

## Reports of the Kansas State Board of Agriculture

### Section 12, Pages 331 - 360

These reports by the State Board of Agriculture include the proceedings of the board, reports for the previous year, maps of counties, abstracts of counties, miscellaneous articles, and reports of agricultural societies, the state fair, state and county statistics, agricultural industries and products, the agricultural college, and the Kansas Academy of Science. The annual reports began in 1872 and were succeeded by biennial reports beginning in 1877-78. Volume numbers were discontinued with the 1953-1956 report; the last being volume 44. From 1953 to 1976 the reports drop "biennial" from the title. Annual reports begin again from 1976 to 1984, except 1982-1983 which is biennial. The dates for each report reflects the reporting year and not the publication date, which was usually a year later. The title of each report reflects the form given on the title page. Only volumes 1 (1872), 2 (1873), 3 (1874), 4 (1875), the centennial edition (1875), 5 (1876), 6 (1877-1878), 7 (1879-1880), 10 (1885-1886), 11 (1887-1888), 13 (1891-1892), and 14 (1893-1894) are currently available.

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If the forest area of the State were increased to any considerable extent, it is probable that gentle showers would be more frequent; and there would be fewer violent storms. Protected by the forest from immediate evaporation, the rains would sink into the earth to sustain springs; and the streams would be more constant, while damaging floods would be less apt to occur.

Very impressive lessons may be drawn from other lands, where disastrous results have followed the destruction of forests, and beneficial effects have attended their restoration; but we do not need the details of these experiences to teach us the importance of tree-planting in Kansas. The condition and necessities of the State are a standing lesson.

The foregoing reflections, obvious to all intelligent men, show that the subject of tree-planting has wide and general relations for economists and Statesmen to consider. Its interest is not confined to the farmer whose land is without the needed timber. It involves, with the spread of settlements westward, possible influences on climate of the highest consequence to the west half of the Mississippi Valley.

#### THE TIMBER SUPPLY.

When we think of the present price of pine lumber in Kansas, and ask ourselves what it must be in a few years, with the forests of other States disappearing and none of our own to rely on—when we find our ash, hickory, oak, walnut and other native trees fading away as our population and wants increase—when we reflect on the material needed for buildings, fuel, fences, implements, machinery, railroads, and the other diversified uses of civilized life, not only for the present, but for the vastly increased population the State will soon have—forest culture is seen to be one of the most important subjects which can engage attention.

The present population of the State will soon consume all the timber in it. The same process is going on in other States. If we are to have no reproduction, here and elsewhere, there must soon be a general want without supply. The natural increase of our people, and the immigration that will continue to come, will hasten the period of destitution.

Let any man in Kansas ask himself, "Where is the pine lumber of the future to be sought?" The region of the lakes and the upper Mississippi will be stripped before the babe of to-day will reach the age to vote. In the pineries of Missouri and Arkansas, where all was original wilderness but a few years ago, the railroad is extending, and the hum of the saw-mill is heard. The pineries of the States east and southeast tell the same tale. Not only must the pine lumber to supply Kansas come from distant points, with heavy freight charges, but distance and charges will increase, and it must also have the enhanced cost due



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to increasing scarcity where produced. The supplies cannot, to any considerable extent, come from the west. The forests of Wyoming and New Mexico are too distant. Colorado will soon need all her timber for agricultural and mining industries, rapidly extending, and for growing cities and multiplying railroads. Kansas must, therefore, grow her own pines, or substitutes for them, to save her people from a future drain of their earnings beyond computation.

The hard wood timber of Kansas can, at best, last but a few years, if we are to have no reproduction in the old, nor planting in new forests. In the States eastward, it is disappearing with a rapidity already measured by increasing prices. Day by day, the demand increases, and the supply diminishes. The supplies of the future—whence shall they come? from what remote points are they to be brought? Coming in the shape of raw lumber, or as wagons, or implements of husbandry—what is to be the cost? It is clear that no supplies can come from the West. Official reports to the general government tell us that west of the one hundredth meridian of longitude, the material of a common wagon does not grow on the continent. We may say, that west of a line drawn north and south through the middle of Kansas, the tree has not grown from which a good axe-handle could be made.

The supply of railroad ties is daily becoming more difficult. The Kansas Pacific Railway has already five hundred miles of track in the State. Each mile requires 2,500 ties, or 1,250,000 in all. The average life of a tie is five years, and the average demand is, therefore, 250,000 ties a year, to keep up this one road. The railroad system of Kansas, even if not extended, will soon require at least a million ties a year. Extensions of the roads will at an early day bring up the demand to two millions. Where shall they be got?

Either the future ties for the Kansas railroads must be grown in the State or be brought at high cost from distant regions. If grown at home, the price will be paid at home, and the freight saved. If brought from a distance, the people of Kansas will have no share in the money paid for them; but if, through increased costs of ties, it shall become necessary to increase the rates of passenger and freight transportation, these increased charges must, in part, be borne by the people of the State.

The prospective scarcity and enhanced price, of forest products will reach all classes. They will be felt in the towns and cities as well as on the farms; they will increase the sum to be paid by every man who travels or ships property on railroad; they will reach the pocket of every man who builds a house, or buys an implement of husbandry. The church and school house will not escape them; and they will put their mark on every article of furniture in the dwelling, from the cradle to the piano.



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But these evils, present and impending, are not without alloy. They suggest, that in growing timber for future supplies, there must be possibilities of profit to the farmer and land owner. No other product of the soil is so sure of a rising market as timber. The profit may seem remote, but it is certain, and the market cannot fail.

#### FOREST CULTURE FOR PROFIT.

There are two kinds of profit which the farmer expects to make: that from the annual product of his labor sold for cash or its equivalent; and that which is in the shape of enhanced value of his estate. The first, or immediate return, is not to be derived from tree planting; the second begins with the first seeds, cuttings or trees put in the ground. As a prairie claim is worth more after some breaking is done, so the farm is increased in value from the very day on which the grove or wind-break is planted. This kind of profit increases from year to year, and is proportioned to the number and kinds of trees planted, and the care taken of them. Another profit will accrue, in a tangible shape, after a few years have passed: if the trees have been planted closely to secure upright growth, the time will soon come for removing a portion, and those taken out will be useful for fuel and fencing stuff, and also have a cash market value.

The current profit which the farmer will enjoy from shelter to his crops and live-stock from groves and wind-breaks, is, like the enhancement in value of his estate, perhaps to intangible for estimate, but is none the less actual and certain. But if his first work has been well done, if the best kinds of trees have been planted and well cared for, during a term of ten fifteen or twenty years, he will enjoy from sales a very considerable return, and yet leave on each acre, trees enough to be worth perhaps ten times the value of the land if no tree were upon it.

There are localities in Kansas where, in twenty years from seed, walnut trees will grow large enough for two railroad ties each, standing ten feet apart, or four hundred and thirty-six to the acre, and they will not be less than two dollars a tree for ties alone, and not counting anything for the tops and stumps. There are other kinds of trees which will, in ten or fifteen years, be large enough for ties, standing eight feet apart, or nearly seven hundred to the acre; and these will be worth at least a dollar each. Why, then, shall not all railroad ties needed in the future be produced in the State? Why should a million or two millions of dollars a year be sent out of the State a few years hence for ties that might be grown at home?

The thrifty farmer, by devoting a part of his land and labor to forest culture, if he can manage to plant but an acre a year, will be adding to the value of his estate, and establishing a source of future income beyond any estimate he it likely to make. He need not mortgage his farm, or borrow money on note of hand in order to begin the work. A little



extra exertion, a little vigorous effort, and he will have a beginning made. The honest pride which he and his family will feel as his trees grow, will co-operate with certainty of profit to brace him up in further efforts.

Farmers having native wood on their land, can with profit imitate the land owners and foresters of Europe, by making it a rule to plant one or more trees for every one they remove. In France and Germany the utmost care is taken to have continued succession of forest growth, and the same rule is observed in England and Scotland. The importance of this rule cannot be too strongly urged on the farmers of Kansas, particularly those on the edges of the prairie districts.

In Europe, men of capital plant timber as an investment, assured that nothing will pay a better or more certain interest. In the United States the day has perhaps not yet arrived for this to be done on a large scale. Capital, especially in the west, is yet comparatively scarce and dear; and so many opportunities present themselves to realize immediate returns, that a smaller near profit is apt to be preferred to a greater remote one. Besides, the whole subject of forest culture is so new in our country, that we need not wonder that the attention of capital has not been turned to it. Scarce ten years have elapsed since the prospective exhaustion of the forests, and the consequent timber famine that impends over us, have become the subjects of earnest discussion. Great movements require time to organize themselves; and so it is with forest planting, by monied men. Time must be taken for consideration; especially as we have yet no trained class to take practical charge of the work, and must wait till such are furnished by Agricultural Colleges or other agencies.

Inquiry is to some extent directed to the possibility and probability of creating future estates of great value, by judicious investment of money in tree-planting; and such inquiry will lead to action. That such investment would be profitable is the conviction of those who have given the subject most attention. But, however successful he may be, the capitalist, remote perhaps from the scene of operation, and depending on others, is yet shorn of many advantages enjoyed by the farmer. The latter, on his own farm, sees personally to all parts of the work, and possibly does it with his own hands. If it can be profitable to the capitalist, as such, to plant a forest, it must of necessity be more profitable to the farmer.

#### TREES TO PLANT.

Two years ago the Farmers' Institute of the State Agricultural College made up a list of trees to be recommended for cultivation and trial, as follows:

1, Ailanthus; 2, Ash; 3, Box Elder; 4, Catalpa; 5, Cedar; 6, Chestnut; 7, Coffee Bean; 8, Cottonwood; 9, Elm; 10, Hackberry; 11, Hick-



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ory; 12, Honey Locust; 13, Larch (European); 14, Linden; 15, Locust; 16, Maple (silver and sugar); 17, Oak; 18, Osage Orange; 19, Pine; 20, Poplar; 21, Tulip Tree; 22, Black Walnut; 23, Butternut; 24, Willow.

When we inquire over what extent of the surface of Kansas these trees can be grown, we are led to imagine the State divided into three great divisions or belts, in each of which the conditions of climate and soil may be said to differ more or less from those of the others.

The first eastern belt may be taken to extend from the east line of the State to the meridian of Abilene; the second or middle belt from Abilene to Ellis, and the third from Ellis to the west line of the State.

Separated by no striking features of the physical geography, these imaginary divisions merge into each other by such gentle gradations, that one can hardly be said to be ended before the other has already begun. There is no abrupt transition, but only a progressive change, the effect of which is seen in the native vegetation, always in harmony with climatic conditions. Aggregating eighty-one thousand square miles, these belts present a diversity of soil, but the general rule is that none of it is unsuited to tree growth.

In nearly all of the first belt from the State line to the meridian of Abilene—a region about four times the size of the State of Massachusetts—all the trees in the list may be successfully grown. Some do better than others, but there are localities where all do well. Experiments by Mr. Kelsey, at Ottawa and Pomona; by Mr. Gale, in the college grounds at Manhattan; by citizens of Junction City, of Abilene, and of numerous other localities, where a spirit of enlightened enterprise has impelled to action—have been rewarded by encouraging success. There are no difficulties in the way of forest culture in a large part of this belt, but such as arise from lack of capital, of knowledge, or of enterprise. It may with truth be said, that in no part of the country west of the Mississippi do trees—both deciduous and evergreens—grow better than in this part of Kansas.

In the middle belt, as we go westward, we find that the causes which affect the natural vegetation exercise a similar influence on the artificial forest. This influence is slightly manifested at Bosland (Wilson), about seventy-five miles west of Abilene, and more decidedly at Ellis, sixty-three miles further, and near the one hundredth degree of longitude. Ellis is beyond the point at which it has been supposed that trees would survive on the the uplands without irrigation; yet on trial it is found that the foregoing list does not require a very serious reduction to suit that distant locality. The deciduous trees which have done best on trial (in the Kansas Pacific Railway field) at Ellis, are ailanthus, ash, box elder, catalpa, cottonwood, elm, honey locust, silver maple, black locust, osage orange, lombardy poplar, white poplar, and black walnut. Of evergreens, Austrian and Scotch pines and red cedar grow vigorously;



but the white pine, which is vigorous in the eastern part of the State, does not promise so well at Ellis. Hickory and oak have not been tried. Larch, which is with care available at Bosland, is feeble west of that point. The success attending the experiments at Ellis is important, as nearly 60,000 square miles of Kansas are east of that meridian, over which equal and greater success may be considered certain.

In the western belt, from Ellis to the Colorado line, we are in a region heretofore reputed worthless. It is the traditional "desert," but it is not in fact a desert. It is only an immense region of grass-covered plains, rising above the level of the sea from 2,000 feet at Ellis to about 3,500 feet at the west line of Kansas; a region of good soil, but with a climate less propitious than in the middle and eastern belts. Starting at the east line of the state, with a yearly rainfall averaging forty-two inches, there is a gradual diminution towards the west, until at the west line it is not more than half that measure; and with decreasing rainfall we have increasing dryness of the air and more persistent winds. These conditions are unfavorable to forest growth; yet the trials made under orders of the Kansas Pacific Railway, have shown that several of the trees named in our list may be grown with a fair share of success, even to the remotest border. It would be idle to expect them, without irrigation, to exhibit the vigorous and luxuriant growth to which we are accustomed in the middle and eastern belts; but they do live and grow, sufficiently to compensate for planting and care.

The fact that trees may be grown to the west line of the State—without irrigation, where it has been supposed to be essential—is to have great significance in the future, in aiding the progress of settlement. The increasing population of the United States indicates that the plains of Kansas will soon be needed in all their extent for productive uses. It will be a comparatively slow process to establish settlements—with comfortable homes, sheltered by forest and fruit trees—in all parts of that immense region called "the plains;" but as the years roll on, even this will be accomplished. The sparse settlements already extended to Ellis, in Kansas, will in time be continued westward to meet those coming eastward in Colorado.

Time will not permit a review of the tree list in detail, in order to select particular kinds as most advantageous to plant; nor could such selection well be made, except in reference to the particular locality where the trees are to grow. The list embraces some of foreign origin, and many of the principal trees of the northern half of the United States, the value of which is too well known to need comment. Some trees whose timber is much in demand for special uses, requiring elasticity and strength, are slow growers. Others of much value for fuel and timber, as the ailanthus, catalpa, locust and walnut, grow quite rapidly. It is believed that in eastern Kansas these four trees will grow





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large enough for railroad ties in less time than any others of equal value. The Austrian and Scotch pines, the American white pine, and the native red cedar, are believed to be the best evergreens to plant in any part of Kansas. The cottonwood commends itself by its rapid growth; the variety called yellow cottonwood in Illinois and Missouri, where it is cut into lumber, might be grown with advantage as a substitute for pine. To the general list the native mulberry might be added, and perhaps also the deciduous cypress. Trials of the cypress at the State Agricultural College, have resulted very favorably.

#### MODES OF PLANTING.

To produce from seed the coniferous (cone-bearing) trees—the larch, the cypress, and the evergreens—the general rule is that the skill of the nurseryman is required. In other States these trees, in immense numbers, are grown from seed in nurseries, and are sold while small, at prices enabling the farmers, if so disposed, to plant them by thousands. Such is not yet the case in Kansas; but until we shall have nurseries to supply the young trees cheaply, it is not likely that they will be largely planted. Even if there were no freight charges to be considered, the trees cannot be so safely brought from a distance as to be available to any great extent in forest planting. But every farmer with means to do so can have a few hundreds or thousands, and will do well to procure them.

The elm and silver maple ripen their seed in the spring, and they must be planted without delay. The cottonwood, poplars, and willows, are grown from cuttings. The seeds of all the other trees named in the list mature in the autumn, and most of them may be planted then, or kept till spring. The seeds of some kinds may be planted at once, where the trees are to stand, as the hickory, oak and walnut. Other trees may be started in seed beds and transplanted at one or two years old.

There is little or no mystery in the operations, beyond that of common garden or field culture.

The distance apart at which trees should be planted has been much discussed. The general decision is in favor of close planting, say four by four feet. The trees are more likely to be upright in habit than if grown at greater distances, and when they begin to crowd each other, can be thinned out. The plantations at Ottawa were successful with trees two to four feet apart in the rows, and the rows twelve feet apart. The argument in favor of this mode is, that it enables the farmer to spread his grove over more land, and have room for corn or potatoes between the rows of trees, until they are large enough to need all the ground. The bill pending in Congress to grant a homestead at the end of three years to any one having one acre in sixteen of his claim in timber trees, two years planted, provides that they shall not be more than



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twelve feet apart each way. On the entire management of forest plantations, however, we have as yet a great deal more theory than experience; but one thing is clear, that the farmer is not apt to go far wrong, let him plant as he may. It is more important that tree-planting should go on, than that any rigid rules should be established as to the distance apart the trees are to stand.

#### TREE SEEDS.

Farmers in the wooded districts can supply themselves with native seeds at a small cost of labor and time. Even where there are but fringes of trees along the streams, large quantities of seeds can in some seasons be gathered. Where seeds can be thus had in the neighborhood, it is cheaper and better to gather them, than to buy from a distance, as they will be fresh, and can at once be planted or placed in safety for keeping. The gathering of tree seeds has not yet become general in Kansas; but it is a work in which even children can aid, and ought not to be neglected. All our native trees are of value, particularly the ash, box elder, elm, honey locust, hickory, maples, oaks and walnuts. No money ought to be sent out of the State for these seeds, at least until all from the native trees are consumed each year. Tree seeds are not yet an article of commerce in the State, because there has not yet arisen a general demand for them; but the time will come when dealers, as in other States, will collect them for sale. It is only within two or three years, that any one in Illinois has had tree seeds for sale, but now there are several dealers; and we may reasonably hope for the same trade to begin in Kansas at an early day.

#### CONCLUSION.

In what is here said, the aim has been not so much to say what is new as what is true. If the thoughts and suggestions have presented themselves to other minds, that is a fact which adds to their value and should not weaken their effect. We have need to press into service all the knowledge we can gather, and after all, we shall still be learning daily from experience.

In truth, forest culture has not yet so possessed the general mind, as to have produced results of much consequence, so far as actual tree-planting is concerned. Compared with what ought to be done, the work so far accomplished is small; but compared with what had been done a few years ago, it is large. It is a great deal to have made a beginning, and we have learned much to aid future efforts.

It is an immense work, particularly west of the Mississippi, to provide for the future such products of the forest as will inevitably be needed. Thus far, governments have done but little. The legislature of Kansas, and of some other States, has recognized the importance of the work; and some action in Congress is probable during the present



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session to encourage tree-planting on the public lands. But we lack the energetic and systematic action which European governments take in regard to the forests, and will probably never have it. We must therefore rely on the people, and on such corporate organizations as may have an immediate interest.

The Kansas Pacific Railway has been the first corporation to give serious attention to forest planting in the State. The steps taken by this company have already resulted in good; the subject has been kept before the people, much information has been diffused, and other corporations have been stimulated to similar action. But it is not the business of a railway company to plant forests, if such duty can be avoided. This is a work for individual farmers and land owners. The managers of the railway would rather buy their timber than grow it; and the people who plant in order to supply the future wants of this and other roads will have an unfailing market. The railroads of the State have always been compelled to import timber and lumber at a large outlay of money, and to this outlay that for ties is already added.



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## STONES OF KANSAS.

BY J. G. HASKELL.

*To the Kansas State Board of Agriculture:*

My response to the very kind invitation of your Secretary to write a few words concerning the "Stones of Kansas," will necessarily be brief, as I suppose it ought to be.

I must preface by remarking that what I say must be considered from the standpoint of a mechanic and not that of a geologist or scientist.

The developments of the last five years lead us to the belief that we are now only upon the threshold of the State's great storehouse of valuable building material. So rapid and so valuable have been the discoveries and developments of the last five years, that it is no wonder we feel elated, and imagine, with good reason too, that no prairie State in the Union excels us in the variety and excellence of building stones. Almost every quarter-section of farming land in our whole broad domain, lies within convenient distance to a quarry of suitable stone for all the uses of the farm, even to the erection of what would be in any country on the globe, handsome farm houses and barns, to say nothing of fences and lesser improvements such as will be made when the surplus of labor will place the cost within reach.

Every city and town is therefore convenient to this great staple supply, and in the absence of native timber, and in the presence of the imported article at high cost, the stone quarries are called upon, and respond to the demand, furnishing us with better buildings, at comparatively low figures, than most States produce in their pioneer structures. All these quarries are in most convenient and available form, being from three to eight feet deep, and in layers or courses of from four to twenty inches, thus being readily obtained without blasting or other expensive process.

Leaving the material found in all localities and as common and staple as a corn field, and seeking something to supply the demands of mechanic art, and the result of our observation is equally complete and satisfactory. A large number of localities in the State afford the most satisfactory grades of stone in large masses, uniform in texture and color. These lie in immense fields, usually cut at various points by the railroads, and exhibiting so many uniform characteristics, as to render the proposition certainly true, that the intermediate country is occupied



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in the same manner. The material is slightly different at different points along a line of hundreds of miles, but the family resemblance is the same.

The limestones may be said to be the leading material, and the blue, the gray and the white, are the leading divisions.

The blue and gray are most general in their distribution over the State, nearly all the common limestones found everywhere being related more or less nearly to these two classes.

The white, as at present developed, extends over the greatest area, and is more nearly uniform in leading characteristics than any other material in the State.

This great belt of choice building material enters the State from Nebraska, through Marshall, Washington and Nemaha counties, and following Clay, Riley, Pottawatomie, Dickinson, Davis, Morris, Marion, Chase, the west part of Lyon, Butler and Greenwood, disappears in the sand formations of the Arkansas slope. Detached quarries of the same general class are found in the counties adjoining those above named, but these embrace most of the field above referred to. An interesting and instructive paper could be written by a geologist, touching the differences in color and minor characteristics of the quarries along this belt: for example, the stone along the eastern side of the belt at Waterville, and down the Blue river to Chase county, is of a grayish white color, and more or less porous. That down the Republican river at Junction City and along the western side of the belt into Marion county, is of a light cream color, and porous. In Lyon and Morris counties it seems to attain its maximum hardness. In Chase county it reaches its greatest perfection, being quite white, and almost entirely free of the porous condition above referred to. In Butler and Greenwood, it is not only hard, but contains more foreign substance than elsewhere. These ledges differ from those of the common material inasmuch as they are more solid, less "seams," or "drys," and yet are broken enough to render the process of quarrying an easy one. The thickness of the ledges is from three to seven feet in layers or courses, of from eight inches to five feet, furnishing material of all dimensions for any required use.

A portion of the stone within the range above referred to, resembles in texture the celebrated soft stones of Europe; can be sawed with a common wood-cutting instrument; can be planed to a surface with a common wood-working tool, and yet, properly handled, will carry its full load in the largest structures. The surfaces harden instead of wearing with exposure, so that, judging from the appearance in the quarry, a sufficient length of time would render the exposed surfaces nearly as hard as glass. Frost seems to possess no power over any of the material in this belt. It is a well-known fact that nearly all hard limestones, in common with all other building stones, yield to the action of

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the frost, when taken from the ground late in fall or during winter. The experiment has been fully tried at various places in all parts of this immense field, and no appreciable difference is observed as to the season when the material should be taken from the ground.

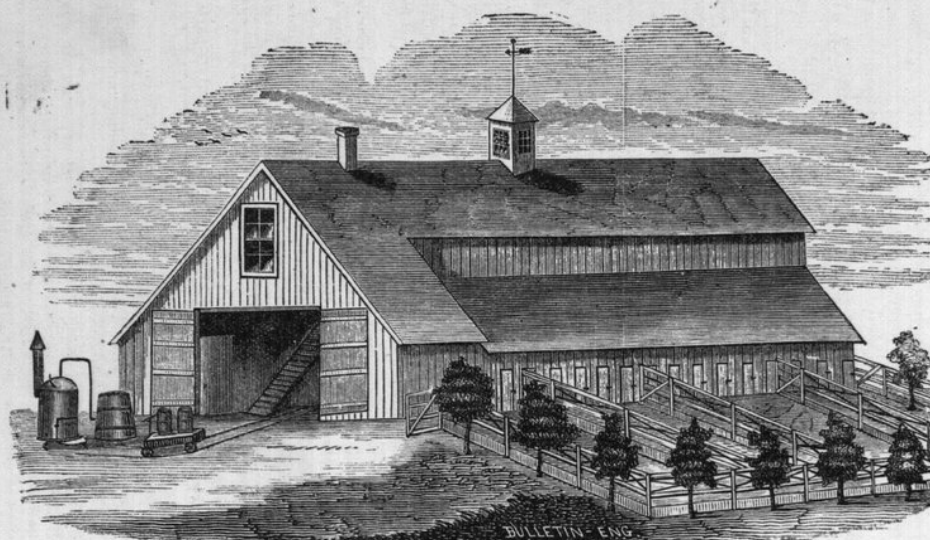
As if planned by the Great Architect to best serve the people of the whole State, this immense field stretches nearly from side to side of the State, mid-way of that part destined to be most densely populated. It is already cut by five leading lines of railway, and is thus placed within easy carrying distance of a majority of the leading centers of trade and business.

Already the demands upon it are constant and heavy. The State House at Topeka is mostly from Junction City, with parts for special use from Cottonwood Falls in Chase county; and the leading business houses of Topeka, Atchison, Leavenworth, Lawrence, Emporia, etc., (all more or less remote from the field itself, but in communication by rail,) are dressed with this superior material. In many places it resembles the justly celebrated limestones of Joliet and Lamont, in Illinois, which have contributed so much to the embellishment of Chicago. In addition to the inexhaustible supply embraced within this great area, are other localities which possess deposits of equally valuable material. Fort Scott has its neighboring quarries of choice material in pleasing variety. The Osage river on the Fort Scott & Gulf railroad gives us an exceedingly choice sand or freestone. Wyandotte, on both the Kansas and Missouri rivers, offers the State an endless supply of fine material. Some of the quarries at the penitentiary, in Leavenworth county, are held in high esteem. Jefferson county has an extraordinarily hard and durable gray limestone, almost equal to granite in its powers of resistance. Pottawatomie county, at St. Mary's Mission, has a fine and durable grade of blue limestone—this is employed for the steps of the State House portico. Ellis county has a soft limestone, easily quarried and worked, and finely adapted to the wants of that locality.

Thus the State is abundantly supplied with material which is unsurpassed for utility or embellishment, and still we have only broken the outcroppings of her vast resources. Every year uncovers something new and valuable.

I do not wish this paper to be considered as anything like a complete review of what we already know. It is as superficial as the excavations we have made in the development of our quarries. Future years will give us the details in full.





J. K. HUDSON'S PIGGERY—Elevation.



### DESCRIPTION OF MAJ. J. K. HUDSON'S PIGGERY AT HILLSIDE FARM, WYANDOTTE COUNTY, KANSAS.

The building is one hundred feet long by thirty-two feet wide, well drained and ventilated, built of No. 1 pine, upon stone foundations. The floors of the pens are of two inch plank; the partitions on either side are movable, so that two or more pens can be thrown into one if necessary or desirable.

Each inside pen is provided with an outside box of uniform width, thirty feet deep, through which runs fresh spring water. It was found impracticable to show all the yard pens in the view, but by reference to the ground plan it will be seen that the gates between the fourteen different yards, when open, form an alley five and one-half feet wide, through which the manures can be wheeled out and the pens cleaned while the pigs are confined in the yards; this alley also makes easy the work of shifting animals from one portion of the building to another. The upper story of the middle portion of the building is used for storing field seeds, which are extensively grown upon this farm. Under the seed room is a drive-way twelve feet wide. Through this is laid a wooden track, on which a little truck car is pushed to convey feed from the steamer to the pens.

Major Hudson claims for his piggery that it economizes labor, and affords excellent care and protection to a large number of breeding animals, giving warmth in winter and shelter and ventilation in summer. By opening the large doors at each end and the fourteen small doors on each side, the freest ventilation is secured in both directions, the interior walls of the pens being, of course, but a few feet high, and the space above open.

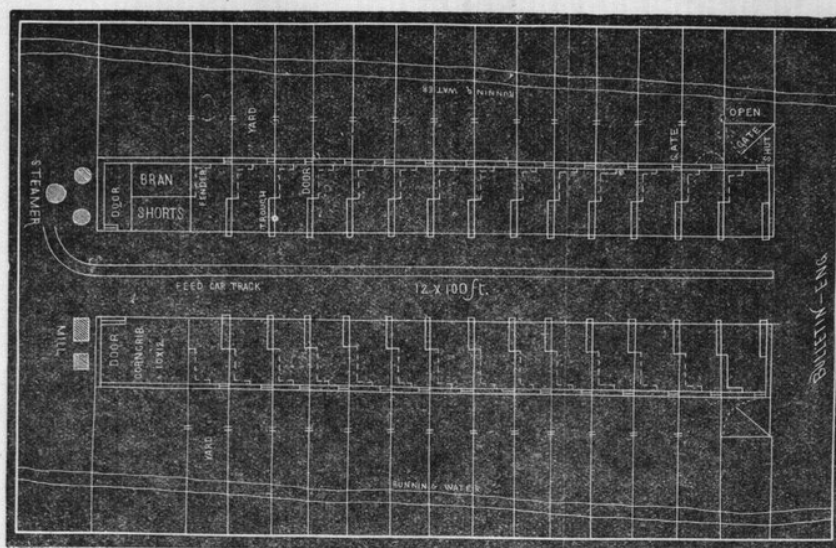
The breeding house is perhaps the most complete in all its parts of any in the United States, devoted to swine and for the breeding of pure Berkshires, no other breed being allowed on the farm.

The ultimate plan of the establishment contemplates a three story central barn provided with a steam engine for grinding and cooking food, and an eastern wing devoted to cattle.

Connected with the piggery on the north, east and west are clover pastures, and on the west are strong, never-failing springs which supply an abundance of pure water; one of the greatest recommendations and necessities of the place, in Mr. Hudson's opinion.



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J. K. HUDSON'S PIGGERY—Ground Plan.



### DEPARTMENT

OF THE

## KANSAS ACADEMY OF SCIENCE.

ORGANIZATION AND HISTORY, BY JOHN D. PARKER, SECRETARY.

In a general sense science is restricted to what is certainly known. The boundaries have been well ascertained, the general features mapped out, and the territory is clearly defined. In a more specific sense, science observes the phenomena of things, produces in experiments results not ordinarily occurring in nature,—inducts facts, deduces truths, collects general principles, and arranges them in systematic order.

The scientific *method* of the present age is different from that of the past. The ancient logic is fruitless as a means for the discovery of truth. The inductive philosopher of the present age collects all the facts of his subject, classifies them into tables, expunges those that are not significant, gathers the vintage, scrutinizes with respect to true value and import, illustrates if practicable by actual experiment, discovers the law of phenomena, and rises in his knowledge, from one generalization to another, until all the facts crystalize into one comprehensive system.

The scientific *spirit* of the present age simply inquires, "What is truth?" Truth is to be found at all hazards, and bought at any price. All known things are to be laid under contribution. New appliances are to be constructed, and new methods of analysis invented, until we stand, if possible, face to face to the absolute.

The scientific spirit of the present age is also liberal. Its faith is as large as the universe. All things are believed possible until proved impossible; all things are believed true until proved untrue. Nothing is to be rejected that stands the touchstone of observation, comparison and experiment.

The scientific spirit of the present age is also fearless. All truth



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must be consistent with itself. No two facts of the universe can contradict each other. No two laws of the universe can disprove each other. Scientific men are, therefore, willing to follow whithersoever truth may lead them. The most venerable errors of the past, however cherished and embalmed in the human heart, are to be destroyed. The most sacred shrines of the old world are to be desecrated, the idols of the temple of science to be thrown down, and the foundations of the temple itself to be removed. Science lays its fearless hand even on revelation itself, and gives it a new interpretation.

The results of inductive scientific investigation are almost beyond belief. Our respected ancestors, only three or four centuries ago, were little better than barbarians. The darkness of that period is profound and painful. "Out of that darkness and chaos," says a recent writer, "have come all our civil and religious freedom, all our philanthropy, and benevolence, all our diffused comfort and luxury, most of our good manners and morals, and all the splendid achievements of our modern scientific investigation." As the inductive philosopher seated himself before the chaff heaps of antiquity to winnow out the grains of truth, a mighty task was laid upon him. Every premise must be thoroughly established, every observation re-observed, every experiment re-conducted, and every comparison recollected. Nothing less than a new creation lay before him. Well may the works of the great founder of the inductive philosophy be christened *Novum Organum* and *Instauratio Magna*.

Moved by the impulses of the age, a few naturalists in 1867 resolved if possible to effect an organization for the cultivation of science, particularly in its relation to the State of Kansas. Kansas occupies an important field in its scientific aspects. The scientific marvels of our age flow out of associated effort. Scientists need opportunity to compare results and effect exchanges. They need to be inspired to go forth into the fields of nature by the presence of other explorers.

After considerable correspondence among the naturalists of the State in reference to the possibility of effecting such an organization, a letter was published in the *Kansas Journal of Education*, for March, 1868, calling attention to the benefits of such a society, and the necessity of effecting an organization at an early day. The publication of this letter met with such favor, and called forth so many responses from the friends of science throughout the State, that the following "call" was issued in July of the same year:

#### "STATE NATURAL HISTORY SOCIETY."

"We, the undersigned, desirous of securing the advantages arising from association in scientific pursuits; and of giving a more systematic direction to scientific research in our State, do hereby invite all persons in the State interested in natural science to meet at Topeka on the first



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Tuesday of September next, at 3 p. m., at the college building, for the purpose of organizing a State Natural History Society:

JOHN FRASER,	G. F. CHAPIN,
D. H. ROBINSON,	J. H. CARRUTH,
B. F. MUDGE,	R. D. PARKER,
J. A. BANFIELD,	JEFF. ROBINSON,
J. S. HOUGHAM,	PETER McVICAR,
J. D. PARKER,	F. H. SNOW,
R. A. BARKER,	J. S. WHITMAN,
D. BROCKWAY,	RICHARD CORDLEY,
J. R. SWALLOW."	

Pursuant to this call, a meeting of the naturalists of the State was held in Lincoln College, Topeka, Kansas, September 1st, 1868. On mature deliberation and thorough discussion, an organization was effected under the name of the Kansas Natural History Society.

At the third annual meeting of the Society, held in the University building at Lawrence, on the 5th and 6th of September, 1870, President John Fraser suggested that the scope of the Society be enlarged to comprehend the whole field of science within the borders of the State.

On motion, Messrs. John Fraser, F. H. Snow, D. H. Robinson, Frederick W. Bardwell, and John D. Parker, having been appointed a committee on enlargement of the scope of the Society, made the following report, which was adopted:

WHEREAS, The unexpected success of this young Society, as at present organized, has awakened in many the desire to have its scope enlarged so as to embrace in its membership observers and investigators in other lines of scientific inquiry; and,

WHEREAS, It appears to us that such a change in our organization is calculated to promote the interests of science, and thereby the higher interests of our State; therefore,

*Resolved*, That the name and scope of our Society be so changed as to include every line of scientific exploration and observation conducted by residents within our State.

At the fourth annual meeting, held in the rooms of the Board of Education at Leavenworth, on the 25th and 26th of October, 1871, the Constitution and By-Laws were so amended as to embrace in the membership of the Society, observers and investigators in every line of scientific inquiry, and the name of the Society was changed from the Kansas Natural History Society to the Kansas Academy of Science.



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#### PROCEEDINGS OF THE SOCIETY.

The first annual meeting of the Society was held in Lincoln College, Topeka, Kansas, September 1st, 1868. After mature deliberation and thorough discussion, the association was organized, and the following officers were elected for the current year:

B. F. Mudge, President; J. S. Whitman, Vice-President; John D. Parker, Secretary; Frank H. Snow, Treasurer; John A. Banfield, Curator.

The second annual meeting of the Society was held in the Presbyterian church, Topeka, Kansas, September 7th, 1869.

The following papers were read:

On the Internal Heat of the Globe, by B. F. Mudge.

On Solving the Higher Equations, by Edward Cave.

A public lecture was delivered on the Mound Builders, by John D. Parker.

The officers of the previous year were re-elected.

The third annual meeting of the Society was held in the University building, at Lawrence, on the 5th and 6th of September, 1870.

The following papers were read:

On the Plants of Kansas, by James H. Carruth.

On the Fishes of the Kansas River, as observed at Lawrence, by Frank H. Snow.

On the Internal Heat of the Earth, by John D. Parker.

On the Comparison of the Coals of Kansas with other Western Coals, by Wm. H. Saunders.

On the Saurian Formation of Kansas, by B. F. Mudge.

On the Moss Agate Formation of Kansas, by B. F. Mudge.

The following public lectures were delivered:

On the Aims, Organization and Advantages of Scientific Associations, by John Fraser.

On Hugh Miller, or the Workingman's Education, by John H. Barrows.

The following officers were elected for the current year:

John Fraser, President; B. F. Mudge, Vice-President; John D. Parker, Secretary and Librarian; Frank H. Snow, Treasurer; B. F. Mudge and Frank H. Snow, Curators.

The fourth annual meeting of the Society was held in the rooms of the Board of Education, at Leavenworth, on the 25th and 26th of October, 1871.

The following papers were read:

On the Plants of Kansas, (continued from last year) by James H. Carruth.



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On the Birds of Kansas, by Frank H. Snow.  
On the Burlington Gravel Beds, by John D. Parker.  
On the Darwinian Theory, by John Wherrell.  
On some rare forms of Crystalization of Gypsum, by B. F. Mudge.  
On the Red Sandstone of Kansas, by B. F. Mudge.  
The following public lectures were delivered:  
On the claims of the Natural Sciences, by Frank H. Snow.  
On the Geology of Kansas, by B. F. Mudge.  
The following officers were elected:

John Fraser, President; B. F. Mudge and Robert J. Brown, Vice-Presidents; John D. Parker, Secretary; F. H. Snow, Treasurer; B. F. Mudge and F. H. Snow, Curators.

The fifth annual meeting of the Society was held in the Congregational church, at Manhattan, on the 8th and 9th of October, 1872.

The following papers were read:

On the Peculiarities of the Cherokee Language, by D. H. Robinson.  
On Ventilation, by Colonel William Tweeddale.  
On the Plants of Kansas, (continued from last year) by James H. Carruth.

On two varieties of Limestone, from Junction City, by William H. Saunders.

On two varieties of Coal, from Colorado, by William H. Saunders.

On the Birds of Kansas, (continued from last year) by Frank H. Snow.

On the Geology of the Arkansas Valley, by B. F. Mudge.

On the Relation of Light to the Quantity of Gas Consumed, by F. E. Stimpson.

On the Remoteness of the Final Catastrophe, by John D. Parker.

On what is Good for an Artist, and what an Artist is Good for, by Miss Lizzie J. Williams.

On the Sources of the English Language, by J. H. Lee.

On the National Park, by Joseph Savage.

A public lecture was delivered on the Agreement of the Bible with Geological Science, by Rev. Charles Reynolds, D. D.

The officers of the previous year were re-elected.

The following commissions were confirmed for the current year:

B. F. Mudge, Geology; F. H. Snow and Edwin A. Popenoe, Entomology; D. H. Robinson and J. H. Lee, Language; F. W. Bardwell, Engineering; F. E. Stimpson, Physics; John Fraser, Astronomy; J. H. Carruth, Botany; John Wherrell, Mineralogy; William H. Saunders, Chemistry; John D. Parker, Meteorology.

The next annual meeting of the Society will be held at Lawrence, at the call of the Executive Committee.



### CATALOGUE OF PLANTS SEEN IN KANSAS.

BY J. H. CARRUTH.

*With additions by Prof. F. H. Snow and Prof. E. Hall.*

It is with great reluctance that I present this catalogue of the plants of Kansas, because it is so incomplete, even for Douglas county. I hope, if spared, to add more names to it.

Kansas is out of the field of both Wood and Gray, and I find plants that are not in either of their books. I have then to resort to Eaton of forty years ago, or to send plants to some one who can enlighten me. I have several such cases now on hand. I find plants corresponding partially, but not entirely, to descriptions in the book, and then I am in doubt whether they are varieties, or distinct species not in the book.

Botanists seem not to have finished arranging species into their appropriate genera; consequently the same plant has different names in different books. I shall use the names in Wood's Botanist and Florist, presuming that they are according to the most recent decisions.

Botanists are not agreed, or, if they are, it is but recently, as to whether plants with certain marks are species or only varieties. In such cases, I shall give the name, and, perhaps, my opinion.

The botany of Kansas differs considerably from that of New England and New York. Having no peat bogs, we lack the side-saddle flower, and all plants peculiar to such places. Having but little sandy land, we have few plants peculiar to that kind of soil. So far as I know, the whole large Order Ericaceæ, including the huckleberry, cranberry, checkerberry, spoon-wood, pinxter and rosebay, is entirely wanting.

The Coniferæ, including the pines, spruces and cedars have but one representative, the Red Cedar, and that is rare.

The Betulaceæ, including the birch and alder are wanting.

In the Order Cupuliferæ, which includes the oak, the beech and the chestnut are wanting.

The splendid magnolia and tulip tree, common farther east and south, are not found here.

The large Orders Malvaceæ, including the hollyhock; Cruciferae, including cabbage and mustard; Orchidaceæ, including the wild Lady's Slipper; and Cyperaceæ, including sedges and other grass-like plants with triangular stems, have but few representatives. Ferns, mosses and lichens, (such mosses, so called, as grow on rocks and rails,) are rare, and ground pines are wanting; Fungi are not common, though I



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have seen specimens of the puff-ball family four or five inches in diameter.

On the other hand, the Leguminosæ, including the pea and clover; the Compositæ, including asters, golden rods and sunflowers; and the Gramineæ or grasses are well represented.

The plants in the following list which I have not seen, I give on the authority of Prof. F. H. Snow, of the Kansas State University, and Prof. E. Hall, of Athens, Illinois, who has made more than one journey through Kansas, to observe its botany. And I would especially commend to the notice of those who have not seen it, a paper of his in the Report of the Department of Agriculture for 1870, on the grasses of the region between the Mississippi and the Rocky Mountains. It will interest the farmer as well as the botanist. For the list of ferns I am indebted to Mr. James Wilson, of Leavenworth. A few plants have been sent me by Prof. Mudge, of the Agricultural College. No doubt in the Western part of Kansas, differing geologically from the Eastern, and especially in the salt and gypsum regions, some peculiar plants will be found.

J. H. CARRUTH.

Plants not in Wood's Class Book nor Gray's Manual are marked thus, \*. Those that were introduced or came themselves are marked thus, †.



PLANTS OF KANSAS.—CATALOGUE.

*Ranunculaceae.*

*Clematis*, Virgin's Bower.

*C. verticillaris*, Mrs. Craig of Franklin county. Rare.

*C. Virginiana*. Rare.

*C. Viorna*. Leather flower. Among bushes. Not common.

*Anemone*, Wind Flower.

*A. Caroliniana*.

*A. Virginiana*.

*A. Pennsylvanica*.

*A. cylindrica*.

*Thalictrum*, Meadow Rue.

*T. cornuti*.

*Ranunculus*, Crowfoot.

*R. multifidus*.

*R. oblongifolius*.

*R. abortivus*.

*R. repens*. Snow.

*Myosurus*, Mouse Tail.

*M. minimus*. Rare.

*Isopyrum*, False Rue Anemone.

*I. biternatum*. Snow.

*Aquilegia*, Columbine.

*A. Canadensis*, cliffs near Humboldt.

*Delphinium*, Larkspur.

*D. fricorne*, wet grounds. Common. Flowers deep violet.

*D. azureum*, variety *virescens*. Flowers greenish white. Common on prairies.

† *D. consolida*. Snow.

*Anonaceae.*

*Asimina*, Papaw.

*A. triloba*. Woods near streams.

*Menispermaceae.*

*Menispermum*, Moonseed.

*M. Canadense*. Climbs bushes.

*Berberidaceae.*

*Podophyllum*. May Apple, or Mandrake.

*P. peltatum*. Common.



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*Nymphaeaceae.*

Nelumbium, Water Bean.

N. luteum, Yonkopin. (An Indian name.) Ponds near streams, splendid.

*Papaveraceae.*

Argemone, Prickly Poppy.

† A. Mexicana. Snow.

*Fumariaceae.*

Dicentra, Ear-drop.

D. cucullaria. Snow.

Corydalis, Corydalis.

C. aurea. Golden Corydalis, Lawrence.

*Cruciferae.*

Nasturtium, Water Cress.

N. tanacetifolium.

N. sinuatum.

N. palustre.

Iodanthus. False Rocket.

I. hesperidoides. Snow.

Arabis, Rock Cress.

A. dentata. Snow.

Sisymbrium.

S. officinale. Hedge Mustard.

S. canescens. Tansey Mustard. Snow.

Draba, Whitlow Grass.

D. cuneifolia. Snow.

Sinapis. Mustard.

S. nigra. Black Mustard.

Capsella, Shepherd's Purse.

† C. Bursa-pastoris. Common.

Lepidium, Pepper Grass.

L. Virginicum.

L. rudemale. Common.

*Capparidaceae.*

Cleome, Spider Flower.

\* C.—. Undetermined, sent from Western Kansas by Professor Mudge. Pretty.

Polanisia.

P. graveolens. Quarries, Lawrence. Pretty, but ill-scented.



*Violaceae.*

Viola, Violet.

V. delphinifolia. Common.

V. cucullata. Common.

V. pubescens. Common.

*Hypericaceae.*

Hypericum, St. John's Wort.

H. corymbosum, (rare,).

H. angulysum. Snow.

*Caryophyllaceae.*

Silene, Campion, Catch-fly.

S. stellata. Common.

S. antirrhina. Snap-dragon Catch-fly.

Cerastium, Mouse-ear Chickweed.

C. viscosum. Snow.

Mollugo, Carpet Weed.

† M. verticillaris. A common weed.

*Portulaccaceae.*

Portulacca, Purslane.

† P. oleraceae. Too common.

Talinum.

\* T. parviflorum. Snow.

Claytonia, Spring Beauty.

C. Virginica (?). (Possibly the C. Caroliniana).

*Malvaceae.*

Malva, Mallows.

† M. rotundifolia.

Sida.

S. spinosa, Becoming troublesome in gardens.

Abutilon, Indian Mallows.

† A. Avicennae. Road-sides. Said to be troublesome in Illinois.

Hibiscus.

\* H. Trionum. Flower-of-an-hour. Escaped from gardens.

H. militaris. Wet places. Resembles Hollyhock.

*Tiliaceae.*

Tilia, Linden.

T. Americana. Bass-wood. Not common.

*Linaceae.*

Linum, Flux.

L. sulcatum. Prairies. Scattered.



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#### *Geraniaceae.*

Oxalis, Wood-sorrel.

*O. violacea.* Common.

*O. stricta.* Common.

Geranium, Crane's-bill.

*G. Carolinianum.*

Impatiens, Touch-me-not.

*I. pallida.*

#### *Rutaceae.*

Zanthoxylum, Prickly Ash.

*Z. Americanum.*

#### *Anacardiaceae.*

Rhus, Sumac.

*R. glabra.* Common.

*R. copallina.* Mountain Sumac.

*R. Toxicodendron.* Poison Ivy.

*R. radicans.* Climbing Ivy.

*R. aromatica.* Sweet Sumac.

#### *Sapindaceae.*

Acer, Maple.

*A. dasycarpum.* White Maple, river banks.

*A. saccharinum.* Sugar Maple, Linn county.

Negundo, Box Elder.

*N. aceroides.* Common.

Staphylea, Bladder Nut.

*S. trifolia.* Occasional.

Æsculus, Buckeye.

*Æ. glabra?*

*Æ. flava.* Snow.

#### *Celastraceae.*

Celastrus, Staff Tree.

*C. scandens.* Common.

Euonymus, Burning Bush.

*E. atropurpureus.*

#### *Rhamnaceae.*

Ceanothus, Jersey Tea.

*C. Americanus.* Prairies.

*C. ovalis.*

Rhamnus, Buckthorn.

*R. lanceolatus.* Near streams.



*Vitaceae.*

Vitis, Grape Vine.

*V. aestivalis*. ? Common. Leaves not rust colored beneath, panicles loose, fruit tart, ripe in October.

*V. cordifolia*. Leaves dark green, panicle loose, fruit very small, tart, ripe in September.

*V. riparia*. Leaves light green; panicle compact, fruit pleasant, ripe July to September.

*V. vulpina*? One place. Leaves small, shining on both sides, most below, slightly lobed, teeth crenate, slightly mucronate.

*V. indivisa*. Fruit not eatable.

*V. quinquefolia*. Virginia Creeper, common.

*Polygalaccae.*

Polygala, Milkwort.

*P. incarnata*. Prairies, scattered.

*P. verticillata*. Lawrence.

*Leguminosae.*

Schrankia, Sensitive Brier.

*S. uncinata*. Common.

Desmanthus.

*D. brachylobus*. Has a cluster of hooked pods.

Gymnocladus, Coffee tree.

*G. Canadensis*. Frequent.

Gleditschia, Honey Locust.

*G. triacanthus*. Common.

Cassia, Senna.

*C. chamaecrista*. Sensitive Pea. Common.

*C. Marylandica*. American Senna. Occasional.

Cercis, Red Bud.

*C. Canadensis*. Common.

Baptisia, Wild Indigo.

*B. leucophea*. Common.

*B. leucantha*. Common.

*B. australis*. Snow.

Vicia, Vetch.

*V. tetrasperma*. Lawrence.

*V. Americana*.

*V. Caroliniana*. Snow.



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Desmodium, Bush Trefoil.

- D. nudiflorum, acumdatum.
- D. acuminalum.
- D. viridiflorum.
- D. cuspidatum.
- D. Canadense.
- D. sessilifolium.
- D. ciliare.
- D. canescens.
- D. paniculatum.

Lespedeza, Bush Clover.

- L. capitata. Prairies. Common.
- L. Violacea.
- L. repens.

Crotalaria, Rattle-Pod.

- C. sagittalis. Rare.

Trifolium, Clover.

- † T. repens. White Clover.
- † T. pratense. Red Clover.
- T. reflexum. Buffalo Clover. Rare.
- T. ———. One plant on bank of the Wakarusa. At the time I made it T. Carolinianum, but? Flowers flesh colored.

Melilotus.

- † M. alba. Sweet Clover. Gardens.

Psoralea.

- P. floribunda. Prairies. Common.
- \* P. argophylla. Prairies. Scattered.
- P. stipulata. Prairies. Rare.
- \* P. esculenta. Prairies. Not common. Has a root shaped like a turnip; one inch in diameter; eaten by Indians.

Amorpha, Lead Plant.

- A. fruticosa. Prairies. Common.
- A. canescens. Prairies. Common.

Dalea.

- D. alopecuroides. Prairies. Common.

Petalostemon.

- P. candidum. Prairies. Common.
- P. violaceum. Prairies. Common.

Astragalus, Milk Vetch.

- A. Canadensis. Occasional.
- A. caryocarpus. Prairie Pea. Rocky places. Common.
- A. Mexicanus. Snow.

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Tephrosia, Goat's Rue.

T. Virginica. Handsome. Indicates sand in the soil.

Robinia, Locust.

† R. pseudacacia. Yellow Locust. Likes the country, but not the borers.

Apios, Ground Nut.

A. tuberosa. Wet places. Tubers; several on a root. Eatable when cooked.

Phaseolus, Kidney Bean.

P. diversifolius. Sandy places.

P. pauciflorus. Not Common.

Amphicarpea, Pea Vine.

A. monoica. Bushes.

A. Pitcheri?

### Rosaceae.

Prunus, Plum and Cherry.

P. Americana. Wild Plum. Common.

P. serotina. Black Cherry. Rare.

Rubus, Bramble.

R. villosus. High Blackberry. Bushes. Common.

R. Canadensis. Northern Dewberry. Stony places. Occasional.

R. occidentalis. Black Raspberry. Bushes. Common.

Geum, Avens.

G. Album. Not rare.

G. Virginianum. Not rare.

G. ———? Root leaves polywoggy.

Fragraria, Strawberry.

F. Virginiana. Polygamous. The pistillate blossoms have small petals. Common.

Potentilla, Cinque Foil.

P. Canadensis. Five Finger.

P. Norvegica.

P. paradoxa. Snow.

Rosa, Rose.

R. setigera. Prairie Rose; Bushes, fine. Cultivated.

R. lucida. Prairies.

R. blanda. More common than the last. A variety of one of these has fruit conical, eight or ten together.

Agrimonia, Agrimony.

A. Eupatoria.

A. parviflora.

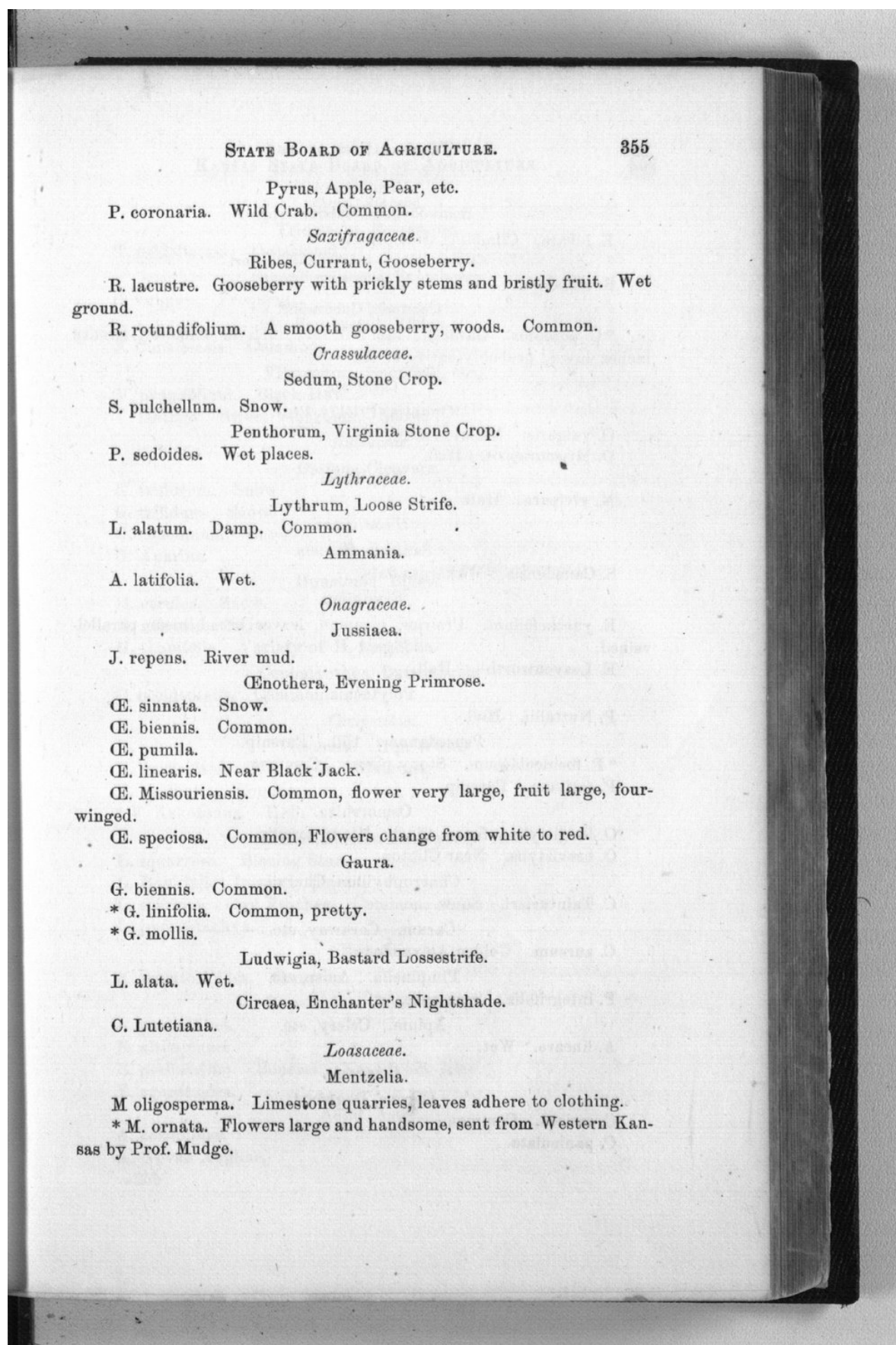
Crataegus, Thorn.

C. tomentosa. Black Thorn. Common.

C. crus-galli. Cockspur Thorn, Miami county.



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Pyrus, Apple, Pear, etc.

P. coronaria. Wild Crab. Common.

*Saxifragaceae.*

Ribes, Currant, Gooseberry.

R. lacustre. Gooseberry with prickly stems and bristly fruit. Wet ground.

R. rotundifolium. A smooth gooseberry, woods. Common.

*Crassulaceae.*

Sedum, Stone Crop.

S. pulchellum. Snow.

Penthorum, Virginia Stone Crop.

P. sedoides. Wet places.

*Lythraceae.*

Lythrum, Loose Strife.

L. alatum. Damp. Common.

*Ammania.*

A. latifolia. Wet.

*Onagraceae.*

*Jussiaea.*

J. repens. River mud.

Oenothera, Evening Primrose.

O. sinnata. Snow.

O. biennis. Common.

O. pumila.

O. linearis. Near Black Jack.

O. Missouriensis. Common, flower very large, fruit large, four-winged.

O. speciosa. Common, Flowers change from white to red.

*Gaura.*

G. biennis. Common.

\* G. linifolia. Common, pretty.

\* G. mollis.

Ludwigia, Bastard Lossestrife.

L. alata. Wet.

Circaea, Enchanter's Nightshade.

C. Lutetiana.

*Loasaceae.*

*Mentzelia.*

M. oligosperma. Limestone quarries, leaves adhere to clothing.

\* M. ornata. Flowers large and handsome, sent from Western Kansas by Prof. Mudge.