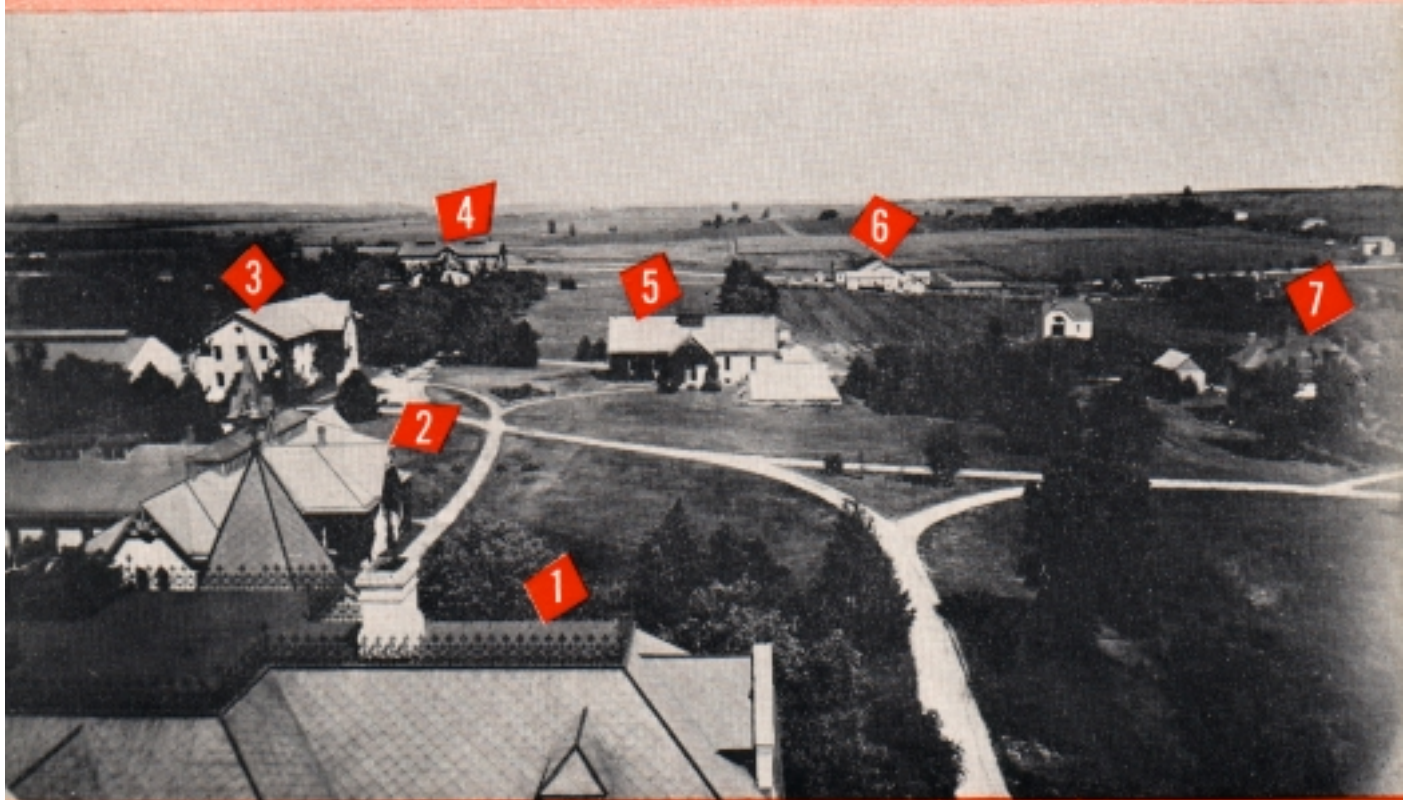


Agricultural Research at Kansas State Agricultural College (KSU) Before Enactment of the Hatch Act (1887)

by
LELAND E. CALL



A picture taken about 1877 from the top of Anderson Hall (1) looking north shows the old Chemistry Building (2) which now houses mathematics, the Shops Building (3), the "Old Armory" (4) soon to be razed, the old Horticultural Building (5), the old stone barn (6), and the President's residence. The last three were razed to make room for new buildings.

AGRICULTURAL EXPERIMENT STATION

Kansas State University of Agriculture
and Applied Science

MANHATTAN

GLENN H. BECK, Director

CONTENTS

| | Page |
|--|------|
| Organization of the Station by the College | 3 |
| Hatch Money Used for Building | 3 |
| Facilities for Early Experimental Work | 6 |
| Acquisition of Land | 6 |
| Obstacles to Progress | 11 |
| Land Purchased for Experimental Work | 12 |
| Purchase of Livestock | 13 |
| Physical Plant | 15 |
| The Library | 20 |
| Agronomic Investigations | 20 |
| Wheat Variety Tests | 21 |
| Corn | 21 |
| Alfalfa | 22 |
| Sorghums | 23 |
| Fertilizer Investigations | 24 |
| Horticultural Investigations | 25 |
| Orchards | 26 |
| Forests and Shelterbelts | 28 |
| Museum | |
| Livestock Investigations | 30 |
| Feeding Experiments | 31 |
| Carp Culture | 32 |
| Investigations in the Natural Sciences | 33 |
| Chemical Investigations | 33 |
| Entomological Investigations | 36 |
| Botanical and Zoological Investigations | 37 |
| Meteorological Investigations | 37 |
| Summation | 39 |

ON THE COVER

A view of the campus about the time of the enactment of the Hatch Act in 1887. The picture taken from the top of the right wing of Anderson Hall, looking north, shows the Horticultural Building in the center, the "Old Armory" in the distant left, and the Stone Barn in the distant center.

Agricultural Research at Kansas State Agricultural College (KSU) before enactment of the Hatch Act (1887)¹

LELAND E. CALL²

Agricultural research has been recognized from the beginning as a proper function of Kansas State University. Authority to engage in such work was granted by the Kansas Legislature in one of the early acts setting forth the functions of the institution. On March 3, 1863, the legislature approved "an act for the government of Kansas State Agricultural College for the benefit of agriculture and the mechanic arts." Section 9 of this act stated that, "The Board of Regents shall report annually the progress of said College, regarding any improvements and EXPERIMENTS made, with their cost and results, and such other matters, including State and industrial and economical statistics as may be supposed useful." (1)

The citizens of the State also recognized agricultural research as not only a proper function but as a duty of the institution. They were often critical of the College in early days for not being more active in agricultural investigational work. This is manifest from early records which show that the President of

the College felt at times an obligation to defend the institution for not being more active in this field of work. In an article entitled "Farm Experiments, in Agricultural Colleges" the president expressed himself as follows: "How far should these colleges, as such, prosecute experiments in agriculture? has to be answered. That these colleges should be the first to feel the need, and that they should make efforts to find the accurate knowledge wanted, was to be expected. . . . But to teach and to investigate are separate undertakings, either of which may take the whole man. So the first duty of these colleges to give "a liberal and practical education" to the youth under their influence may prevent even those natural investigations which a professor of agriculture or horticulture desires." (2)

It was chiefly due to the desire upon the part of the general public for the Agricultural College to undertake more investigational work in agriculture and the recognition that definite provision would need to be made for this function if much was to

1. Contribution No. 104, Office of the Dean, Agricultural Research, Teaching, and Extension, and Director, Agricultural Experiment Station, Manhattan.

2. Dean of the School of Agriculture Emeritus and Director of the Agricultural Experiment Station Emeritus.

be accomplished, that led to legislation under the Hatch Act authorizing the colleges to undertake investigational work and providing funds for this purpose. The Hatch Act was passed by the United States Congress and approved by President Cleveland March 2, 1887. The major provisions of the Act as set forth in the words of the Act were as follows:

1. "That in order to aid in acquiring and d i f f u s i n g among the people of the United States useful and practical information on subjects connected with agriculture, and to promote scientific investigation and experiment respecting the principles and applications of agricultural science, there shall be established under direction of the college or colleges or agricultural departments of colleges in each State or Territory established, or which may hereafter be established, in accordance with the provisions of an act approved July second, eighteen hundred and sixty-two, entitled "An act donating public lands to the several States and Territories which may provide colleges for the benefit of agriculture and the mechanic arts" or any of the supplements to said act, a department to be known and designated as an "Agricultural experiment station."

2. "That it shall be the object and duty of said experiment stations to conduct original researches or verify experiments on the physiology of plants and animals; the

diseases to which they are severally subject, with the remedies of the same; the chemical composition of useful plants at their different stages of growth; the comparative advantages of rotative cropping as pursued under the varying series of crops; the capacity of new plants or trees for acclimation; the analysis of soils and water; the chemical composition of manures, natural or artificial, with experiments designed to test the comparative effects of crops of different kinds; the adaptation and value of grasses and forage plants; the composition and digestibility of the different kinds of food for domestic animals; the scientific and economic questions involved in the production of butter and cheese; and such other researches or experiments bearing directly on the agricultural i n d u s t r y of the United States as may in each case be deemed advisable, having due regard to the varying conditions and needs of the respective States or Territories."

3. "It shall be the duty of each of said stations annually, on or before the first of February, to make to the governor of the State or Territory in which it is located a full and detailed report of its operations, including a statement of receipts and expenditures."

4. "That bulletins or reports of progress shall be published at said stations at least once in three months. . . . Such bulletins or reports and

the annual reports of said stations shall be transmitted in the mails of the United States free of charge for postage."

5. "That for the purpose of paying the necessary expenses of conducting investigations and experiments and printing and distributing the results as hereinbefore prescribed, the sum of fifteen thousand dollars per annum is hereby appropriated to each state to be specially provided for by Congress in the appropriations from year to year. . . . Provided, however, That out of the first annual appropriation so received by any station an amount not exceeding one fifth may be expended in the erection, enlargement or repair of a building or buildings necessary for carrying on the work of such station; and thereafter an amount not exceeding five percentum of such annual appropriation may be so expended."

6. "That the grants of moneys authorized by this act are made subject to the legislative assent of the several States and Territories to the purposes of said grants."

The Kansas Legislature was in session at the time of the passage of the Hatch Act by Congress. The legislature acted promptly in accepting the provisions of the act. It adopted Senate Concurrent Resolution No. 27, March 4, 1887.*

The House concurred in this act under suspension of the rules the same day. Senate

Concurrent Resolution 27 reads as follows:

"Resolved by the Senate, the House of Representatives concurring therein,

"That the annual appropriation of \$15,000 made available to the state of Kansas under the act of Congress for the maintenance of an experiment station for the benefit of agriculture in connection with each college established under the act of Congress approved July 2, 1862, be and is hereby placed under control of the Board of Regents of the Kansas State Agricultural College, subject to rules and regulations expressed or implied in the act of Congress named above."

Organization of the Station by the College

The College acted promptly following the acceptance of the Hatch Act by the Kansas Legislature. March 7, 1887, three days after the Legislature acted, the faculty voted that President Fairchild and Professors Shelton, Failyer, Popenoe and K e l l e r m a n should constitute a special committee to devise means of carrying out the provisions of the act. Haste in action, however, was unnecessary, since the appropriation authorized under the act did not become available immediately. The Comptroller of the Treasury

* Confusion has arisen regarding the exact date of the acceptance of the provisions of the Hatch Act by the Kansas Legislature. Bulletin No. 1 of the Kansas Agricultural Experiment Station gives the date as March 3, 1887, not March 4. This appears to be in error, since legislative records show that Senate Concurrent Resolution No. 27 was adopted by the Senate under suspension of the rules March 4, 1887, as shown in Senate Journal 1887, p. 846. The House concurred in this resolution under suspension of the rules March 4, 1887, as shown in House Journal 1887, p. 1130. This concurrence was reported to the Senate as shown in the Senate Journal 1887, p. 866.

held that owing to a verbal defect the appropriation could not be made. This was not corrected until a special appropriation bill was passed by Congress and approved February 1, 1888.

J. T. Willard, who was a member of the faculty of the College at the time the Hatch Act was passed, in his History of Kansas State College of Agriculture and Applied Science, wrote as follows regard-

ing the delay in the appropriation and the plan of organization of the station.

"The delay may have been a somewhat disguised blessing, as it gave opportunity for much-needed discussion in all the institutions, and in meetings of organizations. There can be no doubt that first expenditures were more wisely made than would have been the case without such discussion.

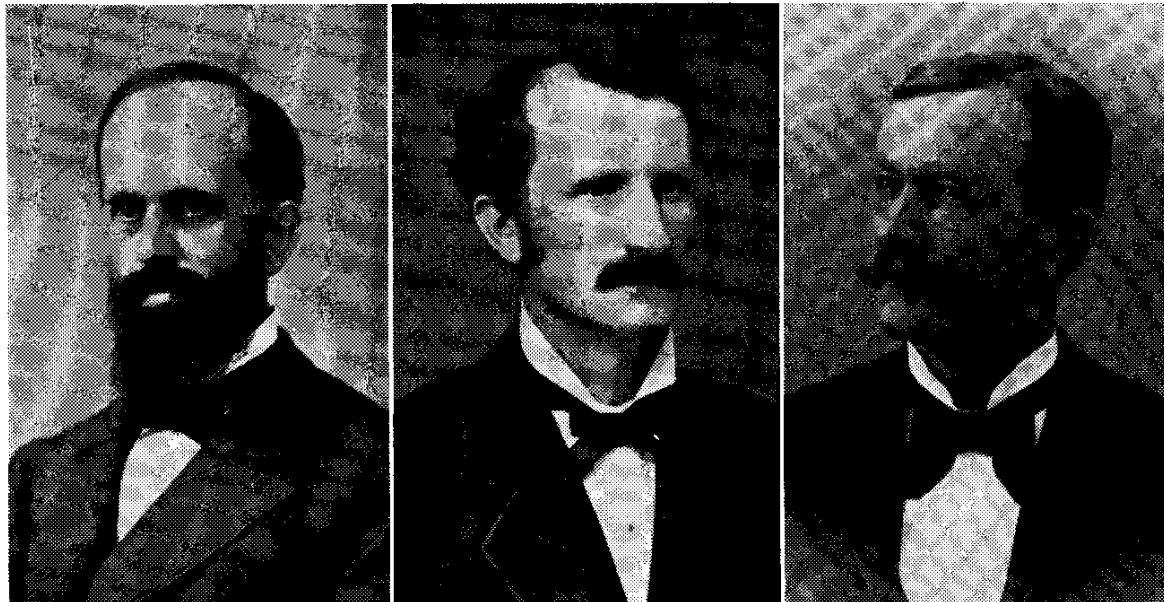


Fig. 1.--Members of the first Experiment Station Council. (Top) G. H. Failyer, Professor of Chemistry, and W. A. Kellerman, Professor of Botany; (bottom) G. T. Fairchild, President; E. M. Shelton, Professor of Agriculture and Director; and E. A. Popenoe, Professor of Horticulture and Entomology.

"The organization adopted for the Experiment Station was the result of a great deal of discussion, and displayed the same democratic attitude which was exemplified by President Fairchild in the control of its educational procedures. The plan was adopted by the Board of Regents, February 8, 1888. Its vital feature was this provision: 'The general executive management of the Station shall be under the control of a council to consist of the president of the College, the professors of agriculture, horticulture and entomology, chemistry, botany, and veterinary science, and such other officers of the College as the Board may designate.'

"A second provision was: 'The president of the College shall be ex officio chairman of the council, and shall have the same supervisory control of the Experiment Station as of other departments of the College.'

"The professor of agriculture was designated to be ex officio director of the Station, the duties being to keep the records of all meetings, receive and maintain all general correspondence with the Station, attend to the publication and distribution of all reports and bulletins, and, under direction of the council, certify to all bills, and act as general superintendent in executing the plans of the council.' " Prof. E. M. Shelton thus became the director of the Station, and was designated by the Board as the one to exercise the franking privilege granted by the Hatch Act." (3)

The duties and scope of the work of the heads of the several departments were outlined in general terms, and it was provided that "Each member of the council shall have full control of experiments assigned to his own department, and if any question arises as to the scope of any experiment, or by whom it shall be conducted, the same shall be decided by the President of the Council." (4)

Under the plan of organization "the experiments to be undertaken by the Station were determined by the combined judgment of a group of men, and that the director was purely executive in his functions, outside the work approved for his own department; and that in case of a disagreement between, or among, department heads, the president of the College held the deciding power: This arrangement grew out of the previous equality of status of department heads, and the fact that there was none to which the others were willing to become subordinate. This form of organization continued until 1906." (5)

Hatch Money Used for Building

A provision of the Hatch Act authorized that out of the first annual appropriation so received by any state, an amount not exceeding one fifth may be expended in the erection, enlargement, or repair of a building or buildings used for carrying on the work of each station. Of the \$15,000 of Hatch funds made available

to the Kansas Station for the first year (1888), \$2,612.39 was used for the erection of a small, one-story building for offices for the Department of Horticulture. Included and connected with this building was a series of three small greenhouses or propagation pits. This building was located north of Anderson Hall on an area between the present Farrell Library and Denison Hall. This building was razed in 1953 to make room for the stack addition on the south side of Farrell Library.

Facilities for Early Experimental Work

During the early years of the life of the institution, facilities for experimental work were most meager. The farm consisted of 100 acres of poor upland. Funds for support were lacking and teaching and other duties occupied fully the time of the small faculty. Some of the early reports of the College set forth the conditions under which work was attempted. J. S. Hougham, Professor of Agriculture in 1869, wrote as follows: "It should be remembered that the institution has no barn or team, and until this year (1869) scarcely any implements or tools, and as yet no proper shelter for those we have, and hence works at great disadvantage." (6)

Professor Hougham secured \$200 this year (1869) for all phases of work on the farm. In a letter written to the editor of *Kansas Farmer* he explains how this appropriation of \$200 was used. "In April,

1869, I received two hundred dollars in 'State Scrip' to be used for the benefit of the Agricultural department of this institution. The 'scrip' was sold for one hundred sixty dollars in currency. I have used the appropriation of 1869 with the following result: Planted 600 three-year-old maple trees, 25 choice apple trees, 200 seedling peach trees, 900 grape vines, 50 gooseberry sets, 150 currant sets, and 20 assorted roses, all of which are doing well. Besides the above, I have used about twenty dollars of said appropriation in procuring flower seeds and seeds of forest trees, which were also planted." (7)

That the limitations under which work was being attempted were recognized at the time is set forth in the report of the farm superintendent, Fred E. Miller, to the President of the College for the year 1871. In his report he says, "Until the facilities of the College for the prosecution of the more complex and scientific experimentation are such as to insure thorough and continued effort, I would suggest that our operations be confined to the simpler subjects, such as methods of preparing the soil, subsoiling, extra cultivation, etc., and these in time will open the way to higher efforts." (8)

Acquisition of Land

The most significant event that occurred during the early days of the institution, both from the standpoint of teaching and research, was the acquisition of additional land.

Prior to 1875 the only land available for the use of the institution was an eighty acre tract upon which Bluemont College was located, plus an additional 20 acres adjoining this area on the east. All of this area was rolling upland, some of which was too precipitous for cultivation, and a por-

tion of it had underlying limestone rock so near the surface that the soil was too shallow for cultivation. This area also embraced the campus upon which the college buildings were located. The need for additional land better adapted for farming was fully recognized by the faculty. A re-

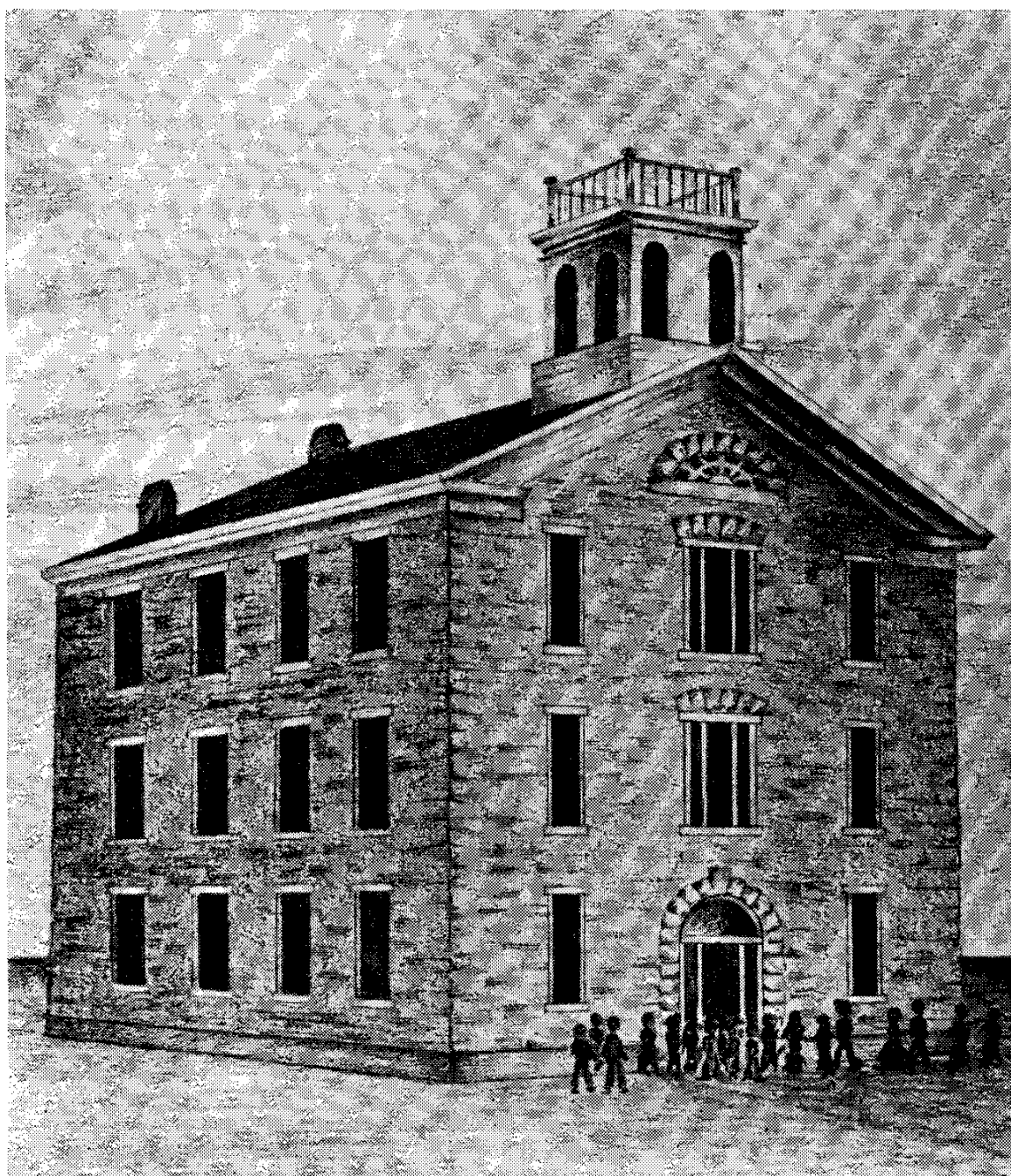


Fig. 2.--The Bluemont Central College Building. Then first college building erected in 1859 and given to the college in 1863. It was on the Bluemont College farm that the first experimental work was conducted.

quest was made of the Board of Regents prior to 1870 for authority to purchase additional land. This authority was not granted. The report of the Board for 1870 contained the following statement: "The Board of Regents decided not to purchase additional land for the farm, but to receive proposals for acquiring it by donation to the Institution and the State." (9) This was a wise decision. It resulted in steps being taken to acquire the land by donation. The first step was to secure authorization from the Legislature to permit the institution to accept such a gift and to authorize an issue of bonds for this purpose. This authorization was secured from the Legislature of 1871 when an act was passed authorizing the Township of Manhattan, Riley County, to issue bonds in an amount not to exceed \$25,000," said sum, or as much thereof as may be necessary, to be expended in the purchase and equipment of a farm, at or near Manhattan, for the use and benefit of the State Agricultural College; no part of this sum is to be issued until the voters of said township shall have voted in favor of said proposition." (10)

The second step was to secure a favorable vote upon the bond issue by the voters of Manhattan Township. This was done. The report of the Regents for 1871 states that "In the month of April the township of Manhattan by a decided majority, voted \$12,000 in bonds for the Insti-

tution. These bonds were duly issued, and in July the Regents purchased 155 acres of valuable land northwest of the town."* "They also purchased 160 acres, mostly of bottom land, on the Wild Cat creek, making a farm of 415 acres, 315 acres of which is under cultivation." (11) Additional information concerning the purchase of this land is contained in a letter written by Rev. R. D. Parker, Secretary of the College, and published in the August 15, 1871, issue of *Kansas Farmer*, which in part reads as follows: "The Board (of Regents) have added \$25,000 to the \$12,000 in bonds voted by Manhattan and have purchased one hundred sixty acres of rich creek bottom upon the Wildcat and one hundred fifty-five acres of second bottom and hill land adjoining Manhattan town site. This purchase is all under fence, and mostly under cultivation; and the site nearest the city is one of the finest for a great institution that can be found in the Kansas Valley." (12)

The land purchased on Wild Cat Creek (SW1/4, S 13, T 10, R 7) was obtained from two individuals. The north 80 from Jesse Ingraham for a consideration of \$3,440 (transfer recorded in office of Registrar of Deeds, Riley County, Book G, p. 764, July 11, 1871) and the south 80 from Walter Richeson for a consideration of \$3,440 (transfer recorded in office of Registrar of Deeds,

* This is the tract upon which the main campus of the College is now located.

Riley County, Book G, p. 774, July 13, 1871). This entire quarter section (160 acres) was resold by the College on July 27, 1872, to Jesse Ingraham, the man from whom the north 80 had been purchased the year before. The selling price was \$7,200, or \$320 more than the College had paid for it. The reason for this sale is not known. This left the College with 260 acres of land.

The donation made by the citizens of Manhattan Township in providing money for the purchase of land had a most desirable effect upon the people, of the state and upon the attitude of the Legislature toward the financial support of the College. It was not until after this donation that the Legislature appropriated for the support of the College with any degree of generosity. It also gave great encouragement to the faculty. It really marked the most important first step forward in building at the College a great educational institution. The Editor in the June 15, 1871, issue of the *Kansas Farmer*, after reporting the gift, commented as follows: "The outlook for the prosperity of the State Agricultural College was never so flattering as now." (13)

The acquiring of additional land, while providing a much needed resource without which the institution could not have provided for its needs in either agricultural instruction or research, did at the same time present problems. While the land acquired was basically well adapted for its purpose,

the condition of the land at the time of its purchase, from the standpoint of husbandry, left much to be desired. Some of the problems were discussed by the superintendent of the College farm, Fred E. Miller, in the annual report of the College for 1872, the first year after the land was purchased. Mr. Miller wrote as follows: "A brief summary will indicate the circumstances under which we began the season's work. Two hundred and sixty acres--in two tracts--and with the exception of eighty acres upon which the college buildings stand, so poorly fenced that cattle trespassed at will upon every field--were awaiting

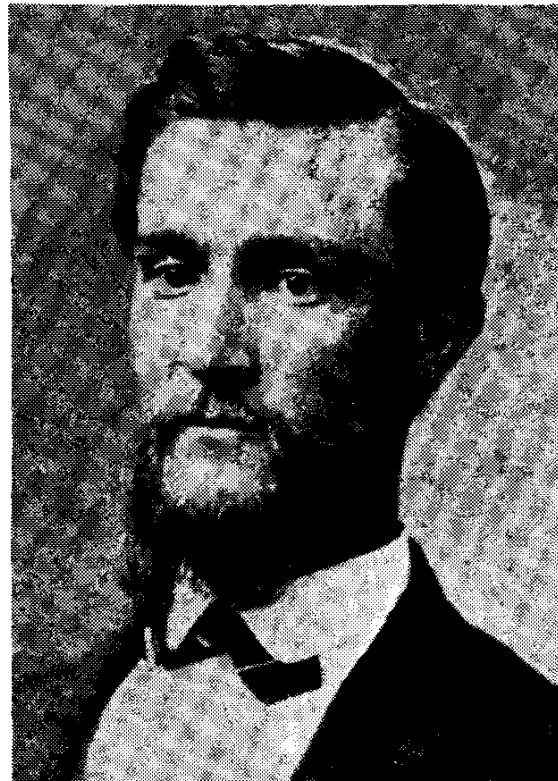


Fig. 3.--Major Fred E. Miller, Professor of Practical Agriculture and Superintendent of the Farm, 1871 to 1874. "He took up with great vigor the development of the College farm."

cultivation in the season soon to open. The land itself (newly purchased), was overrun with weeds, prominent among which were bur-grass* (*Cenchrus tribuloides*), cocklebur (*Xanthium strumarium*), the smart-weed (*Polygonum*) by the solid acre, giving the most encouraging indication to be found of the natural fertility of the soil, but which fertility, however, had been greatly reduced by long neglect, careless and superficial supervision, and from want of rotation of crops and application of manure. To cultivate these two hundred and sixty acres, the department had under its command one employee . . . , one team of mules, harness and wagon; one serviceable turning plow; one square harrow; two cultivators; one roller seed drill; one reaper and mower; one revolving rake and a few hand tools. . . . It was a gloomy outlook. The treasury was worse than empty. The season was rapidly advancing and the Legislature had, as yet, made no provision for the support and the development of the industrial department of the college. Such, then, was the condition of affairs toward the close of February 1872. . . . Relief came, however, early in March, the Legislature appropriating fifteen thousand dollars for the development of the industrial departments of the college during the current year." (14)

While the \$15,000 appropriated for the industrial departments was encouraging, es-

pecially in providing funds for the fencing of the farm and for the starting of a barn, it fell far short of meeting the apparent needs of the institution. Some of these needs were presented by the Editor of the *Kansas Farmer* in an editorial published March 1, 1873. It reads as follows: "It is an assured fact that if we are to ever have a creditable institution at Manhattan, the State must do its part. By liberal local donations and personal sacrifices upon the part of the worthy President, we now have a magnificent body of land enclosed with an excellent stone fence. We have some fine orchards and groves of forest trees started. We have one wing of a farm barn in a half completed state. We have two good farm teams and a very limited supply of farm tools. And if we except a fine geological cabinet, built free of expense by the indefatigable labors of Professor Mudge and a tolerable library, this is all there is to the Agricultural College of Kansas. Not a breeding animal upon the place, and no place to keep them if we had them. No college building worthy of the name. No chemical apparatus with which to teach chemistry. Have we a right to expect any very important results from such a condition of affairs? Have the farmers of the State the right to ask the Legislature appropriate to their College a sum sufficient to put it on a working basis? What this sum should be the Com-

* Now called sandbur *C. paniciflorus*.

mittee appointed by the Legislature to look the ground over are more competent to judge, perhaps, than we are. It suggests itself to our mind, however, that the foundation of a new College building should be laid out this season. The wing of the barn must be completed to save what has been done. The farm must have some stock to utilize the feed raised. Chemical apparatus must be procured, or the foundation of an Agricultural education cannot be laid, and the fund must be provided with which to pay student labor. It is well known that the salaries of the Professors are provided for from the sale of lands, but this is the only use to which that fund can be put. All the rest must be done by the State." (15)

Obstacles to Progress

Many obstacles stood in the way of the state meeting these obligations. During the next decade the state suffered many vicissitudes. From a climatic standpoint conditions could hardly have been less favorable. The seasons were most unfavorable for crop production. In addition a severe invasion of grasshoppers occurred in 1874. The extent and severity of these disasters to the crops and orchards of the College farm are set forth in reports of the College for 1875. Professor Shelton of the Farm Department wrote as follows: "The season just past had been in this locality one of unusual severity. The remarkably dry season of 1874 has been followed by a

winter and spring during which the rainfall was exceedingly light and insufficient. As a result, the crops have suffered from the drouth from the very outset. When to this are added the ravages of grasshoppers in the spring and early summer, the cause of the light crops of 1875 in this locality will be easily understood. To particularize, our winter wheat passed through the winter without suffering material injury, and up to the middle of May promised a large yield. About this time the grasshoppers ruined six acres outright, and from then until harvest-time the remainder suffered so severely from the dry weather, that the average yield was less than ten bushels per acre of inferior grain. Substantially what has been said of the wheat crop may be said of all crops upon the College farm." (16)

The damage suffered in the orchard was even greater. Professor Gale, Superintendent of the Horticulture Department, reported as follows: "The ruin was most complete in the experimental apple orchard. The extent of this may be comprehended by the fact that out of more than one thousand varieties of apple trees . . . we have only twenty-one varieties remaining, and some of these seriously, if not fatally, injured" (17). Losses similar to those suffered by the College were suffered likewise by the farmers throughout most of the state. In some places destruction was complete, leaving the farmers and their families destitute. Many

farm families left the State, returning to their former homes. However, others were able to remain through generous gifts of clothing and food. It was not a time when generous appropriations by the Legislature for the support of the College could be expected. They were not made.

Furthermore, it was during this period (1870's and 1880's) that the country as a whole passed through a severe economic depression. This added further to the severity of economic conditions in Kansas. It encouraged the frugality of the people of the state and delayed further financial support to the College by the Legislature.

The third factor that without doubt delayed financial support for the College was the controversy that arose during this period as to the character of the education that should be offered by the College -- cultural or vocational. This controversy resulted in the resignation of President Denison and the appointment of President Anderson. It also resulted in the dismissal by the Board of Regents of three leading members of the faculty, Professor B. F. Mudge, Professor of Geology and Zoology; Fred E. Miller, Professor of Practical Agriculture and Superintendent of Farms; and Dr. H. J. Detmers, Professor of Veterinary Science.

So much time and thought by both the faculty and the friends of the institution was given to this controversy that

progress in other respects was retarded and financial support by the Legislature was no doubt delayed.

However, progress was made gradually toward the development of the College in ways that would prepare for agricultural research and provide a foundation for the establishment of the Agricultural Experiment Station. Among these accomplishments was the acquisition of additional tracts of land for the College farm.

Land Purchased for Experimental Work

The Third Biennial Report of the College for 1881-1882 states that "a lot of 16 acres adjoining the College farm being offered for sale at \$40 an acre, it was thought best to secure it, although no authority had been granted by the Legislature for such a use of funds." (18) Regarding this purchase Professor Shelton the next year reported as follows: "The purchase of sixteen acres north of the College farm, made by the Board the past winter, has proved greatly to the advantage of the farm in many ways. This field . . . has been enclosed with a substantial fence, made of three boards and two barbed wires, with posts set every eight feet." (19)

With the acquisition of this sixteen acres "the College farm, including the old College farm, occupies 271 acres, of which, roughly speaking, there is used by the horticulture department and occupied by the grounds and buildings

about 52 acres. Of the remaining 219 acres about 140 acres are in use as arable lands and tame-grass meadows, leaving 79 acres of unbroken prairie." (20)

The purchase of additional land was authorized by Act of the Legislature approved March 4, 1885. Section 1 of this Act reads as follows: "That the Board of Regents of the Kansas State Agricultural College be authorized to purchase additional land for EXPERIMENTAL purposes out of income fund of said College, not exceeding 10 percent of the amount derived from the endowment fund of said institution for the years eighteen hundred eighty-four and eighteen hundred eighty-five." (21) Following this action by the Legislature the Board of Regents purchased additional tracts totaling 44 acres of farm land. Regarding this land Professor Shelton, in his report submitted June 30, 1886, wrote as follows: "The recent purchase by the Board of forty-four acres additional land for use of the farm, while a welcome and much-needed increase in the field of farm operation, is yet likely to add much to the rough work of the farm for some years, without being of very direct value. About 32 acres of this new purchase was, when secured by the Board, in the condition of raw prairie, for the most part unfenced." (22) The college farm at the time of the establishment of the Experiment Station contained therefore 315 acres of land made up of

tracts as follows: The old Bluemont College farm, 100 acres; the purchase in 1871 (the present campus of the College), 155 acres; the purchase in 1881, 16 acres; the purchase in 1886, 44 acres; a total of 315 acres.*

Professor Shelton in 1883 explained as follows the purpose for which the college farm was operated: "The College farm is not an experimental station, although fairly well equipped for practical and experimental work. Rather the farm is maintained as a part of the educational machinery of the College. Its object is to furnish instruction to the students of the College, no less than to aid, by experimental investigation, general agriculture. It should be said, however, that the policy is to enlarge as far as practicable, the experimental work of the Farm Department." (23)

Purchase of Livestock

There is no record of the institution owning livestock during the first few years of its existence. In 1869 Professor Hougham, in his annual

* The 44 acres of land purchased in 1885 consisted of several small blocks purchased from the Beebe estate August 29, 1885. Willard, in his history of the College, on page 89 mentioned the purchase of eight small tracts totaling 68 acres. The eight tracts mentioned by Willard must refer to the purchases of both 1881 and 1885. But the area reported by Willard totals eight acres more than can be accounted for in the recorded purchases of the Board of Regents. Willard's records of purchases would give a total area of 323 acres for the farm. This must be in error, since Shelton (Fourth Biennial Report of the College, 1883-1884, p. 95) gave the size of the farm in 1884 as 271 acres. When to this is added the 44 acres purchased in 1885, it makes a total area for the farm of 315 acres, not 323 acres as reported by Willard.

report, wrote that "It should be remembered that the institution has no barn or team." (7) But in 1870 he says "We hope to have a wagon and team of horses." (24) The following year (1871) Fred E. Miller, farm superintendent, reported that "A span of mules that has given excellent satisfaction has been purchased by and with the advice of Regent Higinbotham at a cost of \$500." (25) Additional work stock was purchased in 1872 following an appropriation of \$15,000 by the Legislature for the development of the industrial departments of the College. These purchases consisted of one span of mules three years old, \$400; one span of mules seven years old, \$400; and a saddle horse four years old, \$100.

There is no record of the institution owning livestock other than mules and a saddle horse prior to 1873. Fred E. Miller, in his report for 1872, states "That other stock than mules and horses mentioned should be placed upon the farm at the earliest possible moment. . . . The principal breeds of cattle, sheep and swine, should be represented here as soon as accommodations are secured for their proper keeping. An appropriation for this effect is sadly needed." (26)

This need was met the next year (1873) when \$4,322 was spent for the purchase of livestock. Cattle, swine and chickens were purchased. Four breeds of purebred cattle were obtained--Durham (Shorthorn), 3 cows and one

bull; Devon, two cows and one bull; Galloway and Jersey, one cow and one bull of each breed. The highest priced animal purchased was a two-year-old Durham cow, Grace Young Fifth, for which \$1,080 was paid. In addition to purebred cattle a grade Durham nurse cow and three grade steers (3 years old) were also purchased. Four breeds of purebred swine were purchased--a pair of Essex and a trio each of Poland China, Chester White and Short-faced Lancastershire. Three varieties of chickens were purchased--a trio each of Buff Cochin, Black Brahma, and Houdan hens. The institution was also presented with a pair of Leghorn White chickens. The Board of Regents the same year also negotiated for the purchase of a fine herd of Berkshire swine from which during the year upward of \$100 worth of young pigs were sold for breeding purposes.

The purchase of purebred cattle by the College did not meet with universal approval. An attempt was made to prevent it in 1876 by the Ways and Means Committee of the Legislature. An article in the February 19, 1876, issue of *The Industrialist* states that the "Agricultural College bill just agreed upon by the Ways and Means Committee . . . provided that the Regents shall order the discontinuance of the buying of blooded cattle." This provision of the bill was not enacted.

The breeds of Devon cattle and the breeds of Poland

China, Chester White and Lancastershire swine were soon discontinued by the College. The inventory of cattle and swine for 1878 shows the following breeds represented: Shorthorn, Jersey and Galloway cattle and Essex and Berkshire swine.

The Aberdeen-Angus breed of cattle appears on the inventory first in 1883-1884, and Herefords in 1887-1888. At the time of the establishment of the Experiment Station the livestock owned by the College consisted of the following: 48 head of cattle of the following breeds: 28 Shorthorns, 14 Jerseys, 4 Aberdeen-Angus, and 2 Herefords. "Two pair of Galloway, for some time owned by the college, had just been sold." Two breeds of swine--about 30 Berkshires and eight Poland China. The work stock

consisted of two teams of horses and a saddle pony.

No sheep were owned by the College prior to the establishment of the Experiment Station although this was regretted by Professor Shelton who, in his report for 1879-1880, expressed himself as follows: "I desire . . . to call attention of the Board to the fact of the general awakening of our farmers to the importance of sheep husbandry, and to state my convictions that the College farm should not be behind in this matter, but that it ought to number in its 'illustrative apparatus' representatives of at least two breeds of sheep--say Cotswolds and Merinos." (27)

Physical Plant

At the time of the passage of the Hatch Act the College possessed a physical plant

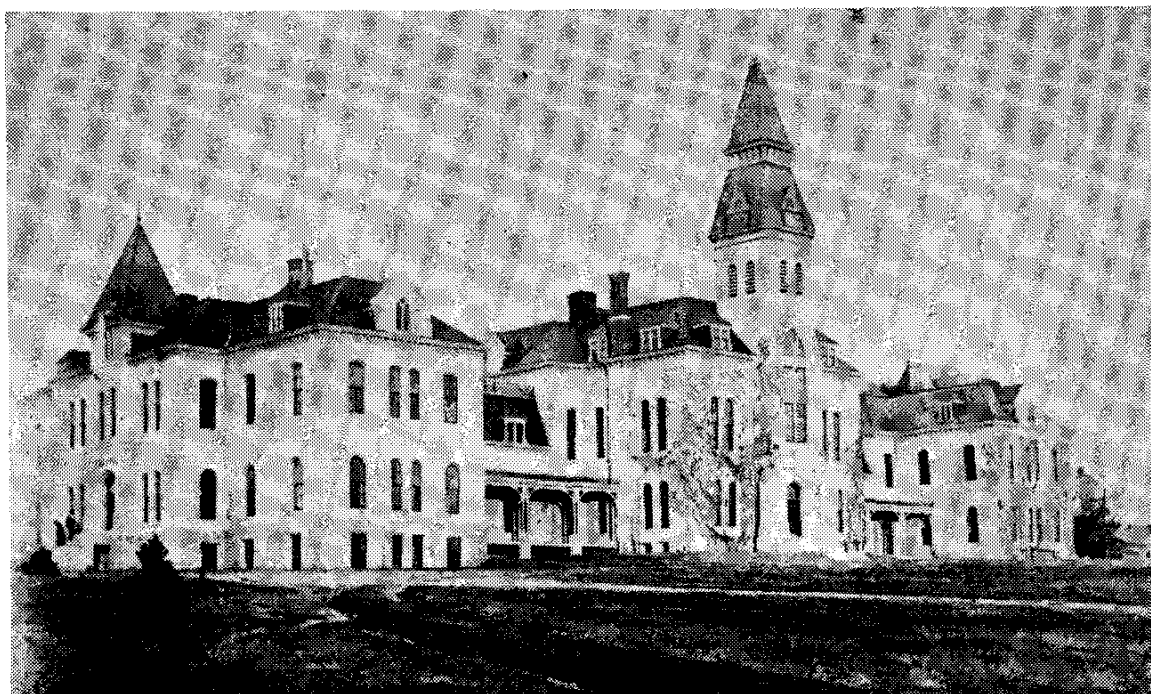


Fig. 4.--Anderson Hall. About the time of its completion in 1884. The right wing of this structure completed in 1879 was called at the time the "Practical Agricultural Wing."

that provided many of the essential facilities needed for investigational work. The farm of 315 acres has been described. The main college building, named later Anderson Hall, was built piecemeal. The first section, the north wing, called at the time the Practical Agricultural Wing, was completed in February 1879. The building as a whole was completed in 1884. This building provided offices and work space for a part of the early staff of the Experiment Station. The first barn at the institution was started in 1872 on land recently acquired, now the main campus of the University. A description of this building as planned was published in the report of the State Board of Agriculture for 1872. It never was completed as planned and was used as a barn for only a short time when in 1875 it was remodeled for general college purposes. The January 29, 1876, issue of the *Industrialist* has this to say about the barn.

"A year ago we had a barn, a substantial, stone edifice, costing \$11,000. It had fine windows, beautiful ceilings, and handsome doors. It was warm, dry and pleasantly located. In short, everything that could appeal to the higher and better natures of animal kind had been done for the place. But even here there were disadvantages. A load of hay could not be driven into the barn. The half mile walk for water exercised both man and beast and was inconsistent and expensive, as two men were constantly required to care for the stock. So we cheerfully surrendered this spacious dwelling of our high bred animals to the literary de-

partment, marched our stock across the fields till we found water and plenty of it; and close by a building was erected. This building cost-\$173; it is quite as comfortable and more convenient than the \$11,000 affair, for although our herd has nearly doubled, one man finds no difficulty in doing all the 'chores.' "

After remodeling, the barn became the chief College building and remained as such until the north wing of Anderson Hall was completed in 1879. At the time the Hatch Act was passed, a portion of the old College barn building was used by the Department of Botany and Zoology for offices and laboratories. It also housed the museum. It has since served many useful purposes, including accommodations for the Department of Agricultural Engineering. It was condemned a few years ago but still stands between Waters and Veterinary Halls. It is usually referred to as the "old armory."

A second stone barn was built in 1877 at a cost of \$4,000. It consisted of a main floor and basement, was 97' long and 48' wide. It was built of limestone erected in the best style of rubblework. It provided space for 32 head of cattle and seven horses. It also had a root cellar that would store 2,000 bushels of roots. Concerning this barn, Professor Shelton wrote as follows in his report of December 31, 1878: "Since last November the new barn has been in constant use and I am prepared to speak positively of its merits. Accustomed as our herd was to an old shed which leaked like a sieve, and which

after every rain was more than ankle-deep in the most tenacious mud, we can appreciate the blessings of warm, dry stables, convenient granaries and bays, and dry, roomy yards such as the farm now has." (28)

This barn soon became inadequate, especially for the livestock experimental feeding work that was being started at about that time. In 1884 Professor Shelton writes, "We need a good barn, the same to be devoted exclusively to experimental work." (29) The next Legislature appropriated \$4,500 for an experimental barn and \$1,000 for a cattle shed and corn crib.

The appropriation of \$4,500 for the barn was used to build an addition to the one built in 1877. The original barn was 97' x 48', and the new addition built primarily for experimental purposes was 76' x 48'. It was constructed of stone to match the original barn. A basement 9' 6" high underlay the entire barn, with an upper story 16' high. The barn furnished room wholly in the basement for 51 head of cattle, with additional rooms for

pens and stalls that increased the capacity fully one-half. A silo was built with walls of solid masonry in one corner of the barn. In addition to ample storage space for hay, fodder, roots, grain and prepared feed, the barn had an engine room and fuel room with masonry walls, as protection against accidents from fire. It also had an office and specimen room where the records of the farm were kept and for storage of specimens of farm and experimental crops. The barn was completed in 1885.

In addition to the barn an experimental piggery building 42' x 24', constructed of stone and having ten pens separated longitudinally by a 4' alley, was built at a point east of the new addition to the barn and at right angles to it.

This barn, as enlarged, served until 1914 when it was razed and the material used, in part, for the construction of a third stone barn. This barn was located on land north of the campus proper. The construction of the east wing of Waters Hall in 1913,



Fig. 5.--The second stone barn built in 1877 at a cost of \$4,000 as it appeared after its enlargement for experimental work in 1885.

located a short distance southwest of the old barn, made the removal of the barn desirable. A full description of the barn is contained in the Appendices of the Fifth Biennial Report of the Kansas Agricultural College, 1885-1886, pp. 120-125.

In 1876 an appropriation of \$4,000 was secured for a horticultural and botanical building. A one-story building 31' x 80' was built, having a basement with work shops and cellars. It served the departments of horticulture, entomology, botany and zoology until botany and zoology were moved to the "old Armory" building shortly before the establishment of the Experiment Station. Professor Gale, head of the Department of Botany and Horticulture, in his report for 1876, says, "We are now provided with a commodious Horticultural Hall and lecture room with ample work-room and cellars for the storage of roots, vegetables, and fruits." (30) In the fall of 1880 a small structure 13' x 24' to be used as a propagating pit and greenhouse was built in the southeast angle of the Horticultural Hall. It was heated by a small brick furnace with flues passing under the benches. It was utilized for greenhouse purposes and for the propagation of plants from cuttings and seed. The building was utilized first for work in horticulture, botany and entomology and was used later by the college photographer. It was razed in 1959 to provide for the location of the new Denison Hall.

Another building that was utilized in part for experimental work before the Experiment Station was established was the Chemistry Building, erected in 1876. \$8,000 was appropriated for this building. The Regents in their report of December 16, 1876, stated, "The laboratory is a stone building, pointed range work, one story, cross-form 109' x 109'. . . . It is admirably designed, and furnishes more room and better laboratory facilities than any building of its cost in the United States." (31) A woodcut and description of the building were published in *The Industrialist* of October 12, 1876. The building still stands directly north of Anderson Hall and houses the Department of Mathematics.

Perhaps more progress might have been made in providing buildings and equipment suitable for experimental work during President Fairchild's administration (1879-1897) if it had not been the opinion of the President "that the state should be asked to furnish only the buildings and the services for which it was obligated under the Morrill Act." (32) It was the feeling, especially on the part of the faculty who were interested in investigational work, that not as much was done as might have been done to provide equipment for experimentation. This may account in part for the use of a portion of the first appropriation under the Hatch Act for the construction of facilities for

horticultural investigational work.

President Fairchild's attitude toward investigational work appears to be more that of a cautious administrator rather than one lacking appreciation for such work. In his article "Farm Experimentation for Colleges," previously mentioned, he expressed himself further as follows: "For the most part, no means for special experiments have been provided, and no adequate opportunity has been afforded, while the people have looked for results far out of proportion. It has been the old story of 'bricks without straw'. . . . Finally, no satisfactory answer has ever been given to the question of expense. Frequently, no estimate can be sufficiently accurate beforehand, and no adequate fund is placed at disposal of the careful experimenter, or results seem out of

proportion to the expense, and dissatisfaction is the result. All these considerations need to be generally and effectively weighed before public expectation can be reasonable toward our colleges, and before the colleges can decide upon their proper share in this great work of increasing the stores of accurate knowledge. Sometime, in the not far distant future, endowed experiment stations will work out problems impossible of solution in college work and private enterprise will do still more." (2)

The faculty of the College in general was unwilling to await the endowment of an experiment station before undertaking experimental work. They felt compelled to do what they could with the limited resources at hand. No member of the college faculty was more enthusiastic about experimental work than Pro-

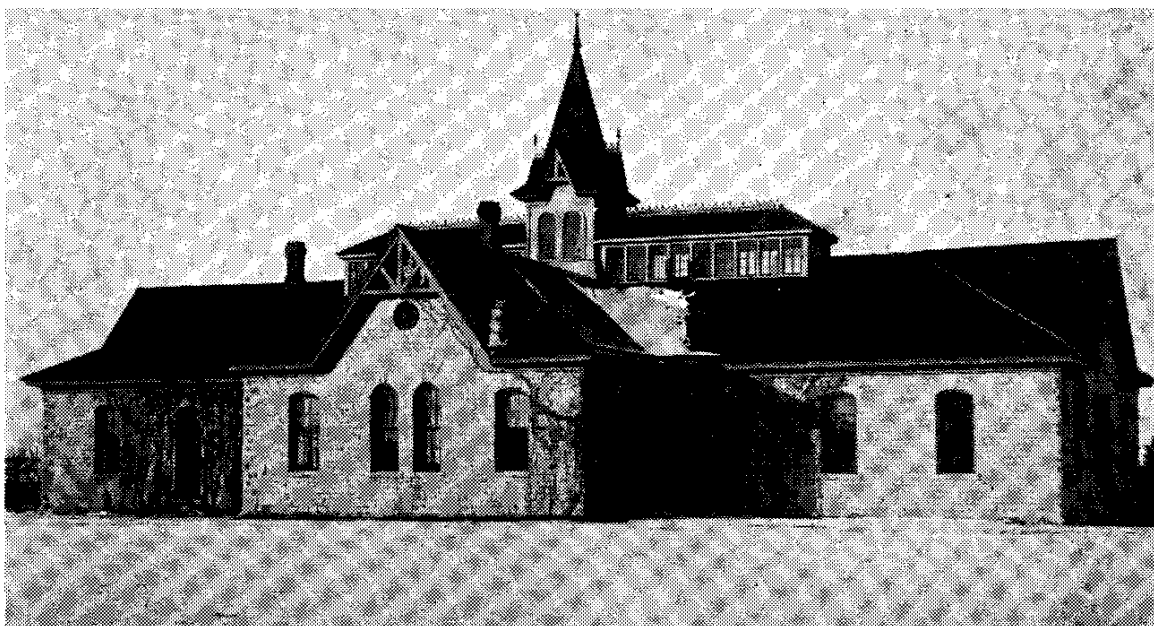


Fig. 6.--The Chemistry Building built in 1876 at a cost of \$8,000 was reported to "furnish more room and better laboratory facilities than any building of its cost in the United States."

fessor Shelton and no department was more active than the Farm Department in such work. He expressed not only his own attitude but the attitude in general of the faculty when he wrote in 1886 as follows: "Of all the work done in my department, it is at least doubtful if any brings as quick a return as this (experimental work) in popular appreciation. In the past year the cost of our experimental work has been paid out of general college funds. In view of the public character of this work, I suggest the State Legislature be asked to meet the cost of our future experimental undertakings. About \$500 will be required to meet the expenses of experiments planned for the coming year." (33)

The Library

The institution had the beginning of a library when the Hatch Act was passed. "A careful inventory of the books June 30, 1887, gives the following results: 6,572 bound volumes valued at \$10,211.76; 2,350 bound pamphlets valued at \$45.00; 360 bound volumes of duplicates valued at \$101.75. Total value of books, \$10,358.51." (34) The appropriation for the purchase of books for the year was \$500.

Professor Lantz, Chairman of the Library committee of the College, expressing the needs of the library at the time, wrote as follows: "The most serious need of the library, at present, is more room. . . . At the farthest but two more years will bring us

to the limits of our shelf-room. Our present reading-room is far too small, and is really unfitted for the purpose. It is poorly lighted, and has only standing room for readers, and but little of that. The reading-table has not sufficient space for the proper arrangement of our magazines and exchanges." (35)

Agronomic Investigations

The early agronomic investigational work, as Fred E. Miller, farm superintendent, reported, was "confined to the simpler subjects." It consisted of studies of the adaptation of different crops to the climatic conditions of the region, variety tests of the more important crop plants, tillage tests, fertilizer experiments, and crop sequence studies. The annual report of the President for 1869 shows that during that season eight varieties of wheat, four varieties of oats, two varieties of barley, two varieties of rye, six varieties of Irish potatoes, and two varieties of sweet-potatoes were grown. Buckwheat was also grown. The report also states that "Our experiments with corn the past season (1869) do not favor very early planting on upland."

J. S. Hougham, professor of agricultural science, reported in 1870 that one half acre of dwarf broom corn was grown, that it was in "high favor" and that seed was made available to supply those who desired it. This is the first instance of record of the distribution of seed by the College

to farmers. No indication of the amount of seed distributed is available and the report does not state whether the seed was sold or distributed without cost to farmers.

The production and distribution of good seed of improved crop varieties continued to be a service of the College throughout its early days. Professor Shelton, in 1880, wrote, "In addition to sending large quantities of seed to different parts of the State, we have, by correspondence, been enabled to place a large number of farmers in communication with reliable dealers in seeds not easily accessible. This branch of work has been to us very pleasant: and we know that it has been profitable to our farmer friends." (36)

Wheat Variety Tests

Wheat of different kinds and varieties was tested. More attention was given to spring wheat than the value of the crop proved to deserve. Some of the early spring wheat varieties tested were White Australian, Red Australian, and White Oregon. As spring wheat proved unadapted, attention turned more to tests of winter wheat. An importation of seed of winter wheat was obtained from France (variety "Touzell") in 1869. It was tested extensively the next two years but proved unsatisfactory. "Other foreign varieties of wheat that were tested on the College Farm gave unsatisfactory results." (37) Five varieties of winter wheat, Early

May, Golden Straw, Silver Chaf, Arnold's Golden Metal, and Fultz, were grown in 1879. Early May gave the best results. Professor Shelton, under whom the tests were conducted, reported, "Of the considerable number of sorts tried by us during the past six years, none proved equal to the red Early May." (38)

Fifty-one varieties of winter wheat were sown in 1887. All of these appear to have been soft wheat. In summarizing, Professor Shelton states, "The results of our experience with something over one hundred sorts of winter wheat have abundantly satisfied me that the Kansas farmer can only rely upon the fine, early ripening red sorts--often of southern origin--of which Early May and Zimmerman are types." (39) The College had made no tests of Turkey type wheats prior to the establishment of the Experiment Station.

Corn

Corn was a more important crop than wheat in the economy of Kansas in the days before the Experiment Station was established. It was better adapted to growing on sod land than wheat and could be grown with less mechanization. Corn was also grown more extensively than wheat on the College farm. King Phillips was one of the most popular varieties. Experimental work with corn consisted of testing varieties of both dent and flint corn, methods of planting, a comparison of the planting in drills with the

ordinary old method of planting in hills, the value for seed purposes of seed, with the number of rows varying from 12 to 24 rows of corn on the cob, a trial of seed corn from butts, centers, and ends of the ears, a comparison of large and small dent corn, the value of subsoiling and manuring, the influence of the thickness of planting on yield and quality, and the value of gypsum as a fertilizer for corn.

An acre yield test of corn was conducted on the College farm in 1872. "On September 26, one acre was measured from center to center of space between rows, by a committee of disinterested neighbors." This committee certified to a yield by weight of 6,400 pounds or 88.7 bushels to the acre.

Alfalfa

As early as 1874 it was reported that "Experiments have been inaugurated the past season with twenty-two varieties of clovers and grasses, and to this number additions will be

made as fast as they can be obtained." (40) The varieties planted were not given, and it is not known whether alfalfa was included. The first mention of alfalfa was in 1875 when Professor Shelton wrote, "The success which has attained the cultivation of this plant (alfalfa) in California and in various South American countries gives it a special promise for Kansas."

(41) Experience with alfalfa on the College Farm antedated the time of this report. Later Professor Shelton reported "Our experience with alfalfa . . . began in the spring of 1874 when we sowed two pounds of seed with oats in the piggery yard. . . . To our great surprise the alfalfa survived this hard treatment and the following spring we found many plants growing vigorously. In the spring of 1875 we procured forty pounds of seed, mostly from California; this was sown in several plats, with grain and alone and upon different soils. . . . Thus far



Fig. 7.--The College Campus about 1877 showing the Chemistry Building on the left, the Horticultural Building in the right center, and the "Old Armory" on the right. The building in the center left is the "Shops."

all have done well." (42) The next year (1876) six acres of alfalfa were seeded on the College Farm.

In 1880 Professor Shelton reported as follows: "In regard to the value of alfalfa for Kansas, I have no hesitation in saying that, all things considered, it is our most valuable clover. . . . Alfalfa is perennial, perhaps eternal; at all events it will outlive the 'oldest inhabitant.' It makes the most pasturage for neat stock and the best 'hog pastures.' It cuts the most hay; we cut four crops from the same ground last season. And these, briefly, are my reasons for believing in alfalfa." (43) A little later (1885) shortly before the establishment of the Experiment Station, Shelton wrote with somewhat more restraint. He said, "In general, it may be said that no grass or clover can be permanently successful in Kansas that has not the ability to withstand high temperatures and drouth as well as severe freezing. . . . In a course of long experience with tame grasses in Kansas the idea has steadily grown with me that orchard grass is generally our best and most successful grass. . . . Alfalfa is also sure to be a favorite with Kansas cultivators, although a wider experience is needed to determine accurately its place." (44) There is no record of bromegrass (*Bromus inermis*) having been grown on the College farm before the establishment of the Experiment Station.

Most kinds of crop plants available at the time were being tested. Fairly extensive varietal tests of oats, barley, mangoes, and potatoes were conducted. Rye, flax, hemp, buckwheat, castor bean, millet, sugar beets, and cowpeas were grown. Also most of the tame grasses and several legumes in addition to red clover and alfalfa were grown. In 1874 two acres of mangoes were grown, yielding 287 bushels of roots to the acre. A root cellar, capable of storing 2,000 bushels of roots, was built in the basement of the barn constructed in 1877. Roots provided succulent feed for cattle during the winter months, much as ensilage has done at a later date.

Sorghums

Sorghums were not grown extensively in the early days by the College, and those produced were chiefly of the saccharin types. They were creating more interest on the campus at the time from the standpoint of the production of sugar than for feeding purposes. They had, however, become an important crop for rough feed by the time the Experiment Station was established. In fact, a report of the activities of the College farm for the season 1886 shows that "during the first week in September eighteen tons of sorghum were cut into inch lengths and packed away in the silo for use in the condition of ensilage." (45) This was probably the first crop to be put in the silo that was constructed in a corner of the

experimental barn completed in 1885.

Fertilizer Investigations

Fertilizer investigations were started at an early date. Two materials that were readily available were stable manure and gypsum, stable manure from the barns and feed yards in the town of Manhattan, and gypsum from the deposits along the Blue River Valley to the north of Manhattan. In the spring of 1872 farm work was delayed by inclement weather. The farm superintendent reported on the use of the time as follows: "At the first start, heavy frosts, night after night, stiffening the soil to an inch or more in depth, delayed work for a time; but the interval was well employed in hauling manure from the town--the three teams (one wagon b o r r o w e d)--hauling and spreading by actual weight from fifteen to twenty tons per day. This has been continued at every odd hour through the season, weather permitting, upward of five hundred tons having been spread." (46)

A study of the influence of manure in the production of wheat together with different methods of preparing the soil for the crop was started in 1872. More extensive plot work with both manure and gypsum was started in the fall of 1875. Two sets of experimental plots were laid off for the purpose of testing the efficacy of well-rotted barnyard manure and gypsum or plaster applied as a top-dress-

ing on wheat. All told, 16 experimental plots were employed. The general plan of experiment was to begin each series with a plot to which manure was applied; to the next plot nothing was applied, and to the next, plaster. The treatments were replicated. Manure was applied in February at the rate of 28 loads to the acre, and the plaster, which was secured from Blue Rapids, Kansas, was applied at the rate of 160 pounds per acre. Gypsum was also tried on alfalfa and corn. Four experimental plots were laid off in an alfalfa field and plaster applied at the rate of 160 pounds per acre on alternate plots in early April. Finally plaster was tried on corn in hills, one teaspoonful of plaster to each hill, after the corn had been up one month. Six plots were used, untreated plots alternating with plastered plots as in the other experiments. The results were summarized as follows: "1. For the application of manure as a top-dressing to wheat, for the present season, no increased yield of grain, and only a slightly increased yield in straw is shown. 2. For the application of plaster to wheat, no increase in either grain or straw is shown, and for the use of plaster on corn only a very slightly increased yield of grain. 3. The application of plaster to alfalfa increased yield of hay 326 pounds per acre." (47)

In 1877 further work was undertaken in which ashes as well as manure and plaster

were tested. Results were much the same as for previous years. Reporting on the work, Professor Shelton wrote, "The results of this experiment correspond very closely with a similar one made upon the College farm in 1876. It seems to show that upon our uninjured prairie soils, and during such favorable seasons as have lately favored this State, manure upon wheat is of doubtful value." (48) Much the same results were obtained in 1883 when tests were conducted with manure applied to corn. Salt was also used as a fertilizer upon wheat without beneficial results.

After more than ten years of experimental work with barnyard manure as a fertilizer, Professor Shelton summarized the results as follows: "In our experience, manure made during the winter months and hauled afield the following spring is rarely of much benefit to crops grown the first year after such application. The second and third years, however, have generally shown very decidedly the beneficial effects of a dressing of barnyard manure. Manuring even when the manure costs nothing, is always an expensive operation; the true policy of Kansas farmers, therefore, is to maintain the condition of the farm by judicious cropping, thorough cultivation, and pasturing, so that general manuring may be avoided and the annual yield of manure applied to particular crops

and easily-accessible fields." (49)

Some experimental tillage work was undertaken. It consisted of subsoiling, particularly for corn, and harrowing of young, growing winter wheat in the spring. Neither practice proved particularly beneficial.

Horticultural Investigations

Next to agronomic investigations, experimental work in the field of horticulture was the most extensive in the early years of the College. Two reasons at least account for part of the attention given this type of work. First, it could be done with the limited resources available. Not much expense was involved and the work could be done with hand labor, the most of which was supplied by students. In the second place, there was urgent demand upon the part of the early settlers for information as to the types of trees that could be grown successfully under prairie conditions. Also for information as to plants that could be grown for fruit production and for the beautification of the frontier homes. The interest that existed in the planting of forest trees on the prairie at this time was great. President Denison stated the situation as follows in his report to the Regents in 1872: "The question of raising forests is vital to Kansas, not only in respect to fuel, fences, lumber, railroad ties, etc., but for wind-breaks, and to modify the climate and secure a more full

and equal distribution of moisture on the plains." (50)

Interest in the planting of forest trees was also manifest by the passage of the "Timber Act" by Congress in 1873. This act permitted homesteaders to file on up to 160 acres additional land when one fourth of the additional area was planted to trees, following approved methods. While the investigational work with trees at the College was not early enough to serve as a guide to planting under the "Timber Act," it did serve to check upon the results that the settlers secured and confirmed the difficulties that they encountered.

Early horticultural investigations at the College were along the following lines: (1) Fruit and orchard investigations. (2) Forest tree and shelterbelt investigations. (3) Vegetable studies. (4) Work

with ornamental plants and flowers.

Orchards

The first fruit orchard on the College farm was planted in the spring of 1868 when 220 apple trees were planted. Additional plantings were made in 1869 when 25 apple trees and 50 peach trees were planted; 150 additional peach trees were planted the same year. In 1871, E. Gale, Professor of Horticulture, reported, "There are now in the orchard about 2100 apple, pear, peach, cherry and plum trees." (51) In addition to the orchard plantings, the College had on hand about 40,000 nursery trees embracing a large variety of apple, pear, peach, plum, cherry and ornamental trees besides small fruits. This nursery stock was sold to the public. All these early plantings were on the old Col-



Fig. 8.--The Horticultural Building constructed in 1876 at a cost of \$4,000. The propagation pits in the foreground were constructed with Hatch funds in 1888.

lege farm. When the new farms were bought in 1871, there was growing on one of the farms (Foster) an apple orchard. This orchard was never used experimentally. Professor Gale reported as follows regarding it: "Many of the apple trees upon the Foster place, and some of those probably upon the old College farm are without names, and I would respectfully suggest that these trees be used for instruction in top-grafting, so that every tree upon the College farm may have a name." (51)

In 1873 Professor Gale suggested the establishment at



Fig. 9.--Elbridge Gale, Professor of Horticulture and Botany, 1871-1879. "In 1873 Professor Gale suggested the establishment at the College of an experimental orchard patterned after the orchard of the London Horticultural Society in England."

the College of an experimental orchard patterned after the orchard of the London Horticultural Society in England. He wrote, "It is now generally believed that Kansas promises to be one of the leading fruit-growing states in the Union. . . . In such an orchard there should be collected for the purpose of fruiting upon the same grounds, and under similar circumstances, every variety of fruit which can be of any value to the country." (52)

With such an experimental orchard in mind, Professor Gale in 1872 started to collect. He reported that leading pomologists of the country had very cordially aided and that he had collected 650 name varieties. The next year (1873) Professor Gale reported a start on this project. He reported more than 1,000 varieties of apples growing on the ground, chiefly in nursery rows. But as far as possible top worked on orchard trees. He wrote, "The experimental orchard is designed to accomplish the following objects: (1) To afford opportunity for extended comparison of varieties upon the part of our students. (2) To carefully test the different varieties of fruit having even a local importance, and to decide upon the adaptability of any variety to our climate. (3) To afford a convenient channel for the introduction of valuable varieties. (4) To aid in sifting out our almost inextricable nomenclature." (53) Professor Gale, in 1874, reported the start of

an experimental pear orchard in which there were about 600 trees and 235 varieties.

The experimental orchard as envisaged by Professor Gale did not materialize but the development of the orchards continued and Professor E. A. Popenoe, who had succeeded Professor Gale, reported in 1882 that "The orchards are now in better condition than ever before, the trees being in good health and mostly well shaped." (54) The plantings at the time on the lower campus were in two orchards known as the "north orchard" and the "south orchard." The north orchard was located north and east of the building called at the time Horticultural Hall, on an area now occupied in part by Farrell Library and south of Waters Hall. The south orchard was located on the south side of the present campus. At the time of the establishment of the Experiment Station the north orchard contained 268 apple trees numbering 47 different varieties. In addition to apples the orchard contained important varieties of pears, peaches, cherries, plums, grapes and bush fruit.

Forests and Shelterbelts

Some studies of the adaptation of forest trees were started as early as 1869. Some plantings were made of soft and hard (sugar) maple as well as beech trees. Sixteen varieties of acacia trees received from Australia were also planted. Professor Gale in 1871 said that "Provisions

should at once be made for the commencement of an experimental forest; and I would respectfully ask that a portion of ground be designed for permanent forest planting." (55)

The reports of the year 1872 show that there was under the direction of the Department of Horticulture 40 1/4 acres of land. Of this there were devoted to experimental forests and shelterbelts 11 3/4 acres, to orchards 15 1/2 acres, to vineyards 2 1/2 acres, and to nursery 10 1/2 acres.

There were growing in the experimental forest 34,489 trees, in the shelterbelt 2,072 trees, making a total of 36,670 trees. The shelterbelt was planted around the orchard on the old College farm. The shelterbelt consisted principally of soft maple, ailanthus, and Lombardy poplar. The land selected for tree culture was that least well adapted to the cultivation of root crops and cereals of any broken on the College farm. Plantings consisted of European larch; white, red and green ash; Osage orange; catalpa, ailanthus; black walnut; hickory nut and maple.

In 1878 Professor Gale summarized the results of eight years of work in testing the adaptation of forest trees to Kansas conditions. He mentions the testing of over 100 varieties and divides the list into those he considers unadapted and should not be considered for planting in Kansas and those which through the eight years have been of unquestioned success.

He writes, "It is just possible that the past eight years have given us a severer test upon the value of these several species of trees than we shall ever experience again,* but the chances are quite as much in the other direction; hence it will be wise to prepare to meet like disasters in the future. In selecting species of trees for our first planting, we should take those that are native to Kansas soil. . . . I can simply endeavor to indicate the relative value of our leading native trees for forest-culture, all things considered, by placing them in the following list, with the most valuable first: black walnut; ash, green and white; red cedar; Kansas willow (*S. fragilis*); box elder, honey locust; coffee bean; hackberry; cottonwood; soft or silver maple." (56)

The development of the campus on its present location afforded an opportunity to plant and to test the value of many species of trees. The grounds were used for nursery plantings where the trees were started and transplanted later to new locations for landscaping and for the beautification of the campus. This afforded an opportunity to accomplish two purposes -- a study of the adaptation of forest plantings and at the same time to develop the campus as an arboretum of usefulness and beauty.

The first mention of an arboretum on the campus was by Professor Popenoe in 1879 when he reported, "I have also located and begun the

planting of an arboretum. . . . The trees will be planted in nursery-rows, arranged, so far as possible, consistent with their respective modes of growth, in accordance with natural relationships. This tree nursery will be the source from which can be obtained trees for removal to the lawns, as they are needed." (57)

Some work was done with flowers, shrubs and vegetables. In the early 1870's a large number of flowering shrubs were selected and planted to test their ability to endure the climate.

In addition to the studies mentioned above on the adaptation of forest and fruit trees to the climatic conditions of Kansas, other horticultural investigations were undertaken as follows: a series of experiments in root-grafting with special reference to the comparative length of root and cion of different varieties of apple, pear, plum, peach and almonds; the effect of climatic conditions upon the wood growth of trees under Kansas conditions; the effect of cross fertilization of strawberries; and tests of the value of spraying orchard trees with arsenical poisons to control codling moth.

Museum

Collections for the start of a museum of zoological, botanical and entomological specimens were begun as early as 1877 under the direction of the professor of botany and practical horticulture. That

* This period included the grasshopper year of 1874.

year Professor Gale reported, "We have obtained through the Agricultural Department at Washington, a collection of seeds. . . . We have also received from the same source a valuable collection of dried-plant specimens, a few of which are European, but most of them are from the Western mountains and plains. . . . We have also secured during the past year a good collection of native Kansas wood specimens." (58) Substantial additions were made to the museum collections in 1878 and 1879.

By the time the Experiment Station was established in 1887 the museum contained many valuable collections. The care and direction of the museum was transferred to the Botany Department. The museum was housed on the

second floor of the "old armory" building.

Livestock Investigations

The first livestock owned by the College, other than mules and a riding horse, was purchased in 1873. Most of this livestock was purebred of excellent quality, and the offspring was in demand by farmers for breeding purposes. The earliest contribution in the field of animal husbandry that the College made to the farmers of the state was the distribution of the offspring of these animals.

In 1874 the superintendent of the farm, E. M. Shelton, reported, "A considerable increase in the number of swine has taken place, and sales have been made from time to time." (59) On August 14, 1875, he wrote "Our Berkshires are regarded by com-

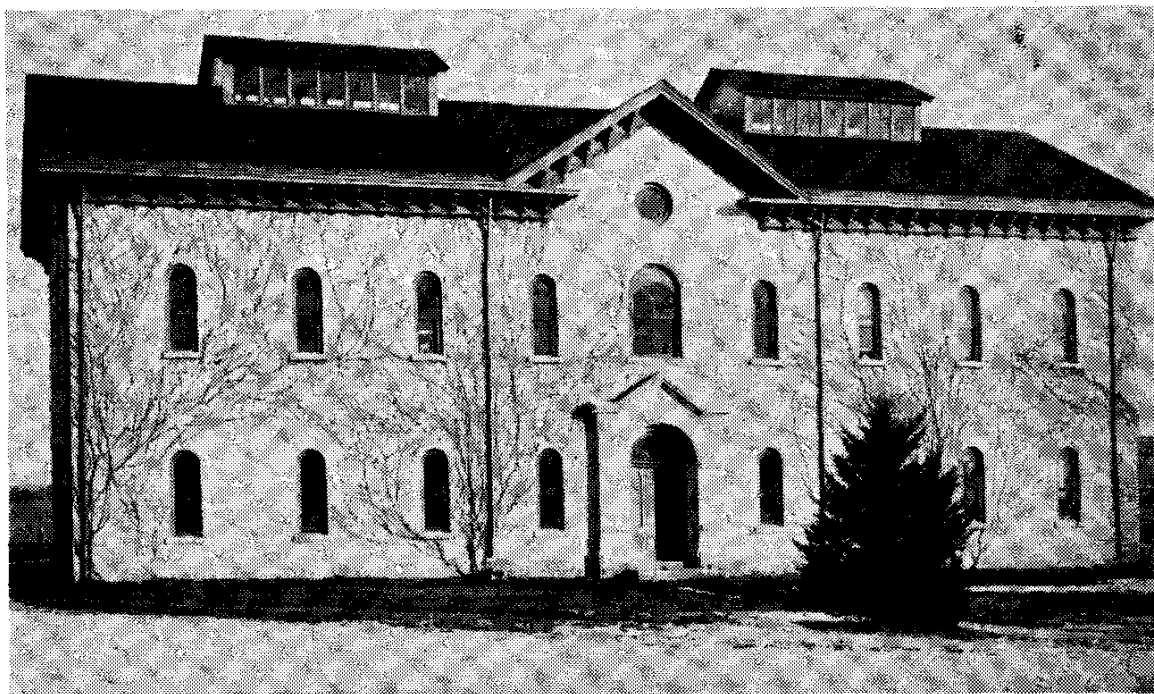


Fig. 10.--The "Old Armory" built in 1872 as the first section of a barn that was never completed for this purpose. It was remodeled in 1875 and served as the principal college building until 1879 when the north wing of Anderson Hall was completed.

petent judges as being among the best. We have pigs of this sort, farrowed in November last, that weigh 220 pounds in store condition. It will not be out of place to add that we are continually selling young breeding animals of the above mentioned sort to the farmers at the lowest prices. During the past year several hundred dollars worth have been disposed of." (60) The next year (1876) it was reported that "The demand throughout the State for breeding animals of College stock has been very great, greatly in excess of the supply, in fact, and considerable sales at fair prices have been made." (61)

The College continued to sell its surplus of purebred breeding stock, both swine and cattle, up to the time that the Experiment Station was established. The year of its establishment (1887) Professor Shelton reported as follows: "The demand for stock has been much less brisk than in previous years, and prices have generally ruled low. Nevertheless, we have succeeded in disposing of most of our surplus breeding stock at living prices." (62)

Feeding Experiments

It was several years after livestock was acquired by the College that the first feeding experiment was started. One of the earliest tests was reported in 1878 and was a simple one, consisting of feeding whole milk to a young growing pig. A pig was fed three pints of milk a day until it had consumed 31 1/2

quarts of milk, when it weighed 50 pounds more than the heaviest of its litter mates that had not received milk. (63)

The first carefully planned and executed livestock feeding experiment was conducted during the winter of 1880-81. It was planned primarily for the purpose of determining the value of shelter for fairly mature pigs fed during the winter months. At that time most pigs were fed by farmers in the open, in groves of timber or in unprotected yards. The experiment was started November 1, 1880, and terminated January 16, 1881. Five pigs were fed in the basement of a warm barn and five others were fed in an open yard on the south side of a closed board fence without protection except all lots had "straw nests." The pigs were penned, fed and weighed individually. All were fed corn alone except two pigs in each of the sheltered and unsheltered pens received bran at the rate of two pounds per day per pig in addition to corn. The pigs were weighed weekly and the air temperature recorded. The pigs varied in weight from 226 to 285 pounds at the start of the experiment and from 369 to 439 pounds at the end. The total gain for the individual pigs in each of the five replications varied for the sheltered pigs from 156 to 166 pounds and for the yard pigs from 117 to 157 pounds. The pigs fed outside gave a much smaller return for feed consumed, in all cases less "total gain" and

much less "gain per cwt." The results with bran "seem to show that corn alone can be more profitably used for fattening hogs than the mixed feed consisting of corn and bran." (64)

This experiment was repeated in succeeding years with the omission of bran from the rations, since "This bran ration . . . complicated the experiment in its principal object, so that it was deemed best . . . to employ as feed corn only." (65) The results of the repeated test confirmed those obtained from the original experiment.

Other livestock experimental work conducted prior to the establishment of the Experiment Station related to the following subjects: (1) An estimate of the value of whole milk for feeding young, growing pigs. (2) Cooked and raw corn as feed for fattening pigs. (3) Alfalfa and orchard grass for hog pasture. (4) A comparison of corn meal with corn and cob meal for beef making. (5) The value of warm drinking water for milch cows. (6) The period of gestation in cows.

Carp Culture

In the late 1870's and the early 1880's much interest developed in Kansas in the production of carp in farm ponds. Professor Shelton, having been influenced by the public interest existing in carp production, wrote enthusiastically in the spring of 1881 as follows: "There are few farmers in Kansas who could not furnish a quarter or half an

acre of ground, which might be devoted to the raising of these valuable fishes; . . . and as fish ponds, be made the most pleasant and profitable parts of the farm." (66)

An effort was made to produce carp in ponds on the College farm. The first fish pond constructed in the spring of 1881 had a superficial area about 12 x 30 feet. It was shallow and constructed hastily to receive German carp supplied by the United States Fish Commission in Washington. A second and deeper pond was dug in the summer of 1881. This pond was about 30 x 30 feet and held when full three feet deep of water which experience had shown to be sufficient to prevent the complete freezing of all the water in the pond. An early report on the success of the venture reads as follows: "At one year old, our carp bred, but the increase was slight. During the summer of 1883, however, they increased enormously, the produce numbering thousands, which in many cases were four inches in length before fall." (67) Two years later, however, Professor Shelton made a final report upon the carp-growing venture as follows: "Under the head of live stock, it seems appropriate to mention our little experiment with carp culture, which has been referred to in previous reports. During the past two years the fish have multiplied very slowly, owing to the depredations of their natural enemies, crawfish, mink and turtles, which it was found

impossible to exclude from the ponds, owing in part to their proximity to a neighboring stream. During the year these depredations have succeeded in destroying every one of the finny residents of the carp ponds." (68)

Investigations in the Natural Sciences

Investigational work in the natural sciences began in 1866 with the appointment of Benjamin F. Mudge as Professor of Natural Sciences. Professor Mudge spent most of his vacation months on geological explorations through central and western Kansas. Regarding these explorations the Board of Regents in 1871

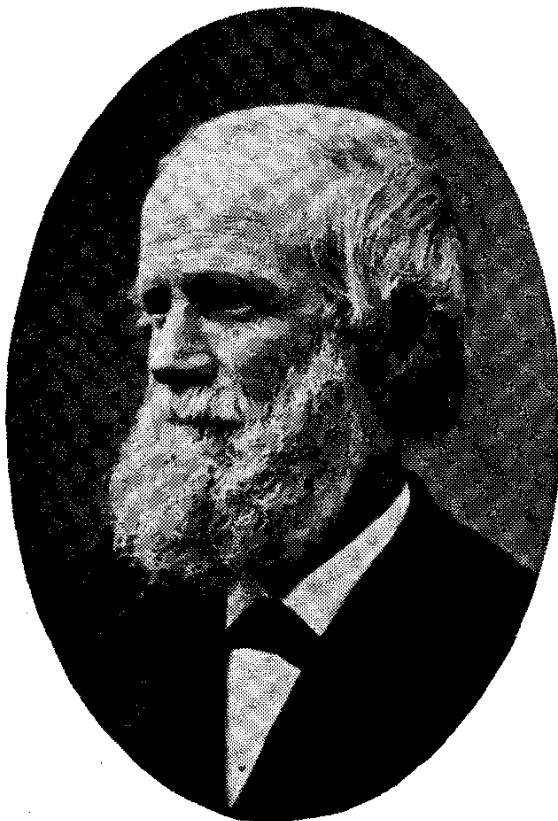


Fig. 11.--Benjamin F. Mudge, Professor of Geology and Zoology, 1866-1874. "Possess an interest circumscribed by no state or national boundaries."

reported as follows: "That of B. F. Mudge, our indefatigable Professor of Natural Sciences, poses an interest circumscribed by no state or national boundaries. His researches upon the plains, during his vacations, are already giving an impetus to inquiry, and an examination of the rich geological and mineralogical fields abounding on our southern and western borders." (69) Professor Mudge the same year (1871) reported good progress in collecting a herbarium of Kansas plants and making a collection of native insects.

As the institution grew and as the faculty increased, investigational work was undertaken in aspects of chemistry, botany, zoology, entomology, and meteorology relating to agriculture.

Chemical Investigations

One of the first investigations in chemistry was a study of the farm soils of Kansas, undertaken for the Kansas State Board of Agriculture. These studies were started in 1875. Professor Kedzie, head of the Department of Chemistry and Physics, reported upon this work as follows: "Soil samples have been collected from nearly every cultivated county. A few of these have been minutely analyzed, and many more generally examined, to determine the quantity of organic matter, etc. These have been arranged and classified in the rooms of the Secretary of the Board at Topeka. This is a work, how-

ever, which will require years for its ultimate completion.”

(70)

Another study to which much time was devoted by the staff of the Department of Chemistry was a determination of the sugar content of sorghum and of the suitability of the different varieties of sorghum for the production of sugar.

Much interest centered in efforts to produce sugar from sorghum from the early 1870's through the 1880's and continuing into the early 1890's. Sorghum was being used extensively for the production of syrup. An editorial in the March 26, 1879, issue of the *Kansas Farmer* states that “The sorghum crop is assuming considerable importance in the state. 20,291 acres were planted to sorghum cane last year from which was manufactured 2,333,566 gallons of syrup valued at \$1,166,783.”

(71)

Since the consumption of sugar was increasing rapidly in the United States and since much of the sugar consumed was imported, it was to be expected that effort would be made to produce sugar from a crop that had been so successfully grown for syrup. Early efforts to produce sugar from sorghum were made by the Champaign Sugar Company at Champaign, Illinois, and by the Rio Grande Sugar Company of Cape May County, New Jersey. These efforts were sufficiently successful to encourage the establishment at Sterling, Kansas, of a mill

to produce sugar from sorghum.

Later, mills for this purpose were operated at Hutchinson, Ellsworth, Ottawa, Fort Scott, and Topeka. The State Board of Agriculture appointed a sugar commissioner to help organize the sugar interests of Kansas. The production of 726,711 pounds of sugar was reported for the Hutchinson, Sterling, and Ottawa plants in 1884. Up to 100 men were employed at the Ottawa plant in 1887. This same year (1887) the Kansas Legislature voted to pay a bounty of two cents a pound for sugar produced in the State from sorghum.

Professor Failyer visited the Sterling plant in the summer of 1881 and reported as follows: “These new industries are having a marked influence upon the prosperity of Sterling and vicinity.” (72)

The investigational work at the College, relating to the production of sugar from sorghum, consisted principally of studies of the sugar content of sorghum varieties and the suitability of different varieties for sugar production. Some special equipment was provided by the College for this work. The August 18, 1883, issue of *The Industrialist* carried the following announcement: “The Chemistry Department is experimenting in sorghum sugar and has just provided a saccharometer for extensive analysis of juice at different stages of ripeness and under various circumstances of culture and treatment. Professor Failyer has

a sorghum crop ready to be worked and J. T. Willard, assistant chemist, is on the ground ready to work."

The Chemistry Department studied the sugar content of many varieties of sorghum but gave special attention to four varieties, that appeared to be the most promising. These varieties were: Early amber, Link's hybrid, Kansas orange, and Honduras. A study of the progressive development of the sugar content of these varieties was made by selecting stalks at different stages of growth and maturity. Beginning when the sorghum seed was in the stage of soft dough and making analyses at intervals of three to five days until three weeks after the seed was ripe. Different portions of the stalks were analyzed. Professor Failyer reported that "It was conclusively shown that the middle portion of the stalk is far richer in crystallizable sugar than the ends. . . . Also that the quality of the juice increased until perfect maturity of the stalk." (73) The crystallizing properties of sorghum syrup were also studied. Professor Failyer reported as follows regarding this work: "A portion of our work with sorghum during the last season was to test its crystallizing properties, or rather of the melada.

While nothing new was brought out by these trials, the results supplemented the analyses and confirmed the conclusions drawn from them. With good ripe cane, almost

perfect crystallization was obtained." (74)

Another study undertaken by the Chemistry Department was reported upon as follows by Professor Failyer: "At the request of a large number of farmers, I have also undertaken an examination of the fungus corn smut, to determine its supposed poisonous qualities, and its connection, if any exists, with the extensive losses of stock through the State in the past two years. A preliminary analysis has already been made, but the full investigation will be completed during the coming vacation." (75)

Professor Failyer became discouraged with his attempts to do experimental work without financial Support, and such work was almost nonexistent in the Chemistry Department during the ten years immediately prior to the passage of the Hatch Act. He expressed his discouragement and the position of the department relative to such work in his report to the President in 1886. He wrote as follows: "I have, during the year, on two separate occasions, asked appropriations for experimental work, understanding one year ago that you were so adjusting the work of the departments as to make this possible. Such appropriation was not made. In the absence of a response to my request, I have felt justified in dropping the matter, further than to say that I am ready at any time to take up such work." (76)

Entomological Investigations

Investigational work in entomology before the establishment of the Experiment Station consisted chiefly of the collection and classification of insects. As early as 1871, Professor Mudge reported that "A majority of our native insects have been collected monthly." (77) In 1872 it was reported that 800 species had been collected.

A project that proved of much interest to Professor J. S. Whitman, head of the Department of Botany, Entomology and Geology, was the effort that was made in the 1870's to produce silk in Kansas. This effort was described in an editorial that appeared in the *Kansas Farmer* in 1871, as follows: "It may be news to some of our readers that we have a silk factory in successful operation in this State. Mr. Boissiere, a wealthy French gentleman, established a factory in Franklin County some two or three years ago, which is now turning out several hundred yards of silk ribbon per day, from the raw material. This gentleman is also planting large groves of mulberry and ailanthus to feed the silkworms; and will gradually increase his facilities, as circumstances permit." (78) The silk factory was located at Silkville, near Williamsburgh, Franklin County, Kansas, and was operated by Mr. E. V. Boissiere. Mr. Boissiere described his factory and its operation in a letter written October 26, 1872, to

A. M. Blair, secretary of the Franklin County Agricultural Society, that read in part as follows: "I commenced the weaving of silk velvet ribbon in 1869 but with very inadequate accommodations. In the following year I erected a factory, 28' x 85', one story high, with walls of stone, which gives me ample room. I have now two looms, constantly employed: one capable of turning out 112 yards of ribbon one-half inch wide per day; the other, 72 yards, one inch wide. These looms employ two men and three women, and part of the time, a young girl. I shall soon have a third loom completed and set up, for weaving ribbon three inches wide, which will be capable of turning out 40 yards per day. . . . I planted a quantity of white mulberry seed procured from France, for the sole purpose of rearing silkworms. They produced an abundance of trees." (79) Professor Whitman was in touch with these operations. He visited Silkville in the summer of 1875. In his report to the Regents in 1874 he wrote: "I was enabled to make some interesting experiments with native and foreign silk-spinning insects. Five native and three foreign species were successfully raised at the College." (80)

Professor Whitman also acknowledged the receipt from Silkville of specimens of raw and manufactured silk raised and manufactured on the Silkville plantation, also of Chinese mulberry plants. This

silk - manufacturing venture did not prove successful but mulberry trees are still to be found growing on the plantation site at Silkville.

Botanical and Zoological Investigations

No extensive investigation-al work in botany or zoology was undertaken by the College before the establishment of the Experiment Station. Work that was done consisted principally of the collection and classification of plants for the herbarium and the zoological specimens for the museum. As early as 1871 Professor Mudge reports the collection of about 2,000 specimens of minerals and fossils. The next year he reports upon the gathering, naming and mounting of 27 species of wild grasses. He also reports upon observations on the ecological distribution of buffalo-grass as follows: "As the buffaloes disappear, and almost before the white settlers occupy the land, the buffalo-grass begins to die out, and these nutritious grasses come in and cover the prairies. This fact has long been known, but what appears to me a reasonable cause for the change has never been given." (81) Collections were continued from these early days down to the establishment of the Experiment Station. They constituted a major part of the specimens that were to be found in the museum at the time the Station was established.

Meteorological Investigations

Kansans have always been interested in the weather. This interest stems no doubt in part from the location of the state near the center of the continent where extreme variations in climatic conditions naturally occur and in part from the chief occupation of the state--agriculture--which is so greatly affected by climatic conditions. It is not surprising, therefore, that meteorological observations were the first scientific findings recorded at the College. Weather records antedate the establishment of the institution. They were started on February 1, 1858, by Professor Isaac Goodnow, one of the founders of Bluemont College, and continued by him until 1863 when Bluemont College became Kansas State Agricultural College. At this time responsibility for taking weather records was assumed by President Denison, the first president of the Agricultural College. They were taken by him until May, 1866, when the responsibility for the records was assumed by Professor Mudge. The weather records of the College are the oldest, from the standpoint of continuity, of any in Kansas.

Weather record taking at this early date was a confining and exacting chore. Self-recording devices such as are in use today were not available. All records were from personal observation. Not only was the amount of rain and snow-fall recorded, but the time of

the beginning and end of each storm and the depth of snowfall were noted. Air temperatures, cloud conditions, wind direction and velocity were recorded daily at 7:00 a.m., 2:00 p.m. and 9:00 p.m. Notes on weather phenomena were meticulously recorded. These recordings consisted of such observations as frost, lightning, hail and violent windstorms as well as the influence of weather on natural phenomena such as the flight of ducks and geese and the appearance of first blossoms on fruit trees, flowering shrubs, etc. The weather observer of that day, walking leisurably between home and office, had an opportunity to observe natural phenomena in a man-

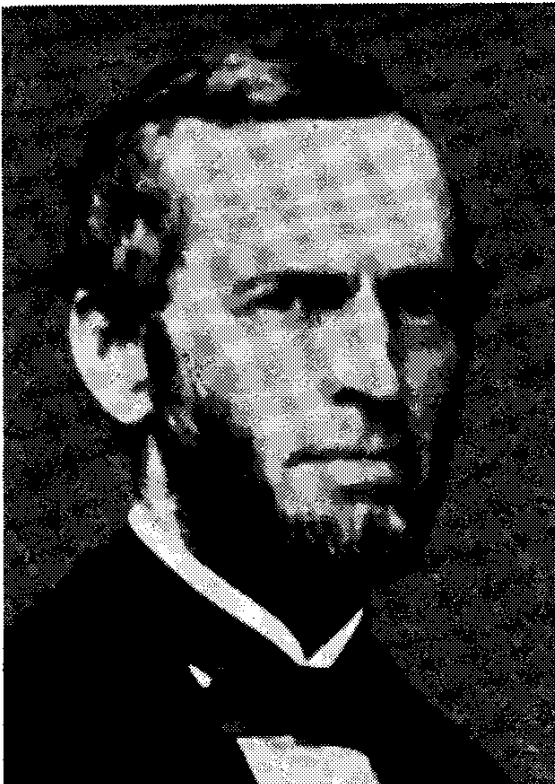


Fig. 12.--Joseph Denison, the first President of College, 1863 to 1873. President Denison took the weather records for the College from 1863 to 1866.

ner denied present-day automobile riders.

With the appointment of Professor Kedzie in 1873 and the retirement of Professor Mudge, weather observations became the responsibility of Professor Kedzie. He wrote, "Negotiations are now pending . . . for the manufacture of a special set of meteorological instruments, for which an appropriation has been made. With the instruments already on hand a full record is kept --three observations per diem --the results forwarded regularly to Washington, and abstracts furnished for publication to the State papers." (82)

In 1874 Professor Kedzie wrote again as follows: "The instruction (meteorology) is assisted by our very complete meteorological records, which are now kept under the supervision of the Chief Signal Officer of the Army, and also by daily maps and reports of the War Department, which are regularly received. I have also adopted the system of distributing through the entire State, and to many points east, printed abstracts of the meteorology of each month at this station." (83) In 1875 Professor Kedzie reports further as follows: "In connection also with my series of meteorological observations for the Signal Service, I have organized a corps of volunteer observers in various portions of the State, for the purpose of investigating the prevalence of ozone in the atmosphere of Kansas, through the different seasons of the year. These observations will be re-

ported to me regularly at the close of each month. The results will be especially interesting for the purpose of comparison with similar investigations now in progress under the direction of the State Board of Health, of Michigan." (84) The next year (1876) Professor Kedzie reported further as follows: "The series of meteorological observations, under the direction of the Signal Service Bureau, have been continued without interruption during the year. These records have now been in progress for upwards of sixteen years, and are each year becoming of greater importance. I have also been assisted at different points through the State by a number of volunteer observers, members of the Kansas Academy of Science, who have been aiding me in determining the quantity of ozone daily present in Kansas atmosphere. The results are now being tabulated and compared with those of Eastern observers, and promise to prove of great interest." (85)

These early records so meticulously taken and recorded through the first sixteen years of the College, as reported by Professor Kedzie, have been continued and taken with equal care and constitute today the best set of meteorological records in the State, from the standpoint of continuity.

Summation

When the Hatch Act was passed in 1887 authorizing the establishment of an Agri-

cultural Experiment Station at the Kansas State Agricultural College, a good foundation had been laid for such an agency. A reasonably competent faculty had been assembled who, through nearly a quarter of a century, had gained experience in the conduct of agricultural research. Some highly creditable experimental work had been planned and executed, especially in agronomy, animal husbandry, and chemistry. A physical plant had been built primarily for instruction but which would serve with reasonable satisfaction until more adequate facilities could be provided. A farm of 315 acres had been acquired. The farm was reasonably well equipped and stocked with the leading breeds of cattle and swine. The start on a library had been made as well as the beginning of an arboretum and a museum. Contact had been made with citizens of the State. They had been assisted in securing improved livestock and better varieties of crop plants. They had been helped with special problems such as forestry plantings, sugar and silk production and the adaptation of crops to the new environmental conditions of the plains. The institution had become an agency to which the people looked increasingly for help. This help could not have been supplied without the financial assistance of an agency such as the Experiment Station. The College was ready to use effectively the assistance that the Sta-

tion would provide, and the people of the State were ready to make productive use

of such assistance as the College, with the aid of the Station, could supply.

REFERENCES

1. Fifth Biennial Report, KSAC. 1884-1885, p. 162.
2. Industrialist, Oct. 29, 1881.
3. Willard, J. T. History of KSAC, pp. 67-69.
4. Bulletin No. 1, Agr. Expt. Sta., KSAC, April 1888, p. 5.
5. Willard, J. T. History of KSAC, p. 69.
6. Hougham, J. S. Annual Report, KSAC, 1869, p. 10.
7. Hougham, J. S. Kansas Farmer, May 1870, p. 78.
8. Miller, Fred E. Annual Report, KSAC, for the year ending Dec. 31, 1871, p. 28.
9. Denison, J. Annual Report, KSAC, for 1870, p. 10.
10. Kansas Farmer, May 15, 1871, p. 70.
11. Annual Report of the Regents for KSAC, 1871, p. 11.
12. Parker, R. D. Kansas Farmer, Aug. 15, 1871, p. 127.
13. Editorial, Kansas Farmer, June 15, 1871, p. 87.
14. Miller, Fred E. Annual Report of KSAC, 1872, pp. 22-23.
15. Editorial, Kansas Farmer, March 1, 1873, p. 72.
16. Shelton, Edward M. Annual Report, KSAC, 1875, pp. 14-15.
17. Gale, E. Annual Report, KSAC, 1875, p. 19.
18. Third Biennial Report, KSAC, 1881-1882, p. 5.
19. Shelton, Edward M. Third Biennial Report, KSAC, 1881-1882, p. 31
20. Fourth Biennial Report, KSAC, 1883-1884, p. 28.
21. Fifth Biennial Report, KSAC, 1885-1886, p. 176.
22. Shelton, Edward M. Fifth Biennial Report, KSAC, 1885-1886, p. 71.
23. Shelton, E. M. Fourth Biennial Report, KSAC, 1883-1884, p. 95.
24. Hougham, J. S. Annual Report, KSAC, 1870, p. 9.
25. Miller, Fred E. Annual Report, KSAC, 1871, p. 24.
26. Miller, Fred E. Twelfth Annual Report of the Department of Public Instruction of Kansas, 1872, p. 283.
27. Shelton, E. M. Second Biennial Report, KSAC, 1879-1880, p. 16.
28. Shelton, E. M. First Biennial Report, Supt. of Public Instruction of Kansas, 1877-1878, p. 343.
29. Shelton, E. M. Fourth Biennial Report, KSAC, 1883-1884, p. 29.
30. Sixteenth Annual Report of the Department of Public Instruction of Kansas, 1877, p. 140.
31. Sixteenth Annual Report of the Department of Public Instruction of Kansas, 1877, p. 114.
32. Willard, J. T. History of KSAC, p. 84.
33. Shelton, E. M. Fifth Biennial Report, KSAC, 1884-1885, p. 70.
34. Sixth Biennial Report, KSAC, p. 51.
35. Lantz, D. E. Sixth Biennial Report, KSAC, p. 52.
36. Shelton, E. M. Industrialist, May 1, 1880.
37. Eleventh Annual Report of the Department of Public Instruction of Kansas, 1871-1872, p. 248.
38. Second Biennial Report, KSAC, 1879-1880, p. 17.
39. Shelton, E. M. Bulletin No. 4, KSAC, 1888, p. 43.
40. Shelton, E. M. Fourteenth Annual Report, Department of Public Instruction of Kansas, 1874, p. 118.
41. Shelton, E. M. Industrialist, April 24, 1875.
42. Shelton, E. M. Industrialist, Feb. 26, 1876.
43. Shelton, E. M. Industrialist, March 20, 1880.

44. Shelton, E. M. Fifth Biennial Report, KSAC, 1884-1885, p. 142.
45. Shelton, E. M. Sixth Biennial Report, KSAC, 1887-1888, pp. 42-43.
46. Miller, Fred E. Twelfth Annual Report of the Department of Public Instruction of Kansas, 1872, pp. 253-254.
47. Shelton, E. M. Sixteenth Annual Report, Supt. of Public Instruction of Kansas, 1876, p. 137.
48. Shelton, E. M. First Biennial Report of the Department of Public Instruction of Kansas, 1877-1878, p. 347.
49. Shelton, E. M. Fifth Biennial Report, KSAC, 1884-1885, p. 140.
50. Denison, J. Twelfth Annual Report, Department of Public Instruction of Kansas, 1872, p. 245.
51. Gale, E. Eleventh Annual Report, Department of Public Instruction of Kansas, 1871, p. 257.
52. Gale, E. Thirteenth Annual Report, Department of Public Instruction of Kansas, 1873, p. 223.
53. Gale, E. Fourteenth Annual Report, Department of Public Instruction of Kansas, 1874, pp. 120-121.
54. Popenoe, E. A. Third Biennial Report, KSAC, 1881-1882, p. 41.
55. Gale, E. Eleventh Annual Report, Department of Public Instruction of Kansas, 1871, p. 257.
56. Gale, E. First Biennial Report, Supt. of Public Instruction of Kansas, 1877-1878, p. 354.
57. Popenoe, E. A. Second Biennial Report, KSAC, 1879-1880, p. 27.
58. Gale, E. First Biennial Report, Supt. of Public Instruction of Kansas, 1877-1878, p. 352.
59. Shelton, E. M. Fourteenth Annual Report, Supt. of Public Instruction of Kansas, 1874, p. 116.
60. Shelton, E. M. Industrialist, Aug. 14, 1875.
61. Shelton, E. M. Industrialist, March 18, 1876.
62. Shelton, E. M. Sixth Biennial Report, KSAC, 1887-1888, p. 43.
63. Industrialist, March 2, 1878.
64. Second Biennial Report of the Kansas State Board of Agriculture, 1879-1880, p. 441.
65. Fourth Biennial Report, KSAC, 1883-1884, p. 96.
66. Shelton, E. M. Industrialist, March 12, 1881.
67. Shelton, E. M. Fourth Biennial Report, KSAC, 1883-1884, p. 118.
68. Shelton, E. M. Fifth Biennial Report, KSAC, 1885-1886, p. 72.
69. Eleventh Annual Report of the Department of Public Instruction of Kansas, 1871, p. 233.
70. Kedzie, Wm. F. Fifteenth Annual Report, Department of Public Instruction of Kansas, 1875, p. 175.
71. Kansas Farmer, March 26, 1879, p. 104.
72. Industrialist, Sept. 24, 1881.
73. Failyer, G. H. Industrialist, Jan. 19, 1884.
74. Failyer, G. H. Industrialist, Feb. 2, 1884.
75. Failyer, G. H. First Biennial Report, Supt. of Public Instruction of Kansas, 1877-1878, p. 358.
76. Failyer, G. H. Fifth Biennial Report, KSAC, 1885-1886, p. 74.
77. Mudge, B. F. Eleventh Annual Report of the Department of Public Instruction of Kansas, 1871, p. 262.
78. Kansas Farmer, August 15, 1871, p. 53.
79. Transaction of the Kansas State Board of Agriculture, 1872, p. 221.

80. Whitman, J. S. Fourteenth Annual Report of the Department of Public Instruction of Kansas, 1874, p. 131.
81. Mudge, B. F. Twelfth Annual Report of the Department of Public Instruction of Kansas, 1872, p. 396.
82. Kedzie, W. K. Thirteenth Annual Report of the Department of Public Instruction of Kansas, 1873, p. 216.
83. Kedzie, W. K. Fourteenth Annual Report of the Department of Public Instruction, 1874, p. 135.
84. Kedzie, W. K. Fifteenth Annual Report of the Department of Public Instruction of Kansas. 1875, 175.
85. Kedzie, W. K. Sixteenth Annual Report of the Department of Public Instruction of Kansas, 1876, p. 143.