Transactions of the Kansas State Board of Agriculture, 1873

Section 11, Pages 301 - 330

This annual report from the Kansas State Board of Agriculture includes information on livestock and other agricultural topics. Also covered are county statistics for population, acreages, productions, live stock, and assessed valuation of property. Information on the Ninth Annual State Fair and the Transactions of the Sixth Annual Meeting of the Academy of Science is also included.

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and gives him and his hands a little rest, which it would seem is justly due to that class.

There is perhaps no business more confining and which requires such constant skill and watchfulness as with those who have the management of cheese factories. The labor itself is very considerable, while the responsibility and oversight in the management of milk and the operations of cheese-making must be excessively wearing and annoying. But under the plan proposed, manufacturers can look forward to a brief respite, at least, each day from their labors. If this plan be adopted, when the cheese is in the press at the factory the day's work is at an end, and the few hours of leisure thus given are no more than conduce to health and a reasonable share of enjoyment, which it would seem all who labor are justly entitled to.

It is true in the plan proposed there would be a slight additional expense to the farmer over the old system, for extra cans, and it would impose upon him the care of the evening's milk at the farm; but all this would be more than met in the bare cost saved of hauling the night's milk, to say nothing of the inconveniences that arise from being obliged to deliver milk in the evening under all circumstances of unfavorable weather, or other causes constantly occurring to render such delivery objectionable. It must be evident then that an arrangement of the kind proposed would be an advantage to both parties, the dairymen and the manufacturer, and I hope to see it largely put in practice.

CHEESE MANUFACTURE.

It would be impossible in the brief limits of a single address to even touch upon all the points of interest connected with cheese and butter manufacture. I can only offer in conclusion a few suggestions in regard to cheese manufacture, when that branch is followed by itself as an exclusive business, or when butter making is not connected with it.

What the markets demand, is a cheese of solid texture, that is mellow under the finger but yet of sufficient firmness to be safely handled; that will not decay and fall to pieces while in the hands of the dealer; that is of a clean, nutty flavor, melting in the mouth, and having that delicious aroma that forces itself upon the attention of the consumer. A bad or poor-flavored cheese does infinite mischief by cloying the appetite and disgusting those who try to eat it. Just as a bad oyster taken by chance in the mouth will make you sick of oysters for a long time.

Now, what are the requisites on the part of the manufacturer for the production of a fine article? In the first place the night's milk will be improved by the use of an agitator, which throughout the night gently moves the milk at intervals, exposing its particles to the atmosphere. These agitators work on the top of the milk, carried by the waste water of the vat, and not only serve to cool the milk but prevent the cream from rising. Then in setting the milk, high temperature should be avoided.

We should remember and understand the principle that ferments are most active between 90° and 100°. It is an object, therefore, for the cheese maker to keep his milk out of the range of active ferments, as far as possible, for these induce decomposition, bad flavor, and ultimate loss. This principle is not generally understood, even by our best dairymen, and I am convinced that great losses are entailed on this account. Manufacturers are often careless about shutting off heat at the proper moment, and the milk is raised into the range of active ferment, where, if there happen to be any germs from bad milk mingled in the mass, they are developed with great rapidity, and decomposition has set in and been carried too far even before the curd is ready to be cooked. The heat applied in the scalding process still further promotes this ferment, and so, during the heat of summer, in bad curing rooms, the cheese is almost certain to get out of flavor.

The cheese maker it will be seen has to deal with that class of organism imperfectly understood by scientific men; for the nature of it is still a puzzle to the learned. We know that cold arrests, and that boiling heat completely destroys the germs. If we always had perfect milk, or knew precisely the progress of ferments, the cheese manufacturer

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would be able to conduct his operations in such a manner as to secure desirable results. But this cannot be known, and hence the constant care must be to keep this low organism in abeyance, for so sure as it is once allowed to measure arms with the cheese maker he is lost, and it will be impossible for him to regain his position and produce a fine product. You will understand then under what disadvantage it is to introduce such a ferment as rennet in the milk that is already inoculated with another active and vicious class of ferments, especially at high temperature, when these germs spring into giants with fearful rapidity. It will be safer then to set the milk at a temperature no higher than 78° to 82°. After coagulation is perfected, and the gang of steel knives has divided the mass, it should be left a sufficient length of time for the whey to form; then the horizontal gang of steel knives may be used, dividing the mass into cubical blocks. This will finish what is understood by the term "breaking," and it should be accomplished before any additional heat is employed. We use heat in the subsequent operations, not for the purpose of "cooking the curd," but in order more readily to expel the whey and develop a chemical change for breaking down the caseine so that it may be in a condition to be easily transformed into a mellow, flaky and delicious morsel that melts under the tongue, leaving a clean, nutty, new-milk taste in the mouth. But we cannot spare the time nor labor, and so we use heat, and if we employ it properly we get the most desirable results. If we watch the artisan tempering steel to make it tough, elastic, and of the true stuff, you will see that he proceeds leisurely with the heated metal, cooling it by degrees, touching with a little water, and watching every change till it assumes the right color, when he plunges it into the water to check any further change, and lets it cool off slowly. So in cheese making the work must not be hurried, the heat must be slow and gradual, giving the curds time to do their own work, the cheese maker meanwhile watching all the conditions, and standing ready at any time to hold in check the curds, when the proper changes are perfected and developed.

The heat should never be higher than 100°, and perhaps 96° to 98° will give the best results. It is always best to draw the whey early, at the first sign of any perceptible acidity, since you cannot tell what taints you have to contend with. Then the curds may be left exposed to the atmosphere until the proper degree of acidity is reached. Much cheese is spoiled in flavoring by being put in the press too warm, as a large bulk of warm cheese promotes undue fermentation and decomposition. Curd should never be salted or put to press above a temperature of 75° to 80°. In the treatment of floating curds, the principles to be observed in checking fermentation should be observed, and such curds should be passed through a curd mill, as by this means the particles are broken up, allowing the free egress of gases. Cheese is often spoiled by over-salting, as the curing proces is checked and held back so that the transformation never becomes perfect.

The curing room should be kept at a temperature of about 70°, and in order to secure uniformity, the walls should be filled with some non-conducting material, like straw or tanbark. Then there should be two or three divisions, with air chambers in the ceiling above, and ventilators for conducting off moisture and gases arising from cheese during the process of curing. Every curing room should be provided with the means of heating — hot-water pipes running round the ceiling are best, for at no time should the temperature fall so low as to check fermentation while the cheeses are young. If the curing process is often checked at this early stage there will always be a tendency to imperfection, both in texture and flavor.

MODE OF MAKING CHEESE.

The night's milk is drawn into the vats and cooled to 65° by Austin's agitator and running water, the morning's milk is run into the vat, and the whole heated to 84°, when the rennet and annotto are stirred in. As soon as the coagulated milk will break smoothly over the finger, and before it is very hard, cut and cross-cut, but rather coarsely. Heat to 96° or 98°, in the meantime stirring with rakes to prevent packing. Let it remain until

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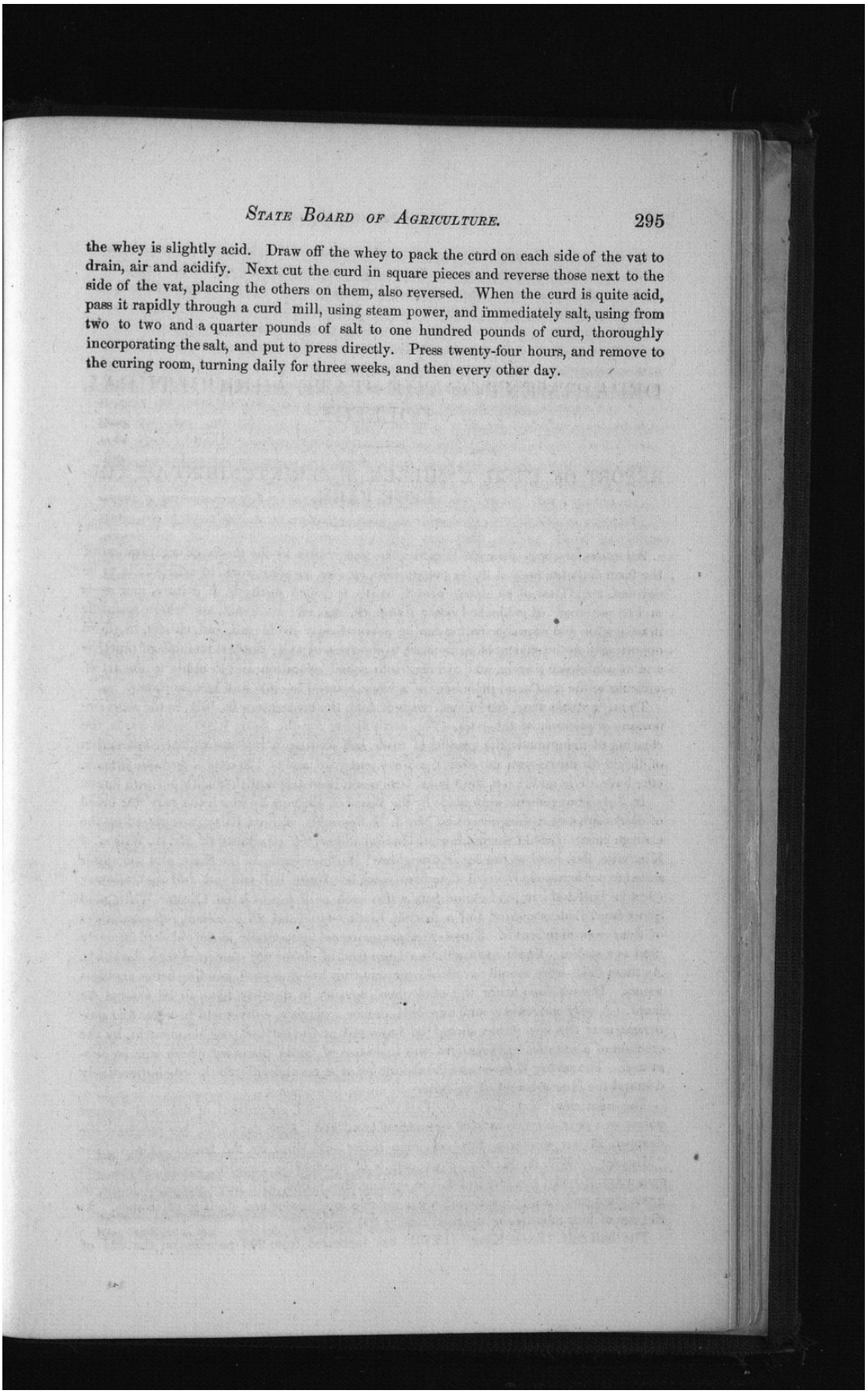

the whey is slightly acid. Draw off the whey to pack the curd on each side of the vat to drain, air and acidify. Next cut the curd in square pieces and reverse those next to the side of the vat, placing the others on them, also reversed. When the curd is quite acid, pass it rapidly through a curd mill, using steam power, and immediately salt, using from two to two and a quarter pounds of salt to one hundred pounds of curd, thoroughly incorporating the salt, and put to press directly. Press twenty-four hours, and remove to the curing room, turning daily for three weeks, and then every other day.

DEPARTMENT OF THE STATE AGRICULTURAL COLLEGE.

REPORT OF FRED. E. MILLER, SUPERINTENDENT OF COLLEGE FARM.

Attention has been principally given the past season to the thorough organization of the farm department, and to its preparation for the peculiar work to which it is to be devoted, viz.: That of an experimental station, at which methods of culture, new seeds and crops, breeds of cattle and other live stock, etc., can be tested, and where scientific investigation and experimentation can be systematically conducted, and, chiefly, to afford opportunity to the student of agriculture to observe and study the best methods of practice and to participate therein, and to bring into actual operation and to apply to the art of agriculture the truths and principles of science learned in class and lecture rooms.

The new stable wing, 48x96 feet, received from the contractors in July, is the most important acquisition of the year. The earth-filling for the floor, 1,200 cubic yards, the clearing of the grounds, the grading of roads, and seeding of interspaces, the construction of liquid-manure cistern and drains, and compost yard, and of 120 rods of portable fencing, etc., have all, in addition to the regular farm work, been accomplished with our own forces.

In July arrangements were made by the Board of Regents by which the very fine breed of Berkshire swine, then owned by Mr. J. B. Reynolds, of Fort Riley, was placed on the College farm. Late in August Regent Hudson and myself purchased of Mr. A. Wilson, of Kingville, four head of the best thoroughbred Durham cattle in the State, and soon after added to our herds one Devon bull and two cows, one Jersey bull and cow, and one Galloway (Scotch) bull and cow, and to our pens a trio each of Poland-China, Chester White, and Short-faced Lancastershire, and a pair of Essex swine, and all excellent representatives of their respective breeds. These swine are quartered temporarily in the old shed formerly used as a stable. Yards opening into a large field of clover are connected with the sheds. As these sheds were the only available quarters, they are thus used, pending better arrangements. Distant from water, the whole herd, seventy in number, have to be watered by hand. A very convenient and excellent site for a piggery, convenient to water and pasturage, near the new stable, should be improved at the earliest possible moment, by the erection of a suitable building, and the inclosure of yards, plans for which will be submitted. The saving of labor and the separation of sexes and different breeds imperatively demand the improvement of this site.

The roan cow "Kate Lee" (A. H. B.), five years old, an animal of fine and mature points as a short-horn, is as well a remarkable milker. Five days after her purchase she dropped in our stables a dark-red roan heifer calf, sired by the famous prize-winner "Minister" (6363 A. H. B.) This calf is of remarkable breadth, length, depth and symmetry of body, straight and full in outline, fine boned, with large, powerful joints, of great vigor and vitality, combined with notable intelligence and docility of temper. At the age of four months she weighed nearly 400 pounds.

The bull calf "Zenas King" (15,801) has increased from 900 pounds (on the 22d of

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August, 1873) to 1,400 pounds under similar conditions when thirteen months old (Dec. 30th, 1873). With the other bulls he has daily exercise under the yoke with a light draft, and is led in addition three times each day one-half mile to water. Although far from mature, yet in the development of "points" has more than kept pace with the increase in weight, as is denoted by the greater depth of body, width of back and quarters, and fullness in the crops. His feed is chopped clover, and timothy and Hungarian hay, beets and mangolds, with oats, shorts, and occasionally a little chopped corn with the cut feed. Preference is given nitrogenous food over carbonaceous, in order to promote development of bone, muscle, sinew and nervous force rather than an accumulation of fat.

The Jerseys were purchased from the herd of Mr. E. A. Smith, of Lawrence, and have fully sustained the reputation given them by their former owner.

The North Devons were purchased from Saxby and Burton, Freeport, Illinois, importers from the herds of Locke, Cutter, and others, of Canada. They have made gratifying improvements. Much interest is felt in this breed of cattle, and no effort will be spared to test their adaptability to the wants of our State. Their remarkable improvement upon prairie grass alone last October, is a very encouraging circumstance. They are, as well as the Jerseys and short-horns, herd-book animals.

The young Galloways (Scotch), also from Saxby and Burton, have steadily gained in flesh and size, and it is thought these valuable acquisitions will prove excellent animals with which to cross upon certain of our native stock for beef. Hardiness, early maturity, good fattening capacity, and the firm, even texture of fine yet tender, juicy, marbled beef in the best places, are the qualities claimed for them. They consume less and gain more in proportion to food consumed than any cattle on the farm.

Without exception all of the above-mentioned cattle are in good, hearty condition, and while all have improved in flesh and size, this increase has been secured without running into that condition of helpless obesity that too often is considered the chief end to be attained in feeding thoroughbred cattle. Well and regularly fed on a varied diet, daily groomed and stabled, and amply bedded in a clean, airy, well-ventilated, yet warm and well-lighted stable, kindly and gently handled, with daily exercise in the open air, the increased vigor and tone and feeling of contentment exhibited by them, give high promise of their future usefulness. As models for class instruction and illustration they are among the most valuable acquisitions of the College.

In the general conduct of the farm much attention has been paid to the care of hedges, fences, roads, roadsides, and fence-rows. Hedges have been carefully trimmed, pyramidal in shape, and the pruning conducted with reference to a thick, close growth at the bottom. Weeds along fence and hedge-rows have been kept down with cultivator, hoe and scythe. In the warfare unceasingly waged against weeds, one of the most efficient weapons has been found to be the mowing machine. Pastures, grass and stubble lands and roadsides are more economically and efficiently "weeded" with the mower than with any other implement. Gauged high, and passed over these lands as often as the more noxious or abundant weeds come in bloom, they are cut off at the most critical period of their existence. The ease and economy with which the improved condition and appearance of the farm are thus secured alone recommend the practice. The work can often be prosecuted when the soil is too wet for other out-door work.

Work on the lawn at the College has been prosecuted to some extent. American arbor vitæ, Norway spruce, European larch, Mountain, Scotch and Austrian pines, Irish juniper, red-bud, crab, walnut, butternut, elms, white ash, mountain ash, snow ball, and other evergreen and deciduous trees and shrubs have been added to the lawn this season, and generally are doing well, although in an exposed situation. The drives have been extended and graded, and a portion of the old corn field has been added to the lawn, and has been seeded down with red and white clover, blue-grass, and red-top and timothy, and

already presents a close, even turf. Further work in this direction is contemplated, as opportunity for it is presented, it generally being done at seasons of leisure.

Prominence is given to the cultivation of clover, warranted by the success heretofore met with in its cultivation. The field seeded down in the spring of 1872, and mentioned in my last report as "No. 16," returned a yield, from trial plats, from 3,200 pounds to 10,400 pounds per acre of mixed clover and timothy hay, that had stood seventy-two hours in the cock. Experiments were made in this field testing the relative values of gypsum and stable manure. The lack of store room at the proper time defeated the completion of the experiments, but sufficient data was obtained to report a large increase upon the plats top-dressed with manure in the winter, and an equally great increase upon plats sown with gypsum in the spring. The plaster was obtained both from the Solomon and Blue Rapids quarries. A ton of the ground rock was presented the College by Messrs. Olmstead & Darling, of the latter place.

One of the most gratifying results of the season's operations is the successful growing of timothy seed. Test plats were set aside for this purpose, and from them twelve bushels of bright, plump seed were secured.

The chief reliance of the farm for hay is upon Hungarian. Early sown and thickly, six pecks or more per acre, upon good land, *and cut in the blossom*, three to five tons of fine, sweet, nutritious hay is obtained that is relished and eaten with avidity and impunity by all our hay-eating animals. Not least among its recommendations is its capacity to flourish in hot, dry weather.

Our crops have generally been above the average for this season. Corn, oats, barley buckwheat, potatoes and beets have fallen below that of last year, while wheat and rye are above it. The rye sown on "Field No. 5," from which 100 bushels of corn were taken last year, made an enormous growth, and ran over thirty bushels per acre.

Of the varieties of spring grain sent out by the Department of Agriculture at Washington, the Arnotka and Oran wheat, White Schonen and Potato oats were nearly entire failures. The Probstier barley was nearly so, the Saxonian barley was better, but was much inferior to the Brewer's Delight and Thanet varieties, sent out by the Department some years ago.

The Tappahannock and Touzelle wheat, sent out late in the fall of 1872, proved entire failures, although sown on inverted clover sod. The Cooley corn from the Department grew well and matured early, but its thin ears of flinty corn can never compete with the heavy ears of the softer, yellow dent, so well adapted to this climate.

The College corn, a bright yellow dent, has been selected for a number of years with reference to a certain standard. Since its introduction upon this farm, the selection of seed has been from stalks bearing two good ears, and with such success that the present season 25 per cent. of our corn showed double-eared stalks, and from our best field of 7½ acres seventy bushels of ears so selected were secured.

The White and Yellow French and Imperial Sugar Beets, and Long Red and Yellow Globe Mangolds sustained again this season the reputation gained last. The large yield of these roots, and the economy of their use in the feeding of horses, cattle, swine and sheep, and especially milk-giving animals, in our dry winters and in the spring before vegetation starts, demand that more attention be paid to their cultivation and use.

Field "G" was this fall prepared for and sown with winter wheat in pursuance of the system of rotation adopted. Two varieties of grain were sown—May and a white wheat largely and successfully grown in this vicinity the past year. The long drouth this fall delayed sowing until the last of September, and the want of sufficient rain has operated unfavorably, but the land is even, and the promise fair. The wheat was sown in twelve plats, testing various fertilizers.

A piece of medium upland prairie, inclosed and pastured for years, and from which not to exceed one-fourth or one-third of a ton of hay per acre had been taken the summer

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previous, was broken in several plats, to test methods of reducing raw prairie sod. The first and sixth plats were broken in the usual way, from two to three inches deep. The second and fifth plats were trench-plowed in addition—that is, a common turning plow followed the breaker, and threw some four inches of soil over the inverted sod. The third and fourth plats were sub-soiled in addition, the sub-soil following in the furrow of the turning plow, and merely loosening the soil to the depth of from ten to fifteen inches. Plats four, five and six received, before plowing, a dressing of fresh stable manure, applied during the winter and spring.

The whole tract was harrowed with the Thomas harrow, and planted immediately with College yellow dent corn, on May 31st, 1873. Single cultivators were passed between the rows through the season, to keep the surface loose and open. The corn stood the drouth admirably, and was cut and shocked early in September. Late in October the corn was husked, the soft separated from the hard, and corn and stalks weighed, both being very dry. The following tables present the result of the experiments:

No. of Plat...	Area—acres.	Method of Treating the Sod.	Yield in Pounds. Hard Corn...	Soft Corn...	Total....	Stalks....
1	.541	Common breaking, alone	215	72	287	542
2	.484	Common breaking and trench-plowing	235	95	330	680
3	.458	Common breaking, trench-plowing and sub-soiling	392	37	430	760
4	.384	Same as No. 3, and with manure	443	21	464	460
5	.402	Same as No. 2, and with manure	417	12	430	730
6	.682	Same as No. 1, and with manure	435	40	475	700

No. of Plat.....	Yield per Acre. Bushels. Hard Corn...	Soft Corn...	Total....	Pounds. Stalks....	Per Cent. Hard Corn.....	Soft Corn.....	Proportion of Stalks to 1 of Hard Corn...	Increased Yield. Per Cent. Plats.....	Hard Corn.....	Soft Corn.....	Increased Yield. Per Cent. Plats.....	Hard Corn.....	Soft Corn.....
1	5.68	1.86	7.54	1000	75	25	2.5	2 over 1	22.2	46.7	6 over 1	60.4	*56.4
2	6.94	2.73	9.66	1405	72	28	2.9	3 over 1	115.5	*38.7	5 over 2	113.8	*84.2
3	12.24	1.14	13.38	1658	92	8	1.9	3 over 2	76.4	*58.2	4 over 3	34.6	*33.3
4	16.48	.76	17.24	1224	96	4	1	5 over 6	62.9	*46.9	.....	.....	.....
5	14.84	.43	15.28	1816	97	3	1.8	4 over 6	80.9	*6.2	.....	.....	.....
6	9.11	.81	9.93	1026	92	8	1.6	4 over 5	11.1	76.8	.....	†69.6	†57.9

*Decrease. †Average increase of manured plats.

It must be borne in mind that the season was unusually unfavorable to the corn crop, and that the usual practice is to let the sod, broken late in May or early in June, lie fallow until fall, or until the next spring. Throwing aside, then, the extra cost of breaking over ordinary plowing, the accounts with the plats would present about the following average:

Increased Per Cent. Cost.		Yield.	Increased Per Cent. Cost.		Yield.
2 over 1	15 per cent.....	22.2	4 over 5.....	19.2 per cent.....	11.1
3 over 1	40 per cent.....	115.5	6 over 1.....	15 per cent.....	60.4
3 over 2	21.7 per cent	76.4	5 over 2.....	13 per cent.....	113.8
5 over 6	13 per cent.....	62.9	4 over 3.....	10.7 per cent.....	34.6
4 over 6	34.8 per cent	80.9			

One of the more remarkable features of the experiment is the great reduction of soft corn on the manured plats, dropping to one-half, one-third and one-sixth, while the hard corn shows, if not a corresponding increase, an encouraging progress in that direction. The proportion of hard corn to stalks, also, is much in favor of the manured sod. So much has been said of the inexhaustible fertility of our virgin soils, that I was not prepared for quite so marked a difference. As a matter of economy, the present price of

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corn would hardly justify the outlay for the sake of this crop, merely; but, in view of the time usually lost after breaking raw prairie, the crop experimented upon was simply a clear gain, as far as the breaking alone is concerned.

The utter inability to procure and use manure by most of our people breaking up raw prairie farms would seem to render the experiment of but little practical value, but if the experiment is of no other value than to furnish another illustration of the necessity for saving and using manure, and the benefits accruing therefrom, it is *far* from valueless. Again, it is a popular opinion that the use of manure, particularly green stable manure, is conducive to growth of stalk, rather than of grain. The results recorded above do not seem to justify the opinion.

But more than all else, the above results are valuable as an illustration of the truth that there is no particular panacea for short or for poor crops. In order to secure the best returns, deep plowing, thorough surface cultivation, and the use of fertilizers, must go hand in hand. The more perfectly all are combined in the practice of any system of agriculture, the closer will be the connection of practice with gratifying issues.

The following tables present in a condensed form the results of the experiment in the preparation of land for wheat, mentioned under head of "Field No. 2," in my last report (1872), which please see:

No. of Plat.....	Area—acres...	Preparation of Soil.	Yield in Bushels. Total.....	Yield in Bushels. Per acre...	Increase per Acre over Summer Fallow (No. 2). Bushels.....
1	1.6	Hungarian sod, no manure	15.11	9.44	1.37
2	1.36	Summer fallow, no manure	10.98	8.07	.....
3	1.28	Hungarian sod, top-dressed with rotted manure	28.10	21.95	13.88
4	1.32	Summer fallow, top-dressed with lime	15.58	11.80	3.73
5	1.1	Summer fallow, and one-half rotted manure	23.50	21.36	13.29
6	0.66	Summer fallow, and green stable manure	16.42	24.87	16.80
7	0.61	Summer fallow, and green stable manure	16.70	27.38	19.31

No. of Plat.....	Aggregate Straw and Wheat. Pounds.....	Straw less Grain. Pounds.....	Straw per Acre. Pounds.....	Wheat per Acre. Pounds.....	Proportion of Straw to 1 of Wheat.....	Quality of Wheat. Order of Excellence. No. of Plat.....	Remarks on Quality.
1	5,390	4,483	2,802	556.4	5	3	Plump, and quite even.
2	5,245	4,586	3,372	484.2	7	5	Nearly as good.
3	8,880	7,194	5,620	1,317	4.3	7	Medium; smaller grain.
4	6,035	5,100	3,863	708	5.5	6	Medium; smaller grain.
5	13,490	12,080	10,982	1,281.6	8.6	1	Smaller and more shrunken grain
6	5,745	4.760	7,212	1,492.2	4.9	2	Smaller and more shrunken grain.
7	7,189	6,187	10,142	1,642.8	6.2	4	Smaller and more shrunken grain.

The soil is a medium, upland clay; the field slopes very gently to north and east. It had been under cultivation some twelve years, chiefly to corn, without manure, the stubble having been burned each year. The last crop was corn, cockle-bur and stramonium.

The old stalks were cut, and, with a rank growth of weeds, turned under early in June, 1872. The field was laid off, east and west, in semi-plats, which were treated as follows:

Plats numbers 7 and 6, after plowing, were heavily dressed with green stable manure, which was soon after plowed under on plat 7, and incorporated with the soil by means of two-horse cultivators on plat 6. Plat 5 was dressed in the same manner with half-rotted stable manure, which was worked under with cultivators. Plat 3 and 1 were sown with Hungarian May 25, which was cut for hay about the first of August, some two and one-half or three tons per acre of fine hay being the product. The plats were then plowed and treated with the rest of the field until just before sowing, when plat 3 was top-dressed with thoroughly rotted manure, which was harrowed in. Plats 1 and 2 received

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no manure. Plat 4 was top-dressed just before sowing, with lime, at the rate of twenty bushels per acre. Plats 7, 6, 5, 4 and 2 (and later 3 and 1, as above,) were harrowed and cultivated through the season sufficiently to keep weeds down, and the surface fine and loose. All were sown September fifth and sixth, 1872, with May wheat, a little over one bushel of seed per acre being used. The drill passed *across* the plats, or from north to south. The wheat came up more evenly, and when winter closed in looked better upon plats 7, 6, 5 and 3. Of the remaining plats, 4 was the best. In the spring a good deal on plat 4, and the greater part of 1 and 2, were found frozen out. Harvesting was rendered tedious by excessive rains, accompanied by high winds. Considerable of the grain was lodged, but none so much so that the Marsh Harvester was unable to cut it. Plat 5 suffered most in this respect, 6 and 7 following in order. Plat 3 suffered but little if any from this cause.

From the tables it will be seen that the unaided capacity of the soil was 8.07 bushels per acre (No. 2). Alongside that plat, on the one hand, a plat (No. 1) raised a good crop of Hungarian hay, and gave a larger return of wheat by 1.37 bushels per acre, while a tract, similar to plat 1, but top-dressed with rotted manure at an expense of less than $10 per acre, gave an increase of 13.88 bushels per acre, and over plat 1 of 12.51 bushels per acre. That is, an investment of $10 (less with us) returned, the first season, the money invested *and a dividend thereon of twenty-five per cent.* The stocks of but few banks or other "grinding monopolies" pay better.

Contrasting plat 3 with plats 5, 6 and 7, while we have in the latter a considerable increase in grain over plat 3, in total value of products they fall below that plat. The average market value of the hay for the last year has been $15, which added to the crop of wheat gives to plat 3 a value of products of $15.59, $12.08 and $9.57 respectively over the products of plats 5, 6 and 7. The legitimate inference then from one year's experiments only, is, it would seem, that a crop of Hungarian hay, *cut in the blossom*, the soil carefully top-dressed with thoroughly rotted manure after plowing under the stubble is, if not the most desirable preparation for wheat, at least preferable as far as dollars and cents are concerned to summer-fallow, either with or without manure.

This, however, may be an entirely superficial view of the matter, and at the best continued experimentation for a series of years is needed to furnish data upon which to establish opinion and practice. I regret in this connection to state that means for ascertaining these results were not placed at my disposal in time to continue this season the more desirable and important features of the experiment. That the summer-fallow was of great value in the killing of weeds I have not the slightest doubt, nor that it was the most economical method of clearing the field. The plats summer-fallowed were much freer from weeds after harvest than the two plats upon which Hungarian was grown.

A noticeable fact in this connection is the proportion of wheat to straw on the different plats, it being the greatest on plat 3, dressed with rotted manure. It is possible that on this plat the straw-producing capacity of the soil was diminished by the heavy crop of hay just before removed, and that the grain-producing elements were but sparingly appropriated by the Hungarian, rendering the condition of the soil more favorable to the production of grain than to the growth of straw. However this may be there is but little doubt that had the Hungarian been allowed to ripen its seeds, as is usually done, the crop of wheat would have been much smaller, and the hay far less valuable.

That the effect of stable manure upon wheat is to increase the straw at the expense of grain, the above tabulated results do not seem to confirm.

The average proportion of grain to straw on the plats dressed with green stable manure was 1 to 6.6 lbs., and on plat 3 the proportion falls to 1 to 4.3, when thoroughly rotted stable manure was used, *while on the plat upon which no manure at all was spread, the proportion was 1 to 7.* On the plat adjoining (No. 1), where the green Hungarian stubble and sod, plowed under but four weeks before sowing, served in a measure as manure, the proportion

was 1 to 5, and on the plat dressed with lime, where doubtless a largely increased decomposition of organic matter took place, the proportion was but 1 to 5.5. It is important in this connection to remember that the green stable manure was not only applied somewhat early in the season, but, as well, was thoroughly incorporated with the soil by plow, cultivator and harrow. It will be seen, too, that the proportion of wheat to straw bears a close relation to the time of the application of the green manure, it being greater the earlier the application. Granting for a moment, however, the truth of the popular report, it is evident that an increase of straw from 3,372 pounds per acre to 10,142 pounds, is not such an evil after all, when accompanied by an increase of wheat from 8.07 bushels to 27.38 bushels per acre; and the additional handling of 6,770 pounds of straw per acre is no very serious inconvenience, when accompanied by 19.31 bushels of wheat of better quality. Indeed, the proportion of the additional wheat to straw is 1 to 5.8, or *greater than the average of the two plats upon which no manure was used.*

It will be observed also that the lodged grain, too, is not only closely related to the time of applying the manure, but also nearly as closely to the proportion of grain to straw, and to the yield of grain. Thus, while on plat 3 with wheat to straw as 1 to 4.3, and a yield of 22 bushels per acre, there was but little lodged grain; on plat 5, which received green manure last, with straw at 8.6 (the lowest), the grain was lodged the most.

Another fact needs to be taken into consideration, viz.: the quality of the wheat. In this respect the plats stood as follows: The best wheat was from plat 3, followed in order by plats 5, 7, 6, 1, 2 and 4. The wheat from No. 3 would grade with the best amber of the season. That from plats 5, 7 and 6 represented the average article offered in the market, and that from Nos. 1, 2 and 4 would be graded below medium.

FRED. E. MILLER.

KANSAS STATE AGRICULTURAL COLLEGE, MANHATTAN, Dec. 15, 1873.

IMMIGRATION.

Since the admission of Kansas into the sisterhood of States, her growth in population and material wealth has been unprecedented in the history of any of the Northwestern States. Immigration has not been attracted hither by visions of fortunes to be made in a day by gold-digging and diamond-hunting. Her prosperity has been steady and permanent. The production of all kinds of grains, fruits and staple crops known to this latitude is no longer problematical. The practical tests of twelve years have given results that will go forth as the very best of immigration agents. They will go to the young men in the Eastern States who are casting about to see whither they can better their condition. They will go to foreign countries, teeming with intelligent and industrious people, restless for the prosperity attending the development of a new country, where homesteads can be acquired at a mere nominal price. We want these men—their strong arms, their noble purposes, their capital.

In territory Kansas is an empire by herself, and capable of sustaining a dense population. The elements of diversified industry which nature has so lavishly bestowed upon her will satisfy the tastes and wants of all classes. But to properly develop the State we want *labor*. Kansas not only offers rare inducements to the capitalist to engage in agriculture and manufactures, in the older-settled portions of the State, where he can have the advantages of schools, churches, and the many luxuries and comforts of life; to the man of small means, who pushes forward to the frontier to homestead or pre-empt; but to artisans, mechanics and laborers. Especially is there a great want of good, reliable farm hands. A year spent here in becoming acquainted with the soil, productions, local wants and culture, before purchasing a farm, will, in most cases, prove an economical investment.

The following tables of the nativity and destination of immigrants arriving at Castle Garden, New York, during the year, indicate the advantages growing out of efforts put forth on the part of Western States in giving to the world such statistical information concerning their development and resources as will enable immigrants to form a comparative estimate of the advantages of each before leaving their old homes in the East for new ones in the West:

Transactions of the Kansas State Board of Agriculture, 1873

*Number and Nativity of Passengers landed at Castle Garden, New York, during the Year 1873.

Where From.	Total.	Where From.	Total.
Alsace	3,022	New Brunswick	52
Austria	1,683	Oldenburg	502
Anhalt	20	Prussia	30,751
Armenia	14	Portugal	8
Asia	1	Romaine	46
Australia	5	Russia	4,295
Africa	9	Switzerland	4,804
Bavaria	10,301	Saxony	2,479
Baden	5,520	Schleswig	2,320
Bremen	254	St. Helena	.....
Belgium	582	Scotland	8,320
Bohemia	3,927	Sweden	10,175
Brunswick	200	Spain	48
Canada	55	South America	11
China	4	Turkey	26
Denmark	6,159	United States	1,839
East India	17	Wales	2,925
Egypt	2	Wurtemburg	4,619
England	32,930	Waldeck	21
France	2,820	West India	24
Gibraltar	1	Province of Brandenburg	801
Greece	16	Province of Lauenburg	33
Hamburg	443	Province of Posen	5,394
Hungary	911	Province of Pomerania	9,195
Hesse-Darmstadt	2,325	Province of Saxony	252
Hesse-Nassau	1,888	Province of Silesia	821
Hanover	4,825	Province of Thuringia	1,009
Holstein	2,577	Province of Westphalia	483
Holland	4,512	Rhenish Province	1,108
Helgoland	2		
Ireland	69,745	Total	268,288
Isle of Man	160		
Italy	6,859	Returned to United States:	
Lorraine	708	Born in United States	1,839
Lippe Detmold	20	Naturalized	13,467
Liebeck	16		
Luxemburg	517	Total	15,306
Mecklenburg	6,771		
Mexico	6	Total new arrivals	252,982
Malta	13		
Norway	6,066		
Nova Scotia	21	Decrease for year 1873	252,982

*Destination of Passengers who have landed at the Emigrant Landing Depot, Castle Garden, New York, during the Year 1873.

Destination.	No.	Destination.	No.
Alabama	54	Minnesota	6,367
Arizona	1	Mississippi	33
Arkansas	55	Missouri	3,724
Australia	6	Montana	100
Brazil	.....	Nebraska	1,706
British Columbia	16	Nevada	210
California	3,727	New Brunswick	53
Canada	3,116	New Zealand	1
Central America	.....	New Hampshire	192
Chili	.....	New Jersey	11,188
China	.....	New Mexico	.....
Colorado	249	New York	95,951
Connecticut	5,480	North Carolina	29
Cuba	3	Nova Scotia	16
Dakota	678	Ohio	15,169
Delaware	388	Oregon	91
District of Columbia	346	Pennsylvania	30,586
Florida	24	Rhode Island	2,955
Georgia	164	South America	18
Idaho	13	South Carolina	112
Illinois	26,168	Tennessee	361
Indiana	3,534	Texas	337
Iowa	3,342	Utah	2,484
Japan	5	Vancouver's Island	.....
Kansas	1,044	Vermont	337
Kentucky	771	Virginia	338
Lima	.....	Washington	4
Louisiana	183	West Indies	6
Maine	352	West Virginia	242
Maryland	1,444	Wisconsin	14,122
Massachusetts	14,152	Wyoming	53
Mexico	15		
Michigan	14,438	Total	268,288

*Tables furnished by E. D. Webster, General Superintendent of office of Commission of Emigration, Castle Garden, New York.

Transactions of the Kansas State Board of Agriculture, 1873

Tickets are placed on exhibition at the principal points in Europe for the principal places in this country. The foregoing table shows that only 1,044 out of 268,288 emigrants arriving at Castle Garden during the year, were destined for Kansas—the lowest number destined for any one of the Northwestern States. A mere glance at this table conveys a lesson of great import—of encouragement to those States that have generously supported an immigration bureau, and of admonition to those that have not.

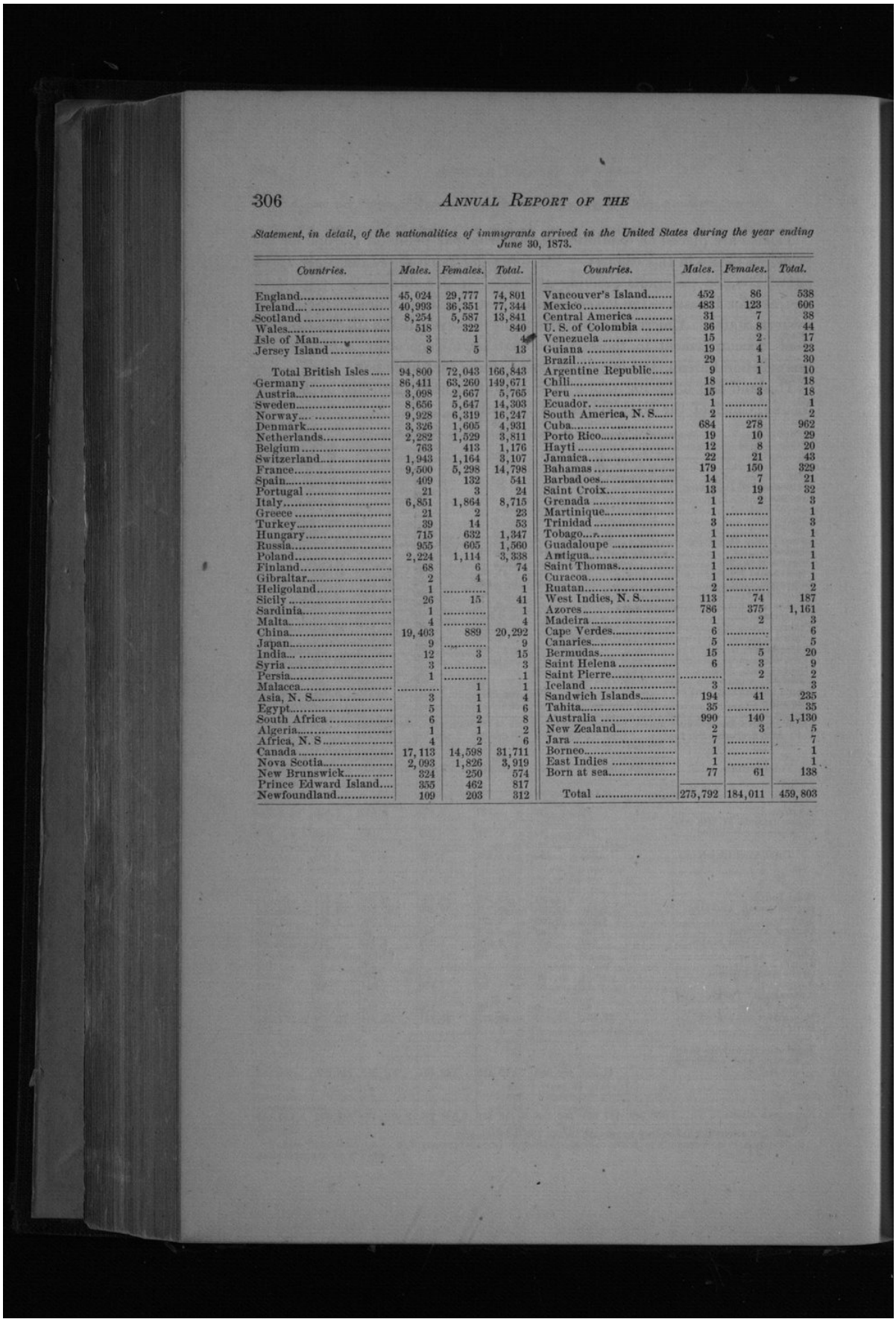
This and the following tables of immigration were furnished by Edward Young, Chief of the U. S. Bureau of Statistics:

Statement by decades of the Immigration into the United States.

Countries of Departure.	*Prior to 1820, Estimated*	1821–30	1831–40	1841–50	1851–60	1861–70	1871 and 1872	*Aggregate*
Great Britain and Ireland		81,827	283,191	1,047,763	1,338,093	1,106,977	301,842	4,159,693
Germany		7,729	152,454	434,626	951,667	822,007	262,796	2,631,279
Austria-Hungary						9,886	11,021	20,907
Sweden and Norway		91	1,201	13,903	29,931	117,798	47,959	201,886
Denmark		189	1,063	539	3,749	17,885	6,104	29,529
Netherlands		1,127	1,412	8,251	10,789	9,539	3,128	34,246
Belgium		28	22	5,074	4,738	7,416	1,132	18,410
Switzerland		3,257	4,821	4,644	25,011	23,839	6,855	68,427
France		8,868	45,575	77,262	76,358	37,749	19,562	265,374
Spain		2,616	2,125	2,209	9,298	6,966	1,176	24,390
Portugal		180	829	550	1,055	2,081	429	5,124
Italy, &c		439	2,288	1,948	9,236	12,992	10,270	37,173
Greece		20	49	16	31	82	28	226
Turkey		21	7	59	83	137	55	362
Russia, Poland and Finl'nd		10	646	656	1,621	5,050	5,849	13,932
Gibraltar						1		1
Corsica						3		3
Other parts of Europe		2	5	2		1	10	20
Estimated arrivals prior to 1820	250,000							250,000
Total Europe	250,000	106,507	495,688	1,597,502	2,452,660	2,180,409	678,216	7,760,982
Azores		13	29	27	2,873	3,643	1,905	8,790
Other islands of the Atlantic not specified		345	74	10	227	140	183	979
Total Atlantic islands,		358	103	337	3,100	3,783	2,088	9,769
West Indies		3,998	12,301	13,528	10,660	9,700	2,531	52,718
British North America		2,846	13,624	41,723	59,309	167,349	80,217	364,708
Mexico		4,818	6,599	3,271	3,078	2,386	1,097	21,249
Central America		107	44	368	449	86	21	1,085
South American States		542	856	3,579	1,224	1,443	233	7,877
China		3	8	35	41,397	68,059	16,672	126,174
Japan						259	40	299
Other Asiatic States		12	40	47	58	130	39	326
Africa		17	52	55	210	324	65	723
Australasia, Pacific and East Indies		82	9	29	158	255	3,209	3,742
*Countries not stated		32,894	69,801	52,777	25,911	57,244	32,634	271,261
Born at sea						14	210	224
Total other countries than Europe and countries not stated		44,959	103,334	115,412	142,454	307,259	136,968	850,386
Aggregate aliens	250,000	151,824	599,125	1,713,251	2,598,214	2,491,451	817,272	8,621,137

*Includes aliens not intending to remain in the United States.

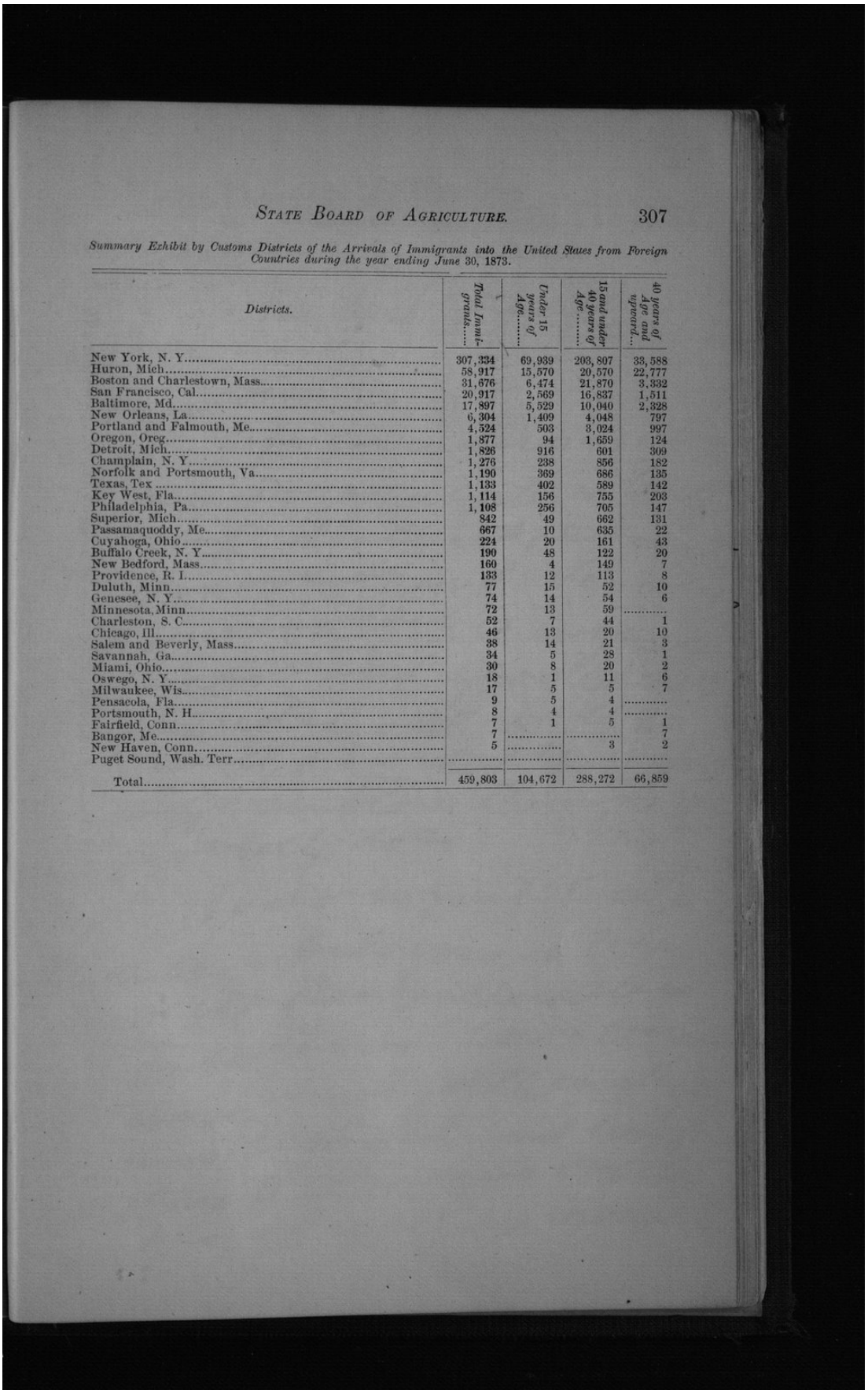
Transactions of the Kansas State Board of Agriculture, 1873



Statement, in detail, of the nationalities of immigrants arrived in the United States during the year ending June 30, 1873.

Countries.	Males.	Females.	Total.	Countries.	Males.	Females.	Total.
England	45,024	29,777	74,801	Vancouver's Island	452	86	538
Ireland	40,993	36,351	77,344	Mexico	483	123	606
Scotland	8,254	5,587	13,841	Central America	31	7	38
Wales	518	322	840	U. S. of Colombia	36	8	44
Isle of Man	3	1	4	Venezuela	15	2	17
Jersey Island	8	5	13	Guiana	19	4	23
				Brazil	29	1	30
Total British Isles	94,800	72,043	166,843	Argentine Republic	9	1	10
Germany	86,411	63,260	149,671	Chili	18		18
Austria	3,098	2,667	5,765	Peru	15	3	18
Sweden	8,656	5,647	14,303	Ecuador	1		1
Norway	9,928	6,319	16,247	South America, N. S.	2		2
Denmark	3,326	1,605	4,931	Cuba	684	278	962
Netherlands	2,282	1,529	3,811	Porto Rico	19	10	29
Belgium	763	413	1,176	Hayti	12	8	20
Switzerland	1,943	1,164	3,107	Jamaica	22	21	43
France	9,500	5,298	14,798	Bahamas	179	150	329
Spain	409	132	541	Barbadoes	14	7	21
Portugal	21	3	24	Saint Croix	13	19	32
Italy	6,851	1,864	8,715	Grenada	1	2	3
Greece	21	2	23	Martinique	1		1
Turkey	39	14	53	Trinidad	3		3
Hungary	715	632	1,347	Tobago	1		1
Russia	955	605	1,560	Guadaloupe	1		1
Poland	2,224	1,114	3,338	Antigua	1		1
Finland	68	6	74	Saint Thomas	1		1
Gibraltar	2	4	6	Curacoa	1		1
Heligoland	1		1	Ruatan	2		2
Sicily	26	15	41	West Indies, N. S.	113	74	187
Sardinia	1		1	Azores	786	375	1,161
Malta	4		4	Madeira	1	2	3
China	19,403	889	20,292	Cape Verdes	6		6
Japan	9		9	Canaries	5		5
India	12	3	15	Bermudas	15	5	20
Syria	3		3	Saint Helena	6	3	9
Persia	1		1	Saint Pierre		2	2
Malacca		1	1	Iceland	3		3
Asia, N. S.	3	1	4	Sandwich Islands	194	41	235
Egypt	5	1	6	Tahita	35		35
South Africa	6	2	8	Australia	990	140	1,130
Algeria	1	1	2	New Zealand	2	3	5
Africa, N. S	4	2	6	Jara	7		7
Canada	17,113	14,598	31,711	Borneo	1		1
Nova Scotia	2,093	1,826	3,919	East Indies	1		1
New Brunswick	324	250	574	Born at sea	77	61	138
Prince Edward Island	355	462	817				
Newfoundland	109	203	312	Total	275,792	184,011	459,803

Transactions of the Kansas State Board of Agriculture, 1873



Summary Exhibit by Customs Districts of the Arrivals of Immigrants into the United States from Foreign Countries during the year ending June 30, 1873.

Districts.	Total Immigrants.....	Under 15 years of Age.....	15 and under 40 years of Age.....	40 years of Age and upward.....
New York, N. Y.	307,334	69,939	203,807	33,588
Huron, Mich.	58,917	15,570	20,570	22,777
Boston and Charlestown, Mass.	31,676	6,474	21,870	3,332
San Francisco, Cal.	20,917	2,569	16,837	1,511
Baltimore, Md.	17,897	5,529	10,040	2,328
New Orleans, La.	6,304	1,409	4,048	797
Portland and Falmouth, Me.	4,524	503	3,024	997
Oregon, Oreg.	1,877	94	1,659	124
Detroit, Mich.	1,826	916	601	309
Champlain, N. Y.	1,276	238	856	182
Norfolk and Portsmouth, Va.	1,190	369	686	135
Texas, Tex	1,133	402	589	142
Key West, Fla.	1,114	156	755	203
Philadelphia, Pa.	1,108	256	705	147
Superior, Mich.	842	49	662	131
Passamaquoddy, Me.	667	10	635	22
Cuyahoga, Ohio	224	20	161	43
Buffalo Creek, N. Y.	190	48	122	20
New Bedford, Mass.	160	4	149	7
Providence, R. I.	133	12	113	8
Duluth, Minn.	77	15	52	10
Genesee, N. Y.	74	14	54	6
Minnesota, Minn.	72	13	59	.....
Charleston, S. C.	52	7	44	1
Chicago, Ill.	46	13	20	10
Salem and Beverly, Mass.	38	14	21	3
Savannah, Ga.	34	5	28	1
Miami, Ohio	30	8	20	2
Oswego, N. Y.	18	1	11	6
Milwaukee, Wis.	17	5	5	7
Pensacola, Fla.	9	5	4	.....
Portsmouth, N. H.	8	4	4	.....
Fairfield, Conn.	7	1	5	1
Bangor, Me.	7	.....	.....	7
New Haven, Conn.	5	.....	3	2
Puget Sound, Wash. Terr.	.....	.....	.....	.....
Total	459,803	104,672	288,272	66,859

New-York Tribune.

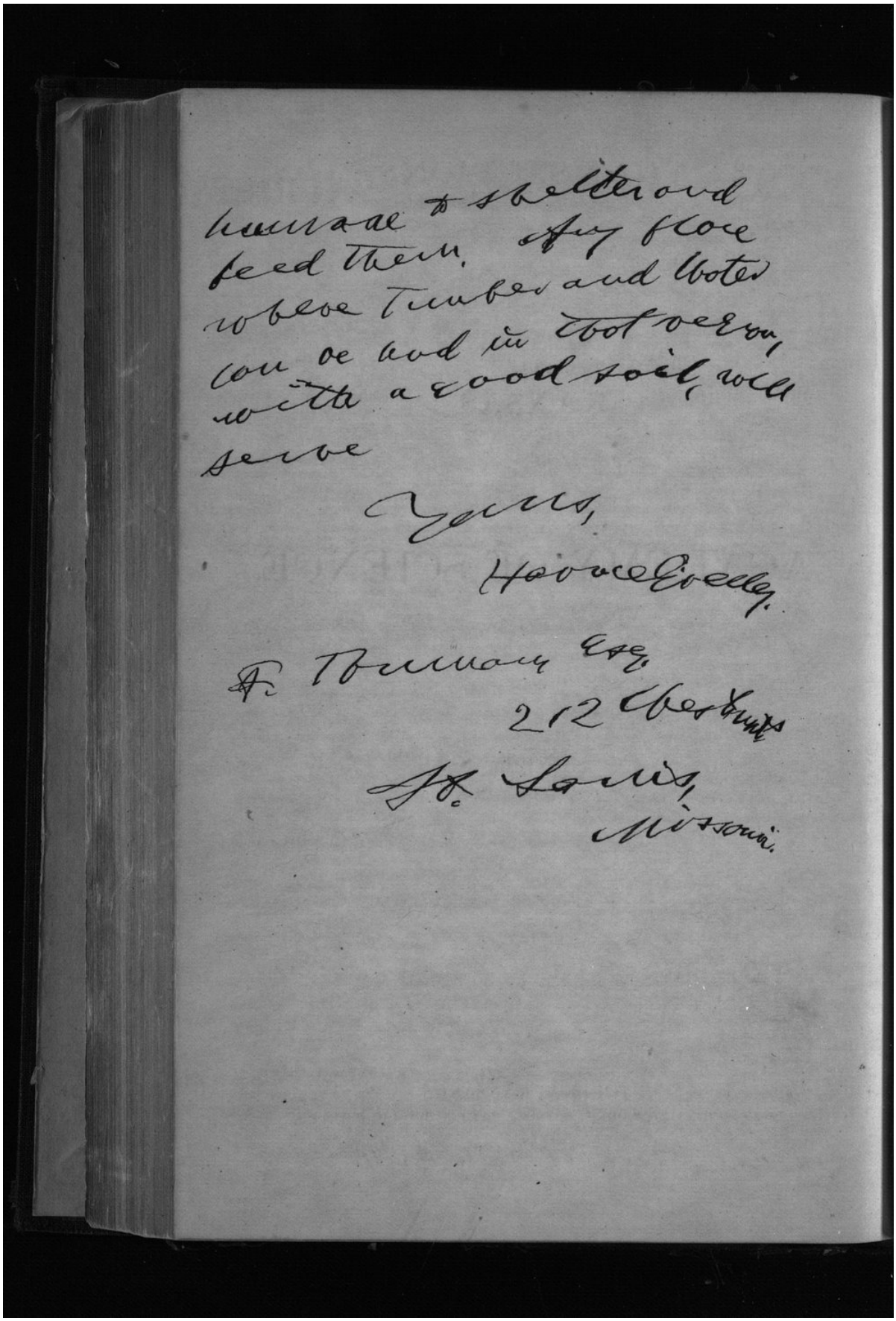
Private

New York June 24, 1872.

Dear Sir:

In founding a colony, the first requisite is leadership. With a President, Treasurer and Secretary of whom each is thoroughly honest and devoted to the idea, all will go well, provided the majority sustain them, as it generally does.

I advise you to locate on the Arkansas or some of its Rocky Mountain tributaries. Corn grows and cattle can live there unsheltered and unfed, though it is more profitable, as well as more



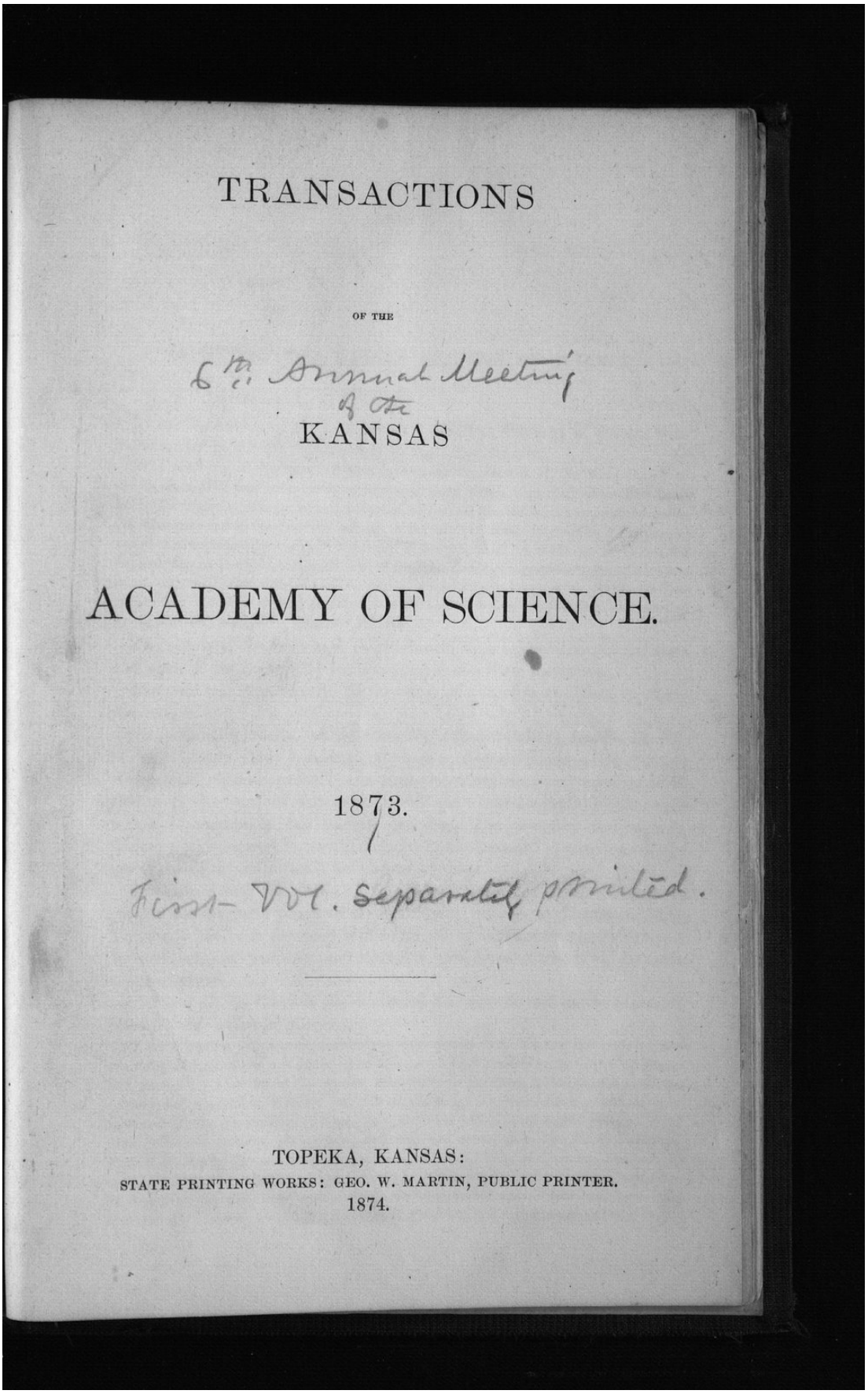
humane to shelter and feed them. Any place to have Timber and Water can be had in that section, with a good soil, will serve

Yours,

Horace Greeley.

F. Putnam Esq.
212 Chestnut
St. Louis,
Missouri.

Transactions of the Kansas State Board of Agriculture, 1873



TRANSACTIONS

OF THE

6th Annual Meeting
of the
KANSAS

ACADEMY OF SCIENCE.

1873.

First Vol. Separately printed.

TOPEKA, KANSAS:
STATE PRINTING WORKS: GEO. W. MARTIN, PUBLIC PRINTER.
1874.

REPORT OF THE KANSAS ACADEMY OF SCIENCE.

At the last session of the Legislature, the Kansas Academy of Science was incorporated as a State organization by the following act:

"The Academy of Science shall be a co-ordinate department of the State Board of Agriculture, with their office in the agricultural room, where they shall place and keep for public inspection the geological, botanical and other specimens, the same to be under the direction and control of the officers of the said Academy of Science. An annual report of the transactions of said Academy of Science shall be made on or before the fifteenth day of November, of each year, to the State Board of Agriculture, for publication in the Annual Transactions of said Board. This section to be inoperative and void unless accepted by the said Academy of Science, in writing, signed by the president and attested by the secretary thereof." [Chapter 137, Sec. 2.]

The people of the State have thus indicated their appreciation of the aims and work of the Society, by incorporating it as a State institution.

The year has been fruitful to the cause of science in the State, in many respects.

Professor B. F. Mudge, of the State Agricultural College, has discovered, in Osage county, fossil footprints, of which a paper containing a full synopsis is appended. This is probably the most important discovery ever made in science in the State of Kansas, and will add a laurel wreath to the well-earned reputation of this veteran geologist. The discovery has already elicited a wide interest in scientific circles in the East, and several tons of the specimens have been ordered for Eastern cabinets.

Professor Frank H. Snow, of the State University, has continued to publish his carefully prepared meteorological reports, at Lawrence. The University has been provided with a full set of self-registering instruments for meteorological purposes, and there is a good prospect that it will be made a signal station.

Professor J. H. Carruth has continued his observations on the plants of Kansas. He writes in substance:

"I have become acquainted with twenty-one species that I gave last year on the authority of Prof. Snow and Hall. The year past I have studied more the hedge plants and grasses. I have found the garden gooseberry to be *Ribes hirtellum*, native in the country, but not wild in Kansas. My list of plants for the year, which I send, is to be increased by the observations of Prof. Snow, who has added about eighty species. Prof. John Wherrell collected all summer, and will add some; also, Mr. E. A. Papineau. Prof. B. F. Mudge has sent me some specimens, and Mrs. Craig, of Quenemo, has brought me a teasel not in the books. I have found two which Prof. Wood thinks are new, viz.: an Asclepias, one foot high, with a single nodding umbel, and a Rosa, with lone stem quite prickly; leaflets, about nine, and flowers about ten, and fruit mostly conical."

Prof. Wood proposes to name these plants after their discoverer as a recognition of his long and unrewarded service in this department of science. Prof. Carruth has also discovered some undetermined plants which may prove to be new to science. Other members of the Academy have been laboring faithfully in their respective departments, the fruits of which appeared abundantly at the annual meeting.

The need of a more thorough scientific survey of the State is being felt in various ways by the people. The State, for example, possesses the most ample water-powers along its numerous streams for manufacturing purposes. Could these be determined by a competent engineer, and utilized, it would result in an immense annual saving to the State. Science thus applied to the practical affairs of life yields rich returns to any people.

PROCEEDINGS OF THE SOCIETY.

The sixth annual meeting of the Society was held in the University building, at Lawrence, on September 8th and 9th, 1873, and was largely attended by the scientific men of the State. The papers read before the Society were of unusual merit, and the proceedings elicited a very general discussion in the public journals. There was such a pressure of papers and business before the Society, that the President suggested the necessity of resolving it into sections, as is customary in larger scientific associations, so that all the papers presented could be read.

The following transactions of the Society are of public interest:

The subject of auxiliary societies was introduced, discussed and approved, and a committee, composed of F. H. Snow, B. F. Mudge and F. E. Stimpson, was appointed on the same. The Topeka Scientific Institute was admitted as an auxiliary society.

The attention of the Society was called to the subject of standard weights and measures for Kansas, and the following resolution was adopted:

"*Resolved*, That a committee of three be appointed to consider the question of standard weights and measures for the State, and to report some recommendations to the Legislature of the State during the next session—reporting as a committee of this Academy, F. W. Bardwell, F. E. Stimpson, and Robert J. Brown."

The following papers were read:

On the Action of Lime on Soils, by Miss Jennie Detmers.

On traces of the Mound Builders in Kansas, by B. F. Mudge.

On the Meteors between the sixth and the thirteenth of August, by John Fraser.

On Tornadoes, by John D. Parker.

On the Composition of Comets' Tails, by F. W. Bardwell.

On our Public Works, by William Tweeddale.

Transactions of the Kansas State Board of Agriculture, 1873

On the Lepidoptera of Kansas, by F. H. Snow. (This paper was illustrated by a large collection of butterflies and moths, very neatly mounted in trays.)

On Explosive Mixtures, by F. E. Stimpson.

On Fossil Footprints in Osage county, by B. F. Mudge.

On the Coleoptera of Kansas, by Edwin A. Papineau.

On the Climate of Kansas, by F. H. Snow.

The following public lectures were delivered:

On Darwinism, by Peter McVicar, D. D.

On John Dalton, or the Quaker Man of Science, by Charles Reynolds, D. D.

The following officers were elected for the current year:

President—Frank H. Snow.

Vice Presidents—John A. Banfield, John D. Parker.

Secretary—John Wherrell.

Treasurer—Robert J. Brown.

Curators—Frank H. Snow, B. F. Mudge and Edwin A. Papineau.

The following Commissioners were confirmed for the current year:

Geology—B. F. Mudge.
Ornithology—F. H. Snow.
Entomology—F. H. Snow, Edwin A. Papineau.
Language—D. H. Robinson, J. H. Lee.
Engineering—F. W. Bardwell.
Technology—F. E. Stimpson.
Astronomy—John Fraser.
Meteorology—John D. Parker.
Botany—J. H. Carruth, John Wherrell, F. H. Snow.
Mineralogy—W. D. Kedzie.
Chemistry—William H. Saunders.

Society adjourned to meet Monday evening, September 7, 1874, at Topeka.

SYNOPSIS OF PAPERS.

TRACES OF THE MOUND BUILDERS IN KANSAS.

BY BENJAMIN F. MUDGE.

Few traces of the old mound builders are found after passing fifty miles west of the Mississippi river. No mounds have been found in Kansas, and the few traces of their villages are very obscure. The object of this paper is to draw attention to the subject, that others may be induced to notice and record any fact within the bounds of our State which will throw light on the existence of this ancient race.

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About half a mile from the crossing of the old Santa Fe trail at Cow creek, in Rice county, are seen the remains of pottery, etc., showing that at least a temporary village formerly existed at that spot. The area covered is small, and the pottery very fragmentary.

In the extreme northeastern corner of Riley county, on a farm, we found fragments of pottery, arrow heads and other stone implements, and also the clippings of stone left where the implements were made. The area covered over twenty acres, and is a very pleasant locality for a small village. There is a fine spring near, and plenty of running water at all seasons in the creek. This locality was drawn to my notice by J. M. Morris, Esq., county treasurer, who presented me with fragments of various utensils collected from the spot.

But the most important locality seen by us in Kansas lies not far from Asher creek, on the southwesterly side of the Solomon river, in Cloud county. The locality is on a rolling prairie, just above the river bottom, which is here quite narrow. The most marked feature of this village is the pottery, where their domestic articles were manufactured. It (the pottery) covers an area from one-fourth to half an acre, rising irregularly at the highest point about two feet above the level of the adjoining prairie, and is composed to a great extent of the materials and debris from the old workshops. In it we found a considerable quantity of the clay dug from the banks of an adjoining ravine, which had never been moulded; some partly moulded, and sometimes mixed with straw, probably to be used in the coarsest articles. Also, fragments from what appeared to be the ovens in which the pottery had been baked. These fragments showed marks of fire, and were too clumsy and coarse to have been part of any household utensil, and were mostly in a heap in the highest and central part of the pottery.

The extent of the village was obscure, as the rank grass covered the ground for long ages, and nearly obliterated all traces of what once existed. That these villages were made by mound builders, appears evident from the appearance of the pottery. Not only is the texture similar, but the ornamental markings are like those described by Foster and others. The peculiar figures seen on the vessel figure 43, page 244, of Foster, are frequently seen. Also, the clearly defined marks as made by moulding the vessel on the inside of baskets. There were "ears" on fragments of the larger vessels, as if designed for bails.

These few traces of the ancient race which preceded our Indians show that the mound builders never visited this region in large numbers, or made very permanent towns. They were probably some of the remote settlements on the outskirts of their civilization, represented by our pioneers, provided our population should cease to extend its advance—a few of their tribes who chose to live where free range of territory was more congenial to their habits than the more densely settled portions of the Mississippi and Ohio valleys, where so many of their large mounds are seen.

RECENT DISCOVERIES OF FOSSIL FOOTPRINTS IN KANSAS.

BY B. F. MUDGE.

About the 1st of July, in crossing Kansas avenue, Topeka, we noticed, on a slab of the flagging, clearly defined footprints of reptiles. There was no hesitancy in referring the stone to the quarries of Crane & Dodd, of Osage. Taking the next train to that place, and carefully examining the quarries, a mile apart, we were well rewarded for our trouble.

The flagging at the new quarry consists of four principal layers, respectively one and a half, two, three, and four inches in thickness, interlaid usually by thin seams of soft shale. The flagging is fine-grained sandstone of close texture, coming out in slabs sometimes ten feet by twenty-five.

At the old quarry, the layers are not so distinct. The slabs, as they are quarried, are frequently inclined to split in thin sheets, some of which are marked by footprints. The best of the smaller ones were thus obtained, giving a fine specimen of footprint and cast.

The deposit is just above the middle of the coal measures, and about a dozen feet above the coal seam worked at Carbondale and Osage. The slabs or layers containing the footprints afford but few fossils, although there are numerous fucoidal impressions with ripple-marks. But immediately above and below the flagging, are calcareous strata containing abundant remains of the usual marine fossils of the period.

We have selected thirty slabs containing footprints, for preservation, there being a few others too poor to pay for removal. Most of these contain but one set of tracks, but several contain two of different species, and one has four sets.

The most common footprints, represented by more than half of all that were found, were large, saurian-like tracks, in character and shape a little like Polemarchus gigaus of Hitchcock. It differs in being but two-thirds as large, and in the proportional length of the toe and heel. In our species the toes are all nearly of the same length, five inches, and the heel four inches, making the total length nine inches. The width of the heel is five inches. There are some indications of a fourth short lateral toe. The length of the stride is from twenty to twenty-two inches. Width of the trackway, from center to center of the footprint, is from four to six inches. There are about twenty slabs marked by this species, some of which are very poor. The number of footprints on the slab varies from two to twenty.

The tracks of this species differ much in size, so much so that I was at first inclined to consider them of two species; but I now class them as old and young individuals. On the largest slab, the smaller (there being three rows of tracks) are half the size of the larger, and it will be no great stretch of the imagination to suppose that in this case the mother was followed by her offspring.

Over two hundred footprints of this species were seen, and all found in the four-inch flagging. They are all casts. The outline of the foot in this species

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is indistinctly defined, rendering its description and indentification very difficult. The reason that no direct footprints were discovered was very apparent. The layer on which the animal walked was a soft clay, which did not harden, but crumbled in removal of the layer above. But the latter being of fine sand and a small trace of lime, took the print of the footstep and hardened to stone. For sidewalks this layer is the most durable, and is in demand where large and firm slabs are desired. In several places on Kansas avenue, Topeka, the slabs show where the raised casts of the footprint have been taken off by the stone-mason to give an even surface. Their relative position can still be easily traced.

Another footprint is that of a smaller animal, the foot measuring by the toes about two inches in length—heel not discovered. Number of toes, four, the fourth being small and obscure. A lateral spur was found in a few instances. Length of the stride, twelve inches, and width of the trackway from center to center, six inches. These tracks were found on six slabs, and on several solitary pieces at three different quarries. Some were also obtained by splitting the larger slabs from the old quarries. The footprint and cast of the same track were, in such cases, obtained. In several instances the lobes of the toes were distinctly seen. The general impression left after a study of this species is, that the animal must have been a clumsy reptile, with some of the traits of both frog and salamander. The number of tracks seen on single slabs varied from one to sixteen. About one hundred and fifty tracks of this species were procured.

The best and most distinctly preserved tracks are those resembling the Cheirothereum. These are found at what is called the "Old Quarry." These tracks are very clear in the outline of the front toes, but the heel is obscure. The outline of the foot appears to have been four and a half to five inches wide, and in length five and a half. The length of the stride is from twenty-one to twenty-two inches. The hind footprint usually covers the heel of the fore foot. We obtained both the true track and the cast. The width of the trackway is eleven and twelve inches, measuring from center to center. The front foot has four toes, the hind foot five, the fifth being short and perhaps rudimentary. The footprint shows that the animal in walking rested his weight mostly on the toes, as these are strongly and clearly impressed, while the heel can be traced with difficulty. In several instances the wrinkle of the skin could be seen. No trace of a claw was visible. In plumpness the toe resembles the Chierotherium, the toes being more divergent. It also resembles the foot of the Saurotus Primevus, found in the sub-carboniferous of Pennsylvania, but is clearly an animal differing from both. We procured twelve slabs of this species, and a few single tracks. From four to sixteen footprints were found on each slab, numbering in all about one hundred.

These footprints are as distinct and clear as the average of those found in the sandstone of the Connecticut valley. They are sufficiently perfect to give the characteristics of the feet of these animals, and their modes of progression, from which they can be reconstructed.

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We found also five small tracks somewhat like the above, measuring three-fourths of an inch in length by one and a fourth in breadth. This was not enough to decide the character of the animal.

On one slab are two prints very much like a mule's foot, or, rather, his shoe. A similar mark has twice been described (in Europe and America), as a footprint; but recent investigations have decided that it is the impress of a fucoid or marine plant.

We have here four distinct species, all probably different from those previously discovered, from other parts of the world. They also are valuable from the fact that few footprints are found west of the Alleghany mountains. Their geological position down in the coal measures also adds to their scientific value. We have not given so detailed a description of them as is necessary for identification of species, as some of them will go to Yale College, and there be compared with their large collection, and Prof. Marsh will then proceed to assign their true paleontological character and name them. I have compared them with known footprints of the Connecticut valley, and have been surprised at their apparent resemblance; yet, when we recollect that those are *triassic*, while ours are in the middle of the coal measures, it seems most probable that they are generically distinct, and will add new races to the earliest air-breathing animals of our globe.

REPORT ON THE BOTANY OF KANSAS FOR THE YEAR 1873.

BY J. H. CARRUTH.

During the past year I have devoted what time I could spare from other duties to a further examination of the Plants of Kansas, and herewith give the result. Some cases doubtful last year have been solved, and I have become acquainted with twenty or more of those given last year on the authority of Professors Snow and Hall.

The past year our corps of observers has been much increased. In addition to Prof. Snow, we have had Prof. Wherrell, of Leavenworth; Dr. Saunders, of Lawrence; Mr. Papineau, of Topeka; and Dr. Watson, of Ellis; to whom the proper credits will be given. The latter gentleman has given thirteen, none of which are found in Wood's Class Book or Gray's Manual.

It is sometimes asked, Of what use is botany to a farmer? I have repeatedly known persons to set out wild grape vines, and look two or three years for fruit, when the blossoms had stamens or male organs only, and could never produce fruit. Some grape vines from seed have perfect blossoms; that is, both stamens and pistils, and some have stamens only. But vines from cuttings always have the same kind of blossoms as the vine they were taken from.

A man once set a large garden full of strawberry plants, nearly all of which had pistils, or female organs only. He had plenty of blossoms, but

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no fruit. By putting a sufficient number of either perfect or staminate plants among them, he might have had fruit.

A lady once cut off the "false blossoms," staminate ones, from her cucumber vines, to make them bear better. She should have known that these were just as necessary as the others. A botanist knows how to keep different varieties of corn, melons, etc., from intermixing and degenerating.

Last summer Dr. Wright, of Penn Yan, New York, wrote me that he had seen in a New York paper a statement that a grass or grasses in Kansas never produced seed. He did not believe it, but wished to know whether I knew of any such grass. I replied that every plant in favorable circumstances produced seed, but if the soil, climate or season were unfavorable, and especially if the plant also produced tubers, it might seldom produce seed. From time immemorial (to me), my father had in his garden a dense thicket of artichokes, helianthus tuberosus. They never blossomed till I cultivated some of them in hills like potatoes. Sweet potatoes seldom or never blossom in this climate, but doubtless they do in their native place. Some varieties of common potatoes seldom or never blossom; others blossom, but produce no seed; while others produce seed abundantly. I have noticed that those varieties which have "balls" have poor, watery potatoes.

A patch of wild rice in a wet basin near Osawatomie sent up no flower stalks for seven years, and then it had them twelve feet high.

The three most common and valuable prairie grasses of Kansas, some years produce only leaves, except in some favored spots.

Buffalo grass, so called in Miami county, seldom or never blossoms, but doubtless it does further west.

Some pear trees and plum trees blossom abundantly, but never bear fruit; probably from a lack of something in the soil that is needed to perfect the fruit.

Plants not in the Class-book nor Manual, are marked thus;* immigrants thus.†

ADDITIONS TO THE CATALOGUE OF THE PLANTS OF KANSAS FOR THE YEAR 1873.

RANUNCULACEAE.

Clematis, Virgin's Bower.

C. Pitcheri. One specimen.

Anemone, Wind Flower.

A. patens or Nuttalliana. Western Kansas. Snow.

Ranunculus, Crowfoot.

R. recurvatus. Lawrence and Leavenworth. Snow.

R. fascicularis. Wakarusa woods. Snow.

NYMPHEACEAE.

Nymphaea, White Water Lily.

N. odorata. Southern Kansas. Prof. Mudge.

FUMARIACEAE.

Corydalis.

C. aurea, variety Flavula. Lawrence. Snow.

C. montana. Lawrence, Snow. Topeka, Papineau.

CRUCIFERAE.

Nasturtium, Water-cress.

N. sylvestre. Lawrence, rare.

Dentaria, Pepper Root.

D. laciniata. Wakarusa.

Cardamine, Bitter Cress.

C. rhomboidea. Leavenworth. Wherrell.

Arabis, Rock-cress.

A. Canadensis. Vinland.

Brassica and Sinapis, Cabbage and Mustard.

† B. arvensis. Field Mustard. Snow.

Lepidium, Peppergrass.

* L. intermedium. Lawrence. Saunders.

Vesicaria, Bladder-pod.

* V. Fendleri. Ellis. Watson.

CAPPARIDACEAE.

Cleome, Spider Flower.

* C. integrifolia. Leavenworth. T. E. Wilcox, U. S. A.; also Topeka, Papineau.

VIOLACEAE.

Viola, Violet.

V. sagittata. Lawrence, one specimen. Snow.

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CARYOPHYLLACEAE.

Agrostemma, Corn Cockle.

† A. Githago. Topeka. Papineau.

Cerastium, Mouse-ear Chickweed.

C. nutans. Lawrence. Not abundant.

Arenaria, Sandwort.

* A. stricta. Ellis. Watson.

MALVACEAE.

Callirrhoe, Mallow.

* C. involucrata. Salina; also Russell Co. Snow.

Malvastrum.

* M. coccineam. Abundant in Central and Western Kansas. Snow.

GERANIACEAE.

Geranium, Crane's Bill.

G. maculatum. Leavenworth. Wherrell.

BALSAMNACEAE.

Impatiens, Touch-me-not.

I. fulva. Topeka. Papineau.

POLYGALACEAE.

Polygaea, Milkwort.

* P. alba. Ellis. Watson.

LEGUMINOSAE.

Vicia, Vetch.

*V. linearis. Common at Lawrence. Snow.

Lathyrus, Sweet Pea, etc.

*L. linearis. Ellis. Watson.

[Are these two the same?]

Trifoliam, Clover.

T. procumbens. Yellow Clover. Topeka, Papineau.

†T. arvense. Topeka, one specimen. Papineau.

Astragalus, Milk Vetch.

*A. multiflorus. Ellis. Watson.

Oxytrophus.

*O. Lambertii. Western Kansas. Snow.

Glycyrrhiza, Licorice.

*G. lepidota. Lawrence. Also sent from Marshall county by W. J. McLaughlin. Abundant in alkali lands. Snow.

Hoffmanseggia.

*H. Jamesii. W. Kansas. Sent by Prof. Mudge.

ROSACEAE.

Pyrus, Apple, etc.

P. angustifolia. Lawrence. Snow. I think I found the same, but could hardly make it agree.

Rosa, Rose.

*R. ————. Lawrence. Referred to last year as a variety. Mr. Wood thinks it distinct. Stem strigous, 18 high; leaflets, mostly, 2; flowers corymbous, about 10; fruit mostly conical.

LYTHRACEAE.

Cuphea, Cuphea.

C. viscosissima. Near Osawatomie.

ONAGRACEAE.

Œnothera, Evening Primrose.

*Œ. lavendulaefolia. Ellis. Watson.

Gaura.

*G. virgata. Lawrence. Snow. Probably the same as G. linifolia given last year from Eaton.

Ludwigia, Bastard Loose-strife.

L. alternifolia. Leavenworth. Wherrell.

L. palustris. Lawrence. Saunders.

Myriophyllum, Water Milfoil.

M. scabratum. Lake four miles from Lawrence.

CACTACEAE.

Opuntia, Prickly Pear.

*O. vulgaris, var. Rafinesquii. Lawrence. Saunders.

SAXIFRAGACEAE.

Heuchera, Alum Root.

H. hispida. Lawrence. Snow. Also Leavenworth. Wherrell.

UMBELLIFERAE.

Cicuta, Water Hemlock.

C. maculata. Lawrence.

Cryptotaenia, Honewort.

C. Canadensis. Lawrence. Snow.

Æthusa, Fool's Parsley.

Æ. cynapium. Lawrence. Snow.

COMPOSITAE.

Liatris.

L. cylindracea. Lawrence. Saunders.

Aster, Aster

A. sagittifolius. Lawrence. Saunders.

Diplopappus, Double-bristled Aster.

*D. ericoides. Ellis. Watson.

Solidago, Golden-rod.

S. virgata. Miami county.

S. speciosa, var. rigidiuscula. Topeka. Papineau.

Heterotheca.

H. scabra. Lawrence, one specimen. Snow.

Eclipta.

E. procumbens, erecta and alba, var. brachypod. Lawrence. Saunders.

Silphium, Rosin-weed.

S. laevigatum. Lawrence. Common.

*S. asperrimum. Lawrence. Snow.

Heliopsis, Ox-eye.

H. laevis. Type of which var. scabra is more common. Lawrence. Saunders.

Echinacea, Purple Cone-flower.

*E. atrorubens. Lawrence. Occasional.

Rudbeckia, Cone-flower.

R. triloba. Lawrence.

R. hirta. Lawrence. Snow.

Lepachis.

*L. pulcherrima, var. of columnaris. Lawrence. Saunders.

Helianthus, Sunflower.

H. tracheliifolius. Lawrence. Saunders.

Gutierezia.

*G. Euthamiae? [T. and A.] Mr. Wood says Genus certain, species doubtful—rag pappus uniformly wanting. He suggests the name G. heteropappus. Roadsides. Eudora and Paola. Fifteen inches high, branching above; flowers bright yellow.

Cirsium, Thistle.

C. Virginianum. Lawrence. Saunders.

Krigia, Dwarf Dandelion.

K. Virginica. Lawrence, one specimen. Snow.

Hieracium, Hawkweed.

H. Gronovii. Lawrence. Snow.

H. paniculatum. Lawrence. Snow.

LOBELIACEAE.

Lobelia, Lobelia.

L. spicata. Topeka, rare. Papineau.

CAMPANULACEAE.

Specularia.

*S. leptocarpa. Lawrence, one specimen. Snow.

PLANTAGINACEAE.

Plantago, Plantain.

P. lanceolata. Lawrence, one place; also Topeka. Papineau.

OROBANCHACEAE.

Conopholis, [Wallroth]; Philipea. [Don.] Squaw Root.

C. Ludoviciana. From W. J. McLaughlin, Marshall Co. Snow.

SCROPHULARIACEAE.

Linaria, Toad-flax.

*L. vulgaris. Road-side, Lawrence.

Pentstemon, Beard-tongue.

P. grandiflorus, Russell Co., abundant. Snow. Also Lawrence. Saunders.

P. pubescens. Various places. The P. Digitalis of last year.

Conobea.

C. multifida. Osawatomie. Also Lawrence. Snow.

Veronica, Speedwell.

V. Anagallis. One place seven miles southwest of Lawrence.

Castilleja, Painted Cup.

*C. pallida. Ellis. Watson.

LABIATAE.

Scutellaria, Scull-cap.

*S. Drummondii. Lawrence, rare. Snow.

S. lateriflora. Sent from Marshall Co. by S. D. Mauk. Snow.

Stachys, Hedge Nettle.

S. palustris. One place five miles east of Lawrence.

S. sylvatica. Lawrence, one specimen. Snow.

[S. sylvatica, Nutt., S. Nuttalliana. Shuttlew.]

BORRAGINACEAE.

Echinospermum, Burr-seed.

*E. Redowskii. Ellis. Watson.

CONVOLVULACEAE.

Cuscuta, Dodder.

C. conuiflora. Lawrence. Saunders.

C. Gronovii. Lawrence, common. Snow.

ASCLEPIADACEAE.

Asclepias, Milkweed.

A. Sullivantii. Wakarusa bottom. More social than other species.

A. Vasegi. One place.

* A. ——— Lawrence. Several specimens. Mr. Wood cannot find its name. Stem slender 2″ diam., 15′ high, pubescent; leaves opposite, lanceolate, sessile, round at base, acute at apex; 2″ long,–10″ wide; umbel one, terminal, *nodding'* peduncle 1′–2′.

ARISTOLOCHIACEAE.

Asarum, Wild Ginger.

A. Virginicum. Lawrence. Woods.

POLYGONACEAE.

Polygonum, Knot Grass, etc.

P. maritimum. Lawrence. Occasional.

CHENOPODIACEAE.

Cycloloma.

* ? C. ——— . A specimen was on exhibition at the State Fair from Southwestern Kansas, 2½ ft. broad, and 15 inches high, with a short stem one or two inches in diameter. The leaves had fallen off; the fruit was smaller than on specimens found here.

EUPHORBIACEAE.

Acalypha, Three-seeded Mercury.

A. gracilis. Lawrence. Saunders. A. gracileus, Gr. same as A. Virginica, E.?

ORTICUCEAE.

Parietaria, Pellitory.

P. Pennsylvanica. Lawrence.

JUGLANDACEAE.

Juglans, Walnut.

J. cinerea, Butternut Lyon county. Papineau.

Carya, Hickory.

C. aquatica. Common. Known by leaflets resembling peach leaves.

C. mitro carpa. Near Osawatomie. The bark is nearly black.

C. ——— . Little trees found near Clinton. Leaflets about 9, closely sessile, abovato–lanceolate, and *strongly cordate at base.* If this is the C. amara, this point should be noticed.

CUPULIFERAE.

Quercus, Oak.

Q. falcata, Spanish Oak. Lawrence and Willow Springs.

SAURURACEAE.

Saururus, Lizard-tail.

S. cernuus. Lawrence, one specimen. Snow.

NAIADACEAE.

Najas, Water Nymph.

N. flexilis. Lake four miles north of Lawrence.

Potamogeton, Pond-weed.

P. natans. Lake. The one foretold last year.

P. pectinatus. Lake. All three abundant.

ALISMACEAE.

Sagittaria, Arrow-head.

S. variabilis, var. gracilis, leaves narrow, same lake. Also var. obtusifolia, latifolia and sagitterfolia, very common, distinguished by Dr. Saunders.

Echinodorus.

E. rostratus. Lake, abundant. Snow.

HYDROCHARIDACEAE.

Anacharis, Ditch Moss.

A. Canadensis. Lawrence. Saunders.

AMARYLLIDACEAE.

Hypoxis, Star-grass.

H. filifolia. Topeka. Papineau.

SMILACEAE.

Smilax, Greenbrier.

S. tamnifolia. Lawrence. Snow.

LILIACEAE.

Allium, Onion.

*A. reticulatum. (?) Ellis. Watson.

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PONTEDERIACEAE.

Heteranthera.

H. reniformis. Lawrence. Saunders.

JUNCACEAE.

Juncus, Rush.

J. tenuis. Lawrence; very common.
J. megacephalus, or J. nodosus, var. megacephalus. Lawrence. Common.
J. scirpoides, var. echinatus. Lawrence.

CYPERACEAE.

My cyperaceae were mostly examined by Dr. S. H. Wright, of Penn Yan, N. Y. Prof. Snow's are undoubtedly correct.

Cyperus, Galingale.

C. phymatodes. Lawrence.
C. Michauxianus. Lawrence. Saunders.
C. inflexus. Lawrence.
C. inflexus, var. thrice longer. Lawrence.
C. acuminatus. Lawrence.
C. compressus. Lawrence.

Eleocharis, Spiked Rush.

E. palustris. Lawrence.
E. tricostata. Near Eudora.
E. olivacea. Lake.
E. tenuis. Lawrence.

Scirpus, Bulrush.

S. debilis. Lawrence.
S. fluviatilis. Water.
S. polyphyllus. Lawrence, common. Snow.
S. lineatus. Lawrence.

Fimbristylis.

F. spadicea. Lawrence.

Trichelostylis.

T. autumnalis? Lawrence.
T. capillaris? Lawrence.

Carex, Sedge.

I give the names as in Wood's Botanist and Florist, and in the order of that book. Where the names given me were different, I give both names.

C. vulpinoidea. Lawrence.
C. stipata. Leavenworth. Wherrell.
C. cephalophora. Lawrence.
C. rosea. Leavenworth. Wherrell.
C. scoparia. Lawrence.
C. cristata. Lawrence.
C. straminea. Lawrence.
C. festucacea. Lawrence. Snow.
C. adusta. Lawrence.
C. stricta. (acuta), Lawrence. Snow.
C. Davisii. Lawrence.
C. stenolepis. Lawrence. Snow.
C. laxiflora. Lawrence. Snow.
C. granularis. Lawrence.
C. panicea. Lawrence.
C. Meadii. Very common in Eastern Kansas. Snow.
G. Hitchcockiana. Leavenworth. Wherrell
C. lanuginosa. (pellita.) Lawrence. Snow.
C. polymorpha. Lawrence. Snow.
C. riparia. (laenstris.) Lawrence. Snow.
C. ampullacea. (utriculata.) Lawrence. Saunders.

GRAMINEAE—THE GRASSES.

The gramineae given below were all found near Lawrence, except as otherwise given:

Leersia, False Rice.

L. oryzoides, Cut Grass.

Agrostis, Bent Grass.

A. vulgaris, Red Top.
A. alba, White Bent, Bonnet Grass.
A. elata, Taller Thin Grass.

Sporobolus, Drop-seed Grass.

S. cryptandrus.

Cinna, Sweet Reed Grass.

C. arundinacea. River bank near Osawatomie.

Muhlenbergia, Drop-seed Grass.

M. glomerata.
M. diffusa. Alongside walks and in shady places covering the ground. Leaves very short and nearly at right angles with the stem.
*M. ————. River bank, Osawatomie. Mr. Wood cannot find the name. He thus describes it: "Slender, glabrous, branching, one foot high; panicle erect, capillary, loose, branches in 3s and 5s, whorled. Spikelet scarcely 1″ long, much shorter than their pedicels. *Glumes pointed, rough on the keel, the upper one shorter, but longer than the two equal obtuse 3-veined poles*, which have a few short beards at their base. Comes nearest to M. Mexicana, but is decidedly different by the characters italicized."

Calamagrostis, Reed Bent-grass.

C. Canadensis, Blue Joint. One place Wakarusa bottom.

Paspalum.

P. fluitans. Mostly under water. Osawatomie.

Panicum, Panic Grass.

P. proliferum.
P. agrostoidcs.
P. viscidum. Snow and Saunders.

Bromus, Brome Grass.

B. secalinus, Chess.
B. mollis, Downy Chess.
B. ciliatus.

Tricuspis.

T. (Wralepis) purpurea.

Dactylis, Orchard Grass.

D. glomerata.

Festuca, Fescue Grass.

F. ovina. Sheep's Fescue.
F. pratensis, Meadow Fescue.
F. elatior.

Eatonia.

E. obtusata.

Melica, Melic Grass.

M. mutica. Scattered, tall, conspicuous.

Eragrostis.

E. reptans. Riverbank, Osawatomie.
E. Purshii.
E. erythrogona. Seen once.

Poa, Spear Grass.

P. compressa.
P. sylvestris. Both have flattened stems.

Glyceria, Manna Grass.

G. nervata.
G. maritima.

Triticum, Wheat.

T. violaceum. Distinct from T. repens or Couch Grass.

Leptochloa.

L. mucronata. Osawatomie.

Eleusine, Yard Grass.

E. Indica. Yard of Presbyterian church, Lawrence.

Buchloe, Buffalo Grass.

* B. dactyloides. Ellis. Watson.

A grass called by this name grows near Osawatomie, but it seldom or never blossoms, so that it would require close observation to determine it. It grows in stools as Buffalo grass is said to, and is of about the same size.

Filices, Ferns.

Polypodium. Polypody.

P. incanum. Burlington. Mrs. J. N. Locke.

Aspidium, Shield Fern.

A. spinulosum, var. Bootii. Lawrence. Saunders.

HEPATICAE.

Marcantxia.

* M. polymorpha. Saunders.

Species added, about 175.

Not east of the Mississippi, about 27.

LAWRENCE, Kas., Dec. 1873.

SPECULATIONS IN REGARD TO COMETS' TAILS.

BY F. W. BARDWELL.

Of all questions in Astronomy pressed conspicuously upon notice, none seem to elude the grasp of the scientist with more subtlety than that of the character and composition of comets' tails. From Copernicus to Newton, from Newton to Le Verrier and to the spectroscopist of to-day, are seen a series of brilliant triumphs. The Ptolemaic epicycles have vanished into the simplest of curves; the multitudinous array of celestial orbs follow each other with infinite precision and never-ending succession, according to laws comprehensible almost by a child. The perturbations of Uranus have responded to the interrogations of Le Verrier and Adams, and our sun and the more distant suns, though they tarry not in their courses at the command of any modern Joshua, yet reveal to the searching gaze of the spectroscopist the secrets of innumerable ages, and declare their common membership of one illimitable system.

Such are the conquests of astronomers; and yet an intruder, as it were, rushes impetuously into the insignificant domain of our own solar system, and, it may be, with a passing nod to Jupiter, whirls angrily around the sun, whose proximity seems to kindle a fiery train, then retreats as suddenly as he appeared, departing with regal courtesy, never turning the back toward the gaze of his august majesty, the Sun, and at his disappearance leaves the ignorant beholder terrified, and the startled philosopher bewildered.

Let us glance briefly at the more important facts, and try to find out their significance. Comets are those bodies moving around our sun in orbits of considerable eccentricities. Perhaps this characteristic is the most decisive of those which serve to distinguish them from other members of our solar system, though the classification may really be empirical. There is, indeed, great diversity in the phenomena attending different comets. Some accomplish their revolutions in three or four years; others in three or four thousand years; others still in a hundred thousand years; and finally, it is thought, some never revisit our solar system. Many comets have tails, so called, while others have none; and still others are surrounded by envelopes of a hazy or misty appearance. Some of the so-called tails have been of remarkable extent, and in general have followed the comets in approaching the sun,