THE

STATE AGRICULTURAL COLLEGE

OF THE

STATE OF COLORADO.

FOURTH ANNUAL REPORT

OF

The Agricultural Experiment Station.

1891.

FORT COLLINS, COLORADO.

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Letter of Transmittal.

HON. JOHN L. ROUTT,

Governor of Colorado:

SIR—I have the honor to transmit herewith the Fourth Annual Report of the Agricultural Experiment Station, conducted in connection with the State Agricultural College, as required by law.

Respectfully submitted,

FRANK J. ANNIS,

Secretary of the State Board of Agriculture.

THE STATE AGRICULTURAL COLLEGE,
FORT COLLINS, COLO.,
January 31, 1892.

Fourth Annual Report of the Director.

1891.

To the Executive Committee of the State Board of Agriculture:

GENTLEMEN—My position as Director dates from November 4, less than one month. Should I fall short in this report, which I respectfully submit, will you kindly ascribe it to my limited knowledge of the affairs of this office acquired in that short time.

Since my duties commenced, November 6, I have sent out Station literature as follows: Bulletins of No. II., 3; of No. III., 4; of No. V., 11; of No. VI., 6; of No. VII., 1; of No. VIII., 26; of No. IX., 6; of No. X., 14; of No. XI., 62; of No. XII., 23; of No. XIII., 106; of No. XIV., 90; of No. XV., 50, and of No. XVI., 795. Total bulletins sent out in November, 1,197. About one dozen Third Annual Reports have been mailed. Bulletin No. 16 had not been sent to those on the Colorado and foreign mailing lists. This accounts for the large number of that publication going out the past month. There is quite a demand for No. 8, which treats on alfalfa; Nos. 11 and 14, on sugar beets, and Nos. 13 and 16, from the Irrigation Engineering Section. The first mentioned, though the second edition was published, is almost exhausted.

It will be my endeavor to increase the mailing list of our Colorado people, for whose benefit this Station was

organized, and to reduce the other lists, except when to the advantage of this Station and College. A great many names have been added to the Colorado list during the past month, and complete lists of the members of the Granges of Colorado and of the State Horticultural Society have been secured.

In this connection, I will state that it is my intention to procure a suitable book and take it to each Farmers' Institute this Winter, in which to invite those desiring the Station literature to register.

One hundred and forty-three letter and postal card communications have been received, given attention, placed on file, and all answers copied. It requires considerable time to respond intelligently to the queries contained in many of these letters.

During the year 1891, bulletins have been prepared and issued as follows:

No. 14, January—"A Progress Bulletin on Sugar Beets," from the Chemical Section, by Prof. David O'Brine.

No. 15, April—"Two Insect Pests; The Codling Moth and The Grape-vine Leaf-hopper," from the Section of Entomology, by Prof. Clarence P. Gillette.

No. 16, July—"The Artesian Wells of Colorado and Their Relation to Irrigation," from the Section of Meteorology and Irrigation Engineering, by Prof. Louis G. Carpenter.

No. 17, October—"A Preliminary Report on the Fruit Interests of the State," from the Section of Horticulture and Botany, by Prof. Charles S. Crandall, was recommended by the Station Council to your Committee, by whom it was approved at your last meeting. Since that time we have made call for bids and let the contract for printing and binding at $2.25 per page.

In Council, convened on the evening of November 23, I suggested the advisability of indexing all former

bulletins, and with this one, as it is the close of the year, complete the first volume of the Colorado Station bulletins. This suggestion was approved, and the bulletins pertaining to each department have been indexed by the Professor in charge. This index, with the seventeen bulletins, makes a nice sized volume, and should be bound at once for the Station Library. A great number of valuable bulletins from other Stations have accumulated. These should be bound as rapidly as enough are secured for a good sized volume.

It is proposed to print a four-page pamphlet of instruction for the benefit of the Station. To this end, there has been prepared, by each member of the Council, a concise statement as to what the department under his charge is prepared to do in the way of analyzing, determining species, varieties, etc., and offering information as to how to take and send specimens for determination. Bids will be invited at once for this printing, if satisfactory to your Committee.

Agreeable to the law on the subject, I wrote to the Secretary of each, the Colorado State Bureau of Horticulture, the State Grange, and the State Cattle-Growers' Association, requesting that a member from each be appointed to form one of a Committee of Inspection to visit the College December 9, and act in that capacity. The first two Associations responded, appointing respectively, Judge W. B. Osborn, of Loveland, and Hon. C. C. Calkins, of Longmont.

At the time of my attending the Grand Junction Fair, a number of prominent men made inquiries about and urged the necessity of a Sub-Station on that side of the range. We are receiving numerous letters from that part of the State. If a Station is established there, they propose to supply the necessary acreage and buildings, so

that the College would be at no expense, except for Superintendent, teams and implements.

The plans of experiments for the year 1891 were essentially the same, with a few changes in the Sections of Botany and Horticulture and Meteorology and Irrigation Engineering, except the Agricultural Section, which this year came under different direction, and the new Section of Entomology, in charge of Prof. Clarence P. Gillette. The plans of the lines of work conducted in each will be found under their respective reports, as also numerous valuable results.

I herewith submit the reports from the Sections of Agriculture, Horticulture and Botany, Chemistry, Meteorology and Irrigation Engineering, and Entomology; also from the United States Grass Station, and the San Luis Valley, Arkansas Valley, and Divide Sub-Stations. These need no comment. By their perusal the progressive work of each is manifest. Their needs are usually so explicitly set forth as to be easily comprehended.

Respectfully,

WALTER J. QUICK,

Director.

FORT COLLINS, COLO., December 9, 1891.

ANNUAL REPORT OF THE

AGRICULTURAL SECTION.

To the Executive Committee of the State Board of Agriculture:

GENTLEMEN—After a most satisfactory season, generally, with crops, it is with pleasure that I submit the following report of the year 1891, for this Station, which, in point of fact, covers only the past nine months, as I took control in March.

Quite a large supply of grains and various seeds were found belonging to the Station, and almost enough implements for all necessary preparation of soil and cultivation of crops. A much needed overhauling and rearranging was given everything, and the necessary implements and tools purchased so far as funds were available.

The best fanning mill obtainable was purchased and all suitable grains prepared for market, and the fact made known that we had a large quantity of such seed. The farmers seemed to appreciate this, and speedily took advantage of the opportunity to procure reliable seed. Within three weeks we were compelled to give notice that we had disposed of all surplus grains.

The experiment grounds had heretofore been laid out each year with wooden stakes, and it is said that the lines of the plats were never identical two successive years.

This brought an inaccuracy into the records, from the fact that drives and alley-ways would be made a part of the plats; and hence would consist in part of fallow and rested ground. This would be especially undesirable in experiments on soil variation, and with fertilizers. It is my belief with all plats, and particularly when the soil is being tested, that the ground on all sides should grow the same, or a similar crop. To obviate the difficulties mentioned, and to reduce inaccuracies to a minimum, the two plots in the experiment ground were divided into two series of plats: "A" on the east, next to College Avenue, containing fifty-one plats, from 0 to 50 inclusive, the other or west plot, containing thirty-three plats, 1 to 33 inclusive, with a border around each entire series, 6½ feet, and a drive around each border 10 feet. I laid out no cross drives or alleys between these plats, but arranged the plats in size from 1-40 to 1-5 acre. They are so located that the largest are separated by the smallest, so the latter may be used as drives, or be planted to the same grain as the plats, or for separate experiments. By this arrangement the plats can be congregated into areas of one-half or one acre for certain experiments when desired. The border along each plat was planted to grain, as in the plat, and I am very well satisfied with the results. The advantages are that there is no fallow resting ground around any plat, from which the outside plants may feed. This ground is depleted by the same kind of grain as that occupying the plat, and the border being cut first, leaves the plat plump and full, with no part of its crop destroyed in cultivation, as is usual at the ends in turning.

The plats are marked permanently with one-inch galvanized iron gas-pipe four feet long, set accurately with the transit instrument, three and one-half feet deep. The six inches above ground is out of the way of the

implements. It is painted white and lettered in black with the letter "A" or "B" on the front, representing the plot, and a figure on each side representing the number of the plat on that side.

I will here state that, for convenience, I do not make the usual use of plot and plat interchangeable, but as block and lot are used—plot representing a larger area sub-divided or subject to division, and plat the sub-division.

For the Spring experiments, and before the plats were relaid, plots "A" and "B" were plowed about eight inches deep and well pulverized. Seventy feet were taken off the east side for the west half of College Avenue, which, with the row of trees in the centre, that have been trimmed, make it quite boulevard-like in appearance, and with the new front fence of Eastern lumber, much more attractive than formerly. The latest improved automatic gate, the donation of Messrs. Reeves & Co., Columbus, Indiana, has reached us and will be set at the entrance of the College Avenue drive, near the new Agricultural Hall.

This drive has been relaid due east and west, graded thirty feet wide, and set to shade trees, twenty feet apart, which, at some time in the future, will be reduced to half the number, making them stand forty feet apart. The irrigating ditches were all cleaned, some reconstructed, and many places riprapped to prevent washing. One dozen new headgates are being made, which will be put into place and numbered before spring.

Plot "A" contains 5.66 acres, divided into thirty-one plats of 1-20 acre each, twenty plats of 1-5 acre, and drive and border. In this plot of ground had been conducted the experiments on soil variations. As it was impossible to tell, owing to the corners having been destroyed, exactly what ground had been used for this purpose, plats were

selected in plot "A" very near identical for the continuation of these experiments. It has not proven wholly satisfactory, due either to the ground having had manure on certain strips, or to fallowing in alleys. This was evident from the excessive growth of certain strips in the crop. However, these experiments will be seen tabulated further on—plats 42–50, plot "A," in Pride of the North corn; 32–41, "A," in Amethyst wheat, and 22–31, "A," in Excelsior oats. The Winter rye, plats 14–21 inclusive, "A," is a valuable experiment as exhibiting the fallacy of sowing Fall rye, late in the Spring, if grain is the object. It was thought that it would not head at all, but, after making a very heavy growth of blades, a few shoots appeared which matured and were harvested, with the poor results as shown in the table. It is proposed, since it is a splendid stand, that it be left another year, and the results observed. Three plats, 0, 1 and 2, "A," were sown to ten varieties of wheat received direct from India. They resulted splendidly, and give great promise of being good for Colorado. Three varieties are exceptionally fine; they matured in from 100 to 104 days. These India varieties have never before been grown in the United States. They were only grown for seed this year. A large per cent. did not germinate, having been injured by insects and otherwise. In 1892 we hope to speak more definitely of these varieties.

Flax was grown on plats 4 and 6, plot "A," the former to European, yielding at the rate of 16.43 bushels per acre, and the latter to common, or American, yielding 14 bushels. The seed is fine from both, but better from the European, while the fibre excels in the American.

Plot "B" contains 3.25 acres, divided into nineteen plats of 1-40, four of 1-20, three of 1-10, and seven of 1-5 acre each, drive and border about all. Plat 1 was sown to Polish wheat, from hand-picked seed, for the purpose of

strengthening the straw if possible. Plats 24 and 19 were Winter varieties of French wheat. They exhibited no heads. The same should have been said of plat 5, in plot "A," Centennial wheat, except that it headed in September, but frost prevented its filling.

SUGAR BEETS.

Plats 3–17 inclusive, contained the Government experiment of one measured acre of Vilmorin Improved sugar beets. The instructions of the United States Chemist were followed, and nine pounds of seed to the acre sown, which germinated excellently; however, considerable transplanting was necessary on the south half of the acre. This was due to two causes: First, that part of the acre is lower, and, having an impervious subsoil, it was kept too wet by the inclement weather, for the young plants. Second, the attack, by an army of flea beetles, on this part of the patch, had to be combatted. The ravages of the beetles were checked by a mixture of paris green and flour. The results are very satisfactory, as shown by the analyses from the Chemical Department at Washington. Three samples were sent for analysis: The first, of immature beets, sent October 9, exhibited 15.70 sugar per cent. in juice, an estimated yield of 17 tons per acre, with a probable yield of sugar 3,856 pounds, co-efficient of purity 84.2. The next sample, sent October 31, was of transplanted beets, mature, to see, if possible, the disadvantage of having to transplant for a sufficient stand, and to prove the fallacy, as recommended by some, of transplanting one's entire crop. These show 18.5 sugar per cent. in juice, tonnage 12.4, probable yield of sugar 3,207 pounds, and co-efficient of purity 82.9. The last sent of the Vilmorin variety, November 2, mature beets, exhibited 20 per cent. sugar in the juice, estimated yield 19.8 tons, and probable yield

of sugar per acre 6,126 pounds, co-efficient of purity 90.2. Dr. H. W. Wiley writes: "I would say in addition, that these three beets are phenomenal in sucrose, in purity, and in probable yield of sugar, and that the tonnage per acre is excellent."

On plat 32 was grown Lane's Improved Imperial sugar beet. The Government analysis of sample sent November 10 shows 13.55 sugar per cent. in the juice, estimated yield 17 tons, probable yield of sugar 3,284 pounds per acre, and co-efficient of purity 83.1. A sample each of the above, duplicating those sent to Washington, was at the same time delivered, with similar reports of cultivation, etc., to our Station Chemist. These were reported as spoiled, by delay in the Laboratory, for analysis, and all were duplicated once and some twice. No analyses have been reported to this date.

Here will be found the table of results of all grains grown, excepting some already reported. The other objects in addition to those stated, were to test the variety, time of maturing, and the yield:

TABLE OF EXPERIMENTS.

Plat.	To What Planted.	Planted.	Harvested.	Days Maturing.	Yield on Plats	Yield per Acre.	Remarks.
A—7	Purple Barley	April 27	July 22	86	101 lbs.	42 bus.	
A—8	Guy Malye Barley	April 27	July 20	84	519 "	54 "	
A—9	Palestine Barley	April 27	July 28	89	72 "	40.5 "	
A—10	Tricks Barley	April 27	July 28	92	424 "	44 "	
A—11	Smooth Hulless Barley	April 27	July 28	92	100 "	41.75 "	
A—12	Winnipeg No. 1 Barley	April 27	July 21	85	107 "	44.5 "	
A—13	Algerian No. 3 Barley	April 24	July 30	97	112 "	57.5 "	
A—22-31	Excelsior Oats	April 24	August 12	110	63 bus.	63 "	
A—3	New Zealand Oats	April 27	August 13	108	11 "	35 "	
B—2	Chinese Hulless Oats	May 5	August 15	102	38 lbs.		
A—0-2	India Wheats	April 28-29	August 10-14	100-4			Yield, one peck to each variety.
B—23	Silverhull Buckwheat	May 27	September 10	106			Not yet cleaned.
B—30	Golden Millet	May 14	September 14	123			Not yet cleaned.
B—30	German Millet	May 26	September 14	111			Not yet cleaned.
A—32-41	Amethyst Wheat	April 23	August 12	111	31.5 bus.	31.5 bus.	
A—5	Centennial Wheat	April 27					Winter variety, Spring sown, failed.
B—1	Polish Wheat	May 4	September 10	129	3 pecks.	15 bus.	
B—18	Hebron Wheat	May 2					Winter variety, Spring sown, failed.
B—19	French Dattel Wheat	May 2					Winter variety, Spring sown, failed.
B—20	Eldorado Wheat	May 2	August 17	108	1.5 bus.	60 bus.	
B—21	French Larned Wheat	May 2					Winter variety, Spring sown, failed.

TABLE OF EXPERIMENTS—Continued.

Plat.	To What Planted.	Planted.	Harvested.	Days Maturing.	Yield on Plats.	Yield per Acre.	Remarks.
B—22	Dallas Wheat	May 2	August 20	110	4 bus.	20 bus.	
B—23-24	Egyptian Flint Wheat	May 2	August 8	98	1 "	20 "	
B—25	Ruby Wheat	May 2	August 20	110	3.5 "	17.5 "	
B—26	Arbonte Rye	May 2	September 11	132			Not yet cleaned.
A—14-21	Winter Rye	April 24	August 22	120	4.5 bus.	4.5 bus.	Almost a failure.
A—42-50	Pride of North Corn	May 6	September 19 / October 3	136	2,106 lbs —cars	30 "	
B—27	Snow Storm Corn	May 7	October 5	150	1 bu.	40 "	
B—28	Adams' Early Corn	May 29	October 5	128			Did not fully mature.
B—28	Mammoth Sugar Corn	May 29	October 5	128			Did not fully mature.
B—28	Eight-Week Sugar Corn	May 29	October 5	128			Did not fully mature.
B—31	Burbank's Early Maine Corn	May 23	October 1	131	3 pecks		Quality good.
B—31	Early Orange Cane	May 27	October 7	128			Did not fully mature.
B—31	Amber Cane	May 27	October 7	128			Did not fully mature.
B—31	Folger s Early Cane	May 27	October 7	128			Did not fully mature.
B—31	Amber-Orange Cross Cane	May 27	October 7	123			Did not fully mature.
B—31	Sink's Hybrid Cane	May 27	October 7	128			Did not fully mature.
B—31	Sorghum	May 27	October 7	128			Did not fully mature.
B—32	Everett's Jersey Queen Beets	May 14	November 9	140	720 lbs.	14,400 lbs.	
B—33	Mammoth Prize Beets	May 14	November 9	140	760 "	30,400 "	
B—28	Rutabaga Turnips	May 29	November 9	125	2,050 "	10,250 "	

The Spring was very backward, and much grain late sown.

Of wheat and rye, 6 pecks to the acre were sown, and of oats and barley, 8 pecks. However, the drill did not sow quite the full amount for which it was set.

Grains, both threshed and as they grew, mounted on one frame, attracted much attention at the Fairs at Cheyenne, Fort Collins, Grand Junction and Pueblo. The experiment crops suffered twice for want of irrigation. Water could not be procured.

For the past five months the student labor employed on the Station has been as follows: July, 505 hours; August, 520; September, 207; October, 168, and November, 422.

In August I represented the College at the Washington Convention of the Association of Agricultural Colleges and Experiment Stations, and was the recipient of much valuable information. During my leave I also received immense benefit from visits to the Agricultural Experiment Stations at Cornell, and the Ohio Universities.

With the object of experimenting with milk from the College cows, and of perhaps issuing a bulletin of advice to the farmers and dairymen of the State as to the best milk tester in use, and to make more instructive the lectures on dairying, the following apparatus was purchased: The Babcock milk tester and the DeLaval cream separator. Beimling's tester was ordered, but could not be procured. Two or three of the older and less expensive methods were in the Chemical Laboratory. In want of a better place, and having planned some experiments in connection with the Chemical Department, we have located the apparatus and have been working in the basement of that Laboratory. As a result, we have made eighty-six very satisfactory experiments with the Babcock, and have cleaned and tried the DeLaval, but taken no data. We have accomplished some work with the

Cochran and Shorts methods, which, like a large number with the Babcock, were unsatisfactory for various reasons.

It is the intention to conduct a breeding and feeding experiment with one dozen ordinary range ewes, and to undertake some feeding experiments with cattle and hogs, as soon as arrangements can be made for so doing.

Respectfully submitted,

WALTER J. QUICK,

Agriculturist.

REPORT OF

Section of Botany and Horticulture.

To the Executive Committee of the State Board of Agriculture:

GENTLEMEN—I have the honor to submit the following report of work done in connection with the Experiment Station:

The work of the year has been, in a great part, a continuation of the work outlined for the previous year. Observations upon the weeds of the farm and garden have been continued; a collection of the various species has been made, and notes have been taken regarding their habits of growth, persistence, and the best methods of exterminating them. The data collected is quite complete for this locality, but before a bulletin is issued upon this subject it would be desirable to gather some data from other agricultural sections of the State, where the weeds are of an entirely different character.

The experiments with grasses and forage plants have been conducted the same as last year. The plats of perennial species which were started in the spring of 1890 have been retained, and records have been made of rate of growth, date of blossoming and weight of green and dry product. A number of new and interesting species have been added. The weather, during the early part of the season, was very favorable to the growth of grasses, and all of the garden plats made an excellent showing.

My trip to the northwestern part of the State, authorized in July, for the purpose of collecting plants, and especially grasses, occupied twenty-one days. The route taken was to North Park, by way of Tie Siding and Pinkhampton, across the Park, over the Arapahoe Pass, through Middle Park, across the Gore Pass and down the valley of the Bear River as far as Steamboat Springs. Three days were spent in collecting plants in the mountains about Steamboat Springs. Of the plants collected, 125 species were determined. A considerable number not then worked out I hope to determine during the winter. The plants of this region differ greatly from those of the eastern slope, and these differences are especially noticeable in the arborescent forms.

A large number of specimens of the native grasses were collected, and a creditable showing of northern species could now be made. There are still many species native in the southern part of the State that are not represented in our collection.

The number of species of plants collected on this trip was about 250. Most of them have been determined, and nearly all of them are new to our Herbarium.

The work on the local flora has been carried on during the season, and a large number of species added to our collection. During the month of June, I visited the sub-Stations at Rocky Ford and Table Rock, spending one day at each Station. A number of plants were collected, and notes were made upon such weeds as were observed. At least a week at each of these places could be spent to advantage in the study of the peculiar flora of the region.

During last winter most of the species collected in 1890 were mounted, and classified in the Herbarium cases, and work will soon commence on the mounting of the collection made the past Summer. The additions to

our collection will make it necessary to add to the capacity of our plant cases.

Observations on the leafage, and rate of growth of trees and shrubs, have been continued, as have also the notes on the small fruits. Of culinary vegetables we have tested this season: Cabbages, 10 varieties; cauliflower, 2 varieties; egg plant, 3 varieties; peppers, 10 varieties; lettuce, 1 variety; tomatoes, 20 varieties; onions, 14 varieties, and potatoes, 35 varieties. Full records of these tests will be presented at some future time.

Experiments in grafting, and in the crossing of plants, are in progress. The preliminary report on the fruit interests of the State, recently presented to you, was made necessary by the difficulties encountered in the collection of data for a complete report. I found it very difficult to obtain information by correspondence; this is not due to failure to answer inquiries. The more complete report promised for next year I desire to make as full as possible. The fruit industry is a large and rapidly growing one, and deserves some consideration. A complete report, I have reason to believe, would be appreciated by the fruit growers. From my experiences this fall I conclude that to secure accurate and sufficient data that may make the report creditable to the Station, it will be necessary to personally inspect those fruit-producing regions not yet visited, and I trust it may please you to make provision enabling me to do so.

The fruit nomenclature of the State is much confused. The number of varieties is rapidly increasing, and there is need of a State fruit list. I have commenced the compilation of such a list. Its preparation will involve much labor, but I hope to complete it and make it a part of the report for next year.

The measured acre of sugar beets grown by this department was not on land best suited to the growth of

beets for sugar. The soil is a very stiff clay loam, a portion being thoroughly impregnated with alkali, the effect of which was apparent on the growth of the crop. The growth early in the season was very thrifty, but after July 1 there was little advancement, and the crop did not meet our expectations. The actual yield was about eleven tons, while the computed yield varied on the different quarters from fifteen to twenty tons. The per centage of sugar was, however, quite satisfactory.

As your delegate representing the Experiment Station, I attended the meeting of the Association of Agricultural Colleges and Experiment Stations, held in the city of Washington, August 12 to 15. The sessions held by the Association were very interesting and instructive, and the opportunity to compare methods of work with other workers was thoroughly appreciated.

Respectfully submitted,

CHARLES S. CRANDALL,

Professor of Botany and Horticulture.

REPORT OF

UNITED STATES GRASS STATION.

Dr. George Vasey, Chief of Botanical Division, Department of Agriculture:

SIR—I have the honor to transmit herewith a report of work at the Grass Station for the season of 1891.

The season of 1891, up to the 1st of July, was very favorable to the growth of grasses and forage plants; the rainfall was ample, and the Station plats presented an encouraging appearance. The dry, hot suns of July and August were effective in changing the appearance of all the plats; most species succumbed entirely; a few survived, and still show some live plants.

Such plants from the spring seeding of 1890 as survived the winter were destroyed in April last; a high wind on the 8th removing the surface soil in places, to the depth of several inches. The plats sown in the fall of 1890 did not suffer from this wind, because of the greater amount of moisture in the surface soil.

The entire area, except that portion sown in the fall of 1890, was plowed last April and reseeded; we used the seed sent us by the Department last spring; it was all sown by hand-drills, in rows six inches apart. Seeds of the native grasses, collected in the mountains, were sown on small plats at the same time. The species of *Poa* gave no promise at any time; their growth is too slow and small

to encourage belief in ever succeeding with them. Of the genus *Festuca*, the species *elatior* was at first promising, but it succumbed to dry weather in August. Of the fall sown species, only three came in sufficient quantity to make a showing this season. These were *Avena flavescens*, *Lolium perenne*, and *Agropyrum glaucum*; they did not come evenly, but in places the plants were thick, grew to a height of eighteen inches, flowered and fruited. The plats of these same grasses, sown last April, were decidedly better in number of plants and growth than the fall sown plats, so there appears to be no gain by fall seeding, although a different season might reverse the results obtained this year. Of the spring-sown plats, the best were those occupied by the two species of *Bromus*, *Schraderi* and *inermis*, and of the two, *Schraderi* is the most promising.

The plat of *Panicum miliaceum* made an excellent showing; the plants were thick, and grew rapidly to maturity; they began flowering July 15, and remained green until the first week in August.

On the plat occupied by Polish wheat, the plants came thickly and grew rapidly; the straw of mature plants was two feet high, and the heads were well filled. This plat was especially attractive to the prairie dogs, and their depredations made an accurate estimate of the product an impossibility.

The plat of alfalfa made an excellent growth in the early part of the season; on July 10, the plants stood thickly, were one foot high, and some were in blossom. We have spent a good deal of time, and have tried many methods for the extermination of the prairie dogs, which abound in all the country about the Station, but we do not yet get rid of them; as those near by are killed off, others appear to come in. A further effort will be made this winter to kill them by means of poisoned grain.

While there is as yet little encouragement that any species will be found that can be generally grown without irrigation, there are a few of the species we have experimented with that deserve further trial. I would think it advisable to discard all those species which have thus far been entire failures, and confine our attempts to those which have shown the best resistance to the adverse conditions, and to any species not yet tried that may be thought likely to succeed. The species recommended for further trial are, of grasses: *Bromus Schraderi, Bromus inermis, Lolium perenne, Holcus lanatus, Avena flavescens, Panicum miliaceum,* Polish wheat, and of forage plants other than grasses: *Medicago sativa, Galega officinalis,* and *Poterium Sanguisorba.*

Respectfully submitted,

C. S. CRANDALL,

Professor of Botany and Horticulture.

REPORT OF

CHEMICAL SECTION.

To the Executive Committee of the State Board of Agriculture:

GENTLEMEN—I have the honor to submit the following report of the Station work:

For two months the building was torn up by carpenters and masons working on the new addition, so that but little work could be done. A detailed account of the expenses of the new addition will be found in the College report.

One bulletin has been issued from the Chemical Department (January, 1891) on sugar beets. A series of analyses for insecticides (forty) have been made for Prof. Gillette, of arsenic, London purple, Paris green and Bordaux mixture, etc.; twenty-one analyses of rock specimens of the building stones of Larimer county have been made for Prof. Lawrence; twenty-three samples of snow and rain water have been collected and analyzed for nitrates, ammonia, etc.; ten samples of sugar beets from the farm and garden, besides many samples from the Sub-Stations and other places, have been analyzed.

I have turned over to the Secretary $16 for analyses made during the year. The chemical work of two bulletins, one on milk tests, and the other on loco, is about completed. About 300 milk tests have been made with

the Babcock, Cochran, DeLaval, Short and gravimetric methods. A few tests with hydrogen peroxide and other reagents have been made to preserve milk from souring. The object of the bulletin will be to advise farmers and dairymen what appliances to purchase in order to test the amount of fat in the milk of their cows. Details of the methods, etc., will appear in the bulletin. A sample of Haff's horn killer was found to consist of an impure solution of caustic soda. The following directions were on the bottle:

"Shake the bottle before using. Five drops on a young horn warranted to stop its growing. Use it at any time up to two months old. If the horn has started to grow, cut the tip off with a knife before applying the horn killer. Apply the horn killer with a small stick with a cloth or cotton tied to one end of a swab. Put the horn killer only on the horn button. Hold the swab on long enough to let the horn killer soak into the horn button. One bottle enough for fifty calves. Keep the bottle right side up, and corked. Heat or cold down to zero does not affect it. Agents wanted everywhere."

The bottle holds $1\frac{3}{4}$ ounces and sells for $1, and costs about 5 cents.

Considerable time was spent on the analyses of the loco plant. I visited Livermore or vicinity five times, and made three post mortems. A brief outline of the post mortems is here appended. The first post mortem was made on a 3-year-old colt, the property of Mr. C. The colt was brought in from the range, and was in very poor condition. When driven around the yard he had the peculiar high step so often described as being a characteristic symptom of loco. He was roped, thrown, and his throat cut. The post mortem appearance was as follows: The heart, lungs and liver were normal in appearance. The stomach was completely covered with bots, and contained, besides, a large number of thread

worms. The intestines connected with the stomach duodenum was filled with sand. I estimated that about two shovelfuls were in the intestines. (When it is known that the post mortems are held from twenty to thirty miles from the College, and in such conditions as we can obtain the animals, only estimates can be made of some things). The brain had a clot of blood at the base of it. I advised the owner (because he had twenty horses suffering from like symptoms) to put the animals on good, green feed, so it might act as a physic, and carry the sand out of the system. I recommended a tonic of nux vomica. He told me the affected animals improved so they were all finally sold. The sand, as I think, comes from the animals not being properly salted, and from eating the alkali soil.

The second animal was 2 years old, and in fair condition. He had been taken up, fed and treated for a month in the stable, but he injured himself so by throwing himself in the stable that he had to be turned out in the pasture to live or die. I found the liver, heart, kidneys and spleen normal. The lungs were congested, and covered with dark, livid spots about the size of a twenty-five cent piece. The stomach and intestines did not have a normal appearance, but were pale and apparently bloodless. The small intestines were cut with a scissors, and were found filled with spindle-shaped worms about 6 to 8 inches long. About one quart of them, *Ascaris Megalocephala,* were obtained. In cutting the intestines, before we came to them, I would find a green mucus discharge; as many as six of them would be found in one place, completely closing up the intestines. Bots were found in large quantities. The reason why so many parasites were found, as I think, is because the animals have to get water wherever they can find it, and in many cases drink stagnant, filthy stuff that is loaded with every form of

animal life. The brain was examined, and the usual clot of blood was found at the base. The colt was owned by Mr. J.

Post mortem No. 3 took place about thirty miles from Fort Collins. The owner, Mr. S., had about 100 head of horses. The colt was 3 years old and had been affected the year before. He had been put up in good pasture about one month before I saw him. The liver, lungs and kidneys were more or less diseased. The liver was tuberculous, the lungs congested, the kidneys were filled with ulcers so the pus could be scraped off when cut into. The clot of blood was found at the base of the brain. As the animal had been on green feed for one month, but few parasites were found. Samples were brought to the Laboratory for microscopic examination.

The Bureau of Animal Industry at Washington has kindly consented to assist me in identifying the parasites, and in the microscopic examination of the affected parts. "Franks" were sent me to send the specimens to Washington for identification.

In all the examinations thus far made, I have found cause enough to account for the symptoms. The more I examine the loco question, the more I am persuaded that we must look for some other cause besides the loco weed. The loco weed is so common in and about Fort Collins that if it was the cause of the trouble, animals in *this* vicinity must be affected with the so-called loco disease, but I have not been able to find a single specimen in the neighborhood, while the loco is as abundant here as in the localities where the animals are affected. I have had a great deal of trouble in obtaining subjects for post mortem, as the ranchmen do not want it known that they have any animal affected with loco. They say it would interfere with the sale of their stock. I have been

unable to form any reliable estimate of the number of animals that yearly die from the so-called loco disease.

This brief outline of what I have been doing with the loco question is given; the details of all the work have been withheld for bulletin matter.

The following brief resume of the work of the Chemical Department during the year, is here appended:

Milk analyses	300
Water for drinking purposes	4
Water for nitrates, etc	23
Gypsum	2
Sugar beets	20
Insecticides	40
Building stones	21
Loco weed	14
Unclassified	3
Total	427

The inventory of Station account is included in the College account.

The total number of analyses made since the Station started is 1,300.

Thanking the Board for their kindness and good wishes, and the interest they have taken in my department, this report is respectfully submitted.

D. O'BRINE,
Chemist.

FORT COLLINS, COLO., December 1, 1891.

SECTION OF

Meteorology and Irrigation Engineering.

To the Executive Committee of the State Board of Agriculture:

GENTLEMEN—During the past season the work of this Section has been carried on essentially as outlined in the plan, presented early in the year. This plan is practically a continuation of those of the preceding year, and it is expected to remain essentially the same for several years to come, changes being due principally to added equipment, which will allow the investigation of questions which now we can not undertake, or to conditions which will make it desirable to investigate special questions. The work is in many respects in a better state than in the previous years, and the fund of information collected in many lines, adds to the usefulness of the Section to the public at large, and enables it to speak with some degree of authority on some questions.

The lines of investigation are in those of Irrigation Engineering and Meteorology. In the former, the circumstances are such that the most useful line of work seems to be both in scientific investigation, and in the collection of information. There is throughout this and the adjoining States a vast deal of experience which has never been gathered together, and a lack of a knowledge of which is constantly leading to a repetition of costly errors, which is always finally to the disadvantage to the irrigator.

More or less data has been derived from such sources by correspondence and personal interviews, and I have visited some localities, though fewer in this State than in the previous year. I have, however, visited California, and its principal irrigation localities and works, and have put the Section in connection with many sources of information which will aid its work. Incidently, the irrigation works of Nevada were hastily visited, and the conditions of Arizona and New Mexico observed. Later in the season I had the opportunity to inspect some of the works of Utah, and the methods in use there.

DUTY OF WATER.

During the Summer, experiments were made to determine the duty of water, as it is under the actual conditions of practice. With a good knowledge of this, we can later hope to study with some degree of success the special ways in which water disappears, and by finding what are useful and what are not, establish some basis for improvement in the economical usage of water. Some of the lines of study are taken up with the idea that they will be important in the final consideration of the question.

The experiments of this year are a first step in the problem. Owing to the delays in the shipment of the automatic registers, which we designed to use in the measurement of the water applied to the various crops, the data is not complete even for this season. It has, however, considerable value. Its reduction requires considerable labor, and until that is done we cannot fully determine how valuable it will be. In this series of experiments, we first gained the co-operation of one of the oldest ditches in the valley, with an old priority, and consequently, a ditch where the duty would not have such an abnormal amount as in a ditch that did not have the amount of water which was actually needed.

To make this data of the best value, a knowledge of the amount of land actually cultivated and irrigated is needed, and also a knowledge whether the amount of water supplied was sufficient. Also, how many times each separate crop was irrigated. Some crops under this canal do not need irrigation, on account of sub-irrigation from seepage. The amount of this also needs to be determined, for while the water may be due to the canal, it should be separately considered. The area under experiment includes some 25,000 acres, and the collection of the data requires a good deal of correspondence as well as driving, and some of it cannot be collected until after all the crops are harvested and threshed. This part of the data is still incomplete, and it is possible, can not be made complete this year. It will aid so much in the next year's experiments. In this inquiry, we have had the full co-operation of the community, sometimes in collecting information which might seem to them as personal. To all of them our thanks are due, and especially to S. A. Bradfield, the Superintendent, D. D. Wallace, the Commissioner, and W. E. Hendrickson, in charge of the headgate.

Weirs and self-registers were put in to measure the amount of water used in the irrigation of crops of potatoes on the farms of Mr. S. A. Bradfield and Mr. Sol Hopkins, both near Greeley. Also, one on the farm of Mr. Horace McClelland, of Fort Collins, a former student of the College, to measure the amount used in the irrigation of an extensive field of alfalfa. Capt. W. M. Post, of Fort Collins, also allowed us to put in one to measure the water used on a field of native hay, which was located in the foothills, at the mouth of the Poudre. Another was located on the farm of Walter Campbell, in connection with a wheat crop. Owing to the lateness of the arrival of the instruments, as already mentioned,

some of these measurements, especially that on the wheat crop, are unsatisfactory. To all of those who have so cordially co-operated, the thanks of the Station are due.

We were also allowed to place a self-register in the New Mercer Canal, which waters some thousands of acres, but from the fact that most of the farmers connected with it use water from one of two other ditches, it will be almost impossible to arrive at a definite conclusion regarding the duty of water under this canal.

We have carried on for several years observations at various places in the Poudre Valley upon the rainfall. Such a series of observations is almost necessary in studying the problems relating to the duty of water. During the present season the list of observers co-operating with us has been extended, but all are located in the valley of the Cache a la Poudre, with three exceptions: Those who have co-operated with us in this are the following:

E. H. Leeds—Pinkhamton, in North Park.

S. J. Perry—Upper Pine; elevation 8,500 feet.

R. C. Boyle and John Pearce—Elkhorn.

S. J. Gilkison—Laporte; elevation 5,100 feet.

E. F. Kerr—Middle Box Elder, near Fort Collins; elevation 5,000 feet.

C. Gilpin Brown—Livermore; elevation 6,500 feet.

Horace McClelland—Gaynor, near Fort Collins; elevation 5,000 feet.

F. H. Newell—New Windsor.

E. H. Benton—La Grange School District, near Greeley.

Alice Hopkins—Pleasant Valley, near Greeley.

W. H. McCreery—Loveland.

P. H. Boothroyd—Waterdale, near Arkins, in the foothills.

Carlyle Lamb—Above Estes Park, at the foot of Long's Peak.

Their reports have been very valuable, and are furnishing the means of gaining a knowledge of the

amount and distribution of the rainfall, which is exceptionally valuable in this country.

METEOROLOGY.

The work in Meteorology has consisted essentially of a continuation of the observations of the preceding years. We are now beginning to have a long enough series of reliable observations to form a good basis for the climatic study of this portion of the State. The observations are taken twice daily, by eye readings of the principal instruments, with records from several self-recording instruments. I desire to increase the list of our self-recording instruments as fast as we are able. Several are needed now.

The observations consist of temperature of the air, twice daily, with registering thermometers for maximum and minimum temperatures, and two thermographs: barometer, read twice daily, supplemented by barograph; wind, direction, three times daily, force determined by anemometer; cloudiness, twice daily; wet and dry bulb thermometer, for determining humidity and dew point; temperature of the soil taken at various depths from 3 inches to 6 feet, and at three localities, etc.

The daily amount of the sunshine is automatically recorded, and the amount afterwards measured. This takes considerable time and work, and I am considering a device whereby the amount of sunshine shall be automatically recorded in hours and minutes. Each of the Sub-Stations, excepting the Divide Station, has sunshine recorders similar to ours, and the reduction of their records is made by us.

Special studies have been made on various points, as the relation of dew point and frost or dew, the change in temperature of the air from ground upwards, etc.

The most damaging meteorological occurrence that has happened in this part of the State during the season, was the hailstorm of July 17, which caused damage to crops in the eastern end of this County aggregating over $100,000.

Mr. B. C. Buffum, who was the assistant at the time of the last annual report, received a well-deserved appointment to a professorship in the University of Wyoming, departing for his new field of labor in March. Mr. R. E. Trimble received the appointment the 1st of April and began work immediately. His work has been especially satisfactory, and I am especially pleased to commend his industry and accuracy. Upon him has fallen the immediate labor of taking the observations, and the work has been satisfactorily and well done.

On account of the desirability of completing the calendar year with all the meteorological work, I therefore ask permission to hold such work, as in previous years.

Besides the work already mentioned, the Section has studies practically completed which will need comparatively short time to prepare for two or three bulletins.

Thanking you for the full support you have given this Section, this report is respectfully submitted.

LOUIS G. CARPENTER,

Meteorologist and Irrigation Engineer.

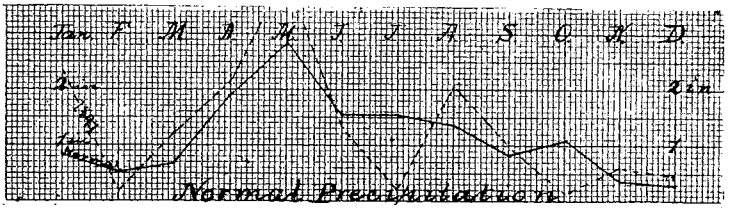
APPENDIX

To the Report of the Meteorologist and Irrigation Engineer.

PRECIPITATION.

Precipitation is the element in which, in the scarcity of water, we are interested more than in any other, as a rule. While the most of the water which is applied to the crops is that which falls upon the mountain water-shed, principally in the form of snow, that which is directly received forms no inconsiderable part, and determines to a greater or less extent the amount of water needed for irrigation. The observing and thoughtful farmer is more and more recognizing the fact that irrigation cannot be given indiscriminately and thoughtlessly without risk of injuring his crop, so that abundant or frequent rains may be so plentiful at times as to carry the farmer through the dry season with little artificial irrigation. The flow of our streams is always low in late Summer, as in July and August, and the needs are great. Rains during that period are especially useful.

The rainfall of the State is very variable, both in its amount and its distribution. The mountains affect the rainfall, both upon themselves and the adjacent plains. Hence the amount of rainfall varies greatly from place to place. At Fort Collins, from a record averaging eleven years, the normal precipitation is less than 14 inches; at Denver it is more than an inch greater. In the eastern part of the State and in the mountains it is greater. Its distribution throughout the year is essentially the same at different places, and is represented in the following diagram showing the normal amount in each month



of the year. The Winter months have the least, the early Summer months the greatest. April, May and June are the months of greatest rainfall. The rivers are generally highest at the same time, so that in consequence, much of the water is allowed to run to waste, as it cannot be used without storage. The following table gives the record as taken at Fort Collins, so far as we are able to complete it. Unfortunately, the record of many months is missing:

PRECIPITATION.

YEAR.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
1872	....	....	....	....	....	....	....	....	....	....	0.02	0.20	.....
1873	0.25	0.16	0.00	1.20	2.30	1.50	1.30	0.85	0.75	0.42	0.20	0.17	9.10
1874	0.06	0.43	1.29	0.77	2.95	0.65	3.15	0.25	0.00	1.00	0.02	0.00	10.40
1879	....	....	....	....	....	....	....	....	....	1.75	0.15	0.60	.....
1880	0.72	1.09	0.38	0.94	0.60	0.86	1.80	0.37	1.47	2.07	....	0.10	.....
1881	1.10	0.55	1.45	....	....	....	....	....	....	....	....	....	.....
1882	....	....	0.17	....	4.97	2.07	1.76	0.89	2.51	0.82	0.29	.	.....
1883	1.00	1.50	0.68	....	2.51	3.18	....	1.78	1.00	1.29	T.	1.33	.....
1884	1.10	0.70	1.15	3.94	4.84	....	....	....	....	0.10	1.80	0.35	.....
1885	1.77	....	....	....	....	....	....	....	....	....	....	....	.....
1887	0.86	0.23	0.25	1.10	1.23	1.96	3.05	2.12	0.54	0.43	0.15	0.00	12.12
1888	0.29	0.36	0.73	1.23	3.39	0.47	0.60	1.01	0.29	0.88	0.38	0.16	9.79
1889	0.21	0.31	0.65	2.07	3.39	2.06	0.79	0.95	0.42	3.16	0.43	0.01	14.48
1890	0.13	0.21	0.22	3.92	1.19	0.12	1.27	3.14	0.07	0.70	0.32	0.12	13.58
1891	2.32	0.16	1.21	2.14	4.07	1.30	0.17	2.05	1.01	0.20	0.60	0.46	15.69
Average	0.82	0.52	.69	1.92	2.83	1.52	1.54	1.34	.81	1.07	0.36	0.29	13.71

T—Trace

During the past season, as well as in the previous seasons, a number of observers have co-operated with us in keeping the record of the rainfall. Their co-operation was originally solicited through the importance of having a more detailed knowledge of the amount and distribution of the rainfall over the region in which we are attempting to determine the duty of water in irrigation. The observers are, therefore, nearly all in the valley of the Cache a la Poudre, and several of them are close to each other. But the table shows that the rainfall noticeably varies, especially during the Summer months, when most of the rainfall comes from the Summer thunder-showers of limited extent, as a rule. The physical conditions undoubtedly govern the rainfall to some extent. It is a

prevailing opinion that certain strips are more exposed to rain and hail than others; and certain other locations are proverbially dry. To how great an extent this will be noticed in careful observation is yet to be determined. The Grass Station in the following table is not far from the line connecting Laporte and Middle Box Elder, and about four miles from each, yet its precipitation is noticeably smaller. This may be due partly to its location on the crest of a ridge parallel to the foothills. Common belief points out locations where hail strikes almost every season, and other neighboring localities where no serious damage has been done since the country was settled.

The stations and observers during the year have been as follows:

PINKHAMPTON—Near the eastern rim of North Park. Elevation supposed to be about 7,500 feet. Miss Fanny Barnes furnished reports in the early part of the season; E. H. Leeds continued them during the latter part.

UPPER PINE—East of the range, but in the mountains, about 35 miles from the foothills. Elevation about 8,500 feet. S. J. Peery has furnished thermometric as well as rainfall reports. This is our highest station.

ELKHORN—Elevation about 7,300 feet. Reports furnished by John Pearce.

LIVERMORE (or Middle Pine)—Elevation a little over 6,000 feet. Observations have been furnished by Mr. Gilpin-Brown.

LAPORTE—First station on the plains. It is about a mile from the foothills, on the river bottom, near the bluffs bounding the mesa. C. J. Gilkison, a student of the Agricultural College, has been the observer.

GRASS STATION—Five miles north of the Agricultural College, which is about four miles from the foothills, and at an elevation of 5,000 feet. The station is a few

hundred feet higher than the College. S. H. Birdsall has furnished reports from there.

GAYNOR—About three miles south of the College. J. H. McClelland is the observer.

MIDDLE BOX ELDER—About four miles east of the Grass Station, at a slightly lower elevation. E. F. Kerr has furnished reports for nearly three years.

NEW WINDSOR, LAGRANGE SCHOOL DISTRICT and PLEASANT VALLEY—All in the valley of the Poudre, the latter two near Greeley. They are all about 4,800 feet in elevation. The observers were J. S. Newell, E. H. Benton, and Miss Alice Hopkins, respectively.

LEROY—A few miles from Sterling, on the south side of the Platte River. Observations were furnished by Chas. Green, who was furnished a rain gauge by the United States Weather Bureau.

ESTES PARK, WATERVALE and LOVELAND—All in the valley of the Big Thompson. The first is at the foot of Long's Peak, and is one of the highest points of settlement in the mountains. Carlyle Lamb is the observer. Watervale is just within the foothills. P. H. Boothroyd is observer. At Loveland, Rev. W. H. McCreery has been the observer, with a rain gauge furnished by the United States Irrigation Survey.

THE DIVIDE EXPERIMENT STATION, near Table Rock, is on the Divide, between the Platte and Arkansas rivers, and where the rain is abundant enough to grow crops without irrigation. We have but this one season's observations at this place, as the station is newly organized, but a study of the table will show that the rainfall continues throughout the Summer, and is much greater than at the other stations. The elevation is about 7,500 feet. G. F. Breninger, the Superintendent, is the observer.

THE SAN LUIS STATION has been changed in location during the year twice, so that the observations have not been carried on at the same place. The station is about 7,500 feet elevation. M. E. Bashor, Superintendent, observer. This valley is surrounded on all sides by the highest mountains of the State, so that the rainfall is correspondingly light.

THE ARKANSAS VALLEY STATION, at Rocky Ford, is at an elevation of 4,000 feet. F. L. Watrous, Superintendent, is observer.

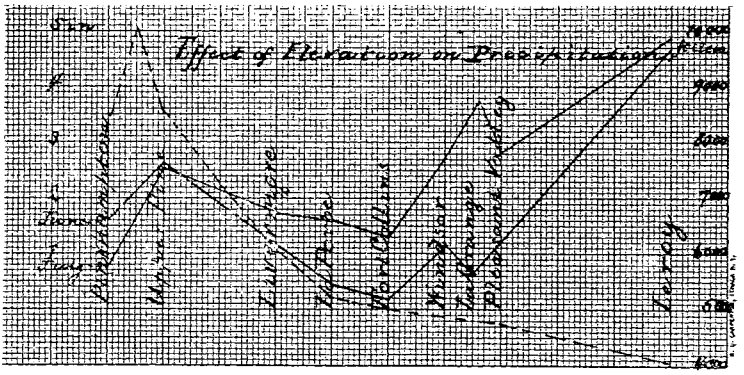
PRECIPITATION, 1891.

STATIONS.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
Pinkhampton	1.27	—	—	—	2.67	0.63	1.61	1.37	1.54	0.78	1.35	—	.....
Upper Pine	2.05	0.54	2.63	1.85	5.94	2.54	2.63	1.19	1.94	T	0.39	0.50	22.20
Elkhorn	2.15	0.32	3.05	1.05	.....	.....	.....	.....	.....	.....	.....	.....	.....
Livermore	2.07	0.87	1.26	1.33	5.19	1.76	1.04	1.58	1.18	0.97	0.82	0.23	18.40
Laporte	2.19	0.07	[1.20]	1.98	3.53	1.60	0.43	1.19	1.43	0.19	0.29	0.53	14.63
Fort Collins	2.32	0.16	1.21	2.14	4.07	1.30	0.17	2.05	1.01	0.20	0.60	0.46	15.69
U. S. Grass Station	2.06	0.43	0.95	1.78	2.85	1.23	0.35	0.90	1.01	0.14	0.69	0.51	12.90
Middle Box Elder	1.47	0.21	1.07	1.35	4.12	1.89	0.96	1.10	1.25	0.21	0.34	0.48	14.15
Gaynor	[2.32]	[0.16]	[1.21]	1.99	3.58	1.81	0.32	2.13	1.07	0.21	0.48	0.47	15.76
New Windsor	.....	.....	.....	.....	.....	2.72	1.16	2.44	0.77	0.17	.....	.....	.....
LaGrange Sch. Dis	.....	.....	.....	.....	.....	3.57	0.62	1.56	0.73	.....	.....	.....	.....
Pleasant Valley	.....	.....	.....	.....	1.95	2.80	.....	.....	.....	.....	.....	.....	.....
LeRoy	1.70	1.00	1.99	1.35	5.02	4.84	4.69	2.89	0.67	0.14	0.37	0.94	25.60
Estes Park	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.00	.....
Watervale	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.55	0.77	.....
Loveland	.....	.....	.....	.....	.....	.....	.....	.....	1.47	0.45	0.50	0.60	.....
Divide Ex. Station	—	—	1.77	1.99	4.72	2.52	3.80	2.70	0.66	0.88	0.59	1.94	.....
San Luis Ex. Stat'n	0.98	0.38	1.11	0.20	0.92	0.38	1.59	0.30	1.39	0.60	0.05	0.99	8.24
Ark. V. Ex. Stat'n	1.50	0.00	1.80	0.43	3.52	2.31	0.74	0.73	1.75	0.21	0.20	1.77	14.96

T—Trace.

The amounts in brackets have been supplied.

The table gives data for an interesting comparison of the differences in amount, according to elevation and to location. Pinkhampton, in North Park, and the San Luis Valley Station are both in the natural parks of Colorado, the latter of which, especially, is protected on all sides by high mountains, which strip the currents of their moisture. From Upper Pine to Laporte, the stations are on the eastern slope of the mountains: Fort Collins to Leroy, the stations are on the plains, all except the last, near the mountains.

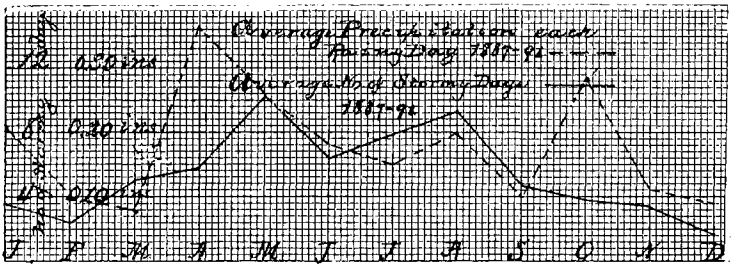


In the diagram, the dotted line shows the elevation of the various stations, the scale being at the right hand side. The two full lines indicate the precipitation at each place during the months of June and July. There is noticed a steady decrease in the amount of rainfall from the highest station to Fort Collins, and then, as we go east, an increase which is considerable before the Colorado-Nebraska line is reached. The mountain stations derive their moisture almost entirely from the western currents, and this falls off as we pass from their summit. Eastward the effect of the supply from the Gulf of Mexico becomes important. And it seems that this effect is felt as close to the mountains as Greeley. There is

reason to suppose that Fort Collins represents a condition of things which is common to a strip of country along the base of the foothills, and where the precipitation is less than it is on either side. The effect may be due, in whole or in part, to the protecting influence of the mountains.

The country near the mountains is often protected from the effect of cold west winds, especially following a warm period. The mountains will be clear and free from cloud, while the plains will be covered with a uniform layer of cloud, due to the cooling effect of the colder upper current on the upper surface of the lower warm and moist air. Generally, this commingling takes place in the upper regions, but occasionally, as in May, 1889, it was sufficient to cause fog. At Fort Collins everything was clear, but fifteen miles eastward the fog was dense.

The following diagram shows the average number of stormy days for each month of the year, and the average precipitation during each stormy day. While May and August have the greatest number of stormy days, April and October have the heaviest storms.



DEW POINT AND RELATIVE HUMIDITY FOR 1891.

Day.	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.	
	D. P.	R. H.	D. P.	R. H.	D. P.	R. H.	D. P.	R. H.	D. P.	R. H.	D. P.	R. H.	D. P.	R. H.	D. P.	R. H.	D. P.	R. H.	D. P.	R. H.	D. P.	R. H.	D. P.	R. H.
1	9.60	72.60	-3.25	100.00	30.80	82.70	16.75	60.75	30.30	47.65	43.60	66.55	51.00	46.35	52.15	60.55	47.55	59.90	36.55	71.80	17.60	45.20	26.10	64.15
2	10.45	73 40	-8.95	37.80	22.00	86.85	18.60	78.55	37.50	55.80	41.45	78.05	54.30	62.00	55.70	78.35	43.70	82.15	35.80	85.20	19.25	58.60	19.80	50 80
3	9.55	61.95	-3.85	76.80	8.35	97.40	20.40	76.20	38.90	66.70	47.40	77.75	54.40	65.45	53.75	66.15	44.00	71.00	33.00	81.30	24.65	43.50	6.90	48.80
4	12.45	70.05	-0.23	79.03	18.75	98.35	22.90	63.70	43.15	58.75	50.35	96.70	55.05	71.95	53.50	63.15	47.90	59.55	33.25	77.90	23.35	47.45	8.40	71.90
5	11.85	68.80	15.90	58.50	11.30	91.10	23.50	68.70	42.10	52.75	51.00	93.65	60.40	71.65	55.25	67.60	43.95	65 35	30.15	78.25	23.45	47.30	17.20	94.85
6	8.80	63.95	5.53	70.80	8.35	100.00	27.20	55.35	43.85	50.60	51.50	82.55	52.05	68.25	59.40	74.00	40.60	47.90	27.70	69.80	23.00	34.05	-1.25	88.30
7	18.25	87.15	10.45	54.55	9.50	100.00	32.75	69.40	46.90	57.30	58.35	78.75	51.75	81.95	54.60	61.20	53.65	85.80	32.50	60.85	25.55	53.85	3.15	68.10
8	22.10	100.0	-0.70	59.35	11.70	78.05	12.75	30.65	34.65	36.10	52.65	54.15	55.15	82.80	54.90	57.55	49.75	78.25	33.10	74.65	15.50	60.80	14.85	58.40
9	6.65	100.0	-13.95	57.20	19.40	71.85	11.30	36.70	41.40	70.45	51.20	69.30	58.80	75.90	56.40	65.45	48.80	73.40	30.50	70.10	18.65	53.20	17.85	40.90
10	0.50	76.45	6.15	88.35	19.40	73.00	26.40	60.40	44.35	94.10	46.10	68.20	52.35	56.90	51.65	55 80	51.05	74.40	28.50	50.35	22.75	52.35	20.45	61.85
11	11.40	63.10	12.15	88.15	8.45	98.40	26.40	70.30	41.45	74.60	53.70	70.10	61.85	75.30	53.95	59.20	48.90	72.20	30.00	56.90	8.50	55.20	16.55	85.55
12	-1.15	91.80	6.45	86.85	11.60	91.80	34.60	73.50	38.95	56.45	51.25	70.90	50.10	55.65	50.75	59.10	16.75	69.35	16.05	39.75	16.35	82.25	20.85	85.55
13	7.70	99.00	11.75	77.70	19.15	90.00	31.15	66.25	42.15	61.20	49.15	59.45	47.75	59.40	49.15	45.30	45.70	67.65	19.90	54.90	20.00	85.35	29.55	91.10
14	6.90	93.60	15.75	77.35	23.80	81.35	31.20	61.10	46.15	68.15	51.15	61.50	49 70	66.00	56.35	68.65	47.30	57.75	20.20	57.15	17.75	88.85	12.20	34.10
15	9.90	95.95	25.40	63.95	26.55	74.05	32.60	65.80	42.00	67.00	47.10	63.15	55.00	69.60	61.50	81.55	41.75	57.60	19.50	35.90	25.30	96.55	13.70	59.75
16	13.85	79.85	24.15	100.00	26.90	68.65	27.00	45.70	43.10	90.10	47.95	89.20	56.35	71.25	57.20	63.55	39.20	39.85	26.00	33.75	-6.95	70.60	20.90	69.95
17	7.60	95.55	19.35	73.35	27.40	65.85	34.56	66.45	46.50	78.00	52.65	78.25	56.65	66.05	57.50	76.30	37.60	38.45	17.35	39.50	2.45	73.80	17.15	80.85

DEW POINT AND RELATIVE HUMIDITY FOR 1891—Continued.

Day.	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.	
	D. P.	R. H.	D. P.	R. H.	D. P.	R. H.	D. P.	R. H.	D. P.	R. H.	D. P.	R. H.	D. P.	R. H.	D. P.	R. H.	D. P.	R. H.	D. P.	R. H.	D. P.	R. H.	D. P.	R. H.
18	12.45	85.45	19.15	89.25	30.65	94.90	37.95	96.20	43.85	64.70	51.85	63.65	58.30	67.00	58.75	81.80	42.95	64.20	21.15	51.15	11.60	75.95	21.05	83.35
19	16.95	82.80	20.70	93.60	23.20	64.60	39.35	79.00	40.20	76.35	56.80	61.80	57.40	78.95	52.40	60.85	44.50	64.65	22.60	50.35	20.10	65.70	19.20	78.25
20	26.35	65.65	13.35	67.85	13.20	36.30	37.80	71.95	42.70	83.30	44.55	57.05	56.70	74.75	51.85	62.60	41.40	62.90	23.55	37.35	15.70	60.80	13.05	66.05
21	23.40	49.00	14.20	89.45	21.70	48.25	30.95	78.00	35.05	89.55	47.25	59.95	56.70	65.65	48.70	84.05	42.55	54.80	28.60	57.05	.....	.....	13.20	59.90
22	15.90	58.10	18.80	88.45	28.45	73.75	35.70	61.15	37.40	89.05	53.30	56.85	53.00	78.50	45.75	74.35	52.10	83.15	20.95	47.15	16.15	67.40	7.40	72.45
23	13.60	95.50	25.40	81.85	29.30	100.00	30.15	76.50	44.80	81.70	53.25	65.35	56.70	74.85	48.05	67.95	48.75	90.40	22.45	36.90	20.25	60.65	11.80	64.40
24	16.35	84.70	20.65	57.75	20.15	98.10	41.65	53.05	44.30	75.45	54.50	72.40	56.90	67.75	51.95	58.60	38.50	82.35	23.15	32.65	18.45	67.35	8.45	85.70
25	20.85	82.15	8.45	67.60	17.45	92.80	43.55	54.70	46.20	92.65	59.20	85.05	55.80	64.60	52.50	74.70	41.10	87.30	24.10	39.05	22.35	65.05	-5.80	84.00
26	23.45	81.75	14.20	57.90	18.05	86.35	19.10	27.70	46.80	79.10	53.70	66.15	59.45	79.50	54.45	92.10	41.45	74.15	25.35	45.50	24.95	60.00	6.10	64.40
27	26.10	92.50	10.45	96.20	28.85	78.25	29.60	42.45	48.70	82.00	51.80	63.40	55.60	62.45	53.20	94.75	37.80	57.50	24.65	58.65	25.10	60.95	20.25	53.00
28	20.00	98.00	16.05	97.95	31.87	88.05	34.80	41.10	49.70	73.30	52.70	68.10	56.30	65.20	50.05	74.45	37.60	65.65	16.80	40.70	20.25	89.85	15.30	61.35
29	-7.45	89.65	.....	.....	27.50	80.35	30.75	34.25	47.75	63.00	49.65	72.70	56.10	72.15	47.40	61.05	31.60	52.75	18.05	36.05	19.50	84.40	9.50	69.70
30	-1.85	83.90	.....	.....	25.20	69.15	27.70	39.10	41.90	50.25	51.80	66.75	53.75	80.70	49.85	65.85	38.45	62.60	16.35	35.40	24.65	53.25	16.35	76.20
31	4.15	87.15	.....	.....	28.05	94.10	.....	.....	47.15	69.50	.....	.....	55.45	76.75	47.15	56.60	.....	.....	17.40	55.60	.....	.....	18.30	85.95
Sums	376.65	2531.50	304.40	2192.28	647.90	2557.35	890.05	1764.45	1319.90	2135.90	1521.00	2097.10	1710.60	2146.65	1642.15	2112.35	1322.80	1999.35	774.70	1662.60	533.20	1860.25	438.00	2159.60
Mean	12.15	81.66	10.87	78.30	20.90	82.49	29.67	58.81	42.57	68.90	50.70	69.91	55.18	69.25	52.97	68.14	44.08	66.64	24.99	53.63	18.39	64.15	14.13	69.66

RETURN OR SEEPAGE WATERS.

After a country has been irrigated for some time, there are some changes in the regime of streams, so that these are more regular in their flow, especially in the dry season; often they may be repeatedly drained to the last drop, and soon have enough to make a respectable stream. Most of this return is from invisible sources, or in quantities too small to measure. While an increase in the volume of streams is noticed in a non-irrigated country, in many of the irrigated valleys the return is attributed to irrigation. The methods of irrigation require that more water shall be applied to the field than is used by the plants. While some water is used by the plant, either incorporated in its tissues or transpired, more sinks into the soil and becomes lost to this crop. We have not observations which will absolutely prove that this increase is solely due to irrigation, but the fact familiar to all irrigating countries, that land previously dry becomes saturated, and requires draining because of the seepage from ditches or irrigated lands of higher location, and other analogous facts, render it very probable that most, if not all, of the return observed is due to the return from the waters which have been applied in irrigation. The return becomes important, because it is so much gained. In the Poudre Valley it equals one-third of the flow of the stream. It is equivalent to an increase in the volume of the stream, in consequence of which more land can be supplied by the stream than would otherwise be possible. It benefits those above the point where it becomes noticeable, as well as those below. Usually those lower on the stream have the first right to water, which in times of low water would require those higher up with later rights to allow the needed amount to pass. But when the return waters become noticeable, those above may drain the

stream, allowing those lower down to be supplied by the waters which reappear in the channel.

A study of this phenomenon is evidently of considerable importance. It is desirable to know the laws governing the return, the amount, the places where the return is observed, and the rapidity with which it returns. It is possible that irrigation in the upper valley of a river is beneficial to the lower valley, by the return later in the season during the period of low water. This was the conclusion arrived at by M. Vigan, who investigated the same phenomenon, known to the French as the "Reproduction of Waters," as it appeared in the valley of the Tet, in Southern France.

Measurements of the return waters of the Cache a la Poudre River have been made at five different times. The first measurement was made in 1885, by E. S. Nettleton, then State Engineer, and B. S. LaGrange, Water Commissioner of the District. In 1889 the measurement was repeated under the direction of Mr. Nettleton, then Chief Engineer of the Rocky Mountain Division of the United States Irrigation Survey, with the co-operation of J. S. Greene, State Engineer. The measurements were made by E. C. Hawkins and L. R. Hope. In 1890 the measurement was made under the direction of J. P. Maxwell, State Engineer, by Messrs. Hope and Hawkins. In 1891, learning that it was not expected to repeat the measurement in this section, in view of the importance of the question, this department offered to co-operate with the State Engineer, and measured and made the gaugings of the Poudre, besides assisting in those of the Platte from the mouth of the Poudre to the State line. This emphasized the necessity of a more careful measurement, as well as measurement at different seasons of the year, to determine whether the increase was the same at all seasons. All the measurements have been made in

the month of October hitherto. Hence the gaugings were repeated in March, 1892. It is intended to make the measurement at different periods of the coming year.

In the first measurement, in 1885, all the ditches were closed. In the other years no other attempt was made than to choose a time when the ditches were not varying the amount of their intake. In the measurements the inflow of several small streams, which was supposed to be all seepage, was not measured. In 1890 one or two were measured, but were not given in the State Engineer's report for 1889-90. In March, 1892, all observed inflows or outflows were measured. For most of the thirty miles the stream was closely followed, so as to intercept all small streams. As far as possible, their source was ascertained, though it was not possible to do this so thoroughly as was desirable. In most cases there was reason to believe that the inflows were from seepage which had appeared below the ditches; the origin, at any rate, was in the seeped lands below the ditches. Such are, therefore, indicated in the table by parentheses, and are not counted in the summation. Coy ditch, which was measured, was afterward found to be wasting in the river at a place not known at the time of the measurement. In the case of the measurement of October, 1891, Mr. Hope, of the State Engineer's office, and Mr. Trimble, of this Section, made the gaugings from Greeley. The observations are given in the following tables:

MEASUREMENTS, 1891.

PLACE OF MEASUREMENT.	River.	Outflow.	Inflow.	Bal.	Observed.	Gain.
OCTOBER 29.						
River at Canon	97.58					
Canon Ditch		.03				
Taylor and Gill Ditch		2.16				
Little Poudre Ditch		5.21				
Larimer County Ditch		1.00				
Fort Collins Water Works		.30				
Pleasant Valley and Lake Canal		6.99				
Larimer County No. 2 Canal		.64				
New Mercer Canal		0				
Jackson Canal		0				
Larimer and Weld Canal		43.30				
		59.63		37.95		
Poudre	54.39				54.39	16.44
OCTOBER 29.						
Pioneer Ditch						
Ames Ditch		.50				
Lake Ditch		.24				
Coy Ditch		1.60				
Box Elder Ditch		3.78				
Cache la Poudre No. 2 Canal		.50				
		6.62		47.77		
Poudre at head of No. 2	56.48				56.48	8.71
OCTOBER 30.						
Whitney Ditch		0				
Eaton Ditch		1.42				
Jones Ditch						
Greeley No. 3 Canal		32.24				
Boyd and Freeman Ditch		2.42				
		36.08		20.40		
OCTOBER 29.						
Poudre, near Greeley Pump House					15.3	
Poudre below Greeley	53.56				53.56	33.16
Ogilvy Ditch		18.12				
Running in (waste)			5.88			
Poudre near mouth	60.72			41.32	60.72	19.40
Total gain						77.71
NOVEMBER 3.						
River at Canon	107.01					

MEASUREMENTS, 1892.

PLACE OF MEASUREMENT.	River.	Outflow.	Inflow.	Bal.	Observed.	Gain.
MARCH 10.						
River at Canon	65.02					
Lew Stone Creek			0.50			
Canon Ditch						
Pleasant Valley Canal		4.38				
Jackson Ditch		2.07				
Little Poudre Ditch		1.08				
Taylor and Gill Ditch		.59				
Fort Collins Water Works		.22				
Larimer County Ditch		0				
Larimer County No. 2		10.10				
New Mercer		.28				
MARCH 11.						
Larimer and Weld Canal		.72				
Pioneer Ditch		0				
Lake Ditch		0				
Coy Ditch		(2.47)				
Dry Creek			(1.25)			
Ames' Slough			(7.00)			
Cooper's Slough			(2.43)			
Box Elder Creek			(2.16)			
Spring Creek			(6.04)			
Box Elder Ditch		.75				
Fossil Creek			(2.72)			
Near Whitney Ditch			(.81)			
MARCH 12.						
Eaton Ditch		.10				
Whitney Ditch		(.06)				
Poudre River n'r Eaton headgate	102.54	20.29		45.23	102.54	57.31
Near Fuller Bridge			1.15			
Inflow above Briggs			(2.25)			
Inflow near Whitney			.98			
Jones' Ditch			0			
Inflow opposite Jones'			(1.35)			
Inflow near Fletcher			(.75)			
Greeley Canal No. 3		0	(.90)			
Poudre near Pump House				103.69	132.75	26.06
Ogilvy Ditch		1.00				
Poudre below Ogilvy Ditch	132.75			131.75	141.49	9.74
	141.49					96.11

Is the return constant? The prevailing idea, supposed to be founded on the measurements, has been that it was increasing. But a study of the gaugings does not seem to substantiate this idea, as in the following table of the

COMPARISON OF MEASUREMENTS OF RETURN OR SEEPAGE WATERS, CACHE A LA POUDRE RIVER.

(Measures in cubic feet per second.)

DATE.	Return Canon to Larimer & Weld Canal.	Return Larimer & Weld to No. 2 Canal.	Return No. 2 to Ogilvy Canal.	TOTAL RETURN Canon to:	
				Ogilvy Canal.	Mouth of Poudre.
1885—October 12 —....	11.86	25.50	49.54	86.90	.....
1889—October 14-17....	11.27	36.79	44.50	92.56	98.96
1890—October 16-18....	25.79	13.66	20.87	*77.57	100.79
1891—October 28-30....	16.44	8.71	33.16	*58.31	77.71
1892—March 10-12.....	.....	†57.31	35.80	96.11	.....

* One-half mile below Greeley.
† Total to head of Eaton Ditch, about a mile below No. 2.

It would evidently be desirable that the gaugings should be made in as short time as possible, so that fluctuations in the river should not interfere with the amount observed at the different points. Rain may have some effect, but in each of the above cases it could not have had much influence. The gauging of 1889 was made during a rainy period, there being .19 inches rain on the 13th, .16 during the following night, and .10 in the night of the 15th and 16th. In 1890, there was no rain after October 9, and before the gauging. On the 9th there was .71. In 1891, there was no rain after October 5. There was a fall of .20 between October 2 and 5. In 1892, between March 3 and 6, there was .83 inches rain, and then none until after the gauging was completed.

EVAPORATION.

Observations on evaporation have been carried on essentially as hitherto. A tank, three-feet cube of galvanized

iron, is sunk in the ground, and the height of the water surface is measured at twelve-hour intervals by means of a hook gauge, by which the reading may be made to a thousandth of a foot, or in good light to much less. The temperature of the water is also measured at the surface at both 7 a. m. and 7 p. m. In addition, a set of maximum and minimum thermometers are kept in the tank, and the temperatures taken by them in addition. The velocity of the wind is measured by the anemometer, which is on the top of the tower of the College building, a hundred feet distant. From these observations, together with the observations of the dry and wet bulb thermometers, the observations are reduced, but from the unsatisfactoriness of the wind record, I have not attempted to make a serious reduction to determine the best formula which will represent the evaporation. For comparing the observations, we have used as a working formula, that derived from the observations of 1889, which is the following: E being the evaporation for 24 hours, in inches, T the vapor tension corresponding to the temperature of the water surface, t the vapor tension observed in the air, W the movement of the wind in 24 hours, in miles, at the surface of the water:

$$E = 0.39\ (T-t)\ (1--0.02W).$$

While this formula was derived from observations confessedly incomplete, it has represented with fair exactness the daily loss by evaporation. In originally producing the formula, the mean temperature was considered to be the mean between the 7 a. m. and 7 p. m. observations, but which, because of the mobility of the water, and the fact that cooling, when it occurs, takes place through the whole mass, while heating takes place practically at the surface, is not the true mean. Cooling then takes place much more slowly at the surface than heating. This fact was

not recognized until a series of observations had been made extending throughout the whole 24 hours. The application of the formula to the observations of 1890 gives the following comparison between the observed and computed values:

EVAPORATION OBSERVED AND COMPUTED, 1890.

(In inches.)

MONTH.	DAYS.			NIGHTS.		
	No. Days.	Evap. Obs'ed.	Evap. Comp'd	No. Nights.	Evap. Obs'ed.	Evap. Comp'd
May	19	1.84	1.47	18	1.08	1.20
June	24	2.61	2.56	24	2.33	2.24
July	31	2.70	2.96	31	2.82	2.81
August	28	1.85	2.20	28	2.13	2.10
September*	5	0.23	0.42	6	0.63	0.42
	.....	.....	.....	†18	2.14	2.42
October*	.....	.....	.....	31	2.93	2.84

* After September 6, 7 p. m. observations omitted on account of early darkness.
† Nights and days together.

Total observed, 156 days, 23.30 inches.
Total computed, 156 days, 23.74 inches.

Besides the standard tank, others were placed in the canal running through the College grounds, and on Warren's Lake. These were not convenient enough of access to prevent losses of record for some weeks at a time from the malicious curiosity of marauders. At the Sub-Stations, tanks corresponding to the standard tank were placed, but the observations were taken without the accuracy of the hook gauge. The results of the observations are given in the following tables.

The evaporation is the net evaporation, after correcting for the rainfall. Subtracting the rainfall from the amount here given, will show the evaporation observed in excess of the rainfall:

COMPARATIVE MONTHLY EVAPORATION, 1891.

(In inches.)

STATION.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Agricultural College	5.03	4.97	5.72	4.91	4.12	3.62	1.73	.75
Divide Station	.....	7.83	5.12	4.13	5.32	.....	.....	.....
Rocky Ford	.....	7.44	7.24	6.50	6.75	0.56	.....	.....

MONTHLY EVAPORATION AT AGRICULTURAL COLLEGE.

(In inches.)

YEAR.	January.	February	March.	April.	May.	June.	July.	August	September.	October.	November.	December.	Total.
1887	2.46	3.23	4.60	5.55	5.19	5.75	5.23	4.24	4.12	3.26	1.48	1.6	....
1888	....	....	....	....	4.45	7.70	7.00	4.66	3.94	2.17	1.35	.99	.....
1889	1.085	1.027	2.75	4.06	3.72	4.336	5.20	5.15	5.19	3.28	.62	1.42	37.83
1890	.855	2.36	3.48	3.50	4.318	5.709	5.440	5.76	3.69	2.71	1.32	1.10	40.24
1891	.....	3.79*		4.466*	5.081	4.972	5.721	4.906	4.123	3.62	1.735	.754	39.12
Evap. pr day, 1891	.....	.....	.....	.....	.16	.17	.18	.16	.14	.12	.06	.02	.....
Mean temp., 1889	.....	.....	.....	.....	.....	66.6	72.0	70.5	61.1	52.7	.....	.....	.....
" " 1890	.....	.....	.....	.....	58.0	67.2	75.0	69.9	62.0	52.1	.....	.....	.....
" " 1891	.....	.....	..	....	59.4	68.5	74.1	70.5	64.3	50.8	.....	.....	.....

* Record for two months.

EVAPORATION PER DAY AT AGRICULTURAL COLLEGE.

(In inches.)

YEAR.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1887	.079	.115	.148	.185	.167	.192	.169	.137	.137	.105	.049	.052
1888	.....	.....	.....	.....	.144	.257	.226	.131	.131	.070	.045	.032
1889	.035	.037	.089	.135	.120	.144	.168	.166	.173	.106	.021	.046
1890	.028	.084	.112	.117	.139	.190	.175	.186	.123	.087	.044	.035
1891	.....	.064*	.....	.073*	.160	.166	.185	.158	.137	.044	.058	.024

* Record for two months.

EVAPORATION FROM A TANK IN THE ARTHUR CANAL.

MONTH.	Evaporation.	Average Temperature of Water Surface.
July	4.92	66.0
August	3.33	67.3
September	3.18	59*

* The temperature of the water for September is derived from the readings at 7 a. m. for a portion of the month, allowing 6° for the amount the mean was above the 7 a. m. reading for the earlier part of the month.

Readings were made of the height of water in this tank twice daily with a stick graduated like a rain-gauge stick. During the latter part of the season they were made daily only.

THE DUTY OF WATER.

During the Summer of 1891 some experiments were carried on for the purpose of determining the amount of water that was used in irrigation, both on a large and small scale.

It had been planned to use automatic registers of a French pattern, made for us in Paris by Richards Bros., well known as makers of self-registering meteorological instruments. On account of delay in making and shipping them, we were not able to place them in the canals and in the various streams until after the first irrigation was made.

The registers, when received, were placed in the measuring flumes of two canals, with the kind consent of the officers.

One was the Cache a la Poudre Canal No. 2, one of the earliest of the large canals in the Poudre Valley; a canal which waters nearly 25,000 acres of land. This canal covers a portion of the Greeley

Colony, and most of the farmers underneath it have had long experience with irrigation, so that their use of water may be considered that of experienced irrigators. More than this, the water right of the canal is one of the earliest on the river, so that the farmers under this canal are less troubled in times of low water than many of the other canals, consequently the duty shown in their practice will be more nearly the normal duty than it would be under a canal where more crops would be put in than the amount of water would suffice to mature.

The register was placed in this canal May 22, and replaced by a new register June 12. The water had been turned on April 28, and for most of the period before the register was placed in position, we have the gaugings of the headgate man, except for the ten days when the flow of water was small.

During the year 1890, the amount of water which entered this canal was sufficient to irrigate the area to a depth of 21 inches, as shown by the Report for 1890, page 68. In order to make the data obtained of the most value, it was necessary to have a knowledge of the kinds of crops and the area devoted to each, as well as the number of times irrigation was given to them. Some weeks were devoted to securing this information, but it was impossible to make it complete for the past season. Further attempts will be continued the coming year, so as to determine with some degree of value the duty of water.

A second register was placed in the New Mercer Canal, a smaller canal on the south side of the Poudre River, watering the land to the south of Fort Collins. In the case of this canal, the area irrigated is also supplied to a greater or less extent by the water from two other canals, the same farmers often having water rights in the three

canals, and generally in two. It was, therefore, practically impossible to distinguish between the area supplied by one canal and that by another, and consequently the measures of the last season will lead to no valuable results.

To determine the duty on a smaller scale on individual crops, water registers were placed to measure the water applied to the alfalfa field of J. H. McClelland, near Fort Collins; to a wheat crop of Walter Campbell's, in the same locality; to a meadow of native grass belonging to Capt. W. M. Post, and to two fields of potatoes near Greeley, belonging to Solomon Hopkins and S. A. Bradfield respectively, both excellent farmers. From the measurements as made thus far, the results have not been as satisfactory as was hoped, and it is expected they will be made more complete during the coming season.

By the duty of water it is hardly necessary to say, we mean the amount of land which a given quantity of water will serve. It may be indicated either by stating the amount of land which the constant flow of a given stream will irrigate, or by the depth of water which is applied. The former is the more common way, and the duty is stated in the number of acres which the constant flow of one cubic foot per second will serve. This, in Colorado, has commonly been taken as 55 acres per second foot, though as pointed out in the Report for last year, water is needed in this amount only for a short time during the Summer. Less is needed during late Summer, so that the average duty for the whole season may be several times as great. Thus, with Cache a la Poudre Canal No. 2, the average duty for the whole season was 120 acres per cubic foot per second, while the duty during the month of June was less than 60.

This method of estimating the duty of water has commonly been used in making water contracts, and has some conveniences, but it gives no real measure of the amount of water which is needed or used. In view of the fact that the needs vary from month to month, a more rational way of stating the duty of water, for the purpose of investigation, at least, is in terms of the depth of water which is applied. From knowing the depth, the flow which is needed to supply this amount in a given time may be readily found by remembering that a cubic foot of water per second is sufficient to flood one acre to a depth of two feet in 24 hours. If a stream of this size irrigates four acres in 24 hours, the depth of water applied is 6 inches. It requires skillful irrigation to apply less water than this in a single irrigation. Even in potatoes, with row irrigation, the measurement of 1891 showed that Mr. Hopkins applied 4.5 inches in depth for one irrigation, and Mr. Bradfield applied 6.4 inches in depth. Both are skillful irrigators, and the fields are in good conditions for economical irrigation.

ACTINOMETRY.

The series of observations upon the intensity of the sunshine, a line of investigation of some promise in Agricultural Meteorology, was interrupted by the breakage of the glass inclosures surrounding the instruments by high winds early in the season. It is expected to continue the observations during the coming season. The Arago-Davy conjugate thermometers, made by Ducretet, of Paris, for this purpose, have proved very satisfactory, except that the corrections have been slightly different for the different thermometers.

SUNSHINE.

The amount of sunshine has been measured, as hitherto, by the Pickering Sunshine Recorder, which photographs the sun, whenever it is shining, upon a piece of sensitive paper. When the sun shines continuously this forms a line, the length of which gives the means of determining the number of hours and minutes of sunshine. The record can not be called entirely satisfactory, but gives good results compared with the cost and simplicity of the apparatus. At sunset and sunrise the solar rays have so little actinic effect that no print is made for sometime. In order that this shall introduce as small an error as possible, the line of sunset or sunrise is first marked on the paper, and the measurement is made with that as a basis. As both the Station at the College and in the San Luis Valley are surrounded by mountains, it has been necessary to measure their heights at the various azimuths, and allow for their effect upon the duration of the sunshine, as mentioned in the Report for 1889.

The high amount of sunshine is noticeable, especially when we recall that in Central New York, chosen as an example of the Eastern conditions, the observed sunshine amounts to only 37 per cent. It is this great amount of sunshine, combined with the dryness, which makes the great range in temperature during the day, and gives to our fruits and flowers their high colors. The amount of sunshine and its intensity is of much agricultural importance, and with increase of knowledge we may expect to perceive the relations more clearly. The measurements for the following tables were made by Mr. Trimble:

HOURS AND MINUTES OF SUNSHINE, FORT COLLINS, 1891.

MONTH.	Sunrise to 9 o'clock.		9 to 12.		12 to 3.		3 to Sunset.		Total for Whole Day.	
	Possible.	Observed.	Possible.	Observed.	Possible.	Observed.	Possible.	Observed.	Possible.	Observed.
January	54-96	26-06	93	57-42	93	56-02	45-50	18-46	286-06	158-36
February	63-33	32-20	84	55-29	84	49-52	54-21	32-08	285-54	169-49
March	90-29	57-51	93	68-05	93	52-58	81-06	37-06	357-35	216-00
April	107-36	58-55	90	65-33	90	65-41	99-10	63-41	386-46	253-50
May	128-33	74-50	93	60-01	93	49-58	120-43	51-12	435-16	236-01
June	132-44	83-47	90	68-11	90	64-21	126-18	68-56	439-02	285-15
July	132-45	87-52	93	72-17	93	57-43	125-29	73-22	444-14	291-14
August	117-24	80-43	93	66-26	93	52-58	108-41	54-44	412-05	254-51
September	94-18	53-42	90	73-17	90	75-11	85-01	55-19	359-19	257-29
October	76-50	54-45	93	79-08	93	76-51	66-37	46-25	329-27	257-09
November	56-25	24-29	90	56-57	90	60-37	47-33	28-42	283-58	170-45
December	48-52	22-12	93	51-48	93	61-08	41-38	24-15	276-30	159-23
Year	1103-45	657-32	1095	774-54	1095	723-20	1002-27	554-36	4296-12	2710-22

DIURNAL VARIATION IN SUNSHINE, 1891.

(In per cent., observed sunshine is of possible.)

MONTH.	Fort Collins.				San Luis.				Rocky Ford.			
	Before 9 a. m.	9 to 12.	12 to 3.	3 to Sunset.	Before 9 a. m.	9 to 12.	12 to 3.	3 to Sunset.	Before 9 a. m.	9 to 12.	12 to 3.	3 to Sunset.
January	48.1	62.0	60.2	40.9	66.5	79.3	79.7	34.5	50.5	61.4	54.1	40.7
February	50.9	66.0	59.4	53.9	63.0	81.3	73.7	51.9	.....	.....	.....	.....
March	63.9	73.2	57.0	45.7	.....	.....	.....	.....	44.5	67.8	64.2	52.2
April	54.8	72.8	73.0	64.3	.....	.....	.....	.....	74.7	89.0	84.4	65.7
May	58.2	64.5	53.7	42.4	76.4	70.4	64.1	54.2	.....	.....	.....	.....
June	63.1	75.8	71.5	54.6	82.1	87.2	76.2	68.0	.....	.....	73.3	65.8
July	66.2	77.7	62.1	58.5	.....	.....	.....	.....	47.7	64.9	70.7	45.4
August	63.8	71.4	57.0	50.4	77.5	97.2	78.7	72.0	67.0	92.4	88.0	54.9
September	56.9	81.4	83.5	64.8	48.4	63.9	80.0	62.2	.....	.....	.....	.....
October	71.3	85.1	82.6	69.7	85.4	94.2	91.1	82.1	.....	.....	86.3	80.9
November	43.4	63.3	67.2	60.3	.....	.....	.....	.....	.....	.....	69.9	55.9
December	45.4	55.7	65.7	58.3	.....	.....	.....	.....	46.1	55.3	50.5	47.0
Average	57.6	70.8	66.1	55.3	71.4	81.9	77.6	60.7	55.0	71.8	71.3	56.5

FORENOONS AND AFTERNOONS COMPARED.

(In per cent.)

MONTH.	Fort Collins.		San Luis.		Rocky Ford.	
	a. m.	p. m.	a. m.	p. m.	a. m.	p. m.
January	56.9	53.8	74.5	63.3	57.2	48.9
February	57.3	57.1	72.9	64.3	.....	.....
March	68.6	51.7	—	—	56.3	58.3
April	62.9	82.6	.....	.....	81.2	71.5
May	60.7	47.2	73.8	59.0	52.4	59.8
June	68.2	61.6	84.2	71.4	37.1	68.8
July	70.9	59.9	73.5	55.0	54.8	55.9
August	69.9	58.4	86.8	75.0	83.7	69.7
September	68.9	74.4	56.1	71.0	—	—
October	78.8	77.2	90.2	87.1	—	83.8
November	55.7	64.9	—	—	—	64.3
December	56.4	63.4	—	—	51.9	49.3

SUNSHINE, IN HOURS AND MINUTES, FOR JANUARY, 1891.

Date.	COLLEGE, FORT COLLINS.					BENT, ROCKY FORD.					SAN LUIS, DEL NORTE.				
	Forenoon.			Afternoon.		Forenoon.			Afternoon.		Forenoon.			Afternoon.	
	Comp.	Observed.		Comp.	Observed.	Comp.	Observed.		Comp.	Observed.	Comp.	Observed.		Comp.	Observed.
		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.
1	4 35	1 35	3	4 21	3	1 21	4 42	1 42	3		1 30	0	4 39	1 39	3	4 33	3	0 24
2	4 35	0	0	4 21	0	0	4 43	1 43	2 48		2 51	1 43	4 40	1 39	3	4 34	2 54	0
3	4 36	1 36	1 50	4 22	1 54	0	4 44	0 12	3		3	1 44	4 40	1 39	3	4 34	3	0 30
4	4 37	1 37	3	4 22	2 34	0	4 44	1 44	2		0 45	0	4 41	1 42	3	4 34	3	1 33
5	4 37	0 41	1 56	4 23	3	1 23	4 45	1 45	3		3	1 45	4 41	0 18	0 57	4 35	2	0
6	4 37	1 37	2 46	4 23	2 53	1 23	4 45	1 30	3		0 69	0	4 42	1 42	3	4 35	3	0 48
7	4 38	0	0	4 23	0	0	4 46	0	0		0	0	4 42	0 51	1 42	4 36	0	0
8	4 38	0	0	4 24	0	0	4 46	0	0		0	0	4 43	0	0	4 36	3	0 51
9	4 39	0	0	4 24	0	0	4 47	0	0		0	0	4 43	1 42	3	4 37	2 18	0 51
10	4 40	1 40	2 54	4 25	0 59	0	4 47	1 47	3		3	1 47	4 44	0	2 17	4 37	2 48	0
11	4 40	1 20	0	4 25	1 14	0	4 48	0	0		0	0	4 44	1 45	3	4 37	3	0 54
12	4 41	1 41	3	4 26	3	1 26	4 49	0	0		0	0	4 45	1 45	3	4 38	0	0
13	4 42	1 42	3	4 26	3	1 26	4 49	1 49	3		3	1 49	4 46	1 45	3	4 39	3	0 54
14	4 43	1 43	3	4 27	2 37	0 08	4 50	1 50	3		3	1 50	4 46	1 45	3	4 40	3	0 57
15	4 44	0	3	4 27	3	1 27	4 51	0 30	3		2 24	0	4 47	0	0 36	4 41	3	0 48
16	4 44	0	2 04	4 28	3	1 28	4 51	0 51	0 03		1 27	1 30	4 48	0	0 24	4 42	0 21	0
17	4 45	1 45	3	4 29	1 35	0	4 52	1 52	3		1 39	0	4 49	0 42	1 54	4 42	0	0
18	4 46	1 46	3	4 29	3	1 29	4 53	0 15	1 15		0 15	0	4 50	0	2	4 43	3	0 51
19	4 47	0 08	1 50	4 30	0 27	0 22	4 54	1 54	3		3	1 54	4 50	1 48	3	4 44	3	0 51
20	4 47	0 42	2 21	4 30	2 15	1 30	4 54	0 54	2 45		2 27	0 10	4 51	1 48	3	4 45	3	1
21	4 48	0 17	1 56	4 31	0 11	0	4 55	1 21	2 06		2 57	0 12	4 52	1 48	3	4 45	3	0 57
22	4 49	0	1 15	4 32	3	1 16	4 56	0	0 03		1 36	0 18	4 53	1 51	2 03	4 46	0	0
23	4 50	1 50	1 55	4 33	3	1 33	4 57	0 33	3 00		3	1 57	4 54	1 51	3	4 47	3	1 03
24	4 51	0	0 55	4 34	2 35	0 27	4 58	1 42	3		2 21	0 54	4 55	1 15	2 36	4 48	3	1
25	4 52	0 19	2 04	4 35	3	1 35	4 59	0 21	0 21		2	1 59	4 56	0 30	1 03	4 49	2 30	1 21
26	4 43	0	2 21	4 35	2 15	0	5 00	2	3		3	2	4 56	1 54	3	4 50	3	0 45
27	4 54	0	0	4 36	0	0	5 00	0	1 15		0 27	0	4 57	1 30	2 11	4 51	1 24	0 09
28	4 55	0	0	4 37	0 27	0	5 01	0	0		0	0	4 58	0	0	4 52	2 48	0
29	4 56	1 56	3	4 38	2 03	0 32	5 03	2 03	3		3	2 03	4 59	1 57	3	4 53	3	0 51
30	4 57	1 57	2 50	4 39	2	0	5 04	1	1 30		0	0	5 00	1 30	3	4 54	3	0 57
31	4 59	0 14	1 45	4 40	0 03	0	5 04	0	0		0 30	0	5 01	0 48	3	4 55	1 03	0
	147 16	26 6	57 42	138 56	56 2	18 46	150 58	29 18	57 6	Same as forenoons, as there are no mountains on horizon.	50 18	23 35	149 12	37 24	73 43	145 54	74 06	18 15
Per Cent.		48.1	62.0	.....	60.2	40.9	.....	50.5	61.4		54.1	40.7	.....	66.5	79.3	.....	79.7	34.5

SUNSHINE, IN HOURS AND MINUTES, FOR FEBRUARY, 1891.

Date.	COLLEGE, FORT COLLINS.						BENT, ROCKY FORD.						SAN LUIS, DEL NORTE.					
	Forenoon.			Afternoon.			Forenoon.			Afternoon.			Forenoon.			Afternoon.		
	Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.	
		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.
1	5 00	0 55	2 40	4 41	3	1 21	5 05	....	....		....	....	5 02	1 15	3	4 56	3	1
2	5 01	0 55	2 45	4 42	3	1 42	5 06	....	....		....	....	5 03	0	0	4 57	0 48	0
3	5 02	0 28	1 37	4 43	3	1 43	5 07	....	....		....	....	5 04	1	3	4 58	3	1 58
4	5 03	1 50	2 40	4 44	0 57	1 44	5 08	....	....		....	....	5 05	1 28	3	4 59	3	1 59
5	5 04	2 04	2 46	4 45	3	1 45	5 10	....	....		....	....	5 06	2 06	3	5 00	2 54	2
6	5 06	2 06	1 37	4 46	0 40	1 16	5 11	....	....		....	....	5 07	2 07	3	5 01	1 06	1 30
7	5 07	0	0 55	4 47	3	1 47	5 12	....	....		....	....	5 08	2 08	3	5 02	0	0
8	5 08	2 08	2 35	4 48	0	0	5 13	....	....		....	....	5 09	2 09	3	5 03	3	2 63
9	5 09	2 09	3	4 49	3	1 49	5 14	....	....		....	....	5 10	2 10	3	5 03	3	2 03
10	5 10	2 10	3	4 50	2 50	1 50	5 15	....	....		....	....	5 12	2 12	3	5 04	3	1 15
11	5 11	2 11	3	4 51	3	1 51	5 16	....	....		....	....	5 13	2 13	3	5 06	3	2 06
12	5 13	1 17	3	4 53	2 42	0 49	5 17	....	....		....	....	5 14	2 14	3	5 07	3	2 07
13	5 14	0	1 01	4 54	3	1 54	5 18	....	....		....	....	5 15	2 15	3	5 08	3	2 08
14	5 15	0	0 17	4 55	1 43	0 17	5 19	....	....		....	....	5 16	1 15	1 48	5 09	2 03	1 57
15	5 17	0	0	4 57	0	0 08	5 20	....	....		....	....	5 17	1 09	0 57	5 11	2 51	0 57
16	5 18	0 52	2 46	4 58	0	0	5 22	....	....		....	....	5 18	0 45	1	5 12	0 51	0
17	5 19	1 09	2 51	4 59	2 34	0	5 23	....	....		....	....	5 19	1 24	2 51	5 13	1 24	0
18	5 20	0 03	0 22	5 00	2 48	0	5 24	....	....		....	....	5 21	0	0 12	5 15	1 03	0 15
19	5 22	1 03	2 46	5 02	0	1 30	5 25	....	....		....	....	5 22	1	2 57	5 16	3	2 16
20	5 23	2 04	3	5 03	2 55	2 03	6 26	....	....		....	....	5 23	2 23	3	5 17	3	1 36
21	5 24	0 06	0	5 04	0	0 46	5 27	....	....		....	....	5 24	2 24	3	5 18	3	0 27
22	5 26	1 18	2 38	5 06	2 23	1 27	5 28	....	....		....	....	5 24	0 18	0 33	5 20	2 18	0
23	5 27	2 27	3	5 07	3	2 07	5 30	....	....		....	....	5 25	1 01	3	5 22	0 09	0
24	5 28	2 26	1 12	5 09	1 35	1 35	5 31	....	....		....	....	5 26	2 26	3	5 23	1 25	0
25	5 29	0	0	5 10	0 16	1 13	5 32	....	....		....	....	5 26	2 26	2	5 24	2 51	2 18
26	5 31	1 45	3	5 11	0	0	5 33	....	....		....	....	5 27	2 27	3	5 26	1 45	0 33
27	5 32	0 05	0	5 13	0	0	5 34	....	....		....	....	5 27	0 54	3	5 27	1 37	0 54
28	5 33	0 50	3	5 14	2 29	1 31	5 35	....	....		....	....	5 28	1	2	5 29	2 27	2 12
29	5 34	....	....	5 15	....	....	5 36	....	....		....	....	5 28	....	....	5 30	....	....
	153 07	32 20	55 29	143 36	49 52	32 8	155 13	....	....	Same as forenoons, as there are no mountains on horizon.	....	....	153 61	44 9	68 18	150 36	61 52	34 34
Per Cent..		46.8	66.05	.....	59.36	53.9	.....	....	....		....	....	.....	63.05	81.3	.....	73.65	51.9

SUNSHINE, IN HOURS AND MINUTES, FOR MARCH, 1891.

Date.	COLLEGE, FORT COLLINS.						BENT, ROCKY FORD.						SAN LUIS, DEL NORTE.					
	Forenoon.			Afternoon.			Forenoon.			Afternoon.			Forenoon.			Afternoon.		
	Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.	
		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.
1	5 35	2 35	3	5 16	3	2 07	5 37	1 30	3		0	0 33	5 29	....	....	5 30	....	....
2	5 36	2 10	2 07	5 17	2 45	1 27	5 38	1 06	3		3	1 41	5 30	....	....	5 32	....	....
3	5 37	2 37	3	5 18	1 30	0	5 39	2 39	3		3	2 39	5 31	....	....	5 33	....	....
4	5 39	0	0 14	5 20	0 35	0	5 41	0 15	2 15		3	2 21	5 32	....	....	5 35	....	....
5	5 40	1 07	3	5 21	0 14	0	5 42	0 09	3		3	0 30	5 34	....	....	5 36	....	....
6	5 42	0 14	0	5 23	3	2 23	5 43	0	0		0	0	5 35	....	....	5 38	....	....
7	5 43	2 43	3	5 24	3	1	5 44	0	0		2 45	2 44	5 37	....	....	5 39	....	....
8	5 44	1 36	3	5 25	3	0 48	5 46	2 46	3		3	1 45	5 38	....	....	5 40	....	....
9	5 46	1 27	2 21	5 27	1 48	1 12	5 47	2 47	3		0 30	0 06	5 39	....	....	5 42	....	....
10	5 47	2 45	2 21	5 28	1 03	1 39	5 49	1 03	1 18		1 45	0	5 41	....	....	5 43	....	....
11	5 48	1 09	2 21	5 30	3	2 30	5 50	1 30	3		3	2 50	5 42	....	....	5 45	....	....
12	5 50	2 50	3	5 31	3	2 31	5 51	1	2 42		3	2 51	5 43	....	....	5 46	....	....
13	5 51	1 47	3	5 32	1 30	2	5 52	2 52	3		3	1 15	5 45	....	....	5 47	....	....
14	5 53	2 53	2 35	5 34	3	1 54	5 53	2 09	3		3	2 53	5 46	....	....	5 48	....	....
15	5 54	2 54	3	5 35	0	0	5 55	2 55	3		2 51	1 09	5 47	....	....	5 50	....	....
16	5 55	2 48	2 55	5 37	0 57	0 14	5 56	2 56	3		0 48	0	5 49	....	....	5 51	....	....
17	5 56	0	1 18	5 39	0	0	5 57	2 57	1 27		0 12	0 33	5 50	....	....	5 52	....	....
18	5 58	2 58	2 33	5 40	3	1 03	5 58	1 03	1 15		3	2 58	5 51	....	....	5 53	....	....
19	5 59	1 47	3	5 41	3	0 51	6 00	3	3		2 03	2 09	5 52	....	....	5 54	....	....
20	6 00	1	2 51	5 43	3	2 43	6 01	0 06	0 09		3	1 57	5 54	....	....	5 56	....	....
21	6 02	2 39	3	5 45	3	2 45	6 02	3 02	3		3	3 02	5 55	....	....	5 57	....	....
22	6 03	2 45	2 34	5 46	0 33	0 03	6 03	1 06	3		0	0	5 57	....	....	5 58	....	....
23	6 04	0	0	5 47	0	0	6 04	0	0		0	0 48	5 58	....	....	5 59	....	....
24	6 06	0	0	5 49	0	0	6 05	0	0		0	0	5 59	....	....	6 01	....	....
25	6 07	1 58	3	5 50	2 39	2 50	6 03	0	0		0	0	6 01	....	....	6 02	....	....
26	6 09	3 09	3	5 51	3	2 42	6 08	1 03	2 33		3	3 08	6 02	....	....	6 03	....	....
27	6 10	3 10	0 24	5 52	1 21	0 39	6 09	0	2 15		3	3 09	6 03	....	....	6 05	....	....
28	6 11	2 03	2 40	5 54	0	0	6 10	1 30	2 48		2 39	1 45	6 05	....	....	6 06	....	....
29	6 13	0	0	5 55	0	0	6 11	0 30	1 21		1 21	2 15	6 06	....	....	6 07	....	....
30	6 14	3 14	3	5 56	2 09	2 51	6 13	0	3		2 48	2 15	6 08	....	....	6 08	....	....
31	6 16	1 39	1 31	5 58	0	0	6 14	0 39	0		0	0	6 09	....	....	6 10	....	....
	183 29	57 51	68 05	171 06	52 58	37 06	183 43	40 24	63 03	Same as forenoons, as there are no mountains on horizon.	59 42	47 24	180 08	....	....	181 06	....	....
Per Cent..		68.9	73.26	.....	57.0	45.7	....	44.0	67.8		64.2	52.2	.....	....	....	.....	....	....

SUNSHINE, IN HOURS AND MINUTES, FOR APRIL, 1891.

Date.	COLLEGE, FORT COLLINS.						BENT, ROCKY FORD.						SAN LUIS, DEL NORTE.					
	Forenoon.			Afternoon.			Forenoon.			Afternoon.			Forenoon.			Afternoon.		
	Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Odserved.		Comp.	Observed.	
		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.
1	6 17	2 45	3	5 59	3	2 24	6 15	3 15	3		2 33	2 59	6 10	....	....	6 11	....	....
2	6 18	3 18	3	6 00	3	3	6 16	3 15	3		3	2 54	6 12	....	....	6 15	....	....
3	6 20	3 20	3	6 02	3	2 54	6 17	1 45	2 39		2 48	2 54	6 13	....	....	6 13	....	....
4	6 21	1 17	2 12	6 03	1 21	2 30	6 19	3 18	3		2 36	3 03	6 14	....	....	6 15	....	....
5	6 22	2 40	3	6 05	3	3 05	6 20	0	1 11		3	3 03	6 15	....	....	6 16	....	....
6	6 23	0	0 39	6 06	3	1 25	6 21	3 21	3		2 27	1 42	6 17	....	....	6 17	....	....
7	6 25	1 28	1 46	6 07	2 20	2 15	6 22	3 21	3		3	1 03	6 18	....	....	6 18	....	....
8	6 26	2 15	3	6 09	3	2 10	6 23	3 24	3		2 33	0 15	6 19	....	....	6 19	....	....
9	6 27	1 28	2 54	6 10	3	3 10	6 25	3 24	3		3	3 09	6 20	....	....	6 21	....	....
10	6 29	3 27	3	6 12	3	3 12	6 26	3 27	3		3	3 09	6 21	....	....	6 22	....	....
11	6 30	1 06	2 35	6 13	2 47	2 31	6 27	3 27	3		3	1 06	6 22	....	....	6 23	....	....
12	6 31	0 11	0	6 14	0 41	1 51	6 28	0	0		2 12	0 24	6 24	....	....	6 24	....	....
13	6 32	0 19	2 46	6 15	1 56	1 29	6 29	1 39	2 03		2 03	3	6 25	....	....	6 24	....	....
14	6 34	0	0	6 17	2 34	2 37	6 31	3 03	3		1 51	1 06	6 26	....	....	6 25	....	....
15	6 35	0 55	3	6 18	1 05	1 05	6 32	3 30	2		1 18	0	6 27	....	....	6 25	....	....
16	6 36	2 54	2 51	6 19	2 18	2 53	6 33	3 33	3		3	1 45	6 28	....	....	6 23	....	....
17	6 37	2 12	3	6 20	0 05	0 11	6 34	3 33	3		3	2 06	6 29	....	....	6 26	....	....
18	6 38	1 53	0 52	6 21	0	0	6 35	0	1 11		0 30	3 12	6 30	....	....	6 27	....	....
19	6 40	0	0	6 23	1 52	2 42	6 37	1 33	2 42		2 54	1 42	6 31	....	....	6 27	....	....
20	6 41	2 37	1 31	6 24	1 32	0 11	6 38	2 18	2 30		1 45	1 57	6 32	....	....	6 28	....	....
21	6 42	0 17	1 20	6 25	1 24	1 26	6 39	3 36	3		3	3 18	6 33	....	....	6 28	....	....
22	6 43	2 57	2 24	6 26	2 02	2 10	6 40	3 39	3		3	3 24	6 34	....	....	6 29	....	....
23	6 44	3 44	2 35	6 27	2 50	3 25	6 41	2 33	3		3	3 24	6 35	....	....	6 31	....	....
24	6 46	3 44	2 46	6 29	2 53	1 59	6 42	2 57	3		3	0 54	6 35	....	....	6 32	....	....
25	6 47	1 58	2 48	6 30	1 52	1 56	6 43	3 42	3		3	3 27	6 36	....	....	6 33	....	....
26	6 48	3 46	2 34	6 31	3	3 31	6 44	2 48	3		3	3 27	6 37	....	....	6 34	....	....
27	6 49	3 46	3	6 32	3	2 47	6 45	3 45	3		3	3 30	6 38	....	....	6 35	....	....
28	6 50	3 49	3	6 33	1 48	0 32	6 46	1 57	3		1 18	0 42	6 39	....	....	6 36	....	....
29	6 52	0	0	6 35	1 24	2 31	6 47	3 09	3		2 09	0 24	6 39	....	....	6 37	....	....
30	6 53	0 49	3	6 36	2 57	1 55	6 48	0	2 48		1 57	1 18	6 40	....	....	6 38	....	....
	197 36	58 55	65 33	189 01	65 41	63 41	196 03	79 12	80 04	Same as forenoons, as there are no mountains on horizon.	75 57	64 14	193 17	....	....	192 31	....	....
Per Cent..		54.8	72.8	.....	73.0	64.3	.....	74.7	.....		84.4	65.7	.....	.....	.....	.....	.....	.....

SUNSHINE, IN HOURS AND MINUTES, FOR MAY, 1891.

Date.	COLLEGE, FORT COLLINS.						BENT, ROCKY FORD.						SAN LUIS, MONTE VISTA.					
	Forenoon.			Afternoon.			Forenoon.			Afternoon.			Forenoon.			Afternoon.		
	Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.	
		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.
1	6 54	3 52	2 43	6 37	0 54	3 33	6 49	....	....		....	....	6 41	3 41	3	6 39	2 54	3 39
2	6 55	3 52	2 45	6 38	0 11	0 35	6 50	....	....		....	....	6 42	3 42	1 48	6 40	1 39	2 26
3	6 56	0 17	2 55	6 40	2 18	0 24	6 51	....	....		....	....	6 43	3 42	3	6 41	2 12	1 12
4	6 57	3 57	3	6 41	3	3 39	6 52	....	....		....	....	6 44	3 44	2 30	6 42	2 54	1 33
5	6 58	3 57	3	6 42	3	3 26	6 53	....	....		....	....	6 45	3 45	3	6 43	3	3 42
6	6 59	3 57	3	6 44	3	3 31	6 54	....	....		....	....	6 46	4 48	2 57	6 44	2 27	1 57
7	7 01	4	2 51	6 45	2 04	1 05	6 55	3 56	3		3	1 15	6 47	0	0	6 45	1 18	1 54
8	7 02	2 43	2 46	6 46	2 07	3 12	6 56	3 36	2 09		3	0 57	6 48	3 42	2 30	6 46	1 30	1 45
9	7 03	2 43	2 26	6 47	0 16	0 19	6 57	0	0		0	0 06	6 49	2 42	1 51	6 47	1 21	1 27
10	7 04	2	1 48	6 49	1 37	0 27	6 58	1 39	2 21		0	0	6 50	3	1 09	6 48	1 33	0
11	7 05	0	0 58	6 50	1 40	3 47	6 59	3 59	3		....	....	6 51	3 48	3	6 48	2 48	1 12
12	7 06	4 06	3	6 51	2 47	3 41	7 00	4	3		2 12	3 54	6 52	3 48	2 18	6 49	0 12	0 21
13	7 07	4 06	3	6 52	2 53	3 47	7 00	1 42	3		3	3 57	6 53	0	0	6 50	0	0
14	7 08	4 06	3	6 53	3	0 51	7 01	4 01	3		3	0 30	6 53	3	2 36	6 51	2 36	0 27
15	7 09	1 26	0	6 54	0	0	7 02	0	1 15		2 24	4	6 54	3 54	1 52	6 52	1 36	1 30
16	7 10	0	0	6 54	0	0	7 03	0	0 36		3	1 24	6 55	3 36	1 36	6 52	0 54	0 09
17	7 10	2 43	2 37	6 55	2 15	3 33	7 04	4 04	3		0 18	1 48	6 56	3 54	3	6 53	2 18	3 51
18	7 11	0 33	2 46	6 56	2 23	1 26	7 05	1 18	0 35		2 39	1 57	6 57	3 54	3	6 54	0	0
19	7 12	3 02	1 56	6 57	1 37	1 51	7 06	0	0		3	1 48	6 57	3 54	3	6 54	0	0
20	7 13	0	0 17	6 58	0	0	7 07	3 15	3		2 51	4 03	6 58	3 57	2 06	6 55	3	3 12
21	7 14	0	0	6 59	0	0	7 08	0	0		1 26	1 51	6 59	0 45	2 36	6 56	0 30	0 09
22	7 15	0	0 06	7 00	0	0 24	7 08	0	1 15		0	1 06	6 59	0	0 36	6 56	2 33	1 54
23	7 15	3 46	3	7 01	2 53	0 38	7 09	4 09	3		2 33	4 06	7 00	2 54	2 54	6 57	2 27	1 15
24	7 16	3 44	2 35	7 01	0	0 32	7 10	4 10	3		0 09	1 54	7 01	3 33	2 03	6 58	2 51	3 51
25	7 17	2 02	2 54	7 02	0 56	0 41	7 10	0	0		1 33	0	7 01	4	2 06	6 58	0 42	0
26	7 17	2 07	3	7 03	1 53	1 16	7 11	0	0		0	0	7 02	3 57	2 33	6 59	1 33	3 54
27	7 18	3 57	3	7 04	2 12	1 31	7 11	0 54	....		2 48	1 24	7 03	4	1 52	6 59	3	3 42
28	7 19	2 02	3	7 05	2 31	3 01	7 12	2 30	....		3	1 06	7 03	0	0 36	7 00	0	3 42
29	7 20	3 49	3	7 05	2 42	0 32	7 12	....	....		3	4 12	7 04	4 03	3	7 00	2 51	4
30	7 20	3 57	2 54	7 06	2 39	2 04	7 13	....	....		3	4 12	7 04	0	0	7 01	3	4
31	7 21	0 06	1 43	7 07	0	1 32	7 14	....	....		3	4 13	7 05	3 39	3	7 01	3	4
											2 39	4 15	7 06	4 06	3	7 02	3	4 02
	221 33	74 50	60 01	213 43	49 48	51 12	218 21	43 13	35 12	Same as forenoons, as there are no mountains on horizon.	52 12	53 48	214 10	92 31	65 29	217 45	59 39	64 56
Per Cent.		58.2	64.5	.....	53.7	42 4	.....	.....	.....		.....	.....	.....	76.4	70.4	.....	64.1	54.2

SUNSHINE, IN HOURS AND MINUTES, FOR JUNE, 1891.

Date.	COLLEGE, FORT COLLINS.						BENT, ROCKY FORD.						SAN LUIS, MONTE VISTA.					
	Forenoon.			Afternoon.			Forenoon.			Afternoon.			Forenoon.			Afternoon.		
	Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.	
		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.
1	7 21	2	3	7 08	1 05	0 57	7 14	2 09	0									
2	7 22	1 53	1 56	7 08	3	3 17	7 15	0 48	0									
3	7 22	0	0 06	7 09	0 41	2 12	7 15	2 06	3									
4	7 23	0	0	7 09	0	0	7 16	0	1 24									
5	7 23	0	0	7 10	0 43	2 58	7 16	0 30	2 33									
6	7 24	0 11	3	7 10	3	3 44	7 17	0 39	0									
7	7 24	4 24	3	7 11	2 53	2 29	7 17	1 48	2 36									
8	7 24	3 15	3	7 11	3	2 23	7 17	0	0									
9	7 25	4 24	3	7 12	1 10	0 14	7 17	3 54	2 21									
10	7 25	2 08	2 29	7 13	2 50	2 39	7 18	0	2 12									
11	7 26	4 24	2 37	7 13	2 53	2 53	7 18	0 45	3									
12	7 26	4 24	3	7 13	2 45	0 38	7 18	....	....									
13	7 26	4 24	2 51	7 13	3	2 37	7 18	....	....									
14	7 26	4 24	3	7 14	1 49	2 47	7 18	....	....									
15	7 26	0	0	7 14	1 37	0 32	7 19	....	....									
16	7 26	0	0	7 14	1 02	0 16	7 19	....	....									
17	7 27	1 59	3	7 14	1 43	4 19	7 19	....	....									
18	7 27	4 17	3	7 14	3	1 35	7 19	....	....									
19	7 27	3 10	2 51	7 15	3	4 19	7 19	....	....									
20	7 27	1 20	1 15	7 15	1 13	2 50	7 19	....	....									
21	7 27	4 27	3	7 15	3	4 18	7 19	....	....									
22	7 27	4 27	3	7 15	3	4 18	7 19	....	....									
23	7 27	4 27	3	7 14	3 12	1 24	7 19	....	....									
24	7 27	3 27	2 54	7 14	2 10	1	7 19	....	....									
25	7 27	4 27	1 39	7 14	1	0	7 18	....	....									
26	7 27	2 37	2 18	7 14	1 21	0 22	7 18	....	....									
27	7 26	4 26	3	7 14	3	4 14	7 18	....	....									
28	7 26	4 26	3	7 13	2 53	1 40	7 18	....	....									
29	7 26	0	2 15	7 13	2 37	4 08	7 18	....	....									
30	7 26	4 26	3	7 13	2 53	3 47	7 18	....	....									
	222 44	83 47	68 11	216 18	64 21	68 56	217 52	12 39	17 06	Same as forenoons, as there are no mountains on horizon.	65 57	85 21	214 31	102 16	78 27	213 02	68 33	83 42
Per Cent.		63.1	75.8		71.5	54.6					73.3	65.8		82.1	87.2		76.2	68.0

SUNSHINE, IN HOURS AND MINUTES, FOR JULY, 1891.

Date.	COLLEGE, FORT COLLINS.						BENT, ROCKY FORD.						SAN LUIS, MONTE VISTA.					
	Forenoon.			Afternoon.			Forenoon.			Afternoon.			Forenoon.			Afternoon.		
	Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.	
		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.
1	7 26	4 26	3	7 13	3	3 41	7 18	2 45	3		0	0 54	7 09	3	3	7 06	2 20	0
2	7 25	4 25	2 10	7 12	2 17	4 08	7 17	4 17	3		3	4 17	7 09	2 45	3	7 06	1 15	0 42
3	7 25	4 25	2 30	7 12	1 10	1 24	7 17	4 17	3		2 24	4 17	7 09	1 30	3	7 05	2 21	3 15
4	7 24	4 24	3	7 11	1 08	0 35	7 16	1	3		3	1 55	7 08	2 51	3	7 05	0	0
5	7 24	3 19	3	7 11	1 45	1 05	7 16	3 09	3		3	1 55	7 08	3 45	2 48	7 05	1 06	0 15
6	7 23	1 28	2 10	7 11	2 01	3 06	7 16	0 33	2 09		3	1 54	7 07	4 07	3	7 04	0 45	0
7	7 23	0 33	0 22	7 10	0	0	7 15	1 15	3		3	2 33	7 07	2 54	1 42	7 04	0	0
8	7 22	0 06	2 15	7 10	3	4 10	7 15	1 45	3		1 51	2 45	7 07	4 07	3	7 03	2 45	4 63
9	7 22	4 22	3	7 09	3	3 01	7 14	4 14	3		3	4 14	7 06	0 21	1 30	7 03	3	4 63
10	7 22	0	0	7 09	0	0	7 14	2 45	3		3	4 14	7 06	4 06	3	7 02	3	4 02
11	7 21	1 59	2 51	7 08	3	4 08	7 13	4 13	3		2 54	4 13	7 05	4 05	3	7 02	3	4 62
12	7 20	1 15	3	7 07	3	4 07	7 13	0	0		3	4 13	7 05	4 05	3	7 01	3	4 01
13	7 20	4 20	3	7 06	3	4 06	7 12	2 36	2 24		0	0	7 04	4 04	3	7 01	3	4 04
14	7 19	4 19	3	7 05	3	4 05	7 12	0	2 33		0	0	7 04	3 30	0 45	7 00	3	0 54
15	7 18	4 18	3	7 05	2 31	4 05	7 11	1 57	2 48		0	2	7 03	3 57	2 30	7 00	0 21	0
16	7 18	4 18	3	7 04	2 23	3 55	7 11	4 11	3		0	0	7 02	....	....	6 59	2 30	1
17	7 17	3 30	3	7 03	2 39	2 42	7 10	0	0		3	0 06	7 02	....	....	6 58	2 36	3 58
18	7 16	4 16	3	7 02	2 25	3 31	7 09	0	0		2 30	3 54	7 01	....	....	6 58	3	2
19	7 16	0 27	1 09	7 01	0	0	7 08	0	0		3	2 33	7 01	....	....	6 57	0 24	....
20	7 15	2 04	3	7 00	1 10	1 51	7 08	0	0		2 39	0	7 00	....	....	6 56	....	....
21	7 14	4 14	3	6 59	3	2 34	7 07	0	0		0 45	0 54	6 59	....	....	6 56	....	....
22	7 13	4 13	3	6 58	3	3 58	7 06	0	0		3	1 33	6 58	....	....	6 55	....	....
23	7 12	0 08	1 53	6 57	0 49	1 02	7 06	3 45	3		3	1 39	6 58	....	....	6 54	....	....
24	7 11	4 11	3	6 56	3	3 57	7 05	1 45	3		3	4 05	6 57	....	....	6 54	....	....
25	7 11	0	2 57	6 55	1 57	2 45	7 04	4 04	2 33		2 06	0	6 56	....	....	6 53	....	....
26	7 10	4 10	1 06	6 55	0 16	0	7 03	4 03	3		2 18	0 15	6 55	....	....	6 52	....	....
27	7 09	4 09	1 59	6 54	0 57	0	7 02	0 06	0 39		2 30	0	6 54	....	....	6 51	....	....
28	7 08	2 18	3	6 53	3	3 29	7 02	0	2 24		2 15	0 30	6 54	....	....	6 50	....	....
29	7 07	2 07	0 42	6 52	0 11	0	7 01	3 15	2 03		3	4 01	6 53	....	....	6 50	....	....
30	7 06	0 03	0	6 51	0	0	7 00	0	0		0 27	0	9 52	....	....	6 49	....	....
31	7 05	4 05	2 10	6 50	0	1 54	6 59	2 36	0 48		1 06	0	6 51	....	....	6 48	....	....
	225 45	87 52	72 17	218 29	57 43	73 22	222 00	61 31	60 21	Same as forenoons, as there are no mountains on horizon.	65 45	58 31	217 50	49 07	39 15	216 07	37 26	36 06
Per Cent..		66.2	77.7	.....	62.1	58.5	.....	47.7	64.9		70.7	45.4	.....	.....	.....	.....	.....	.....

SUNSHINE, IN HOURS AND MINUTES, FOR AUGUST, 1891.

Date.	COLLEGE, FORT COLLINS.						BENT, ROCKY FORD.						SAN LUIS, MONTE VISTA.					
	Forenoon.			Afternoon.			Forenoon.			Afternoon.			Forenoon.			Afternoon.		
	Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.	
		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.
1	7 04	2 10	1 20	6 49	0 27	1 27	6 58	1 06	2 21	Same as forenoons, as there are no mountains on horizon.	1 54	0 09	6 50	3 51	3	6 47	2 51	0 39
2	7 03	0	0	6 48	0 41	2 21	6 58	3 57	3		3	2 12	6 49	3 51	3	6 46	1 24	2 15
3	7 02	0	0	6 46	0 17	1 57	6 56	3 57	3		3	2 12	6 48	3 48	3	6 45	2 30	1 03
4	7 01	2 49	1 43	6 45	0	2 02	6 55	0 54	3		2 18	0	6 47	1 24	2 15	6 45	0 18	2 15
5	7	2 10	3	6 44	0 57	1 40	6 55	0 54	3		3	2 42	6 46	2 42	3	6 44	3	3 42
6	6 59	3 59	3	6 42	2 15	0 17	6 54	3 51	3		2 33	0	6 45	3 45	2 39	6 43	1 51	1 12
7	6 58	3 58	3	6 41	3	3 41	6 53	3 51	3		3	0 45	6 44	3 42	3	6 42	2 09	0 42
8	6 57	1 53	3	6 40	2 32	0	6 52	1 54	3		3	2 03	6 43	3 42	3	6 41	0 09	3
9	6 56	3 56	3	6 39	2 53	1 48	6 51	3 48	3		2 45	3 20	6 42	2 06	3	6 40	1 06	3
10	6 55	3 55	3	6 38	2 37	2 53	6 50	3 45	3		3	3 48	6 41	3 39	3	6 39	1 39	2 24
11	6 54	3 54	3	6 37	3	3 37	6 49	2 45	3		0	0	6 40	3 39	3	6 38	3	3 39
12	6 52	1 29	2 29	6 35	3	0 49	6 47	0	2 48		0 15	0	6 40	1 33	3	6 37	2 54	3 36
13	6 51	3 50	2 13	6 34	1 08	2 10	6 46	0	3		3	0 57	6 39	3 39	3	6 36	3	3 36
14	6 50	0	0	6 33	1	0	6 46	3 45	3		3	2 48	6 38	3 36	3	6 35	1 06	3 36
15	6 49	3 49	0 58	6 32	0 34	1 27	6 45	3 45	3		1 48	2 27	6 37	3 36	3	6 34	1 48	2 48
16	6 48	2 57	0 41	6 31	1 10	3 31	6 43	3 42	3		3	1 03	6 36	3 36	3	6 33	3	3 36
17	6 46	3 46	3	6 29	0 49	0 52	6 42	2 51	3		3	3 42	3 36	3 33	3	6 32	2 54	3 15
18	6 45	3 30	3	6 28	2 10	0 19	6 41	3 42	3		2 03	3 42	6 35	2	3	6 31	3	3 33
19	6 44	3 44	2 40	6 27	1 06	0	6 40	3 39	3		3	2 12	6 34	2 27	3	6 31	3	3 33
20	6 43	3 43	3	6 26	1 48	2 48	6 39	3 39	3		2 12	3 27	6 33	2 15	3	6 30	2 36	0 27
21	6 41	0 14	0 22	6 24	0	0	6 38	2 54	3		3	3 39	6 32	2 24	3	6 29	3	3 15
22	6 40	3 40	3	6 23	3	3 23	6 37	1 09	3		3	2 21	6 30	2 30	3	6 28	2 06	0
23	6 39	2 32	3	6 22	3	3 22	6 35	3 33	3		3	3 36	6 29	2 09	3	6 28	3	3 27
24	6 38	2 18	3	6 21	1 27	2 42	6 34	1 33	3		3	2	6 28	1 45	3	6 27	3	3 27
25	6 36	3 36	3	6 19	2 07	0 22	6 33	3 33	3		3	3 03	6 27	2	3	6 26	3	1 24
26	6 35	0	0	6 18	0	0	6 32	0	0		3	2 30	6 26	2 09	3	6 26	3	0
27	6 34	0	0	6 17	0	0	6 31	0	0		3	0 30	6 24	2 57	3	6 25	2 42	3 03
28	6 33	2 31	3	6 15	3	3 15	6 30	3 27	3		3	2 30	6 23	2 06	2 39	6 24	3	2 30
29	6 32	3 32	3	6 14	3	3 14	6 29	3 27	3		3	1 27	6 22	0 54	1 51	6 23	3	3 24
30	6 30	3 24	3	6 13	3	3 12	6 28	0 51	3		3	2 54	6 21	1 42	3	6 23	1 09	3 21
31	6 29	3 24	3	6 12	3	1 35	6 27	1 03	2 48		3	1 03	6 20	3 18	3	6 21	3	3 21
	210 24	80 43	65 25	201 41	52 58	54 41	208 19	77 15	85 57		81 51	63 15	204 29	86 18	90 24	203 31	73 12	79 33
Per Cent.		68.8	71.4	.....	57.0	50.4	.....	67.0	92.4		88.0	54.6	.....	75.5	97.2	.....	78.7	72.0

SUNSHINE, IN HOURS AND MINUTES, FOR SEPTEMBER, 1891.

Date.	COLLEGE, FORT COLLINS.					BENT, ROCKY FORD.					SAN LUIS, MONTE VISTA.				
	Forenoon.			Afternoon.		Forenoon.			Afternoon.		Forenoon.			Afternoon.	
	Comp.	Observed.		Comp.	Observed.	Comp.	Observed.		Comp.	Observed.	Comp.	Observed.		Comp.	Observed.
		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.
1	6 28	3 22	3	6 10	0	6 25	....	....	Same as forenoons, as there are no mountains on horizon.	....	6 19	3 15	3	6 20	1 03
2	6 25	3 22	3	6 09	1 32	6 24	....	....		....	6 18	3 15	3	6 19	2 42
3	6 25	0	2 54	6 07	3	6 23	....	....		....	6 18	2	3	6 18	1 48
4	6 24	2 54	3	6 06	2 18	6 22	....	....		....	6 17	3 09	2 18	6 17	1 48
5	6 22	2 51	3	6 05	3	6 21	....	....		....	6 16	3 09	3	6 16	2 45
6	6 21	0 06	3	6 03	3	6 19	....	....		....	6 15	0 18	3	6 15	1 15
7	6 20	0	0	6 02	3	6 18	....	....		....	6 14	0 12	0 45	6 14	2 42
8	6 18	3 05	2 54	6 01	3	6 17	....	....		....	6 13	0	0 09	6 13	3
9	6 17	3 08	3	5 59	3	6 16	....	....		....	6 12	0	0	6 12	2 48
10	6 16	1 59	0 50	5 58	2 29	6 15	....	....		....	6 10	0	0	6 11	2 51
11	6 15	3 05	3	5 57	3	6 13	....	....		....	6 09	0	0	6 09	3
12	6 13	2 18	1 48	5 55	2 25	6 12	....	....		....	6 08	3	3	6 08	3
13	6 12	2 43	3	5 54	3	6 11	....	....		....	6 06	2	3	6 07	3
14	6 11	2 51	3	5 53	2 42	6 10	....	....		....	6 05	2	0	6 06	2 48
15	6 09	2 38	3	5 52	3	6 09	....	....		....	6 04	1 06	0	6 05	3
16	6 08	1 53	3	5 50	2 31	6 07	....	....		....	6 02	0	0	6 03	0
17	6 07	2 18	2 21	5 49	2 26	6 06	....	....		....	6 01	1 54	3	6 02	2 45
18	6 05	0	0	5 48	2 18	6 05	....	....		....	6 00	2 03	0 30	6 01	3
19	6 04	2 38	3	5 46	3	6 04	....	....		....	5 58	1 39	3	6 00	3
20	6 03	2 40	3	5 45	3	6 03	....	....		....	5 57	0 48	3	5 59	2 51
21	6 01	1 31	3	5 43	1 53	6 01	....	....		....	5 55	0 27	2 42	5 57	2 12
22	6 00	0	0 38	5 42	1 51	6 00	....	....		....	5 54	0 57	1 54	5 56	1 30
23	5 59	0 25	3 51	5 41	2 53	5 59	....	....		....	5 53	2 08	1 45	5 55	2 06
24	5 57	0 08	2 49	5 39	1 29	5 58	....	....		....	5 51	1 27	3	5 54	0 45
25	5 56	0	0	5 38	0 33	5 57	....	....		....	5 50	0	0	5 53	3
26	5 55	0	2 21	5 37	3	5 55	....	....		....	5 48	2 06	3	5 51	3
27	5 53	2 21	3	5 35	2 45	5 54	....	....		....	5 47	2 45	3	5 50	3
28	5 52	1 58	3	5 34	3	5 53	....	....		....	5 46	2 03	3	5 49	3
29	5 51	1 26	3	5 33	3	5 52	....	....		....	5 44	2 06	3	5 48	3
30	5 49	1 31	3	5 31	3	5 51	....	....		....	5 43	0 21	2 50	5 46	1 21
	184 18	53 42	73 17	175 21	75 11	184 00	....	....		....	181 11	44 08	57 33	181 55	72 00
Per Cent.		56.9	81.4		83.5		....	....		....		48.4	63.9		80.0

Date.	SAN LUIS, MONTE VISTA.	
	Afternoon.	
	Comp.	Observed.
		After 3 p. m.
1	1 27	
2	0	
3	3	
4	2 03	
5	1	
6	3 12	
7	3 09	
8	3 09	
9	2	
10	3 06	
11	3 06	
12	3 03	
13	0 45	
14	3	
15	3	
16	0	
17	0	
18	2 54	
19	2 51	
20	2 51	
21	0 54	
22	0	
23	0	
24	0	
25	1 48	
26	2 15	
27	2 45	
28	2 45	
29	2 45	
30	0 24	
	57 12	
Per Cent.	62.2	

SUNSHINE, IN HOURS AND MINUTES, FOR OCTOBER, 1891.

Date.	COLLEGE, FORT COLLINS.						BENT, ROCKY FORD.						SAN LUIS, MONTE VISTA.					
	Forenoon.			Afternoon.			Forenoon.			Afternoon.			Forenoon.			Afternoon.		
	Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.	
		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.
1	5 48	1 20	0 40	5 30	3	1 16	5 50	2 48	1 54	Same as forenoons, as there are no mountains on horizon.	3	2 51	5 42	1 27	3	5 45	1 48	0 48
2	5 47	0	0	5 28	0	0	5 48	2 48	3		3	2 48	5 41	2 09	1	5 43	2 24	0
3	5 45	1 37	3	5 27	3	1 40	5 47	2 48	3		3	2 48	5 40	2 09	3	5 42	3	2 42
4	5 44	1 53	3	5 26	2 45	2 12	4 46	2 39	3		3	2 45	5 38	2 09	3	5 40	3	2 39
5	5 43	2 21	2 37	5 24	0	0	5 45	1 06	0 12		3	2 45	5 37	2 06	3	5 39	3	2 36
6	5 41	2 37	3	5 23	3	2 20	5 43	2 45	3		3	2 42	5 36	2 18	3	5 37	3	2 33
7	5 40	2 26	3	5 21	3	2 02	5 42	2 45	3		3	2 42	5 35	2 33	3	5 36	3	2 33
8	5 39	2 10	3	5 20	3	2 18	5 41	2 42	3		2 51	2 30	5 33	2 33	3	5 35	3	2 30
9	5 37	2 12	3	5 19	3	2 15	5 40	2 42	3		2 24	0	5 33	1 71	3	5 33	3	2 30
10	5 36	2 32	2 04	5 17	0 54	0 24	5 39	2 39	3		0	0	5 32	2	3	5 32	2 45	0 42
11	5 35	0 14	1 56	5 16	1 43	1 08	5 37	0	0		0	2 21	5 31	2 06	3	5 30	2 27	2 09
12	5 33	1 45	3	5 14	3	1 40	5 36	2 33	3		3	2 33	5 30	2 30	3	5 29	3	2 09
13	5 32	2 21	3	5 13	0	0	5 35	2 26	3		3	2 33	5 29	2	0	5 27	0	0
14	5 31	2 21	3	5 11	3	2 10	5 34	0 39	3		0	0	5 28	2 03	3	5 26	3	2 21
15	5 30	2 15	3	5 10	2 29	1	5 33	0 06	0		3	2 30	5 27	2 24	3	5 24	3	2 18
16	5 28	1 59	2 51	5 08	2 50	2 07	5 31	2 33	3		3	2 30	5 26	2 24	3	5 23	3	2 15
17	5 27	2 12	3	5 07	3	2 07	5 30	2 33	3		3	2 30	5 25	2 21	3	5 21	3	2 12
18	5 26	2 24	3	5 06	3	2 04	5 29	....	....		3	2 30	5 24	2 21	3	5 20	3	2 09
19	5 24	2 04	3	5 04	3	2 04	5 28	....	....		3	2 24	5 23	2 21	3	5 18	1 45	0
20	5 23	2 01	3	5 03	3	0	5 27	....	....		3	1 51	5 22	2 18	3	5 17	3	2
21	5 22	1 56	3	5 02	3	2 02	5 25	....	....		3	2 21	5 22	2 21	3	5 16	3	2 15
22	5 20	1 59	3	5 00	3	2	5 24	....	....		3	2 21	5 21	2 20	3	5 15	3	2 15
23	5 19	1 56	3	4 59	2 12	0 16	5 23	....	....		3	2 21	5 20	2 19	3	5 13	3	2 12
24	5 18	1 53	3	4 58	3	1 45	5 22	....	....		3	2 21	5 19	2 18	3	5 12	3	2 12
25	5 17	1 76	3	4 57	3	1 56	5 20	....	....		3	2 18	5 18	2	3	5 10	2 42	2 09
26	5 16	2 10	3	4 56	3	1 56	5 19	....	....		3	2 18	5 17	2 15	3	5 09	3	2 09
27	5 14	1 44	3	4 54	3	1 53	5 18	....	....		3	2 15	5 16	2 15	3	5 08	3	2 09
28	5 13	0 06	0	4 53	2 04	0 41	5 17	....	....		2 24	0	5 15	2 18	3	5 07	2 24	2 06
29	5 12	0	0	4 52	2 04	1 51	5 16	....	....		2 59	1 06	5 14	0 18	2 36	5 05	2 30	2 06
30	5 11	1 20	3	4 51	2 50	1 43	5 15	....	....		1 42	0 42	5 13	1 57	3	5 04	3	2 03
31	5 09	1 01	3	4 50	3	1 35	5 14	....	....		2 18	1 19	5 12	0 09	2 30	5 03	3	2 03
	169 50	54 45	79 08	159 37	76 51	46 25	171 14	.....	.....		80 18	63 15	168 37	64 33	87 36	167 00	84 45	60 45
Per Cent.		71.3	85.1	.....	82.6	69.7	.....	.....	.....		86.3	80.9	.....	85.4	94.2	.....	91.1	82.1

SUNSHINE, IN HOURS AND MINUTES, FOR NOVEMBER, 1891.

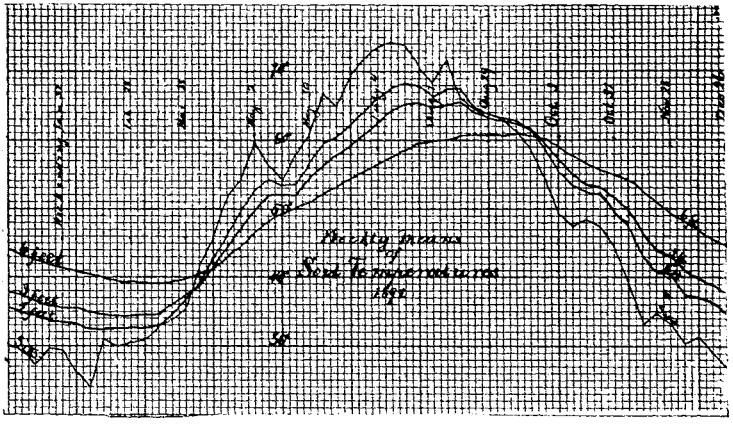
Date.	COLLEGE, FORT COLLINS.						BENT, ROCKY FORD.						SAN LUIS, MONTE VISTA.					
	Forenoon			Afternoon.			Forenoon.			Afternoon.			Forenoon.			Afternoon.		
	Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.	
		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.		Before 9 a. m.	to 12 m.		12 to 3 p. m.	After 3 p. m.		Before 9 a. m.	to 12 m.		12 to 3 p. m.	After 3 p. m.
1	5 08	0	2 37	4 49	3	1 35	5 13	....	....		0	0	5 11	....	....	5 02	....	....
2	5 07	0	2 10	4 48	3	1 37	5 11	....	....		2 09	0 45	5 09	....	....	5 01	....	....
3	5 06	1 03	1 20	4 46	0 51	1 30	5 10	....	....		3	1 27	5 08	....	....	5	....	....
4	5 05	1 15	3	4 45	3	1 26	5 09	....	....		3	2 09	5 07	....	....	4 59	....	....
5	5 03	1 26	3	4 44	3	1 30	5 08	1 03	3		3	1 06	5 05	....	....	4 58	....	....
6	5 02	1 48	3	4 43	2 12	0	5 07	1 09	3		3	2 06	5 04	....	....	4 57	....	....
7	5 01	2 01	3	4 42	3	1 32	5 06	0 33	3		3	1 24	5 03	....	....	4 56	....	....
8	5 00	1 37	2 48	4 41	2 50	1 21	5 05	0	0		3	1 30	5 02	....	....	4 55	....	....
9	4 59	0 44	1 15	4 40	0 49	0 08	5 04	2 03	3		2	2 03	5 01	....	....	4 54	....	....
10	4 58	1 26	3	4 39	3	1 26	5 04	1 33	3		0 24	0	5	....	....	4 53	....	....
11	4 57	0 33	3	4 38	3	1 30	5 03	0	0		3	1 18	4 59	....	....	4 52	....	....
12	4 56	0	0	4 37	0	0	5 02	1 12	3		3	2	4 58	....	....	4 51	....	....
13	4 55	0	1 15	4 36	0 08	0	5	2	3		0 09	0	4 57	....	....	4 50	....	....
14	4 54	0	0	4 35	0 08	0 11	4 59	0	0		3	2	4 56	....	....	4 49	....	....
15	4 53	0	0 44	4 34	2	0 30	4 59	1 57	3		2 36	1 57	4 55	....	....	4 48	....	....
16	4 52	0 22	3	4 33	3	1 21	4 58	0	2 06		3	1 57	4 55	....	....	4 47	....	....
17	4 51	1 45	3	4 32	3	1 32	4 57	1 51	3		0	0	4 54	....	....	4 46	....	....
18	4 50	0	0	4 32	0	0 35	4 56	0	0		2 30	0 36	4 53	....	....	4 46	....	....
19	4 49	1 31	3	4 31	3	0 30	4 55	1 54	3		3	1 09	4 52	....	....	4 45	....	....
20	4 48	1 15	3	4 31	3	1 30	4 54	0	0		0	0	4 51	....	....	4 44	....	....
21	4 47	0 36	0 21	4 30	2 31	1 30	4 54	1 51	2 57		3	1 33	5 50	....	....	4 43	....	....
22	4 46	0	0	4 30	1 32	1 08	4 53	1 51	3		2 27	1 54	4 49	....	....	4 43	....	....
23	4 45	0	0 06	4 29	0 27	0 43	4 52	1 51	3		1 21	0	4 49	....	....	4 42	....	....
24	4 44	1 39	3	4 29	3	1 29	4 52	0	0 30		0	0	4 48	....	....	4 41	....	....
25	4 44	1 28	3	4 28	0	0 41	4 51	0	0		3	1 15	4 47	....	....	4 40	....	....
26	4 43	0	0	4 28	1 24	0 35	4 50	1 30	3		0	0	4 46	....	....	4 39	....	....
27	4 42	0 55	1 44	4 27	1 13	0	4 49	0 12	3		2 36	1 27	4 45	....	....	4 39	....	....
28	4 41	0	0	4 27	3	1 26	4 48	0 54	3		3	1 48	4 45	....	....	4 38	....	....
29	4 41	1 26	3	4 26	3	1 26	4 48	1 18	3		3	1 48	4 44	....	....	4 37	....	....
30	4 40	1 39	3	4 25	2 29	0	4 47	0 21	2 36		1 42	0	4 44	....	....	4 37	....	....
	146 25	24 29	56 57	137 38	60 37	28 42	149 24	.....	.....	Same as forenoons, as there are no mountains on horizon.	62 54	33 12	147 50	.....	.....	144 15	.....	.....
Per Cent.		43.4	63.3	.....	67.2	60.3	.....	.....	.....		69.9	55.9	.....	.....	.....	.....	.....	.....

SUNSHINE, IN HOURS AND MINUTES, FOR DECEMBER, 1891.

Date.	COLLEGE, FORT COLLINS.						BENT, ROCKY FORD.						SAN LUIS, MONTE VISTA.					
	Forenoon.			Afternoon.			Forenoon.			Afternoon.			Forenoon.			Afternoon.		
	Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.		Comp.	Observed.	
		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.		Before 9 a. m.	9 a. m. to 12 m.		12 to 3 p. m.	After 3 p. m.
1	4 40	0	1 03	4 25	2 26	1 05	4 47	1 45	3		0	0	4 43	....	....	4 36	....	....
2	4 39	1 39	2 06	4 25	0	0	4 47	0 45	3		3	1 45	4 43	....	....	4 36	....	....
3	4 38	1 37	3	4 24	3	1 26	4 46	1 45	3		3	0 30	4 42	....	....	4 35	....	....
4	4 38	0 39	1 59	4 23	2 50	0 43	4 45	0	0 24		0 30	0	4 42	....	....	4 35	....	....
5	4 37	1 59	0	4 23	0	0	4 45	0	3		3	1 42	4 41	....	....	4 34	....	....
6	4 37	0	0	4 23	0	0	4 44	0	1 24		3	1 42	4 41	....	....	4 34	....	....
7	4 36	1 37	3	4 22	3	1 21	4 44	1 45	2 51		1 24	1 42	4 40	....	....	4 33	....	....
8	4 36	0	0	4 22	1 45	1 21	4 44	0 15	0 42		0	0	4 40	....	....	4 33	....	....
9	4 35	0 58	3	4 21	3	1 21	4 43	1 18	3		3	1 39	4 40	....	....	4 32	....	....
10	4 35	1 15	0 28	4 21	0	0	4 43	0	0		0	0	4 39	....	....	4 32	....	....
11	4 35	1 26	3	4 21	3	1 21	4 43	0	0 48		1	1 33	4 39	....	....	4 32	....	....
12	4 35	0 22	2 54	4 20	1 48	0	4 43	0 45	2 57		2 39	1 33	4 39	....	....	4 32	....	....
13	4 34	0 55	0 11	4 20	0 43	0 08	4 42	0	0		0	1	4 38	....	....	4 32	....	....
14	4 34	0	0	4 20	0 49	0 11	4 42	1 09	2 30		2 30	0 04	4 38	....	....	4 31	....	....
15	4 34	1 34	3	4 20	3	1 21	4 42	0 39	3		1 18	0 54	4 38	....	....	4 31	....	....
16	4 33	0 39	2 41	4 19	3	1 21	4 41	1 39	2 42		0 24	0	4 38	....	....	4 31	....	....
17	4 33	1 31	3	4 19	3	1 21	4 41	0 03	0		0 06	0	4 38	....	....	4 30	....	....
18	4 33	1 31	1 39	4 19	2 45	1 21	4 41	1 21	3		3	1 39	4 37	....	....	4 30	....	....
19	4 33	1 31	3	4 19	0 49	1 10	4 41	0 21	1 33		0	0	4 37	....	....	4 30	....	....
20	4 32	0	2 51	4 18	3	1 10	4 41	1 42	3		2 06	0	4 37	....	....	4 30	....	....
21	4 32	0 58	3	4 18	3	0 19	4 40	0	0		3	1 39	4 36	....	....	4 29	....	....
22	4 32	0 22	2 29	4 19	3	1 08	4 40	1 36	0 48		0 54	1 39	4 37	....	....	4 30	....	....
23	4 33	0	0	4 19	2 47	0 51	4 41	1 36	3		3	1 39	4 37	....	....	4 30	....	....
24	4 33	0	0	4 19	0	0	4 41	0	0 48		2 12	1 39	4 37	....	....	4 30	....	....
25	4 33	0 14	3	4 19	3	1 10	4 41	1 39	0		3	1 39	4 37	....	....	4 31	....	....
26	4 33	0 36	1 34	4 19	2 07	1 10	4 41	1 06	0 48		0	0	4 38	....	....	4 31	....	....
27	4 33	0 30	0 58	4 20	0 49	0 08	4 41	1 39	3		1 27	0	4 38	....	....	4 31	....	....
28	4 34	0	1 48	4 20	3	0 57	4 41	1 36	3		0	0	4 38	....	....	4 31	....	....
29	4 34	0	0	4 20	2 30	1	4 42	0	0		0	0	4 39	....	....	4 32	....	....
30	4 34	0 28	2 10	4 21	0	0 51	4 42	0	0 09		3	0 57	4 39	....	....	4 32	....	....
31	4 35	0	0	4 21	3	0	4 42	0	0		0 30	0	4 39	....	....	4 33	....	....
	141 52	22 12	51 48	134 38	61 08	24 15	145 58	24 24	51 24	Same as forenoons, as there are no mountains on horizon.	47 00	24 55	144 05	....	....	140 28	....	....
Per Cent		45.4	55.7	.....	65.7	58.3	.....	46.1	55 3		50.5	47.0	.....	....	....	.....	....	....

SOIL TEMPERATURES.

The temperatures of the soil at different depths were read as before. In set A, which is near the College building, the temperature is read twice each day: the other sets are read but once each week. Set A is on a slope facing south, grassed, in a sandy, clay soil. Set B is in a low place with dark soil, and with ground water at a depth of about five feet. This is subject to irrigation. Set C is on a knoll near the College barn, and on the northern slope. These are in a soil which has never been irrigated. A comparison of the temperatures at the different depths will show that during the Winter season the soil is coldest at the surface, and as warming takes place, that at the surface warms the fastest, so that after the 1st of April the surface becomes the warmest. The maximum temperature at a depth of six feet is nearly six weeks behind that of the surface, taking place in the latter part of August, while the surface begins to cool after the middle of July.



EXTREMES AND THEIR DATES.

DEPTHS.	Set.	Max.	Date.	Min.	Date.	Range.
3 inches.....	A	84.0	July 24.	17.8	February 9.	66.2
6 inches.....	A	80.6	July 11.	21.9	February 10.	58.7
	B	69.8	July 9.	28.5	February 12.	41.3
	C	77.7	July 23.	23.2	February 12.	54.5
12 inches.....	B	66.8	August 15.	31.4	February 12.	35.4
	C	75.3	July 23.	26.0	February 12.	49.3
24 inches.....	A	68.7	July 26.	32.1	February 14, 16 and 17.	36.6
	B	63.7	August 15.	34.6	March 14.	29.1
	C	71.8	July 30.	30.7	February 12.	41.1
36 inches.....	A	65.6	August 16, 17, 19 and 20.	34.0	February 19, 22, 23 and 26.	31.6
	B	62.2	August 20.	36.6	March 14.	25.6
	C	67.4	July 30.	34.1	February 19.	33.3
72 inches.....	A	63.8	Sept. 17.	39.0	March 12-23.	24.8
	B	68.5	August 20.	40.5	March 14 and April 10.	28.0

WEEKLY MEANS OF SOIL TEMPERATURES FROM SET A, 1891.

WEEK ENDING.	DEPTH.				
	Three inches.	Six inches.	Two feet.	Three feet.	Six feet.
January 3	30.23	31.24	35.54	37.87	44.13
January 10	29.36	30.66	35.04	37.36	43.34
January 17	27.38	28.58	34.38	36.69	42.70
January 24	29.83	30.21	33.71	35.91	41.99
January 31	29.42	30.06	33.61	35.63	41.32
February 7	26.13	27.32	33.30	35.46	40.92
February 14	23.97	25.54	32.52	34.86	40.45
February 21	30.96	31.08	32.41	34.43	40.03
February 28	29.91	30.62	32.56	34.29	39.58
March 7	30.43	30.93	32.70	34.41	39.36
March 14	29.85	30.56	32.76	34.47	39.15
March 21	32.73	31.63	32.91	34.62	39.05
March 28	33.85	33.45	34.55	35.95	39.27
April 4	35.44	36.01	36.78	37.43	39.78
April 11	41.84	42.65	39.18	38.85	40.36
April 18	45.85	45.86	43.19	41.91	41.42
April 25	51.60	50.82	45.98	44.36	42.99
May 2	54.19	54.21	49.92	47.53	44.66
May 9	59.91	58.89	52.68	49.97	46.61
May 16	56.59	56.41	54.19	51.95	48.32
May 23	54.21	54.09	53.34	52.11	49.50
May 30	58.07	58.26	53.65	51.94	50.11
June 6	60.66	60.53	56.76	54.40	50.89
June 13	66.89	66.29	59.48	56.37	52.10
June 20	65.01	64.62	60.40	57.92	53.37
June 27	69.57	69.36	62.13	59.16	54.41

WEEKLY MEANS OF SOIL TEMPERATURES FROM SET A, 1891—Continued.

WEEK ENDING.	DEPTH.				
	Three inches.	Six inches.	Two feet.	Three feet.	Six feet.
July 4	71.81	71.75	64.12	60.92	55.46
July 11	73.64	73.31	66.09	62.61	46.59
July 18	74.24	74.51	67.81	64.31	57.74
July 25	73.88	74.57	68.36	65.21	58.74
August 1	70.59	71.04	68.03	65.54	59.47
August 8	68.44	68.69	66.29	64.77	60.01
August 15	71.84	71.60	67.45	65.07	60.15
August 22	65.97	67.19	67.61	65.70	60.72
August 29	64.84	65.21	64.71	64.08	60.86
September 5	63.24	64.09	63.83	63.29	60.78
September 12	63.04	63.48	63.35	62.84	60.76
September 19	61.39	62.09	62.90	62.51	61.09
September 26	58.79	59.84	61.47	61.75	60.80
October 3	54.78	56.59	58.97	59.66	60.08
October 10	49.41	51.48	55.43	57.12	59.09
October 17	47.52	49.71	53.36	54.97	57.86
October 24	48.46	50.37	52.31	53.55	56.70
October 31	47.46	49.46	52.22	53.20	55.84
November 7	44.34	46.21	49.70	51.51	55.05
November 14	39.16	41.77	47.75	49.97	54.26
November 21	33.22	35.17	43.18	46.66	52.76
November 28	34.90	36.13	40.86	44.00	51.00
December 5	33.25	35.10	40.59	43.19	49.46
December 12	30.25	31.72	37.76	41.09	48.14
December 19	31.34	32.53	37.06	39.84	46.79
December 26	29.08	30.79	36.26	39.02	45.69

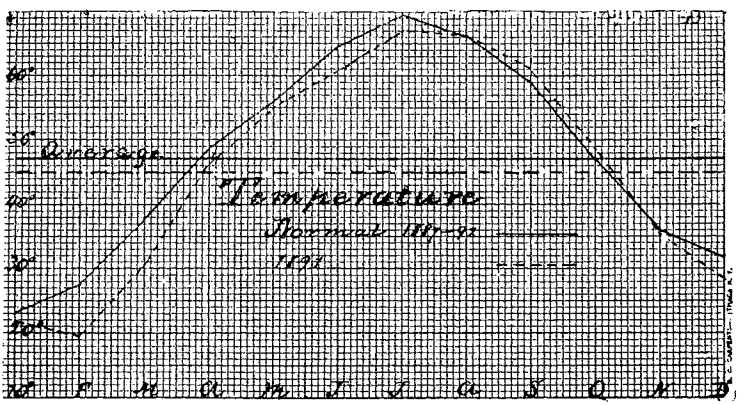
WEEKLY READINGS OF SOIL THERMOMETERS, 1891.

WEEKLY READINGS.	SET B, LOW GROUND. DEPTH.					SET C, UNIRRIGATED. DEPTH.			
	6 in.	1 ft.	2 ft.	3 ft.	6 ft.	6 in.	1 ft.	2 ft.	3 ft.
January 2	31.7	35.3	38.0	40.7	45.1	31.1	33.1	37.4	39.1
January 30	33.4	35.1	37.0	38.7	41.0	30.3	32.0	34.6	35.9
February 5	30.0	32.6	36.4	38.6	42.5	26.2	28.6	33.3	36.3
February 12	28.5	31.4	35.0	37.6	40.9	23.2	26.0	30.7	34.6
February 19	31.6	33.0	34.8	38.0	41.4	29.3	30.0	33.4	34.1
March 14	31.2	32.8	34.6	36.6	40.5	31.0	31.9	33.8	34.8
March 19	39.1	37.0	36.6	37.7	40.9	39.0	36.1	35.8	35.7
March 26	34.7	36.4	38.0	40.0	40.9	33.9	35.4	37.5	37.5
April 2	35.6	36.9	38.1	39.3	41.1	35.4	35.1	37.2	37.5
April 10	44.7	41.2	40.0	40.3	40.5	46.7	41.4	40.4	39.1
April 16	48.0	44.7	42.7	42.4	42.4	50.2	46.7	44.7	41.9
April 23	52.3	47.3	44.6	44.2	43.8	54.0	49.0	46.9	44.1
April 30	55.2	51.9	48.7	47.5	45.4	57.9	54.5	51.8	47.8
May 8	64.6	57.4	52.7	50.6	47.5	65.3	61.1	56.9	51.7
May 14	59.6	55.4	52.8	51.9	49.1	62.5	58.3	56.2	52.7
May 21	50.4	52.4	52.6	52.2	50.0	51.9	53.5	55.1	52.8
May 29	59.5	55.3	52.4	51.9	50.7	62.9	58.1	55.3	52.2
June 4	56 0	55.9	54.0	53.4	51.4	58.5	58.5	57.2	54.0
June 11	61.5	58.8	56.2	55.0	52.4	66.5	63.6	60.3	56.4
June 18	62.1	59.0	57.0	56.2	53.3	69.2	63.7	61.5	58.2
June 25	63.8	58.9	59.4	57.2	54.0	70.4	67.8	64.7	60.1
July 2	66.1	63.1	59.7	58.1	54.8	73.7	69.5	66.2	61.8
July 9	69.8	64.3	60.6	59.2	55.5	76.1	70.8	67.6	63 5
July 16	68.6	65.3	62.0	60.3	56.2	77.5	73.7	70.1	65.1
July 23	69.0	66.3	62.7	61.0	56.8	77.7	75 3	71.4	66.7
July 30	66.8	66.1	63.0	61.3	57.2	73.6	74.1	71 8	67 4
August 6	68.3	65.0	62.1	60.9	57.6	73.8	71.1	69.7	66.4
August 15	69.6	66.8	63.7	62.1	58.1	74.9	73.3	71.1	67.2
August 20	67.0	65.5	63.4	62.2	58.5	71.2	69.7	69.6	66.9
August 27	62.1	62.3	61.6	61.2	58.4	64.7	65.6	66.4	64 8
September 3	61.9	61.5	61.4	61.2	58.5	66.3	65.1	66.2	64.3
September 10	62.4	61.8	61.0	60.8	58.5	66.3	65.6	64.9	63.7

WEEKLY READINGS OF SOIL THERMOMETERS, 1891.
(Continued.)

WEEKLY READINGS.	SET B, LOW GROUND.					SET C, UNIRRIGATED.			
	DEPTH.					DEPTH.			
	6 in.	1 ft.	2 ft.	3 ft.	6 ft.	6 in.	1 ft.	2 ft.	3 ft.
September 17	61.0	62.2	61.1	60.7	58.7	69.7	67.5	66.0	63.6
September 25	56.9	58.9	60.0	60.3	58.6	59.9	61.2	64.0	63.0
October 1	57.1	58.0	58.5	60.0	58.4	60.7	61.5	61.7	61.0
October 8	51.2	52.7	55.2	56.9	57.9	53.7	53.5	57.0	58.2
October 15	49.4	50.7	53.6	55.6	56.9	51.7	51.6	55.3	56.2
October 22	51.0	51.1	52.9	54.4	56.0	52.8	52.6	53.3	55.0
October 30	50.1	51.0	52.4	53.8	55.2	52.0	52.4	54.3	54.5
November 5	48.1	49.5	50.6	52.4	54.6	49.7	49.2	51.8	52.8
November 12	40.5	45.7	49.1	51.2	53.6	40.7	44.3	49.7	51.3
November 19	37.4	41.4	45.7	48.6	52.5	35.9	38.9	44.8	47.9
November 26	38.2	40.5	43.9	46.6	51.2	37.2	37.7	42.6	45.3
December 3	36.3	40.4	43.5	45.8	49.8	35.3	37.6	41.3	44.3
December 11	34.6	37.7	40.7	43.6	48.5	33.7	35.1	39.1	41.7
December 17	33.8	37.1	40.4	42.8	47.5	32.4	34.3	48.6	40.9
December 24	31.6	35.1	39.0	41.7	46.3	30.2	31.8	36.6	39.3

TEMPERATURE.



TEMPERATURE, 1891.

Date.	JANUARY.						FEBRUARY.					
	7 a. m.	7 p. m.	Mean.	Max.	Min.	Mean.	7 a. m.	7 p. m.	Mean.	Max.	Min.	Mean.
1....	14.0	21.0	17.5	39.0	15.4	27.2	-2.0	-4.5	-3.3	10.1	-11.0	-0.5
2....	9.1	28.9	19.0	40.9	8.9	24.9	-3.5	-9.6	-6.6	5.9	-12.5	-3.3
3....	12.5	33.3	22.9	44.8	9.5	27.2	-2.5	6.0	1 7	30.9	-15.0	7.9
4....	15.5	28.1	21.8	46.8	14.5	30.7	-0.5	10.0	4.8	31.5	-2.0	14.8
5....	12.8	30.9	21.8	45.0	7.2	26.1	34.8	24.2	29.5	46.5	4.2	25.3
6....	18.1	23.0	20.6	48.9	17.0	32.9	7.9	20.6	14.2	32.9	5.0	19.0
7....	15.1	28.0	21.5	33.8	9.6	21.7	29.2	20.3	24.8	31.0	4.9	17.9
8....	22.3	21.9	22.1	26.9	22.0	24.5	10.2	12.1	11.1	13.9	5.8	9.9
9....	11.0	2.3	6.7	24.0	12.0	18.0	-10.5	5.5	-2.5	22.8	-14.5	4.1
10....	-12.0	26.3	7.1	28.2	-13.0	7.6	2.1	16.1	9.1	33.8	-4.1	14.9
11....	18.8	25.5	22.2	30.1	12.0	21.0	15.1	15.2	15.1	33.5	1.0	17.2
12....	-6.2	8.1	0.9	24.6	-9.1	7.7	2.2	17.2	9.7	34.3	1 0	17.7
13....	5.6	10.3	8.0	35.6	3.0	19.3	7.9	28.0	18.0	42.1	4.8	23.4
14....	3.1	13.8	8.4	31.1	-1.9	14.6	15.8	29.9	22.8	36.9	7.0	22.0
15....	11.8	9.9	10.9	32.9	9.0	20.9	33.5	39.1	36.3	45.7	25.3	35.5
16....	27.1	12.8	19.9	40.0	2.7	21.4	25.1	23.2	24.1	26.8	24.5	25.6
17....	2.9	14.5	8.7	33.0	0.2	16.6	30.2	25.0	27.6	34.8	20.9	27.9
18....	9.9	22.0	16.0	46.0	5.0	25.5	17.1	26.8	22.0	30.4	17.6	24.0
19....	15.3	26.4	20.8	36.5	3.9	20.2	24.0	18.3	21.1	29.9	22.3	26.1
20....	34.2	40.0	37.1	47.3	14.9	30.6	18.7	27.1	22.9	35.0	10.0	22.5
21....	41.7	40.8	41.3	48.1	33.1	40.6	12.2	21.7	17.0	32.2	4.7	18.4
22....	31.6	26.1	28.8	33.8	30.5	32.1	15.8	27.9	21.8	38.2	15.6	26.9
23....	13.2	16.2	14.7	27.0	11.0	19.0	25.8	37.1	31.5	44.5	22.0	33.3
24....	13.8	27.2	20.5	41.3	9.0	25.2	39.1	29.0	34.0	42.8	33.0	37.9
25....	25.0	26.1	25.6	39.8	12.6	26.2	23.8	13.7	18.8	30.7	20.7	25.7
26....	24.0	32.8	28.4	43.3	19.7	31.5	24.4	29 6	27.0	37.0	8.9	22.9
27....	29.0	27.0	28.0	32.8	23.6	28.2	13.7	9.1	11.4	19.6	13.6	16.3
28....	22.0	19.5	20.7	26.2	21.4	23.8	5.0	28.1	16.5	37.2	1.9	19.6
29....	-13.7	1.5	-6.1	21.4	-11.4	5.0	.....	.....	.....	.....	.....	.....
30....	-11.5	15.5	2.0	26.8	-16.3	5.8	.....	.....	.....	.....	.....	.....
31....	5.2	9.7	7.5	20.4	1.7	11.1	.....	.....	.....	.....	.....	.....
Sum.	421.2	669.4	545.3	1096.3	276.8	686.6	414.6	546.7	480.6	890.3	215.6	552.9
Mean	13.59	21.59	17.59	35.36	8.93	22.15	14.81	19.52	17.16	31.80	7.70	19.75

TEMPERATURE, 1891.

Date.	MARCH.						APRIL.					
	7 a. m.	7 p. m.	Mean.	Max.	Min.	Mean.	7 a. m.	7 p. m.	Mean.	Max.	Min.	Mean.
1 ...	28.4	43.0	35.7	48.4	25.9	37.1	27.5	29.6	28.6	36.7	24.7	30.7
2....	38.6	12.7	25.7	52.0	34.1	43.1	21.9	27.3	24.6	38.9	12.9	25.9
3....	4.1	13.9	9.0	19.0	3.0	11.0	23.9	29.9	26.9	41.0	17.7	29.3
4....	13.2	25.1	19.1	32.0	10.0	21.0	34.1	33.8	33.9	47.1	23.1	35.1
5....	14.8	12.1	13.5	21.8	14.5	18.1	27.1	39.1	33.1	56.9	16.8	36.9
6....	8.7	8.0	8.3	18.1	4.0	11.1	33.8	53.9	43.9	66.8	27.0	46.9
7....	1.0	18.0	9.5	21.2	-4.1	8.5	36.0	48.9	42.5	62.9	29.0	45.9
8....	10.7	25.9	18.3	35.2	5.0	20.1	41.1	42.2	41.6	51.0	38.9	45.0
9....	19.1	38.8	29.0	51.0	15.8	33.4	32.7	47.1	39.9	56.8	33.1	44.9
10....	35.1	19.3	27.2	44.7	33.9	39.3	32.2	49.0	40.6	67.0	21.4	44.2
11....	5.0	12.7	8.8	23.2	7.7	15.5	37.3	53.8	45.6	71.5	29.9	50.7
12....	4.8	22.6	13.7	31.9	1.1	16.5	43.6	42.3	42.9	62.6	33.2	47.9
13....	16.5	27.9	22.2	36.0	14.0	25.0	38.0	46.0	42.0	56.0	35.0	45.5
14....	22.3	36.0	29.2	48.2	17.6	32.9	36.4	53.1	44.8	63.0	29.0	46.0
15....	29.9	38.3	34.1	54.0	24.8	39.4	42.0	45.4	43.7	61.8	30.7	46.3
16....	29.9	45.0	37.4	61.3	25.0	43.1	42.8	55.9	49.3	65.8	31.0	48.4
17....	38.4	37.5	38.0	45.0	36.0	40.5	41.5	49.0	45.3	53.5	30.6	42.0
18....	31 6	32.4	32.0	46.4	25.9	36.2	39.2	38.8	39.0	41.4	38.8	40.1
19....	26.7	46.3	36.5	58.0	22.0	40.0	42.6	49.0	45.8	58.9	37.0	48.0
20....	38.7	37.4	38.0	47.7	36.8	42.2	47.5	45.9	46.7	56.9	41.1	49.0
21....	32.2	49.7	40.9	66.0	23.8	44.9	44.3	50.2	47.2	63.0	33.9	48.4
22....	32.6	40.3	36.4	48.9	29.9	39.4	45.0	55.9	50.5	66.9	36.9	51.9
23....	31.5	27.1	29.3	32.6	30.8	31.7	48.0	61.4	54.7	71.7	34.1	52.9
24....	20.9	20.3	20.6	26.0	19.4	22.7	52.2	67.8	60.0	81.4	38.0	59.7
25....	18.5	20.1	19.3	31.9	14.0	23.0	54.6	66.5	60.5	81.9	39.0	60.5
26....	13.9	29.5	21.7	41.7	6.1	23.9	48.0	55.3	51.7	65.4	39.1	52.2
27....	29.5	40.9	35.2	51.8	24.0	37.9	45.0	60.2	52.6	67.1	33.2	50.2
28....	33.6	36.1	34.9	50.1	28.1	39.1	53.1	65.7	59.4	80.9	36.0	58.4
29....	32.5	33.9	33.2	39.2	31.6	35.4	57.8	64.0	60.9	76.2	46.9	61.6
30....	32.0	36.8	34.4	51.1	25.1	38.1	45.5	60.1	52.8	69.8	38.0	53.9
31 ...	29.2	29.9	29.6	42.8	25.9	34.3	.....	.....	.....	.....	.....	.....
Sum..	723.9	917.5	820.7	1277.2	611.7	944.4	1214.7	1487.1	1351.0	1840.8	956.0	1398.4
Mean	23.35	29.60	26.47	41.20	19.73	30.46	40.49	49.57	45.03	61.36	31.87	46.61

TEMPERATURE, 1891.

Date.	MAY.						JUNE.					
	7 a. m.	7 p. m.	Mean.	Max.	Min.	Mean.	7 a. m.	7 p. m.	Mean.	Max.	Min.	Mean.
1....	46.5	60.5	53.5	74.0	33.0	53.5	54.2	56.0	55.1	65.0	42.1	53.6
2....	49.8	57.5	53.6	64.1	31.2	47.7	54.0	58.2	56.1	71.0	37.9	54.4
3....	43.5	58.9	51.2	72.0	36.8	54.4	54.2	54.4	54.3	64.9	45.8	55.4
4....	53.6	65.0	59.3	78.8	40.6	59.7	50.8	51.8	51.3	57.9	48.0	52.9
5....	58.0	65.2	61.6	82.8	42.4	62.6	50.8	54.8	52.8	62.4	48.7	55.6
6....	59.1	71.8	65.5	83.4	42.2	62.8	51.2	62.8	57.0	71.8	46.1	58.9
7....	59.8	65.8	62.8	83.0	45.0	64 0	60.0	70.5	65.2	82.9	44.9	63.9
8....	62 4	68.9	65.6	84.6	45.9	65.2	64.8	76.2	70.5	83.9	47.1	65.5
9....	59.9	46.8	53.4	78.8	44.9	61.9	64.8	61.1	63.0	81.1	52.3	66.7
10....	42.4	47.6	45.0	54.1	40.6	47.3	52.2	61.2	56.7	67.7	40.0	53.9
11....	45.6	53.6	49.6	63.2	40.5	51.9	57.5	70.9	64.2	77.9	44.3	61.1
12....	55.0	55.1	55.0	67.8	39.1	53.4	59.9	62.1	61.0	78.2	51.8	65.0
13....	52.2	59.5	55.9	72.8	37.5	55.2	62.4	65.5	63.9	79.5	45.0	62.2
14....	55.6	57.4	56.5	72.9	41.9	57.4	61.8	67.7	64.8	77.1	47.8	62.5
15....	60.5	45.8	53.1	60.9	50.8	55.8	59.9	59.5	59.7	70.5	44.0	57.2
16....	45.0	47.0	46.0	49.0	43.6	46.3	49.5	53.0	51.2	59.1	48.0	53.6
17....	52.8	53.8	53.3	61.9	36 6	49.3	57.5	61.4	59.5	73.2	49.6	61.4
18....	53.3	59.6	56.5	72.9	44.6	58.7	59.0	70.8	64.9	77.9	43.5	60.7
19....	54.6	57.3	55.9	71.9	47.6	59.8	64.5	63.9	64.2	77.2	52.9	65.0
20...	50.8	44.9	47.9	55.1	41.9	48.5	59.7	64.3	62.0	79.3	55.6	67.5
21....	37.3	38.9	38.1	43.9	32.8	38.3	60.0	62.8	61.4	72.5	41.6	57.0
22....	39.7	*35.0	37.3	48.8	33.4	41.1	63.2	75.5	69.3	86.9	42.9	64.9
23....	49.2	51.4	50.3	67.4	34.7	51.1	65.3	65.2	65.3	79.2	53.6	66.4
24....	55.5	48.7	52.1	67.3	40.3	53.8	60.2	67.3	63.7	73.7	53.4	63.6
25....	46.8	49.9	48.4	51.9	45.8	48.8	65.8	62.1	64.0	76.0	48.6	62.3
26....	52.0	54.4	53.2	62.3	45.2	53.8	65.5	67.2	66.3	78.4	52.6	65.5
27....	51.4	56.9	54.1	73.3	40.9	57.1	61.5	67.8	64.7	77.0	49.2	63.1
28....	56.5	*55.0	55.7	77 8	41.4	59.6	62.5	64.4	63.4	77.0	50.9	63.9
29....	56.9	67.5	62.2	78.4	44.9	61.6	57.7	59.2	58.5	71.2	53.6	62.4
30....	62.9	59.2	61.1	78.9	48.6	63.8	60.8	65.7	63.2	80.2	42.0	61.1
31....	58.6	55.8	57.2	71.2	39.5	55.3	.....	.....	.....	.....	.....	.....
Sum.	1627.2	1714.7	1670.9	2125.2	1274.2	1699.7	1771.2	1903.3	1837.2	2230.6	1423.8	1827.2
Mean	52.49	55.31	53.90	68.55	41.10	54.83	59.04	63.44	61.24	74.35	47.46	60.91

*Draper Recorder.

TEMPERATURE, 1891.

Date.	JULY.						AUGUST.					
	7 a. m.	7 p. m.	Mean.	Max.	Min.	Mean.	7 a. m.	7 p. m.	Mean.	Max.	Min.	Mean.
1....	72.2	73.6	72.9	88.2	46.0	67.1	67.6	65.0	66.3	81.3	47.4	64.4
2....	66.7	69.0	67.9	77.5	44.6	61.0	61.0	64.1	62.6	78.2	43.2	60.7
3....	63.9	69.3	66.6	87.0	50.4	68.7	62.8	68.0	65.4	87.3	44.9	66.1
4....	62.9	65.7	64.3	81.1	41.2	61.2	64.7	68.2	66.4	90.2	51.2	69.7
5....	67.1	70.5	68.8	83.4	55.4	69.4	63.5	69.4	66.5	88.3	56.0	72.1
6....	63.9	61.5	62.7	73.6	56.5	65.0	69.5	66.8	68.1	89.9	55.7	72.8
7....	57.2	57.3	57.2	68.5	55.0	61.8	66.1	71.8	69.0	89.2	52.4	70.8
8....	54.3	66.7	60.5	78.3	52.6	65.4	64.7	72.7	68.7	88.0	52.3	70.2
9....	62.1	71.3	66 7	88.1	57.4	72.8	66.0	70.7	68.3	84.4	54.0	69.2
10....	67.8	68.9	68.4	81.4	48.0	64.7	67.1	72.8	70.0	90.1	52.8	71.4
11....	65.5	75.8	70.6	87.8	60.7	74.2	65.5	72.2	68.8	82.9	48.1	65.5
12....	62.7	70.2	66.5	85.4	50.6	68.0	61.9	73.2	67.6	92.0	53.0	72.5
13....	58.6	65.5	62.0	75.2	48.9	62.1	68.0	76.6	72.3	93.1	47.5	70.3
14....	56.0	66.7	61.4	78.9	48.4	63.6	64.5	69.4	66.9	83.2	57.5	70.4
15....	61.4	69.3	65.3	81.8	51.0	65.4	67.1	67.8	67.5	82.6	55.1	68.8
16....	64.9	66.9	65.9	81.2	48.2	64.7	69.5	71.0	70.2	85.6	55.1	70.4
17....	64.8	72.0	68.4	83.1	49.0	66.1	64.8	65.4	65.1	84.4	52.0	68.2
18....	65.7	74.9	70.3	85.5	51.9	68.7	64.5	64.4	64.5	84.0	53.8	68.9
19....	65.3	62.8	64.1	84.0	56.8	70.4	65.0	70.1	67.5	84.5	53.3	68.9
20....	63.8	66.0	64.9	89.4	51.2	70.3	64.7	65.2	65.0	83.2	51.7	67.4
21....	64.0	73.6	68.8	89.0	46.2	67.6	57.4	49.8	53.6	65.6	55.5	60.6
22....	67.5	68.6	68.0	81 5	52.2	66.8	50.8	57.3	54.0	73.9	36.7	55.3
23....	63.2	67.2	65.2	82.8	53.7	68.3	52.3	65.5	58.9	79.8	37.6	58.7
24....	64.0	72.9	68.5	86.4	56.8	71.6	67.0	68.2	67.6	88.0	46.5	67.2
25....	65.2	71.2	68.2	82.5	57.0	69.7	59.0	62.3	60.7	82.7	45.2	64.0
26....	65.8	66.0	65.9	86.7	50.5	68.6	53.3	60.4	56.8	62.8	52.7	57.7
27....	68.2	70.2	69.2	86.0	52.0	69.0	52.2	57.2	54.7	65.1	50.4	57.8
28....	68.0	69.2	68.6	80.7	58.0	69.4	53.0	65.2	59.1	80.0	42.4	61.2
29....	64.2	66.5	65.3	80.4	55.2	67.8	57.0	65.6	61.3	81.7	44.3	63.0
30....	56.8	61.2	59.0	65.6	55.5	60.5	60.0	63.9	62.0	83.4	45.8	64.6
31....	61.7	63.9	62.8	80.3	46.7	63.5	59.1	68.4	63.7	88.1	45.1	66.6
Sum..	1975.4	2114.4	2044.9	2541.3	1607.6	207.44	1929.6	2068.6	1999.1	2573.5	1539.2	2056.4
Mean	63.72	68.21	65.65	81.98	51.86	66.92	62.25	66.73	64.49	83.02	49.65	66.33

TEMPERATURE, 1891.

Date.	SEPTEMBER.						OCTOBER.					
	7 a. m.	7 p. m.	Mean.	Max.	Min.	Mean.	7 a. m.	7 p. m.	Mean.	Max.	Min.	Mean.
1....	61.6	62.1	61.9	84.0	46.9	65.5	45.7	45.1	45.4	64.6	39.6	52.1
2....	48.9	49.2	49.0	62.8	47.5	55.1	40.6	39.9	40.2	45.7	39.0	42.4
3....	48.1	58.6	53.4	76.0	34.3	55.2	34.8	42.8	38.8	54.3	30.4	42.3
4....	59.2	66.9	63.0	81.9	44.6	63.2	37.6	42.0	39.8	55.8	32.3	44.1
5....	51.7	59.5	55.6	78.9	39.7	59.3	36.2	36.8	36.5	53.4	29.0	41.2
6....	55.6	67.9	61.8	86.3	43.9	65.1	29.3	46.5	37.9	63.5	19.9	41.7
7....	57.4	58.4	57.9	80.8	56.4	68.6	38.9	53.2	46.1	70.8	30.2	50.5
8....	53.2	60.2	56.7	70.3	45.7	58.0	36.4	45.8	41.1	68.2	28.3	48.2
9....	52.5	63.9	58.2	79.2	45.4	62.3	34.2	46.4	40.3	73.5	28.0	50.8
10....	57.1	61.5	59.3	81.3	44.4	62.9	40.2	55.8	48.0	74.2	35.4	54.8
11....	57.8	58.9	58.3	76.8	48.9	62.8	40.4	49.6	45.0	70.8	31.5	51.1
12....	53.5	61.9	57.7	78.2	42.3	60.3	39.2	37.8	38.5	57.8	36.4	47.1
13....	51.2	62.2	56.7	84.3	42.0	63.1	30.2	40.7	35.4	59.0	19.5	39.3
14....	57.1	67.2	62.2	88.1	45.4	66.8	27.6	42.2	34.9	67.3	21.0	44.1
15....	58.8	61.3	60.0	86.9	47.9	67.4	37.6	58.7	48.2	76.2	26.2	51.2
16....	59.6	76.2	67.9	88.8	45.2	67.0	58.0	50.4	54.2	67.6	38.7	53.2
17....	60.3	68.0	64.2	83.5	51.0	67.2	38.2	42.1	40.1	59.4	33.3	46.3
18....	51.3	61.2	56.2	74.8	46.0	60.4	29.2	50.2	39.7	68.2	21.2	44.7
19....	56.2	57.1	56.7	75.7	47.8	61.8	33.7	46.3	40.0	77.5	25.4	51.5
20....	48.2	61.2	54.7	81.6	36.0	58.8	40.5	60.4	50.5	75.8	32.9	54.3
21....	49.6	65.9	57.7	80.2	40.5	60.3	41.4	44.5	42.9	64.7	36.8	50.8
22....	57.2	57.5	57.4	74.9	55.1	65.0	34.1	54.9	44.5	76.6	25.8	51.2
23....	51.4	51.9	51.6	74.7	47.8	61.3	39.7	59.8	49.8	79.8	30.7	55.2
24....	43.4	44.6	44.0	77.2	39.4	58.3	46.3	60.0	53.1	76.2	36.1	56.2
25....	46.8	48.9	47.9	54.2	43.4	48.8	42.0	56.5	49.3	77.3	31.3	54.3
26....	46.8	54.5	50.6	70.3	43.3	56.8	38.7	53.3	46.0	74.0	34.6	54.3
27....	45.6	66.4	56.0	75.8	35.5	55.6	32.8	45.2	39.0	73.9	27.3	50.6
28....	48.8	49.0	48.9	64.6	42.7	53.7	32.2	53.2	42.7	73.7	29.1	51.4
29....	41.4	68.7	55.0	83.4	35.9	59.6	38.2	53.8	46.0	75.2	28.0	51.6
30....	46.3	57.0	51.7	82.9	40.9	61.9	42.9	40.6	41.7	59.0	40.9	49.9
31....	.....	.....	.....	.....	.....	.....	27.0	37.8	32.4	45.1	20.9	33.0
Sum.	1576.6	1807.8	1692.2	2338.4	1325.8	1832.1	1163.8	1492.3	1328.0	2079.1	939.7	1509.4
Mean	52.55	60.26	56.41	77.95	44.19	61.07	37.54	48.14	42.84	67.07	30.31	48.69

TEMPERATURE, 1891.

Date.	NOVEMBER.						DECEMBER.					
	7 a. m.	7 p. m.	Mean.	Max.	Min.	Mean.	7 a. m.	7 p. m.	Mean.	Max.	Min.	Mean.
1. ..	34.6	39.1	36.9	53.5	24.5	39.0	35.9	38.4	37.1	57.1	33.9	45.5
2....	29.4	35.8	32.6	61.2	21.8	41.5	42.6	30.3	36.5	43.4	28.7	36.1
3....	40.2	45.0	42.6	67.9	28.8	48.4	25.6	21.6	23.6	34.0	25.3	29.6
4....	36.6	49.8	43.2	72.2	33.1	52.6	8.9	24.6	16.7	39.2	9.8	24.5
5....	35.3	52.2	43.7	75.9	30.9	53.4	19.7	17.2	18.5	21.0	14.2	17.6
6....	50.3	50.6	50.5	61.1	33.5	47.3	1.8	1.0	1.4	25.1	1.3	13.2
7....	39.6	44.1	41.8	59.0	25.0	42.0	0.0	26.9	13.4	42.4	-10.0	16.2
8....	30.6	23.8	27.2	44.6	27.0	35.8	29.6	26.0	27.8	43.8	14.5	29.2
9....	22.5	49.0	35.8	52.0	13.4	32.7	37.0	43.2	40.1	60.0	18.2	39.1
10....	53.2	29.3	41.2	61.8	39.5	50.7	32.2	31.9	32.1	35.0	31.5	33.2
11....	25.3	19.3	22.3	36.3	24.5	30.4	15.4	25.4	20.4	40.1	17.2	28.7
12....	19.1	23.4	21.3	24.0	13.8	18.9	19.8	29.4	24.6	45.3	16.0	30.6
13....	22.4	25.2	23.8	33.8	20.3	27.0	29.4	34.3	31.8	45.2	18.9	32.1
14....	22.8	18.4	20.6	30.8	19.4	25.1	42.6	36.3	39.5	43.8	32.7	38.1
15....	23.4	28.9	26.1	34.9	12.8	23.9	22.3	32.3	27.3	49.2	22.6	35.9
16....	0.4	-1.0	-0.3	13.2	-1.1	6.0	27.0	32.4	29.7	55.0	18.8	36.9
17....	-1.0	18.7	8.9	28.9	-6.2	11.4	18.9	25.7	22.3	48.4	18.0	33.2
18....	13.7	28.2	20.9	35.1	9.0	22.0	21.4	29.6	25.5	51.9	16.3	34.1
19....	25.3	35.2	30.3	48.7	17.7	33.2	21.8	28.2	25.0	44.3	16.7	30.5
20....	17.9	39.2	28.5	52.1	16.8	34.5	15.8	32.7	24.2	49.4	18.4	33.9
21....	39.2	....	....	46.8	31.4	39.1	23.7	31.7	27.7	42.8	19.8	31.3
22....	17.1	34.7	25.9	46.9	12.2	29.5	11.4	19.6	15.5	38.9	13.3	26.1
23....	27.0	41.6	34.3	45.7	26.1	35.9	16.4	30.4	23.4	46.4	15.2	30.9
24....	25.9	30.6	28.3	46.9	21.4	34.2	16.8	7.5	12.2	16.7	7.4	12.1
25....	27.5	39.0	33.2	48.1	26.4	37.2	2.8	-7.4	-2.3	13.2	-4.8	4.2
26....	29.4	54.2	41.8	59.3	28.4	43.9	1.4	35.8	18.6	40.6	-9.4	15.6
27....	50.7	32.6	41.7	56.0	45.4	50.7	29.2	43.0	36.1	54.7	24.7	39.7
28....	19.7	25.9	22.8	40.5	19.6	30.0	28.3	25.3	26.8	34.6	28.3	31.4
29....	17.8	29.4	23.6	55.9	11.6	33.8	9.9	26.7	18.3	43.5	8.3	25.9
30....	32.6	50.6	41.6	62.0	25.3	43.6	20.6	24.7	22.6	41.1	15.1	28.1
31....	....	....	....	....	....	....	26.6	17.4	22.0	33.9	16.7	25.3
Sum.	828.5	992.8	891.1	1455.1	652.3	1053.7	654.8	822.1	738.4	1280.0	497.6	888.8
Mean	27.62	34.23	30.73	48.50	21.74	35.12	21.12	26.52	23.82	41.29	16.05	28.67

TERRESTRIAL RADIATION THERMOMETERS.

Date.	JANUARY.				FEBRUARY.				MARCH.			
	Height Above Ground.			Minimum Air Tem'ture.	Height Above Ground.			Minimum Air Tem'ture.	Height Above Ground.			Minimum Air Tem'ture.
	6 in.	12 in.	24 in.		6 in.	12 in.	24 in.		6 in.	12 in.	24 in.	
1....	1.7	8.2	9.0	15.4	-15.8	-12.2	-14.5	-11.0	20.7	21.8	22.0	25.9
2....	-1.0	4.0	5.5	8.9	-14.2	-14.2	-14.2	-12.5	30.0	31.0	31.8	34.1
3....	-3.5	2.4	4.5	9.5	-19.0	-11.2	-17.9	-15.0	0.0	1.0	1.0	3.0
4....	7.3	9.5	10.5	14.5	-8.7	-6.9	-6.0	-2.0	4.7	5.8	7.0	10.0
5....	1.7	2.4	2.6	7.2	-2.6	-1.1	0.0	4.2	8.5	14.0	13.9	14.5
6....	10.0	11.7	11.9	17.0	-1.9	-0.8	0.0	5.0	-4.0	-0.8	1.1	4.0
7....	2.5	3.9	5.0	9.6	0.6	0.9	1.5	4.9	-9.5	-7.6	-7.0	-4.1
8....	21.0	21.5	21.5	22.0	5.7	5.6	4.8	5.8	-1.2	0.0	0.9	5.0
9....	16.7	13.5	7.0	12.0	-18.1	-16.2	-16.9	-14.5	12.2	13.4	13.6	15.8
10....	-19.2	-18.0	-17.9	-13.0	-7.1	-5.9	-6.1	-4.1	26.9	28.8	30.0	33.9
11....	2.9	4.8	7.8	12.0	-2.9	-2.0	-1.3	1.0	-4.0	-3.0	-2.0	7.7
12....	-16.0	-14.1	-15.0	-9.1	-3.4	-1.9	-1.9	1.0	-4.0	-3.0	-2.0	1.1
13....	-2.6	-1.1	-0.9	3.0	0.5	1.2	2.0	4.8	9.0	10.5	10.9	14.0
14....	-13.0	-10.2	-9.0	-1.9	2.8	3.2	3.8	7.0	12.2	14.0	14.0	17.6
15....	4.0	5.0	5.5	9.0	21.5	23.0	23.4	25.3	17.9	20.8	21.2	24.8
16....	-3.0	-2.8	-1.9	2.7	26.8	25.0	24.3	24.5	19.8	21.0	21.8	25.0
17....	-7.9	-6.0	-5.8	0.2	20.3	20.3	20.1	20.9	31.9	33.7	34.4	36.0
18....	-1.9	-0.9	0.7	5.0	11.7	13.6	13.8	17.6	18.0	18.0	17.8	25.9
19....	-2.0	-1.1	-0.4	3.9	22.2	19.9	19.8	22.3	12.0	15.8	16.5	22.0
20....	7.8	9.4	9.8	14.0	5.2	6.0	6.8	10.0	24.0	32.8	33.2	36.8
21....	22.6	24.0	26.8	33.1	2.0	2.0	2.4	4.7	17.8	19.6	19.8	23.8
22....	23.9	27.0	27.4	30.5	12.7	13.0	13.2	15.6	27.0	27.9	28.0	29.9
23....	5.0	6.9	7.4	11.0	18.1	19.0	19.0	22.0	30.0	30.4	30.7	30.8
24....	4.1	4.9	5.6	9.0	29.8	30.0	30.4	33.0	19.0	20.0	20.0	19.4
25....	13.0	14.5	14.7	12.6	14.9	16.0	16.2	20.7	19.0	13.8	12.8	14.0
26....	14.7	16.0	16.9	19.7	4.6	5.9	5.8	8.9	1.5	2.1	3.0	6.1
27....	10.4	11.8	11.2	23.6	11.0	11.5	11.7	13.6	19.0	21.0	21.0	24.0
28....	17.2	11.8	11.8	21.4	-0.8	-0.1	-0.1	1.9	22.8	24.5	25.4	28.1
29....	-17.0	-17.2	-17.5	-11.4	.....	.....	.....	.....	29.0	30.0	30.6	31.6
30....	-20.3	-19.6	-20.1	-16.3	.....	.....	.....	.....	18.0	18.9	19.0	25.1
31....	-2.9	-3.0	-3.3	1.7	.....	.....	.....	.....	19.9	21.3	21.8	25.9
Sum.	76.2	120.1	131.3	276.8	156.8	143.6	140.1	215.6	448.1	497.5	512.2	611.7
Mean	2.46	3.87	4.24	8.93	5.60	5.13	5.00	7.70	14.45	16.05	16.52	19.73

TERRESTRIAL RADIATION THERMOMETERS.

Date.	APRIL.				MAY.				JUNE.			
	Height Above Ground.			Minimum Air Tem'ture.	Height Above Ground.			Minimum Air Tem'ture.	Height Above Grouud.			Minimum Air Tem'ture.
	6 in.	12 in.	24 in.		6 in.	12 in.	24 in.		6 in.	12 in.	24 in.	
1....	21.6	23.8	23.9	24.7	23.0	27.1	28.0	33.0	36.6	38.2	39.0	42.1
2....	6.0	9.0	9.1	12.9	23.7	28.7	28.0	31.2	31.2	33.8	34.0	37.9
3....	9.4	12.9	13.2	17.7	28.5	31.8	33.6	36.8	39.6	41.3	41.6	45.8
4....	17.7	19.6	19.7	23.1	31.2	35.6	36.7	40.6	43.8	45.0	45.5	48.0
5....	8.1	12.6	12.9	16.8	35.4	38.5	39.3	42.4	39.0	47.2	47.5	48.7
6....	19.4	22.6	23.1	27.0	35.9	38.6	39.0	42.2	39.9	40.8	43.5	46.1
7....	23.2	25.1	25.4	29.0	35.9	39.4	40.9	45.0	40.0	41.6	41.8	44.9
8....	34.7	37.0	37.1	38.9	36.6	40.4	42.5	45.9	43.2	44.0	44.5	47.1
9....	28.3	30.2	30.8	33.1	31.6	37.7	39.6	44.9	48.0	48.7	49.2	52.3
10....	15.0	17.9	18.0	21.4	38.6	38.7	38.5	40.6	36.2	36.8	37.0	40.0
11....	23.0	26.1	26.8	29.9	30.5	34.9	37.2	40.5	40.4	41.7	41.9	44.3
12....	25.7	28.0	29.0	33.2	27.4	32.3	35.0	39.1	48.0	48.9	49.4	51.8
13....	31.2	33.0	33.8	35.0	29.0	32.8	34.9	37.5	40.8	41.9	42.3	45.0
14....	23.9	25.9	26.1	29.0	35.0	38.1	39.1	41.9	40.6	41.7	42.9	47.8
15....	22.9	26.4	27.1	30.7	40.9	46.6	47.9	50.8	36.7	38.2	39.5	44.0
16....	22.1	26.8	27.1	31.0	37.7	39.4	40.9	43.6	45.5	46.6	46.1	48.0
17....	22.9	25.7	27.2	30.6	28.1	36.3	33.3	36.6	47.0	51.7	48.1	49.6
18....	38.7	26.0	26.2	38.8	38.2	40.2	41.8	44.6	42.5	43.0	43.9	43.5
19 ...	31.8	34.0	34.8	37.0	37.6	40.0	42.9	47.6	48.0	49.4	49.8	52.9
20....	37.3	39.0	39.1	41.1	33.5	36.7	37.9	41.9	48.6	49.7	50.7	55.6
21....	29.1	29.4	31.0	33.9	31.9	31.9	31.8	32.8	34.2	35.5	37.0	41.6
22....	30.1	32.8	33.0	36.9	27.2	29.5	29.9	33.4	38.4	39.7	38.6	42.9
23....	26.1	29.2	29.8	34.1	29.1	32.2	32.1	34.7	44.4	46.0	47.9	53.6
24....	29.7	33.0	33.8	38.0	27.0	35.9	26.8	40.3	48.4	49.8	50.0	53.4
25....	28.5	33.0	34.0	39.0	43.6	44.1	44.7	45.8	43.9	44.8	44.9	48.6
26....	29.1	34.8	35.9	39.1	42.7	44.0	44.6	45.2	48.9	49.5	49.8	52.6
27....	25.5	30.0	30.8	33.2	37.2	38.6	38.6	40.9	38.0	39.6	40.1	49.2
28....	25.5	30.8	31.0	34.0	34.2	37.5	37.7	41.4	41.9	44.2	45.1	50.9
29....	35.2	41.9	43.0	46.9	40.4	41.5	41.6	44.9	51.8	52.1	52.0	53 6
30....	27.4	32.7	33.8	38.0	38.5	41.0	42.8	48.6	37.8	38.6	39.1	42.0
31....	....	....	....	....	34.0	35.2	35.7	39.5	....	....	....	....
Sum.	752.1	829.2	846.5	956.0	1046.1	1145.2	1173.3	1274.2	1261.3	1310.0	1322.7	1423.8
Mean	25.07	27.62	28.22	31.87	33.75	36.94	37.85	41.10	42.14	43.67	44.09	47.46

TERRESTRIAL RADIATION THERMOMETERS.

Date.	JULY.				AUGUST.				SEPTEMBER.			
	Height Above Ground.			Minimum Air Tem'ture.	Height Above Ground.			Minimum Air Tem'ture.	Height Above Ground.			Minimum Air Tem'ture.
	6 in.	12 in.	24 in.		6 in.	12 in.	24 in		6 in.	12 in.	24 in.	
1....	39.2	40.1	40.9	46.0	44.0	44.8	45.2	47.4	40.3	42.1	42.9	46.9
2....	39.4	41.0	41.2	44.6	39.4	40.0	41.0	43.2	45.5	45.8	45.7	47.5
3....	46.5	48.0	47.5	50.4	41.9	42.2	42.4	44.9	30.0	31.5	31.8	34.3
4....	41.0	42.8	43.2	41.2	46.4	46.8	47.2	51.2	39.0	40.8	41.3	44.6
5....	51.0	52.1	52.6	55.4	49.8	50.0	52.0	56.0	33.4	34.9	36.1	39.7
6....	51.0	52.8	53.6	56.5	51.9	52.3	53.2	55.7	38.6	40.5	40.8	43.9
7....	50.9	51.9	52.8	55.0	48.9	49.2	49.7	52.4	49.9	52.0	53.1	56.4
8....	53.0	52.5	52.0	52.6	49.8	49.9	50.2	52.3	41.9	43.6	44.1	45.7
9....	54.5	55.3	55.9	57.4	50.4	50.6	50.9	54.0	42.0	42.9	43.2	45.4
10....	41.9	43.0	43.7	48.0	48.6	48.8	49.1	52.8	40.5	41.9	42.1	44.4
11....	53.2	54.6	56.2	60.7	44.6	45.0	45.2	48.1	44.0	45.1	45.2	48.9
12....	45.0	46.2	47.4	50.6	48.9	48.8	50.0	53.0	38.6	39.9	39.9	42.3
13....	41.3	42.6	44.2	48.9	43.4	44.1	44.3	47.5	35.3	38.6	39.0	42.0
14....	41.6	42.4	43.3	48.4	49.5	52.7	53.8	57.5	38.4	40.6	41.9	45.4
15....	47.4	48.4	49.0	51.0	51.5	53.0	53.2	55.1	41.2	43.0	44.2	47.9
16....	43.7	44.3	44.7	48.2	51.7	51.8	52.8	55.1	37.9	39.9	41.2	45.2
17....	43.6	44.2	44.9	49.0	48.5	49.7	50.0	52.0	40.7	45.2	47.6	51.0
18....	48.9	49.2	49.5	51.9	51.4	52.0	52.2	53.8	38.2	40.8	42.3	46.0
19....	52.9	53.5	54.2	56.8	49.8	50.4	50.8	53.3	40.7	42.4	43.2	47.8
20....	46.8	47.6	48.1	51.2	45.7	47.9	48.3	51.7	30.2	31.8	32.5	36.0
21....	40.6	41.8	42.7	46.2	49.8	51.9	52.3	55.5	33.4	35.7	36.3	40.5
22....	43.9	44.7	46.8	52.2	32.8	34.6	34.7	36.7	48.6	49.7	51.8	55.1
23....	49.9	50.6	50.9	53.7	34.7	35.6	35.6	37.6	44.0	45.7	46.2	47.8
24....	52.6	53.2	54.1	56.8	40.3	42.0	42.9	46.5	37.7	37.4	37.3	39.4
25....	51.8	52.4	53.7	57.0	39.1	40.5	41.0	45.2	40.4	41.2	41.7	43.4
26....	46.0	47.0	47.9	50.5	51.9	51.2	51.0	52.7	37.9	39.6	40.7	43.3
27....	48.5	49.0	49.2	52.0	50.7	49.5	50.1	50.4	31.4	32.5	32.8	35.5
28....	53.0	52.4	54.1	58.0	38.4	39.7	40.1	42.4	37.1	38.5	39.0	42.7
29....	52.6	53.1	53.6	55.2	38.1	40.0	40.6	44.3	30.6	32.2	32.4	35.9
30....	54.2	54.2	53.8	55.5	40.0	41.8	42.5	45.8	35.4	37.3	37.7	40.9
31....	43.7	44.2	44.3	46.7	38.4	39.9	40.3	45.1	.....	.....	.....	.....
Sum.	1469.6	1495.1	1516.0	1607.6	1410.3	1436.7	1452.6	1539.2	1162.8	1213.1	1234.5	1325.8
Mean	47.41	48.23	48.90	51.86	45.49	46.35	46.86	47.65	38.76	40.44	41.15	44.19

TERRESTRIAL RADIATION THERMOMETERS.

Date.	OCTOBER.				NOVEMBER.				DECEMBER.			
	Height Above Ground.			Minimum Air Temp'ture.	Height Above Ground.			Minimum Air Temp'ture.	Height Above Ground.			Minimum Air Temp'ture.
	6 in.	12 in.	24 in.		6 in.	12 in.	24 in.		6 in.	12 in.	24 in.	
1....	34.1	36.6	37.0	39.6	19.0	20.0	20.1	24.5	28.6	30.6	30.8	33.9
2....	37.9	38.8	38.6	39.0	17.0	19.0	19.0	21.8	24.9	25.5	26.3	28.7
3....	25.8	27.8	28.4	30.4	22.9	24.3	24.9	28.8	23.4	23.4	23.4	25.3
4....	25.4	27.5	28.3	32.3	25.7	27.8	28.2	33.1	4.0	6.0	6.3	9.8
5....	24.2	25.9	26.2	29.0	23.2	24.5	24.9	30.9	6.0	8.6	9.2	14.2
6....	15.3	16.8	16.9	19.9	24.7	27.3	28.4	33.5	-5.0	-4.1	-2.9	1.3
7....	25.2	26.7	26.9	30.2	19.0	20.4	20.6	25.0	-16.9	-14.6	-14.0	-10.0
8....	23.2	24.8	25.8	28.3	19.9	21.4	22.3	27.0	8.8	10.0	10.6	14.5
9....	22.4	23.9	24.4	28.0	7.6	9.8	10.5	13.4	13.9	15.0	15.0	18.2
10....	24.4	26.7	27.9	35.4	31.8	36.0	37.6	39.5	26.4	28.2	28.7	31.5
11....	25.7	28.0	28.3	31.5	22.8	23.4	23.5	24.5	11.0	12.0	13.2	17.2
12....	27.3	31.7	32.8	36.4	7.0	16.0	10.7	13.8	11.3	12.4	13.2	16.0
13....	23.4	25.2	25.5	19.5	18.0	18.6	19.3	20.3	19.0	20.4	20.8	18.9
14....	15.1	16.8	16.9	21.0	16.8	18.7	18.6	19.4	31.9	32.2	32.2	32.7
15....	18.5	21.7	22.2	26.2	6.7	8.7	9.2	12.8	13.5	17.7	18.7	22.6
16....	30.9	33.3	34.0	38.7	-8.0	-5.4	-5.0	-1.1	13.5	14.7	14.6	18.8
17....	27.0	28.8	30.1	33.3	-11.6	-9.6	-8.8	-6.2	11.7	13.6	13.8	18.0
18....	14.7	16.7	17.0	21.2	4.4	5.2	5.5	9.0	11.7	12.0	13.2	16.3
19....	18.6	20.3	20.6	25.4	11.9	13.7	14.1	17.7	9.2	9.6	10.8	16.7
20....	24.7	26.7	27.2	32.9	12.9	14.4	14.5	16.8	12.8	14.5	15.0	18.4
21....	26.4	30.3	30.7	36.8	27.6	29.4	30.7	31.4	14.8	16.8	16.8	19.8
22....	21.2	22.6	22.9	25.8	6.5	8.9	9.0	12.2	6.8	8.5	8.5	13.3
23....	24.9	26.9	27.2	30.7	20.2	23.2	23.5	26.1	10.0	10.6	11.7	15.2
24....	29.1	31.3	32.0	36.1	14.7	17.3	17.9	21.4	14.7	15.0	14.8	15.7
25....	24.6	26.1	26.8	31.3	21.7	22.5	22.8	26.4	-9.7	-7.6	-7.6	-4.8
26....	27.2	30.7	31.2	34.6	19.6	21.2	21.6	28.4	-15.0	-12.0	-11.8	-9.4
27....	21.1	23.9	24.1	27.3	45.6	46.8	46.7	45.4	20.6	20.8	21.5	24.7
28....	21.8	23.6	24.0	29.1	8.0	12.8	13.9	19.6	22.9	25.0	25.2	28.3
29....	23.5	23.5	.....	28.0	11.9	13.0	13.0	11.6	1.7	3.6	3.7	8.3
30....	35.1	37.7	37.9	40.9	21.0	22.2	22.3	25.3	11.2	12.2	12.3	15.1
31....	14.6	17.0	17.6	20.9	.....	.....	.....	.....	12.7	14.0	14.1	16.7
Sum.	753.3	818.3	807.4	939.7	488.5	545.5	560.1	652.3	350.4	394.6	408.1	505.9
Mean	24.30	26.40	26.05	30.31	16.28	18.18	18.67	21.74	11.30	12.73	13.16	16.32

AVERAGE DAILY BAROMETER, 1891.

DATE.	January.	February.	March.	April.	May.	June.
1.....	24.937	24.738	24.838	25.066	24.941	24.660
2.....	24.852	24.869	24.862	25.165	24.819	24.769
3.....	24.938	25.100	24.985	25.196	24.972	25.060
4.....	25.132	24.869	24.731	25.247	25.088	25.119
5.....	24.960	24.879	24.789	25.025	25.125	25.037
6.....	24.897	24.728	24.834	24.865	25.077	25.009
7.....	25.063	24.645	24.867	24.650	24.949	24.880
8.....	25.137	24.985	24.856	24.608	24.841	24.776
9.....	25.153	24.948	24.694	24.945	25.008	24.729
10.....	24.999	24.802	24.706	25.094	25.176	24.982
11.....	25.236	24.714	24.974	24.884	25.066	24.916
12.....	25.176	24.895	24.988	24.840	25.074	24.822
13.....	24.948	25.106	25.060	24.995	25.064	24.711
14.....	24.806	24.938	25.008	24.838	24.897	24.720
15.....	25.135	24.656	25.030	24.790	25.019	24.927
16.....	25.185	24.561	24.909	24.799	25.173	25.089
17.....	25.115	24.714	24.840	24.912	25.092	25.003
18.....	25.202	24.846	24.976	24.872	24.919	24.726
19.....	25.199	24.580	24.807	24.778	24.726	24.753
20.....	25.144	24.773	24.777	24.854	24.943	24.802
21.....	25.040	24.889	24.837	25.023	25.219	25.066
22.....	25.074	24.591	24.887	25.080	25.150	24.815
23.....	25.015	24.419	24.909	24.949	24.992	24.891
24.....	24.940	24.514	25.171	24.805	25.111	24.993
25.....	25.017	24.843	25.120	24.757	25.175	24.981
26.....	24.874	24.880	24.895	25.184	25.149	24.896
27.....	24.733	24.858	24.738	25.291	24.965	25.027
28.....	24.850	24.856	24.585	25.060	24.954	25.082
29.....	24.912	.....	24.756	24.949	24.788	25.209
30.....	24.688	.....	24.818	25.062	24.856	25.084
31.....	24.728	.....	24.846	.....	24.814	....
Sum.....	774.983	694.196	771.088	748.583	775.142	747.534
Mean.....	24.999	24.793	24.874	24.953	25.005	24.918

AVERAGE DAILY BAROMETER, 1891—Continued.

DATE.	July.	August.	September.	October.	November.	December.
1.....	25.033	25.104	25.114	24.675	25.139	24.697
2.....	25.108	25.193	25.306	25.016	25.114	24.597
3.....	25.033	25.053	25.095	25.162	25.120	24.793
4.....	25.064	25.012	25.122	25.127	25.132	24.629
5.....	25.022	25.020	25.269	25.069	24.919	24.877
6.....	25.022	24.973	25.160	25.106	24.853	25.151
7.....	25.123	25.007	25.141	25.184	24.786	25.049
8.....	25.016	25.089	25.227	25.238	25.100	24.888
9.....	24.922	25.073	25.121	25.125	24.858	24.763
10.....	24.950	24.994	24.974	24.990	24.799	25.210
11.....	24.822	25.153	25.041	24.826	25.128	25.412
12.....	24.961	25.116	25.112	25.025	25.045	25.236
13.....	25.205	25.073	25.070	25.125	24.942	24.879
14.....	25.184	25.074	24.996	25.031	24.902	24.950
15.....	25.093	25.084	24.991	24.900	24.841	25.169
16.....	25.120	25.089	24.884	24.965	25.228	25.121
17.....	25.151	25.097	25.061	25.343	25.227	24.981
18.....	25.124	24.990	25.018	25.355	24.896	24.985
19.....	25.039	24.953	25.006	25.123	24.929	24.864
20.....	25.026	25.029	25.035	25.183	24.816	24.634
21.....	25.027	25.214	25.001	25.271	24.778	24.659
22.....	25.166	25.259	24.971	25.163	24.945	24.953
23.....	25.236	25.139	24.855	25.102	24.957	24.581
24.....	25.216	24.940	25.150	25.128	24.998	24.752
25.....	25.260	25.083	25.144	25.134	24.810	24.907
26.....	25.147	25.277	24.946	25.270	24.767	24.823
27.....	25.077	25.256	24.913	25.230	24.894	24.582
28.....	25.064	25.148	25.166	25.084	25.211	24.703
29.....	25.042	25.144	24.819	24.929	25.105	24.759
30.....	25.055	25.108	24.587	25.101	24.796	24.616
31.....	25.033	25.107	.....	25.214	.....	24.685
Sum.....	777.341	777.851	751.295	778.194	749.035	770.935
Mean.....	25.075	25.092	25.043	25.103	24.968	24.869

OBSERVATIONS IN THE MOUNTAINS.

In comparing the observations at Manhattan and Fort Collins, the interesting fact is noticed that the temperature at Manhattan is frequently higher than at Fort Collins, especially during the Winter months. This is more noticeable with the observations at 7 a. m., although it is common with those at 7 p. m. An inspection of the following table, giving the observations made at the same hour, shows this. This is more unexpected, as Manhattan is situated in the mountains, at an elevation of nearly 3,500 feet above Fort Collins.

During the month of January, the temperature at Fort Collins at 7 a. m. averages about five degrees lower than at Manhattan, and an inspection of the lowest temperatures shows also that it is colder than at Manhattan. The observations at Manhattan are taken by Mr. S. J. Peery, who has shown great interest in them.

The instruments were furnished by the College, and were tested by us before sending, so that the record may be looked on with considerable confidence.

After the month of February, the difference of temperature is not so noticeable.

COMPARISON OF TEMPERATURES, FORT COLLINS AND MANHATTAN, 1891.

MONTH.	7 A. M.		7 P. M.		LOWEST, 7 A. M.	
	Fort Collins.	Manhattan.	Fort Collins.	Manhattan.	Fort Collins.	Manhattan.
January*	16.56	21.71	21.65	21.35	-13.70	4.0
February†	14.80	16.57	18.52	19.57	-10.50	6.0
March‡	23.35	18.48	29.60	20.35	1.0	-5.0
April	40.49	30.87	49.57	26.37	21.9	6.0
May	52.49	41.71	55.31	44.32	37.3	25.0
June	59.04	52.60	63.44	51.73	49.5	35.0
July	63.72	58.74	68.21	56.39	54.3	46.0
August	62.25	61.52	66.73	56.90	50.8	48.0
September	52.55	52.80	60.26	49.57	41.4	38.0
October	37.54	43.71	48.14	40.26	27.6	35.0
November	27.62	29.10	34.23	29.55	-1.0	12.0
December	21.12	18.00	26.52	19.28	0.0	-5.0
Sums	671.53	448.81	543.18	435.64	.....	.....
Means	39.29	37.40	45.26	36.30	.....	.....
January, 1892*	13.26	18.48	20.16	21.03	-25.4	-15.0
February, 1892†	21.24	21.46	27.23	23.25	-7.8	9.0
March, 1892‡	27.02	25.18	34.78	25.11	-13.0	1.0

COMPARATIVE TABLE, FORT COLLINS AND MANHATTAN.

MONTH.	MEAN TEMP. 7 a. m.—7 p. m.		Total Precipitation—rain and melted snow—Inches.	Total Snowfall—Inches.	MEAN DEW POINT.		MEAN RELATIVE HUM.	
	Manhattan.	Fort Collins.			Manhattan.	Fort Collins.	Manhattan.	Fort Collins.
January	21.5	19.1	2.05	24.	19.00	14.22	73.96	83.05
February	18.1	17.2	0.54	7.	8.57	10.86	67.50	78.28
March	19.4	26.5	2.63	25.	10.15	20.90	69.22	82.49
April	28.6	45.0	1.85	12.	15.04	29.67	59.60	58.81
May	44.5	53.9	5.94	.....	30.31	42.57	60.50	68.90
June	52.2	61.2	2.54	.....	39.05	50.70	64.52	69.91
July	58.6	66.0	2.63	.....	42.61	55.18	61.95	69.25
August	59.2	64.6	1.19	.....	44.79	52.97	61.66	68.14
September	51.2	56.4	1.94	.....	37.32	44.08	61.65	66.64
October	42.0	42.8	T	.....	30.00	24.99	65.79	53.63
November	29.3	30.9	0.39	5.0	21.65	18.39	74.95	64.15
December	18.6	23.8	0.50	7.5	10.86	14.13	74.50	69.66
Sums	442.2	507.4	22.20	80.5	309.85	378.66	786.80	832.91
Averages	36.85	42.28	.....	.....	25.78	31.55	65.57	69.41

T—Trace.

Annual Summary, Agricultural College, Fort Collins, Colo., for 1891.

MONTH.	Mean Pressure, Corrected for Temperature Only.	TEMPERATURE. (Degrees.)			Tot'l Precipitation (rain and melted snow), Inches.	Total Snowfall, Inches.	WIND.		Relative Humidity Mean.	Dew Point, Mean.	No. Stormy Days. .01 Precipitation or More.	No. Days on which frost or dew was Observed.		No. of Days when Temperature was Below 32°	No. of Days when Min. Temperature was below 32°
		Mean.	Max.	Min.			Prevailing Direction.	Maximum velocity or Force, Miles.				Fr'st.	Dew.		
January	24.999	22.15	48.9	-16.3	2.32	22.0	WNW.	36	81.66	12.15	5	11	.....	28	20
February	24.792	19.75	46.5	-15.0	0.16	1.4	WNW.	48	78.28	10.86	5	12	.....	25	27
March	24.874	30.46	66.0	-4.1	1.21	6.0	S SW.	48	82.49	20.90	12	16	.....	13	27
April	24.953	46.61	81.9	12.9	2.14	1.8	W.	60	58.81	29.67	4	10	5	3	13
May	25.005	54.83	84.6	31.2	4.07	T.	S SE.	48	68.90	42.57	13	.....	9	0	1
June	24.918	60.91	86.9	37.9	1.30	0	SE.	48	69.91	50.70	10	.....	9	0	0
July	25.075	66.92	89.4	41.2	0.17	0	SE.	48	69.25	55.18	4	.....	12	0	0
August	25.092	66.33	93.1	36.7	2.05	0	S SW.	30	68.14	52.97	16	1	15	0	0
September	25.043	61.07	88.8	34.3	1.01	0	W SW.	48	66.61	44.08	11	4	11	0	0
October	25.103	48.69	79.8	19.5	0.20	T.	W SW.	60	53.63	24.99	2	15	.....	0	19
November	24.968	35.12	75.9	-6.2	0.60	7.8	WNW.	80	64.15	18.39	6	6	.....	10	26
December	24.869	28.67	60.0	-10.0	0.46	4.8	WNW.	102	69.66	14.13	3	11	.....	19	29
Sums	299.691	541.51	901.8	162.1	15.69	43.8	.....	.....	831.52	376.59	91	86	61	98	172
Average	24.974	45.13	75.75	-12.6	.....	.....	SW.	.....	69.29	31.38	75	.....	.....	.....	.....

Annual Summary, for 1891, Divide Experiment Station, George F. Breninger, Superintendent.

DATE.	TEMPERATURE. (Degrees).			Total Precipitation (rain and melted snow), Inches.	Total Snowfall, Inches.	WIND.		Relative Humidity, Mean.	Dew Point, Mean.	No. Stormy Days, .01 or more Precipitation.	No. Days on which Frost or Dew was Observed.		No. of Days whose average Temp're was below 32°.	No. of Days whose Min. Temperature was below 32°
	Mean.	Max.	Min.			Prevailing Direction.	Maximum Velocity or Force, Miles.				Fr'st.	Dew.		
January														
February														
March				1.77	11½					4			—	—
April		73.5		1.99	13	SW.				4	1	6	—	—
May		72.1		4.72	8	SW.		70.10	36.98	10	3	1	—	—
June		80.6		2.72	0	SW.		67.20	44.00	8	9	2	—	—
July		85.5		3.80	0	SW.		70.91	50 55	14			—	—
August	62.16	82.8	35.8	2.70	0	SW.		71.84	49.74	11	10	1	0	0
September	56.73	82.0	32.0	.66	0	SW.		63.83	40.58	6	3	2	0	1
October	45.44	69.0	19.0	.88	4	SW.		59.42	23.47	4	1		1	18
*November	33.92	72.3	-6.0	.59	6.9	w sw.		64.61	14.84	5			10	18
†December	21.98	48.0	-12.5	1.94	18.2	W.		82.13	14.07	8			23	27
Sums														
Average														

* 22 days in November. † 27 days in December.

Annual Summary, for 1891, San Luis Experiment Station, Monte Vista, M. E. Bashor, Superintendent.

MONTH.	Mean Pressure Corrected for Temperature Only.	TEMPERATURE. (Degrees.)			Total Precipitation (rain and melted snow), Inches.	Total Snowfall, Inches.	WIND.		Relative Humidity, Mean.	Dew Point, Mean.	No. of Stormy Days (.01 or more Precipitation.	No. Days on which Frost or Dew was Observed.		No. of Days whose average Temp're was below 32°	No. of Days whose Min. Temperature was below 32°
		Mean.	Max.	Min.			Prevailing Direction.	Maximum Velocity or Force, Miles.				Fr'st.	Dew.		
January	22.565	13.0	42.0	-18	.93	9¾	w.	—	.....	.....	5	.....	.....	31	31
February	22.450	17.4	44.0	-1.8	.38	2	w.	—	.....	.....	3	.....	.....	24	28
March	—	—	—	—	—	0	—	—	.....	.....	—	.....	.....	—	—
April	22.651	41.1	76	16	.20	2	w.	—	—	—	1	.....	.....	15	25
May	22.728	49.7	75	25	.92	½	s.	—	—	—	5	.....	.....	0	11
June	22.658	56.6	87	30	.38	.....	w.	—	.....	.....	4	.....	.....	0	3
July	22.839	62.6	86	40	1.59	.....	n nw.	—	.....	.....	8	.....	.....	0	0
August	22.879	62.2	88	34	.30	.....	nw.	—	69.27	48.00	3	.....	.....	0	0
September	22.844	56.1	83	30	1.39	.....	s.	—	73.05	43.72	5	.....	.....	0	4
October	.....	40.1	70	18	.00	.....	w.	—	62.42	26.00	0	.....	.....	0	28
November	.....	32.9	59	8	.05	.....	.....	—	76.63	18.92	1	.....	.....	13	30
December	.....	13.1	49	-22	.99	12 2	w.	—	—	—	6	.....	.....	29	31
Sums	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

Annual Summary, for 1891, Arkansas Valley Experiment Station, Frank L. Watrous, Superintendent.

MONTH.	TEMPERATURE. (Degrees).			Total Precipitation (rain and melted snow), Inches.	Total Snowfall, Inches.	WIND.		Relative Humidity, Mean.	Dew Point, Mean.	No. Stormy Days, .01 or more Precipitation.	No. of Days whose average Temp're was below 32°.	No. of Days whose Min. Temperature was below 32°.
	Mean.	Max.	Min.			Prevailing Direction.	Maximum Velocity or Force, Miles.					
January	23.58	54	-8	1.50	13	W.	—	—	—	2	25	31
February	31.00	72	-8	0.00	0	—	—	—	—	0	5	23
March	39.70	72	-6	1.80	4	W.	—	—	—	13	4	25
April	50.92	90	15	0.43	—	W.	—	—	—	2	1	11
May	60.64	89	31	3.52	—	SW.	—	—	—	5	0	1
June	68.45	95	43	2.31	—	W.	—	—	—	5	0	0
July	73.68	98	50	0.74	—	N.	—	—	—	7	0	0
August	73.27	100	45	0.73	—	W.	—	—	—	2	0	0
September	67.55	95	34	1.75	—	SW.	—	—	—	6	0	0
October	53.02	82	24	0.21	—	W.	—	—	—	2	0	15
November	38.52	76	4	0.20	2	S SW.	—	—	—	4	9	28
December	30.71	69	-4	1.77	11½	W.	—	—	—	6	20	30
Sums	611.04	—	—	14.96	30½	—	—	—	—	54	64	161
Average	50.92	—	—	.....	.....	.....	.....	.....	.....	4.5	.....	.....

REPORT OF

ENTOMOLOGICAL SECTION.

To the Executive Committee of the State Board of Agriculture:

GENTLEMEN—I have the honor to submit herewith my report of work done in the Entomological Section during the year 1891. As it is expected that this work will be duly reported upon in future bulletins, what I offer here is but a brief outline. The work may be classified under the following heads:

1. Issuing Bulletins.
2. Experiments with Insecticides.
3. Breeding-cage Experiments.
4. Observations on Insects in Field and Garden.
5. Visiting Localities Suffering from Insect Ravages.
6. Collecting and Preserving Insects.
7. Experiments in the Apiary.
8. Experiments for the Destruction of Prairie Dogs.

Bulletin No. 15 was issued from this department early in April. It treats of two of Colorado's worst insect pests, the Codling Moth and the Grape-vine Leaf-hopper.

The experiments with insecticides have been for the purpose of determining the effects of the different arsenites on foliage; to determine the proportions in which they can be safely used on different plants; to determine the best methods of applying them to prevent the injuries

that arsenites generally do to foliage, and to determine the value of the different insecticides for the destruction of insects.

The breeding-cage experiments were for the purpose of determining the food habits, life histories and parasites of injurious insects, and much valuable data has been obtained by means of them.

Under field observations, I will mention the following insects of decidedly injurious habits that were studied more or less last Summer, and all, except one, the thrip that attacks the leaves of the cucumber vine, occurred in the vicinity of Fort Collins:

The Codling Moth or Apple Worm, is very abundant and does great injury to the apple crop of the State.

The Grape Leaf-hopper is the worst insect pest that the vine has to contend with, and did considerable injury to the College vineyard last Summer.

The Fruit-tree Leaf-roller*(*Cacœcia argyrospila*) stripped fruit trees, rose and raspberry bushes, in many places, of their entire foliage, leaving them as bare as in mid-Winter.

The Box-elder Leaf-roller **(*Cacœcia semiferana*) was equally bad in defoliating the Box-elder trees.

Currant and gooseberry bushes were many of them completely defoliated by the joint work of two span-worms ***(*Thamnonoma 4-linearia* and *T. flavicaria*) and the Native Saw-fly ***(*Pristiphora grossularia*), and there were none that entirely escaped their attack.

The American Tent Caterpillar (*Clisiocampa Americana*) was very abundant on fruit trees, and especially on the so-called Deer-bush (*Circocarpus parviflorus*) which grows so abundantly on the foothills.

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* Determined for me by Mr. L. O. Howard, of the Department of Agriculture, and also by Dr. C. H. Fernald, of Amherst, Massachusetts.

** Determined for me by Dr. C. H. Fernald, of Amherst, Massachusetts.

*** Determined for me by Mr. G. D. Hulst, Brooklyn, New York.

The Currant and Gooseberry Fruit-fly *(*Trypeta canadensis*) caused at least 75 per cent. of the gooseberries to turn red and fall prematurely from the bushes in my garden, and it also destroyed many currants. I am not aware that this insect has ever been recorded as a very injurious species.

The imported Currant Borer (*Sesia tipuliformis*) is very abundant in this vicinity, boring into currant stems, causing them to die. Squash vines suffered much from the attack of a maggot, the larva of a two-winged fly ††(*Cyrtonema stabulans* (?) *Fabr.*,) boring at the roots, causing them to rot off about the time that the vines began to run.

Thrips have done a considerable injury to onion tops, causing them to whiten and die, and leaves of cucumber vines have been similarly injured in some places in the State.

The Plum Gouger (*Cocotorus Scutellaris Lec.*) is very bad on the native varieties of the plum, which are entensively grown in the State.

The imported Cabbage worm (*Pieris rapæ*) is now as abundant here as in the East, and does much injury to cabbages and cauliflowers.

Flea-beetles of two species (*Systena taeniata*† and *Phyllotreta albionica*) have done considerable harm to cabbages, beets, raddishes and some other plants.

The Bean Leaf-beetle (*Epilachna corrupta*)* has been a most serious pest on wax beans in field and garden in this vicinity, entirely destroying the crop in many instances. It promises to be to the bean crop what the Colorado Potato Beetle has been to the potato crop, or

† Determined for me by Prof. Tyler Townsend, Las Cruces, New Mexico.
†† Determined for me by S. W. Williston, Lawrence, Kansas.
* Determined for me by Mr. L. O. Howard, of the Department of Agriculture.

even worse, as it is not so easily managed by the use of insecticides.

The Pea-weavil (*Bruchus pisi*) has been extremely abundant in gardens. Examinations of peas in the gardens and in the market indicated that nearly 100 per cent. of the peas had the grubs in them, and thirty or forty eggs were sometimes found on the same pod.

The Boll Worm (*Heliothis armigera*) has been quite bad, eating into the ears of sweet corn and into tomatoes.

This year has seemed remarkable to me on account of the large number of insect pests that made their appearance, some of them never before reported as of economic importance.

It is evident that there is need of a large amount of careful experimental and systematic work in the line of economic entomology in the State, and I feel very much the need of a trained assistant to help me the entire year.

During June, July and August, of the past Summer, I was assisted by Mr. G. H. Buffum in the experimental work.

Accompanying this report is a complete invoice of the property belonging to this Section of the Experiment Station.

All of which is very respectfully submitted,

C. P. GILLETTE,

Entomologist.

REPORT OF

San Luis Valley Experiment Station.

To the Executive Committee of the State Board of Agriculture:

GENTLEMEN—I received my appointment in June, 1891, as Superintendent of the San Luis Valley Station, then situated east and south of Monte Vista, in Rio Grande County.

I arrived June 23. Messrs. Ryan and Small came a day later, and, in looking over the Station, concluded that the committee appointed to make the selection had made a mistake in its location. Messrs. Ryan and Small presented their views, which were approved by your Honorable Body, and after a careful investigation of locations and soil, it was concluded advisable to remove to the present location, four and one-half miles north of Monte Vista, in Rio Grande County, bordering on what is known as the Gun-Barrel road.

As a result of my work on the new Station, a cottage is completed at a cost of about $700. Necessary outbuildings have been constructed to comfortably house all stock and tools mentioned in the inventory. Twenty acres were thoroughly watered, and this twenty acres, with fifteen acres not irrigated, has been well plowed for the coming year.

The potatoes, with twenty acres of wheat and eight acres of oats, growing on the old Station, have been harvested and threshed, and placed in a granary. The yield is 700 pounds of potatoes, 220 bushels of oats and 140 bushels of wheat. The potatoes, consisting of thirty different varieties, have been placed in a pit for winter, and will be used exclusively for seed, here, and at the other Stations. The wheat is frost bitten, having been sown late, and will make feed only. The oats are well matured, and will sell to an advantage for seed in the spring.

I took charge in July, but have not received any record from my predecessor relative to the time of planting any kind of grain. I have no record of the past year, and know nothing of the names of crops growing, or the yielding or producing qualities of potatoes, wheat or oats.

My plans for the future have been presented to and approved by Prof. Walter J. Quick, with such changes as he sees in his own good judgment to make.

Respectfully submitted,

M. E. BASHOR,
Superintendent.

REPORT OF

Arkansas Valley Experiment Station.

To the Executive Committee of the State Board of Agriculture:

GENTLEMEN—Through Director Walter J. Quick, I have the honor to present the regular annual report of the Arkansas Valley Agricultural Experiment Station:

GRAIN EXPERIMENTS.

Two plats, of two acres each, of fall-plowed alfalfa sod were sown April 6 and 7, one to Amethyst, and the other to Sonora wheat. Both plats were irrigated twice. The Sonora was harvested July 13, and the Amethyst July 20, the former yielding thirty and one-half bushels per acre, and the latter twenty-eight. Quite a thick stand of alfalfa followed the harvesting, and this was irrigated and plowed under for fall wheat.

The following-named grains were grown on plats of 1-26 of an acre for each variety, but on account of the large amount of grain picked for exhibition purposes, it was thought a fair estimate of the yield of each plat could not be obtained:

Wheat—Ontario, Centennial, Fountain and Polish.

Oats—Chinese Hulless and Eureka.

Barley—Black, Melon and Phœnix.

Of the wheats, only the Polish is of value, except for exhibition.

Black and Melon barleys may prove to be profitable crops. Nine acres of fall-plowed wheat ground were planted to Colorado White corn, April 28. It was harrowed three times, cultivated three times, hoed twice and irrigated twice. The yield was 29½ bushels per acre.

It has been found extremely bad policy to plow ground in the fall when it is not sufficiently moist to work well. It not only makes the soil lumpy, and hard to work, but its productive power is deadened, and it takes a season's cultivation to bring it back to the starting point.

GARDEN CULTURE.

Twenty varieties of peas were grown for variety tests. Dan'l O'Rourke was earliest, and of the late sorts, Champion of England, Stratagem and Telephone excelled.

Thirty-one varieties of beans were grown, with the following results: For early string, Early Mohawk and Early Red Valentine were first, and later, Golden Wax and Flageolot Wax were best.

For shell beans, the common Mexican was most productive, and to this may be added, it is the most salable of any, except the small Navy, which will not average over half the yield of the Mexican.

Burpee's Lima bean, which is sold at the rate of 25 cents for four beans, did not respond, in any appreciable degree, to the kindliest treatment.

Small plats of the following-named products were grown, with good results in each instance: Lupines, Lentils, Chamas, Vetches, Red French Millet, American and European Flax, Virginian and Spanish Peanuts, Okra, Egg Plant, Black Nubian peppers, Pop-corn, and many other small plants of less importance.

Watermelons—The Vancluse, Swink, Swink-Delaware and Station melons were grown. The Swink was first in earliness and quality; the Swink-Delaware was the best

for shipping, and the Station melon is worth another season's trial.

Cantaloupes—For quality and productiveness combined, Netted Gem is first. For quality alone, Burpee's Market excels, and Skillman's Netted is a good standard variety.

Squashes—Mammount Chile, Warren, Pike's Peak and Fordhook were planted, and Fordhook was the only variety that withstood the overwhelming onslaught of the squash bug. This variety is a vigorous grower, and very prolific. It can be highly recommended for late Summer and early Winter.

Pumpkins—Connecticut Field and Sugar pumpkins were grown, with good results.

Turnips—Breadstone and Purple Top Milan were sown May 1. They grew well, but, as found in other seasons, early turnips are poor in quality. Those sown in August are much better.

Beets—Eclipse and Blood Turnip beets were grown with good results. These were two excellent varieties.

Cabbage—Surehead, Mammoth Marblehead and Red Drumhead were set in open ground May 11. Surehead is a valuable middle-season cabbage. Very large specimens of the other two varieties were grown, and they were in great demand for exhibition. Mammoth Marblehead is too coarse grained to excel in quality, and Red Drumhead is an improvement, as regards size, on the old Red Dutch.

Cauliflower—Two years experience with this vegetable has taught that it will not head during hot weather. That, even, when set, May 15, it simply forms leaves, and shows no inclination to head until after September 5, from which time to November 10, unless stopped by severe frost, it grows thriftily, and heads well.

Tomatoes—Of the ten varieties grown, Chemin was earliest, and can be recommended for early market when grown on very rich soil. Livingston's Perfection proved best for general crop.

It has been observed, in reference to tomatoes, that home-grown seed is less satisfactory than seed grown at lower altitudes.

Celery—Seeds were sown in open bed April 25. Germination was very slow. Plants were only fit for setting July 20. Their growth was scarcely noticeable until September 1, after which growth was rapid. White Plume and Golden Leaf Blanching were ready for use October 20, and were of the finest quality. Giant Pascal is an excellent Winter celery. To raise good celery in this section, the land must be superlatively enriched, and plants should receive water every other day the first month after setting. There is no necessity for setting plants before July 25, and banking will then commence about September 10.

Irish Potatoes—A row of Hercules potatoes, cut to two eyes, was planted March 17 on land fertilized with wood ashes and rotten manure. By June 29, the tubers had attained the size of goose eggs, and were much finer than California potatoes in market at the time. Two weeks later the potatoes were sprouting badly, and became rough and ill shaped. The potato shows an extreme dislike for hot weather in this section. From two year's experience, I believe that, with proper handling, this early crop of potatoes (dug by July 8) can be made a great success here. Nine varieties of potatoes, from seed grown at the Station two years previous, were planted June 3. The rows were plowed deep and fertilized before planting with a mixture of wood ashes and rotten manure. This experiment proved to my satisfaction the conclusion I had already arrived at in reference to seed potatoes in this sec-

tion: That the longer home-grown seed is propagated, the more inferior in yield, size and quality will be the product. Seed should always be obtained from localities that are naturally adapted to the raising of potatoes.

ORCHARD.

Ninety-five apple trees were added to the orchard last Spring. Of these, thirteen died from not receiving sufficient water at the first irrigation. The balance have made a sturdy, vigorous growth. The orchard at present consists of the following list of trees, all of which are going into the Winter in prime condition:

Apples—Wealthy, 21; McMahon's White, 1; McIntosh Red, 1; Farmense, 11; Mann, 11; Early Harvest, 11; Cooper's Early White, 11; Tetofsky, 11; Whitney's No. 2, 11; Red Astrachan, 11; Ben Davis, 11; Pewaukee, 11; Salome, 5; Peter, 5; Missouri Pippin, 5; Sops of Wine, 6; Fall Winesap, 10; Alexander, 9; Smith's Cider, 8; Wagoner, 9; Baldwin, 6; Utter Red, 3; Twenty Ounce Pippin, 10; Yellow Bellflower, 9; Northern Spy, 9; Walbridge, 9; Paul's Improved, 5; Crab, 240.

Pears—Clapp's Favorite, 16; Flemish Beauty, 4; Langworth, 5; Keiffer's Hybrid, 14.

Plums—Wild Goose, 100; Chicasaw, 5; DeSota, 10; Forest, 10.

GARDEN.

The plums are all annual bearers, except the Wild Goose, which is not self-fertilizing, and is not situated near enough to other varieties. Of the apples, Tetofsky and Cooper's Early White, both set in the Spring of 1890, commenced bearing the past season. The two-year-old portion of the orchard was seeded to red clover last spring. It may be deemed good practice to plow under occasionally, and reseed when trees come in bearing.

NURSERY.

Of the fruit trees sold last spring from two-year-old nursery, good reports have been heard, except in cases of three orders, sent to Larimer County. These were delayed in transit twenty to thirty days each, consequently the trees were dried out, and 50 per cent. failed to grow.

There are 350 trees left of the first nursery, which were small, or, from other causes, unsalable. These should remain in the rows one more year, to become established before being transplanted again. Forest trees left in nursery number 300—Elms, Ash, Walnut, Elder and Sycamore. As stated at the time, the stock of root grafts set in the spring of 1890 was very inferior in mechanical finish. They were ordered from the Phœnix Nurseries, Bloomington, Ill. It is but justice to add, however, that after handling over 200,000 of their grafts in the last twelve years, this is the first inferior lot found. It may be worth adding, also, that the Deleware Red Winter apple, mentioned below, and so widely advertised as a winter apple of extraordinary growing and keeping qualities, is none other than the Lanner, a common winter apple of only ordinary merit. Two hundred and fifty grafts of each variety below given were set, and the numbers indicate the number of fine, salable trees of each variety: Black Arkansas, 100; McMahan's White, 95; Peter, 77; Fink, 65; Yellow Transparent, 111; Wolf River, 104; Delaware Red Winter, 107; Florence Crab, 98. Twenty-two Alexander peach trees from 50 buds are making vigorous growth and promise well.

VINEYARD.

All vines set two years ago began bearing this season. Part of the vines were laid down and covered last winter, and part were simply fastened to the ground without

being covered. No difference could be noticed in condition of the vines. Of those bearing, Lady Washington was the most prolific, and Brighton the finest in quality. The California Mission grape is found to thrive here with good winter protection.

Small Fruits—There are growing on the Station grounds, Manchester, Captain Jack, Jessie, Bubach's No. 5 and Wilson strawberries. The value of strawberries must be expressed locally, as a given variety may succeed at one place and not at another with like treatment. Captain Jack and Bubach's No. 5 are worthless here. Jessie is good as a fertilizer. Wilson does not succeed so well here as in other localities. Manchester, on rich ground, properly fertilized with Jessie or Wilson, is our most valuable berry so far. We also have on the grounds the Industry and Houghton Gooseberries, Greeg, Golden Queen and Cathbert raspberries, and Wilson blackberry.

HALF-ACRE PLATS.

Sweet Potatoes—Plants were securred of a local grower and set on different days, as plants could be obtained, from May 12 to 29. They were irrigated five times, cultivated twice, and hoed three times.

Sales	$100 82
Expense	34 00
Net	$ 66 82

The important feature in growing Sweet potatoes is to use the least amount of water practicable after plants are started. Too much water lessons yield and injures quality.

Flax—One-half acre was sown April 28 with grain drill, using fifteen pounds of seed. The crop received no irrigation, and no attention, except to pull weeds. Harvested 160 pounds of seed.

Value	$8 00
Expense	6 60
Net	$1 40

Tomatoes—A half acre of tomatoes was grown to determine if they could be profitably raised at one-half cent per pound, the canning factory price. Plants were set as they came forward from May 13 to June 12. Had they all been set at once, the crop might have made a better showing. The plat was irrigated five times, cultivated twice, and hoed twice.

Sales	$25 85
Expense	20 70
Net	$ 5 15

Refugee Beans—This crop was also grown for the factory at the rate of $1.25 per cwt. The crop is cheaply raised, and, though the price is low, a profit would have resulted but for the fact that the factory stopped work just before the second picking began.

Sales	$14 05
Expense	14 40
Loss	$ 35

Broom Corn—One half acre was sown in drill May 5. A fairly good qvality of corn was grown. It was not quite so long or so heavy as desirable. The quality of seed or cultivation may have had something to do with it. The needs of the crop were not well understood, and another trial might result more favorably. It was sold to the Star Broom Company, Pueblo, Colo., at the rate of $50.00 per ton. Yield of broom material, 400 lbs.

Sales	$10 00
Expenses	15 00
Loss	$ 5 00

Irish Potatoes—During the past Winter, a half acre previously in Sugar beets, was prepared for potatoes. Straw was hauled on to a depth of ten inches all over the plat. Nothing more was done until June 5, when the

straw was burned off and the land plowed eight inches deep, turning under the ashes. Two hundred and fifty pounds of Mammoth Pearl potatoes had been secured for seed. This seed came from the San Luis Valley, and the tubers were very large. Upon cutting seed to one eye, and dropping in rows, it was found that, owing to the scarcity of eyes in the potatoes, the seed would plant only one-half the plat, lacking one row. In the mean time, the rows had all been laid off, in expectation that the planting would be finished. The weather was very dry and warm. More seed was secured, and planted the next day in the afternoon. By this time the furrows were dry, and the result was that only two-thirds of the stand was secured on this portion of the one-half acre. The above experience points a lesson which every farmer will do well to remember. Let the potatoes be dropped and covered immediately after the plow that opens the furrow. The plat was harrowed June 15, cultivated July 3 and 15, and irrigated August 1, 11, 25, and September 5. The first planting of June 8, a little short of one-fourth acre, produced 63 bushels of salable potatoes. The next planting, June 9, a little more than one-fourth acre, produced 27 bushels, making 90 bushels for the one-half acre. The tubers were of good size, many of them weighing a pound and a half, and in quality they were equal to the very best grade of Greeley potatoes. The plat produced less than two bushels of small or unsalable potatoes. The entire crop was sold at once for $1.00 per cwt.

Sales	$54 00
Expense	27 90
Net	$26 10

The expense could be much reduced by purchasing seed in the fall, when it is cheap. Last spring seed cost

$2.50 per cwt. Fine potatoes are now selling on the Divide at 35 cents per cwt.

SUGAR BEETS.

The seed of the Vilmorin was received from the Fort Collins Station with instructions from Director C. L. Ingersoll, to plant one acre, dividing it into quarters; the first quarter to receive no irrigation, the second quarter one irrigation, the third quarter two irrigations, and the fourth quarter three irrigations. These instructions were faithfully carried out, except in one particular. The ground was dry when planting was done and after the seed had lain in the ground two weeks without sprouting, it was thought necessary to irrigate. Two days after irrigation was finished, the customary rain came. The crop was cultivated three times, hoed twice, and irrigated as described.

Plat No. 1, without irrigation during growth, yielded at the rate of nine tons per acre; No. 2, with one irrigation during growth, at the rate of ten and four-fifth tons per acre; No. 3, with two irrigations during growth, at the rate of nine and nine-tenths tons per acre; No. 4, with three irrigations, also yielded at the rate of nine and nine-tenths tons per acre. Two samples each of these several plats were sent at two different times to the Fort Collins Station for analysis. Two samples were also sent to the Agricultural Department, at Washington, D. C., for analysis. The first samples sent were taken from plat No. 1, grown without irrigation during growth. Yield recorded, 14 25-100 per cent. sugar, no further estimate being given. The second samples were taken from plat No. 2, grown with one irrigation during growth, and yielded 15.2 per cent. sugar, and at the estimated yield of 10 4-5 tons per acre, gave a probable product of 2,285 pounds of sugar per acre. These are all the analyses reported on to date. One-half the main crop of beets has been sold for stock feed, at $5.00 per ton. The balance will be sold if possible.

Winter Wheat—Four acres of alfalfa sod were sown in Spring wheat this season, producing a fair stand of alfalfa. After harvest it was plowed and sown to Winter wheat, as was also two and one-half acres of oat stubble, two years old, from pea and clover sod. Four acres of land adjacent to the Station grounds, and not needed for planting this year, was plowed in April, and in June sown to buckwheat. It was cut once to avoid seeding, and the last of August it was plowed, and sown to Winter wheat September 12. Each plat was irrigated in October, and each exhibits a good even stand of wheat. Small plats of Winter rye, and of Ruby and Red Russian Winter wheats were sown with good results thus far.

GENERAL FARMING.

The tract of 125 acres was brought under cultivation by the Station last Spring. Forty acres were seeded to alfalfa. All that could be done this year was to kill the weeds and prepare for hay next year. The land was literally seeded down with sunflowers, cockle burs, dog fennel and other foul growths. It was clipped twice with the mower, the land being irrigated three times, the last time in October, to prepare for an early crop next season. With the exception of a few spots, aggregating about two acres, the stand is thick and even all over the 40 acres. This, with 12 acres seeded by renters, makes 52 acres of alfalfa on the farm. Twenty-five acres of last year's corn ground was sown to Amethyst Spring wheat. Yield, 14 1-2 bushels per acre. One plat of 36 acres, and another of 11 acres, were planted to Colorado White corn. The larger field will make about 20 bushels per acre, and the other about 30 bushels per acre; crop not all harvested yet. Different conditions of moisture and freedom from weeds made the difference in crop.

The farm is now comparatively free from weeds, so that crops can be started without being "smothered" before getting out of the ground. All wheat ground was plowed this Fall, the larger part being irrigated before plowing.

Respectfully submitted,

FRANK L. WATROUS,

Superintendent.

REPORT OF

The Divide Experiment Station.

To the Executive Committee of the State Board of Agriculture:

GENTLEMEN—I have the honor, through Director Walter J. Quick, to submit the following report of work done, and present condition of the Divide Experiment Station:

The Station was established and put in operation on March 1, of the present year. The farm, consisting of 40 acres, with the exception of 1.6 acres, was unbroken, virgin soil. This 1.6 acres of broken ground had been turned over the year before. The first crop was grown on it the past season. The season's work has been more of a preparatory one than one of experiments. The Station is located mid-way between the Denver & Rio Grande Railroad and the Denver & Fort Worth Railroad, one mile from the northern boundary of El Paso County, and ten miles east of Monument. The approximate altitude is 7,200 feet. The soil is a good representative of the majority of land in this vicinity of the Divide, which is mostly a fertile, black loam, with more or less sand. The depth varies from one to three feet, underlaid with a strata of sand and coarse gravel, with considerable lime. About one-third of the land slopes with an even and gradual descent to the east, an equal portion to the north and

south, and the balance, which takes in a large depression of nearly a semi-circular form, slopes to the west. The whole is drained by East Cherry Creek.

IMPROVEMENTS.

A stable 14x24 was built, and is used at present for shelter of Station team, tools, etc. A portion is fitted up as a work shop. An instrument house, 2x2 feet and 4 feet high, 5 feet from sod, slatted sides to admit free passage of air, was built for the accommodation of thermometers etc., surrounded by a small yard inclosed with woven wire, in which are kept the evaporation tank and rain gauge. One hundred and sixty rods of three-wire fence was built, separating the Station farm from the main body of land from which it was purchased. Thirty-three acres of ground have been broken. One-third of the land embodied in the declivity surrounding the house has been terraced—made into four terraces, with an average height of bank of three feet, and an average surface area each of 7,200 square feet. These are to be planted to shrubbery, vines, and miscellaneous plants. A cellar, 10x18 feet, was excavated into the hill, the face of the wall being made even with the terrace embankment. It is well supplied with bins, well ventilated and frost proof. One well has been dug by contract, with a depth of 32 feet, and there is another in progress. The ground has all been fall plowed and harrowed, preparatory to another season's work. The farm has been divided into sections, which will again be laid out into plats.

On May 7, five acres of newly broken ground were sown broadcast to alfalfa. The ground was prepared by breaking deeply, harrowed twice with disc harrow, and twice with ordinary drag harrow. Four acres were sown with oats, using 45 pounds of oats to 18 pounds of alfalfa seed per acre. One acre was sown without oats, and a

very good stand was secured. As the season advanced, the alfalfa sown with the oats was choked back and growth retarded. During the forepart of July the ground became quite dry, and many of the feeble plants perished. On August 10 the oats was cut and used for Station hay. These four acres will need a re-seeding in places where the weaker plants have died. The one acre which was sown to alfalfa alone made quite a vigorous growth, considering this altitude. On August 11 it was badly damaged by hail. On September 17 it was cut for hay, yielding one-half ton of dried feed.

GRASSES.

On May 15 plats of the following grasses and forage plants were sown:

Alfalfa, White Clover, Italian Millet, Brome grass, Kentucky Blue grass (did not germinate), Meadow Fescue, Perrenial Rye grass, Orchard grass, and Large Canary grass. All made a vigorous growth, which was left uncut to protect the roots over Winter. Alfalfa yield, 30 pounds green feed; Millet, 96 pounds. Size of plats, 175 square feet.

TREES.

The following varieties of trees and bushes were planted during April and May; all are alive and growing:

Yellow Pine 2, Douglas Spruce 5, Aspen 2, Lombardy Poplar 2, Hoag's Seedling Plumb 12, Industry Gooseberry 18, White Hedgehog 4, and Fay's Currant 3.

Some miscellaneous plants and flowering shrubs were planted. All grew, and some were in bloom the past Summer.

Strawberries—Two dozen each of Glendale, James Vick, Jucunda, Lenning White, Sharpless and Wilson were presented to the Station by Mr. A. N. Hoag, of Fort Collins, Colo. Owing to the distance the Station is from

the railroad, the plants were five days on the way until planted, followed by extreme dryness. Though watered at two-day intervals, only a very small per centage lived.

Sugar Beets—One measured-acre of beets, of the Klein Wanzlebener variety, were drilled in on May 18. The ground, which was of the year before, was plowed ten inches deep, and sub-soil five inches, harrowed twice and planked once. The seed was drilled in rows eighteen inches apart, followed by rolling. These have been wheel-hoed four times, hand weeded and thinned, leaving one plant every six or eight inches. They were harvested on October 24 and 27, with a yield of 14,859 pounds. Two analyses, made by Dr. H. W. Wiley, of the Agricultural Department at Washington, D. C., and one by Dr. O'Brine, of the State Agricultural College, of average specimens of beets, are given below:

Dr. Wiley:	Serial No.	Wt. in Grains.	Per Cent. Sugar.	Co-purity.
1...10-9-91	15,984	290	13.45	74.4
2...10-24-91	15,376	285	13.27	72.0
3...Dr O'Brine	.....	....	.....	....

Potatoes—May 18 the following varieties were planted by dropping single-eyed pieces sixteen inches apart, in deeply plowed furrows, cultivated three times, hoed twice:

	Wt. of Largest Tuber in lbs.	Yield per acre, bu.
Strawberry	1.8	217.0
Hoag's Seedling	.9	156.0
Compton's Surprise	1.7	150.7
Late Ohio	1.5	237.9
Pearl Prolific	1.5	224.9
White Wisconsin	1.0	205.5
White Elephant	1.8	258.3
Rose Seedling	1.8	221.7
Mammouth Pearl	1.1	215.8
Perfect Peach blow	.8	90.7
Grange	1.1	208.6
Pride of Japan	.7	140.9
Farina	.5	108.9
New Queen	1.5	206.2
Seedling No. 37	1.0	217.4
Seedling No. 65	.7	204.5
Seedling No. 15	.9	250.3
O. K. Mammouth	1.3	241.8

Corn—The three varieties, as given with results, were planted in drill rows on May 19, receiving three thorough cultivations, and hoed once. It was cut on September 9, and weighed green, and again after ten days:

	Height of Stalk.	Wt. per acre Green.	Wt. per acre Dry.	Ear.
Mastodon Field	7.0	19,008	9,990	Soft Milk.
Minnesota Sweet	4.5	14,520	7,480	Nearly Ripe.
Rice Pop	5.0	38,323	20,420	Hard Milk.

Vegetables—Small packages of seeds of the following varieties of turnips were sown broad-cast on June 11. The last three varieties were sown July 1, and did not reach their maximum growth:

	Wt., Largest, lbs.	Wt., Average, Dozen.	Yield per Acre, lbs.
Purple-top Globe	8.2	30.0	50,568
Purple-top Aberdeen	3.7	14.0	18,272
Flat Purple-top Strap Leaf	4.0	14.0	20,506
Purple-top Rutabaga	4.5	23.5	40,892
Pomerean Globe	3.2	13.0	32,708
White Norfolk	3.0	8.9	22,083
Early White	3.5	14.0	10,858

Peas—Yorkshire Gem and McLean's peas were planted on May 20; both kinds grew well; the former bore an average of 14 pods to each vine, the latter 12.

The Chantenary and Oxheart carrot did exceedingly well.

Three varieties of onions were sown in drill rows on May 19. They were too late to attain any size, and will be used as sets another season. The Mexican did the best. Curled Silicean and Prize Head lettuce were sown broadcast on sod on May 20; the latter often measured 18 inches across the head; the former was capable of enduring more cold, and after the Prize Head was killed by frost, the Silicean was still green.

Radishes—The Scarlet Turnip-rooted variety were grown fit for table use in 20 days.

On September 9, the following varieties of Fall grains were sown in drill rows, running the full length of

Section B—600 feet, the size of the plat varying with the number of rows of grain. It was thought advisable to have the plats in this form, as it is generally known that better results can be obtained, while with small, square plats the grain about the edges is of poor quality, and the continual turning and tramping is of no benefit.

Meteorological observations are taken at 7 o'clock a. m., and 7 p. m., which include reading of maximum, minimum, wet and dry bulb thermometers, measurement of rainfall, evaporation, direction of winds. Three reports are made out each month. One is sent to the Central Station at Fort Collins, one to Denver, thence to Washington, and one reserved for Station use.

SUMMARY.

MONTH.	TEMPERATURE.			HUMIDITY.			DEW P'NT.			Rainfall.	Evaporation.	Sunshine.	Prevailing Winds.
	Highest.	Lowest.	Mean.	Highest.	Lowest.	Mean.	Highest.	Lowest.	Mean.				
April	73.5	9.5	36.0	100	.....	....	....	....	....	1.99	....	....	NW.
May	72.1	28.0	47.9	100	26	69.0	47	06	35.0	4.72	....	59.0	SW.
June.....	80 6	40.0	60.0	100	21	70.0	66	22	43.0	2.72	...	69.8	SW.
July.....	85.5	47.0	62.6	100	30	72.2	61	32	51.4	3.87	8.42	60.0	SW.
August ..	82.8	35.8	61.5	100	41	72.0	59	36	49.8	2.70	4.13	—	SW.
Sept.	82.0	32.5	52.5	100	31	63.9	51	27	40.0	.66	3.27	—	SW.
October..	69.0	19.0	45.7	100	26	39.5	50	5	23.5	.88	—	—	SW.
Nov.....	69.0	-6.0	—	100	.....	.....	....	....	....	.48	....	....	NW.

Frosts—Traces of frost in low places occurred on May 21-22, June 27, August 22, and September 3. Killing frost occurred September 27 and 28.

Dew—During the months of June and July heavy dews were of usual occurrence, decreasing somewhat during August, and but twice in September.

Hail—During early summer hail accompanied nearly every rain storm, but not severe enough to do much

damage until August 11, which wrought destruction in its path, crossing the Station farm.

Lunar rainbow on October 3. Solar halo on November 21.

NOTES ON DESTRUCTIVE INSECTS.

The common wire worm did some damage upon the roots of the sugar beets, but it was found they had no preference to the beets, but often cut the amaranthus off in the same manner. The corn worm is quite common. The flea beetle proves quite destructive on radishes, turnips, etc. A sprinkling of wood ashes applied while the dew is still on proved an effective remedy, leaving the plants to strengthen beyond the harmful attack of insects.

In my work I have had the assistance of a man six weeks.

Respectfully submitted,

GEO. F. BRENINGER,

Superintendent.

REPORT OF

The Special Examining Committee.

To the Executive Committee of the State Board of Agriculture:

In accordance with the appointment received from the Colorado State Horticultural Society, and from the State Grange, we, the undersigned, have this 10th day of December, 1891, completed our examination of the Experiment Station at Fort Collins.

Our first impression was of the necessarily superficial character of such an examination, and of the impossibility of a detailed inspection of the different departments during the two days allotted to our work. We became, however, as we proceeded, more and more impressed with the increased excellence of the institution, as well as its capacities, and that the State and Government appropriations are in no sense squandered. We believe the new buildings under process of erection, and the many improvements being made on the farm, are not only needed movements, but are conducted with care, not only as to quality, but economy as well. Everything in detail appears to move like clock work. Each department is acquiring more and better apparatus, and the Faculty, we believe, as a whole, are not excelled by any similar institution in the United States.

One of the most important departments is that of Physics and Irrigation Engineering, and we believe nowhere could be found a better man for this charge than

Prof. Louis G. Carpenter. We urge upon the Board the continuance of a hearty support consistent with the means available. The growing needs of the great arid West will demand all the men that can be graduated from this department for years to come.

Walter J. Quick, Professor of Agriculture, and now Director of the Station, has been added to the Faculty during the past year.

As we consider this one of the most important departments of the College, as well as the most extensive, more time was consumed in its examination. Being somewhat conversant with this department in the past, it would seem as if new life had been infused in it throughout. Everywhere over the farm transformations are taking place that will soon make this (so-called "poorest farm in the State)" one of the best as well as one of the most beautiful. We think this is as it should be. We believe the art of taking advantage of the natural contour of the surface, with an eye to a pleasing effect, if only in laying out fields of different kinds of crops, the location of the orchard or garden, or the placing of a clump of shade trees, is a factor that enters into the problem of keeping the boys on the farm. Already the comparatively inexpensive setting out of shade trees with driveways through them, is attracting the public to it for a pleasure drive.

The new Agricultural Hall, being erected some sixty rods south of the Main College building, will add to the capacity and efficiency of the Station, besides being more centrally located. We approve of the keeping and breeding of blooded stock, so long as our farmers can avail themselves of the undertaking to improve their own herds by the use of the product at cost to the Station. Prof. Quick is an enthusiast along the line of breeding thoroughbreds, having had much experience in Indiana. The thoroughbred Shropshire sheep, and Cruickshank and

Bates strains of thoroughbred Shorthorn cattle, are a credit to the institution. It is urged that much scope be given to the Farm Department of the Station. Great progress has been made in this direction and it should be continued. The Professor has certainly exhibited a talent that proves he can be trusted with such work in the placing and arrangement of the sheep house and yards, in the alterations in the Barn, and in the rearrangement of the fields of the farm. Much of this work has been done by the students and would be creditable to a mechanic.

There has been much discussion of late years over the question of boys leaving the farm. Let no element enter here that will foster this desire of the boys, if it exists. If the boys are required to do any of the labor, don't confine them to the drudgery part. We believe, however, Mr. Quick is in the right course along that line.

We suggest that the valley between the College buildings and the Agricultural Hall be devoted to a park or lawns, instead of its present use. This will give relief to its present appearance of being cramped for room, and will add vastly to the appearance of the Station, at little expense.

The Department of Botany and Horticulture, in charge of Prof. C. S. Crandall; of Zoology and Entomology, under Prof. C. P. Gillette; of Chemistry and Geology, conducted by Prof. D. O'Brine, and of Mechanics and Drawing, in charge of Prof. J. W. Lawrence, who is also the acting President, were each visited, and we have no comments to make, except in praise. As a whole, we belive the chairs are filled by a hard-working, conscientious and capable corps of Professors.

The Armory was visited and the military drill of the young gentlemen, under Captain J. C. Dent, of the United States Army, watched with interest and satisfaction. We

consider this department by no means the least important, and it should receive every encouragement.

A meal was taken at the Dormitory, in charge of Mrs. S. C. Kimball, without previous notice, and we believe that department is in good hands.

The closets and bath-rooms were visited, and we find the sanitary part of the Station in excellent condition.

One evidence that the College, as a whole, is becoming better known and appreciated, is in the increased attendance. The Preparatory and Freshmen classes are larger than ever before, but we find them not large enough.

While we will not presume to advise your Honorable Body as to the best means of advertising the institution, and presenting to the parents of Colorado its advantages, we would suggest that one of the best methods is in conducting a series of Farmers' Institutes throughout the State. Seeing is believing, and we would recommend that every farmer and tax-payer in the State become closer related to the College by frequent visits and a personal inspection, and we feel justified in guaranteeing a cordial reception. But the College can, in a measure, be brought to the people through the medium suggested. We note with pleasure that the Board, at its last regular session, consented to assist in six of these institutes the coming Winter. Do not stop at six. Give them your aid and assistance all over the State. Let the Professors give them plain talks on plain subjects, and we believe an interest will be awakened everywhere.

In conclusion, we wish to thank the Professors and all the officials for the courtesy extended by answering every question, and doing their utmost to give us an insight into the practical workings of their departments.

Respectfully submitted,

W. B. OSBORN,
C. C. CALKINS,
Committee.

The State Agricultural College.

EXPERIMENT STATION FUND.

Treasurer's financial statement for the fiscal year ending June 30, 1891:

RECEIPTS

From U. S. Treasurer, per appropriation of Congress	$15,000,000	

DISBURSEMENTS.

For salaries, Station Staff, Officers and Assistants		$ 7,961 45
For Agricultural Section, labor and supplies		325 35
For stationery and postage		98 58
For Horticultural Section, labor and supplies		293 12
For Divide Experiment Station		762 41
For Chemical Section, chemicals and apparatus		205 83
For printing Bulletins		266 75
For Meteorology and Irrigation Engineering		157 82
For Executive Committee, per diem and expenses		407 20
For San Luis Valley Station		730 94
For Association Agricultural Colleges and Exp. Stations		10 00
For Arkansas Valley Station		1,976 72
For Entomological Section		91 33
For Buildings at Divide Station and Arkansas Valley Station		750 00
For printing Annual Reports		759 00
For printing Reports, and manufacture of Tobacco		203 50
	$15,000 00	$15,000 00

I, Frank J. Annis, Treasurer of the Agricultural Experiment Station Fund, do hereby certify that the above is a correct statement of the receipts and disbursements on account of said fund, for the fiscal year ending June 30, 1891, and as shown by the Treasurer's books.

FRANK J. ANNIS,

Treasurer.

We, the undersigned, members of the Finance Committee of the State Board of Agriculture, do hereby certify that we have examined the books and vouchers kept and on file in the office of the Agricultural Experiment Station, and we find the foregoing report is a correct and true statement of the receipts and disbursements on account of said Station, for the fiscal year ending June 30, 1891, and as shown by said Treasurer's books; that the Treasurer holds properly audited and receipted vouchers for all of said disbursements.

We further certify that the whole amount received by the said Treasurer, for the use of said Station, was expended during said fiscal year.

JOHN J. RYAN,
J. E. DuBOIS,
CHAS. H. SMALL,
Finance Committee.

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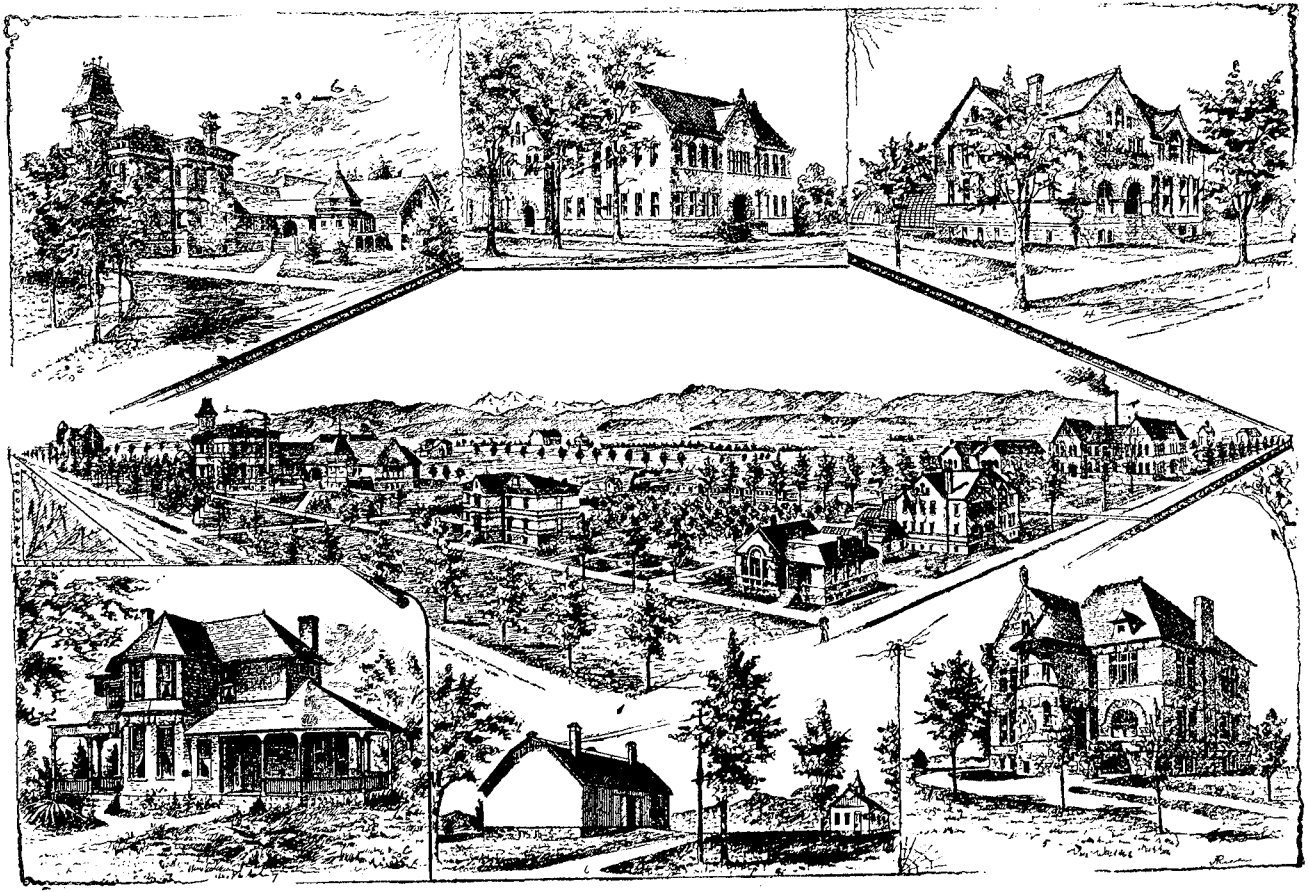

THE STATE AGRICULTURAL COLLEGE BUILDINGS, FORT COLLINS, COLORADO.