CROSS EXAMINATION by Mr. Thomas.

Q How much water did you tell Judge Hatch you had running through the conduit now into your system, was it 115 feet?

A Approximately 115.

MR. A. C. HATCH: If the court please, I think probably it would be more in order when there are so many of these people that we be allowed to redirect after each of the several defendants have cross examined, and keep in mind the matter on which that particular one has made his examination.

THE COURT: It is immaterial to the court other than this, that opens up possibly matters that would take considerable time, if you redirect and then possibly a little more cross

examination by the party. I am inclined to think we would proceed a little faster. However, it may be a little difficult for you, if it is I will let you do that under spedial circumstances, if you find it necessary.

MR. A. C. HATCH: I would like to ask particularly about a matter brought out by Mr. Coleman.

THE COURT: You may do so at this time.

RE-DIRECT EXAMINATION by Mr. A. C. Hatch;

Q Did you at any time have any knowledge of any protest having been made to Mr. Deming because the Provo Reservoir Company was not put upon a 70 acre duty?

A No, I did not.

Q Do you know that protest was made to Mr. Deming by the Provo Reservoir Company in 1914? A. Yes.

Q State what it was?

A Because the distribution to the Provo Bench Canal Company was made at a 40 acre duty.

Q And what was the duty that you were using at that time?

A Approximately 110.

CROSS EXAMINATION by Mr. Thomas continued.

Q I was looking for the note I made as to the statement you made as to the amount of water now running through the system, was it 115 or 135?

A 115 now about, it fluctuates somewhat.

Q But it is practically 115? A. Yes.

Q That would lower the duty to about 50 acres, wouldn't it?

A Well, I was counting the duty at the points of diversion of the various laterals. We have a certain loss that has to be taken care of.

Q I was trying to ascertain what water you were now taking through the system?

A We are taking 115 second feet, delivering it at the Bench. We have a certain loss and between 60 and 65 acre duty.

Q Of course in taking the water under our present system you have to include that loss in your acre duty, wouldn't you?

A I don't get just what you mean by that question.

Q You are taking, as I understand it, 115 second feet of water out of Provo River, figuring your own acreage as you have given it, that 115 feet of water if carried without loss would do duty on a basis it is now being used on the basis about one foot to 50 acres of land approximately?

A Yes, something like that.

Q Now, in arriving at your duty, you stated, as I remember the testimony at times duty went from one foot to a hundred acres, sometimes going 110 acres? A. Yes.

Q That is, during the low water season?

A Yes.

MR. COLEMAN: 145 acres in 1925.

Q Now, do you know -- your business, as I understand it, is to pass over the stream and apportion the water according to the shares to the respective laterals?

A Yes.

Q And where a lateral calls for a specific number of shares, then you see that proportion of the stream represented by the shares is diverted into those laterals?

A Yes.

Q So that in arriving at your duty, as you have given it here, you base the number of shares that you turn out on the number of acres represented by that lateral, did you?

A Yes.

Q So that, as a matter of fact, you don't know whether that water that you diverted through the laterals actually did duty, did service upon the 110 and 145 acres, or whether it was used on a smaller tract, do you?

A I don,t know absolutely.

Q As a matter of fact, you don't know at all about that?

A It is my judgment that it was.

Q Yes, but you don't know of your own knowledge?

A No.

Q So that, when you were giving your estimate as to your duty, you were basing it wholly upon the shares represented by the owner in the company that was charged against his particular lateral at the time you diverted it?

A Well, there are some cases, considerable number of individual cases that I know, for instance , a man has ten shares of our water, and he is irrigating ten acres of land with it, but to know absolutely every man is irrigating exact number of acres for which he has shares, I could not say.

Q You don't know?

A I know of considerable number of individual cases.

Q Can you give us the name of an individual who had 145 acre duty of water and raised an average crop thereby under your system?

MR. JACOB EVANS: We don't claim anything of that kind. MR. THURMAN: That is when he had a short crop when he had that duty.

THE COURT: That is my recollection.

MR. THOMAS: I don,t want to put words in the witness's mouth that he didn,t give, of course, I understand him to say even with that very high duty an average crop was raised.

MR. RAY: Of grain, he said.

THE COURT: Early crop, average crop, but in that year during the early period was 75 acres, and the combination of the duty of 75 during the high water and 145 during the low water period, succeeded in raising, as I understood the witness, average crops of the early grain. That is, those grains that were harvested early in the year, but the late crops, there was

a shortage. That is the substance of the evidence as I got it.

Q Was there any crop raised on those lands where the water or duty one second foot to 145 acres?

A Was there any crops raised?

Q Yes.

A Yes, there were crops raised.

Q what was the crop raised?

A Well now, I will modify that, I don't know of an actual, or of a case where a duty of 145 acres raised a crop; that is that I have measured up the strip of land and found that amount of water applied.

Q That is if the water could have been taken at all or -- let me withdraw that -- that in xxxxx such cases if the water did duty at all it did duty or had to do duty on 145 acres, is that what you want us to understand?

A Yes, as I said before, some alfalfa tracts that I had in mind when subjected to a duty of 145 acres suffered in the latter part of the season.

Q Let me interrupt you there, when you say it suffered, are we to understand there was no crop raised?

A No, partial crop raised.

Q Partial crop only. Now, as a matter of fact, that particular tract you have in mind, the crop was pretty badly burned, wasn't it?

MR. THURMAN: That is the 145?

MR. THOMAS: Yes.

MR. THURMAN: If the court please, we don't contend on the Provo Bench anywhere 145 is sufficient. If we can shorten this examination by making that admission we will do it.

MR. WILLIS: The question I raise in this is to test the credibility of the witness as to any of it.

MR. THURMAN: Any of what?

MR. WILLIS: Anything he had testified to in the way of duty of water.

MR. THOMAS: D° I understand, Judge Thurman, that you don't contend that such high duty would produce crops on the Provo Bench. Do you contend --

MR. THURMAN: We don't contend it is sufficient water.

MR. THOMAS: Will you admit it is insufficient water to produce a crop?

MR. THURMAN: I won't say it would not produce any crop. I think perhaps it would produce some kind of a crop, but now a crop worth while, a man giving his attention to.

MR. THOMAS: I agree with you fully and am trying to ascertain what kind of acrop this was. I might say we could go to interminable lengths on this, but what I want to get at is what kind of a crop was raised at that prticular place with that amount of water. Now, tell us just the condition, Mr. Jacobs --

MR. RAY: Nobody contending for that duty, I object to it as immaterial.

MR. JACOB EVANS: We second the motion.

MR. THOMAS: Does anyone contend it is anywise sufficient? Certainly we don't. If the plaintiff says it is wholly insufficient we will desist.

THE COURT: That is the substance of the statement made by Judge Thurman.

MR. BAGLEY: Let me ask counsel for the plaintiff a question. Don't your contract provide that it is considered as primary water right between a duty of 75 and 150 acres?

MR. JACOB EVANS: I could not answer that.

MR. A. C. HATCH: Our contracts are a second foot for 70 acres as long as it can be maintained, but we will not be held liable for breach if we furnish a second foot for 150 acres. in the later wat er season or xxx very dry season.

MR. THURMAN: On some lands that might be considered

sufficient, I don't know .

MR. A. C. HATCH: And on some lands and some kind of crops we say that is sufficient if utilized by the users to the best possible advantage. In some cases by a pipe system I understand that as high as a thousand acres of orchard is irrigted with a second foot of water, some parts of the United States.

MR. RAY: We object to counsel testifying here, your honor please, unless he is sworn.

MR. A. C. HATCH: I am simply answering the question asked by Mr. Bagley.

MR. THURMAN: The Judge's word is as good as an ordinary witness under oath, anyway.

MR. RAY: He is testifying to hearsay.

MR. A. C. HATCH: No, I have witnessed the process of the irrigation where they use the pipe system, delivered the water.

THE COURT: Are these admissions satisfactory to you so you don't care to examine further on that point?

MR. THOMAS: On that point. Now, that I may understand the matter so as to shorten the cross examination, plaintiff admits that such quantity of water as one second foot to 145 acres would be wholly inadequate to raise a crop?

THE COURT: Raise the ordinary crops raised by farmers.

MR. THURMAN: On Provo Bench land, that is all he has testified about.

MR. THOMAS: Then I want to know about these lands in Provo City, that Provo City is interested in. Let us understand that now, so we won't be cut short subsequently. I have stated as I understood the agreement to be, or the stipulation. Now, do I understand, Judge Thurman, that he limits that wholly to Provo Bench Land?

THE COURT: I understood him to so state basing it upon the fact this witness has not testified at all with reference to any other lands.

MR. THOMAS: Does provo bench lands only include those lands under the provo Bench Canal, or other lands similarly controlled by the Upper East Union or East Union, Little Dry Creek?

MR. THURMAN: I will say the lands he testified t about.

MR. THOMAS: Let us have the canals named so that we won't be under any misapprehension subsequently and have
8 arguments what has been stipulated to.

MR. A. C. HATCH: The East Union and Upper East Union are on another side of the river from any of the lands this man has testified to, as shown by the Exhibit 47.

MR. THOMAS: I understand that, Judge Hatch, but it is for the purpose of shortening the cross examination, and you have made a certain statement as to your stipulation, I want to know if you will carry that stipulation to lands that are on the south side, which are similar to those lands on the north side of the river?

MR. A. C. HATCH: If the court please, we will admit that under the present system of irrigation and use of water that as to those lands, that the record remain during the entire season that there are none of the lands under the Provo River system that a duty of 145 acres per second foot would be sufficient.

MR. THOMAS: That covers it very explicitly.

MR. THURMAN: Now, take up 144, process of elimination.

MR. A. C. HATCH: We don't even under that admission admit that under a certain condition and certain uses the 145 acre duty might not be sufficient for some lands under our system, which extends into the Salt Lake County.

Q Looking over my notes, Mr. Jacobs, I find that you stated in July, I think, of 1915, or rather after July 1, of 1915, there was no water available or in your system, did I understand you aright, after July 1, 1915 that you had no water available?

A About July 1st is when I went down to about the 145 acre duty.

Q And was it later in the season your water failed you?

A No, water never failed us, we continued throughout the season on that duty.

Q Then I misunderstood you on direct examination. When you said that the crops were normal crops and thirfty, did you have reference to the time of their harvest, or the early spring, along in the latter part of June?

A Well, general condition of them through the season as observed by me.

Q Were you able to make any investigation as to the tonnage per acre of alfalfa and bushels per acre of grain harvested?

A No, I did not.

Q You could not give any testimony then as to that?

A No,

Q I wanted to ask you a question about the lakes, Mr. Jacobs, then I think I am through. Did you take into consideration at any time when you were measuring the water the approximate amount of precipitation that occurred in those lakes in that region? A. No.

Q Have you any data on that at all?

A I have none.

Q Is it a fact that there is considerable precipitation there during the summer months, do you know?

A Well, depends on what considerable means. There is some precipitation.

Q Can you give any information to us at all what precipitation

occurs there?

A No, I cannot.

Q If the dams were not in whatever precipitation there was would of necessity flow directly into the river, would it not, if there were no dams at the lakes there to hold the water back?

A No, I think it would not, I think it would probably flow into the lakes.

Q And wouldn't that go out into the river?

A If the lakes raised high enough to the outlet point it would, but the lakes due to previous evaporation below the outlet level, it would probably fill up again.

Q To the outlet level?

A Well, may be below it or above it, depending upon the amount.

Q Have you ever been there at the lakes prior to the installation of these dams by the Union Reservoir Company, and by the plintiff?

A No, not the three principal.

Q Can you give any opinion at all as to the conditions preceding the installation of the dams by the plaintiff company?

A No, I cannot.

Q Can you give us, do you know, what the evaporation amounts to there during the months of June, July and August?

A I have no data.

Q No data at all. Have you ever made any estimate of measurement?

A I never made any measurement on evaporation.

Q As to the outflow, Mr. Jacobs, what was the outflow from the main lakes; by the main lakes I mean the Washington, Wall and Trial Lakes, during the months, or the years 1914, 1915 -- taking 1914 first?

A The storage outflow?

Q Yes.

A I answered that.

MR. JACOB EVANS: He can give you that from the things he gave this morning and save making another record of it.

MR. THOMAS: I have this data, there is nothing further.

CROSS EXAMINATION by Mr. Ray.

Q Mr. Jacobs, at what point below the lakes there did you say you measured the outflow?

A It is measured at the junction of the drain from the two lakes, about half a mile below the Washington outlet, and quarter of a mile below the Trial outlet. The Wall Lake is discharged through the Trial Lake.

Q Now that water is measured in what has always been a natural stream there, that is --

A Natural channel, yes.

Q Is there any water going into that channel between the outlet of the lake and point of measurement, any seepage water?

A No, there is none.

Q Upon what investigation do you base that statement? there is no seepage water between the outlet of the lakes and the confluence of the two streams?

A Fact I have traversed the channel when the gate valves were closed down and no discharge.

Q Now, coming down, Mr. Jacobs --

A I would like to modify that saying there is a slight seepage immediately below the dam, does not amount to anything, doesn't get very far down the channel.

Q Coming to the tunnels on the -- in the Provo Canyon here through which the canal of the Provo Reservoir passes, is there any seepage water collected in those tunnels?

A No.

Q Are they perfectly dry?

A The lower tunnel is perfectly dry during the time that there is

no water running through it in our conduit. The upper tunnel has water standing in from the conduit, from the fact that the flume line which connects up with the tunnel at the lower end is higher elevation than the bottom of the tunnel, but as to seepage into the tunnels, I could not determine.

Q There is some seepage, at least, into it?

A No, I wouldn't say there is any.

Q Would you say there wasn't any?

A Not in the upper tunnels.

Q In the lower tunnels? A. Yes.

Q Now, have you ever determined the percentage of your acreage lying below the old canals and that lying above them?

THE COURT: When you say old canals, do you refer --

MR. RAY: Provo Bench Canal and North Union and West Union.

A Yes, there is btween thirteen hundred and fourteen hundred acres.

Q Lying below?

A Lying below the older canals.

Q Now, under your agreement with your water contractors, you are required todeliver them 70 acre feet.

MR. A. C HATCH: Seventy-five.

Q Seventy-five acre feet of water to each acre to a certain period, and then between that point and 150 --

THE COURT: I think you mistated the question, read it, I don't think you intended to say that.

(Question read)

MR. A. C. HATCH: Let me correct my statement made a while ago as to the 70 acres, it is 75 acres is the mimimum acreage to a second foot of water.

A Did you say 75 acre feet to each acre of water?

Q One acre foot to each seventy-five acres of land. (Thank you, your honor) And from then up to a second foor to each 150?

A Yes, we deliver a minimum of a second foot for each 75 acres during the high water period and second foot for 150 acres during the low.

Q And when you figure your duty you use a share of water as an acre of land? A. Yes.

Q Have you ever takn a survey and measured under your canal at any time the number of acres which were being cropped?

A No.

Q Do you Mr. John S. Park? A. Yes.

Q Do you know how many shares he has in your canal in 1914 and '15?

A I do not.

Q Do you know how many acres of land he irrigated with it?

A I do not.

Q Do you know whether or not a share was sufficient for four acres in the latter part of the year 1914?

A I don't think it was.

Q Whether four shares was sufficient for an acre?

A No, I don't.

Q Do you know Mr. Henry Downs? A. Yes.

Q Do you know how many shares he has in your canals

A I do not.

Q Do you know how many acres he irrigated?

A I do not.

Q Do you know whether through his lateral in the latter part of 1914 or '15 it would take three or four shares of water to irrigate one acre of land?

A I do not.

Q Do you know Mr. Niels Jacobson?

A No.

Q Do you know his son or his father?

A No.

Q Do you know what their experience was? A. No.

Q Do you know Mr. Don Clayton? A. Yes.

Q D° you know how many shares of water he had in your --

A No.

Q Do you know how many ~~xxxxx~~ acres of land he attempted to irrigate with it? A. No.

Q Do you know Mr. Lawhorn?

A Which Mr. Lawhorn?

Q Any Mr. Lawhorn. Do you know a Mr. Lawhorn? A. Yes.

Q One who lives on Provo Bench? A. Yes.

Q Do you know how many shares he has? A. No,

Q How many acres he has? A. No.

Q Or what he irrigated with it? A. No.

Q Now, you were -- I want to call your attention to your experiment No. 9, and No. 10, did I understand you correctly when you said the total area there was 7.53 on the two experiments, on the Lovelace land, 7.53 acres?

THE COURT: 7.52.

A 7.52.

Q Did you measure that accurately;?

A Yes sir.

Q And how long did you say it was -- you stated it was 250 feet by 1500, didn't you ?

A The upper ~~pat~~ piece was 750 and the second piece was 501. Then there was a piece in the corner that was not irrigated on one side. It was 93 feet. I made a mis addition of those before, it is 1344 feet.

Q Inst-ead of 1500?

A The way I add it up now.

Q Now, ~~m~~ when you say the period between irrigations in these different experiments which you have referred to, from 1 to 14 inclusive, you say that was hearsay as to the Marriott Land, as to the Lovelace land and as th the Knight land?

A Yes.

Q Now, for instance, take the ~~Fxx~~ Threaher tract, experiment 5,

how did you determine that it was ten days between irrigations in that case?

A I visited the tract at the time of the second irrigation ten days after the first.

Q Well now, when the first?

A The first was the date I gave, August 7, 1914.

Q When was the next?

A August 17th, I didn't take any experiments on that .

Q You don't know whether it was irrigated between the 10th and 17th, do you, of your own knowledge?

A No, I don't.

Q Do you know that as to any single tract in this, when it was and was not irrigated, except upon the dates you were there?

A I know that the period first stated here is the maximum, I don't know whether it was irrigated between then or not.

Q So that if it had been irrigated between that it would take a less quantity of water for irrigation at the subsequent irrigation, wouldn't it, require less quantity?

A Yes, it would require less uantity.

MR. JACOB EVANS: You don't contend it was actually irrigated?

MR. RAY: I don't know a thing about it. Some of these were six days and some were thirteen days, I don't know what the fact is anymore than the witness does. That is all.

CROSS EXAMINATION by Mr. Bagley.

Q You stated in your direct examination that in 1914 the area irrigated under the system of the plaintiff was 4,786 acres, is that right? A. Yes.

Q And for the following year 1915, 6,170 acres? A. Yes.

Q Now, the contract under which the plaintiff sells water to consumers designates the waters of two classes, what they

call acresof primary water and acres of secondary water, is that right?

MR. JACOB EVANS: Just a moment, is this contract in writing, this general contract?

A Yes.

MR. JACOBS EVANS: Copies of it can be had?

A Yes.

MR. JACOB EVANS: I object to it as not the best evidence.

MR. BAGLEY: Very well, it was just preliminary, anyway. I didn't think there was any dispute on that.

MR. JACON EVANS: What is the use putting this into the record?

MR. BAGLEY: It is preliminary to something I am going to ask that I think is material.

Q In determining what you have stated as the area irrigated, you have counted the number of shares which the company has contracted to sell, and to which water was delivered from your system? A. Yes.

Q And you are not able to say whether that number of acres of land was actually irrigated, or whether only half that number of acres of land were irrigated, are you?

A No.

Q So that what you mean is when you say that there was irrigated under this system 4,786 acres is that on the basis of distribution your company turned out to water consumers water for that many acres of land? A. Yes.

Q They call it acres of land, you don't call it shares, do you?

A No, we call -- those terms are used synonymously.

Q And that same rule is true for the year 1915?

A Yes.

Q And you have no knowledge at all regarding the actual areas irrigated by the water from the plaintiff's canal.

MR. JACOB EVANS: Object to that because it has been answered by the witness at least half a dozen or a dozen times from various different attorneys in this case.

MR. BAGLEY: If it has been answered, I won't insist on it. It has been answered two ways, I am sure about that, if it has.

MR. A. C. HATCH: We will ask the question be read.

THE COURT: The question is withdrawn, Judge Hatch.

MR. BAGLEY: On the assumption that he has answered it the way I stated it.

MR. JACOB EVANS: We will ask for the question.

MR. BAGLEY: If there is any doubt about it, I won't withdraw it.

THE COURT: The question may be read. I don't understand he has stated it just as you have stated it, that is my recollection. Read the question.

(Question read)

A I have made no measurements of it, the total areas.

Q And when you stated in your testimony that the crops ~~irrigated~~ grown on these landswere of average quality, that is for the year 1914, and that the grain crops for 1915 was of average amount and quality, it had reference only to those lands which were actually cropped under your system or the plaintiff's system? A. Yes.

Q And if the water which was delivered to consumers was applied on half of the area for which it was intended, let me say, and produced these crops, then the result would not be such as might be concluded from your testimony on direct examination that all of the areas had produced this character of crops?

MR. JACOB EVANS: I object to that as calling for a conclusion of the witness and being purely argumentative,

THE COURT: I think it is probable that is the

situation, I don't think it needs the testimony of any witness. Of course, if you change the premise you change the result.

CROSS EXAMINATION by Mr. McDonald.

Q Mr. Jacobs, what method did you adopt in determining the quantity of water in the tests which you have made, how did you measure the water.

A We used various methods, In some cases a weir, other case a rating flume with a current meter measurement and in another case the current meter measurement was made in the natural bed of the stream.

Q Any of it done by what you call the float system?

A No.

Q In the year 1914, as compared with other seasons is what we call an extraordinary wet season, was it not, that is, there was a great quantity of rain?

A Well, yes, it might be classed a little above normal, I wouldn't say very extraordinary.

Q Do you remember? A. Yes.

Q You say it was not extraordinary as compared --

A I say it was a little above normal.

Q A little above normal? A. Yes.

RE-DIRECT EXAMINATION by Mr. A. C. Hatch;

Q Have you any actual knowledge that any number of persons under your system applied the water upon the number of acres of land represented by the shares held by them?

A Yes.

Q Approximately, if you can say, what proportion of the users?

MR. RAY: Object to that as callinf for hearsay as to what a man asks for.

MR. A. C. HATCH: It is redirect.

THE COURT: Read the former question, I didn't understand it that way.

(question read)

THE COURT: That is the way I understood it.

MR. RAY: I didn't understand.

Q Under your system ?

A I could not say off hand, it would take me sometime to go over each individual case.

Q I wish you would do that and give it to us later. That is all.

H. F. THOMAS, called by the plaintiff, being first duly sworn, testifies as follows:

DIRECT EXAMINATION by Mr. A. C. Hatch.

Q Where do you reside, Mr. Thomas?

A Provo, Utah.

Q Have you held the position of commission for the distribution of the waters of the Provo River under either the so-called Morse or Chidester decrees?

A Yes sir, under both of them .

Q How long were you commissioner?

A About nine years.

Q While acting as commissioner, I will ask you whether or not you distributed all the water distributed to the Blue Cliff Canal Company or the Provo Reservoir Company in addition to the quantity named in the decrees as Provo River water certain springs, water of certain sprins?

A Yes.

Q What springs were they and what names were the springs known by?

A Well, I don,t know their full names, I suppose some of them are without names. There was what we called the Steele Springs the Heiselt and Maple Hollow.

Q Now, the Maple Hollow spring, do you know whether or not that spring is now diverted to the city through its water pipe?

A I do not.

Q Where is that spring situated?

A I should judge half to three-quarters of a mile easterly or northeasterly of Mr. Heiselt's residence.

Q Have you any knowledge of the quantity of the flow of that spring? A. No sir.

Q Could you give approximately the quantity?

A I suppose if they were collected together it would make neighborhood of a third to a half second foot .

Q How much water did you distribute while water commissioner as for these several springs to the Provo Reservoir Company?

A All of them together?

Q Yes.

A One and a half second feet.

Q That was your judgment of the quantity of water that flowed in all of them including the Maple springs?

A Yes sir.

Q Now, for how many years did you so distribute it?

A I think only the one, 1911.

Q 1911? A. Yes sir.

Q Were you commissioner after that?

A I think that was my last year.

Q Who followed you?

A I think the next year was T. J. Farrar

CALEB TANNER, called by the plaintiff, being first duly sworn, testifies as follows:

DIRECT EXAMINATION by Mr. A. C. Hatch:

Q Mr. Tanner, have you made any investigations to determine whether or not there is a loss by seepage or evaporation of the waters discharged from the Provo reservoir or the Union Reservoir Company's reservoirs between the reservoirs and the intake of the canals of the several parties claiming the use of that water when discharged?

A Made some tests to determine whether the channel used in the Provo system was a wasting channel.

Q When were those tests made?

A In 1913.

Q You may state what your determination was with regard thereto?

A It is almost without exception a channel of accumulation from the lakes or storage reservoirs to the intake of the plaintiff canal at Heiselt's at the mouth of Provo canyon.

Q Did you make any measurements to determine whether or not the water was increased by the turning in of the water from the reservoirs with the same quantity at the intake of the plaintiff's canal?

A I did not.

Q You may state, Mr. Tanner, just what you did with relation to that matter in your experiments and investigations?

A These experiments, measurements were begun on September 10th, 1913, after the impounded reservoir water had all been released. During the period covered by the experiments, rainy periods occurred in the upper section of the river which furnished through the sections of determination varying quantities of flow, and so far as whether this quantity of flow came from rainfall or storage water in my judgment was not material.

Station No. 1 was located on the Provo River at the Meldrum cabin about six miles below the storage reservoir and some six miles above the forest ranger's cabin at Soapstone.

Station No. 2 was located on the Provo River two miles and a half above the ranger's cabin on Soapstone, being approximately along the course of the stream three and one-half miles from station No. 1.

Station No. 3 was located on the Provo River about two miles below the ranger's cabin on Soapstone, being approximately along the course of the river four and one-half miles from station No. 2.

Station No. 4 was located on the Provo River near the upper end of the Stewart ranch being approximately along the course of the river four and one half miles from station No. 3.

Station No. 5 was located on the Provo River about one-half mile above the steel bridge across the Provo River connecting Woodland with Bench creek, being approximately along the course of the river four miles from station No. 4.

Station No. 6 was located on the Provo River about one-half mile above the Utah Power & Light Company's Murdock diversion dam, approximately along the course of the stream six and one half miles from station No. 5.

Station No. 7 located on the Provo River about one-fourth mile below the Murdock diversion dam of the Utah Power & Light Company.

Station No. 8 was about four hundred feet above the intersection of the tail race of the Murdock power plant with the channel of Provo River being approximately along the course of the stream two miles from station No. 7.

Station No. 9 was located on the Provo River at the Rating flume of the Provo Reservoir Company just below the wagon bridge on the road from Heber to Midway at the place commonly designated as Midway dam.

Station No. 10 located on the Provo River just below the wagon bridge which crosses Provo River west of the town of Charleston, being approximately along the course of the stream

four and one-half miles from station No. 9.

Station No. 11 was located on the Provo River near the lower end of the farm of J. W. Hoover, about one mile below the Wahlsburg station of the D. & R. G. railroad, being approximately along the course of the river three miles from station No. 10.

Station No. 12 was located on the Provo River at the U. S. G. S. gauging station in Provo Canyon, being approximately along xxxx the course of the river six miles from station No. 11.

Station No. 13 was located on the Provo River at Donnan's resort in Provo Canyon.

Station 14 was located on the Provo River at Heiselt's in Provo Canyon, just above the diversion dam of the Provo Reservoir Company, being approximately along the course of the stream five miles from station No. 13.

The river, for the purpose of this investigation, was divided into these sections, the terminae of which are the stations given above. For convenience of statement these sectionsare designated as follows:

Section A: Provo River, its tributaries and diversions included between Station No. 1 and Station No. 2.

Section B: Provo river, its tributaries and diversions included between Station No. 2 and Station No. 3.

The same general description applies to the balance of the sections, so that I will shorten the matter by mentioning the sections and then stating the stations between which it is included.

Section C: Between stations 3 and 4.

Section D: Between stations 4 and 5.

Section E: Between stations 5 and 6.

Section F: Between stations 7 and 8.

Section G: Between stations 9 and 10.

Section H: Between stations 10 and 11.

Section I: Between stations 11 and 12.

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Section J: Between stations 13 and 14.

Section A, the river was measured on September 10th at 2:00 P. M., beginning, and ending at 3:30 P. M. The discharge was 31.55 second feet. Gauging at station 2 was made on September 11th, at 8:00 A. M. beginning, ended at 9:30 A.M. In the interval between the observation on the 10th and observation on the 11th, gauges having been set at both station No. 1 and station No. 2. The gauge peg at station No. 2 showed a recision of one-fourth of a foot. The discharge was 33.31 second feet. On the morning of September 12th, 8:15 A. M. the gauging, second gauging was begun, terminated at 9:15. The gauge showed a recision at station No. 2 of .06, giving a discharge of .93 of a second foot. The gaugings at these two stations were read during the intervals covered by the investigation, the measurements of September 10th, to 12th. September 10th, at noon, at station No. 2, the gauge height was 0, at 7:00 P/M. it had reseded. .02 of a foot. At 8:00 A. M. on the 11th, it had receded.01, so that it was a minus one hundredth. At 12:45 P. M. pn the 11th, it had receded so that the gauge read minus two one-hundredths. 3:30 P. M. on the same date the gauge read minus three one-hundredths. On the 12th at 7:00 P. M. the gauge read minus three one-hundredths. September 12th at 8:15 A. M. the gauge read minus six one-hundredths. At 9:15 minus six-one hundredths. At noon of the 12th minus six and a half one-hundredths. At 1:00 P.M. minus seven one-hundredths. At 2:00 P. M. minus seven and a half one-hundredths. At 3:00 P.M. minus eight one-hundredths. At 4:00 P. M. minus eight one-hundredths.

With the measurements at Station No. 2, the gauge reading being five hundredths of a foot apart, I constructed a reading table showing the discharges at the several intervening heights and interpolated those discharges plus two hundredths on the gauge by the rating table, gives 35.96 second feet; plus one-hundredths

35.09; zero 34.21; minus one-hundredth 33.31; minus two-hundredths 32.44; minus three-hundredths 31.56; minus four-hundredths 30.69; minus five hundredths, 29.81; minus six hundredths 28.94; minus seven hundredths, 28.06; minus eight hundredths, 27.19.

The gauge reading at station 2, noon on the 10th was zero. The gauge reading at station 2 at seven P. M. September 10th, was a plus of two hundredths. Measurement at Station No. 1 was at 2:30 P. M. to 3:30 P. M. September 10th, assuming the stage of the river measured at Station No. 1 reached Station No. 2, about 4:30 P. M., and that was considerably more than an hour of intervening time that had elapsed and was the mean of the accounts given for Station No. 2, then the discharge at Station No. 2 for the same stage of the river as measured at Station No. 2, would be 35.09 second feet.

The inflow into Section A, at the Station No. 1 was 35.55 second feet.

There were at thirteen points between Station No. 1 and station No. 2, tributaries entering the stream ranging in volumes from two hundredths to four tenths of a second foot. The aggregate of these thirteen tributaries which were all of the superficial inflow between Station No. 1 and Station No. 2 was 1.10 second feet; added to the inflow at Station No. 1 gives 32.65 second feet.

The outflow at Station No. 2 as above, 35.09 second feet,

Again in Section 2, of 2.44 second feet.

MR. RAY: Will you please give me again, I did not get it, the aggregate of the thirteen small tributaries between Sections 1 and 2.

A 1.10.

MR. RAY: What was the gain, again?

A 2.44 second feet. Now, the same system was pursued in the treatment of each of the several sections which I have heretofore

given from A to J.

Section B, with the same treatment shows a gain of .63 second feet.

Two determinations on C, rain storm intervening between the two, gave in one a loss of 1.77 and gain of 1.63 in the other.

D, two determinations, a loss of 1.04 in one determination and gain of 1.78 in the other determination; a storm also intervening between the two determinations. This rain strom being in the upper country and fluctuating the stage of the stream.

E, gain of 6.47.

F., the conditions were such that the Power Plant operation interfered with the observation so that it gave two interpretations to the determination. The extreme of one interpretation was a loss of one one-hundredths of a second foot, and extreme of the other interpretation gave a gain of 1.15 second feet.

G, a gain of 5.27 second feet.

H, gain 8.16;

I, gain 12.92;

J, gain of 9.84;

I have assembled this data with the several stations and sections marked upon a map of the United States Geological survey and I have also in the text of that report given the complete observation data for each set of observations.

Q All included within that?

A Measurements of the flow of Provo river.

MR. A. C. HATCH: We offer the matter as plaintiff's Exhibit 48.

MR. RAY: I object ~~ex~~ to it, your honor please, as incompetent, immaterial and irrelevant; I don't know what it contains.

THE COURT: I was going to suggest probably the determinaton as to whether it shall be admitted, or whether you desire --

MR. RAY: I would not object to it, that is for

general observation.

THE COURT: I was just about to make the suggestion in reference to that question, whether it shall be admitted or whether you desire to make the objection you have made or some other objection, might be postponed until the next session of the court and in the meantime counsel might have an opportunity to examine it.

MR. RAY: I don't desire your honor be precluded from having it before you if it just contains in a concise way what the witness has testified to.

THE COURT: I am merely suggesting you should have an opportunity to examine it before you object.

MR. A. C. HATCH: We have no objection to that. May it please the court, Mr. Wanner will be called away on an important matter on Monday and probably cannot be back until Tuesday.

THE COURT: I think that will be satisfactory. Some of the counsel may desire to cross examine Mr. Tanner upon this before it is admitted, before you determine whether you wish to object to it or not.

MR. HATCH: I am of the opinion he may not be here so that no one may be disappointed at his absence on Monday or Tuesday.

MR. RAY: He will be available for cross examination later.

MR. HATCH: Oh yes, we offer it now so as to give you every opportunity to examine it between now and convening of the court.

4:45 P. M., Recess to 10:00 A. M. June 12, 1916.

CALEB TANNER - - - - -

DIRECT EXAMINATION by Mr. A. C. Hatch continued.

Q Have you determined from your investigation as testified to by you on Saturday whether or not a stream of water turned into the Provo River at the reservoirs of the plaintiff at or near the head of the river, if unmolested, will increase the volumeof water in the river at the intake of plaintiff's canal to the amount of the quantity of water turned in at the reservoir?

A Yes sir.

Q What is your determination in thatregard, that it increases it to the amount turned in or not?

A It would increase it to the amount turned in and probably a small increment of addition by the reduction of the evaporation element on the stream because of the hastening of flow due to the presence of the additional supply contributed by the storage water,

MR. A. C. HATCH: I will say, if the court please, On Saturday I stated that Mr. Tanner would not be here and probably by reason of that the parties are not prepared with the cross examination and we will not object to them cross examining him at a later time.

THE COURT: They may have the privilege of cross examining later if they desire to, but any attorneys who have cross examination now may do so.

CROSS EXAMINATION by Mr. Willis:

Q You say that there would be no loss on the water turned in from the Provo reservoirs in their transmission from the place of their being turned into Provo River down to the head of the defendant's canal; is that what I understood you?

A Yes.

Q How do you account for that, there is always a loss, isn't there, from evaporation and seepage along a stream, isn't there?

A No.

Q Do you maintain then that in no case waters flowing say -- what is the distance from where the Provo Reservoir water is turned into the Provo River to the head of the first canal?

MR. A. C. HATCH: First canal of the Provo Reservoir Company?

MR. WILLIS: No, I mean of the defendant's, I am speaking of the defendant's -- approximately, Mr. Tanner?

A I should say about twelve miles.

Q Now, you mean to be understood to say then that any water that the Provo Reservoir turned into the Provo River would not lose from evaporation between that point of commingling with the river and the first canal, twelve miles below?

A Yes, the stream would lose by evaporation.

Q And wouldn't it also lose by seepage?

A No.

Q You maintain then that all the seepage -- there would be seepage of water, wouldn't there, in that distance?

A I didn't find any.

Q In the Provo River?

A I didn't find any and I examined it, measured it carefully.

Q Then it would be impossible, wouldn't it, Mr. Tanner, to convey water in any channel unless it was at least cemented that distance without there being some seepage -- there might be an increase in the whole flow at different points by reason of springs or other means of augmentation but at the same time there would be a seepage, wouldn't there?

A No, the whole problem between the lakes and the first diversion channel with a flow of forty second feet in the natural stream and twenty additional second feet from the tributaries entering the natural channel between the reservoirs and the plaintiff's or defendants' first canal, if there were present a quantity at the said defendants' canal of sixty second feet or more, the channel could not be a channel wasting or precolation losses

taken as a unit.

With a hundred feet entering at the upper end of the section, sixty feet being contributed by storage water, the evaporation element would not be materially increased, therefore there would be an actual saving by the presence of additional water and actual saving in evaporation because the stream does not increase in area or superficial dimension by reason of the additional sixty feet of flow.

Q There would be then some evaporation, although you contend that it is not proportionate to what the evaporation would be if it were not augmented by the additional sixty feet, is that a fact?

A Be some of the actual mollecules of storage water that would go up into the atmosphere as vapor, but the presence of the storage water would relatively decrease the evaporation; its presence would be an actual benefit to the stream.

Q What is the nature of the bed of the Provo River from where the provo Reservoir turns its water into the Provo River to the head of the first canal, twelve miles below, generally speaking?

A About half the distance it is practically on solid rock, the upper half, and lower half it is in a narrow channel with boulder, gravelly bottom.

Q Now, how did you measure the wattr in the measurements that you made about which you testified here last Friday?

A Made the measurements with a small Price current meter, using sections of the natural stream bed.

Q There were no weirs or anything of that kind?

A No.

Q And in your masurements then, of course, you only measured a small portion of the stream and computed from that the balance of the stream, didn't you?

A A current meter is about five inches -- four inches and a half, something like that in diameter, and the velocity determinations were taken a foot apart so that the filaments in half of the

section were determined.

Q It might not be an absolute measurement, it would have to depend to some extent upon computations and estimations as to the balance of the flow of the water other than that you actually measured, wouldn't it?

A The meter is tated at bureau standards within a certain percentage of accuracy and that percentage I could not name off hand. Of course, within the limits of these calibrations of the instrument, it was true. The actual observations of depth were made by a staff, and even on a bed of the stream with the boulders and irregularities on the bed improved as much as practicable by reconstruction there would be inaccuracies of determination. The section in places or sections in places where the stream moved with considerable velocity the determinations were not absolutely exact. The current of the water rising on the staff makes an estimation of quantities by matter of judgment within certain limits, but I should say these measurements made with the meter were within two per cent.

Q Give us the increase of water as you found it between Station A and B, will you please?

A 2.44.

MR. RAY: Is there a Station A and B, or is it 1 and 2?

A Section A.

MR. RAY: But it is Station 1 and 2, isn't it?

A Yes.

Q As I understood it, Station No. 1, draws its name from the territory between station A and B?

A Just the opposite; stations are by numbers and sections are by letters.

Q Give us the increase which is 2.44 at Station A?

A Section A, increase 2.44 second feet.

Q Now then how near to accuracy would you say that increase is? under your method of determination?

A About two per cent.

Q Do you mean to say then you could measure within two per cent of the flow of the water and increase of water by the method that you employed in a stream such as that?

A Yes.

Q And conditions existing as they existed in your measurements in Provo River?

A Yes.

Q And you would say the same thing with relation to the increases that you found all down the river as you have testified to just now, would you -- that you could determine it within two per cent?

A Measurements, yes.

CROSS EXAMINATION by Mr. Ray:

Q You testified, Mr. Tanner, that Provo River is an accumulating channel, did you not?

A Yes.

Q Accumulating is the word I am inquiring about as distinguished from a losing channel. You mean by that, do you not, that with in the sections taken by you there was more water at the lower end of a section than was measured into the section at its upper end?

A Measured into the section at the upper end and contributed to the section by superficial inflow between the upper and lower ends.

Q Might there not also be a subterranean inflow into the river?

A There doubtless was.

Q And that you were not able to measure?

A No.

Q Now, what time of day did you measure the superficial inflow?

A Sometimes, at all times of the day.

Q Did you measure any particular superficial inflow the same superficial inflow at all times of the day?

A No, but gauges were maintained to cover the fluctuation during the whole period the section was under observation.

Q There are great variations in the amount of flow in the small streams and springs in the tributaries of Provo River?

A In some instances there is doubtless condiderable variation in period of the year.

Q And of a day?

A And probably in periods of days. Just how great those fluctuations are I am unable to say but in the upper section above the Heber Valley proper the contributing inflows were constant. The periodic changes in the contributing inflows were more observable in the Heber Valley section.

Q You don't mean absolutely constant even in the upper section, do you?

A The fluctuations, such as I observed in the inflow when there was no atmospheric disturbances were constant. For instance, Little South Fork was observed for -- the South Fork stream was observed for two or three says, the gauge was maintained for that interval of time and there was no appreciable fluctuation.

Q That is one of the largest tributaries, is it not?

A About twenty second feet.

Q But when you get down to the very small tributaries where you have thirteen, I think, between stations 1 and 2, contributing a very small amount of water, there is a great fluctuation in those is there not?

A No, I would say not.

Q Some fluctuation?

A When there is some atmospheric disturbances to cause it; there might be after a heavy rain storm fluctuation of considerable character that would disturb the regularity of the flow.

Q Now, Mr. Tanner, whatever variance there was in that, in the upper sections, did you determine it with accuracy?

A Yes.

Q But you did not determine the sub-surface inflow?

A No.

Q Without determining the sub-surface and unmeasured inflow, how are you able to determine that there was not more water flowing into a section at its upper head plus the surface inflow, plus the sub-surface inflow than was flowing out below?

A The answer which I made to that proposition is confined to the superficial water, the water flowing upon the surface; I don't know about the sub-surface or subterranean conditions except that the fill is comparatively meager until you get down nearly to Woodland, channel being excavated in rock formation, partly filled by debris of undertermined thickness. What was transpiring in that section below the surface stream and down to the bed rock I have no information to cover it.

Q Either as to the inflow or outflow?

A No, except that very material happenings with reference to increase and decrease could not very well take place down there without making an impression upon the surface stream.

Q But if there were coincidents, material happenings, both as to inflow and to outflow, your determination would not take note of that, would it?

A No.

Q Now, are you familiar with the formation around the Trial Washington and Wall Lakes.

A Generally, yes.

Q How does it compare with the strata through which the river runs during its first twelve miles?

A The formation in that upper section mostly sand stones. When you get down there are somewhat tighter formations after the stream passes over the falls.

Q How far down is that?

A I should say probably three miles.

Q The formation is at least similar for the first three miles?

A Yes, I should think so.

Q You heard the testimony of Mr. Wentz, in the lakes there was a constant seepage and drainage towards the Weber River shed, did you? A. Yes.

Q What is your opinion whether there is such drainage from the lakes?

A I think probably that there is such a drainage as described by Mr. Wentz?

Q Why then is there not a similar drainage along the bed of the river where the surface of the water is constantly exposed to a similar formation?

A There doubtless would be to the extent of that contact.

Q So that while Provo River during that section is a channel of accumulation, it is also a channel of loss?

A I call your attention again that the first station is just below the falls and not covering this tract.

Q Yes, but the water from the Provo reservoir passes this tract, does it not?

A Yes.

Q But I want all the section favorable and unfavorable there, I want to call your attention to the river as it is, not as you have sectioned it; it is a channel of loss as well as gain along that section, is it not?

A The loss--

Q Will you answer the question yes or no, and then you can explain if you can, answer it yes or no.

A The loss in that section doubtless to the extent of its contact with the same formation that has such contact, where it has such contact.

Q It has such contact, hasn't it?

A I think it does, I am not so very familiar with that section. I have been there but not so familiar as I am --

Q Then, if you are not familiar with it, you don't know whether it is a section of loss or whether some of these unusual conditions --

A No, I don't know.

Q That is what I wanted to get at. Now, as you go down the channel Mr. Tanner, you say there is some wash observed occasionally and if I may make a crude cross section here, I may better illustrate my idea. Take this as a cross section of the river and take this line as the lower surface of the water, and assume that the small circles represent in exaggerated form a river wash which has boulders of varying sizes, do you find any material amount of soil in the section marked "river wash"?

A Yes, there is fine material distributed between the coarser material.

Q What is the form of that material, soil, I ask if there was any soil?

A Right in the bed itself the filling would be mainly sandy material.

Q Which would lie here largely, would it not, if it were in the part, it would be washed away by the current, wouldn't it?

A Oh no, the boulders themselves are set in it.

Q Not clear to the top, are they?

A Right to the top.

Q Is there area impervious to water then?

A I will say more or less. No, I don,t think it is impervious to water by any means.

Q Aren,t there many sections along there where the current has left practically a wash of rock?

A Yes.

Q Now, along those places there is a sub-current of water constantly

moving down, isn't there?

A I should think there would be.

Q And is that sub-current a measurable flow?

A I presume it would be if you had the time and instruments to make it.

Q It would be a flow very difficult xx of measurement, at least, would it not?

A No, I don't think so.

Q Tell me how you would get x the rate of flow through that medium?

A Ordinarily in making a measurement of sub-flow in a stream channel a series of holes are drilled in an upper section across the river channel; a second series of holes are drilled at a small distance below the first series; a chemical, ordinily ammonia and chloride is added to the water in the upper set of holes and then by means of an electrical, sensative electrical mechanism, its presence at the lower set of holes is determined, when it reaches the lower set of holes; the ammonia-chloride being carried from the upper set to the lower set by the water.

Q That experiment you have not performed in this case, that determination, you have not made? A. No.

Q Have you made an investigation of the geological formation through which the river flows at all points below the first station?

A Yes.

Q Are you able to say there are no faults and no underground channels which carry the water to a drainage area otherwise than through the channel of the Provo River?

A There may be faults in that country and channels of escape, but I observed none.

Q Now, you are familiar with Provo lake, are you not -- Utah Lake?

A Yes.

Q There have been measurements made of all the surface inflow to

Utah Lake, have there not? A. Yes.

Q And data preserved upon it? A. Yes.

Q Has it not been determined that the sub-surface inflow to Utah Lake is greater than the surface inflow?

A No.

Q What is the relative proportion of the surface and sub-surface inflow into Utah Lake?

A I don't recall what it is, but I am satisfied the sub-surface inflow is not as great as the surface inflow.

Q Do you know how they compare?

MR. A. C. HATCH: If the court please, we object to this question as not being cross examination of this witness.

MR. RAY: So counsel may know what I am trying to get at, there is an immense amount of water comes into Utah Lake. The witness knows what I want to find out. I want to find where it comes from in this drainage area, if it is not from the surrounding underground percolation from the water shed.

THE COURT: Objection overruled.

MR. A. C. HATCH: Note an exception.

A I don't recall it now, but I think my remembrance is and it is pretty definite, that the superficial inflow is some but the subterranean flow is very large.

Q And do you know the source of the subterranean inflow?

A Oh, in some instances it comes in by great springs.

Q Over towards Saratoga?

A Yes, and other places.

Q But do those springs account for all the subterranean inflow?

A I don't think so.

Q But what is the source of the water supply to those springs?

A In the surrounding country that lie at a higher elevation, I should say.

Q It finds its way from the water shed to the lower strata and

then comes up in the base of the lake, bottom of the lake?

A That is my judgment.

Q Does the water shed east of the range here contribute somewhat to that, in your opinion?

A I think so.

Q So that there is some faults and subterranean channels which convey water directly to Utah lake subterranean?

A There may be.

Q And does your determination give you an opinion whether or not any of those may draw water in any quantity from Provo River from the reservoirs of the plaintiff to the intake of theis canal?

A So far as the faults are concerned, I don't think any faults contribute, because all the faults I know about are north and south faults.

Q What about the stratification then, some seepage through the strata which would dip to a point below and away from the Provo river?

A Where the stratification leads from the adjacent country towards the lake, I should think -- and it was open I should think a considerable supply would move along these planes down to the lake.

Q Now, Mr. Tanner, a stream -- I will withdraw that -- does a stream moving down a channel where the water is constantly agitated, evaporate more than a stream moving with a smooth and undisturbed surface?

A My judgment is it does, although I know of no experiment covering that matter.

Q That is a matter commonly accepted by men of your profession that is does evaporate more? A. Yes.

Q Have you ever made a determination to say how much more?

A Not on a running stream, but made some observations on a disturbed, static body of water which is under a strong wind, somewhat comparable.

Q What is the evaporation on Provo Lake per annum, the surface of Utah Lake?

A About sixty inches.

Q Five feet? A. Yes sir.

Q Assume for the purpose of this question that the agitation of the water does contribute to the evaporation, does the speed of the stream contribute to the agitation?

A Yes, it disturbs the stream more as it increases in size.

Q Have you ever made any experiment to determine how much the speed of the stream affects the agitation?

A No, not by measuring the relative evaporation of each.

Q Have you ever determined how much the addition of the amount of water contributed to Provo River by the Provo Reservoir Company increases the speed of the stream?

A Yes.

Q How much?

A It increases it at different stages, different amounts.

Q Yes, depending upon the amount already in the stream?

A Yes.

Q So that in order to get an accurate determination you would have to have the element of agitation of the water in it, wouldn't you, as to evaporation?

A To be absblute, yes.

Q Are you able to say, leaving out the surface inflow, eliminating it, and eliminating the sub-surface inflow, if you turned a hundred second feet of water from Wall Lake intothe Provo River channel how much water would arrive at the gate of the Provo Reservoir canal in Provo Canyon, it it were not commingled with any water at any time?

MR. A. C. HATCH: If the court please, we object to that as not being cross examination and there is no such condition as suggested by the question as can ever enter into this case.

THE COURT: Objection is overruled.

MR. A. C. HATCH: Note an exception.

A All I have in a matter of a question of that kind is simply a judgment. My judgment is that about ninety-seven or ninety-seven an a half second feet would reach the heading of the Provo reservoir canal if it flowed down a channel such as the channel of Provo River assuming that channel in its resent physical state and there being no contributions to it either superficial or subterranean and no losses from it, either superficial or subterranean.

Q That is, taking into consideration, then, solely the element of evaporation, is it not? A. Yes.

Q And you have no judgment what loss there would be through the channel itself, ~~xx~~ have you, Mr. Tanner?

A I cannot understand just what that question means, is it hitched on to the other?

Q No, it is seggregated from the other. We have gotten the evaporation loss; now, have you any judgment as to what loss there would be in that hundred second feet of water through a channel where the water came in contact with it?

A Assuming the conditions of channel with the subterranean water conditions as they are now, I don't think there would be any loss.

Q Wouldn't be any loss? A. No.

Q What about your answer then there might be some loss at the upper section where it came in contact with the stand stone strata such as were found in the Wall Lake?

A There might be a loss up there, I cannot say definitely.

Q Then, there would be some channel loss if there were strata to which that surface was exposed at the upper end which carried it to the Weber river shed?

A If these strata planes were open and dipped in that direction, surface stream came in contact with them.

Q What is the condition of them, are they open?

A I don,t know.

Q Are they open in Wall Lake?

A I don,t know. All that I know about that matter is that the dip of the strata are from Provo area off in that direction.

Q Now, eliminate that section where you say there might be some loss, are there any other sections in which there might also be some loss?

A No, I don't think so.

Q What about sections C and D?

A Sections C and D are given in the resume under the extreme unfavorable interpretation of the data.

Q Yes, and you find them to be losing sections, do you not?

A Under that assumption. Now, that assumption was based upon connecting certain observations of inflow in the upper section with certain subsequent observations of outflow from the lower sections and in the test the relationship of those observations are made. In the first section to which you made reference the observation at the upper section was made in the morning, the observation at the lower section was made in the evening. The river was a falling river, and taking the inflow in the morning at the upper section and correlating that with the observation at the lower section in the evening was giving too much value to the inflow, but even under that experiment and interpretation and I deemed it advisible to add it to the data, there occurred a loss; but under conditions where the observations were carefully correlated and the time limit reasonable between the two sections there was a distinct gain.

Q Which did you report then in your resume, as losing or gaining sections?

A Both.

Q As losing and gaining sections, so that there were times you

reported in your resume of your report they were losing sections--did that report mean what it said?

A The resume simply gives the quantitative facts under certain interpretations of the data. The data are all that I observed whether they were the most consistent set or the less consistant set, and the extremes of the data are contained in the resume. Now, the resume don't contain all the deductions. They are in the test, but they contain the extremes of the observations.

Q But you offered to the court a resume showing at times section C and D were losing sections, did you not?

A Under certain interpretations which are specifically set out in the data.

Q You certainly considered those interpretations were fair and logical, did you not?

A The text itself goes into that matter on page 7, in which is given the first loss observation. This note is appended. The inflow assumed above is probably excessive. The stream at Station No. 3 from six P. M. on the 12th to nine A. M. on the 13th, had fallen a hundredth of a foot. Weather conditions remain stationary until the evening of the 13th, so that the river stage assumed being the sum of the nine thirty A. M. observation estimation of the stream at Station 3, and three thirty P. M. observation of the North Fork were doubtless higher than it should be.

Q How much higher?

A I don't know.

Q Has thatreport then any value to the court, that portion of it if you don't know the element of drop in the river?

A I do know the extreme element of drop.

Q Do you know the element of drop between your 9:30 measurement and your next measurement?

A The text would give that.

Q Then if you know that drop, where is the element of uncertainty

in the conclusion? If you knew the drop why is the amount assumed at 9:30 probably an excessive amount?

A This stream in the section under discussion was observed at the upper section in the evening. I returned to the same station again in the morning. The gauge had fallen a hundredth of a foot in the interval. I proceeded down the stream to the lower station, taking in the meantime the gauge at the North Fork, setting a gauge peg at the lower station in the afternoon of that day. The fact that the stream was a falling stream is predicted upon the recision that took place from the evening observation to the morning observation just given, and of course is an assumption. The fact that it continued to fall at the upper station, but since it fell also at the lower station, it was assumed that the fall was a continuing fall at the upper station. The total, however, of departure, is relatively small, the recision of the stream not being a very considerable amount.

Q One hundredth of an inch?

A Of a foot.

Q Was it not? A. Yes, sir.

Q And you had that data before you as to its recision of one-hundredth of a foot?

A Between the evening and the morning, yes.

Q How does the Provo Reservoir Company get its water past the dams in Wasatch County, its reservoired water?

A I cannot answer that matter, I don't know.

CROSS EXAMINATION by Mr. Mcdonald.

Q Mr. Tanner, wouldn't it the true and practical way to determine the amount of loss from your reservoires be to determine the quantity of water which you put in the natural flow and then determine -- giving it time to reach the Wasatch dam -- then determine the difference at the weir of the Wasatch dam, between the

normal flow and the amount that you put in?

A That is all right as a theory, but as a practical matter it would not be as dependable and exact as the methods that I used It is not material whether the contribution comes into a section that is under observation from a storage reservoir or from rainfall in the upper river. While the section B -- while Section C, was under determination the stream ran from forty to eighty second feet. That additional forty second feet was just as satisfying in the determination of the matter of loss, whether ir came from a rain storm as it did, or if it should have come from a storage reservoir. Further, the use of water along the river in the time when the storage reservoir water is running, is in condition of maximum usem diversions are constantly being made from the stream and the probability of interruptions on any set of observations are so great, a small interruption serving to vitiate a set of observations extending over days, that as a practical engineer, I am satisfied, confident, that the determinations that were made in September and October are far more definite in the settlement of this question of loss than any attempted determinations that might have been entered upon in the season of maximum use of river water. That the thing is practical as a theoretical matter and might have been dtx determined that way, I don't deny, if the regulations could have been made perfect.

Q Could not the regulations be made and especially so in the year 1915 when we were some eighty-seven days without any rain during that whole of the irrigating period, practically in Wasatch county?

A I don't think the regulation could have been made without having the stream pt policed most carefully.

Q Isn,t it a matter of fact if you turn in say forty second feet from your reservoir and giving it sufficient time to reach the Wasatch dam and assuming that no person is diverting any of your

water from the channel, wouldn't the best means and truest and practical means of determining that, eliminating the rain question you speak of, be the measure at the weir of the Wasatch dam of the defendants"?

A Why, you have got a great big assumption right in the middle of that.

Q What is the assumption?

A Nobody is going to touch that river.

Q I say, take any of your water from the river at any point above the Wasatch dam?

A There isn't any difference in storage water and natural flow. You cannot separate one mollecule from another when it is commingled.

Q I don,t mean to get technical, Mr. Tanner, but there is a given quantity of water put in at your reservoir pond and then assuming nobody touches any of that quantity between that point and the Wasatch dam, wouldn't the practical and best way to determine it be by measuring the difference between the normal flow and the quantity passing over the dam?

A Only fault of that is your assumption.

Q What is that somebody might take some above?

A No question about the might; they do take it. There are numerous diversions and they can make no difference between one volume of water and another volume of water as long as it is water.

Q Assuming they don't take any of your water from the natural channel, would it not be the fair and practical way to determine the question to measure it at the weir of the Wasatch dam?

A I think I have answered the question fair as I can, and as far as I can. When you speak of a fair and proper way and have the assumption in the middle that cannot possible be reached, in my judgment, under the conditions that you assume, I don't see how I can give an answer that would be fair and proper, but I can say this now: if the river be policed from the storage

reservoir to the Wasatch dam and the diversions from it are not suffered to interfere or the contributions thereto to be fluctuated, a determination such as you suggest might be made, but the section is a very long one.

Q You say it might be made?

A The probability of interference by weather conditions in the time of the transit are so material that I don't think it as good a settlement as entering upon the stream in smaller units that you can supervise and regulate with more certainty.

Q That is your judgment in the matter? A. Yes.

Q You have given us your judgment only?

A Oh, it is not -- I know, any practical man knows that it is pretty difficult to regulate a long stream like that for the purpose of finding something in transit in it. It is simply a matter of practical appreciation of the physical difficulties.

Q Now, suppose that there are sixty feet of the norxmal flow of the river and that twenty feet of that is taken our between the reservoirs and the Wasatch dam by users of water -- I am speaking now of the normal flow -- and no more than twenty feet is taken out, it is running out through the weir properly gauged and measured, you go and turn your water in and there is still twenty feet and no more being taken out between those two points; then would you say that it would not be the practical and best way to measure at the weir of the Wasatch dam?

A Well, if you will get one more assumption and say, assuming that every contributing element along that stream was measured in its inflow into the river so as to exactly know what its contribution was during the interval, then I could say what you have said was satisfactory.

MR. RAY: That would include, Mr. Tanner, would it not, both the sub-surface and subterranean inflow?

A I think that is true, yes.

Q Is there a great difference in those conditions? I am speaking of

the normal flow of the river; does it fluctuate during its normal condition to any great extent?

A Oh yes.

Q To what extent?

A When you get into the Heber Valley you get some distinct fluctuations. I don't know what the causes of them are, and I cannot tell the reason why, but they are periodic, must have some sort of connection with that big contributing area that comes from the Midway section.

Q Anything that comes from the Midway section would not affect the Provo River in any sense, would it, so far as irrigators of the valley above the Wasatch dam are concerned?

A Well, I was answering the question I thought it had bearing upon -- no, it would not, I made a wrong assumption there, it would not.

Q How much, if you can give us an idea, Mr. Tanner, does the river vary or fluctuate, say in the course of twenty days during its normal flow?

A In the upper section?

Q From the Wasatch dam up?

A Speaking of quantities of second feet, I should think that within the limit of twenty days there might be an extreme variation there amounting to from three to six hundred second feet.

Q What would be the cause of that?

A When the snow fall ran out.

Q I am speaking during normal flow of the river?

A That is part of the normal flow, in its regular regimen, it is high water and --

Q I limit it to the low water season we usually refer to that as the normal flow of the river?

A I observed a hundred per cent myself in September.

Q What was the cause?

A Doubtless rain in the upper river; I don't know definitely, but I

presume it was.

Q Outside of any rain have you made any observation?

A As to what its fluctuation would be?

Q Yes.

A No, I couldn't say that I have connected any fluctuation with anything else except rainfall in the upper river.

JOHN C. WHEELON, called by the plaintiff, being duly sworn, testifies as follows:

DIRECT EXAMINATION by Mr. A. J. Evans.

Q Where do you reside?

A At Garland, Utah.

Q What is your business?

A Civil, hydraulic and agricultural engineer.

Q How long have you been engaged in that business?

A Twenty-two years.

Q Have you been employed by any company during that time?

A Yes sir, several.

Q Will you name them? and the length of time of each?

A Grand Valley Canal Company in Colorado, four years; Bear River Water Company of Utah for a year and a half, for the Bear River Water Company, one year.

MR. RAY: That is the one you gave the year and a half, I understood?

A No, there is another company. There is the Bear River & Ogden Water Works Company two years and the Bear River Water Company one and a half years, and the Utah-Idaho Sugar Company for the balance of that period, about fifteen years, I believe.

Q The balance of the twenty-two years?

A Yes.

Q What would that be, so as to get it specific?

A I may not be exact in those figures, but it is approximately fifteen years.

Q About nineteen years?

A Yes sir.

Q Have you been with the Price River Irrigation Company?

A Yes sir, as consulting engineer.

Q Now, what did your work consist of the first company you were with?

A Grand Valley Canal Company?

Q Yes sir.

A In canal construction and maintenance at that time.

Q And with the Bear River Valley Company?

A Construction and maintenance and operation.

Q And of what does it consist and has consisted with the Utah Sugar Company, Utah-Idaho Sugar Company?

A Consisted of construction, maintenance, operation of canals, power plant, power line and reclamation of lands and farming of lands.

Q And irrigating lands?

A Irrigating lands.

Q Has that part of the business come under your personal supervision? A. Yes sir.

Q Have you done any farming on your own account?

A Yes.

Q Have you made any demonstrations as to the quantity of water necessary to produce the best results in the raising of crops? A. Yes.

Q What was the answer? A. Yes.

Q And average crops that are usually raised by farmers throughout the country? A. Yes

Q And you acquainted with the lands under the provo City lots to any extent?

A. I have visited them and examined them.

Q You have made some examinations? A. Yes.

Q How many?

A The Provo City acreages five examinations.

Q I hand you plaintiff's Exhibit 49, and ask you to examine it.

MR. JACOB EVANS: What is that?

MR. A. J. EVANS: It is just a plat showing the country where Mr. Wheelon visited and made his examinations. I wanted to put it up so that he could more accurately locate and attorneys could all see where these examinations were made.

Q You didn't make this map yourself?

A No sir.

Q You put these figures in yellow and numbers on the map yourself didn't you?

A Yes.

MR. A. J. EVANS: We ask permission that it may be tacked up and if we shall find it important, to introduce it in evidence we will have to have it verified by the man who made it.

MR. RAY: If you will tell us, as far as I am concerned what itshistory is, unless someone objects on the ground of its accuracy, I cannot object on the ground it is a copy or has not been identified.

MR. A. J. EVANS: Mr. jacobs made it but he is not here, and we are only putting it on the board now for the purpose of showing the location of the various tracts of land.

MR. THOMAS: Under the various systems now under discussion in this suit?

MR. A. J. EVANS: Yes, they are all marked on there and the locations particularly where Mr. Wheelon made his examinations.

MR, THOMAS: Let me ask, Mr. Jacobs made that map from some county plat or map?

MR. A. J. EVANS: I am not sure where he took it from, he took it from some map, I don't know whether a county map or not. He would verify its accuracy if it becomes necessary for us to do that.

Q The map shows in yellow circles and in figures, they go by numbers. I will ask you, Mr. Wheelon, how many examinations you made?

A Twenty-five.

Q Will you tell the court now what you found in No. 1, that is, in the city lot proper?

A Can you see the numbers from there?

Q You can point them out. Point out the location now of No. 1, beginning with No. 1.

A That is about half a block north of the University on the west side of Academy Avenue in a lot.

Q So as the record will be made clear you are now pointing at the number on plaintiff's Exhibit 49, what did you find in your examination as to the quality of soil, depth and character and so on?

A The soil is sandy loam for two feet and six inches in depth filled by a close gravel, the gravel closely imbedded in sand. 3.8 feet. Have the water plane 6 feet and 2 inches below the surface.

MR. RAY: Your honor please, may we have the date of this, because the date of the water plane may be very material.

Q We will ask you at this point when you made that examination?

A On June 10th.

Q Of this year? A. Yes sir.

Q 1916? A. Yes.

Q And were all the examinations made on the same day?

A Yes.

Q And how was that examination made?

A This was made in a pit made by a shovel.

Q What do you say as to the capilarity of that pit or soil?

A Capilarity of that sort of soil might be considered ax as medium, it is not the best nor the poorest.

Q What, in your opinion would be a proper quantity of water to apply to that kind of soil and suffisin conditions as obtained there from your examination to produce the best result in the raising of crops, if you know?

A The amount of water divided into two divisions, first, the amount of water that the soil can hold and retain until crops are able to transfer it to the air through the stem and leaves, and second the amount of water that is necessary to supplement that to the extent of the losses that are unavoidable in the practice of irrigation such as water that percolates below the use of the crop, below the line of capilarity attraction. The first should be considered as crop requirement which I place at 20 inches, 20 acre inches for permissible service to give the ground water that will aford the crop this 20 inches of moisture should be about three acre feet per season.

Q That includes the 20 inches, does it?

A Yes sir, that gives about ten inches for unavoidable waste in the sub-soil.

Q Now, referring to No. 2, will you just point that out on the map?

A No. 2 is right there.

Q Can you locate it?

A That is on 5th East between 4th and 5th North on the east side of the street at M. S. Goodmanson's.

Q You say that was located on the property of M. S. Goodmanson?

A Yes sir.

Q What was the character of that soil?

A This soil is a clay loam, four feet and four inches with a sub-soil of fine sand. No water plane was visible.

Q By what method --

A This observation was made in a post hole dug by a shovel, about the size of an ordinary fence post hole.

Q What would be the crop requirements upon that class of land?

A The capilarity of this soil is good.

Q In acre feet if you would just --.

A And the permissible service to that sort of land would be 2.5 feet in my judgment, allowing the same amount for crop requirement. Crop requirements are the same in every case of agricultural growing of crops.

Q You mean by that that it would require 2.5 acre feet per acre per annum?

A Yes, that is besides the natural precipitation, that is applied water.

Q Now, will you point out No. 3 on the map?

A No. 3 is in the vicinity of No. 2 right there, thatis on 4th East and 1st North Street, on the west side of the street in a lot belonging to E. E. Corfman.

Q What is the quality of soil there?

A This soil is a sandy loam, three feet and four inches in depth with a clay gravelly subsoil of close gravel. I mean a gravel that is very closely and tightly inlaid in sand. This ~~is~~ was an auger hole where this observation was made and there was no water table observable.

Q What do you say as to the capila-rity?

A The capilatity of that soil is medium.

Q And the --

A With a permissible service of three acre feet, including 20 inches as crop requirements.

Q Point out No. 4 on the map?

A No. 4 is on the corner of 4th East and 4th South. This examination was made in the street, in an auger hole in the street.

Q And the class of soil?

A This soil is a clay loam 4 feet. No sub-soil or water plane observed.

Q You might give us the capilarity in each case?

A Capillarity of this soil is good, and you have a permissible service of 2.5 acre feet per season.

Q The next as compiled here as No. 10, point that out on the map, also give the location?

A No. 10 is located on 5th North and 7th West in the street, auger hole. This soil is sand clay loam 22 inches in depth, no sub-soil or waterplane observed. The capillarity of this soil is also good with permissible service of 2.5 acre feet per season.

Q The next we have is No. 22, purporting to be under the Timpanogos Canal. Will you point that out?

A 22, located on Mr. William M Roylance's orchard. This examination was made in an argue hole. The soil is a clay loam three feet in depth. No sub-soil or water plane observed. the Capillarity of this soil is good, with a permissible serve service of 2.5 acre feet during the season.

Q No. 20 Smith and Carter Ditch, point that out?

A No. 20, that is near William Carter's plance. This examination was made in a road, cut on the Edgwood road to Provo Bench. This soil is a sandy gravel loam 20 inches. Sub-soil cement gravel. No water plane was observed here. Capillarity of this soil is very poor and permissible service for this class of land should be three feet per acre.

Q In each of these cases you mean per annum?

A per season, yes sir.

Q No. 11 on Provo Bench, point that out as formerly.

A No. 11, located in that portion of the Bench.

MR JACOB EVANS: Do you know what canal it is under?

A That is Provo Bench Canal, I think they call it.

MR. RAY: Can you locate it as to section?

A Yes, I think I can. It is near the center of Section 26. The township and range is not marked on this map.

MR. RAY: 6 South 2 East.

MR. COLEMAN: Whose place.

A It is in a field owned by the Provo Brick Company, it is an excavation where they are getting out soil for brick. Excavation six feet deep. This soil is a clay loam four feet with a sub soil of sand and gravel, two feet. No water plane was observed here. The capillarity of this soil is good, with a permissible service of 2.5 acre feet per year or per season.

Q No. 12.

A No. 12 is in the southeast corner of Section 23.

Q Under what canal, Provo Bench?

A Provo Bench. This examination was made in a field excavation belonging to Mr. Irwin Jones, soil here is a sandy clay loam two feet in depth, sub-soil sand and gravel, two feet four inches. No water plane was observed here. Some cement gravel in places. Capillarity of this soil is poor. It should have a permissible service of three acre feet.

Q Take No. 13.

A No. 13 is very close to the other locations, northeast corner of Section 26.

Q You mean 13 is very close to 12? A. Yes sir.

Q What is under the Provo Bench Canal?

A Yes sir, under the Provo Bench. It is on Joe Richmond's farm. This is a post hole, soil here is a sand clay loam, four feet No sub-soil or water plane observed. The capillarity here is good, requiring a permissible serve of 2.5 acre feet per year.

Q Take No. 14?

A No. 14 is also under the provo Bench. No. 14 is in Section 14, along near the west line of Section 14, in the northwest corner of section 14, Provo Bench, John D. Dixon's orchard. Examination was made in a post hole. Soil is sandy loam with

some coarse gravel inliad three feet in depth, no sub-soil nor water plane observed here. The capillarity of this soil is medium, requiring a permissible service of 2.5 acre feet.

Q Under Provo Bench System No. 15?

A No. 15 is on the line between 9 and 10.

Q Between 9 and 10 what?

A Sections 9 and 10.

Q Same township?

A This is about half a mile west of Orem Station on Wayne Draper's farm. The soil here is a sandy loam, 4 feet in depth, no sub-soil nor water plane was observed. The capillarity of this soil is good with a permissible service of 2.5 acre feet.

Q Take No. 16 on the Provo Bench?

A No. 16 is right there at the top. That is in Section -- Section is not marked there; it is pretty close to the top of the map. That is an excavation on the Linden Ward meeting house. This soil --

Q First or Second Ward?

A Second Ward meeting house.

Q That is on the Bench.

A Under the Provo Bench. The soil here is a clay loam two feet in depth, sub-soil sand and gravel two feet very ~~poure~~ poorest gravel three feet. No water plane observed. Capillarity here is very poor, should have permissible service of 3.5 acre feet.

Q Now, under the Upper East Union, No. 23?

A No. 23 is on Section 31. This is in Carl Peterson's field. Examination was xx made in an auger hole. The soil here is a sandy loam three feet. No sub-soil or water plane was observed. Capillarity of this soil is good with a permissible service of 2.5 acre feet.

Q Upper East Union again, No. 24.

A No. 24 is on Section 6, near the north line of Section 6, on John Elaxon's place in an auger hole. This soil is a clay loam

three feet in depth, water plane at the bottom of the excavation three feet below the surface. No subsoil observed. The capillarity of this soil is good with a permissible service of 3.5 acre feet.

Q Under the Upper East Union, No. 26?

A No. 26 is on a line between Section 7 and Section 8, on James Bates' place, this observation was made in a cut in the ditch bank, the soil here is a clay gravel two feet of sub-soil of sand and gravel, capillarity here is little below medium. This should have permissible service of three acre feet per year.

Q Now, take Little Dry Creek No. 7.

A Right here on Section 3, this is on the north side of Center street in a field , Ralph Poulton's place , in an argus auger hole; soil here is a clay loam 3.8 feet in depth. The water plane here is 3.2 feet below the surface. No sub-soil was observed here, the capillarity of this soil is good. with a permissible service requirement of 2.5 acre feet.

Q Little Dry Creek again, No. 8?

A No. 8 is on Section 2, that is between 10 and 11 West Streets. Joe Smith's place. Observation was made in an argue hole, soil here is a sandy clay loam, four feet in depth, sub-soil sand and gravel, 20 inches, water plane is five feet and twe-tenths below the surface, the capillarity of this soil is good with a permissible service of 2.5 acre feet.

Q Still under Little Dry Creek, No. 9.

A. No. 9 is located there on the line between Sections 1 and 2. This is near 1st North Street. Thomas Jones place, the soil here is a sandy clay loam, four feet and four inches, no sub-soil nor water plane was observed. The capillarity of this soil is good with permissible service of 2.5 acre feet.

Q Next return to the First Ward Pasture, No. 5.

A No. 5 located on a line between 7 and 12. This observation was taken in an argus auger hole, a few rods south of the north

line of the pasture. Soil here is a clay loam, three feet and four inches. That is, far as we went length of the auger, we don't know how much farther. Water plane here is 18 inches below the surface. The capillarity of this soil is good, with a permissible water service required of 2.5 acre feet.

Q Next take the East River Bottom Water Company No. 21.

A No. 21 is on a line between Sections 19 and 24. This is in a pasture notth of Edgwood Park in an auger hole, soil here is a sandy loam 17 inches deep and to the water plane. This is river bottom land. No sub-soil observed. Capillarity here is good with a permissible service requirement of 2.5 acre feet.

Q That is near the Provo River, is it, north from here?

A Yes, on the Provo River Bottom.

Q Park & Nuttall Ditch, No. 19.

A No. 19 is on Section 13, this is on Provo River Bottoms about three-quarters of a mile from the mouth of Provo Canyon, this soil is a very coarse gravel and cobblestone; it is not very good forfarming. It is not worth the water that would be necessary to make farming profitable on it, in my judgment.

MR. RAY: I move that be stricken out upon the ground it is irrelevant and immaterial.

MR. A. J. EVANS: It may go out.

Q You made nodeterminations, Mr. Wheelon, on that tract, on that examination as to what would be a proper requirement in acre feet per season of water?

A No.

Q Take Fort Field No. 6.

A No. 6 is on Section 10, on the northwest quarter of Section 10. This is located on 6th Street, opposite Frank Carter's house in a field, observation was made in an auger hole, soil here is a clay loam three feet and four inches in depth, water plane is 22 inches below the surface, no subsoil observed here.

Capillarity of this soil is good, permissible service of 2.5 acre feet.

Q Provo Reservoir Company No. 17.

A No. 17 located between Sections 11 and 12. D. W. Crandall's place east of Col. Loose's farm and north of the Canyon road. This observation was made in a post hole. Soil here is clay gravel loam, three feet six inches in depth. No sub soil nor water plane observed here. Capillarity of this soil is medium, should have a permissible water service of three acre feet.

Q Provo Reservoir Company No. 18?

A No. 18 is on Section 12. This is on J. William Knight's place near the mouth of provo Canyon. Observation was made in a post hole, soil here is a sandy sand gravel loam three feet six inches. No sub-soil or water plane observed. Capillary of this soil is medium, should have a permissible water service of three acre feet per year.

Q Did you make any other observations, Mr. Wheelon, at this time?

A There is no more of those observations that I made.

Q I will ask you if you observed the general conditions surrounding where these observations were made as to its similarity, surface similarity, to where the observations were made?

A Yes.

Q And what did you find?

A Found from general appearance that the soil changes quite abruptly in short distances. Having no observation as to the depth of those different characteristics, I could not say any further.

Q Mr. Wheelon, based on your opinion as an expert and your own experience, I will ask you to state, assuming that a tract of land with an area of from two to three thousand acres, having an average depth of soil of two feet with a sub soil of gravel, what would be the best quantity of water to apply in acre feet to produce the result, the best result as to quantity of crops

raised upon said land?

MR. RAY: Now, I object to that on the ground that the witness has not been shown competent to express an opinion upon that either as to experience or any other qualification, and that the hypothesis does not relate to any land with any shown similarity to any such tract of land in this case or the crops to be raised. The rainfall, period of irrigation-- might be down in Africa, as far as that is concerned, where the rainfall is a hundred inches a year. The hypothesis is so incomplete the answer forthwith would become irrelevant and immatetial.

THE COURT: I think so, I am inclined to think you have necessary elemensts lacking in the question to make it applicable to any situation in this case.

Q I will add that area being situated on Provo Bench, the quantity of water in acre feet per acre to produce the crops common to this locality.

MR. RAY: Same objection, your honor.

THE COURT: Do you want to make an objection?

MR. THOMAS: I want to emphasize the objection, your honor please, made by --

THE COURT: You need not emphasize, the objection is overruled, but with this understanding that the evidence before you conclude will supply some of the lacking elements here. You have now located it so that it would be a material answer.

MR. A. J. EVANS: As to the quantity Mr. Wentz testified the entire bench was in that condition about two feet of soil.

MR. THOMAS: That is not the question here.

THE COURTL That was the question ts in my mind. What question did you have in addition to that?

MR. THOMAS: If the court please, I think the question

still weak in its hypothetical statement that it does not cover the conditions as they are here existing. It is evident he wants the witness to testify to a judgment of the duty of water under the land in this system. I think the question is still faulty that it does not set out with sufficient detail the character of the soil, the precipitation except in a general blank way.

THE COURT: I think it is sufficient in that respect. I didn't remember there had been any evidence there was a tract of this size that had uniform soil two feet in depth.

MR. A. J. EVANS: That was Mr. Wentz' testimony.

MR. RAY: Your honor please, with Mr. Thomas' permission, there is no evidence in the record of that character, and I assert it with considerable confidence because I have been interested in provo Bench, and Mr. Wentz said there was an average from one and a half to three feet and in some places so far as he knew ~~thersxw~~ the soil was much shallower than one and a half feet. I submit that is the record, and there is no definite soil survey and Mr. Wentz testified he had made none positively.

~~MHE~~ COURT: I will take your statement, Mr. Evans, there is such evidence in the record. If there is not of course your hyphothesis will not support it and it will be improper.

MR. A. J. EVANS: I will simply say this, Mr. Wentz was asked that question specifically and he said that while the soil varied, as my distinguished brother says, but it was an average about two feet covering that entire area. That is as I remember the record.

THE COURT: If that is the record, the objection is sustained, because that would not support your hyphthesis.

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12 Noon, Recess to 2:00 P. M.

CALEB TANNER recalled

CROSS EXAMINATION by Mr. Thomas.

Q Just two or three questions, Mr. Tanner, did you take into account the number of diversions between the respective stations in your measurement of the river?

A Yes.

Q Are you able to say what loss or gain occurred at each of the respective diversions? A. No.

Q Did you make any investigation to determine that?

A No, the determinations were made in sections.

Q Just as you have indicated?

A And are as I have reported.

Q Are you able to state any more accurately than you have or in your direct and cross examinations, the loss by seepage on any part of the Provo River?

A I don't think I could state it in any more detail than I have heretofore.

Q In your cross examination by Mr. Ray, if I understood you a right, you said there was a likely loss from seepage through the part of the upper channel of the Provo River before the main diversion occurred?

A There may be, I am somewhat uncertain as to that stretch lying between the lakes and Station No. 1. However, so far as this problem is concerned the seepage loss chargeable to the storage water would be limited and the additional new area of stream section that would be added by reason of the presence of the storage water, this cannot be large in that upper section in any place, because the stream is narrow and swift. I should say that in this section, on an average the stream would not be more than a couple or three feet wider than it would without the storage water.

Q As you go down the stream that loss through seepage must increase, musn't it, by reason of the added water increasing the

surface of the river?

A No. It is dependent measureably upon your formation and I think the upper part of the area is in sandstone, and the lower part of the area gets down into more compact and shallow lime form.

Q Your report in effect doesn't then tell us any more than the difference between the superficial inflow and outflow of the river, does it?

A That is about the substance of the matter.

CROSS EXAMINATION by Mr. J. E. Booth.

Q Mr. Tanner, just one question, I haven't heard it asked, and it will be very brief. There is a certain amount of evaporation that takes place during the courtse of the river down Provo River, is there not? A. Yes.

Q Now, would that evaporation be increased if there were more water put in in the ratio of the increase of the water?

A No.

Q Have you any idea why, or what the difference is, say suppose there were a hundred second feet in the river and it should be doubled, about what would -- there would be a certain evaporation on a hundred second feet, about how much would it increase on two hundred?

MR. RAY: I object to that upon the ground it appears from the evidence of the witness he has no foundation for a belief upon that, much less a judgment.

MR. JOHN E. BOOTH: I supposed the foundation had been laid, questioning him for two days. I am surprised they have overlooked a little thing of that kind.

THE COURT: Objection is overruled. I suppose his experience would entitled him to make an estimate on it.

MR. RAY: Note an exception.

A I have not figured for those precise quantities. The pre-

sence of the flow of water that I observed in the upper reaches of the stream varried between 40 and 90 cubic feet a second. The 40 foot stream covered nine-tenths of the area that the 80 foot stream did. The evaporation element therefore with a 40 foot stream absolutely, was practically the same as with an 80 foot stream, and the 80 foot stream ran through the section at a higher velocity so that the presence of the additional water really reduced the percentage of evaporation on each second foot of stream.

CROSS EXAMINATION by Mr. Thomas.

Q Mr. Tanner, that depends, almost wholly, does it not, upon the size of the channel?

A That is what I was trying to tell, that was the channel I had, I had the channel that is there, and observed itwhen it was carrying 40 and when it was carrying 80.

Q That is Provo River?

A The Provo River.

Q At what point, do you recall now?

A I recall at Melldrum's cabin making careful measurement of the cross section at each five hundred feet, five hundred paces, below that down to the point where Bench Creek enters the Provo River, about a quarter of a mile above the Woodland bridge, steel bridge.

CROSS EXAMINATION by Mr. Ray.

Q What is that distance in miles?

A It is a good many miles, say about twelve miles, I should say.

Q Have you a record of those cross sections? A. Yes.

Q How frequently does the cross section of provo River vary in its course?

A It varies, different cross sections at a number of places,

and the cross section is quite consistent. We have quite a long stretch of stream for instance, where the river passes under the wooden bridge above Bench Creek. From there down along the extreme north side of the valley to a point somewhat above the Woodland steel bridge the channel is defined, restricted, quite uniform.

Q Higher up it varies a good deal, doesn't it?

A Higher up it varies a good deal. From the point where the old mill race heading, that is applied to the mill site below the Stewart Ranch. from thence up to the Stewart Ranch, it flows in more than one channel. Then at the head of Stewart Ranch in the neighborhood of Shingle Creek it flows in more than one channel, but generally speaking the river is confined from Section 1 down to the rather flat and open area at Shingle Creek. Then it spreads out again in the lower end of the Stewart Ranch, and from thence on down to the heading of the mill site I have spoken about. Then it is restricted for quite a long distance, then down nearly to the Woodland bridge and while it flows in independent channels down through the Woodland area, the stream at about 80 foot stage, 60 to 80 foot stage, pretty well covers the whole bed of the stream.

Q Now, Mr. Tanner, it is the habit of the Provo Reservoir Company or has been in the past, has it not, to turn off this water during the very low water season?

A Yes.

Q How does it get that water past the dams at Midway and through there, over them or how?

A I don't know.

Q It uses the river channel clear down, doesn't it?

A I would not be sure what the actual operation of the matter is. I answered that question before, I didn't know.

Q I want your judgment on it, so I will put it hypothetically. Suppose they do use the river channel all the way down, and

there are tight dams at Midway and upper Midway dam and several other places along the river; except for the water which is permitted to pass over the dam by the Provo Reservoir Company, that water as it passes over the dams is not commingled with other waters, except as the seepage increases of course if the dam is tight; then all the evaporation, or substantially all, and all the seepage would be from the waters released by the provo Reservoir, would there not?

A With such limitation, I would say that would be the case.

CROSS EXAMINATION by Mr. Thomas.

Q Just one question further, Mr. Tanner, when the river is so low that the plaintiff finds it necessary to discharge the storage water isn't it a fact that the loss by seepage is greater than it would be if the discharge were emptied into the river at high water season?

A I should say any increement that is added to the stream, that the higher the stage would reduce the element of loss. In other words, I think a hundred second feet would run through that river with less loss than fifty; 200 with less loss than 100.

MR. RAY: You mean less precentage of loss, or less total of loss?

A Less procentage, I am speaking in ratio.

MR. THOMAS: I understood him to convey that meaning. I believe that is all.

CROSS EXAMINATION by Mr. Ray.

A May I ask one other question, rather disorderly way to proceed, Mr. Tanner, you say that the loss in the upper section is only in proportion to the increased area of the bed covered by the stream because of the reservoir water. Do I understand you properly there?

A In that section.

Q As a matter of fact, the reservoir water it turned off when there is practically no natural flow in those upper streams because the lakes have so far receded that there is no natural flow, isn't it?

A I don't think so. I have been up there in that vicinity other years when they had no dams there at all, and there was always flow in that stream.

Q From those lakes?

A Flow in that stream. I don't know just what tributaries it has, but it is in the tributary country up there and that was water flowing by this same place in other years when I have been there when there was no storage construction at all.

Q You know where the confluence of the two streams from the Wall Lake reservoir and the Washington Lake reservoir is, do you?

A In a general way.

Q Was there any water in that channel late in the season above that point ?

A I am only speaking now with reference to the limitations of my actual examination. That is confined to the section from the Melldrum's cabin, down from that. From that on up it is just more or less general experience that I am not very certain about, only I know at the Melldrum cabin in other years, and that is about five or six miles below the reservoir, there is a living stream of considerable size.

Q And as you go up doesn,t your memory suggest to you it gets smaller and smaller as you approach the lake?

A Well, I think that that is true . There is quite a stream going over the falls that lie between Melldrum's cabin and the lakes.

Q When you say up the stream you make that definite in second feet approximately?

A I should say it is somewhere between -- it is xx of course a

guess, but in the neighborhood, I think my memory serves me betwen five and thirty second feet, something like that.

Q So if the reservoir company added 56 second feet to it they would be covering a relatively high percentage of the channel, would they not?

A They would not where it is running in that rocky section, pretty well covers it, You see you have nearly vertical walls there for entire distance, and your stream runs in the gorge, pretty well covers if you only have 20.

Q You would have to have some lateral sides to this stream as well as depth and bottom?

A Yes, to the extent they went up on the sides they would cover new country.

Q There would be increased area to that extent?

A Yes.

Q When you say you leave the sand stone and come down into the more compact material, or shallows, those shallows are all stratified, are they not?

A Yes, but the movement along those stratifications which are shallows is almost negligable.

Q Some?

A Unless they go through fault ~~planes~~ planes or fracture, the bedding planes are not planes of movement for water like sand stone.

Q Not to the extent of sand stone, of course.

A As compared with sand stone they are negligible.

CROSS EXAMINATION by Mr. Bagley.

Q At the time that you were conducting these investigations, Mr. Tanner were there any tight dams across the river at any point?

A I think there was a tight dam across some channel at the entrance to the heading of the Kamas Canal. That was one channel, then there was a tight dam clear across the whole

river at the Midway dam, or at the Wasatch dam, or practically tight. Then there was a dam across the place called the Midway upper dam that was practically tight and had on one side of it a flume in which water was running from the river up through the flume and into the river bed below the flume. Those are about the only constructions that I observed along the course of the river.

Q Then at these socalled tight dams except the one at the Kamas Canal had ways provided for passing water through or over them?

A No ways at the Wasatch dam I observed. and remember.

Q At the Midway dam?

A The Midway dam had a place itself.

Q Did you make any measurement of the quantity that was passing theough this flume? A. Yes, 33.77 second-feet.

Q Was that passing through the dam?

A Midway dam.

Q Lower or Upper.

A I think they call it the Upper Midway dam.

Q Did this same condition exist in both the Midway dams, that is, the volume through the dam?

A I don't remember that distinctly, I don,t think so, I think this is a place only where there is a flume in all of the structures that are in the river from the head down to this point or below , this is the only flume.

Q Now, then, so that it will be clar, at the Wasatch dam there was par practically a tight dam across the entire river?

A Yes.

Q And there was no flume or other means whereby water could be passed through or under or around this dam?

A No, the water that was ~~mxpong~~ seeping over, if it got over at all, it run over in an uncertain sheet.

Q Was it passing over?

A There was a little water getting through and over the dam, but the dam was continuous across there. There wasn't any consentrated channel of escape through.

Q It was a substantial damming of the river?

A Yes.

Q Intended to be such?

A That was the way I would look at it.

Q This water that percolated through the dam was such as probably with the improvement there could not be prevented, that is, the loss?

A I think it could have been prevented. probably the necessities of the mill company or the companies that were using it was not sufficiently high just at that time to require the tightening of it so that it was absolute, but it was relatively a tight dam.

Q Was the dam that you mentioned at Kamas across the entire river?

A Across that branch. There was another branch that was free.

Q So that was only a partial interference with the whole river? A. Yes.

Q Now, at the Midway then, you think it is the upper dam, there was this flume?

A At least it is on the road between Heber and Midway, it is that dam there.

MR. A. C. HATCH: That is the lower dam.

Q And then if that were the lower dam, did you observe the upper dam?

A No I did not observe the upper dam, I don't if it was in, but there was a dam down there at the bridge.

Q That is where this flume passed the water?

A Yes, there wasn't much water being taken for irrigation purposes at this time. The Kamas Canal had quite a stream in and the lower Kamas Canal had practically no water in and so

with nearly all the diversions that in irrigation season are in use were practically distinued, and I think probably that they had ~~fixed~~ discontinued the use of the ditch in that upper Midway dam, they were running some water into their canal at the lower Midway dam, I remember that.

CROSS EXAMINATION by Mr. Wahlquist.

Q You say there was a little water seeping from the Wasatch dam; was that amount as much as the 33.77 feet that was passing through the flume at the side of the Midway lower dam?

A I would be uncertain as to that. My memory of it is that the construction was a continuous construction and what was getting by wasmore or less penetrating the construction without any defined channel of escape over or through.

Q And would not be to the amount of 33.77 feet immediately below the Wasatch dam?

A I would say not.

Q So that the percent at least of this water at the Midway lower dam was water that had risen in the channel below the Wasatch?

A I should say so, yes.

RE-DIRECT EXAMINATION by Mr. A. C. Hatch.

Q Mr. Tanner, do you know where the dividing point between the Wasatch Canal and the Provo Reservoir Company is located?

A No.

Q Do you know where they have a concrete gate, a measuring gate?

A I know that there is such a thing, but I have never visited it, been right to the point.

Q Do you know whether or not the water reaches the Provo River from this gate at a point above the Midway upper canal?

A I cannot be certain as to that.

MR. A. C. HATCH: I will say to the court that be-

fore closing we will show the water diversion in that section so that it may be clear.

Q Have you ever made an estimate of the evaporation of the Provo water from the Provo River for its entire course, assuming that it was a body of water covering the area that it covers?

A Yes.

Q Have you the figures with you, can you give them?

A Asuming --

Q Yes.

A That the --

Q Body of water the length of the provo River, what would be the evaporation per day or for any length of time?

A Assuming a river sixty miles long and about eighty feet wide, or alittle better.

Q For its entire length.

Q Which is a dimension that covers amply the situation, and assuming the evaporation of the observed evaporation in this valley on very hot days of July and August, namely one third of an inch in depth the total evaporation from such a surface would be equivalen to a flow of approximately 8 cubic feet of water a second. Now, the provo River is not as wide on the average in its normal flow as I have indicated, nor is the evaporation in its upper and mountainous regions as much as it is in the hottest days of July and August, as I have indicated, so that my judgment based upon what I know of the facts is that a flow of between two and five second feet of water would take care of all of the evaporation losses from provo River in sixty miles of its flow.

Q And eighty feet in width?

A No.

Q Assuming that Provo is --

A Yes, from two to five second feet. There is a good many uncertainties there. We don't know very much about the

evaporation in the high elevations, but they are not as large as they are down in the lower country and clearly they are not as large as the observed evaporation in the lower country on the hottest days of the year.

CROSS EXAMINATION by Mr. Wahlquist.

Q The time you speak of when you noted the flow at the Wasatch Canal and then at the Midway dam by the wagon road, did you follow down the channel of the river, or did you go from the Wasatch Dam to this point at the Midway dam by way of the wagon road?

A Now, my memory of all this examination is that right from the head to the diversion of the Provo Reservoir Company's canal I observed every linear foot of length of Provo River.

Q Then Mr. Tanner, did you observe the tight dam at the Wastch Canal on the same day that you observed this flume where there was 33.77 second feet passing the Midway dam?

A No, I did not observe that on the same day.

Q On two different days. How far apart are thosetwo dates?

A I think that we got to the Midway dam sometime in the evening and went down to the Midway upper dam sometime in the morning.

Q Now, which side of the river did you go down on?

MR. A. C. HATCH: Just a moment, if the court please, I don't understand that answer.

MR. BAGLEY: He referred to the same dam twice.

MR. A. C. HATCH: Midway dam and then went down to the Midway Upperdam.

THE WITNESS:READ MY answer.

(Answer read)

THE WITNESS: It should be Wasatch dam.

Q You speak of the Midway upper dam, Mr. Tanner, and yet you located it as being near thewagon road between- Heber and Midway. Is the dam that you speak of where there was a

flume letting this amount of water through --

A That is between Heber and Midway on the wagon road, at the wagon bridge.

Q Then you evidently don't know where the Midway upper dam is at all, do you?

A Yes, it is in the section above there, that is the Midway lower dam.

Q Did you observe the Midway upper dam with reference to what kind of a dam that was as at this same time?

A I don't recall that.

Q Did you observe if there was also water being diverted into the Buchler Ditch and into the ditch conveying water to Johnson's mill at that particulat time of year when you observed these other two dams?

A No, I don't recall that.

Q Which side of the river did you go down, if you followed the river every linear foot of it?

A From the head.

Q Just between the Wasatch dam and Midway lower dam?

A Down through that bottom.

Q On the east side?

A It might have been on the east side, down through those bottom channels.

Q You didn't follow the main channel of the river and inspect both sides of it, as to water being diverted from the river?

A No, not in that section.

Q So there may have been other ditches besides those that I have named, conveying water from the river between those two points at that very time, may there not?

A Surely.

CROSS EXAMINATION by Mr. Ray.

Q Just another question on the question of evaporation--

A I think making just a word of explanation here, if the court

please, the record will show that the determination made in the experiment leaves upon that stretch of channel from the Midway Upper dam to the Wasatch dam so far as quantitative measurements are made -- there was considerable complication with reference to the transfer of the storage water through this section, and complicated further with the use of the storage water in some of the mills there, and in conjunction with some of the irrigation companies who take water out to the left. It is a gaining section, but the detailed investigation is not at hand for that section in minutia. It is for all the other sections.

CROSS EXAMINATION by Mr. Wahlquist.

Q Just a question, you mentioned again the Midway upper dam.

Q When, if at all, was you at the Midway upper dam in 1915?

A Well, I went down through that section of the river from the Wasatch dam down through the river channel to the Midway lower dam and presumably passed all the obstructions and diversions that were in the main channel.

Q(And did you presumably pass them within viewing distance, or were you considerable distance from the river to the east. You understand that Midway is on the west side of the river, do you not?

A Yes sir, I understand that.

Q And presumably the Midway canal would be conveying water --

A There isn't any question about it, I crossed over that canal a number of times. It lies higher than the one that is diverted --

Q In 1915? A. Yes.

Q Can you give any particular date with reference to the time you visited either the Wasatch or the lower Midway dam that you also visited the Midway upper dam?

A No, I didn't say I visited the Midway upper dam to be definite

about it. I am not satisfied in my mind about it. I crossed the canal at some of the days that the work was going on there, but I don't have in mind distrinctly the Midway upper dam or the diversion of water therein from the bed of provo River.

Q No distinct impressesion now at all of the condition of the Midway upper dam?

A No, and I have made no measurements in that immediate vicinity.

CROSS EXAMINATION by Mr. Ray.

Q Mr. Tanner, what is the average width of provo River for sixty miles?

A Name the stage.

Q Well, the stage you took to fix the evaporation, what stage did you take -- I will withdraw the question -- to fix the evaporation.

A I took the stage that would give somewhere between two and five second feet evaporation. I know, for instance, that the average width is very much less than 82 feet.

Q Why did you take 82 feet at all then?

A Because there are some sections that are that wide.

Q Good many sections wider than that too, aren't there?

A No sir.

Q No places on Provo River--

A Oh yes, the total Provo River in isolated instances would be wider than that, but there are few places there as wide as 82.

Q What is the width at any stage of Provo River, the average width at any stage of provo River, the average width?

A I should say somewhere between -- in the neighborhood of fifty feet, in the neighborhood of fifty feet, as an average.

Q Have you made measurements of width and length, of prevailing width in order to determine that?

A Yes.

Q At what elevation of the river did you make those measurements?

A I cannot give the elevations. I should think in the neighborhood of seven thousand, seventy-five hundred, something like that.

Q I mean on the river stage?

A From 40 feet to 80 feet in the upper section and from 200 -- from 196 to 290 in the lower section.

Q So that that is the stage of the river?

A Yes. The river in the lower part is wider, but of course it is relatively shorter than the river in the upper section.

Q State what is the average width of the Provo River from here to Heber City, at the stage indicated I mean, of course?

A Taking the 200 foot stage and continuing that stage of the river at the bridge where the road crosses between Charleston and Midway then ce down to the mouth of Provo Canyon, or rather down to the Telluride dam, I think the mean width would probably be in the neighborhood of ninty feet.

Q What would it be at the 300 foot stage?

A Well, that means the 300 foot stage at the Telluride dam, and 200 foot stage above there.

Q Now, what is the elevation, the maximum elevation of the reservoir systems?

A I should say about nine thousand feet.

Q As I remember it there is testimony in here they are ten thousand feet in elevation, do you know whether they are as high as ten thousand feet?

A Well, I say about, I wouldn't say. My knowledge of it comes from a consultation of the topographic maps and there is one in the report there.

Q If you can find out what that shows and it is the source of your information, refresh your recollection.

A This is not the most recent map.

Q The elevation hasn't changed, I assume.

A Well, the accuracy of determination is very much better upon modern sheets than it is upon the old sheets, and unfortunately lakes are somewhate off of the contour area. They may be ten thousand feet, they are just under those high peaks that range up to twelve .

Q And the evaporation is greater at the same temperature at ten thousand feet than it is at four thousand feet, isn't it?

A That depends upon --

Q Well, everything else being constant the evaporation is greater at ten thousand feet than it is at four thousand feet, isn't it?

A That only leaves the tenuousness of the atmosphere and I should say yes. Every other possible physical element is against the answer.

Q But the water boils at lower temperature up there doesn't it?

A Yes.

Q Considerably lower, and one of the elements of evapiration is air pressure, is it not? A. Yes.

Q An element?

A Yes, I admitted that was the one element in favor of answering the question in the affirmative.

Q I am entirely conscious that the temparature is not as high up there, Mr. Tanner, and will permit you to state that when the times comes. Have you ever made any test to determine the relative evaporation under the prevailing temperatures theres and the prevailing temperatures on provo Lake?

A No, we don't have any observations that have been made in this country on that matter.

Q Have you ever made any? A. No.

Q You stated in your answer there were a good many things you didn't know about, didn't you?

A Yes.

Q So you put your variation between two and five second feet?

A Yes.

Q A matter of variation of 150 per cent?

A Yes.

Q So that you had considerable uncertainty about it, didn't you, about just what the evaporation would be?

A Yes.

JOHN C, WHEELON, recalled.

DIRECT EXAMINATION by Mr. A. J. Evans.

Q Mr. Wheelon, in the examination this morning, referring to the number of holes from 1 to 26 inclusive, I think I didn't ask you at what point the quantity of water stated by you was necessary to be, whether at the land or at the head gates?

A At the land?

Q At the land? A. Yes sir.

MR. A. J. EVANS: May it please the court, the matter we had in controversy before adjourning, I won't take any further time on that, we have another witness perhaps that would be better on that point, and you can cross examine Mr. Wheelon.

MR. THOMAS: You withdraw the hypothetical question?

MR. A. J. EVANS: Yes, and it may be stricken from the record.

CROSS EXAMINATION by Mr. Thomas.

Q Mr. Wheelon, the only examination you made of any of the soils in provo City or under this system are those that you have particularly called our attention to this morning?

A Yes.

Q And from your statement, your judgment is that the condition of the soil varies greatly within short distances?

A Yes sir.

Q Dkd you make any examination other than that which you have stated as to subsoils?

A No.

Q Doesn't the condition and character of subsoils very greatly determine the duty of water upon the soil in which the plants obtain their food?

A No sir.

Q Are we to understand then that the shallow soil in which the plants would live woubd require as much or more water where the subsoil was near the surface and of porous character ?

A If the necessary fertility is there and you can furnish the required amount of water for the plant and hold it and that soil is deep enough to retain it while the plant is using it, the depth of soil doesn't make any difference.

Q But you have answered the question and then denied it, as I understand it. The upper surface -- lets call that soil in which the plant lives as the upper ss surface -- doesn't the depth of that upper surface determine very largely the duty of water?

A It may determine the amount of water you would like to waste, but it doesn't determine --

Q Mr. Wheelon, I am not talking about the water we would like to waste, I am asking you if the depth of that surface soil doesn't largely determine the duty of water to that soil? You mean permissible amount of water, that should be given or the crop requirement of the water.

Q I will say as we generally term it, the duty of water; as I understand your expression of permissible use you used it as synonymous with the duty of water, the amount of water that was necessary to produce the crop to a maximum -- maximum crop?

A I divided the duty of water in those two subjects the crop requirements and the amount of water that is necessary to

waste on order to hold the crop requirements for the serving crop.

Q Then you include a certain necessary waste in the water applied upon the land?

A Yes.

Q With the crop requirement, and those two, I understand, constitute the duty of water to that land?

A Yes.

Q Then doesn't the depth of the upper surface and the depth and character of the subsoil determine, or aren't they factors in determining the duty of water?

A Yes.

Q Now, where there is a soil that is varying from a few inches to three and four feet of sandy character and with an admixture of clay underlaid with a gravelly subsoil, wouldn't such subsoil greatly determine the duty of water upon the upper surface?

A Not greatly, it would to some extent.

Q And where there is a subsoil of gravelly character doesn't it require a greater duty of water to produce the same crop as where there is a less gravelly or more sandy formation in subsoil?

MR. A. C. HATCH: I don'tunderstand the question.

MR. THOMAS: Let's see if the witness does.

MR. A. C. HATCH: Please read the question, I don't think counsel intends what he sayd.

(Question read)

MR. THOMAS: Change the word "as" to "than" and I will let the question stand.

MR. A. CL HATCH: Pardon me, did I understand greater duty where more water is applied to a greater quantity of land, where more water is put upon that land there is a less duty. I may be in error.

MR. THOMAS: That is not the thing I have in mind at all.

MR. A. S. HATCH: That is what I thought.

THE COURT: If you understand the question you may answer it.

MR. A. C. HATCH: Greater quantity of water instead of greater duty.

MR. THOMAS: Let Mr. Wheelon answer it.

A The question, your honor, takes into consideration soils I wouldn't farm at all. When you come to two or three inches of soil, out of my line of business. Give me anything like a reasonable farming circumstance and I will be very glad to answer the question.

Q Now, read the question as I gave it. It is not a question of what you would do.

(Question read)

MR. JACOB EVANS: I object to that, if the court please, as being uncertain and indefinite, so uncertain and indefinite that any answer the witness might make would be of no value to the court.

THE COURT: The objection is overruled. I think I understand the question, however, I have the same view Judge Hatch has with reference to its meaning, but Mr. Thomas says he means that.

RAY: Mr. Thomas uses the word duty instead of quantity in the question and that is the source --

MR. THOMAS:

THE COURT: The substance of the question is with that coarser ~~xxxxxxx~~ subsoil and smaller quantity of water, he asked the witness whether the smaller quantity of water would not sufficiently irrigated it with a coarser subsoil than would be required with a finer soil. That is the substance, as I understand it.

THE WITNESS: Could not I inquire as to the distance from the surface through the soil to that surface.

THE COURT: I understand this question is without any reference to the distance through the top soil. It may be very deep or shallow, I understand, it is not aimed with reference to the depth of the soil on top of the surface.

THE WITNESS: I could not answer that question satisfactory to myself.

Q You are taking into consideration this fact, are you not, Mr. Wheelon, whether you would farm the kind of soil that you have met here for instance in your examination.

A In my farming operation I use the surface soil, sandy or clay loam as my water retainer, as a sponge. If that is shallower or deeper I am reminded there as to the frequency with which I must fill this retainer for the use of the crop that is to grow from it. It does not change the quantity of water that the crops require. Water function is to serve the plant roots in the soil, render them available for the good of the plant. If the fertility is there and I conserve the water often enough to fill my retainer I am not so particular as to the depth of that sponge or retainer, but I should know very closely as to the distance from the surface of the ground to the bottom of my soil, so I as to know how much water I shall afford to pass through and use my sponge as a leach purely in order to supply my crops with water.

Q Where your sponge is supported with a very gravelly formation, do you not have to put over the surface a larger quantity of water so as to have your sponge filled ?

A No sir.

Q Can you fill your sponge first without in part at least supplying the gravelly subsoils or your underpinning for your sponge?

A I should do.

Q But can you, as a matter of fact?

A Yes sir.

Q It it possible for you to flood a piece of ground and hold sufficient within your sponge to satisfy the plant life without

allowing a considerable waste to go through into the gravelly subsoil?

A I could do it if my soil was what I consider a farmable, feasible, farmable soil.

Q What do you call a farmable, a feasible soil as to depth?

A I should want two feet of good sandy or clay loam .

Q Where there is a gravelly subsoil, however, or what we call pea gravel size or even larger, aren't you required to apply the water more frequently by reason of the great drainage underneath your sponge?

A Yes sir.

Q That being true then that the amount of water that you put on would have to be probably more frequently applied than whens you had a hardpan or clay subsoil?

A Yes.

Q Does the amount that you put on, or in the amount of water that you put on, are you governed by the crop that you raise?

A Yes.

Q And in determining the amount of water or the duty of water for lands here in this city and vicinity did you take into consideration the variable character of crops raised?

A Yes.

Q Would you say that a larger duty or a larger amount of water would be necessary to support say a strawberry crop than an orchard or a wheat crop ?

A More than either one, yes.

Q Then, where there was small plants, such as strawberries, garden truck and the like, is it your judgment a larger quantity of water is required than where grain or alfalfa is raised?

A No more than alfalfa but more than for grain.

Q Would you say the smaller crops require more frequent application and larger amount of water than orchards?

A Yes.

Q Isn't it a fact where the smaller plants are raised more frequent applications have to be made to support the plant life?

A I just answered that, didn't I. I would say yes to that question.

Q Then while probably no more water would be required so far as the existence of the plant is concerned, isn't it true that a larger amount of water is necessarily wasted to support a small plant than the larger plant you have spoken of, such as grain and the like?

A A very small amount more, yes.

Q But still an appreciable quantity?

A Yes.

Q Have your investigations under this system been sufficient to determine what such quantity or per cent would be?

A Those crops should have crop requirements of 18 to 20 inches.

Q That is the smaller crops?

A Yes, the soil four feet in depth, those crops should be raised maximum crop with 20 inch crop requirement, and 2.5 feet water duty, as you term it.

Q That I may understand you, Mr. Wheelon, again let me ask if in this 2.5 acre feet you include the necessary amount of water to support plant life and the necessary waste?

A Yes sir.

Q That is as I understood you at first? Have you taken into consideration, or have you made any investigation as to the probable losses of water in transmission under this system, that is, from points of diversion to points of use?

THE COURT: I think Mr. Wheelon stated this is all based on the water at the land.

MR. THOMAS: He did, your honor, but I asked if he has made any investigation at all on this other matter.

A No.

CROSS EXAMINATION by Mr. Corfman.

Q Mr. Wheelon, in your examination made of the soil on lands covered by the Little Dry Creek Irrigation Company's canal, you testified you examined the soil on the land of Ralph Poulton, Joseph Smith and Thomas Jones?

A What ditch did you say?

Q Little Dry Creek, No. 7?

A Yes sir.

Q Now you also testified these lands would require 2.5 acre feet of water, is that estimate based on the examination made right at the place that you made the test or the acreage throughout the irrigation district?

A That is principally based on the observation made right there at the --- that place and the immediate surroundings and vicinity.

Q Based on what you found at the point you made the test?

A Yes sir.

Q Did you over the lands of the Little Dry Creek Irrigation Company? A. No.

Q Speaking of the East Union, upper East Union, your test No. 26, you made two examinations under that canal or irrigation system?

A We made three, I believe, 23, 24 and 26.

Q And did you go over the lands in that district?

A No sir.

Q And your judgment is based on what you found at the points where these tests were made?

A Yes, this was in an open ditch, where the ditch had cut the soil down.

Q Who accompanied you on this occasion.?

A Mr. Abel John Evans, and I think man by the name of Deane.

MR. JACOB EVANS: McCune.

A McCune, was it?

Q They were representing the interests of the plaintiff?

A I believe so, I don't know which side the plaintiff is though.

Q Now, the same conditions, the conditions that you have testified here in Provo City are as you found them at the points where you made the tests?

A Yes.

CROSS EXAMINATION by Mr. John E. Booth.

Q Mr. Wheelon, I have not been here all the time that you testified to, I was called out; what does this word anger --

A That is auger, the stenographer made a mistake spelling that word.

Q I notice your crop requirement in all of these tests you have made seems to be the same, 20 inches?

A Yes sir.

Q And the permissible service three, three acre feet or two and half acre feet, I think, in all. No, one three and a half, Provo Bench, one place where you made no estimate, and Carter and Young Ditch you report it is not worth farming, something of that kind.

A That was No. 19, under the Park and Nuttall Ditch.

Q Yes, Park and Nuttall Ditch. I think that with that exception they are practically alike, three acre feet and two and a half acre feet, except the one No. 16 where you put three and a half acre feet. No. 16 is three and a half, is that what you meant?

MR. RAY: What he testified to.

Q That is on Provo Bench ?

A Yes.

MR. THURMAN: Near Pleasant Grove, ain't it?

A Yes sir, three and a half.

Q That is north of 15th east?

A That is right there at the Second Ward meeting house, right in the excavation.

Q I don't understand what you mean by Second Ward.

A It is the new meeting house just getting the foundation in, I think it is on the state highway.

MR. RAY: The Linden Ward meeting house?

A Yes, the Linden Ward meeting house.

Q I see, I think, under the location, I thought you meant the Sharon meeting house. I would like to call your attention first to No, 20 on the first page, was that test made up on the hill or down in the bottom?

A That was made on a road , out right on the Edgewood Road Provo Bench.

Q Right in the road?

A Right in the road cut, yes sir.

Q About the middle of the cut from the top of the hill down to the river, just beyond the bridge?

A I think so.

Q Nobody farms in there, do they?

A I wouldn't want to.

Q That is not what I asked.

A No, I didn't see any farms, at least, I don't remember any farms in there.

Q So that that would not be a fair test for farming ground, would is?

A I wouldn't think so.

Q I thought not, then we can pass that for the present. I would like to ask, so far as you know, whether any of the defendants were asked to go along with you in making these tests?

A Asked to go along?

Q Yes, do you know whether they were or not?-- yourself, Mr. Evans and Mr. McCune, I think, were the three?

A Yes sir.

Q Do you know whether or not anyone else representing other interests were asked to go with you?

A No, I don,t know.

Q You don't know about it?

A I don't know.

Q Now, going to page 3, No. 21, you say that you would want your soil two feet deep, I think you remarked to that?

A Yes.

Q I notice you have here 17 inches, East River Bottoms Water Company, only 17 inches there. What would you do, would you haul soil to make up the difference in that two feet?

A We struck water on that. As long as there was plenty of water there the capillarity --

Q That is not answering my question, would you give up the farm, or would you haul in soil to make up the two feet?

A No, I would improve that soil, if that was the depth of my soil, I would improve it by putting in plenty of humus and making that soil as rich as I required for the kind of crops I wanted to grow.

Q Where would you get your humus?

A It will grow vegetation enough so that you can plow it under, and build it up.

Q Plow all your crops under until you got enough humus?

A Yes.

Q I guess that would reach it that far.

A They are doing it in Illinois and other places.

Q Does it make any difference what sort of crop, I notice you have a uniform requirement, crop requirement, 20 inches all the way through here; does it make any difference what kind of a crop?

A Yes, it does, I put that amount at the very maximum any crop would be likely to require.

Q And some crops would require less than that?

A Yes.

Q Think there would be some difference between sugar beets and

sagebrush, for instance? A. Yes.

Q And you think 20 inches is enough for sugar beets?

A Yes.

Q That is all they actually require to mature the crop?

A Yes.

Q And if it was crops x otherwise than alfalfa or something of that kind, then it would have required --

A Alfalfa would require about as much as sugar beets.

Q It would?

A That is a good crop.

Q How about wheat?

A Wheat would require about half.

Q How about oats?

A It is little less than half.

Q Doesn't oats require more than wheat?

A I don't find it so in my work. There is very little difference I find between wheat and oats.

Q Let me ask this, have you made a calculation as to what the acre feet that you refer to here would require or would make in second feet, we have talking about second feet a good deal, as you have heard. A. Yes.

Q Can you give us about what that would be in second feet?

A I think I have a table here.

Q If you have I would be glad to get that.

A If I am permitted to read, I haven't made the calculation myself.

MR. A. L. BOOTH: That would depend upon the length of the irrigation season.

MR. JOHN E. BOOTH: I am getting to that.

MR. WILLIS: Wouldn't it be better to pick out some specific tract.

Q I am taking it as two and a half acre feet and three acre feet, if I could get it to one I could probably get the other.

A For instance, one second foot of water flowing for six months will cover one hundred and twenty acres of land thirty-six inches deep. That is not just what you want, is it?

Q No sir, I have got that myself.

THE COURT: I don't know I understand your question, Judge Booth.

MR. JOHN E. BOOTH: It is this, your honor please, he says permissible service three acre feet, that is three acre feet during the year. I asked him if he could give me what that would be in second feet.

A In duty per second foot?

Q Yes.

A That would be 122 acres.

Q 122 acres to the sedond foot?

A Yes.

MR. A. C. HATCH: What period of time, irrigation period?

Q I was going to ask that next. What period of time do you place as the irrigation season?

THE COURT Just before you answer that question, Mr. Wheelon, did you base that answer upon three acre feet or two and a half?

A Three acre feet.

THE COURT Three acre feet was 122?

A Yes sir, duty of 122 acres per second foot that would be six months period.

Q Now, taking the 20 acre inches, take a crop, how many irrigations in the six months would you want for that?

A That depends again on the depth of my sponge that I am operating.

Q But you don't make any reference here in your report as to your sponge, you just put it absolutely here crop requirement 20 acre inches?

A Yes, you asked me how many times I would want to apply that.

Q Yes, would you want to apply that say commencing irrigation first of April, would you give it the whole 20 inches in April?

A No, I wouldn't do that.

Q Now then, I want to know how you would do it?

A I would put that into this sponge in just the quantities and frequency with which that sponge could deliver the water, and hold it anddeliver it.

Q How would you determine that?

A Well, I determine it because my farm -- I have three farms with a tile drain and know what I am doing.

Q We don't happen to have tile drain in a good many of these places and so that would not apply here.

A I have endeavored here to attempt in this permissible duty of water enough to ~~app~~ allow you to waste a few inches.

Q Let us get this first --

MR. JACOB EVANS: If the court please, he has asked him, I think he should be permitted to answer it in his own way.

MR. JOHN E. BOOTH: I don't know whether he should or not, he can answer it my way, we will keep good natured over it. I want to know how you would determine just when that is required in the places that you have given this --

A In the absence of tile drainage I should dig holes and examine the level of the water in my subsoil.

Q That is with auger? A. Yes sir.

Q So that in order to determine the order of watering you would take an auger, go over your farm and see whether you wanted it or not?

A I have seen places where they have them permanently provided. When that water begins to fill in your subsoil it is time to stop irrigating.

Q So that if it is like it is here as you probably know, they

water in turns -- do you know anything about that sortof irrigation? A. Yes sir.

Q And if your augers didn't show you needed water you would let your turn go past, would you, wouldn't water then except when your auger said so, not when your turn come?

A The auger hold wouldn't be supposed to hold any water in the bottom at all. When it did appear there I would desist.

Q Whenever there was no water in the auger hole you would want to water?

A No, I would examine my soil with a shovel.

Q Wouldn't the auger hole tell whether you wanted it or not?

A The auger hole would give me the free water, not the capillary water.

Q Is the free water and capillary water different?

A Yes sir.

Q In what way?

A Why, the free water, or water that the ground is unable to hold and retain -- the capillary waters are the waters that form and fill around the different particles of the soil and are not free water.

Q If there was no free water there and no capillary water there, then you would want to irrigate, wouldn't you?

A Yes sir.

Q Whether it was your turn or not?

A Yes.

CROSS EXAMINATION by Mr. Thomas.

Q Mr. Wheelon, just one question, please. Doesn't the porosity of the soil and the subsoil determine the amount of water necessary to be applied at each irrigation to reach all parts of the tract to be irrigated?

A Yes, it does.

Q Having in mind the character of soil such as you found upon th

Provo Bench, do you think it would be practical to irrigate all parts of those various tracts equally at the same time?

A No, I would not.

CROSS EXAMINATION by Mr. Ray.

Q Mr. Wheelon, where were you born?

A In Ontario.

Q Canada?

A Canada.

Q Where did you receive your education.,

A Well, to tell the truth, I haven't got any; I never have graduated.

Q I didn't mean to infer that, I should have asked you if you had attended college?

A I never attended college.

Q Because I don't contend that is necessary to an education at all. Mr. Wheelon, where did you live prior to coming to Utah?

A I lived in Denver twelve years.

Q What was your business there?

A I was contractor and builder part of the time and building inspector for Edbrook and Merine architect Company.

Q That was until you became employed with the Grand Valley Canal Company? A. Yes sir.

Q You never took any degree as an agricultural engineer for hydraulic engineer?

A No, not as a hydraulic engineer, had a degree conferred upon me about a year ago by the State Agricultural College.

Q Now, since you have been with the Utah-Idaho Sugar Company, what has been your title?

A Chief Engineer.

Q What has been you duty?

A The duties have been rather varied. My department, of which I am the head, has included the extension of the old Bothwell

Canal taken from Bear River in the narrows between the Bear River Valley, as it is known, and the Cache Valley, and we build power plant transmission lines.

Q Have you personally had to do with the beet producing end of the Utah-Idaho Sugar Company?

A Not particularly, no sir. I have been preparing land for it.

Q In what vicinity?

A In the vicinity between Garland and Corinne.

Q Now, prior to your association with the Grand Valley Canal Company had you been actively connected in any way with irrigation engineering or agriculture?

A I had been raised on a farm, but not on irrigation.

Q Not an irrigation farm, what territory have your duties been confined to in the State of Utah?

A Well, in the Box Elder county and Emery County, Carbon County, and in consulting way in several other districts.

Q But I mean your duty as supervising , what had you to do in Carbon county, for instance?

A I hadcharge of the Price River Irrigation Company's canal and Mammoth reservoir construction,

Q The construction of them?

A Yes, and the operation and maintenance.

Q Of the canals? A. Yes sir.

Q You are not an irrigator under those canals, are you?

A I have a farm there, yes sir.

Q Have you practically irrigated it yourself?

A No sir.

Q In Emery County what --

A That is in Emery County.

Q In Carbon County what?

A Our system runs through Carbon County and my farm happens to be located across the line in Emery County.

Q So you have never been a practical irrigator in Emery or Carbon

County? A. No sir.

Q When did you first come to prove on this suit?

A I visited here two years ago, I believe.

Q In connection --

A About now.

Q For about an hour ?

A About this time of year.

Q I will ask you to state how long did you remain at that time?

A I think two or three days.

Q For what purpose?

A For consultation.

Q You didn't go over the land of the different companies at that time, did you?

A I just traveled over some of the district, but I made no careful examination.

Q And then you came here next since this suit, at the trial, did you?

A Yes sir.

Q You started out Saturday morning, the 10th, with Mr. Evans and Mr. McCune?

A McCune was the name.

Q And you made your observations numbered from 1 to 26 inclusive on the 10th, did you? A. Yes.

Q You observed twenty-six post holes or cuts or basements over this entire area, that was the extent of your observations as indicated in your report here?

A Yes sir.

Q That would be twenty-six observations to about thirthen thousand eight hundred acres of land, or more, would it not?

A I am not acquainted with the extent of the area.

Q You left what time Saturday morning?

A I couldn't say, about eight o'clock, I guess.

Q What time did you return?

A About five.

Q How many post holes did you digin that time, or wha x watch the digging of?

A I did not gid any, they had been prepared , but we dug, put the auger down and gathered the material..

Q So that you spent upon these lands making these tests,period of one day, did you?

A Yes sir.

Q In that time covering an area of this sort your attention was necessarily confined to what you saw as you looked at the cut or down the post hole, wasn't it, as to the character of soils and subsoils? A. Yes sir.

Q You made no measurement to determine the extent of the territory represented by the post hole or a cut, did you?

A No.

Q Now, assuming that the Provo Bench Canal Company has about forty-three hundred acres of land irrigated under its system, you made six observations upon that, did you not?

A I won't be sure about that, I don't remember under the --

Q Provo Bench Canal.

A Six.

Q That would be one observation for about seven hundred acres of land, would it not ?

A I don't know.

Q Well, if there were forty-three hundred acres of land and six observations, it would be substantially one to seven hundred plus acres of land?

A On the average.

Q Some of these observations were very close together, were they not?

A On the Provo Bench?

Q On the Provo Bench.

A I could not answer that question, I don't believe -- 11, 12, 13, 14, 15.

Q I call your attention to experiments 11, 12, 13.

A Yes.

Q They are in an area of less than a half a section, are they not?

A 14 and 15 -- yes sir.

Q There are material variations in the contour of the country on Provo Bench, are there not?

A Material --

Q Variations in the contour, swales and higher places?

A Some undulation there, yes sir.

Q Did you attempt to take your samples in order to cover all the variations of conditions on Provo Bench?

A I suppose that we attempted tod.

Q Do you know, did you pick out the areas where these observations were made?

A No.

Q So that you don't know whether they are in any degree representative conditions which obtain on Provo Bench, do you?

A Not positively.

Q Do you know at all?

A Yes, I know at all.

Q Tell me then how many acres of land on provo Bench are comparable with the condition which you found in experiment No. 11?

A I could not answer that question.

Q No. 12?

A Or that one either.

Q No. 13? A. No.

Q 14? A. No.

Q 15? A. No.

Q 16? A. No.

Q Can you say that there were fifty acres of land on Provo Bench of which your experiment No, 11 would represent the condition?

A You mean in one continuous piece of ground?

Q Yes. A. No.

Q Ten acres? A. No.

Q Five acres? No.

Q Now, you classed your soils up there as clay loam, sandy clay loam, and I think as gravel clay loam, did you not?

A You have reference to this 11, 12, 13, 14 and 15?

Q I mean in general. A. Yes.

Q Which class of those lands in your opinion require a high duty of water, sandy clay loam, clay loam or gravel clay loam? lower duty of water?

A Which requires the lowest duty or the most water?

Q Yes.

A Well, the gravel sand, I think, the sandy gravel would require, would sieve more water through it.

Q That is the result of your experience with the sandy gravel that it requires the high water duty?

A And clay gravel.

THE COURT: I think you mis-spoke yourself.

MR. RAY: The lower duty, I think your honor, thank you.

Q Now state, so that I may have it in mind, which class of those lands require the lower duty of water?

A Such lands as --

Q I don't want it specifically, I want the class, not specifically.

A The sand gravel.

Q The sand gravel?

A Sand gravel loam.

Q Which number of your experiement was the sand gravel loam, where did you find any of that?

A I don't think there is any here.

Q Wouldn't a sandy gravel require more water than a sandy gravel with loam?

A I think so.

Q That would require more water than the sandy gravel with loam,

would it not, andstill in Experiment 20, which I wish you would refer to, you find three acre feet is sufficient, do you not?

A Yes.

Q And when you turn to Experiment 16 you find a clay loam, one requiring a less water and you find a duty of 3.5 acre feet required.

A In --

Q Just answer my question yes or no, then I will ask you to explain. A. Yes.

Q What is the distinction between the clay loam soil described in Experiment 16 and that described in Experiment 20?which varies its duty?

A The example 16 contains gravel with any sand or humus in it.

Q But you dassify it as a clay loam.

A Yes, clay loam for two feet, and balance of it is extremely porous gravel , expecially porous.

Q Then the subsoil has something to do with it, hasn't it?

A Yes, in that case the soil is not very deep.

Q Wherever you find a soil not very deep and porous sub-stratum it has something to do with it exactly as a parsisai practical irrigating proposition?

MR. THURMAN: No use getting excited about it.

MR. RAY: I will ask the questions.

MR. THURMAN: I am objecting to that.

A Yes, where- it is as porous as that is.

Q Do you how many acres of land on Provo Bench are more porous than that which you observed in Experiment No.16?

A No.

Q As a matter of fact, the tract covered by experiment No. 16, around the Linden Ward house is infinitely better land from an irrigation standpoint than that covered by Experiment No. 14, which you gave a duty of two and a half, is it not?

A You say the soil around No. 16 is better than that around No. 14?

Q Uniformly, yes.

A I wouldn't think so.

Q Isn(t the soil around the Linden ward house better soil than that around the Dixon farm?

A I didn't think so.

Q Did you observe the crops around the Linden school house, ward house?

A I could not recall.

Q Is there any beets around there, Linden Ward house?

A What?

Q Beets.

A No, I don't think I did, I don't remember just what was growing there.

Q Wasn't it your observation that there were beets around the Linden Ward house and that there were no beets because the soil is so thin they cannot be grown in the vicinity of the Dixon plade?

A No, I cannot say that is my impression.

Q So you don't know whether that is a fact or not ?

A No.

Q The area observed by you in these five experiments, Mr. Wheelon, would not cover more an than a tenth of an acre as an actual experiment, would it, in the six experiments on Provo Bench?

A All combined, you mean?

Q All combined, yes.

A You mean taking distance between one observation and the other?

Q I mean the are observed in the holes or the cuts or the basements? A. Yes.

Q That would not cover more than a tenth of an acre, would they?

A No.

Q Now, those washes, those undulations as you refer to, a re old water channels, are they not?

A I don't know.

Q Would it determine the character of the soil if they had been old water channels?

A I think it would.

Q Did you take into consideration whether they had been old water channels? A. No!

Q If they were old water channels, the overflow, the high water, would distribute the loam as an overflow, would it not?

A Usually does.

Q And the treat of the stream current would carry it away, and there would be a very thin soil there, wouldn't it?

A Usually.

Q You didn't place your experiment in relation to those conditions, at all, did you? A. No.

Q As a matter of fact, take Experiment No. 12, the Irwin Jones place, you took an excavation in his basement, didn't you?

A Yes.

Q And it is on the south side of a hollow there, is it not? South side of a swale?

A I didn't notice the swale.

Q It is on the south side of the swale where the soil would be cut, isn't it, Mr. Wheelon?

A I didn't notice.

Q You don't know whether it is or not?

A No.

Q And didn't observe whether there was a swale there?

A I didn't see a swale.

Q Do you know whether there was one there or not?

A I don't know that there is.

Q Are you willing to state there is no swale?

A No.

Q And you give to that land a duty of three acre feet. Now, how does that farm and the land surrounding it compare with Experiment No. 13 as a farm -- not the post holes, but as a farm,

and as to its water requirements -- the Joe Richmond place?

A The Joe Richmond farm appeared to be superior soil to the other.

Q They adjoin each other? A. Yes.

Q Do they not? A Yes.

Q Do you know how thick the soil on either farm is except as this one excatation and the one auger hole show?

A No.

Q Don't know anything about them? A. No.

Q So that, as a matter of fact, they may be just the reverse in their water requirements of what your expriment would indicate, may they not?

A I wouldn't say they would be.

Q And wouldn't say they would not, would you?

A No.

Q This subsoil forms a very natural drainage, does it not?

A I think so.

Q And the thickness super-soil is very material, isn't it?

A Yes.

Q Don't know the area of very thin soils in any of that district do you?

A The --

Q Area of very thin soil? A. No.

Q You speak of this sponge of yours , the sponge as a container of water cannot be any thiuker than the surface soil, can it?

A No sir.

Q And if you have a good surface soil underlain, for instance, with a stratum of clay near the surface, that affords rather an ideal condition for irrigation, doesn't it?

A I don't know, I would say that we have more trauble with our clay soil than we do with our sandy subsoil.

Q So far as the tetention of water is concerned?it forms somewhat of a container, doesn't it?

A Yes.

Q And sand forms, you think, a better one?

A Well, I think so, because it is more valuable.

Q More valuable in what way?

A Good fine sand, it is better aerated and water passes down, drains out little better.

Q At least those conditions right there clay or sand are preferable to the great gravel or sobblestone substratum under which the water immediately drops away?

A Yes.

Q When you say soil has good capillarity, what do you mean?

A Why, I mean by that that the water can travel from the film surface of one part of soil to the other, at least, readily enough for the service of the crops roots.

Q That had to do with the contact of the particles in the soil and not their character, doesn't it?

A Yes.

Q Their evenness? A. Yes.

Q And physical association? A. Yes.

Q Capillarity is a subject of very expert determination, isn't it, that is you can determine it with nicety?

A It is a natural law that is quite readily understood.

Q But youcan perform experiments other than rubbing the soil in your hand to determine the capillarity of soil, can't you?

A Yes.

Q Did you perform any of those experiments on any of those tracts? A. No.

Q those are experiments which arerecognized as of importance by irrigation engineers, are they not?

A Don't use them in firld practice.

Q I didn't ask you that question, Mr. Wheelon, I say they are recognized as of importance by the irrigation engineering profession?

A I wouldn't say the laboratories condider it very important.

Q Have you used a chemical laboratory in connection with these experiments of yours in any way ?

A No, only for analysing waters.

Q Now, do you know how much any of these soils will absorb in the way of water? A. Yes.

Q By experiment? A. Yes.

Q Give me what the soil in experiment No. 11 of yours will absorb in the way of water, have you made that experiment?

A I didn't make it on this soil, no.

Q I want your experiment, you made it on other soils?

A Yes.

Q Where?

A In Box Elder county.

Q Why?

A To determine the field uses of water in field practice. .

Q You consider it then of importance up in Box Elder County to make those experiments before you arrived at the conclusion for your company, did you? A. Yes.

Q But you didn't do it here? A. No.

Q It might change your mind, might it not, Mr. Wheelon? as to the requirements and relative requirements of some of these soils if you should make such experiments?

A Is that a question?

Q Yes.

A Yes.

Q Now, do you know as an engineering expression what the optimum zone is?

A I don't know as I do.

Q Didn't you ever hear of that expression?

A Yes, I suppose it means the greatest amount.

Q That is not what it means ?

A You must understand I haven't a technical education.

Q I will explain what I mean, it is the water content of the

water content of the soil between five and twelve per cent, and doyou know, taking that zone at what per cent in the zone plants commence to wilt?

A I have heard of it, but I don't know it, that is by my own practice, I am operating exclusive field practice and that is laboratory practice.

Q Assume that soil drops to a point where the plants begin to wilt, it needs water then, doesn't it?

A Usually, yes.

Q Assume that there is an actual percentage determination by your pro fession as to where plants begin to wilt and say that is five per cent, it would be important to know, would it not, how much water a particular soil will absorb and how long it will retain it in order to determine the duty of water?

A We don't get that cose to it, no sir.

Q You don't?

A No, not in our field practice.

Q You rely for your observation upon the field practice, do you?

A Yes sir.

Q Which ought to be just as good as laboratory experiment in your opinion, of course. Now, the Garland soils are very deep spm soils, are they not?

A I don't think so.

Q Ten or twelve feet?

A The clay is deep enough, but our productive soil, I haven't seen, in miles of tile drainage ditches I haven't seen any alfalfa roots below three feet in depth. That soil doesn't do us any good.

Q That doesn't quite answer my question, they may strike some alkali down there and quit, how deep is the soil before you get to hardpan or gravel?

A We have no -- that is, we have no hardpan. We have gravel and clay, gravel, gravel, sand and gravel.

Q At what depth?

A From two to depth I have not discovered yet.

Q Your ground waters are vey close to the surface, are they not?

A Not in all places, in places, portion of the valley.

Q In large portions of the Bear River Valley the ground water is close to the surface, is it not?

A No, I wouldn't say a large part no. There is about ten per cent of our agricultural area there that has been affected by ground water.

Q And in the other you have a hard pan, you say? frequently?

A No, I have heard of hard pan, but have not seen it as such, what I call hard pan.

Q Have you ever tried to raise beets upon a clay loam, or a sandy clay loam or a gravelly clay lom, where the top soil was a foot and a half deet and underlying with 50 or 75 feet of loose material, gravel and rock?

A Yes -- well, I don,t know how deep that loose material is.

Q You d n't know how deep it is?

A No, I don't know how deep that coarse material goes.

Q As a matter of fact, do you know whether or not beets planted upon the soils which represent most of Provo Bench will not grow because it is impossible to water them sufficiently if you waterthem every seven days to make them grow ?

A That is the case here?

Q I ask you if you know whether that is the case here or not?

A No, I don't.

Q Assume, Mr. Wheelon, that the land around Linden, that is your experiment No. 16 , will, take up 30.7 per cent moisture by actual test, and that the Dixon land represented by your experiment 14 will only take up 23 per cent moisture and that each piece of land will hold its moisture in proportion to the per centage which it takes up, would you then say that

the Dixon land was susceptible of irrigation with less water than the Linden land? A. Yes.

Q Irrespective of the amount of water that the soil will take and hold for the plant?

A Yes, because three feet is about all I would want to spare and waste. It is a question how much water you want to waste when yêu are irrigating those lands.

Q I am not talking about waste at all, Mr. Wheelon, I am talking about the water they will take up down to the poihtof beneficial irrigation, and hold it.

A The Dixon land, that is a pretty fair mistore of soil down about three feet.

Q But suppose that soil, Mr. Wheelon, will not absorb a normal quantity of water and that because of its content it will not hold it, because of its gravel content, then do you still say that it will require less water than the Linden land?

A I should say so.

Q If that were true, then water doesn't have much to with irrigation, does it?

A I believe so, I don't see where that would make any differance in that respect.

Q I am not certain you understood my question. I say if the Dixon land will not take much water and won't hold well what it will take, and the Linden land will take by absorbtion substantially more water and hold it xx well, would you still say that the Dixon land could be irrigated successfully with less water?

A In the first place I cannot understand how it would do that.

Q I am assuming that it will.

A I could not answer that question on that assumption, because I don't think the relative conditions of the soils compare with your statement from the appearance.

Q But if I am right in that, what would be your answer? in my

assumption?

A Then the character of both them soils would have to be changed before it would be right.

Q Assume they were not changed?

A I could not answer that question intelligently to myself. If the condition is changed, of course the requirements would change.

Q Take your experiment on the Provo Brick Company, No. 11, there you found in a post hole or auger hole clay loam four feet deep in an excavation. If within a stones throw of that land upon farming land there were soil where the cement gravel was within twelve to sixteen inches of the surface you would say that soil required more water, would you not, Mr. Wheelon?

A It would require greater permissible duty, yes.

Q I don't mean by more water that the plant would actually get more, but it would require more in order to get your water to the plant.

A In other words, I should want to have some water to waste, if I was going to farm that kind of land, I wouldn want some water to spare.

Q Is there such a thing as a practical farming operation wherein one hundred per cent of the water applied is gotten to the ~~pxx~~ plant?

A I doubt if that is ever done.

Q It is impossible, is it not?

A You might say that it is.

Q Suppose you get into the soil itself surrounding the plant four inches of water, that four inches of water doesn't go to the plant, does it?

A Four acre inches or four square inches?

Q Four acre inches of water.

A Four acre inches of water?

Q Yes.

A You mean to say one irrigation of four acre inches was applied to a growing crop, would the crop get all that water?

Q Yes, would it, would it, Mr. Wheelon?

A No, it couldn't get all that water.

Q There would be some go off in evaporation, wouldn't there?

A Evaporation between the stobls of the crop.

Q Great deal of it go off in evaporation, wouldn't there?

A I don't know what you mean by a great deal.

Q A substantial percentage?

A I couldn't say just how much that would be.

Q Some of it would be absorbed by the lower soil, would it not?

A Not necessarily.

Q Practically, would it?

A If properly applied that water should exhaust itself in capillary, furnishing capillary waters to the soil in the vicinity of the root system of the crop. If it is not intelligently applied, practically applied, some of it will go down through the subsoil, if it can get away.

Q Do you mean to say that in intelligent, practical irrigation no water should go in to the subsoil?

A Yes.

Q Absolutely none?

A Absolutely none.

Q How would you irrigate a field of ten acres with a soil a foot and a half thick with boulders below it, with no water going into the subsoil?

A Couldn't do it.

Q Couldn't be done, could it? A. No.

Q Well now, I understood you to say that in intelligent irrigation no water would go into the subsoil?

A It should not go in, I say.

Q Well, just tell me how you would avoid it in that condition?

A You say two feet of soil?

Q Eighteen inches to two feet of soil.

A Eighteen inches to twofeet of soil, I would at least attempt to irrigate so carefully that the water that I applied would be exhaussed in furnishing capillary waters to the soil when it got down to that gravel.

Q Have you ever been able in practice to so irrigate farms of that character?

A No.

Q Suppose in irrigating that farm you have gravelly channels put there by nature, over which you have to run your water, where the surface soil is, just covers the surface one or two inches?

A I would buy another farm, I think, I couldn't farm that kind of land.

Q I am not talking about farming it. I am talking about having to convey your water across such a spot.

A I would put it in a flume if I had to convey it across there, I wouldn't farm that land, I would convey the water across in a flume if I had to have it on the other side.

Q Irrespective of where that occurred in your farm or how irregular?

A I don't think that would matter where it was, if it was in that condition.

Q How deep do lucern roots usually go.

A I have never seen any lucern roots below six feet in depth.

Q As a matter of fact, they go much below that usually, do they?

A I have heard itsaid they do.

Q Now, you said the duty of water which you prescribed in this case was applied upon the land.

A Delivered to the land.

Q Delivered to the land, that was not delivered to the plant?

A No, it was ddlivered on the farms as usually do when we make a delivery .

Q Why do you say delivered to the land?

A Why, because it is a popular expression used in the delivery of water.

Q Why wouldn't it be just the same amount at the head gate, why don't you put it at the head gate instead of the land?

A The head gate might mean any head gate, twenty miles.

Q Why don't you put it twenty miles up to the intake?

A I would if I was furnishing the water from the canals if I could.

Q Suppose you were a farmer where would you prefer to do it?

A I would prefer to take it pretty close to my farm.

Q Why?

A Because I would then be relieved from the losses by seepage and evaporation that usually occur in transmission of water.

Q In puddled canals even that have run for years there is loss by evaporation and seepage? A. Yes.

Q You talked about this duty being in excess of the precipitation, have you? A. Yes sir.

Q You figure some precipitation in order to mature these crops?

A Why we don't take in the precipitation as much as we should in our irrigation practice.

Q No, I assume that is what you meant Mr. Wheelen, and you did take into consideration the precipitation in this case, because you thought we should, did you?

A I don't think I did, no, this is applied water I have reference to.

Q Didn't you state that duty was in addition to the precipitation?

A Yes.

Q When you stated that, you took into consideration then the precipitation, didn't you?

A Or left it out of consideration which ever way you might consider it.

Q Which did you do?

A I left the precipitation out of consideration.

Q Why did you use the statement then in addition to the precipitation?

A Well, this water is applied to the land in addition to what precipitation might fall on it.

Q So that you would give the plant this water and give it all the precipitation? A. Yes.

Q How much precipitation did you figure for the month of June on Provo Bench?

A I didn't make any calculation on precipitation at all.

Q You figured there would be some, at least, didn't you?

A No, I didn't calculate on precipitation at all.

Q I understood you to first say to me what you did.

A I didn't understand you then, I left the precipitation out of the calculation of moisture for those requirements.

MR. JOHN E. BOOTH: If the court please, Mr. Wahlquist asked me to ask one question for him. He had to go away.

THE COURT: Very well.

CROSS EXAMINATION by Mr. John E. Booth.

Q Mr. Wheelon, is it not true that the roots of some crops extent down into the subsoil? A. Yes.

Q Now, in a case of that kind would that crop require less water than it would if it did not run into the subsoil, or would it make any difference?

A It wouldn't make any difference.

Q Suppose that these roots run down to the water level, that what you call it, water plane?

A Water plane.

Q Then would that in that case require less surface water than if that water was not there at the water level?

A It wouldn't make any difference, the water, the roots cannot take any plant food from mere water in the soil. The water plane that is below that point has not the feeding of the

plant.

Q The water plane is not always stationary, is it?

A No.

Q Now, suppose that you plow deep, and afterwards the water plane arises until it is above the bottom of where you plow, would that make any difference?

A Above the bottom of the ordinary plowing depth?

Q Yes.

A If it remained there temporarily it might not do any damage.

Q Would it make any difference with regard to the amount of water that was required?

A If I understand you right, that water remained there any lenghh of time.

Q No, it rises and falls.

A That is what we might call sub irrigation, which is the same as surface irrigation providing the water goes away before it suffocates the roots of the plant.

Q So that with sub irrigation would require less surface irrigation than if there was no ~~surfxss~~ x sub irrigation, that is, rising and falling within short periods of time?

A You would save whatever moisture, capillary moisture that submergence left when it receded.

Q Now, as an illustration of that No. 211 on the third page-- I am more familiar with that -- your water plane 17 inches , that is, you found it saturated when you were there?

A Yes.

Q Now, if that 17 inches found there on Saturday and on Friday, the water just above it to the north and also to the east had been applied very largely for irrigation purposes, and the 17 inches was the result of that irrigation, and in two days that water plane would be twelve inches below there, would that ~~xmxk~~ make any difference in your crop requirement or permissible service?

A& yes sir.

Q What difference would that make?

A It would make a difference in the amount of that water plane left as capillary moisture in the soil when it receded, and the crop re quirement of the soil.

Q Would you then tell me how xxx much difference was in the permissible service and in what way would that be?

A If that came often enough to keep your crop thrifty you wouldn't need any surface irrigation at all.

Q And if it came only once during the season, then it would make only a slight difference?

A That would make a difference of course, that would mean, I should say equivalent to about one irrigation.

Q Now, I have one other question is all. This 20 inch crop requirement I didn't quite get satisfactory answer on my first cross examination, how that should be properly applied, how many times and in what amounts during the six months that you have, that would be trifle over three inches a month?

A That ought to depend considerably on the circumstances as to rain and cloudy weather and man's experience in the soil.

Q Let's leave the rain and cloudy weather out.

A We can't do that.

Q Well then, if you can't leave the rain and cloudy weather out.

A There is a difference in seasons.

Q Can you make this at all reliable?

A I believe that 20 inches as the maximum any crop can use.

Q Then assume there is no rain for one year.

A Yes.

Q Perhaps it wom't be a valid presumption either this year, then how would you apply this twenty inches, commencing on the firstday of April to the first day of October?

A That would depend somewhat on my crop.

Q The crop I say growing, for instance, if it were spring oats?

A Take it the one that requires the whole twenty inches.

Q The crop that requires the whole twenty inches.

A You don't grow any crop that would require quite that much.

Q Give it to us anyway?

A Alfalaf would practically require it.

Q Would come as near as any.

A If you grow a five ton crop, land fertile enough to grow five tons to the ac-re, you can get perhaps eighteen inches of water into it, is what I call ~~xxxxxxxxxx~~ concieveable ~~xxxx~~ requirements, but I would put that on in about three irrigations, and wouldn't put on bus fifteen inches of it.

Q Five inches at a time? A. Yes sir.

Q Put on the first of April five inches?

A No.

Q When?

A I would put one on just before I cut my firstcrop.

Q Suppose you wouldn't have any first crop without you give it water?

A I wouldn't get the five tons.

Q I don't think you would?

A Then the crop wouldn't take near fifteen inches.

Q Suppose you actually need to irrigate in April sometime, how much would you put on, actual necessity now, to get the first crop?

A Do you have to irrigate in April on land that will grow five tons of hay?

Q I don't know how much it will grow, but we have to put water on.

A I would put on, if I had to begin that early -- I would put on about three acre inches at the first irrigation.

Q In April, or right now, if we are successful we can get along in June. When would you give it the next three or more or

less?

A I would put the next irrigation on about -- just before I began to cut the hay.

Q All right, that would be along in June, we have got six inches then? A. Yes.

Q All right then, would you have the next?

A I would irrigate the next time just before I cut the second crop.

Q So that you would raise the second crop, watering just before you cut the first and then let it go until just before you cut the second?

A Yes, I would irrigate thesecond crop before I cut the first crop, stem of the young buds.

Q When you would irrigate again just before you cut the next crop? A. Yes sir.

Q I think I understand you. I will say, Mr. Wheelon, if you come down here to farm you won't need to bring your mowing machine with you. I think that is all.

MR. MCDONALD: Your honor please, in order that the record may be preserved, I move the said court at this time to strike all the evidence of the witness upon the ground that it is incompetent and will not be any aid to the court nor to the Supreme Court so far as the record is concerned in determining the issues in this case.

THE COURT: Motion is denied.

RE-DIRECT EXAMINATION BY Mr. A. J. Evans.

Q Mr. Wheelon, is there any crop that it is necessary to apply water to for a period of six months?

A I don't recall any.

Q What is the usual length of time for applying water, say on alfalfa to begin with?

A On alfalfa between, as the judge says, first of April and

probably the first of September, we irrigate, begin irrigating so early, we don't generally irrigate as late. We irrigate sometimes late in the summer and then irrigate late in the fall after the third crop come off.

Q What would you say as to beets, length of time.

A Irrigation of beets ought to be done inside of sixty days.

Q Wheat, what about about wheat, oats and barley?

A They ought to be irrigated within a period of thirty or forty days, thirty days.

MR. RAY: Your honor please, I move to strike the testimony of the witness as to alfalfa, beets and grains, upon the ground that it appears the witness has no information as to the mexf necessity of this district at the time of irrigation. It appears that he possesses it upon conditions prevailing elsewhere than here.

THE COURT: The motion is denied.

MR. RAY: Note an exception.

THE COURT: Your motion goes more to the weight to be given to the evidence.

Q In answer to Mr. Ray you stated that you would apply water more frequently on land where the soil was shallow?

A Yes.

Q I will ask you now if it would be necessary to apply as great a quantity as if the soil was of greater depth?

A The same crop requirement.

Q Would you do that in the operation of a farm, would you run a greater quantity on the surface?

A At a time, no. It would need less quantity at a time, but more frequent. I didn't understand the question.

Q Therefore you would have some reserve from each watering, so you could apply a greater number of waterings?

A Yes sir.

Q How would you accomplish that, by what method?

A In order to get a small amount of water on the land?

Q Yes.

A At each irrigation?

Q Yes.

A I would have my sources of supply close enough together so that the water would not be running over one part of the ground any greater length of time than was necessary to fill the depth of my ground with capillary moisture.

Q In other words, you would make shorter runs?

A Yes sir.

Q Now, Mr. Ray put a good deal of stress on your No. 11 and No. 12 experiments; is it not a fact that in one case, in the case of No. 11, that you have provided 20 acre inches and provided for ten acre inches of waste?

A Yes.

Q Even on that kind of land? A. Yes.

Q In your computation, and in the No. 12, you have provided the same amount in acre inches for crop requirements and then you have provided 16 inches for waste because of the different class of soil?

A Different class of subsoil, yes.

Q Different class of subsoil, is that a fact?

A Yes.

RE-CROSS EXAMINATION By Mr. Thomas.

Q Mr. Wheelon, do you know whether such plan as Mr. Evans suggested would be ~~practical~~ practicable under the present systems of irrigation here in this valley?

A No, I couldn't say.

Q I have special reference to the frequent and light applications of water.

A Yes, I couldn't say as to that

Q Would you say it would be practicable if the sources of supply

were of such character as to limit the times and amounts of the receipt of the water by the irrigator?

A If the schedule of frequency was such that he could have the water at greater frequency, you mean?

Q Yes. A. Yes.

Q To meet your plan then the distribution of water would have to be at more frequent intervals or at frequent intervals?

A Yes.

MR. THURMAN: That is on certain classes of land.

MR. THOMAS: That is all.

MR. A. J. EVANS: Perhaps for information of the court it might be well to have this produced in evidence. Mr. Wheelon, I hand you plaintiff's Exhibit 50, ask you to examine that, do you recognise that as a compilation made by you from the various twentysix tests that you made on June 10th? A. Yes.

MR. A. J. EVANS: We offer this in evidence, if the court please.

MR. THOMAS: Do you intend to offer 49?

MR. A. J. EVANS: We would be glad to do that, if there is no objection to it. We will offer it anyhow and we can identify it, if necessary, later. I explained in that putting it up there Mr. Wheelon did not make it, but we will offer that in evidence also.

THE COURT I understand Mr. Wheelon did make the yellow penciling part?

MR. A. J. EVANS: Yes sir.

MR. THOMAS: In so far as it is interesting with Mr. Wheelon's testimony, we have no objection.

THE COURT: That is all it could be put in for. Now, with reference to Exhibit 50, does this exhibit contain anything more --

MR. RAY: As I observed it, not.

THE COURT: Then it may be admitted for reference.

RE- CROSS EXAMINATION by Mr. McDonald.

Q Mr. Wheelon, as I understood you you stated that where the land might be shallow that you would use a less quantity of water to get ~~sex~~ ~~it~~ over it. is that correct?

A At each time, yes sir.

Q Well now, isn't it a matter of fact in many instances where the surface or the soil is shallow with gravel and cobble rock as a subsoil you would have to use a greater quantity of water in order to get over it at all than you would where the surface and subsoil was more compact?

A Well, it is necessary to use your surface soil as a leach purely, and I would not want my land to be subjected to that by putting a gread flood of water on that. I would devise some way of supplying the proper amount.

Q Isn't it a fact you would actually have to apply a greater quantity of water in order to get it over the soil at all?

A No, not if it is good farming land.

Q Suppose it is very poor farming land and poor farmer owns it?

A I believe there are cases where the land is not worth the value of the water that is required to irrigate at that extravagant amount.

Q That may be your judgment in the matter, but ~~sex~~ circumstances are such probably, that men are located and have to use such as they have, and we are trying to get at what the actual fact would be .

A You believe the ~~ex~~ ~~ex~~ community then should make a sacrifice in order to supply that one piece of land with an extravagant amount of water?

Q I am not on the witness stand, I am asking you the question, as an expert witness.

A No sir, if I was a community I ~~wo~~ would not make the sacrifice.

Q I am not asking you what sacrifice you would make, I am asking you what it would require to run the water over that land?

A I could not tell that.

Q You don't know.

A Depend upon how extravagant the conditions are there. whether that soil is a foot deep or two inches. Soil so thin and subsoil so porous, I would not as a community make the sacrifice of the water necessary to fill up that tremendous space there in order to furnish a small amount of water to a crop growing on shallow soil.

Q What would you do with the man or men that own farms of that kind?

A I have had to leave land and other people have had to leave them because they were non productive.

Q They do produce and men make a living on them and raise a family.

THE COURT: On such as you have described?

MR. MCDONALD: Yes.

THE WITNESS: I didn't know it.

THE COURT: I think the court will take judicial notice from your question it would not be the case. I think the court would almost take judicial notice.

MR. MCDONALD: As I understand we have a character of land in Wasatch county that is gravelly, the surface is gravelly, it is all gravelly, and you can take, say a second foot of water and undertake to run it over it and it would cover scarcely no portion of the land.

THE COURT: That is a different situation from what you said first.

MR. MCDONALD: No, not at all. I was asking relative to the quantity of water it would take to get over the surface.

THE COURT: I understood your question perfectly, I think your question is very different.

MR. A. C. HATCH: I objedt to the testimony of Mr. McDonald as not being sworn.

THE COURT: I merely made the suggestion in the interest of time. I thought you were not accomplishing anything.

MR. MCDONALD: Witness says he doesn,t know anyway.

RE-DIRECT EXAMINATION by Mr. A. J. Evans.

Q If that were true you could put a greater quantity of water and hurry it over and use it a less length of time , and do the same service, could you not?

A No, the pressume of that water would force so mubh of it down through. I say such lands are not worth water at the present value of water; they are not worth the water necessary to attempt to irrigate -- agriculture is not irrigation on that kind of land.

ANDREW B. LARSEN, called by the plaintiff, being duly sworn, testifies as follows:

DIRECT EXAMINATION by Mr. Thurman.

Q What is your full name?

A Andrew B. Larsen.

Q Where do you reside?

A At Payson.

Q What is your occuption?

A Civil engineer.

Q What particular business are you engaged in at the present time?

A At the present time ,in the construction of lighting system in the Strawberry Valley Project.

Q How long have you been connected with or employed ~~by~~ under the Strawberry Valley Project?

A Since May 1, 1905.

Q So that it may go into the record, tell us generally what the Strawberry Valley project is?

A The project contemplates the storage and transmission of supply of water from the Strawberry Valley water shed, its natural tributary to the Colorado River drainage and transmitting all this water through a long tunnel through the main range into the water shed of the Spanish Fork River and finding its way down the tributaries of the Spanish Fork River to the Utah Lake valley fields in the neighborhood of Payson, Spanish Fork, Salem, Santaquin and part of Goshen Valley.

Q About what are contemplated to be covered by the Project?

A Approximately, entire project will be approximately fifty thousand acres, but the Strawberry Valley water would hardly cover that much .

Q But that Strawberry Valley water with the natural supply from other sources, is that the understanding?

A Yes.

Q Covers about fifty thousand acres?

A No audible response.

MR. RAY: I assume you mean by that, Judge, the lands which are under the canal, and do not propose by that to establish the duty of water, what somebody contemplates?

MR. THURMAN: No, I am just getting a general description of the project is all, so that the record may show.

Q Did you state how long you had been connected with the project ?

A I think so, since May 1, 1905.

Q Eleven years? A. Yes sir.

Q How long have you been engaged in the particular occupation you are in now?

A You mean construction work?

Q Well, irrigation of lands, applying water?

A During the entire period that I have been connected with the

Reclamation Service my work has been somewhat varied character, consist consisted of measurements and computation of stream flow and location of canals, laterals, telephone lines, transmission lines, designing irrigation structures, investigation of water rights, the determination o f the duty of water from special investigation, and in charge of the construction of a high line canal and lateral system under it.

Q HAs your work or occupation included a supervision of tests, application of water to the land with a view of ascertaining the requirements of water for specific tracts of land?

A Yes sir.

Q How long a period of time has that particular occupation existed?

A That particular investigation covers a period of three years.

Q And state whether that is within this area generally that you have described here? A. Yes sir.

Q Payson, Spanish Fork, Mapleton?

A Yes, covers what is known as the Spanish Fork east bench, going as far north as the southern part of Mapleton and all the Spanish Fork district, what is known as the Lake Shore and Benjamin South Field, Salem Canal and a few tracts under the Petettnett Creek in the neighborhood of Payson.

Q Have you yourself had personal supervision xxxx and connection over and connection with applying water to those lands, with a view to ascertaining their requirements?

A Yes, sir, I have personally been in charge of the work.

Q State what you did as supervisor of that branch of the work preliminary.

A The preliminary work consisted of investigating the -- general investigation of the country to determine approximately where the various tests would be carried out so that you would get an idea of the general character of the whole country to be covered and investigation regarding the -- who were the best

farmers in the various districts, who were the owners of the best farms and who best handled their farms, and handled them in the best way, and then selection of the various tracts of land owned by the farmers and the installation of measuring devices for the purpose of measuring the water and making arrangements with the owners of the land for getting the necessary information and also making arrangements with the water masters of the various canals for the purpose of obtaining information from them as to when the users of the water under the various tracts would irrigate. They go by rotation, you know, and so we had the complete information right in the office as to who xxxx of the various parties under -- that we were investigating would irrigate on certain days, and having a list right in our office showing just who would irrigate we would go to those various parties and make measurements of the stream of water they were using.

Q Now, let me ask you there, who measured that water, the farmer or you?

A Myself and two assistants during most of the time.

Q Actually measured the water to the tract to be irrigated?

A Measurements were actually made in close proximity to the tract irrigated.

Q When you say close proximity that is relative xxxx term, what would you say generally, how close?

A Well, generally be maximum distance, perhaps of quarter of a mile, in special cases it might be a little more than that, and good many cases it would be right by the land, but the average distance would be less than a quarter of a mile from the land.

Q Now, who would attend to the actual irrigating?

A The owner of the land and the water.

Q The owners of the land, and you say they were selected as far as you could ascertain the fact because of their competency

or efficiency in handling water upon the land?

A Yes.

Q Was there anything in their farms and condition you found their farms in that would indicate anything about whether they were efficient or not?

A General appearance of the farm would naturally indicate ~~the~~ to some extent how it is being handled, and that, together with other information.

Q Now, in the tests that you made, what generally were the classes of lands, describe them something as likely, as these lands have been described here, or in some way applicable to these lands over there as to being clay or sandy or gravelly or any description that you have in mind?

A There are several classes of land in an endeavor to cover all the classes of land that was under the project.

Q Now, name them in your own way, the different classes of land?

A We had a gravelly clay loam underlaid by gravel and larger stones mixed with more or less sand and clay and sandy clay loam underlaid by heavy clay, and few cases just the reverse of that, a very heavy clay soil for considerable depth. Those were the principal classes?

5:10 P.M., Recess to 9:30 A.M., June 13, 1916.

ANDREW B. LARSEN - - - - -

DIRECT EXAMINATION by Mr. Thurman continued.

Q You are speaking of land in the Strawberry Valley Project were you?

A Yes, those were lands under the Strawberry Valley Project.

Q You ~~my~~ say those tests that you made, that you had charge of, ran though three years? A. Yes sir.

Q Can you name the years?

A 1910, '11 and '12.

Q You recall about how many tests you made in 1903 -- 1910, I should say?

A I think there were forty-three tracts in 1910.

Q Forty-three tracts upon which expreiments were made?

A Yes sir.

Q And as to 1911, do you remember?

A I don't remember exactly, I think there was over a hundred, neighborhood of a hundred.

Q You were in general charge?

A Yes sir.

Q Of that work?

A Yes sir.

Q And in 1912?

A There was, I think 127.

Q Different tracts? A. Yes sir.

Q Now, by those tests did you become familiar with the requirements of the land for water?

A That was the purpose of the test, a study of the conditions and the results would give anybody a good idea of the requirements of the soil to produce crops.

Q That was the real purpose of the test?

A Yes sir.

Q To ascertain what water the land required for the production of crops? A. Yes sir.

Q And I suppose the general purpose beyond that was with a view to furnishing those lands with water?

A Yes sir.

Q Do you know whether the same lands were used in the different years, or did you vary the land?

A To a large extent the same tracts were used. In some cases we did not get the best selections on account of the farmers

not handling the work in good shape. They were careless in the use of water and for that reason we dropped a number of tracts.

Q That is, you dropped the tracts, do I understand, where you found inefficiency in handling it?

A Yes sir.

Q Now, the Strawberry Valley area or the area covered by that project or system is in close proximity to this section of the country here, is it not?

A Yes sir, the north boundary is close. Those tracts extended as far north as the north side of the Mapleton Bench, nearly over to Springville, and then included area down around Spanish Fork, Lake Shore, Benjamin and in Payson.

Q Do you know if the general meteorical conditions, climatic conditions are similar to this section here?

A I have lived in this valley and worked throughout the valley here for a number of years. So far as my observation goes the general meteorological conditions are very similar.

Q Have you made any examination at all of the lands covered by this litigation in this valley?

A Yes sir.

Q What particular section of these lands have you given some attention to and made observations upon ?

A I have made a number of tests covering in a general way the principal part of the area in this valley below the mouth of the canyon irrigated by the provo River.

Q Well, what particular portion of this area in this valley as it has been defined here , such as Provo City, Prove Bench?

A Starting at the head of the valley there the Provo Reservoir Company, a number of tests were taken on that Provo Bench, the west Union.

Q Did you make any test or observation on Provo Reservoir land in this valley? A. Yes sir.

Q What was the character of the lands? That is, of the soil, speaking now generally as to the nature of the soil?

A I can give it to you from my notes here.

Q Refer to your notes.

A I haven't got these separated out that way, they are just lined up just the way I went to them.

Q Now, for convenience then for your convenience and ready reference I withdraw the question relating to provo Bench and ask you what place you visited first to make particular examination. Just a moment, did you make these notes as you went along?

A Yes sir.

Q At the time?

A Yes sir.

Q Go ahead.

A The first place was on June 7th, under the Provo Bench Canal.

MR. COLEMAN: What year?

A 1916. Excavation for a house belonging to Irwin Jones. The formation there is described as eighteen inches of clay loam and gravel, twelve inches of gravel and clay loam, eighteen inches of cemented gravel. That was approximately to the depth of the excavation

Q What is the surface soil, That is, the part that would retain the water for the crop, what is that?

A It is a gravelly clay loam.

Q Gravelly clay loam, and that is underlaid with what,

A Why, you might say more gravelly clay loam. That is, I put gravel first because there is a larger percentage of gravel and underneath that is cemented gravel.

Q Do you recall in your experience in Strawberry Valley Project any land similar to that? A. No sir.

Q No land similar to that? A. No sir.

Q From you from your general reading and wider experience any

opinion as to the requirements of water for land of that kind?

A Yes sir.

Q State in your judgment what would be the duty of water at the land or -- that is, the quarter section for that land?

MR. RAY: Just a minute. May I ask the witness a question to predicate an objection upon. Have you ever had occasion to irrigate yourself lands of that character?

A Not exactly that character.

MR. RAY: Have you read works as to lands which you were able to say were exactly of that character?

A Somewhat similar.

MR RAY: Somewhat similar?

A Yes.

MR. RAY: No complete similarity between them?

A I wouldn't say it would be exactly the same.

MR. RAY: Well, were they comparable so far as you know?

A I should say so yes.

MR. RAY: Will you state where those lands were that you read about?

A I think they have similar material in some of the experiments carried on in Idaho.

Q You don't know what the dimatic dondition there are in comparison with the climatic conditions on this Bench, do you of your own knowledge? A. No.

MR. RAY: We object to his opinion as incompetent, irrelevant and immaterial.

THE COURT: Objection is overruled.

MR. RAY: Note an exception.

Q Did I understand you that you classed this particular spot you are talking about as clay loam?

A Gravelly clay loam, yes sir.

Q You may give your opinion as to what the duty of water would

be per quarter section?

A In order to answer that it would be necessary either for you or me to make certain assumptions. Because the duty of water -- class of soil is only one of the factors that affect the duty of water.

Q I think I see what you mean. I will put the question, reframe the question, and ask you what would be the duty of water for the land delivered at the quartersection, the land is managed and handled by a careful irrigator, and by one who has his land in proper condition to receive the water through cultivation, giving you this now first, in other words, where a reasonably high degree of efficiency exists both in the handling and in the means of getting the water on to the crop?

MR. RAY: Now, I object to that on the ground that the opinion of witness in that respect is irrelevant and immaterial, and upon the further ground that the hypothesis is uncertain and answer cannot have any value to the court. By answering "I mean with a reasonably high degree of efficiency" is so relative a term from the standpoint of the expert, the court and farmer, that no one can understand what he may have in his mind in answering such a question.

THE COURT: Objection is overruled.

MR. RAY: Note an exception.

A In addition to that assumption it will necessary to assume whether or not the water is available at the time that the crop requires it.

Q Well, make that assumption and then answer the question.

A Under those assumptions then in addition to that will depend on what kind of a crop you are going to raise.

Q Well, take alfalfa, a crop which runs through the season and probably requires as much water as any other.

A I should say that soil would require about thirty-six inches.

Q About thirty-six inches running through the season?

A For a crop like alfalfa, that is, an irrigating season of about four months.

Q Now, that is delivered at the quarter section on which the land is situated. Now, have you in mind, as a man of experience, from those matters, how that water would be distributed through the season. You have assumed, or we have assumed that the water is avaibable when needed. Now, when would you say under or inary circumstances it would be needed at the various --

A It would be needed between May first and September first.

Q That is the general time within which --

A Alfalfa requires irrigation during the entire season and the moisture content of the ground should be kept as near uniform as practical during that season. Quantity that would be used

Q would vary somewhat according to the time of the season and regarding temperature, but that does not affect it largely and I would say the requirement of water would be practical uniform during the season.

Q What can you say now whether that particular land you are now testifying about requires a higher or lower duty of water than the average lands of the country?

A Higher. That is a lower duty but larger quantity of water.

Q Larger quantity of water. That includes, as I understand, if I understand the past -- your answer to former questions, that includes allowance for the necessary waste?

A Yes sir.

Q About how many waterings would that land require during the period you name for alfalfa?

A Well, about six.

Q Six waterings. How many crops would you expect of alfalfa?

A Three.

Q That would be about two waterings to a crop?

A Yes sir.

Q Six inches at each irrigation? A. Yes sir.

Q Now, you may take another sample?

A The second sample was taken very close to this and indicates that there is at least in that direction, that kind of soil, only extends for a very short distance.

Q The kind you have described?

A Yes.

Q And proceeding then with the next -- it has been suggested to me to ask you just to put that three feet, acre feet that you have given us, or 36 inches, into seconds, into duty in second feet.

MR. RAY: For a period of four months.

A For an irrigation period of four months it would be stated in second feet as 80 acres to the second foot.

Q Before leaving that I will ask you one further question, would there be any difference in the requirement for water at the first irrigation in the season?

A It usually -- as far as the crop is concerned it would not be any difference, but usually requires little more water to irrigate the first time.

Q For waste?

A Yes, waste, or the ground seems to take up a little more. It is usual and practical irrigation I have noticed that it usually requires a little more the first irrigation.

Q Now, proceed with your second example.

A It was on ground belonging to Joseph Bridgeman about four hundred feet southwest of the Jones place, Excavation for a house that I have previously given. Twenty-six inches of clay loam underlaid by light colored clay, mixed with very fine sand and small percentage of gravel.

Q What did you say was the depth of the clay loam? surface?

A 26 inches of clay loam, underlaid by light colored clay mixed with fine sand and small percentage of gravel.

Q In your experience in Strawberry Valley or otherwise, or in your general reading, have you any lands in mind comparable with thissecond example?

A We have lands that are very similar in general character. Might be a slight difference in the way it would be described.

Q Have you land which, in your judgment, similar xxxx as to its ~~this~~ requirement for water? A. Yes sir.

Q Have you then an opinion of this second example you are furnishing us, as to the requirement for water?

A Yes sir.

Q Delivered at the quarter section?

A Yes sir.

Q You may state what your opinion is?

A Under the former assumption regarding first class cultivation?

Q Yes.

A And different methods of irrigation and benefit of the water when the crop requires it and kind of crop -- is this alfalfa?

Q Same kind, I will confine you to alfalfa and then ask you general questions later on in relation to other crops.

A I would call that about thirty ~~s~~ inches for alfalfa.

Q Two feet and a half? A. Yes.

Q And I assume your answer would be the same as before as to the times of using? A. Yes sir.

Q And period of use? A. Yes sir.

Q And what would be the duty in second feet on that item?

A 96 acres.

Q The duty would be 96 ?

A For the irrigation period of four months.

Q Now, the period necessary to irrigate wheat and other cereals, what do you say the time is, period of irrigation?

A For the grains irrigation season would begin about May 20th, and close about the 15th of 20th of July.

Q Practically two months?

A Practically, yes. Good many cases be a little ~~but~~ bit less

than that, average probably little less thanthat.

Q During the period of irrigation what would be the requirement as to water compared to alfalfa?

A It would be, for instance on that last soil, it would be in the ratio of about two feet to two and a half?

Q Two feet to two and a half in depth on that land?

A Yes.

Q Speaking now of the first class of land?

A The second.

Q Two feet for grain, two and a half for alfalfa?

A Yes.

Q Now, this is based upon the assumption of, as I said before, for reasonably high degree of efficiency, both in the handling of the land and the water, use of good husbandry in both; now, have you a judgment?

MR. RAY: May the record show with the order of the court that we have the same objection and same exception to each of these experiments?

THE COURT: Yes.

Q Now, what I wanted to ask you is what would be the requirement for water in your judgment, if you have an opinion, in case of the land and water being handled as it is handled by the average farmer in the valley here, as you are acquainted with it. You have given it the highest degree of efficiency.

MR. RAY: We object to that without waiving our general objection, on the ground it is not shown he is familiar with the methods of the average farmer.

THE COURT: That is included in the question if he is, that was one of the elements in the question.

MR. THURMAN: Yes, I put in the word in there somewhere and I meant it to apply to whatever contingency exists.

A I am familiar with the average methods of farmers in the neighborhood of Spanish Fork, Payson and the country where we have

been under the Strawberry Valley project where we have carried on these investigations.

Q I shall assume, unless it is objected to, that the average farmer in one place averages up pretty well with the average farmer in other places, you may base it upon your knowledge.

MR. RAY: We renew our objection.

THE COURT: Objection is sustained. I think the question has been answered, however. My view, Mr. Thurman, is, that a reasonable degree of efficiency is that efficiency that is exercised by the average farmer.

MR. THURMAN: That is what I want to get at.

THE COURT: And the former question is the same as this in a different form.

MR. THURMAN: I wanted to get before the court as I did in the beginning, his views, what would be the duty in case of a reasonably high efficiency, and then I propose to follow that up with this idea -- your honor has stated it in better form than I did,

THE COURT: I think the question has been answered. In other words, I regard a reasonable degree of efficiency as being equivalent to that degree of efficiency exercised by the average farmer. That would be my view of it.

MR. RAY: If your honor please, that was the basis of my objection, and if I may be permitted I will make this observation. Mr. Larsen testified that in his experiments he had selected the best farmer and the best farm, and that his observations were predicated upon -- his opinions were predicated upon those observations, and I had the theory in my mind when the question was asked there would be a distinction between his efficiency and the efficiency your honor has in mind, and I still think there likely is just such distinction.

MR. THURMAN: He also said he turned down some farmers because of the lack of efficiency, so while sliding down he

must have struck an average and had some familiarity with it.

MR. RAY: Yes, but he didn't experiment with those except for elimination.

MR. THURMAN: He experimented with those he turned down and knows the result.

THE COURT: I think the evidence on this subject goes more to the weight of the evidence of the witness and how it shall be construed than to its admissibility.

Q You understand what I want now?

A Yes sir, I think I understand what you mean. In our work here it was done for the purpose of determining the duty of water and was naturally figured on the basis of first class method of cultivation and handling of the crops and the duties that we arrived at are based on that assumption that we have first class cultivation, good efficiency in the handling of the water, that the water is abailable when the crop needs it and then the duty of water varies then with the soil and kind of crop that you are raising.

Q Now, taking these results, reasonable effiency both in the handling of the water and land such as the average farmer uses, as you find it, what would the requirement of the water be at the land?

MR. RAY: Same objection, your honor.

THE COURT: Objection is overruled. I want to hear the answer to see whether the witness had in mind any distinction.

MR. RAY: Exception.

A Yes sir, I have. The average method of irrigating, as I have observed it, is not what I would call first class method and would naturally require little more water than the places on which we arrived at our estimates of what the duty of water should be.

Q Well, have you an opinion what would be required on the first

example you gave us on the Provo Reservoir land, Provo Reservoir Company's land.

MR. RAY: Now, your honor please, I object to that as irrelevant and immaterial as how the Levan and Payson farmers would farm the Provo Reservoir land, and it is not shown he knows how the Provo Bench farmers farm their land.

THE COURT: I don't think it is material. I think the average farmer, the farmer of average efficiency and care and skill in the apllication of water would be the test, regardless of whether it was in Payson or on Provo Bench.

MR. RAY: I grant that, your honor, and I did not state my position clearly, but the average may use one quantity there and give Mr. Larsen an opinion, but the average farmer might operate very differently on Provo Bench, because he may be dealing with a different condition there.

THE COURT: I don,t get your distinction exactly. The objection is overruled, he may state.

MR. RAY: Note an exception.

A I think the difference in what I would call first class and average would amount to probably four to six inches in the depth of water.

Q That would be the penalty the system would have to pay for waste? A. Yes sir.

Q And inefficiency farming also, degree of efficiency?

A Yes.

Q Now, you may give us another class of land, taking them in the order you have got, if you have a different class, and state the place where?

A The third place is John D. Dixon orchard.

Q Hohn D. Dixon't orchard? A. Yes sir.

Q That is Provo Bench? A. Yes sir.

Q Describe it?

A 20 inches of clay loam mixed with gravel, underlaid by a mixture

of gravel, clay and sand.

Q Now, is that a different class, requiring a different quantity of water than the last referred to?

A It is somewhat different.

Q What opinion --

A Slight difference in soil, doesn't affect the quantity of water to any extent.

Q What do you say as to the duty of water on No. 3 for alfalfa.

A It ought to be perhaps about a mean of the other two.

Q That is between thirty inches and thirty-six?

A Yes sir.

MR. RAY: That, Mr. Larsen, is with the same assumptions?

A Yes sir.

Q That is under the high degree of efficiency?

A Yes sir.

Q Now, for the average, assume you would allow the same allowance for waste four to six inches?

A Yes, about the same thing.

Q Proceed with the fourth.

A Provo Bench Canal, Mane Draper is the owner of the ground.

MR. JOHN E. BOOTH: Wayne, W-a-y-n-e.

MR. RAY: M-a-n-e.

MR. CORFMAN: Marion, but it is called Mane.

MR. THURMAN: Anyway it is Draper.

THE WITNESS: That is the way the name was given to me. Located threequarters of a mile west of the Orem Station out here on the Bench.

Q Describe the land, the character?

A 18 inches of sandy clay loam.

Q 18 inches sandy clay loam. Subsoil?

A Underlaid by light colored clay mixed with find sane. Hole was four feet deep.

Q I haven't asked you anything about the water plane there, was there such a thing found?

A No sir, not in the observations that I made.

Q That doesn't enter as a factor?

A No sir.

Q What in your opinion is the requirements of water for that land, duty?

A It will be about the same as the second tract.

Q That is thirty inches?

A Yes.

Q All this now is on the assumption of a four months irrigation period for alfalafa? A. Yes sir.

Q You may give us your fifth example, if you have it?

A Linden Second Ward Meeting House, excavation for foundation.

Q Second Ward Meeting House where?

A On the Bench under the Provo Bench Canal. 14 inches of clay loam, thin layer of cementing material underlaid by gravel, clay and sand. Excavation eight feet deep.

Q In your opinion what would be the requirements of water for that land for alfalfa?

A On the same assumptions I would say about thirty-six inches.

Q And about the same as the first number?

A Yes sir.

Q Any others on the Provo Bench, or you can follow your order as you have it?

A Next observation was on land under the Provo Reservoir Company, land belonging to Sam Swab.

Q Was that on provo Bench?

A Yes sir, orchard located about three quarters of a mile east of the Linden Second Ward meeting house, eighteen inches of clay loam underlaid by heavy clay. Hole was dug three feet deep.

Q What is the duty on that?

A It would be a little less than any other soil we have had.

Q What would you put it to feel safe?

A Clay hard to distinguish on so many different grades, but say twenty-seven inches for alfalfa.

Q Twenty-seven inches? and did your estimate as to the requirements for grain as you give it on the first two or three, that will apply to all of these, will it, in the same ratio, at least?

A Yes, in a similar ratio.

Q Proceed with the next?

A Provo Bench Canal, location is a quarter of a mile east of Linden school, John Wright is the owner of the land, pnx planted to sugar beets, two feet of clay loam underlaid by clay.

Q Clay loam underlaid by subsoil clay?

A Yes sir, practically the same thing as the last.

Q Twentysewen inches? A. Yes sir. The next is under the Provo Reservoir Company.

Q It is on Provo Bench? A. Yes sir. The owner of the land was D. M. Crandall, the crop was alfalfa, twenty-four inches of clay loam and gravel, underlaid by gravel sand and clay mixture. Dimensions of some of the rock below two foot. Limit six to eight inches, hole three and a half feet deep.

Q What is your next -- as to the duty?

A For alfalfa. about thirty-six inches. Next was under the Timpanogos Canal.

Q Timpanogos Canal? A. Yes sir, the owner of the land W. M. Roylance, orchard, eighteen inches of clay loam underlaid by heavy clay, hole three feet deep, practically the same thing as couple that were taken over on the Bench.

Q Unlderlaid by clay? A. Yes sir.

Q Twenty-seven inches then?

A Yes sir.

Q Just once for all, convert that into a duty second feet, if you will, for the benefit of us.

A Oh, be about 88.

Q You gave 96 on two and a half.

A I was just reducing it from three feet. That is right, it would be a hundred acres.

Q Go ahead with the next one.

A The Upper East Union Canal corn field, top of bench just below canal, 18 inches of sandy clay loam, 12 inches of finer sand with a small percentage of clay underlaid by sandy clay, holw three feet deep. Lane belonging to A. B. Christensen.

Q What do you find the duty of that to be?

A It ought to be about thirty inches.

Q Thirty inches. Before you proceed with the next, you spoke of the one before, next before that, of Roylance orchard, I want to ask you one question about orchards, what can you say as to the duty of water on orchards.

A Duty of water on orchard under the same assumptions that were made for the other crops, I would place it 18 inches.

Q That for a bearing orchard ?

A Yes sir.

Q And when would that irrigation be, what would be the period of irrigation?

A It would vary a little bit with the season, but ordinarily runs between about the 15th of June and the 15th of September.

Q About three months.

MR. RAY: May I ask a question, is that for all classes and characters of soil, 18 inches?

A That is for the average condition, there would be a difference, of course, where you had an extremely porous subsoil, where the practical irrigation of it would necessarily lose more water than if you had a less porous subsoil.

Q Take the Roylance land as you found it and gave it.

A 18 inches would be plenty.

Q Your next number?

A Timpanogos Canal, the owner of the land was Paul Saulier, one

foot of gravel clay loam, one foot of gravel mixed with clay and sand then sand and clay.

Q Duty?

A That was the only sample of soil I ever seen that was exactly that character, and I don't think there is very much of it in the valley. Might be. I never have seen any soil just like that. As I said before, the slight difference in the character of the soil, is not material as long as you have the fertility and necessary depth of soil to hold the water around the plant root.

Q The main difference, I take it in duty is in this facility for wasting, for losing it.

A That gives you the ~~bx~~ biggest chance to waste water.

Q Well, do I understand you don't have an opinion on this. If you have you may give it.

MR. RAY: I object to the witness giving an opinion upon this, upon the ground it appears he is not qualified.

MR THURMAN: He seems to have a soil there that is a mixture or conglomeration of all the rest that has been mentioned here.

THE COURT: Objection is overruled, I think he may express an opinion.

MR. RAY: Note an exception.

A I think to be safe you could place that on the same basis as what we had down as the thirty-three inches.

Q Midway between the first and second you gave?

A Yes.

Q Very well, proceed.

Q Next was the bank of the Mill race about seven hundred feet below the Smoot Lumber Company. Exposed in the bank there the soil was about five feet of clay loam, mixed with gravel.

Q What, in your judgment, is the duty there?

A On that character of soil I would put it about 33.

THE COURT: 32 or 33?

A 33. I put it 33 because it is half way between 30 and 36. I don't pretend the estimate is close enough so that it is within an inch or anything of that kind.

Q You are just giving your best judgment?

A On the 6th West street, about half a mile south of railroad tract east of the Tanner Race, sugar beet field belongs to Taylor, 12 inches of clay loam, 12 inches of clay, then sandy clay mixed with gravel.

Q What is your judgment as to the duty on that?

A Be about an average, say 30 inches.

Q You call 30 inches about an average? A. Yes sir.

Q Requirement for water? A. Yes sir.

Q In the lands you have examined.

A Little Dry Creek about three hundred feet north of Center Street, in the interurban barrow pit about two feet of clay loam underlaid by sandy clay loam, gravel and rock, that comes in the same class as the thirty-six inchs on the bench.

The Fort Field, the owner of the ground is Ralph Holton, an orchard. On the north side of Center Street, two and a half feet of black clay loam, underlaid by sandy clay water at three feet. hole three and a half feet deep. The duty of water on that under the same assumptions would be higher than on any other land we have so far tested, on account of the fact that the water plane is so near the surface.

Q How is the capillarity?

A Well, that is a relative term and might mean different things to different people, but I say for the ordinary class it is good.

Q I understand you that the ground water plane there is so close to the surface as to contribute something to the irrigation of the crop?

A Yes sir.

Q For that reason the duty is higher?

A Yes sir.

Q That is, the applied water?

MR. COLEMAN: You didn't give the duty.

A For alfalfa here I don't think you would need anywater, it might kill your alfalfa off account of it being so close to the surface. I have seen alfalfa growing on land that had the water plane about that close and might not grow very good, I could not say positively about that, but other crops would require water.

Q And wouldn't require so much you say?

A It would require less and all other crops would require water.

Q Have you any idea of the duty of water on that say for grain, or crops other than alfalfa, beets?

A About twenty inches would be sufficient. The Fort Field, Knudson farm on Center Street near Utah Lake, ditch about four feet ~~sp~~ deep, black clay loam small percentage of sand. There was no hold dug there. It was evident that the excavation was probably a little below the water plane, on account of the fact there was water coming out into the ditch, but the water plane is probably a little closer than four feet.

Q What is the duty of that Fort Field?

A For grain and sugar beets?

Q Well, have you a duty as to alfalfa?

A If the water plane is down four feet, I should think about two feet.

Q For alfalfa? A. Yes sir.

Q Suppose it is above four feet, the water plane?

A Well, this other tract, the water plane was up to two and a half feet, I couldn't say just as to what point it would be advantageous to irrigate it.

Q Now grain crops, beets, what would be the duty?

A About 24 inches.

Q You make some difference between that and alfalfa on account of the roots of alfalfa going down to water, I understand it.

A How is that?

Q I understood you to give about 20 inches for alfalfa.

MR. RAY: Not on this tract.

A I think I said 24 inches.

Q The next one -- you know if these are within the Provo City system?

A I think I named the district, last two what they told me was the Fort Field.

Q How many did you give in Provo District?

A I don,t believe I have given any.

Q All right.

A On June 9th, Provo City, 5th East between 4 and 5 North, on land belonging to M. S. Goodmanson, two feet of clay loam, two feet of sandy clay underlaid by fine sand.

Q The duty?

A Be an average about thirty inches for alfalfa. Provo City, corner of 4th East and 1st North on lot belonging to Mr. E. E. Gorfman, 18 inches of sandy clay loam, very little gravey, 12 inches very sandy clay, fine sand, small percentage -- very fine sandy clay and small percentage of very sandy clay, soil thirty-nine inches deep, gravelly sand and clay in the bottom, that would be about the average, Provo City, corner of 4th South and 3rd East.

MR. BAGLEY: What was the duty on that land?

MR. THURMAN: Aferage he says that is 30 inches.

A 18 inches of sandy clay loam underlaid by sandy clay, some gravel in bottom of hole four feet deep, same thing as last. Provo City, corner 3rd South and 1st West, 15 inches sandy clay loam. Unable to go deeper account of gravel.

Q What is the duty on that?

A Well, just be the amount necessary to be wasted on account of the gravel.

Q What in your judgment would that be?

A Depends on the nature of the gravel which we did not determine, degree of openness and how much clay material was in the gravel. Assuming the average conditions of gravel there, I should say about 33 inch class.

Provo City on the west side of Academy Ave, one half block north of the northwest corner of the University grounds, 24 inches of clay loam, small percentage of gravel, underlaid by gravel of varying size mixed with clay and sand.

Q Duty?

A That would be in the class just above the average.

Q 33.

A Yes. Provo City, 5 North and 8 West, sandy clay loam two feet unable to bore deeper on account of gravel. That would be subject to the same questioning as this one over here, because of not having determined the extent of the clay filling in the gravel. Wouldn't make any difference to the crop what that condition was, but it would be harder to irrigate without loss depending on how coarse it was.

Provo City between 10th and 11th West on Center street, hole dug for power line pole three feet of clay loam underlaid by gravel, mixed with clay and sand. That would be in the class just above the average.

6th South -- that was said to be in the Ford Field, but nobody seemed to know, the gentleman with me did not know for sure whether it was within the limits of the Fort Field or not. It belonged to a man by the name of Martin Christensen and is pretty well down in the southwest. Soil is a clay loam, small percentabe of gravel, more gravelly in the bottom, hole four feet deep, that would be about the average.

First Ward Pasture near the north end 18 inches of clay loam with a small percentage of gravel, underlaid by clay, with a small percentage of sand, ground water at 18 inches, hole two and a half feet deep, apparently more gravel in the

bottom of the hole. That would be in the highest duty class.

Q That would be 160 acre duty?

A 20 inches for a cereal and sugar beets.

Park and Nuttall, that is way up near the mouth of the canyon --

Q Do you know whose land it was?

A It is Park and Nuttall, I believe it is independent water right, I don't believe it belongs to any system.

Q That don't make any difference.

A It is about six inches, gravelly clay loam, underlaid by cobble-rock, gravel, clay and sand. That is a very hard character of land to irrigate without loss on account of the very porous condition of the subsoil.

Q Think that xxx would require a lower duty of water than the others? A. Yes sir.

Q Will you fix the amount.

A I never had any experience with that kind of soil, it would be more than any other kind of soil that we have discussed, and it would depend upon the xffs efficiency of applying the water.

Q Under the assumptions you have made already, what would you say to that part of the ground. High duty of efficiency in handling.

A Well, I think it would be advantageous where it was applied efficiently perhaps, to use as much as four feet on that kind of ground.

Q Before you leave that have you any judgment or opinion as to the best way to irrigate that kind of land as to whether long runs or short runs, rushing the water over it?

A In irrigating that kind of land, it xxxx ought to be prepared in sections, if you are going to flood it, ought to be prepared in sections with a little levee on each side and flooded between those levees and runs made short and shorter in proportion, shorter or longer in proportion to the porosity of the subsoil, so that a comparative large head of water can be

turned on and run across in a hurry and taken off and put on to another place. If it is run across hurriedly it will do just as much good as if you would keep it there a long time andwaste the water by deep percolation.

MR. JOHN E. BOOTH: Under those conditions the water would need to be applied oftener?

A Yes sir, and if you have more water to use and try to use it so as to use as little as possible at each irrigation.

West Union Canal about two thousand feet west of Blacksmith Olsen's house, that is down near the -- just off the bench down northwest of the town.

MR. JOHN E. BOOTH: That is under the West Union Canal?

A Yes sir.

MR JOHN E. BOOTH: Below the canal?

A Yes sir. Two and a half feet of sandy clay loam, ground water at two and a half feet. That would be in the highest duty class.

MR. THOMAS Just a moment, please.

THE COURT: That would be 20 inches?

A For cereals, yes. The West Union againk about a hundred and fifty feet west of the railroad track and about seven hundred feet north of the D. & R. G. & S. P. & L. A. & S. L. crossing northwest of town where these railroads cross. Eighteen inches of sandy clay loam, underlaid by heavy clay, that would be in the average.

The West Union about one half mile north of Vineyard school house 18 inches of very sandy loam, underlaid by clay two and a half feet to water, that would be in the highest duty class.

West Union Canal at Cherry Hill Farm northwest of Provo, 12 inches sandy clay loam, underlaid by sandy clay, three feet to water, in the high duty class.

Q 36, you mean?

THE COURT: 20.

MRL THOMAS: That would be in second feet or acre feet?

A Yes sir.

THE COURT: 20 inches deep would be duty of 142.8 acres, as I figure it.

A Number of acres would depend on the length of the irrigating season.

THE COURT: I mean for this period. I understand it this is all given on the period of four months.

A Grain and sugar beets for the irrigating season of about two months, and duty would be only half as high.

THE COURT I supposed this was all given on the basis --

MR. THURMAN: All these numbers, I understand, are given on the basis of four months irrigation for alfalfa, except for grain it is reduced according to the time it takes, period of irrigation.

THE COURT: This 20 inches then is on the basis of two months, is that right?

A The are all given on the basis of actual measurement of water in depth.

THE COURT: Yes, but applied in two months?

A Applied in whatever the irrigating season for the crop is. For alfalfa the irrigating season is about four months, for grain it is about two months.

Q Let me ask a question right there then, where you give a duty of three feet for alfalfa which takes four months, would you give three feet to grain and put it all on in two months?

A No sir.

Q Give half the amount?

A I wouldn't give three feet to grain.

Q How much would you give to grain? Would it be in the proportion of the period?

A Upon several of the cases mentioned as average, I think, was placed about two feet.

MR. RAY: The witness answered that, I understood him he would give twenty per cent less in the case he mentioned for grain and alfalfa.

THE COURT: On the proportion of two to three, he stated.

MR. RAY: Two to two and a half.

MR. THURMAN: Ratio up two and a half to four.

MR. RAY: Two to two and a half.

MR. THURMAN: I thought it was two and a half for grain and three for alfalfa.

THE COURT: In other words, twenty four inches to thirty inches?

MR. RAY: Yes, that is what he gave, twenty per cent less.

MR. THOMAS: Now, may I ask a question just in passing, in second feet duty of water to acreage, what would be this proportion, one second foot to how many acres?

THE COURT: Which proportion do you refer to?

MR. THOMAS: Cherry Hill land, example given.

THE COURT: 20 inches for cereals.

MR. THOMAS: 20 inches would be in second feet per acre how much?

A 60 acre duty.

MR. THOMAS: And over four month's period --

MR. RAY: 106 2/3.

THE COURT: 20 inches applied during sixty days.

MR. RAY: No, I am not right on that.

MR. THOMAS: Let the witness give it.

A I figured it mentally as sixty acres, I might be wrong.

MR. THOMAS: Now that is cereals, now then, to alfalfa.

A We have no alfalfa at that rate.for that.

MR. THOMAS: No, but I say extending over a period of four months.

A Multiply it by the ratio of time. That is twice as long a time, the duty would be twice as high, that is,twice as many acres.

MR. JOHN E. BOOTH: Give it to us in figures, Mr. Larsen.

A If one is sixty acres two months the other would be 120 acres at four months.

MR. RAY: Now, may I ask a question there, I am sure that is not right. If you extended the period, doubled the peridd and left the acreage the same you would reduce the duty by half, wouldn't you, Mr. Larsen.

A How is that?

MR. RAY: If you extended the period from two to four months on the same ground, with the same relative duty, you would put forty inches on the same acregae, wouldn't you, instead of twenty?

MR. A. L. BOOTH: He said about twenty inches on four months would give you 120 acre duty.

MR. THOMAS: He fixed a certain amount of water for the land, and that would be double the time and increasing the duty.

MR. RAY: I get the distinction.

THE WITNESS: Those are all the examinations I made.

Q And those were made from the 17th of June to what date?

A Last were taken on the 9th. I was out in the field on the 7th and 9th.

Q Did you make any examination at all either ~~furrow or~~ thorough or cursory up in Provo Valley? A. Yes sir.

Q In the Wasatch County? A. Yes sir.

Q When was that?

A I went up to Heber on the evening of the 9th and on the 10th was employed in examining the soils in the neighborhood of Midway under the Wasatch Canal.

Q Were you shown the vicinity of the Wasatch Irrigation Company's land? A. Yes sir.

Q Did you make any examination of those lands?

A Yes sir.

Q State what you did?

A Wasatch Irrigation Company, the first examination made of the soil was in a beet field north of the four mill east of Heber.

Q North of the flour mill, east of Heber?

A Yes, sir, 18 inches of clay loam, underlaid by clay, very small percentage of gravel.

Q Duty?

A I would place that average class.

Q 30 inches?

A To alfalfa, yes.

MR. WILLIS: Whose field was that?

A I haven't the name of the field, it is just across the street from the mill, north of the mill.

Wasatch Irrigation Company, about six hundred feet south of the cemetery on the west side of the road.

Q South of what?

A About six hundred feet south of the cemetery on the west side of the road, that is over on the north side of town. Two feet of clay loam underlaid by heavy clay.

Q Duty?

A That ought to be a little better than the average, I don't know just what, better call it average, I guess.

Q 30 inches, did you say better call it thirty?

A Yes, quarter of a mile south of the mill, that is, going on south from the flowuring mill along that canal.

MR. WILLIS: Do you know the name of any of this land or who the owners are of any of this land you made tests of?

A This near the cemetery, examination was made in the ditch bank.

MR. WILLIS: I asked you if you had the owners of any of these lands you made tests on?

A I don't know, I have got some, but not on these two. Did I finish that last one?

Q No.

A Quarter of a mile south of the mill, clay loam with a small percentage of gravel, that would be about average.

R. A. C. HATCH: Do you know whose land that was?

A No, I didn't have the name of the owner there. Wasatch Irrigation Company, one-half mile southwest of mill and southeast of Heber City, land belonging to John Clegg, heavy clay loam, with a small percentage of sand and gravel.

MR. RAY: You don't give the depth last two, have you that?

A The last one I read was four feet, I guess I didn't read it, I haven't the depth down here, but it was about thred and a half feet.

MR. WILLIS: Which one do you refer to?

A The last one, on the John Clegg land.

MR. HUFFAKER: About three and a half feet?

A Yes sir; heavy clay loam, small percentage of sand and gravel. I guess I read that, that would be about average. The land, to look at it would give yo u the idea it was somewhat gravelly. There is some gravel scattered along the top, go to dig into it and very little gravel that shows up.

Wasatch Irrigation Company, one-fouth mile south of city park, southwest corner of Heber City. Clay loam and small

percentage of sand and very little gravel, three and a ~~af~~ half feet deep, that is about the same class as the other.

Wasatch Irrigation Company, about three-fourths mile south of the south side of Heber, on road leading to Charleston, gravelly clay loam and cobblerock, more gravel and rock with depth. Hole two and a half feet deep, land belonging to Joseph Smith, that is a class of soil that I have never see anyplace else. While the formation and nature of the material is farily compact clay material and these boulders are, as near as I could observe from what work we did there, they seemed to be pretty well bedded in this clay material, so that the loss from deep percolation on account of the presence of the rocks, assuming that is the condition, would not ~~as~~ be large, because the stone, the presence of the stones themselves if they are -- if the openings between the stones are fairly well filled with a fairly dense material will not increase the loss on account of seepage. If the stones would lay in an open way or filled with a very coarse material, of course, it would be -- conditions would be entirely changed on account of the fact it would impracticable to irrigate without larger losses.

Q What do you fix the duty on that land?

A With what knowledge I have of it from that, from the hole that we dug, and from examining about half a dozen other holes, that had been dug by somebody else across a field about a thousand feet from there noth, it all went to indicate that the spaces between the rock was ~~wi~~ well filled with a fairly dense material, and I should say that the duty of the water would be about the medium, just above the average. That is all I have under the Wasatch.

Q Now, in all of these --

MR. A. J. EVANS: Is this all based on alfalfa?

A This is all on the same assumptions we made to start with.

Q Four months period for alfalfa?

A Yes sir.

Q And modifying that in the ratio you have given for grain and other products? A. Yes sir.

Q Now this addition of from four to six inches, if I understand you, is the reward given in watering for inefficiency?

A Yes sir.

MR. RAY: I object to that and move the answer be stricken. That is a question of law, what the irrigator is entitled to, and not a question of the opinion of this witness. The court gives the degree.

MR. THURMAN: That is not the idea at all.

THE COURT: I don,t so understand it. That is his estimate of the difference in the quantity of water used by the average farmer and those under ideal conditions with a high degree of efficiency.

MR. RAY: Hestated that, I didn't object to that.

MR. THURMAN: Now, I wanted to add the general application.

THE COURT: You don't desire by this question to change the estimate made heretofore and the basis upon which it was made?

MR. THURMAN: No.

THE COURT: Then the answer may stand and I will regard it merely as a reiteration of the former statement.

Q Now, I will ask you if you were up into the Kamas country?

A Yes sir.

Q In summer. Before going there, however, I understand you this is all the examinations you made in the Wasatch County?

A Under the Wasatch Canal.

Q I am going too fast then. Did anyone point out to you the land irrigated by the Timpanogos Irrigating Company?

A Yes sir.

Q Did you make any tests? A. NO sir.

Q Could you state ~~as~~ generally from appearances whether it was the same general class of land as the Wasatch Irrigation Company?

MR. THOMAS: Just a moment, I object to this as being incompetent.

Q I will withdraw that and ask you this, are they adjacent to the Wasatch Irrigation Company's lands?

A Yes sir.

Q Do you know ~~s~~ if some of them lie under the Wasatch Canal?

A It was explained to me the Timpanogos crosses the Wasatch. I have been over that soil towards the mouth of the canyon, and that is extremely rocky. I have never made any investigation on that, I don't know how it is connected.

MR. WILLIS: What canyon do you refer to?

A That is Fort Daniels Canyon.

Q Do you have an idea from your observation whether the lands of the Timpanogos Irrigation Company that lie right along adjacent to and above, whether they appear to be of the same general character as to requirement for water?

A I could not say whether the same character or not, on the dividing line they would naturally be similiar, I should think.

Q One tract blends right into the other, does it not?

A Yes, the Wasatch Canal comes around like that and Timpanogos on a higher plane above it.

Q Now, did anybody point out to you whatwas called the Wasatch Extension Company's lands?

A That is land lying farther south from where any of these tests cover.

Q Lies farther south than your tests covered?

A Yes sir.

Q You don't know whether it was more -- or whether it was the same general character or more rocky or less rocky?

A From traveling over the land it is my opinion it gets more rocky towards the canyon, but I never made any investigation to

determine. It has the appearance.

Q You understand they are under a ditch which is simply an extension of the Wasatch Irrigation Company's ditch, you understand that? A. Yes sir.

Q Did you go over into the vicinity or precinct of Midway?

A Yes sir.

Q Did you jxx make any examination there?

A Yes sir.

Q You may give us your -- that is under the Midway Irrigation Company's system of irrigation, that is true, is it, did you understand it?

A Yes sir, that is the information given me that was under the Midway Irrigation Company. On June 10th the first place examined under that district was a bank on the west side of Provo River as you go from Heber to Midway about six inches of clay loam underlaid by numerous layers of limestone and decomposed limestone in approximately horizontal layers. About as near as I could describe that soil. It is a class of soil I have never seen any place else.

Q Have you any opinion as to the requirements for water?

MR. RAY: Object to his giving his opinion on the ground it is irrelevant and immaterial, no foundation for it.

THE COURT: Objection is overruled.

MR. RAY: Note an exception.

MR. WILLIS: And on the further ground he says he is not familiar with it, and for that reason his opinion would be simply without ground at all.

MR. THURMAN: Now, that is not any further ground, that is the same ground Brother Ray based his objection based his objection on.

A I could give you an opinion from other observations and made right in the same locality west of here where the soils appear to be approximately the same. There was a number of observations

made and soil seemed to vary in depth from about six inches to approximately two feet, and at which elevation you would find this rocky material and this limestone material vary somewhat in its character being more dense in some places than in others, but in going over the ground there you would see in a number of places, you would find water standing on the surface which would indicate that it is not extremely pourous, and for that reason, with a sufficient soil to hold the water for crops, and if the rock is not extremely porous, the general quantity of water required should not be ~~xxx~~ greatly different from other soils.

Q What conclusion did you arrive at as to what would be a sufficient duty?

A From my observation of the depth of the soil and way the water stands in different places and fact the soil gets boggy in various places, I should say the quantity of water required on that class of soil would be about an average.

Q 30 inches -- how far was that from the river, do you remember?

A This first observation?

Q Yes.

A It was right close to the river.

MR. RAY: River bank?

A It was within a few hundred feet.

Q Have you any further from Midway?

A Near the southeast corner of the town of Midway in a grain field belonging to Jim Hamilton estate, 15 inches of clay loam underlaid by rock, That is the same material, subsoil being about 15 inches. Then we went out to what they call a Dutch field on the north side of Midway.

Q You mean that would be about the same duty as the first you gave?

A Yes, ~~xx xxxxxxxxxx~~ I explained -- explanation I made I intended to cover this character of land. From my observation there,

assuming it is not extremely porous -- there appears to be some difference in the porosity of the material in different places and may be places where it is different from other places.

Dutch Field, north of Midway, onehalf mile, in grain field, 12 inches of clay loam underlaid by heavy compact clay. Hole three and a half feet deep. That would be -- there ought to be a little higher duty than the average. It is hard to get enough classes to cover every little change, and I would place it in the average class. East of Luke's Hot Pot at Midway, ten inches of clay loam underlaid by rock.

Q By rock?

A Yes, by this limestone.

Q Was your attention called to what they call pot rock up there?

A That is what it is.

Q Did you notice that pot rock to see whether it was more porous than limestone ordinarily is?

A It looks like it was very porous.

Q Very porous?

A That is the appearance of it.

Q Would that waste water?

A It varies quite a bit in appearance, some places appears to be more compact than others and what I base my opinion on is the fact it don't appear to be -- my opinion as to its porosity was the fact in a good many places you see water standing on the surface, and land getting boggy in places, so that that would indicate that this rock formation held the water pretty well. I have never made any test to determine whether water goes through it very easily or not.

THE COURT: Did you give the water requirement of this at Midway, Luke's Hot Pot?

A That would come in that general class. A deep cut in a ditch about one half mile south of Midway, 24 inches of light clay

loam underlaid by clay, cut about six feet deep. This soil is little different from most soils I have seen. It is rather of a losse nature on top and the clay, after you get down, appears to be fairly compact, and account of the chalky nature, but the upper part of it is rather loose and I think it would be harder to irrigate than the average soil, for that reason, not that the soil would need more water but be difficult to irrigate it xx without using more water, and I should judge that it ought to be put in about the class about the average.

West of Charley Brunson's house about half a mile south of Midway 12 inches of gravelly clay loam, percentage of gravel increasing with depth, small percentage of sand below the one foot depth. Hole three feet deep. I place that in the same class. That is all the observations made at Midway.

Q Have you given us all in Wasatch County?

A That is all made in Wasatch County, that is all made in that valley.

Q Now, go to Summit County, Kamas.

A June 11th, west of Kamas, ditch bank shows about 18 inches of clay loam underlaid by heavy clay, ditch at the point this particular observation was made, was four feet deep.

MR. THOMAS: Where was this place? Give me the location little more definitely.

A It was some distance west of Midway.

MR. COLEMAN: Kamas.

A Kamas, yes, going across the bench, road you drive straight east into Kamas and there is a long lane there running about straight east. It was oneach side of the lane, and what I was examining was these ditch banks on either side. This particular observation represents a point in the ditch where it was four feet deep, but I could not give the exact location as to distance, except it was some distance west of Kamas.

The nest place where the observation was made was in the

town of Kamas.

THE COURT: I didn't get the water requirements.

Q Did you give the duty on that last? where you examined the ditch?

A Depends on what you are going to raise. They are not raising anything but grass on it now.

Q You mean by that that is all it is suitable for?

A Now, I think it would be first class soil.

Q What would it be in alfalfa, what would be the duty?

A Average.

Q Have you any opinion what it would be for the crop that is being raised on it, pasture?

A I don't know what pasture land requires, that is, I don't know how much water would be beneficial to use, I never made any experiment on that, wouldn't have much of an opinion what they would need on pasture land.

Q Well, do you know anything from your general reading and information derived from all sources so as to form an opinion whether it requires more or less than it would for other crops?

MR. WILLIS: Object to it because he says he doesn't know.

MR THURMAN: Well, a man of Mr. Larsen's experience and devoting his time generally to this subject, might have an opinion.

THE COURT: I understood Mr. Larsen to say no, he hadn't made such investigations and hadn't such information as to enable him to have an opinion on this subject.

MR. THURMAN: All right, I withdraw it.

Q State your next observation.

A As you go farther east along this lane, you come to the edge of a sort of delta on which the town of Kamas stands, and just happened that they were putting in a water works system

there and had a number of trenches dug all along Main Street, running north and south, and another trench running east and west, and the formation was fairly well exposed and I describe it here, 12 inches of gravel clay underlaid by cobblerock, clay and small percentage of sand. Trench was about four feet deep.

Q Your opinion as to duty for alfalfa?

A I think there would be -- it would be rather difficult to irrigate without loss and I think it ought to be placed a little higher than the thirty-six inch duty, and of course, that would all depend on the efficiency in handling the water, and on the same basis I should say that the ratio, fair ratio would be about forty inches.

Q Do you know whether that land is under any ditch in this system , or whether it is irrigated --

A This land in the neighborhood of Kamas?

Q This land that you have just now given us the example of?

A It is located, Kamas is located right at the mouth of what they call Beaver Creek, and is irrigated from Beaver Creek.

Q It is not irrigated from Provo River?

A Not unless Beaver Creek connects with the river.

Q Have you got any of the Kamas lands that are under the Provo River system?

A Yes sir, we went from there south, south of Kamas about half way to Provo River, ditch about four feet deep.

Q What is that?

A Ditch about four feet deep, examined in ditch bank about six inches of clay loam, underlaid by heavy clay. I would place that in the average class.

Q 30 inches, do you know what canal that was under?

A That was under the South Kamas and Washington, I believe. The man that was irrigating there was using water from both canals on that land.

The Washington Ditch is the highest ditch, the South Kamas comes out a little lower, but after you go north a short distance they come to about the same elevation, so that the water from both canals can be used on the same land.

Q Those canals are both from Provo River?

A Yes sir. South Kamas and Washington, ditch about five feet deep, about one mile south of the last place, two and a half feet of clay loam, underlaid by heavy clay, same class,

Q Average duty?

A Yes sir. The banks of the South Kamas Canal near Woodland --

MR. THOMAS: Just a moment, if you know the names of the owners of these tracts, I wish you would give them.

A I haven't the names. This was in the canal bank. This next one is farther south and near the edge of the bench where you drop off into the river bottom. The banks of the South Kamas Canal near Woodland show about 12 inches of sandy clay loam, underlaid by heavy clay, ditch about three feet deep, that is the same class. Then went up some distance up Provo River on what was called Bench Creek. We crossed the river just little above the Woodland school and went up on the left bank of the provo River, along some farm lands that are being irrigated there. At the point about one mile above Woodland school, ditch bank two and a half feet deep shows rich black clay loam for entire depth, soil more porous than average clay loam, I should think it ought to be in the class above the average, thirty-three.

Q In that on the bench or bottom lands?

A That is on the bench.

MR. RAY: Did you give the subsoil there at all?

A No sir. Same ditch about a quarter of a mile from there, farther up, about two feet of rich black clay loam, underlaid by heavy clay, ditch three and a half feet deep. I will place that in the same class. That was as far up as we went on that side of the

river. We came back and went over towards Kamas and then took the road that leads west past Francis school. There is a school there called the Francis school, and this observation was taken a short distance east of that Francis School, about half a mile. Ditch five feet deep, on cross road between Kamas and Provo River watered from South Kamas and Washington Canals, about twelve inches of clay loam underlaid by heavy clay in the bottom of the ditch. Place that in the same class. Those are all the observations taken.

Q Those are all you made by the river?

A Yes.

Q 30 or 33?

A 30.

Q Just a further question about Wasatch County, did you make any investigation at all in the North Field, what is called the North Field, north of Heber?

A Yes, there is a North Field Irrigation Company. June 10th, south end of North Field between Heber and Midway about one fourth mile north of road between Heber and Midway, meadow on A. J. Cummings, black clay loam underlaid by cobblerock of varying size, bedded in clay, one foot to water. If this is a continuous condition, I wouldn't think it needs much irrigation.

MR. THOMAS: I didn't get the distance to water.

A One foot. It wouldn't need much irrigation way that was situated, water near to the surface and character of the surface down to that point such as to render irrigation unnecessary.

Q It is located in the bottom of the valley and it might be that is a permanent condition, it may be a temporary condition, what was that, meadow land?

A Yes sir, just on the west side of that on land belonging to Mart Jeffs, grain, of the same description, water one foot,

and the grain was not as well along as it is in this country, starting out and looking fairly well, but the surface of the ground wasn't dry. In some places it was entirely wet right on top. The ground water is so near the surface that it is dangerous condition to use land in, on account of the fact it is likely to be made alkaline by the evaporation of the water from the surface and leaving all the salts on top of it. Just what success a man would have with the use of water on land for the raising of crops with the water plane within one foot of the surface I don't know, I have never seen any experiment regarding that.

Q That is all the experiments you have made?

A That is all the observations made.

CROSS EXAMINATION By Mr. Willis.

Q Who was with you when you made these experiments?

A Which ones?

Q In Wasatch County.

A Why, on the day on the Kamas, I mean neighborhood of Heber, I was with Mr. J. R. Murdock and Mr. E. J. Cummings of Heber.

Q When you made the experiments near Heber?

A Yes, near Heber, Heber and Midway.

Q That was on June 10th?

A I believe it was.

Q I think that was the date? A. Yes sir.

Q Now, please refer to your first investigation and examination made near Heber?

A Yes sir.

Q Now, did you dig into the soil there, or how did you come to observe the soil, by what method in your first examination?

A There was a gentleman along there with a pick and shovel dug a hole.

Q How far did you dig?

A Three feet, so I have here, I guess that is what I read.

Q This is cross examination, I want some information whereabouts was that investigation made?

A It was made in a field directly north of a flour mill, east of Heber.

Q And did you find the subsoil more or less cobblerock there?

A No, there was no indication of cobblerock.

Q None at all?

A Small percentage of gravel.

Q Down as far as you went there was no indication of cobble rock at all? A. No sir.

Q And the porous or porosity of the gravel you think would be such that it would hold water fairly well, do you?

A Oh yes, with this small percentage of gravel it would not affect it.

Q What was the nature of the ground surrounding that in the immediate vicinity, did you make any investigations at all, as to the ground immediately surrounding where you made this examination?

A The surface condition appeared to be the same, examining ditch banks and so forth, did not appear to be any change, seemed to be a fairly uniform soil.

Q How much territory did you cover in examining, making the superficial examination immediately surrounding where you made the first examination?

A We drove along the road where you can see the ditch bank.

Q What roads did you drive over?

A I don't know the names of the roads.

Q What direction did you go?

A East from Heber along the road.

Q How far east?

A As far as the flour mill.

Q You didn't go east of the flour mill?

A No, that is as far east as we went.

Q You went along the main road leading from Heber to the flour mill?

A I think it is the main road.

Q And in passing along with a vehicle you noticed the territory as you passed along on either side of the road?

A Yes sir.

Q You didn't get out and make any examination of it?

A I examined the ditch bank in the neighborhood of the mill there.

Q Which ditch bank?

A The --

Q The canal bank, you mean?

A Yes, I guess it is a canal.

Q It is waste water coming from the mill, would it be?

A Yes.

Q Now, how close did you examine that?

A I got off and went down to the ditch bank and examined it.

Q Did you find the bottom of that canal to be cobble rock, loose cobblerock?

A There is cobblerock rock in the bottom.

Q Did you examine it to see whether that was simply a wash or whether that was the soil washed away and the bed of that stream was a natural bed of loose cobble rock?

A I didn't examine it, no, below the bottom, there is cobblerock in the bottom.

Q You would not attempt to say that was not cobble rock washed in there from some distance, would you ?

A I couldn't say whether it was or was not.

Q Why didn't you examine it to determine whether or not that was the bed of the stream of natural cobble rock?

A I didn't have time.

Q How much time did you spend in your examination of the soil in and around Heber City?

A One day around Heber City and Midway.

Q You wouldn't say that from the examination that you made, the time that you spent there that -- you wouldn't attempt to say that was the average donditions that existed there, wouldn you?

A These observations represented the average.

Q Average of the territory in the neighborhood of where you made those examinations?

A I wouldn't say it was or was not. I am basing my opinion on the assumption that the conditions are as these tests indicate.

Q Well, if you were trying to determine what the duty would be for land in that vicinity in order that you might come here before court and ~~intelk~~ intelligently testify here why then didn't you examine the bottom of the creek bed that you saw, and learn whether or not that was not a subsoil of loose cobble-rock.

A Wouldn't make much difference if it was, because it has the depth there. I didn't messure it, I should judge be at least six fee t to the bottom of the ditch.

Q Isn't it a fact that it is not eighteen inches long from the top of the bank down to the bottom of the creek bed of the waste water creek from the mill, that it is not eighteen inches on an average down to that cobblerock?

A You are not talking about the creek I looked at.

Q What creek did you see then?

A I saw the creek below the mill.

Q Whereabouts below the mill ?

A Westerly.

Q In what direction from the mill, immediately west?

A Yes.

Q And do you say that -- how far from the mill did you observe it?

A On the west side of the road.

Q Only follows the road a short distance, doesn't it?

A I didn,t follow it down, about two hundred feet.

Q Do you say that the bank there is, that the bank down to the bed of the creek shows a depth of six feet of soil before you come to the gravel, or to the bed of the creek?

A Yes sir.

Q An average of six feet?

A Well, in that distance I examined it there between the west side of the road and somewhere 150 or 200 feet west, that is approximately the depth of the creek.

Q Now, in order that I may clearly understand where you see this ditch going eastward fom Heber along the main road, do you remember when you get nearly to the mill, of the creek forking, and part of the creek running across the road and being bridged over?

A Might be, I couldn't say.

Q Then after you cross the forks of the creek that the creek runs right along the south side of the road or to your right, as you pass?

A I don't remember any creek down there at all. There are ditches down the re.

Q The ditch that you speak of was on the side of the main traveled road? A. Yes.

Q Which side?

A I don't remember exactly how the ditch is, how that is.

Q As a matter of fact then you didn't notice it, did you, particularly?

A The way the ditch runs.

Q The creek in its general conditions .

A Examined it at the point I stated.

Q How is it you cannot locate it, were you going eastward when you examined, or going southward?

A I was standing on the bank of the ditch examining it and went down the bank.

Q Can you say which way you were traveling in your vehicle when

you got off to examine the ditch bank prior to your stopping to get out of the vehicle to examine the ditch bank?

A Well, the vehicle had passed the corner and started south and then went up the road a little ways turned around and came back and turned around again and went back south.

Q And you examined the ditch immediately west of the mill on the road leading southward, did you?

A West of the road leading south on the west side of the mill.

Q Do you say the soil was at least six feet deep there?

A Yes sir.

Q Now then, where did you say your next examination was? That is, I mean in that vicinity?

A About 600 -- let's see -- about six hundred feet south of the cemetery on the west side of the road.

Q How deep was the soil there?

A Two feet of clay loam underlaid by heavy clay.

Q What did you find underneath that substance?

A I didn't go underneath it.

Q That is as far as you went down?

A Four feet deep.

Q Now then, in making these examinations in that vicinity I notice that -- or in determining the duty, notice you said it ought to be, the duty ought to be about so much, why did you make that statement, that is, I so understood you, Mr. Larsen, I don't want to say anything you didn't say?

A Well, under the assumptions that were made to start with instead of saying "ought to be" should have stated "it will be under those assumptions".

Q Then the conclusion that you would naturally draw is that your examinations were not such as to satisfy your own mind as to the duty of the water; then assuming certain things, you then drew these conclusions and said the duty ought to be as indicated in your direct examination?

A My answer is based on the assumption that the soil is as represented by the examination made in the field.

Q Then what assumption did you make in order todraw the conclusion that would make your duty somewhat doubtful?

A I don't understand your question.

Q What assumptions did you make then, you say assuming certain conditions to exist what assumptions did you take into consideration, what did you assume in connection with your examination, as to any examinations xt that you made?

MR. A. C. HATCH: I submit the witness just answered that question.

MR. WILLIS: I don't think so, your honor.

MR. THURMAN: He started out with the assumption here of efficiency, high degree of handling the water.

MR. RAY: Andavailablity.

MR THURMAN: I assume that is what Mr. Larsen now means.

THE COURT: I think Mr. Willis is attempting to find out whether he has indulged in any other assumption.

MR. WILLIS: I understood him to have other assumptions, I may be wrong.

THE COURT: I understood youto be enquiring whether there were others and if so what they were?

A The only further assumption in connection with it is that the land is as indicated by the tests that were made.

Q Now, you say it was different, or didn't you say it was somewhat different from any other land you had had experience with?

A In connection with this soil?

Q In connection with any soil, your examintions, there, if I understood you right, Mr. Larsen, was that you found conditions existing there different from anything you had observed in your experience, was down in this valley; didn't you so state?

A Did I say that in connection with that soil?

Q Well I will ask you did you or did you not?

A I don't think so.

Q Well, very well, I may be mistaken about it then. You said thoughthat you did in some of the examinations made near Heber you found cobblerock there in great quantities, didn't you.

A Yes sir.

Q And that you assumed as far down as that cobblerock went it was filled with a compact substance such as you found in that which you dug down, didn't you.

A I don't think I assumed quite as much as that.

Q You say you didn't -- refer to it, please, some of that ground that you measured out under the Timpanogos and see if that is not in substance what you said regarding it? Refer to your experiment made under the Timpanogog?

A The only point of difference is that you making me assume that condition as far down as it went. That might be a very indefinite distance.

Q What is your testimony with regard to cobblerock, conditions underneath the cobblerock, condition which you found as a subsoil in the examination made under the Timpanogog?

MR. A. C. HATCH: If the court please, I don't understand he made any examination under the Timpanogos at all, or testified to them.

MR. WILLIS: I understood that he did.

MR. THURMAN: I could not get anything out of him on that.

MR. WILLIS: I will go into this just where he made that statement by the afternoon recess and call his specific attention to it. I think he did so testify.

12:00 Noon, Recess to 2:00 P. M.

ANDREW B. LARSEN - - - - -

CROSS EXAMINATION by Mr. Willis continued.

Q Calling your attention, Mr. Larsen, to the examination made on the lands of John Clegg, do you remember that?

A Yes sir.

Q Laying south of the mill?

A Yes sir.

Q Calling your attention to the requirements of water as to that particular piece examined on the Clegg land, I will ask you if you can state whether the same conditions would prevail as to land lying half a mile south of the Clegg land?

A I couldn't say.

Q Could you as to the lands lying half a mile east of the Clegg land?

A More likely be the case, but I couldn't saydefinitely.

Q What, as to the lands lying west of the Clegg land?

A Is this place -- I don't remember whether that other place is straight west of it or not.

Q It is approximately. You mean the Joe Smith place, you made an examination on the Joe Smith land?

A That is the one that had the rock in?

Q Yes.

A I don't remember whether that is due west or not.

Q Well, it is approximately.

MR. A. C. HATCH: I don't understand Judge Willis is testifying in the case.

MR. THURMAN: It sounds like he was.

MR. WILLIS: Well, it is no evidence, if you fellows are afraid I might it is all right.

MR. A. CL HATCH: Our idea is di-fferent as to its being approximately west half a mile, south and half a mile west.

MR. WILLIS: I will withdraw that.

Q What would you say as to the land lying west of the land of

John Clegg?

A I think that a short distance southwest get into this rocky formation that I mentioned, but just what the distance is I

Q couldn't say.

Q You draw that conclusion from you -- from the superficial

A examination of the lands to the southwest?

A Yes sir.

Q Now, did you hear the testimony of Mr. Wheelon yesterday afternoon as to what he termed necessary waste to meet the requirements of percolation in certain classes of ground?

A Yes sir, I heard the testimony.

Q He said that, he designated certain water as necessary waste to meet the requirements of loose gravelly or cobblestone as a subsoil, do you designate that same requirement as a necessary waste in your experience and knowledge?

A I don't make any subdivision of the quantity.

Q I am not speaking of it -- you recognize such a condition.

A I recognize there is a waste, yes sir.

Q Now then, in making your estimates after examinations and stating the requirements in the several places that you have testified to in your examination of land in Wasatch county, did you take that into consideration, that necessary waste? A. Yes sir.

Q There would be a greater ~~xxxxxxxx~~ necessity of waste where the surface soil is very light or shallow, and the ~~xxx~~ subsoil was open, coarse gravel or cobblerock, wouldn't there, than where it is clay soil?

A Yes sir.

Q There would also be what would be termed necessary requirement for waste if, in addition to the open gravel or cobblerock there was also immediate percolation such as would be likely to occur if that land were lying close to the edge of a bench, wouldn't that be the fact?

A I don't understand just what you mean.

Q Well, suppose you were irrigating land that was -- surface of the soil was thin, the sub soil was loose gravel and cobblestone and that ground were lying next to the edge of a bench with precipice from the bench running down say some ten fifteen or twenty feet, wouldn't there be apt to be seepage from there?

MR. JACOB EVANS: How close to the edge?

Q Say within twenty rods of forty rods of the edge of the bench?

A I should say it would be immaterial.

Q Now, you would not attempt to say, would you, what such examinations as you did make in Wasatch county would determine anything relating to any of the balance of the land except those that were tested or examined and those in the immediate vicinity of where thetests were made?

A My opinion is based entirely on the condition as observed.

Q And that is wholly a superficial -- outside of your examination it is based wholly upon a superficial examination.

A Everything except the actual observations made.

Q That is what I mean, other than the observations you made in the specific places where you made your examination?

A Yes.

Q Now, in Wasatch county you made some seven or eight examinations, didn't you, in that neighborhood?

A Approximately that many.

Q You wouldn't say that the examinationsthat you made were of the general character of the land, the whole of the land of Wasatch county, that is under irrigation, would you?

A The whole county?

Q Yes, that that is under irrigation under the Provo River system?

A Why certainly not the whole county.

Q Now, the same thing would prevail as to the examinations that you made near the Luke Hot Pot Resort, wouldn't they, as you

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