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College Calendar

Session 1902-1903

Session begins Wednesday, September 10, 1902
Second Quarter begins Monday, November 17, 1902
Thanksgiving Day, Thursday, November 27, 1902
Christmas Vacation, one week
Second Term (Third Quarter) begins Wednesday, January 28, 1903
Fourth Quarter begins Friday, April 3, 1903
Session ends, Commencement, June 5-7, 1903

Official Title

THE CLEMSON AGRICULTURAL COLLEGE
OF SOUTH CAROLINA

Postoffice and Telegraph Office: CLEMSON COLLEGE, S. C.
Freight and Express Office: CALHOUN (Southern Ry.), S. C.
Commencement 1902

Program

Friday, June 6th

11 A. M., Address to Graduating Class, Senator H. D. Money
8.30 P. M., Alumni Address, F. G. Tompkins

Saturday, June 7th

11 A. M., Commencement Exercises and Delivery of Diplomas
8.30 P. M., Glee Club Entertainment

Sunday, June 8th

11 A. M., Baccalaureate Sermon, Rev. J. Walter Daniel, D. D.
8.30 P. M., Farewell Exercises, Y. M. C. A.
Board of Trustees

**Life Members**

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<td>Senator B. R. Tillman</td>
<td>Edgefield</td>
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<td>Hon. R. E. Bowen</td>
<td>Pickens</td>
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<td>Hon. D. K. Norris</td>
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<td>Hon. J. E. Bradley</td>
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<td>Hon. M. L. Donaldson</td>
<td>Greenville</td>
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<td>Hon. J. E. Wannamaker</td>
<td>Orangeburg</td>
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**Term Expires 1904**

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<td>Hon. J. S. Garris</td>
<td>Spartanburg</td>
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<td>Hon. Jesse H. Hardin</td>
<td>Chester</td>
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**Term Expires 1902**

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<td>Hon. W. D. Evans</td>
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<td>Hon. A. T. Smythe</td>
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P. H. E. Sloan, Secretary and Treasurer, Clemson College, S. C.

**Executive Committee**

D. K. Norris  
R. E. Bowen  
M. L. Donaldson  
J. E. Tindal  
J. E. Bradley

**Finance Committee**

R. W. Simpson  
A. T. Smythe  
M. L. Donaldson
Board of Visitors 1902-1903

FIRST DISTRICT—Hon. W. G. Hinson, James Island
SECOND DISTRICT—Hon. J. C. Shepard, Edgefield
THIRD DISTRICT—Hon. J. R. Vandiver, Anderson
FOURTH DISTRICT—Hon. D. E. Hydrick, Spartanburg
FIFTH DISTRICT—Hon. J. L. Glenn, Chester
SIXTH DISTRICT—Hon. J. H. Hudson, Bennettsville
SEVENTH DISTRICT—Hon. F. D. Bates, Orangeburg
Faculty

(For 1902-1903)

(In order of seniority.)

HENRY S. HARTZOG, LL. D.,
President

M. B. HARDIN (Virginia Military Institute),
Professor of Chemistry

C. M. FURMAN (A. B., Furman University),
Professor of English

W. S. MORRISON (A. B., Wofford College),
Professor of History

J. V. LEWIS (B. E., Univ. of N. C.; S. B., Harvard; Johns Hopkins),
Professor of Geology

J. S. NEWMAN (University of Virginia),
Professor of Agriculture

J. H. M. BEATY (South Carolina College),
Professor of Textile Industry

P. T. BRODIE (B. S., A. B., Furman University),
Professor of Mathematics

W. M. RIGGS (E. M. E., Alabama Polytech. Inst.),
Professor of Electrical Engineering

Commandant and Professor of Military Tactics

R. N. BRACKETT (A. B., Davidson College; Ph. D., Johns Hopkins),
Assistant Professor of Chemistry

A. M. REDFEARN (B. S., Wake Forest College; M. D., L. I. College Hospital),
Instructor in Physiology

F. S. SHIVER (Ph. G., University of South Carolina),
Instructor in Agricultural Analysis

ALBERT BARNES (M. M. E., Cornell),
Assistant Professor of Mechanical Engineering

J. S. McLUCAS (A. B., South Carolina College; A. B., A. M., Harvard),
Assistant Professor of English

C. M. CONNER (B. Agr., Univ. of Missouri; B. S., Mich. Agr. College),
Assistant Professor of Agriculture
T. G. POATS (Miller School, Virginia; University of Virginia),
Instructor in Physics

G. E. NESOM (B. Sc., Mississippi Agricultural and Mechanical College; D. V. M., Iowa State Veterinary College),
Instructor in Veterinary Science

F. D. FRISSELL (Philadelphia Textile School),
Instructor in Weaving and Designing

WILLS JOHNSON (Miller School, Virginia),
Instructor in Forge and Foundry

C. B. WALLER (A. M., Wofford College; Vanderbilt University),
Assistant Professor of Mathematics

J. WISTAR DANIEL (A. B., Wofford College; M. A., Vanderbilt Univ.),
Assistant Professor of English

C. C. NEWMAN (Clemson College),
Instructor in Horticulture

R. E. LEE (B. S., Clemson College),
Instructor in Drawing

S. C. WRIGHT (B. S., Georgia School of Technology),
Instructor in Machine Shop

L. C. RAILFORD (Ph. G., Md. Col. of Pharmacy; Ph. B., Brown Univ.),
Instructor in Dyeing

SAMUEL MANER MARTIN (S. C. Military Academy),
Assistant Professor of Mathematics

S. W. REAVES (S. C. Military Academy; B. S., University of N. C.; A. B., Cornell),
Assistant Professor of Mathematics

H. H. KYSER (B. S., S. M. E., Alabama Polytech. Inst.),
Assistant Professor of Electricity

J. H. HOOK (B. S., Clemson College),
Instructor in Woodwork

CHAS. E. CHAMBLISS (B. S., M. Sc. Univ. of Tenn.),
Instructor in Zoology and Entomology

C. O. UPTON (B. Agr., Cornell),
Instructor in Dairying and Animal Husbandry

HAVEN METCALF (A. M., Brown Univ.; Univ. of Nebraska),
Instructor in Botany and Bacteriology

G. SHANKLIN (South Carolina Military Academy),
Registrar and Assistant in Mathematics

W. W. KLUGH (B. S. Clemson College),
Assistant Instructor in Drawing
T. W. Keitt (Virginia Military Institute),
Assistant in Freshman and Subfreshman Classes

A. B. Bryan (B. S., Clemson College; B. Lit., Univ. of Nashville),
Assistant in English

John W. Gantt (Miller School, Va.),
Assistant Instructor in Woodwork

D. H. Henry (B. S., Clemson College),
Assistant in Chemistry

B. M. Parker (B. S., N. C. A. & M. Col.; Lowell Textile School),
Assistant Instructor in Textile Industry

O. M. Watson (Furman Univ.),
Instructor in Poultry Industry

M. E. Bradley (A. B., Erskine College),
Tutor

J. E. Hunter (B. S., Clemson College),
Tutor

Board of Health

Henry Hartzog
President

Dr. A. M. Redfearn
Surgeon

Dr. P. H. E. Sloan
Prof. M. B. Hardin
Prof. J. S. Newman
General Information

Origin and Objects

In 1886, a convention of the farmers of South Carolina passed a resolution advocating the establishment of an Agricultural College. The matter was given definite form by the action of the Hon. Thomas G. Clemson, son-in-law of John C. Calhoun, who died in 1888, leaving as a bequest to the State the old Calhoun homestead, Fort Hill, consisting of about 800 acres of land, and about $80,000 in other securities, for the purpose of establishing an Agricultural College.

The Legislature passed an Act which became a law in November, 1889, accepting the bequest. The College opened July 6, 1893, with an enrollment during its first session of 446 students.

The object of the College, in conformity with the Acts of Congress and of the State Legislature, is to give practical instruction in agriculture and in the mechanic arts. To accomplish this object in its highest sense, careful instruction is given in the principles and applications of the sciences bearing upon agriculture and mechanics, and to give the breadth and culture necessary for a rounded education, courses are provided in history, economics and English.

It is considered of the utmost importance that students be taught, not only theoretical methods, but practical work in these methods. To this end, as much time is devoted to laboratory and shop-work, field-instruction and other practical exercises, as to lectures and recitations.

Location

The College is located on the dividing line between Oconee and Pickens Counties, in the picturesque foot-hills of the Blue Ridge. It has an elevation of 900 feet above sea level, and commands an excellent view of the mountains to the north and west, some of which attain an altitude of nearly 5,000 feet. The climate is invigorating and healthful, and the surroundings are in every way favorable to the highest physical and mental development. The buildings are located on the old Fort Hill homestead of John C. Calhoun.

The College is one mile from Calhoun, a station on the main line of the Southern Railway, and two miles from Cherry’s, on the Blue Ridge Railroad. By means of these roads and their connections,
the College is easily accessible from all parts of the State. It is also connected by telephone with Calhoun and Pendleton, and thence by telegraph with all parts of the country. The postoffice is conveniently situated on the campus, and receives five daily mails.

**College Grounds and Buildings**

**GROUNDS.**—The College grounds occupy about 200 acres of land, including the campus, sites of buildings and residences, and grounds for military drill and outdoor athletics. The campus is laid out in walks, drives and lawns, and is shaded by a beautiful grove of native forest trees.

In memory of the lamented R. T. V. Bowman, late instructor in forge and foundry work, the new athletic and parade grounds have been named "Bowman Field."

**Agricultural Hall** is a three-story brick structure, 130x140 feet, trimmed with gray sandstone. It contains twenty-two rooms, including recitation rooms, library and reading room, literary society halls, laboratories for botany, entomology, physics and mineralogy, besides the offices of the President, the Commandant and the Secretary and Treasurer. Adjoining this building is Memorial Hall, the College Chapel, which has a seating capacity of 1,000. It is used for religious purposes and as an assembly room.

**The Mechanical Building** is a substantial brick structure of liberal dimensions, containing about 30,000 square feet of floor space. On the first floor are the mechanical laboratory, machine shop, forge shop, foundry, and the power and light station. On the second floor are the offices and recitation room, while the wood shop occupies the whole of a two-story wing, 45x100 feet. The third floor is entirely occupied by the division of drawing.

The original **Chemical Laboratory** is a two-story brick building, 50x80 feet, covered with slate, and finished inside with Southern pine. Overlapping this at one corner, and connected with it, is a new and somewhat similar building 53x86 feet, of modern style and handsome design. This double building constitutes a commodious structure adequate to all the needs of the department.

**The Textile Building** is a two-story brick structure of modern cotton mill design, protected from fire by automatic sprinklers and a 10,000 gallon water tank in the tower. The first floor is occupied by recitation rooms, carding and spinning rooms, and office. On the second floor are the dyeing and weaving departments.
The Original Cadet Barracks is a three-story brick building, containing 148 rooms for students, a dining hall 134 x 44 feet, and a kitchen 50 x 37 feet. The growth of the College has necessitated the erection during the past year of an additional barracks building 199 x 42 feet, containing 82 rooms. These buildings are heated by steam and lighted by electricity, and have an abundant supply of pure spring water.

The rooms in barracks are furnished with single width iron cots, mattresses, tables, chairs, wardrobes, buckets, pans, cups and mirrors. The dining hall is well supplied with table linen, silverware and china. The kitchen is equipped with modern appliances for culinary purposes.

The bath rooms and closets are located in brick buildings apart from the barracks, and connected with them by covered gangways.

The Electrical Instrument Laboratory is a brick building of special design. It is arranged especially for delicate instrument work.

The Dynamo Laboratory is a modern brick structure, 37 x 80 feet. Besides containing the dynamo electric machinery for instructional use, it also contains the electrical engineering lecture room.

The Horticultural Building, a two-story frame structure, contains the offices, class rooms and collections of the horticultural division, and the local office of the United States Weather Bureau. There are also a spacious, well-equipped green house, a canning house and a packing house, with brick basement.

The Dairy Building is a wooden structure of modern design, constructed especially to illustrate the most approved methods of dairy practice.

The Veterinary Hospital is a commodious two-story frame building, 30 x 48 feet, with a basement 18 x 30 feet. It contains a dissecting room, drug room, an office, feed rooms, and apartments for an attendant.

The Hospital, located more than a quarter of a mile from the barracks, is a wooden building, especially designed for the purpose. It is lighted by electricity, and has a thorough sewerage system. The hospital is in the immediate charge of the College Surgeon, who is assisted by an experienced matron and nurse, thus ensuring the best personal attention to each patient.

The Calhoun Mansion, the former residence of John C. Cal-
houn, is kept in honor of his memory, in accordance with the provisions of Mr. Clemson's will.

RESIDENCES.—Nine two-story brick buildings, nine six-room cottages, and twenty-one smaller houses furnish residences for professors and other officers of the College.

Four additional five-room cottages are now being built.

CLEMSON CLUB HOTEL.—The College Hotel, a commodious building, overlooking the campus, is operated as a club by some members of the faculty. In addition to furnishing a home for the members of the club, it is open the entire year to a limited number of transients.

THE LAUNDRY is a brick building specially constructed and fitted with the improved machinery of a modern steam laundry. It is operated exclusively for students.

EXPERIMENT STATION OFFICES.—A wooden building, containing offices, a library, and storage and seed rooms, is provided for the use of officers of the Experiment Station.

FARM BUILDINGS.—The College is provided with commodious barns and other farm buildings of modern design, which are described more fully in connection with the equipment for instruction in agriculture.

THE POULTRY YARDS are supplied with incubators, brooders and other modern appliances. There are thirty-six pens, 20x32 feet, each containing a house 6x8 feet. For every four pens there is a run 80x150 feet, all enclosed with poultry cabled wire.

**Water Supply**

There are two sources from which water is obtained. The general supply is collected from springs through iron pipes into a reservoir, from which it is pumped into a standpipe eighty feet high, whence it is distributed.

Drinking water is pumped from a bold spring, in a continuous stream, directly into the barracks. It is by this means furnished fresh, pure and cold.

The waste water is used for flushing the sewer pipes, which empty into the Seneca River, a half-mile away.

**Tuition**

The following extract is taken from Section 1120, Revised Stat-
utes of South Carolina, 1893, Volume I., setting forth the powers and duties of the Board of Trustees: "They shall charge each student a tuition fee of forty dollars per annum; * * * indigent students shall not be required to pay said tuition fee."

In accordance with this law, residents of South Carolina are granted free tuition upon presentation of the following certificate, properly signed:

**CERTIFICATE OF INABILITY TO PAY TUITION**

*This is to certify, That I am unable to pay tuition for my ....in the Clemson Agricultural College for the session of 1902-1903.*


Father or Guardian.

I hereby certify that, to the best of my knowledge and belief, the above statement is true.

County Auditor.

All other students pay the tuition fee of $40.00 per session. Blank certificates will be furnished upon application to the President.

**Expenses for the Session of 1902-1903**

For free tuition students .................. $102 42
For tuition paying students .................. 142 42

These charges are due and payable in advance on the first day of each quarter, as follows:

*September 10, 1902, or on date of entrance:*

- Incidental fee .................. $5 00
- Medical fee .................. 5 00
- Uniform .................. 23 00
- Board and washing, first quarter .................. 16 88
- Breakage fee (see page 16) .................. 2 00

Total for free tuition students .................. $51 88
Total for tuition paying students .................. $61 88
November 17, 1902:
Board and washing, second quarter......$16 88

Total for free tuition students......... $16 88
Tuition, second quarter................ $10 00

Total for tuition paying students..... 26 88

January 28, 1903:
For free tuition students, third quarter.. 16 88
For tuition paying students........... 26 88

April 3, 1903:
For free tuition students, fourth quarter 16 88
For tuition paying students........... 26 88

A deposit of $2.00 is required of all students upon entrance, according to the following resolution of the Board of Trustees:

Resolved, That at the beginning of a session each student be required to deposit $2.00 with the Treasurer, to be known as a breakage fee. Whenever the property of the College is damaged, the actual cost of the repair of the property damaged shall be charged to the student who damaged the property. If, however, the responsibility cannot be fastened upon any student, the amount of the damage shall be prorated equally among all the students. At the end of the session any amount to the credit of a student shall be returned to him.

The price of uniforms is subject to fluctuations of the market.
To the above must be added the cost of books and stationery, which may be obtained at the Cadet Exchange at wholesale prices; also $1.50 for diploma, payable on graduation.
Remittances should be made in cash, money order, or New York Exchange, not by local checks, to P. H. E. Sloan, Treasurer, Clemson College, S. C. Banks charge exchange on local checks.
A deduction will be made for board and washing only when a student is absent one month or more.

Uniform
The College uniform is of cadet gray of the West Point pattern, except that the College button is used. For military full dress, the cadet officers wear a plume and sash, and the non-commissioned officers and privates a pompon. This uniform is made of the best Charlottesville mills goods, is neat, and, considering the make and material, is very inexpensive.
Requirements for Admission

Each candidate must be at least sixteen years of age.

Certificates of good moral character are required of all candidates not known to members of the faculty; and if the candidate comes from another college, this certificate must show that he was honorably discharged.

For admission into the Freshman Class thorough proficiency is required in arithmetic, elementary algebra, English grammar, geography and history of the United States. The text-books recommended to those preparing to enter the Freshman Class are Wells’ Academic Arithmetic, Wentworth’s New School Algebra, Whitney-Lockwood English Grammar, Dryer’s or Tarr’s Physical Geography, Eggleston’s History of the United States and its People.

Applicants who pass satisfactory examinations on all the theoretical subjects completed in the freshman year (see courses of study) may be admitted on probation to the Sophomore Class. Students so admitted must not only keep up with the regular course, but must also, within a reasonable length of time, make up all deficiencies in the practical work of the Freshman course.

All candidates for matriculation are subject to a medical examination, and will be excluded from the College on account of consumption, or other contagious or communicable diseases, or permanent disability for manual labor or military duty.

Each student will be required to bring with him four sheets, two blankets, a comfort, six towels, one pillow and two pillow-cases. Beds are single width.

The College rules require that all students be vaccinated, and parents are advised to have this done before sending their sons away from home.

Entrance Examinations

All candidates for admission to the College must take the entrance examinations.

Certificates and diplomas will not be accepted in lieu of these examinations, but candidates are requested to bring them as corroborative evidence of preparation.

On other pages will be found typical examinations for entrance into the Freshman Class. They will be useful in suggesting the character of preparation that an applicant should have.
Regulations of the College

Reports

Monthly reports are furnished to parents and guardians, giving the standing of students in all studies and in discipline. Reports are also issued at the end of each term, showing the grades, based upon class work and examinations, in all studies. Parents will be advised to withdraw students who habitually shirk duties.

No student conditioned on any subject can be promoted to a higher class until all conditions are removed.

Conditioned students are allowed five days from the opening of every session in which to remove deficiencies; and during this period no conditioned student is allowed to attend regular class exercises.

No student is allowed to take the courses of any class more than twice, except by special permission of the faculty.

Any student taking a subject over waives the right to all previous records in that subject, and is placed upon the same footing as students taking the work for the first time.

No student failing of promotion is granted an irregular course that does not include all subjects on which he is conditioned.

All students who are put back into any class must take the full work of that class.

Any student desiring to change his course of study must apply for such change within one month from date of entrance.

Students are not allowed to change from the Agricultural to the Mechanical course and vice versa after the beginning of the Sophomore year.

Students making an average of 90 per cent. or more, in each study, for the year, have their names published at commencement as Distinguished.

The students who make the highest average grade during a term are appointed marchers of their respective sections for the succeeding term.

Irregular courses are not allowed to students in the Subfreshman Class.

Absences from recitation, if they exceed twenty per cent. of the class periods in any subject, must be made up within a month.
Practical work must be made up, hour for hour, under the direction of the instructor.

All students are required to purchase the text-books used in their classes, unless excused for special reasons by the instructors. Text-books are kept at the Cadet Exchange and are furnished to students at wholesale prices.

Matriculation is equivalent to a pledge to conform to the rules and regulations of the College.

Rules for the Appointment of Students

In selecting the students who shall be notified to report to the College, the following rules, prescribed by the Board of Trustees, will govern:

1. Students must undergo a medical examination, and no student will be admitted who is not healthy and free from contagious diseases, including consumption.

2. Students will be apportioned among counties in proportion to representation in the House of Representatives, under the following rules and regulations:
   (a) Boys prepared to enter College classes will have preference over those who can only enter the Subfreshman class.
   (b) As between boys of equal preparation, the oldest will have the preference.
   (c) Other things being equal, the first applicants will receive permission to enter.
   (d) When a county has not sent its quota, the places thus left shall be apportioned among the other applicants.
   (e) Applicants not entering within ten days after the opening of the session will have their rights in the place given to applicants next on the roll.

Military Regulations

In addition to the special regulations of the military department, cadets are subject to the following general regulations:

Cadets are subject to military discipline at all times, and are required to take part in drill, guard duty and other military exercises.

All regular students are required to board in the barracks, except those who live with their parents near enough to attend from their homes.

Each student is required to purchase the prescribed uniform; also
a pair of over-shoes and a rubber coat. Students may provide themselves with such work-clothes as they desire.

Not more than three students are permitted to occupy the same room. Those occupying a room are consulted before another student is assigned to that room. A student not satisfied with his roommates has the privilege of applying for permission to move to another room, and such applications are granted when practicable.

Cadets will at all times be respectful in their bearing to professors and other officers of the College.

The practice known as hazing is positively forbidden, and any cadet indulging in this practice will be expelled from the College.

Cadets are positively forbidden to use, or have in their possession, intoxicating liquors of any description.

The use of tobacco in any form by cadets is prohibited.

Profanity is positively forbidden.

Cards and all games of chance are positively forbidden.

All combinations of cadets for the purpose of censuring or praising one of their number are prohibited; also all combinations to defeat the purpose of any regulation of the College.

Fighting is positively forbidden. If any cadet shall consider himself wronged by another, or by a professor, or by an officer, he is to complain thereof in writing to the President, who will examine into the complaint and take such measures for redressing the wrong as he may deem proper.

Cadets are forbidden to keep any arms in their possession not issued by the proper authority.

Any cadet receiving 100 demerits during a term of five months will be dismissed.

Any cadet absent from barracks at night without proper authority will be dismissed.

**College Organization**

The College is organized into six general departments, as follows:

1. Academic Department
2. Agricultural Department
3. Mechanical Department
4. Department of Chemistry and Natural Science
5. Textile Department
6. Military Department

**Academic Department.**—The departments of instruction in
Mathematics, English and History, which are common to all the courses, are collectively designated as "The Academic Department."

The Agricultural Department comprises the following divisions: General Agriculture, including Animal Husbandry; Horticulture, Entomology, Botany, Dairying, Veterinary Science, Poultry Raising.

The Mechanical Department comprises the divisions of Applied Mechanics, and Mechanical Engineering, Physics, Electrical Engineering, Drawing and Designing, Forge and Foundry, Machine Shop, Woodwork.

The Department of Chemistry and Natural Science includes Chemistry, general, industrial, agricultural and analytical; Geology and Mineralogy.

The Textile Department comprises the courses in Textile Industry.

The Military Department comprises theoretical and practical instruction in Military Science and Tactics.

Experiment Station

The State Experiment Station occupies a portion of the College farm, and affords valuable opportunities for instruction in the various divisions of the Agricultural department.

Under the guidance of the Station officers, the students are expected to familiarize themselves with the different lines of investigation being carried on, and thus to have their interest in agricultural topics awakened, their powers of observation strengthened, and to learn to tabulate and compare results of experiments conducted and to draw conclusions therefrom. The organization and work of the Experiment Station are described at the end of this catalogue.

Farmers' Institutes

During the past year farmers' institutes were held, under the management of the College, in many Counties of the State. The President and Professors of Agriculture, Chemistry, Horticulture, Dairying, Veterinary Science, Botany and other members of the faculty have taken part in these institutes. The purpose has been to bring practical information to the farmer, and to give him the results of scientific investigation in the interest of Agriculture. The success thus far attained is most encouraging, and leads to the hope
that these institutes may become a permanent feature in the work of the College.

They will be continued during the coming vacation. A special institute of seven days' duration will also be held at the College during the month of August, in which, besides the College faculty, a number of prominent speakers from other States are expected to participate.

Farmers wishing an institute held in their County or community should write to the President.

**Student Labor**

The College assumes no obligation to furnish employment to students for wages. Considerable manual labor is necessary to carry on the Agricultural and Mechanical departments of the College. When practicable students are employed in this work and are paid for it at eight cents an hour; but no student is allowed to undertake work that interferes with his College course. The number of students who apply for work always exceeds the number that can be employed. Students who enter late are at a special disadvantage in securing this work.

**Religious Influences**

Every effort is made to surround the students with safe religious influences. There is preaching in Memorial Hall every Sunday morning by ministers of the different denominations, and chapel services are conducted every morning by the President and other members of the faculty. All students are required to attend these exercises unless specially excused.

A Sunday School, at which attendance is voluntary, also meets every Sunday morning, and students are encouraged and urged to attend.

**Young Men's Christian Association**

This is a voluntary organization of the students, and is entirely under their management. The objects of the Association are to promote Christian fellowship among its members and aggressive Christian work among the students. The meetings are held in Memorial Hall every Sunday evening. The membership is of two classes—active and associate. A member in good standing of any evangelical church may become an active member of the Association,
and any young man of good moral character may become an associate member. The faculty are in hearty sympathy with the work of the Association, and render cheerful service when requested to do so. Parents and guardians are advised to encourage the students to join the Association as soon as they reach the College.

**Care of the Sick**

The College Surgeon will keep parents fully informed of the condition of sick students. In case of serious illness parents are notified by telegraph.

Students have permission to call on the Surgeon at any time for advice and treatment. The Surgeon cannot undertake to notify parents every time a student reports to the hospital for medicine or rest, on account of some slight complaint; but parents may rest assured that they will hear from the Surgeon promptly in case of sickness of any consequence.

The health record for the past year has been exceptionally good, and many sanitary improvements have been made to insure the continued health of the students.

The College rules require that all students be vaccinated, and parents are advised to have this done before sending their sons away from home.

**Library**

In the Agricultural building are a series of rooms specially constructed for the use of the Library. About 5,000 volumes of standard English literature, history, biography, general science, etc., and about 1,000 volumes of government publications are now on the shelves. The number of books is being added to each year. They have been recently classified and arranged, and excellent opportunity is now offered students for general and supplementary reading.

In recent purchases for the Library special efforts have been made to procure all available books on South Carolina history and literature.

**Museum**

In the Library suitable cases have been provided for the preservation of curios and relics. The museum is small, but is growing rapidly, and now contains a number of valuable and interesting articles. Donations are earnestly requested. All gifts will be labeled with the names of the donors. Among the recent acquisitions to the museum
is a lithograph copy of the Ordinance of Secession, presented by the Hon. W. A. Courtenay.

**Reading Room**

Connected with the Library is the students' reading-room, supplied with the leading magazines and daily papers, and most of the County papers of the State.

**Literary Societies**

Three literary societies, the Calhoun, the Palmetto and the Columbian, furnish a valuable supplement to the work of the College. These societies afford facilities for practice in debate, oratory, declamation and essay-writing, and their members acquire valuable knowledge of parliamentary law and usage. The meetings are held weekly on Friday evenings. Public celebrations and contests are also held at intervals during the year, at which there are debates, orations and declamations by the students.

The societies occupy halls in the main College building, which are furnished with carpets and opera-chairs, and are maintained entirely by the students. A small fee is charged for initiation, and there are also monthly dues of a few cents to meet running expenses. The total membership usually comprises about nine-tenths of the registered attendance at the College. All students are advised to join one of these societies.

The [*Clemson College Chronicle*](#), a magazine designed to encourage literary work among the students, is published monthly during the session by the literary societies.

**Science Club**

The Clemson College Science Club was organized for the purpose of promoting knowledge of the progress of the natural sciences, theoretical and applied. Public meetings are held every month, at which subjects of general scientific interest are discussed by members of the faculty and advanced students of the College.

**Lecture Course**

A lecture course, employing some of the best talent on the American platform, has been provided for the coming session. These lectures will be delivered in Memorial Hall, and will occur monthly
while the course is in progress. The cost to students will be about $1.00 for the course.

Cadet Exchange

A Cadet Exchange is maintained, where students may purchase at wholesale prices necessary articles, such as books, stationery, collars, cuffs, underwear, etc.

Athletics

It is the policy of the College to sanction and encourage athletics so long as studies and other duties are not interfered with. Class records show that, as a rule, students engaged in athletics do as well in their classes as those who are not. Should future experience reverse these records athletic sports will be restricted or prohibited altogether.

The following resolution relative to athletics has been passed by the faculty: That it is the sense of the faculty that only cadets in good class standing be permitted to play in any intercollegiate game of tennis or of ball—either base or football—to appear in any public exhibition or on the rostrum; or to attend as Clemson's representatives any meeting of any sort at any time or place.

The most popular games this year are baseball and football. It is assumed that parents are willing for their sons to participate in these games unless the President is definitely notified to the contrary. The athletic teams will be permitted to take a few trips each season, usually on Saturdays, to play intercollegiate games. Students must file written permission from parents for these trips.

Rules of the South Carolina Inter-Collegiate Athletic Association

The following rules are an abstract of the Constitution of the South Carolina Inter-Collegiate Athletic Association, to which the following colleges belong: South Carolina College, Wofford College, Newberry College, Clinton College, South Carolina Military Academy, and Clemson College:

ARTICLE VII. QUALIFICATION OF CONTESTANTS

The following persons are debarred from playing with or against the colleges in this Association:

1. Any student who has ever received compensation for his athletic services, or is a professional by definition of the Constitution,
unless such party was a regularly matriculated student of a college on December 27, 1900.

2. Any student who since that date has received compensation or is a professional.

3. Any student who receives any compensation whatever from the College he is attending for his athletic services.

4. Any student who enters College later than thirty days after the opening of the academic year.

5. Any student doing less than ten hours satisfactory class work, or any post-graduate student of more than two years' standing, or who is doing less than five hours satisfactory class work.

6. Any student playing under an assumed name.

7. Any student who, when called upon to sign a statement that he is in no way violating the Constitution of this Association, refuses to do so.

**Distinguished Students**

Students who make an average of 90 per cent. or more on each and every study for the entire session are designated as distinguished. Following is a list of the students who have attained this distinction during the past year:

**Session 1901-1902**

*Senior Class:* S. C. Stewart.

*Junior Class:* T. S. Gandy and T. M. Harvey.

**Medals**

**President's Essay Medal.—** A gold medal is offered annually by the President for the best essay. The subject is announced early in the year and the competition is open to all students.

Awarded in 1902 to Mr. H. C. Tillman.

**Society Medals.—** The literary societies award medals for excellence in debate, oratory and declamation.

The *Clemson College Chronicle* also awards three medals, for the best poem, the best story and the best essay appearing in that publication during the year.
Courses of Study

A selection between the Agricultural and other courses is made at the end of the first term of the Freshman year. The selection between the Mechanical and Textile courses is made at the beginning of the Sophomore year. Students in the Mechanical course choose between Electrical Engineering and Civil Engineering at the beginning of the Junior year.

### Agricultural Course

#### Freshman Class

<table>
<thead>
<tr>
<th>Hours per week</th>
<th>1st Term</th>
<th>2d Term</th>
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</thead>
<tbody>
<tr>
<td><strong>THEORETICAL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mathematics</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>English</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>History</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Agriculture</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Physics</td>
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<td>3</td>
</tr>
<tr>
<td><strong>PRACTICAL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Woodwork</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Mechanical Drawing</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Freehand Drawing</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Forgework</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Botany</td>
<td>0</td>
<td>3</td>
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#### Sophomore Class

<table>
<thead>
<tr>
<th>Hours per week</th>
<th>1st Term</th>
<th>2d Term</th>
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</thead>
<tbody>
<tr>
<td>English</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Chemistry</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Stock Breeding</td>
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<td>2</td>
</tr>
<tr>
<td>Horticulture</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Botany</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Agriculture</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Zoology</td>
<td>1</td>
<td>0</td>
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<tr>
<td>Entomology</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Chemical Laboratory</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Surveying Field Work</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Stock Breeding</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Agriculture</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Entomology</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Botany</td>
<td>2</td>
<td>0</td>
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<tr>
<td>Horticulture</td>
<td>2</td>
<td>0</td>
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<tr>
<td>Zoology</td>
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#### Junior Class

<table>
<thead>
<tr>
<th>Hours per week</th>
<th>1st Term</th>
<th>2d Term</th>
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</thead>
<tbody>
<tr>
<td>English</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>History</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Chemistry</td>
<td>2</td>
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<tr>
<td>Military Science</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Dairying</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Soil Physics (Agr.)</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Horticulture</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Entomology</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Veterinary Science</td>
<td>0</td>
<td>4</td>
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<tr>
<td>Chemical Laboratory</td>
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<td>6</td>
</tr>
<tr>
<td>Soil Physics (Agr.)</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Horticulture</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Dairying</td>
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<td>0</td>
</tr>
<tr>
<td>Entomology</td>
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<td>4</td>
</tr>
<tr>
<td>Botany</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Veterinary Science</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Mineralogy</td>
<td>0</td>
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</tbody>
</table>

Note.—Military drill occupies 45 minutes a day, five days in the week.
### Senior Class

<table>
<thead>
<tr>
<th>Theoretical</th>
<th>Hours per week</th>
<th>Practicals</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st Term</td>
<td>2nd Term</td>
<td>1st Term</td>
</tr>
<tr>
<td>English</td>
<td>2</td>
<td>2</td>
<td>Chemical Laboratory</td>
</tr>
<tr>
<td>History</td>
<td>0</td>
<td>3</td>
<td>Veterinary Science</td>
</tr>
<tr>
<td>Chemistry</td>
<td>2</td>
<td>2</td>
<td>Mineralogy</td>
</tr>
<tr>
<td>Geology</td>
<td>2</td>
<td>3</td>
<td>Agriculture</td>
</tr>
<tr>
<td>Cattle Feeding</td>
<td>2</td>
<td>0</td>
<td>Bacteriology</td>
</tr>
<tr>
<td>Veterinary Science</td>
<td>2</td>
<td>3</td>
<td>Horticulture</td>
</tr>
<tr>
<td>Bacteriology</td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Entomology</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Military Science</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

### Mechanical Course

#### Freshman Class

| Mathematics   | 5 | 5 | Woodwork | 3 | 3 |
| English       | 5 | 5 | Mechanical Drawing | 3 | 3 |
| History       | 3 | 3 | Freehand Drawing | 4 | 4 |
| Agriculture   | 2 | 2 | Forgework    | 3 | 3 |

#### Sophomore Class

| Mathematics   | 5 | 5 | Woodwork | 3 | 3 |
| English       | 3 | 3 | Mechanical Drawing | 3 | 2 |
| Chemistry     | 3 | 3 | Foundry    | 3 | 3 |
| Natural Philosophy | 2 | 2 | Chemical Laboratory | 4 | *3 |
| History       | 3 | 2 | Descriptive Geometry | 0 | 3 |

#### Junior Class

| Mathematics   | 5 | 5 | Machine Shop | 4 | 4 |
| Physics       | 2 | 2 | Mechanical Drawing | 3 | 3 |
| Electrical Engineering or Civil Engineering | 2 | 2 | Electrical Lab. or Civil Engin'ring Field Work | 3 | 3 |
| Mechanics     | 2 | 2 | Physical Laboratory | 3 | 3 |
| English       | 2 | 2 |                |   |   |
| Military Science | 1 | 1 |                |   |   |

*Second Term—Chemistry, first half, 3 hours. Surveying, second half, 3 hours theoretical, 2 hours practical.

Note.—Military drill occupies 45 minutes a day, five days in the week.
## Senior Class

<table>
<thead>
<tr>
<th>Theoretical</th>
<th>Hours per week</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st Term</td>
<td>2nd Term</td>
</tr>
<tr>
<td>Mechanical and Steam Engineering</td>
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<tr>
<td>History</td>
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<tr>
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<tr>
<td>Military Science</td>
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<td>1</td>
</tr>
<tr>
<td>Geology</td>
<td>3</td>
<td>0</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Practical</th>
<th>Hours per week</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st Term</td>
<td>2nd Term</td>
</tr>
<tr>
<td>Shopwork</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Machine or Bridge Design</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Electrical Laboratory or Civil Eng. Field Work</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Mechanical Laboratory</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

## Textile Course

### Freshman Class

| Mathematics | 5 | 5 |
| English | 5 | 5 |
| History | 3 | 3 |
| Agriculture | 2 | 2 |

| Woodwork | 3 | 3 |
| Mechanical Drawing | 3 | 3 |
| Freehand Drawing | 4 | 4 |
| Forgework | 3 | 3 |

### Sophomore Class

| Mathematics | 5 | 5 |
| English | 3 | 3 |
| Chemistry | 3 | 3 |
| Natural Philosophy | 2 | 2 |
| History | 3 | 2 |

| Mechanical Drawing | 3 | 2 |
| Chemical Laboratory | 4 | 4 |
| Descriptive Geometry | 0 | 2 |
| Machine Shop | 3 | 3 |

### Junior Class

| Textile Industry | 9 | 9 |
| Chemical Laboratory | 4 | 4 |

### Senior Class

| Mechanical Engineering | 5 | 0 |
| Textile Industry | 8 | 10 |
| English | 2 | 2 |
| Military Science | 1 | 1 |
| History | 0 | 3 |

| Mechanical Drawing | 2 | 2 |
| Textile Industry | 11 | 8 |
| Mechanical Laboratory | 0 | 3 |

Note.—Military drill occupies 45 minutes a day, five days in the week.
Special Textile Course

First Year

<table>
<thead>
<tr>
<th>Theoretical</th>
<th>Hours per week</th>
<th>Theoretical</th>
<th>Hours per week</th>
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<td>Carding and Spinning...</td>
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<td>Carding and Spinning...</td>
<td>5 5</td>
</tr>
<tr>
<td>Designing</td>
<td>3 3</td>
<td>Weaving</td>
<td>6 6</td>
</tr>
<tr>
<td>Textile Chemistry ......</td>
<td>2 2</td>
<td>Chemical Laboratory...</td>
<td>4 4</td>
</tr>
<tr>
<td>Mechanics</td>
<td>2 2</td>
<td>Freehand Drawing ......</td>
<td>3 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mechanical Drawing ...</td>
<td>3 2</td>
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</table>

Second Year

<table>
<thead>
<tr>
<th>Practical</th>
<th>Hours per week</th>
<th>Practical</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
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<td>Carding and Spinning</td>
<td>2 2</td>
<td>Carding and Spinning</td>
<td>5 5</td>
</tr>
<tr>
<td>Designing</td>
<td>3 3</td>
<td>Weaving</td>
<td>7 7</td>
</tr>
<tr>
<td>Cloth Analysis</td>
<td>3 0</td>
<td>Dyeing</td>
<td>8 8</td>
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<tr>
<td>Jacquard Designing</td>
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<tr>
<td>Tie-ups</td>
<td>0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Textile Chemistry</td>
<td>2 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This course presupposes a knowledge of general inorganic chemistry.

Subfreshman Class

A Subfreshman course is provided for students not prepared to enter the Freshman Class. In addition to instruction in the usual preparatory branches, agriculture, drawing and military drill are also included in this course. The work is closely articulated with the instruction in the advanced classes.

Special Courses

Graduates of this and other institutions, or other mature young men of earnest purposes, who desire to pursue special lines of work will be given every opportunity that the College affords, upon satisfying the faculty that they are qualified to undertake such courses to advantage. Students thus admitted are expected to apply themselves assiduously, and with the approval of the faculty, may board outside of the barracks.
Irregular Courses

Students are earnestly advised to pursue regular courses; but those who for satisfactory reasons are unable to do so, may, upon the approval of the faculty, pursue irregular courses. No student whose time is not fully occupied will be permitted to remain at the College. A student who is behind in any subject will not be permitted to change from a regular to an irregular course. An application for an irregular course must be accompanied by the written approval of parent or guardian, and of instructors in all subjects for which application is made. Diplomas are not issued to irregular students.
Instruction and Equipment

General Agriculture

Professor Newman
Assistant Professor Conner

This study is pursued in all of the classes, commencing with the elementary principles in the Freshman year. During this year the instruction is confined to the application of principles and practice which do not require a knowledge of the sciences related to agriculture.

As the student progresses in the study of the natural sciences, the application of these sciences is taught in their relation to the art of agriculture, special stress being placed upon the protection, improvement, fertilization, and all manipulations of the soil in the preparation for planting and in the cultivation of crops.

The cultivation of each important crop is discussed in the concrete. Special attention is bestowed upon the grasses and their cultivation. In the higher classes the employment and management of labor, farm equipment, and farm management are discussed.


Reference-books: Voorhees' First Principles of Agriculture, Storer's Agriculture, Experiment Station Bulletins, Leading Periodicals.

Equipment

The College has a large storage barn provided with silos, a cow barn furnished with various forms of stanchions, a mule barn provided with the most improved forms of stalls and feed-racks, implement and wagon sheds for storage of tools, etc., compost building for making compost in large quantities, and two large cribs for storage of corn.

Among agricultural machinery and implements may be mentioned the following: Self-binder, corn-harvester, Deering ball-bearing mower, Osborne mower, self-dumping rake, check-row corn planter, Buckeye cultivator, B. F. Avery cultivator, Tower cultivator, disc-cultivator, spring-toothed harrow, smoothing harrows, various forms of pulverizers, manure-spreading machines, fertilizer and grain drill, various forms of small fertilizer drills, Planet, Jr., drill, two Planet, Jr., plows, scientific mill, stone grist mill, Tornado ensilage cutter, small thresher, hand-gin, rock-crusher, road machine, three terrace levels, and a 10 kw. electric motor.
Horticulture

Mr. C. C. Newman

The course in horticulture consists of horticulture proper, home gardening, truck farming, pomology, viticulture, canning and experiment work.

Instruction is given by text-book and lectures, covering the subject of horticulture in its comprehensive sense. The instruction is continued through the entire course and is illustrated by practical exercises in the garden, the orchard, the vineyard and the greenhouse.

In the practical work, the student is required to labor, and is thereby taught by actual experience the use of tools, the proper mode of preparing, fertilizing and cultivating the soil; shipping, storing, and canning vegetables and fruits; training and pruning vines and trees; propagating plants by seeds, grafts, buds, layers, leaves, and divisions. Instruction is also given in the making and use of hot-beds, cold-frames, mulching, etc., together with the art of forcing, crossing, and hybridizing, and the care of plants in the greenhouse.

Equipment

The Horticultural building, a two-story frame house, contains the classroom, offices and collections of the horticultural division, and the local office of the United States weather bureau.

The equipment for practical instruction in horticulture consists of the following: canning outfit complete; greenhouse, 21x140 feet, heated by hot water; experimental garden, about five acres; orchard, vineyard, and plats of small fruits, twenty acres, and a small nursery.

Zoology and Entomology

Mr. Chas. E. Chambliss

The instruction in this division is largely conducted by the laboratory method with lectures and recitations, and is so given as to lead the student to observe and think for himself, as well as to secure a working knowledge of the science for practical purposes.

Sophomore Class

General Invertebrate Zoology.—This course includes a general discussion of groups, and dissection of types, especially of the forms
related to insects, and is further extended to lay a foundation for a knowledge of animal development. Animals of economic importance are given special attention.

*Books of Reference:* Invertebrate Morphology (McMurrick); The Riverside Natural History.

**Elementary Entomology**—This is a laboratory course in entomology devoted mainly to the general structure of insects, and is designed with special reference to economic ends.

*Text-book:* Elements of Insect Anatomy (Comstock and Kellogg).

*Books of Reference:* A Text-book of Entomology (Packard); Guide to the Study of Insects (Packard); Insects (Hyatt and Arms).

**Junior Class**

**Economic Entomology**—By laboratory studies and field work, the students, in this course, will be made familiar with the most important injurious insects. For the systematic and biological work, a collection of fifty species, with full notes on the habits of ten, will be required. The practical work will consist of the preparation and application of insecticides.


*Books of Reference:* Insects Injurious to Fruits (Saunders); Economic Entomology (Smith); U. S. Government, Experiment Station and State Publications on Entomology.

**Equipment**

The Zoological and Entomological Laboratory is located in Agricultural Hall. The equipment includes compound and simple microscopes, an automatic laboratory microtome, dissecting instruments, camera, stereopticon, lantern slides and charts. The entomological cabinet contains a large number of injurious and beneficial insects of South Carolina. The students have access to a small but carefully selected entomological library.

**Botany**

**Mr. Metcalf**

**Sophomore Class**

**Second Term**—During the second term of the Sophomore year the students of the Agricultural course receive instruction in general
botany. During this term they become familiar with the general structure of plants—beginning with the simplest forms and studying to the complex. Incidentally they learn how to manipulate the simple and the compound microscope. A large portion of the time is spent on flowering plants. As this term’s work is the basis for the more advanced botanical studies in the course, considerable stress is laid upon the underlying principles of plant morphology and plant structure.

**Junior Class**

**First Term.**—During this term lessons in plant physiology are given. Some of the simple and fundamental principles are studied. Experiments with water cultures and others of a similar nature are carried on by the students.

**Second Term.**—During the second term the class takes up the study of plant diseases. Attention is directed especially to the diseases of economic plants. They are taken up from a systematic standpoint of the parasite. A careful microscopic study is made; its effect on the pest noted, and the remedy learned.

The practical work consists in microscopic study in the laboratory, exercises in studying the diseases in the field, and collecting specimens—each student collecting and naming correctly an herbarium of twenty-five species of parasitic fungi.

**Senior Class**

**First Term.**—During the first term the class receives instruction in bacteriology. During this work the student becomes familiar with the different methods of sterilization and different culture media. Several species of bacteria are cultivated, mounted and studied in detail. The class is also required to isolate and study a bacterium from a mixture of species. It is the object of the course to acquaint the students with the fundamental principles of bacteriology.

**Equipment**

The botanical laboratory is located on the third floor of Agricultural Hall. The northern exposure makes it especially suitable for microscopic work.

In the laboratory equipment there are the following pieces of apparatus: twenty-five simple microscopes, twenty-two compound microscopes (six of these are bacteriological microscopes), incubator, glass dishes, sterilizer, embedding bath, students’ microtome, section cutters, etc.

A creditable beginning has been made in collecting an herbarium. This
collection includes plants collected in the State, plants received by exchange, and a donation of about twenty-five hundred mounted specimens from Dr. A. P. Anderson. This donation includes plants collected in Minnesota and in Europe, including many species not present in the flora of South Carolina.

Dairy Husbandry

Mr. Upton

Junior Class

Students who take the course in Agriculture receive instruction in the formation and management of a dairy, care of the cows, and feeding for milk production.

In the dairy building the instruction is supplemented by practical work in the care of milk, separation of cream, making butter and cheese, and testing milk and its various products.

The text-book used is Wing's "Milk and its Products," in addition to which the latest methods are gleaned from the various experiment station bulletins.

Those wishing to take a short course in practical work can enter February 1st and continue for ten weeks, during which time instruction will be given similar to that in the regular course.

Students taking the short course must be employed as many hours per week as those in the regular course.

Board and tuition will be the same as for other students in the regular courses.

Equipment

The commodious dairy building has an independent steam plant and water-works, and is supplied with everything needed for making butter and cheese on a factory and private dairy scale, including the leading makes of cream-separators, churns, butter-workers, milk-testers. Students are thoroughly drilled in the use of this apparatus.
Animal Husbandry

Mr. Upton

Sophomore Class

Stock Breeding.—A careful study of the different types of domestic animals is pursued, and the student is thoroughly drilled in the principles and methods of successful breeding, heredity, atavism, variation, selection, fecundity, influence of environment, in-breeding, cross-breeding, grading, influence of previous impregnation.

The different breeds of horses, cattle, sheep and swine are considered, and those best adapted to the South are discussed at length.

The College farm has a number of breeds of domestic animals which serve to illustrate the subject.

As a supplement to this work, the student is drilled in the use of the score-card, which fixes the different types and breeds firmly in his mind.

Senior Class

Stock Feeding.—This course includes the following subjects: Laws of animal nutrition; composition of the animal body; fodders as a source of nutrients; digestion, resorption, circulation, respiration, and excretion; formation of muscle, flesh and fat; composition and digestibility of feeding stuffs, and their preparation and use; feeding for fat, for milk, for wool, for work and for growth.

The available feed-stuffs of the South are discussed at length. Henry's "Feeds and Feeding" is used as a text-book.

Veterinary Science

Dr. Nesom

Dr. Shealy

The object of this course is to acquaint the agricultural student with the elementary principles of veterinary medicine and surgery. The time is too short to make professional veterinarians of those who take this study, but is sufficient to make them more intelligent stockmen when graduated.

The instruction begins with the second term in the Junior year of the Agricultural course and is given as follows:
Junior Class

Second Term.—Anatomy, Physiology and Histology of the domestic animals, four hours a week class room and two hours a week laboratory. Texts, "A Manual of Veterinary Physiology," F. Smith; "Manual of General Histology," Wm. S. Gottheil.

Senior Class

First Term.—Surgery, Materia Medica and Pharmacy, two hours a week class room and three hours a week clinic and laboratory. Lectures on Surgery and Pharmacy. Text: "A Compend of Veterinary Materia Medica and Therapeutics," A. C. Hassloch.

Second Term.—Lectures on the Principles and Practice of Veterinary Medicine, three hours a week class room and three hours a week clinic.

Only the more common diseases of farm animals can be considered during the limited time devoted to this study, but special attention is given to those diseases that occur in epizootic outbreaks. Among these may be mentioned glanders, anthrax, Texas fever, tuberculosis, cholera, sheep "scab," hydrophobia, and favus. Careful consideration is given to the bacteriological and parasitic agencies causing the diseases.

Laboratory.—Laboratory work is given during the lectures to illustrate the structure of normal and pathologic tissues and the simpler reactions in chemical physiology. In pharmacy each student is required to compound a limited number of prescriptions.

Clinic and Dissection.—Every Monday afternoon a free clinic is held at the veterinary hospital. This is liberally patronized by the stockmen of the surrounding country, and affords the students ample practical work in surgical operations and the treatment of animal diseases. Advantage is taken of accidental material for post-mortem examination and gross dissection.

Post-Graduate and Special Work.—Graduates of this and other colleges and young men found proficient in the elementary branches of science and literature may receive special instruction. This work is designed as a preparatory course to entrance into a regular veterinary college. The special needs of each student are considered, and the work is planned to meet his individual case. The course taken here will shorten the time necessary for graduation from the leading veterinary colleges, whether the student desires to
become a veterinary practitioner, government meat-inspector, or army veterinarian.

**Equipment**

The veterinary class-room and laboratory is about 30x50 feet, provided with steam heat, electric lights, water, gas, and the necessary furniture. It is amply supplied with chemicals and the best apparatus for technical work.

The veterinary hospital is a structure of modern design, 48x65 feet, containing apartments for office, drugs, dissecting and horse-shoeing, besides stalls, feed-bins, water supply and electric lights. One of the best revolving operating tables has been provided. The surgical instruments and appliances now on hand, with a few additions, would do credit to a regular veterinary college. A complete outfit for horse-shoeing is provided. A good stock of drugs and chemicals is kept on hand and prescriptions are filled on request.

**Poultry Industry**

**MR. WATSON**

Instruction in this division will embrace a careful study of the origin, and the qualities of the different breeds of poultry, and the student is thoroughly drilled in the principles and methods of successful poultry breeding.

Instruction is given by lectures. Practical work will be done in caponizing, management of incubators and brooders, and judging of fowls by comparison and by score card system.

The Poultry Yards are supplied with incubators, brooders and other modern appliances. There are thirty-six pens, 20x32 feet, each containing a house 6x8 feet. For every four pens there is a run of 80x150 feet, all enclosed with poultry cabled wire.

**Chemistry**

**PROFESSOR HARDIN**
**ASSISTANT PROFESSOR BRACKETT**
**MR. SHIVER**
**MR. HENRY**

**Sophomore Class**

Both Terms.—*General Chemistry.*—Inorganic chemistry and the leading facts and principles of organic chemistry. Text-book, Roscoe's Elementary Chemistry. *Laboratory*—Introductory work and
qualitative analysis. Text-book, Jones' Junior Course in Practical Chemistry.

**Junior Class**

**Both Terms.**—*Industrial and Analytical Chemistry.*—The applications of chemistry in the more important arts and manufactures. Among the subjects studied are: Sulphuric acid; soda; chlorine; potash salts; fertilizers; lime, mortar and cements; glass; porcelain; illuminating gas; coal tar; mineral oils; vegetable and animal oils; soap; fermentation industries, etc. Text-book, Thorp's Outlines of Industrial Chemistry. *Laboratory*—Qualitative and quantitative analysis and assaying. Books used: Jones' Junior Course in Practical Chemistry, Fresenius' Qualitative and Quantitative Analysis.

**Senior Class**


**Equipment**

The original Chemical Laboratory is a two-story brick building, 50x80 feet, covered with slate and finished inside with Southern pine. Overlapping this at one corner, and connected with it by a glass-enclosed passage, is a new and somewhat similar building, 53x86 feet, of modern style and handsome design. This double building, which is well ventilated, heated by steam, and lighted by electricity, constitutes a commodious structure adequate to all the needs of the Department.

On the first floor of the old building, which is used for academic work, there are five rooms. Two of these, connecting with each other, are employed as a laboratory for the Agricultural Seniors. Of the other rooms on this floor, one is a laboratory for post-graduate students and one a balance room, while the third is reserved for such use as the ever increasing demands upon the Department may require.

On the second floor of this building, there are two large laboratories, one for the Juniors in Analytical Chemistry, the other for the Sophomores in General Chemistry. A third and smaller room is used as a balance room.
The Junior laboratory will accommodate seventy-two students, thirty-six at a time; the Sophomore laboratory, one hundred and twenty students, sixty at a time. The laboratories are all provided with hoods for carrying off noxious gases, convenient working tables, water, gas, electric lights, and all necessary appliances for experimental work.

The basement of the building is used for assaying, for the preparation of distilled water and for storage. The air pump and the mixer of the gas machine for supplying the laboratories with gas are placed in this basement and connected with the generator, which is in a brick vault eighty-five feet from the building.

On the first floor of the new building there are nine rooms, all of which are appropriated to the chemical work of the State and of the Experiment Station. On one side of the wide hall which extends the entire length of the building are two rooms for the analysis of fertilizers. Three of these rooms are used respectively for the determination of phosphoric acid, ammonia and potash; the fourth as a balance room; the fifth and last as a sample room. On the other side of the hall there are four rooms. The largest of these is used for the Agricultural Analysis of the Station. Adjoining this is a balance room, in which provision is made also for the optical and electrolytical apparatus. Of the remaining rooms, one is used for water analysis, the other as an office.

On the second floor of this building there are seven rooms; a lecture room, and six smaller rooms which are used for recitations, cabinets, apparatus, chemicals, library and Professor's laboratory.

The lecture room will seat one hundred and seventy students, the seats being arranged in tiers.

The hoods in this building are all connected by earthenware pipes with a tightly-built room, just under the roof, over which there is a large ventilator. An electric fan will be placed in this room, should the draught be found insufficient without it.

The rooms in the basement are used for assaying ores, for the preparation of agricultural products for analysis, and for storage. An electric motor located in one of three rooms supplies the power which drives the machinery for grinding and pulping samples of vegetable substances.

Geology and Mineralogy

Professor Lewis

Agricultural Juniors

Second Term.—Mineralogy.—The elements of Crystallography, with laboratory study of crystal forms by the use of models and natural crystals and the construction of simple drawings; the chemical and physical properties of minerals; laboratory tests of known minerals and practice in the determination of unknown specimens.
Agricultural Seniors

First Term.—Determinative Mineralogy.—A continuation of the above course. Practical study of the common minerals by determinative work in the laboratory, by comparison with labeled specimens of the systematic collection, and by the use of unlabeled collections for practice in identifying minerals at sight.

Both Terms.—General Geology.—The elements of dynamical, structural, and historical Geology. The influences of geologic phenomena on man are emphasized, particularly in the study of rock-decomposition and the formation of soils, the processes of erosion and deposition, and the resultant topographic forms. In historical geology special attention is given to the development of the North American continent.

Second Term.—Economic Geology.—A supplementary course of about twenty lectures given upon the completion of the course in general Geology. The origin and general characters of ore-deposits; the ores of the more useful metals; as iron, copper, lead, silver, gold, etc.; the origin and distribution of the principal non-metallic minerals of value; as coal, petroleum, natural gas, mineral fertilizers, clays, etc. The lectures refer particularly to the economic deposits of the United States.

Engineering Seniors

First Term.—Geology.—This course is designed to furnish a general knowledge of the science, with special emphasis on structural and dynamical Geology in their relations to engineering materials and practice. Specimens are freely used in illustration of the course, in order that the student may acquire a practical acquaintance with the most important rocks and minerals.

Equipment

The systematic collections contain over a thousand labeled specimens of rocks, minerals, and fossils. These are exhibited in glass cases in the laboratory, and are always available to students. There is also an unlabeled collection of minerals for practice in identifying the more important species at sight. Unlabeled collections of the most useful minerals are provided for determinative work in the laboratory.

The laboratory is supplied with water and gas and all apparatus and reagents necessary for the determination of minerals by means of their chemical and physical properties. A chemical balance is also provided, and a Bausch &
Lomb petrographic microscope, with photomicrographic camera and all important accessories.

The class-room is supplied with large physical wall maps of the world and of all the continents, a select series of topographic contour-maps furnished by the United States Geological Survey, an 18-inch terrestrial globe, a 20-inch relief globe (Jones' "New Model of the Earth"), a set of geological and geographical relief models, and several hundred lantern slides.

The library of the department contains the principal standard works of reference in geology and mineralogy, and receives all publications of the United States Geological Survey as issued, including annual reports, monographs, geologic folios, and bulletins.

Mechanical Engineering

Assistant Professor Barnes

In these courses the student is taught the application of his scientific, mathematical and technical knowledge to the design and construction of engineering structures, and of machinery and manufacturing plants in general.

Junior Class

First Term.—Elementary Mechanics.—Motion, force, velocity, work, energy, power, stress, strain, elasticity, resilience, moments of force, centre of gravity, moments of inertia, momentum, hydrostatics.


Second Term.—Mechanism.—Spur, bevel, and screw gearing, belt gearing, lobed and elliptic wheels, epicyclic trains, escapements, ratchet motions, link motions, quick return motions, cam motions.

Text-book—Stahl and Wood’s Mechanism.

Senior Class

Both Terms.—Mechanical Engineering, five hours per week. Lectures and recitations, on the design and construction of steam boilers, heaters, pumps and injectors; theory and design of simple, compound and triple expansion steam engines, gas and gasoline engines, hot air engines, air compressors and motors, ice and refrigerating machinery, heating and ventilating systems, transmission of power; engineering specifications and the law of contracts. Theory of the strength of engineering materials. Graphical solution of problems. Hydraulics.

Both Terms.—Mechanical Engineering—Laboratory Practice.—Study, use and calibration of water-meters, weirs, steam gauges, indicators, dynamometers, calorimeters; efficiency tests of screw-jacks and hoists; tests of fuels and lubricants; tests of building materials, as iron, wood, brick, cement, etc.; erecting, lining up and setting the valves of plain slide-valve and automatic cut-off steam engines; indicator practice; horse-power and efficiency of steam, gasoline and hot-air engines and air-compressors and motors; efficiency trials of steam boilers; duty trial of steam pump and of College pumping engine.

Reference books—Carpenter's Experimental Engineering, Smart's Engineering Laboratory Practice, Thurston's Steam Engine.

Equipment

This laboratory occupies a room 41x45 feet, and contains the following equipment: For steam engineering: 15-horse power horizontal, locomotive type boiler; 6-horse power vertical boiler; Erie 6-horse power plain slide-valve steam engine; 6-horse power vertical steam engine built in the shops; Corliss cross-compound condensing steam engine arranged so that either side may be run condensing or non-condensing and each side independent of the other; Wheeler surface condenser with combined air and circulating pumps; set of steam-gauge testing apparatus; Carpenter's separating steam calorimeter; two throttling steam calorimeters; five steam engine indicators of various makes; two standard injectors. For hydraulic engineering: two hydraulic rams; Pelton water motor; power triplex pump; three duplex pumps of different makes; three weirs; recording altitude gauge; 6 pressure and altitude gauges. For compressed air: Clayton air compressor with jacketed cylinders; improved air motor. For fuel and lubricants: Carpenter's fuel calorimeter with scales, balances, and oxygen generating devices; standard viscometer. For testing building materials: 100,000-pound Olsen automatic vertical testing machine driven by 5-horse power Westinghouse electric motor, and fitted for tension, compression, and transverse testing; Fairbank's cement testing machine; 3,000-pound transverse testing machine. The laboratory also contains a 5-horse power Otto gasoline engine, an Ericsson hot-air engine, a 6-horse power transmission dynamometer, graduated to read horse power direct and built by students, and an assortment of standard thermometers, weights and measures. The apparatus is so arranged that any of it may be used for separate or combined tests, or for any original investigations. Besides the equipment in this room, the electric light and power plant, the heating plant of the College and barracks, the isolated plants at the dairy, horticultural grounds and pumping station are available for instructional purposes.
Junior Year

Both Terms.—Three hours per week are devoted to the study of electricity and magnetism, and the elementary design of electro-magnetic mechanism. The work of this session is largely in laying a foundation for the more strictly engineering work of the Senior year.

Text-books—Thompson’s Elementary Lessons in Electricity and Magnetism, Electricity and Magnetism, Jackson.

Both Terms.—Laboratory Practice.—Three hours per week for the session are devoted to experimentally verifying fundamental electrical laws, measuring currents, electro-motive force, resistance, quantity, induction, capacity, permeability, calibrating instruments, etc.

Reference book—Ayrton’s Practical Electricity, Stewart and Gee’s Practical Physics, Nichols’ Physics, Vol. I., Gray’s Absolute Measurements, Ewing’s Magnetic Induction, Henderson’s Practical Electricity and Magnetism, Vols. I. and II.

Senior Year

Both Terms.—Five hours per week are given to the study and design of dynamo electric machinery. Special attention is given in the second half session to the study of alternating currents, and their applications to light and power. The course is supplemented by lectures and problems on synchronous and induction motors; design of transformers, transmission lines and plants; multiphase wiring, etc.

A dynamo design, with complete set of drawings, is required of each student as part of the course.


Both Terms.—Laboratory Practice.—Three hours per week devoted to the care, management and testing of arc, incandescent and alternating current generators; direct current, synchronous and in-
duction motors; arc lamps; transformers; calibration of station instruments, incandescent lamp photometry, etc.

**Equipment**

**ELECTRICAL INSTRUMENT LABORATORY.**—This is a separate brick building, designed especially for delicate electro-magnetic work—no iron, steel or other magnetic substances having been used in its permanent construction. It contains, in addition to all necessary elementary apparatus, the following instruments: Kelvin-Deka ampere balance, Kelvin four-coil astatic galvanometer, four D'Arsonval dead-beat galvanometers, large ring tangent galvanometer, three Elliott Brothers' standard resistance sets, Elliott Brothers' standard tangent galvanometer, Queen's standard ballistic galvanometer, Nalder Brothers' sensitive galvanometer, Rowland-D'Arsonval ballistic galvanometers, Will-young standard condenser, Becker's chemical balance, Carhart-Clark standard cell, thermometers, Wheatstone bridges, storage and primary cells, etc.

**DYNAMO LABORATORY.**—To meet the demands of larger attendance and increased equipment, a new building has been provided in which is installed the dynamo-electric machinery. This building also contains a class room and a dark room for photometric work. It is a single story brick structure, 37x80 feet, with basement for supply rooms.

The first story is divided into a class room 25x35 feet, and a dynamo laboratory room 53.35 feet. The building is heated by steam and lighted by enclosed arc and incandescent lamps.

The lecture room has elevated seats and is equipped with a complete line of illustration models, apparatus and electrical instruments. It contains an electro magnet capable of supporting the weight of two tons.

The Dynamo Laboratory contains, in addition to rheostats, speed counters, switches, and other small apparatus, the following machines and instruments:

50 H. P. high speed Automatic Engine.


**Direct Current Motors**—15 and 10 H. P. Kester, 7 H. P. (built by students), three 1-6 H. P. Crocker Wheeler.

**Direct Current Instruments**—Weston Laboratory Standard Voltmetre, set of Weston portables, Jewell Ammeter and Voltmetre, Weston Switchboard Ammeter and Voltmetre, Thompson Recording Watt Metre, etc., etc.

**Arc Lighting Apparatus**—Brush and Thompson-Houston Generators, Genl. Elec. Co. constant current transformer, principal makes of open and inclosed arc lamps.

**Alternating Current Apparatus**—15 K. W. Genl. Elec. Co. 2 and 3 phase, revolving field generator complete with marble switchboard and full set of indicating instruments.

7 1-2 K. W. Genl. Elec. Co. single, two and three phase rotary converter;
7 K. W. 3 phase converter built by students.

Genl. Elec. Co. 2 and 3 phase induction motors. Three 3,000 volt constant
potential transformers. Assortment of small transformers, motors and models.


*Miscellaneous*—Two Schoeffer & Budenberg tachometers, leading types of lightning arresters, fuse testing apparatus.

The dark room contains a complete outfit for high potential, high frequency and X-ray work, and a Deshler-McAllister central station type photometer, with rotating stand for incandescent lamp testing.

**COLLEGE Power AND LIGHT PLANT.**—The machinery in the dynamo laboratory is driven by the 50 horse power engine or a 20 horse power motor. Steam and electric power is furnished by the power plant situated in a neighboring building. This plant consists of an 85 horse power Corliss engine, driving a 40 kw. Weston generator and a 30 kw. General Electric Company's multipolar generator. This station furnishes power to 20 motors, ranging from 3 to 30 horse power. These motors are used at different points on the College property for a variety of purposes, such as pumping water, driving agricultural machinery, supplying power for machine shop, wood shop, textile department, etc. Several of these are at a considerable distance from the power station, thus furnishing examples of electrical transmission of power. Three of these, 7 horse power each, were built by students. In addition to power for driving motors, the same generators furnish electricity for lighting the barracks and other College buildings. Students have access to this plant, and are thus enabled to see the practical workings of a combined electric light and power plant, and to test its efficiency.

The aim of the course is to make practical as well as theoretical electrical engineers.

**Requirements.**—Students desiring to take a special course in electrical engineering should remember that no one can hope to become an electrical engineer who has not the necessary foundations in mechanical engineering, to which electrical engineering is the superstructure. Two-thirds of an electrical engineer's training must be mechanical. No special classes will be formed, and students desiring to enter the Junior Class will be expected to be prepared on elementary mechanical drawing, physics and chemistry, and on mathematics, through plane trigonometry. They will be expected to take with the Junior Class, in addition to their electrical studies, physics, mechanics, mechanical drawing and machine shop work. Without these additional branches the student will not be prepared for the more strictly engineering work of the Senior year.

To enter the Senior Class, a student must be proficient in the work of the Junior year, in which physics and calculus are completed.

In addition to the electrical subjects prescribed for the Senior year, he must take—unless he is proficient along these lines—mechanics, mechanical engineering and laboratory, machine shop, drawing and machine design.

Students who are not prepared, or are not willing to take the other subjects
necessary to successful study of electrical engineering, will not be permitted to take a special course in electrical work.

Physics

Mr. Poats

The course in Physics is intended to extend over the Sophomore and Junior years for students in Civil, Mechanical and Electrical Engineering. Students in the Textile Department take Physics during their Sophomore year, while Agricultural students are required to study the elements of Physics, during the second term of the Freshman year.

The instruction is by lectures and recitations, especial stress being laid upon those principles and facts which are fundamental to the several engineering professions. The lectures and recitations are illustrated by numerous experiments before the class.

In the Physical Laboratory the student is taught to perform for himself all the experiments of a general laboratory course. The Properties of Matter, the Laws of Mechanics, Heat, Electricity, Magnetism, Light and Sound are investigated. Students are required to make accurate and neatly written reports of all experiments.

Freshman Class

Second Term.—General Physics.—Text-book—Rowland and Ames Physics, with lectures.

Sophomore Class

Second Term.—Electricity and Magnetism.
Text-book—Carhart and Chute’s Physics.

Junior Class

Both Terms.—Sound and Light.
Text-book—Carhart & Chute’s Physics.
Laboratory Work.—First Term.—Experimental determination of the physical properties of matter and the verification of Laws of Mechanics, Electricity and Magnetism. Second Term.—Experiments with Heat, Sound and Light.
Reference Books—Chute’s Practical Physics, Ames’ Manual of Experiments in Physics, Carhart & Patterson’s Electrical Measurements and others.

Equipment

The Physical Lecture Room and Laboratory is situated in the main College building, is 33x60 feet, and is well equipped for both the lecture and experimental work of a general course in physics.

Drawing

Mr. Lee
Mr. Klugh
*Mr. Matthews

All members of the Freshman Class are required to take Freehand and Mechanical Drawing. Members of the Sophomore, Junior and Senior Classes in Mechanical, Electrical and Civil Engineering, and of the Senior Class in Textile Engineering, are required to take Mechanical Drawing. The Subfreshman Class is given Freehand Drawing during the first term and Mechanical Drawing during the second term, but a knowledge of drawing is not necessary for admission to the Freshman Class.

Throughout the entire course the best methods of work in the drawing rooms of workshops and manufacturing establishments are given.

Freshman Class

Freehand Drawing.—Graded exercises in sketching from plaster coats, machine parts and other objects in pencil, charcoal and ink, particular attention being paid to outlines and perspective.

Mechanical Drawing.—Exercises in the use of drawing instruments, geometrical problems with circles and straight lines, lettering, conventional section and shade lines, working drawings of simple parts of machines from objects.

Sophomore Class

Working drawings of machines or parts of machines from sketches and specifications. Elementary principles of machine design; con-

*Resigned; successor to be appointed.
struction of screw threads, proportioning of bolts and nuts; Isometric drawing, tracing and blue printing.

**Descriptive Geometry.**—Problems with lines and planes; simple solids in simple positions; intersection and development of surfaces; shades and shadows, axonometric projection and perspective.

### Junior Class

**Mechanical Drawings.**—Working drawings of machines from sketches and specifications. Elementary principles of design continued—riveting, couplings, belt gearing, cams, gear teeth, etc., tinting, railroad and map drawing, plans and details of bridges and buildings. Work is assigned with reference to the course of study a student is pursuing.

### Senior Class

**Mechanical Drawing.**—Toothed gearing and details of steam engine, electrical and textile machinery, map and bridge drawing. Design drawing required in graduation thesis.


### Equipment

The drawing rooms occupy the entire third floor of the Mechanical Engineering building; 51x69 feet. The third and fourth floors of the tower are also used as a dark room and blue-print room respectively. A good selection of drawings and models in these rooms are of great benefit to the student in his work. These rooms are equipped to accommodate 35 students each, with cases, boards and T-squares for over 200. Students in the Freshman Class are allowed the use of necessary instruments and apparatus free of charge. Members of the Sophomore, Junior and Senior Classes are required to furnish their own drawing instruments. All instruments used by students must be approved by the instructor in charge, an inferior grade of instruments will not be accepted. Students are advised to buy their instruments at the Cadet Exchange, where samples can be seen and wholesale prices obtained.

Our thanks are due to the following named engineering firms for drawings and samples of their work showing the latest and best practice of the day: Robert Poole & Sons, National Tube Works, Jenkins Brothers, Lombard Iron Works, Pratt & Whitney Co., F. E. Reed Co., and many others.
Wood-work

Mr. Hook
Mr. Gantt

The course in wood-work does not aim to make the student a skilled workman, but rather to teach the proper use of tools and impress the importance of working to exact dimensions. At the same time, it gives a certain amount of manual dexterity, useful in every vocation.

The course covers two years, beginning with the most elementary principles and advancing gradually by a series of graded exercises to the more complicated constructions where special methods and tools are required. All work is done from working drawings, and commercial shop methods are constantly employed.

Freshman Class

Both Terms.—Names, use and case of tools; graded exercises in carpentry, joining and wood-turning; construction of articles from working drawings; use of turning lathe and other simple machinery; construction of boxes, desks, etc., involving dovetailing, gluing, polishing; turning of cups, vases, Indian clubs and other wooden articles.

Sophomore Class

Both Terms.—Use of wood-working machinery, as planer, jointer, circular and jig saws. Pattern work, with graded exercises, showing use of draft, halving, core prints and core boxes. Patterns for machines under construction. Advanced cabinet work and furniture construction, as chairs, desks, bookcases, hall stands, and mantels.

Equipment

The wood shop occupies the two-story wing on the east side of the Mechanical Engineering building, 45x100 feet. The lower floor contains the Freshman Class room, equipped with fifteen work benches and sets of tools, six turning lathes, with tools for each, and other tools for hand work. On this floor is also the planing mill machinery, consisting of a double roll planer, power rip and cut-off saws, band saw, scroll saw, 16-inch jointer, moulding machine, mortising machine, tenoning machine, emery grinder, laths with 12-foot bed, etc.

The upper floor is devoted to the work for the Sophomore Class, and is fitted up with fifteen work benches and sets of tools, six 10-inch turning
lathes, one large pattern lathe, one combination saw and boring machine, one
double-headed shaper, with a full set of cutters, one power carving machine,
jig saw, one Universal trimming machine, special door and sash clamps, steam
glue pots, mitre cutters, etc.

The power is supplied by electric motors conveniently located in the various
rooms. A large lumber yard and dry-kiln provide seasoned lumber at all
times.

Machine Shop

Mr. Wright

Junior Class

Both Terms.—Instruction begins at the bench with exercises in
chipping, filing, scraping and polishing. Castings and drawings are
given the student, and he is required to chip, file, scrape and polish
each casting into the exact form and size represented by the corres­
ponding drawing. From bench work the student is advanced to
machine work, where he is taught turning, boring, polishing, drilling,
threading, planing, milling, grinding, etc., in iron, brass and steel.
In all cases the exercises are required to be worked to drawings.
The graded course of exercises is designed to teach the fundamental
principles and practices of machine metal-work from the simplest to
the most difficult operations. After completing this course of ex­
ercises, work is begun in the construction of tools, apparatus, etc.

Senior Class

Both Terms.—The Senior year is devoted to more advanced work
in the construction of engines, dynamos, motors and other machines.
The student is encouraged to work from his own designs as far as
possible, but is guided and directed by the instructor in charge.

Equipment

The machine shop is located in the southwest wing of the Mechanical build­
ing, which wing is 45x100 feet, well lighted, heated and ventilated.

It contains eighteen benches, with vises, 110 kits of tools and the following
machine tools: 1 18-in.x12-foot engine lathe; 1 18-in.x8 foot engine lathe; 3
14-in.x6-foot engine lathes; 4 14-in.x6-foot Lodge & Shipley lathes; 1 10-in.x
4-foot F. E. Reed pattern maker's lathe; 1 15-in.x8-foot speed lathe; 1 18-in.
drill press; 1 28-in. back geared drill press; 1 22-in.x22-in.x6-foot Powell
planer; 1 Cincinnati cutter and tool grinder; 1 15-in. Gould and Eberhardt
crank shaper; 1 dry emery grinder; 1 12-in. power hack saw; 1 36in. grind-
stone; 1 22-in. Leland and Faulconer wet emery tool grinder; 1 American
twist drill grinder; 2 14-in.x6-foot F. E. Reed compound rest engine lathes; 2
14-in.x6-foot Hendey compound rest engine lathes; 1 10-in. clotting machine,
built by New Haven Mfg. Co.; 1 fan; 1 forge. The tool room in connection
with the shop contains all tools, etc., necessary for use with the machines.
The 7 H. P. motor which drives the machinery was built by students.

Forge and Foundry

MR. JOHNSON
MR. GANTT

Freshman Class

Both Terms.—Forge Work.—The course in forging begins with
instruction in the names of tools, and building and managing fires.
Graduated exercises are then taken up, including drawing out, up-
setting, bending, punching, twisting, welding of iron, welding of
steel, welding of steel and iron, annealing, hardening, tempering,
case-hardening, blueing and browning. Some work is then done in
ornamental forging; The practical instruction is supplemented,
during the progress of the course, by lectures and notes on the prin-
ciples involved, and the details of the best forge practice are thor-
oughly explained.

Sophomore Class

Both Terms.—Foundry Work.—Students are taught the names
and uses of tools; tempering of molding sand; molding and patching
of molds. Patterns of various shapes and sizes are used to illustrate
the different principles of molding, venting and gating; the use of
risers, pressure gates, skim gates, gaggers, chaplets, facing sands;
feeding of castings; core-making; grading and mixing of iron;
charging and managing the cupola. Several weeks are devoted to
work in the brass foundry. The practical instruction is supple-
mented by a course of lectures.

Equipment

Forge Shop.—This is a room 37x60 feet, situated in a wing of the Mechani-
cal building. It is equipped with 18 Buffalo down draft forges and steel-faced
 anvils, with sets of hammers, tongs, swages, fullers, flatters, etc. Continuous
blast is furnished by a Buffalo blower driven by a 15 H. P. electric motor, the
down draft being produced by a 60-inch Buffalo exhaust fan. The shop is
also supplied with vises, swage blocks, emery wheel, bending cone, drill-press, bolt shear, &c.

Foundry.—This building has recently been enlarged to meet the growing demands of the College, and now occupies a space 43x76 feet. It is equipped with a 26-inch Victor Colliant cupola, a Millett's improved core oven, a two-ton post crane, 8 improved moulder's benches, an 18-inch brass furnace, with its usual complement of crucibles, tongs, etc., full sets of moulder's tools for the accommodation of 20 students, besides the usual accessories to the foundry, such as ladles, flasks, etc.

Mathematics

Professor Brodie
Assistant Professors Waller, Martin, Reaves, Shanklin

This course presupposes a thorough knowledge of arithmetic and of algebra through quadratics.

Freshman Class

First Term.—Algebra.—Quadratics (reviewed); simple indeterminate equations; inequalities; theory of exponents, logarithms; proportion and variation; series binomial theorem.

Text-book—Wentworth's Complete Algebra.

Second Term.—Plane Geometry.—Rectilinear figures; circles; similar figures; comparison and measurement of surfaces of polygons; regular polygons and circles. Special attention is given to the formation, on the part of students, of the habit of clear and accurate reasoning and concise expression.


Sophomore Class

First Term.—Solid Geometry.—Planes and solid angles; polyhedrons; cylinders and cones; spheres, spherical polygons and pyramids; volume.

Higher Algebra.—Continued fractions; theory of limits; undetermined co-efficients; exponential theorem; equations in general.

Text-books—Wentworth's Geometry and Wentworth's Complete Algebra.

Second Term.—Trigonometry.—Measurements of angles; trigonometric functions; right triangle; goniometry; relations between functions of one angle; functions of multiple angles; inverse func-
tions; trigonometric equations; oblique triangles; De Moivre's theorem; spherical trigonometry; general formulas; right spherical triangle; oblique spherical triangle; applications.


Descriptive Geometry.—Study of the representation of points, lines, planes, surfaces and solids, and of their relations; tangencies, intersections and developments; shades, shadows and perspective; numerous original exercises.

Text-book—Low's Practical Solid or Descriptive Geometry.

Plane Surveying.—This course includes the general principles and fundamental operations of surveying with compass, level and transit. The field work includes actual surveys of tracts of land, of which the areas are computed and plats are drawn. Experience is given in numerous problems of laying out and dividing up land, and in locating irregular boundaries. Practice is also had in section leveling, laying out terraces, ditches, etc. Ample training is here furnished for the needs of agricultural students, and a preparation is given for the higher work of the engineering courses.


Students in the Textile Course do not take surveying. Students in the Agricultural Course take no mathematics beyond the Sophomore year.

Junior Class

First Term.—Analytic Geometry.—Cartesian and polar systems of co-ordinates; discussion and construction of loci; the straight line; transformation of co-ordinates; circle; parabola; ellipse; hyperbola; general equation of second degree involving two variables; higher plane curves; solid analytic geometry; system of co-ordinates; equation of the plane; the straight line in space; transformation of co-ordinates; surfaces of the second order.


Second Term.—Differential Calculus.—Differentiation of algebraic functions; transcendental functions; successive differentiation and development of functions; functions of two variables; tangents and asymptotes; maxima and minima; radius of curvature; evolutes and involutes; envelopes.

Integral Calculus.—Elementary forms of integration; rational fractions; integration of irrational fractions; successive reduction; integration of functions of two variables; lengths of curves; areas of
plane curves; rectification of curves; cubature of volumes.


Civil Engineering

(Included in the Department of Mathematics.)

To begin the work in Civil Engineering the student must have completed the mathematical course through trigonometry and plane surveying. For the Senior course he must have a working knowledge of analytical geometry and calculus.

Junior Class

Both Terms.—Use and adjustment of transit, stadia, solar, compass and plane-table; topographic surveying with transit and stadia; railroad topography; triangulation; geodesy; city and hydrographic surveying; map and plan drawing, topographical symbols, etc.

Highway Engineering.—Location, construction and maintenance of the country roads and city streets; advantages of various materials for road covering; effects of grades and surface upon the cost of transportation; plans and specifications; practical problems in change of grade and relocation, from surveys of existing roads.

Theory of Railway Construction.—Preliminary and location surveys; location from contour map; laying out of simple and compound curves; setting of slope stakes; computation of earthwork; switches; turnouts; theory of economic location; effects of grades, curves and length upon the cost of operation.

Text and Reference Books—Johnson's Higher Surveying; Gillespie's Roads and Railroads; Burne's Highway Construction; Carhart's Field Engineering; Wellington's Economic Location.

Senior Class

Both Terms.—Railway Engineering.—Surveys are made for a line of railway a mile or more in length; the necessary plans, profiles and cross-sections are prepared; grades are determined, curves laid out, slope stakes set, and all the needed measurements made to enable the student to compute the excavations and embankments, and to estimate the cost of construction.

Surveys of Water Powers.—Discharge of stream, head and avail-
able power; form and dimensions of pond or reservoir; detailed topography of site for dam and determination of its form and dimensions for stability.

Geodesy.—Method of least squares; precise triangulation; base lines; precise leveling; azimuth by solar transit, by polaris and by altitude of the sun; measurement of meridian arcs; the earth as a spheroid; the earth as an ellipsoid; history of geodesy.

Structures.—Building materials; mechanics of construction; derivation of practical formulas; masonry; foundations on land and in water; stability of walls and arches; analytical and graphical investigation of stresses in plate girders, Howe, Pratt, Warren and other types of highway and railroad bridges, and various forms of roof trusses; bridge design.

Text-books.—Wheeler's Civil Engineering; Merriman and Jacoby's Roofs and Bridges; Merriman's Geodesy.

Equipment

The collection of field instruments contains the following: Two 6-inch vernier compasses; 20-inch wye level; engineer's transit, with solar attachment and stadia; plane-table, with 9-inch telescope, vertical circle and stadia; drainage level; 12-foot self-reading leveling and stadia rod; 12-foot New York leveling rod; 10-foot cross-section rod, graduated; Gurley's clinometer, reading to degrees; two surveyor's chains; engineer's chain; standard 100-foot steel tape, graduated to hundredths of a foot; and full supply of ranging poles, flag poles and other accessories. There are also sets of drawing instruments for office work.

In addition to the drawing done under the immediate direction of the instructor in this division, the regular work in drawing and designing provided for civil engineering students is arranged with special view to their needs.

English

Professor Furman

Assistant Professors McLucas, Daniel, Bryan

The purpose of the course in English is to enable the student to acquire the power to express his thoughts with clearness, precision and force; and to cultivate in him a taste for good literature. Elementary English grammar and the rudiments of composition are taught in the Subfreshman classes.
Freshman Class

Lockwood's Lessons in English; Strang's Exercises; readings from Irving and Scott; exercises in composition; supplementary readings.

Sophomore Class

Clark's Practical Rhetoric; weekly exercises in composition; supplementary readings.

Junior Class

Pancoast's English Literature; Hawthorne and Lemmon's American Literature; critical study of Macauley's Warren Hastings; monthly essays; supplementary readings.

Senior Class

Study of Shakespeare; Dowden's Primer and the reading of three plays; advanced rhetoric; monthly essays; supplementary reading; exercises in elocution.

History

Professor Morrison

The course in History includes History of the United States, South Carolina History, General History, Commercial Geography, Civics, and Political Economy.

The method of instruction is a combination of the text-book and lecture methods, with parallel readings, under the instructor's direction as far as practicable. The class-room is supplied with globes, charts, maps and works of reference, in the use of which the young men are carefully trained. The students make liberal use of the many volumes of poetry, historical romance, biography and history found in the College Library.

The History of South Carolina and the History of the South receive special attention. "A people which takes no pride in the noble achievements of a remote ancestry will never achieve anything worthy to be remembered by remote descendants." Every effort is made to enable the young men to see and feel as their fathers and forefathers saw and felt.

Text-books—Eggleston's History of the United States and its People (Subfreshman); Weber's History of South Carolina and
Tilden’s Commercial Geography (Freshman); True and Dickinson’s Our Republic (Sophomore); Anderson’s New General History (Junior and Senior); Walker’s Political Economy—Briefer Course (Senior).

Military Science and Tactics

**Junior and Senior Classes**

**Both Terms.**—The course in military instruction, as prescribed and followed, is both theoretical and practical. The theoretical instruction, given by recitation and lecture, includes the subjects of organization and administration, grand and minor tactics, logistics, castramentation, military engineering, gunnery and pyrotechnics, military history, etc. The practical instruction includes infantry drill, in the school of the soldier, the company, the battalion and the evolutions of the regiment, in both close and extended order, target practice and guard duty, and in the manual of the piece in light artillery drill. Practice is also given in signaling with the flag.

In addition to the benefit which the general government derives from the military instruction given at this and other colleges, it is believed that the discipline enforced, the habits of punctuality and obedience inculcated, the improvement in bearing and appearance of those instructed, and also the practice in directing and commanding others, which nearly all in course of time get, is of immense benefit to the students individually.

**Textile Industry**

**Professor Beaty**

**Messrs. Frisell, Raiford, Parker**

The instruction in this department is given in two separate courses of study.

**Regular Textile Course**

This course comprises a system of liberal education and culture as a part of the textile training. The object has been to arrange a course in which students will not only be given special knowledge of textile subjects, but will at the same time and along with this special training receive the advantages of a good general education.

The first two years of the course are the same as those of the Me-
chanical Department, and are devoted to the study of general principles which underlie the sciences involved in manufacturing. The third and fourth years of this course consist in a study of the materials, processes, machinery and apparatus used in modern manufacturing, from those used in the production of plain coarse fabrics, to those used in the production of fine and elaborate, fancy colored fabrics. The method of instruction, in the two courses, is practically the same, and individual instruction is given in every instance where circumstances will permit.

Special Textile Course

This course has been arranged to meet the demands of mature young men, who already have a good general education. It consists of as many hours of theoretical and practical training, in the mill processes, as the other two courses, but additional time is devoted to the subjects of dyeing, bleaching, etc.

The examination of applicants will be at the College at the beginning of each fall term. For admission to this course it is required that the student be proficient in Mathematics, English, History, Physics, General Inorganic Chemistry and Qualitative Analysis as completed in the Sophomore year at this College. Students taking this course will not be subject to military duty and will not be required to live in barracks.

Details of Instruction.—In carding and spinning, after the subject of raw material has been completed, machinery and processes used in the production of cotton yarns will be taken up systematically, going into a detailed examination and explanation of the separate machines and the mechanisms peculiar to them. Calculations for making changes of gears, speeds, production, etc., and practical operation of each machine will be required.

In designing instruction begins with explanations of the principles of representing weaves on design paper, after which the designing of plain simple weaves, laying out of harness drafts, pegging plans, etc., is taken up, and advancing into the designing of more complicated weaves usually made on harness. After the completion of harness weaves the time will be devoted to designing of Jacquard weaves and tying-up of Jacquards. The aim of the instruction in designing will be to develop originality in the student.

The practical work in weaving is laid out to parallel the instruction
in designing. The first part of the instruction in this work will be on hand looms. After the completion of that amount of work required on hand looms the student is advanced to plain and fancy power looms, where in addition to the practical operation of weaving, the loom will be analyzed and explained in detail, together with timing and setting all working parts. The latter part of this work will be on Jacquards.

Cloth analysis consists in dissecting samples of various kinds of cloth to ascertain the weave, texture, weight per yard and the counts of yarn used in its construction. The students are required to reproduce some of these patterns on the looms in the school.

The work in textile chemistry and dyeing covers inorganic quantitative analysis; the general principles of organic chemistry, with special reference to the coloring matters; the preparation of mordants and dyes, and the application of the latter to the several textile fibres. This is accomplished by means of lectures, accompanied by experiments, written exercises and individual laboratory work, together with practical dyeing in the dye-house. Care is taken to develop accuracy in observation, neatness and clearness in written reports; and to this end each student is required to submit a comprehensive report—including the necessary notes and references from standard works on the subject—of every experiment performed by him. By this method each student is able to verify for himself in the laboratory, the truth of the principle stated to him in the classroom.

**Carding and Spinning**

**Raw Material.**—That the manipulation of cotton fibres may be carried out successfully, under various conditions, it is essential that the characteristics peculiar to the cotton fibre should be understood. Therefore, the introductory work of the students of this department is to examine the physical and chemical properties of cotton fibres, to ascertain their lengths of staple, spinning qualities, color, harshness and softness, and to determine their suitability for making various kinds of yarn, filling, warp, ply yarns, &c. This study of fibres will not be limited to American cottons, but will include the more important commercial cottons of the world. The effects of temperature and humidity on fibres will be fully discussed. Also the handling of cotton, prior to manufacturing processes, together with the injury to cotton fibres therefrom.
OPENING AND MIXING.—Beneficial effects of opening and airing cotton; length of time to air for best results; effects on resultant yarn if not properly opened; necessity of mixing; when to mix cottons and methods of carrying out same; effects of improper mixing; effects of a judicial mixing on the after processes of manufacture; reasons for blending; effects of blending cottons on the resultant yarn, for strength, appearance, cost, etc.; effects on finished products if cottons are not properly mixed or blended.

PICKER ROOM.—Proper situation of picker room; arrangement of machinery in same; automatic feeder; purpose for which used; construction, adjustment of parts, etc.; action on cotton; manner of connecting them to breaker lappers with and without dust trunks; advantages of dust trunk; facilitating good results by proper care; breaker lapper, use, explanation of parts, beaters used, adjustment of working parts and experimenting with different speeds of beater; intermediate and finished lappers, necessity of using same, construction, speeds, care of beaters, kinds of beaters, speeds of beaters for different lengths of staple; evener motion and its control of feed rolls; adjustment of grids to regulate amount of waste, disposition of waste; regulation of air current; effects of air current on proper working of the lapper; lap formation; calculation on above machines for drafts, length of lap, etc.

CARDING.—Purpose of carding; principle upon which cards are built; comparison of types of cards; explanation of purpose and construction of feed plate, licker-in, cylinder, flats, screens, doffer, coiler head, etc.; different settings of card to produce best results on different lengths and qualities of fibre; regulation of waste; amount of draft; grinding; effects of improper grinding on card clothing and fibre; calculations for changing gears and speeds of various working parts.

COMBING.—Sliver lap machine, its construction, use, etc.; care and operation; leather covered rolls, metallic rolls; ribbon lap machine, its construction, use, etc.; advantages of using same; care and operation; lap formation; combing machine, its use, care and operation; detailed explanation of working parts, cylinder, half laps, segments, detaching rolls, etc.; with rules for adjusting and timing same; regulation of waste made; necessity of the process; relation of the process to fine smooth yarns; practical experience in adjusting above machines; calculations for change gears, etc.
RAILWAY HEADS AND DRAWING FRAMES.—Purpose, use, construction, advantages and disadvantages of railway heads; explanation of stop motions, evener; principle of drawing slivers; purpose of drawing frame; comparing work of leather covered and metallic rolls; adjustment of rolls; distribution of draft between the rolls; speeds, stop motions; all calculations on above machines, drafts, production, etc.

FLY FRAMES.—Slubber, intermediate, fine roving and jack frames; construction, care and operation of the modern fly frame; bobbin and flyer lead machines; advantages of the bobbin lead; detailed explanation of working parts, differential motion, horse head, builder, full bobbin stop motion, etc.; adjustment of drawing rolls; calculations for draft, twist, lay, tension and other gears.

SPINNING BOTH ON FRAMES AND MULES.—Construction and use of the ring spinning frame; its principal parts, such as rings, spindles, travelers, builder motion, etc.; the effect of twist on the strength, color and elasticity of the yarn; calculations; the spinning mule and its uses; special features; description of the head stock, cam shaft, and other parts; the copping rail and formation of a cop; different movements in the mule and timing of the same; calculations.

MISCELLANEOUS.—Reelings; bundling; twisting; doubling; spooling, warping, etc.; calculations and information regarding each process.

SLASHERING.—The slasher, construction and use; necessity for slashing; creel, cylinders, size boxes, etc.; mixing of size; different sizing ingredients for special purposes; methods of preparing warps for the slasher.

Weaving

DESIGNING.—Purpose of designing; explanation of “warp” and “filling;” representing weaves on design paper; foundation weaves; plain or cotton weave; weaves derived from plain weaves, such as rib and basket weaves; twill weaves and method of construction; derivative weaves from twills, such as broken, steep, skip, reclining and curved twills; corkscrew twills; entwining twills; satin weave and the purpose of same; weaves derived from satins, such as double satins and granites; shading of satins; figured effects produced by using warp and filling satins; color effects produced by using two or more colors in the above fabrics; methods of constructing granite
weaves; points to be considered in combination weaves; special weaves; honey combs, gauze and imitation gauze, bedford cord, plain and fancy piques, matelasses, etc.; two systems of warp and one system of filling or two systems of filling and one system of warp for the purpose of figuring; explanation of double cloth, purpose and class of fabrics in which generally used; representing double cloth weave on design paper; use of different proportions of "back" and "face" for special effects; method of stitching double cloth so that the stitching will produce a figured effect; stitching so that it will not show either on "face" or "back" of cloth; leno weaves and method of representing on design paper; methods of making drawing-in drafts, chain drafts; plain and fancy drafts; point, skip, mixed or cross draws; rules for finding the number of heddles required for each harness; methods used in reducing weaves to the lowest number of harness.

Jacquard Designing.—Explanation of the various Jacquard machines; methods of shedding, such as, the rise and drop, single lift, double lift machine; single and double cylinder machine; open and closed shed machine; drawing of tie-ups, straight tie-up both in French and English, point tie-up, combination tie-up for special goods as table damask, marseilles quilts, etc.; practical operation of tying-up a Jacquard, cutting leashes, threading of comber board, tying on and leveling up mail eyes; figuring comber board for a given texture of goods; casting out hooks to reduce texture of goods without retying the harness; cutting and lacing cards for a given design; selection of design paper for different fabrics, with regard to picks and ends per inch used; methods used in laying out the figure for a Jacquard design; enlarging the sketch for design paper, etc., etc.

Cloth Analysis.—Methods of arranging cloth sample for analysis; figuring the counts of cotton, woolen, worsted and silk yarns; calculations for converting one system of yarns into that of another; finding the weight of cloth per yard and the counts of yarn used in its construction from the analysis; figuring width of warp in reed and number of reed to use to produce a given width and texture when woven.

This work takes up all representative classes of weaves that can be woven on harness, and gives the student a thorough knowledge of figuring yarns, weight of cloth, ends and picks per inch, etc.

Hand Loom Weaving.—The first practical work in weaving is on
the hand loom. These hand looms have 4x4 box motion and 30 harness dobies. After the design and necessary calculations have been made the student proceeds with dressing, drawing-in, reeding, tying the warp in loom, building harness chain and starting up loom; producing different weave effects from the same drawing-in draft by changing the harness chain; using box motion for color effects; combining two or more systems of filling with one system of warp, two or more systems of warp with one system of filling, two or more systems of warp with two or more systems of filling to produce figured fabrics of a special character; explanation of the different methods used in raising and lowering the harness.

Power Loom Weaving.—Power loom weaving will be taken up after the student has finished the required amount of hand loom work, and will include explanation of plain or cam loom; cam motions used for raising and lowering the harness, such as the under cam, side cam, top cam, etc.; setting cams; sketching cams to produce a given motion; arrangement of strapping for two, three, four and five harness; timing cams to suit the number of harness used; speed of different width looms on the same class of fabrics; selection of temples and measurements for same; Draper loom; warp stop motion, filling change mechanism, etc.; the dobby analysed and explained; methods of shedding; head motions; harness chains for single and double index dobies; chains for head motions; explanation of box motions, four by one, four by four box, etc.; building box motion chains; explanation of multipliers used on box motions and harness motions; let-off motions, Morton, Bartlett, Sheppard and friction let-offs; open and closed shed machines explained; single and double index dobies, etc.

Textile Chemistry and Dyeing

Junior Year.—Inorganic quantitative analysis, including the examination of such chemicals as are of special importance in dyeing. The carbon compounds or organic chemistry. Lectures with experiments, written exercises. The course in organic chemistry is designed to cover the general principles of the subject, to introduce the student to the scientific method and to prepare him for a detailed study of the compounds dealt with later. The instruction is sufficiently broad to be a commentary upon whatever preliminary training
in chemistry the student may have had, and to serve as an introduction to the work of the Senior year.

**Senior Year.**—Organic chemistry with special reference to the coloring matters. This work includes a series of graded exercises in the preparation and testing of organic compounds immediately related to the coloring matters, and the production of some of the typical colors themselves; the whole so selected as fairly to represent the methods made use of in the preparation of what are known as "coal tar dyes." Thus the student is familiarized with the operations by which the crude products found in coal tar are separated, purified and finally converted into such substances as those used by the dyer. Care is taken to develop accuracy in written reports; and to this end each student is required to submit a comprehensive report of every experiment performed by him.

**Dyeing of Textile Fabrics.**—This includes an examination of the physical and chemical properties of the various fibres; bleaching of cotton in the form of yarn and cloth; mercerization of cotton; scouring of wool; purification of supply and refuse waters of bleacheries, dye-houses, etc.; application of natural and artificial coloring matters to cotton, wool and silk; calico printing. Instruction is given by means of lectures, experimental work in the laboratory, practical work in the dye-house. Students are required to preserve, on paper prepared for this purpose, samples of such material experimented with, accompanied by the necessary notes for future reference.

**Building and Equipment**

The building is a capacious brick structure, 168 by 75 ft. The left wing is two stories, the right wing, three stories, high. Although the building was designed especially for educational and experimental work, yet it retains the more prominent features of a modern mill.

The building is well equipped with complete systems of steam heating, humidifiers, shafting, automatic sprinklers, etc., all of which are installed in the most approved manner, from plans furnished by experienced mill engineers.

The equipment consists of: A system of "Vortex" humidifiers from the American Moistening Co.; system of steam heating, and automatic fire sprinklers, from The D. A. Tompkins Co.; shafting, hangers and pulleys, from Jones & Laughlin, Limited, and from T. B. Wood's Sons; one 22-kw. electric motor from the Westinghouse Electric Company; two 15-kw. electric motors from the General Electric Company.
Carding Department

**Pickers**—
One Atherton Automatic Feeder; one Atherton Combination Breaker and Finisher Lapper, with evener motion.

**Cards**—
One Saco and Pettee 40-in. Revolving Flat Card; one Mason 40-in. Revolving Flat Card; two Entwistle Traverse Wheel Grinders; two Entwistle Drum Grinders; Stripping and Burnishing Rolls; complete set Carder’s Tools.

**Combing**—
One Mason Silver Lap Machine; one Mason Ribbon Lapper; one Mason Combing Machine.

**Railway Heads**—
One Saco and Pettee Railway Head, with evener motion, stop motion, and metallic rolls; one Mason Railway Head, with evener motion, stop motion, and metallic rolls.

**Drawing**—
One Saco and Pettee Drawing Frame, deliveries, stop motion, and metallic rolls; one Mason Drawing Frame, 4 deliveries, stop motion, and metallic rolls.

**Fly Frames**—
One Saco and Pettee 40-Spindle Slubber, with latest improved differential motion; one Saco and Pettee 60-Spindle Intermediate Roving Frame, with latest improved differential motion; one Saco and Pettee 80-Spindle Fine Roving Frame, with latest improved differential motion.

Spinning Department

**Ring Spinning**—
One Saco and Pettee Combination Warp and Filing Ring Spinning Frame, 128 spindles; one Mason Combination Warp and Filing Spinning Frame, 112 spindles; two Fales and Jenks Combination Warp and Filling Spinning Frames, 80 spindles each.

**Mule Spinning**—
One Mason Spinning Mule, 120 spindles, 1 3-4 gauge, with all latest improvements.

**Spooling**—
One Draper Spooler, 40 spindles; one Saco and Pettee Spooler, 72 spindles.

**Twisting**—
One Draper Combination Wet and Dry Twister, 48 Spindles; one Fales & Jenks Wet Twister, combined Filling and Taper Top wind, 70 Spindles.

**Winding**—
Reeling—
One D. A. Tompkins Co. Adjustable Reel, 50 Spindles.

Warping—
One Draper Warping and Creel.

Beaming—
One Entwistle Beaming Machine.

Weaving Department

Hand Looms—
Hand Loom Weave Room fully equipped with 4x4 box looms, fitted with 30 Harness Shedding Engines for fancy Cottons. Also Drawing-in Frames, Warping Frames, Beaming Frames, etc.

Power Looms—
One 40 Northrop Loom, with warp stop motion and automatic filling magazine; one 28 Northrop Loom, with automatic filling magazine and Stafford 20 Harness Dobby; one Mason, 4x1 box, Gingham Loom; one Mason Loom, 1x1 box, 46-in. Reed Space, with Stafford 20 Harness Dobby; one Mason Fancy Cotton Loom; one Stafford Fancy Cotton Loom, 20 Harness Dobby, with Leno attachment; one Knowles Light Fancy Loom, "Gem" 30 Harness, 40-in. Reed Space, 4x4 box; one Kilburn & Lincoln Loom, 42-in. Reed Space, 4x1 drop box, arranged for Dobby; one Kilburn & Lincoln Loom, 42-in. Reed Space, 2x2 drop box, arranged for Dobby; one Stafford Dress Goods Loom, with Stafford 400 Hook, Single Lift, Swing Cylinder, Jacquard; one 624 Hook Jacquard Machine Tied for Weaving Damask, mounted on a Crompton, 4x1, drop box Loom.

Jacquard Card Cutting—
One Jno. Royle French Index Foot Power Card Cutter.

Textile Chemistry and Dyeing

The work in Textile Chemistry and Dyeing is carried on in an experimental laboratory and a practical dye-house. These are equipped with the necessary apparatus and chemicals for instruction in organic chemistry, scouring, bleaching, dyeing, etc.

The experimental laboratory is situated on the second floor, in left wing of the textile building, and is fitted with appropriate work-tables furnishing accommodations for sixty-four students working by detachments. Each table is supplied with the necessary arrangements for gas and water, and a drawer and locker in which work may be preserved until it has been examined by the instructor.

The dye-house is situated in the right wing of the textile building, and is fitted up with the necessary apparatus for dyeing larger quantities of material than those operated with in the experimental laboratory.

The School is equipped with Reels, Yarn, Testers, Analytical Balances, and all necessary instruments for experimental purposes.
Departmental Library

For the use of students and instructors, a room in the textile building has been fitted up and is being furnished with the more important books of reference relating to the textile industry. New books are being added constantly. Here are also kept the leading periodicals relating to the subject. The room will open every week day throughout the session.

Donations

The following donations are acknowledged with thanks:

The A. T. Atherton Machine Co., Pawtucket, R. I.—One Automatic Feeder; one Combination Breaker and Finisher Lapper; one lot of Lap Rods.

Saco & Pettee Machine Co., Newton Upper Falls, Mass.—One 40-in. Re­volving Top Flat Card; one Entwistle Traverse Grinder; one Entwistle Drum Grinder; one Burnisher; one set Carder’s Tools; one improved Railway Head, with back, front and full cam stop motion; one 4 Delivery Draw Frame, with back, front and full cam stop motion, fitted with single preventer rolls; one 40 Spindle Slubber; one 60 Spindle Intermediate Roving Frame; one 80 Spindle Fine Roving Frame; one 128 Spindle Combination Warp and Filling Ring Spinning Frame; one 72 Spindle Improved Spooler. A sufficient number of gears were sent with these machines to make various changes that may be necessary.

Mason Machine Works, Taunton, Mass.—One 40-in. Revolving Top Flat Card; one Entwistle Drum Grinder; one Stripper Brush; one set Carders’ Tools; one Railway Head, with back, front and full cam stop motion; one 4 Delivery Draw Frame, with back, front and full cam stop motion, fitted with single preventer roll; one 112 Spindle Combination Warp and Filling Ring Spinning Frame; one 40-in. Plain Loom; one 36-in. Fancy Cotton Loom; one 36-in. 24 Harness Dobby Loom. All necessary gears with these machines to make the required changes.

Half Value on Combing Machinery

The D. A. Tompkins Co., Charlotte, N. C.—One Adjustable Reel; one Draw-in Frame; one Loom Box; one Doffer Box; two Section Beams; one Switch Board, complete.

Draper Co., Hopedale, Mass.—One 40-in. Northrop Loom; one 28-in. Northrop Loom; one 48 Spindle Combination Wet and Dry Twister; one 40 Spindle Spooler; one Warper, with Creel; four Section Beams; Temples as required; Loom Findings.

Crompton & Knowles Loom Works, Providence, R. I.—Half value on following:

One 32” Loom, with 416 hook Jacquard; one 32” Loom, with Leno attachment; one 65” 4x1 Box Loom, with 624 hook Jacquard; one 36” Knowles “Gem” Loom.

Jones & Laughlin Co., Limited, Pittsburg, Pa.—The entire original equipment of Shafting, Hangers and Pulleys.
T. B. Wood's Sons, Chambersburg, Pa.—One-fourth value on equipment of Shafting, Hangers and Pulleys used in new extension of building.

Southern Railway Co.—Half freight rates, over their lines, on entire original equipment of machinery.

Schaum & Uhlinger, Philadelphia, Pa.—One Top Engine Drive, self-balancing, hydro-extractor.

The Metallic Drawing Roll Co., Indian Orchard, Mass.—Metallic Drawing Rolls for Railway Heads and Draw Frames as required.


The Aerophor Co., Boston, Mass.—Complete system of "Vortex" Humidifiers, including pump, tank and connections.

T. C. Entwistle, Lowell, Mass.—Half value on one Beaming Frame.

Fales & Jenks Machine Co., Pawtucket, R. I.—Two Combination Warp and Filling Spinning Frames, 80 Spindles each; one Wet Twister, combined Filling and Taper Top Wind, 70 Spindles.

Kilburn & Lincoln Co., Fall River, Mass.—Two Cotton Looms, 42-in. Reed Space and arranged for Dobbies.

W. W. Altemus & Son, Philadelphia, Pa.—One Bobbin Winder.

New Bedford Paper Co., New Bedford, Mass.—Caps, Cones, Tubes, etc., as required.

Charlotte Supply Co., Charlotte, N. C.—All belting as required.

American Supply Co., Providence, R. I.—Heddles, Heddle Frames, Reeds and Loom Supplies as required.

Loom Picker Co., Biddeford, Me.—Loom Supplies.

The Emmons Loom Harness Co.—Cotton Harness, Reeds and Loom Supplies.

Sykes & Street, New York, N. Y.—Collection of Dye Stuffs.


Wm. Pinkhardt & Kutroff—Collection of Dye Stuffs.

Roney & Rae Co., Woonsocket, R. I.—Twelve Bobbin Holders.

Steel Heddle Manufacturing Co., Philadelphia, Pa.—2,500 Patented Flat Steel Heddles.

Specimen Entrance Examinations

The following questions represent typical examinations for entrance to the Freshman Class. They will be found useful in suggesting the character of preparation that an applicant should have.

Mathematics

For admission to the Freshman Class, thorough proficiency is required in arithmetic, and in algebra through simple affected quadratics. Following is a type of the entrance examination in algebra:

I. Simplify:
\[2x^3(x-3a)-2[2x^4-a^2(x^2-a^2)]-3a[x^3-2x\{a^2+x(a-x)\}+a^3].\]

II. Divide:
\[12x^{6n-8}-x^{1n-2}-20x^{3n-1}+19x^{2n}-10x^{n+1}+2x^2\text{ by }4x^{2n}-3x^{n+1}+2x^2.\]

III. Reduce to its simplest form:
\[\left(\frac{x^3-8y^3}{x(x-y)}\right)\left(\frac{x^2-xy+y^2}{x^2+2xy+4y^2}\right)\div\left(\frac{x^3+y^3}{x(x^2-y^2)}\right)\]

IV. What is the value of \(x\) in:
\[\frac{6-5x}{15}-\frac{7-2x^2}{14(x-1)}=\frac{1+3x}{21}-\frac{2x-2\frac{1}{8}}{6}+\frac{1}{105}\]

V. Solve \(x, y\) and \(z\).
\[\begin{cases} 3x-4y=6z-16 \\ 4x-y-z=5 \\ x=3y+2(z-1) \end{cases}\]

VI. What values for \(x\) and \(y\) will satisfy:
\[(a-b)x+(a+b)y=2(a^2-b^2)\text{ and }ax-by=a^2+b^2?\]

VII. If \(\frac{3}{4}\) be added to the numerator of a certain fraction, the fraction will be increased by \(\frac{1}{2}\), and if \(\frac{1}{4}\) be taken from its denominator, the fraction will become \(\frac{3}{4}\). What is the fraction?

VIII. Solve for \(x\):
\[\sqrt{a+\sqrt{x}}+\sqrt{a-\sqrt{x}}=\sqrt{x}\]

IX. Find the 6th root of:
\[1+6x+x^6+6x^6+15x^4+20x^3+15x^2.\]

X. Solve for \(x\):
\[\frac{2x+1}{7-x}+\frac{4x+1}{7+x}=\frac{45}{49-x^2}+1.\]
History

II. Name and briefly describe three early Indian wars.
III. Name Colonial wars between England and France. State general results.
IV. Name the thirteen colonies and tell the kind of government each had at the outbreak of the Revolution.
V. What cities have been the capital of the United States?
VI. Tell of the successes of our navy in the War of 1812: 1. At sea. 2. On the lakes.
VII. Tell of the Mexican War: 1. Causes. 2. Campaigns. 3. Results.
VIII. Name six accessions to our territory.
IX. Name three great American inventors and tell their inventions.
X. Name two American poets and two novelists. Mention a work of each.

English

Note.—Those students who have formed the habit of reading good literature usually pass the examination with most ease. Reading books by good authors is conducive to correctness and ease of expression. It is urged, therefore, that each applicant see to it that he is familiar with several books by reputable authors. It is not intended to require that certain books shall have been read, but the following are mentioned as suggestions:

DeFoe's Robinson Crusoe, Swift's Gulliver's Travels, Hughes' Tom Brown's Schooldays, Cooper's Last of the Mohicans, Scott's Ivanhoe, Dickens' Oliver Twist, Dickens' History of England, Goldsmith's Deserted Village; Longfellow's Evangeline.

I. Spelling. (Fifty common words difficult to spell.)

Group, salmon, mahogany, fierce, cataract, valise, muscle, twelfth, seize, onion, February, carrot, million, banana, pumpkin, neuter, heifer, salad, mystery, excel, pallid, bosom, lithe, gallop, wizard, pommel, swollen, cyclone, exhaust, partridge, tenement, exhibit, robin, bureau, luscious, rabbit, judgment, label, peaceable, succeed, colonel, vengeance, transferable, penitentiary, piteous, criticise, analyze, insep­arable, independent, abstinence.

II. Reading. Read aloud distinctly and intelligently a short passage from some ordinary prose.

III. Writing. Write a composition of one page on some easy subject; such as, "Why I Wish to Go to College," "My Previous Educational Advantages," "A Picture of My Home," "A Runaway." (In this you will be graded on penmanship, grammatical correctness, ability to say what you intend, and general neatness.)

IV. Grammar. (The analysis of the sentence is regarded as more important than the parsing of words.)

1. Give the principal parts of the following verbs:

Swim, wake, burst, sink, swing, drink, see, attack, cling, eat.
I. If $y = \sin(\sin x)$ prove 
\[ \frac{d^2 y}{dx^2} + \frac{dy}{dx} \tan x + y \cos^2 x = 0. \]

II. Show that the curve $y = \sin^2 x \cos x$ has its maximum ordinate when $x = \frac{\pi}{3}$.

III. The top of a column which sustains a statute 11 feet high is 25 feet above the level of a man's eye. Find his horizontal distance from the column when he sees the statute subtending the greatest angle.

IV. Prove:
\[ \int \left(2x^3 + 7x^2 + 6x + 2\right) dx \quad \text{such that} \quad \frac{x}{x^4 + 3x^2 + 2x^2} \quad \log \left[ x(x+1) \left( \frac{x}{x+2} \right)^{1/2} \right] - \frac{1}{x} \]

V. Show that the curve $y = \sin 3x \cos x$ has its maximum ordinate when $x = \frac{\pi}{2}$.

VI. The top of a column which sustains a statute 11 feet high is 25 feet above the level of a man's eye. Find his horizontal distance from the column when he sees the statute subtending the greatest angle.

VII. Explain and find value to four terms of 
\[ \int \frac{\cos x \ dx}{x} \]

VIII. Find total length of the hypocycloid whose equation is $x^3 + y^3 = a^3$.

IX. The figure bounded by $x = a$ and the parabola $y^2 = 4px$ is revolved about the line $x = a$. Show that the volume generated is 
\[ \frac{1}{5} (32\pi a^3 \sqrt{pa}). \]

X. Prove:
\[ \int_0^2 \int_0^x \int_0^{x+y} e^{x+y+z} \ dx \ dy \ dz = \frac{e^8 - 3}{8} - \frac{3e^4}{4} + e^2 \]
I. In the manufacture of acid phosphates from phosphate rock, free phos­phoric acid, mono-calcium phosphate and bi-calcium phosphate may be formed.

Write equations expressing the reactions in each case and state the reaction especially desired in the manufacture of fertilizers.

II. Write equation expressing the formation of "reverted" phosphate when the reversion is due to the presence of undecomposed phosphate rock in the acid phosphate.

III. How would you determine the proportion of chamber acid necessary for the proper manufacture of an acid phosphate from a given phosphate rock?

IV. What change does the soluble phosphate undergo when an acid phosphate is applied to the soil? Why is the phosphoric acid of acid phosphates not liable to be washed out of the soil, and why is the action of a freshly applied acid phosphate more marked than that of the residue left in the soil from an acid phosphate applied a previous year?

V. Mention some animal and vegetable manures used as sources of nitrogen. State the approximate percentage of nitrogen in each and calculate the equivalent percentage of ammonia.

VI. Calculate the per cent. of potassium in pure potassium chloride. To what per cent. of potash (K₂O) is this equivalent? What is the usual guarantee of commercial muriate of potash?

VII. Into what three groups may food of animal origin be divided? What additional group is there in foods of vegetable origin?

VIII. Find the nutritive ratio of a food from the following data:

<table>
<thead>
<tr>
<th>Percentage Digestion</th>
<th>Composition Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein ...............</td>
<td>12.3</td>
</tr>
<tr>
<td>Fibre .................</td>
<td>24.8</td>
</tr>
<tr>
<td>Nitrogen—free extract</td>
<td>38.1</td>
</tr>
<tr>
<td>Fat ....................</td>
<td>3.3</td>
</tr>
</tbody>
</table>

IX. What is the average composition of cow's milk? Which constituent is the most variable?

X. How does butter differ from oleomargarine?
I. Explain what is comprehended in the study of agriculture as an applied science.

II. How is good texture of the soil obtained? Explain its beneficial effects upon the physical condition of the soil. How, and through what agencies, does it affect the chemical constituents in the soil?

III. What do you understand by "soil mulch?" Explain its influence upon soil moisture.

IV. Name the three most important elements of plant food. Name the principal commercial sources of each. Mention some important legumes. What do they do for the soil? How used?

V. How do plants grow? Explain the uses of the different parts in the economy of the plant. How do plants reproduce? How do the essential organs of reproduction occur in different plants? Give examples.

VI. Discuss the protection and improvement of worn hill lands. Describe the best means used for their protection. How are they most economically improved?

VII. Tell how to provide fresh, green food for stock throughout the year by a combination of pasturage and green soiling crops. Tell what crops you would use at different seasons and how to grow them.

VIII. What is meant by the "free water" of the soil? How may it be removed? Tell how its removal benefits the soil.

IX. Discuss plant breeding for the purpose of improving the quality and increasing the quantity of production. Explain the difference between a cross and a hybrid.

Plant Diseases, Junior Class, June, 1901

I. Give complete discussion of:
   (a). Bordeaux mixture, its preparation and use. (b). Hydrocyanic acid gas, its use and its limitation (include lecture).

II. Write an essay of 200 words (a) on the use of technical terms, and (b) state your objections to their use.

III. (a). Name and describe the nine divisions under which our author discussed fungi. (b). Give the best general "preventative means" for each division.

IV. Grape Mildew—Give, 1, Technical name; 2, Full life history; 3. Effect on host; 4 and 5, Preventative means (full).


VI. Apple Tree Canker—1, Technical name; 2, Plants attacked; 3, General discussion; 4, Preventative means.
VII. Sclerotium Disease—1, Technical name; 2, Plants attacked; 3, Life-history; 4, General discussion; 5, Preventative means.

VIII. (a). False Tinder Fungus—1, Technical name; 2, General discussion; 3, Preventative means. (b) Dry Rot—1, Technical name; 2, General discussion; 3, Preventative means.

IX. Rice Smut—1, Technical name; 2, Distribution; 3, Preventative means.

X. (a). Asparagus Rust—1, Technical name; 2, General discussion; 3, Life-history. (b). The Hawthorn Cluster-cups—1, Technical name; 2, General discussion; 3, Complete life-history; 4, Preventative means; 5, Why did we study this cluster-cups?

Stock Feeding, Senior Class, June, 1901

ASSISTANT PROFESSOR CONNER

1. a. By what is the protein consumption in the body measured?
   b. What influence has the feeding of fat and carbohydrates on the protein consumption?
   c. What is the effect of feeding protein alone?
   d. What is the influence of salt on protein consumption?
   e. From what is fat formed in the body?

2. a. Of what does the increase consist in fattening?
   b. What per cent. of the food is used by the steer to put on fat?
   c. Explain “wide and narrow ration.”
   d. Where may each be used to advantage?
   e. Explain method of calculating ration.

3. a. Give feeding value of corn to steers.
   b. What is the feeding value of the corn cob?
   c. When may wheat be fed in the place of corn?
   d. Why is it best to feed a horse on oats?
   e. Give the value of C. S. meal and linseed meal as a food for stock.

4. a. At what stage would you cut corn, sorghum and cow pea vines for forage?
   b. How does loss occur in saving forage by field curing and in the silo?
   c. What effect has rain or dew on partly cured hay?
   d. Name and give value of some of our grasses and legumes valuable for hay and pasture in the South.

5. a. What does oat straw furnish when used as a stock food?
   b. Give the advantages of soiling.
   c. When does it pay to cook or soak food for stock?
   d. Does it pay to grind grain for hogs?

6. a. Why does silage increase the milk flow?
   b. What gives value as a fertilizer to manure?
   c. How much work will a horse do in 10 hours walking 3 miles per hour, drawing 75 pounds?

7. a. Should grain be fed to steers on pasture?
b. Why is not shelter as necessary for fattening stock as for milch cows?
c. How often should beef cattle be fed?
d. What is the value of breed in beef making?

8. a. Can the per cent. of fat in the milk be changed by feeding?
b. What per cent. of the food is changed into milk and butter fat by the cow?

c. What gives feeding value to whey?

9. a. What is the feeding value of skim milk when fed to hogs?
b. What other kind of food should be fed with skim milk?

c. What gives feeding value to whey?

10. a. Which of the three—sheep, swine or cattle—eat most per 100 pounds, live weight?
b. Which requires most per 100 pounds gain?

Mechanical Engineering, Senior Class, May 28, 1902

ASSISTANT PROFESSOR BARNES

1. Explain the process of Mechanical Refrigeration, giving the cycle in full. Explain the difference between an Ice Plant and a Refrigeration Plant.

2. What is the chemical composition of Acetylene? How is it generated? How is Calcium Carbide made?

3. If calcium carbide costs $0.04 per pound, and one pound will produce 5 cubic feet of gas, which burning at the rate of 1-2 cubic feet per hour, gives 35 candle power; and if kerosene oil is worth 15 cents per gallon and a lamp burning 1-12 of a gallon per hour gives 35 candle power. Which will be the cheaper and how much per week if used 5 hours per day, and the same amount of light is furnished?

4. A double acting steam engine is to furnish 150 horse power at 350 revolutions per minute. If the average effective steam pressure is 75 pounds. Find the diameter of the cylinder and length of stroke, where the stroke is 3-2 the diameter. (Neglect size of piston rod.) What will be the piston speed? What will be the largest size of flywheel that can be used if the safe rim speed is one mile per minute?

5. Draw an ideal card of a four cycle gas engine, indicate upon this card the events of the cycle. Explain how these events are influenced by changing the point of ignition. State three points in favor of the hydro-carbon engine for small powers.

6. A gasolene engine of 30 D. H. P. is to have four cylinders. If the M. E. P. is 70 pounds and the mechanical efficiency 90 per cent., find the diameter of cylinders and stroke, where the stroke=diameter.

7. What are some of the main advantages of petroleum as a fuel? Give the method of using compressed air, and state some of the applications to the arts. What is the effect of reheating the air before using it in the air motor. What advantages has compressed air in mining operations.

8. Distinguish between an exhaust steam feed water heater, and an econ-
omizer. Compare belt driven pumps, and direct acting steam pumps as means of feeding a boiler.

9. What is understood by the terms Contract and Specifications, and what do they include. What are the points that an invention must possess to be entitled to a patent.

Junior Kinematics, June, 1901

ASSISTANT PROFESSOR BARNES

1. Define: Circular pitch; pure mechanism; velocity; intermittent motion; angle of action, in gearing.

Distinguish between rolling and sliding contact.
State the manner of generating the following curves: logarithmic spiral; epicycloid; hypocycloid; involute.

2. State the conditions necessary that a set of gears may be interchangeable.

Show by diagram a method of producing intermittent motion when the driver is a shaft with uniform angular velocity; also one method when the driver is a screw revolving at uniform speed.

3. A train runs at the rate of 110 miles in 2 hours and 40 minutes. The locomotive drivers are 64 inches in diameter and the stroke of the piston is 22 inches. Find (a) the velocity of the engine relative to the earth; (b) the average velocity of the piston relative to the frame of the engine.

4. A pair of grooved friction wheels have pitch diameters of 10 feet and 5 feet; the working depth of the grooves equals 2 inches; the pinion makes 150 revolutions per minute. Find the maximum sliding action in feet per minute, assuming no slip at the pitch lines.

5. A motor furnishes 10 H. P. The speed of the driving pulley on the motor is 1,330 revolutions per minute. If this pulley is 6" in diameter, find (a) size of pulley to be used on line shaft so that the speed may be 190 revolutions per minute; (b) the width of double belt necessary to transmit the power to the shaft; (c) the size of shaft suitable for this work.

6. Two parallel shafts are 24" apart, and are connected by two gears of 4 pitch. The first shaft has a speed of 150 revolutions per minute. The velocity ratio between this and the second shaft is 5 to 7. Find (a) the speed of the second shaft; (b) the number of teeth on each gear; (c) the outside diameter of each gear; (d) the largest size of pulley that can be used on the motor shaft in Prob. No. 5 that will not cause the belt to run at a greater velocity than the safe limit.

7. Prove fully by diagram and demonstration that cones can be used to transfer motion with a definite velocity ratio between shafts that are neither parallel nor intersecting.

8. Name four modes of transmitting motion.

Define an elementary combination, and name the three classes of the parts of a machine.
Name one point in favor of and one point against the use of involute gears.

9. Design and explain a Whitworth Quick Return Motion, in which the return is made during 90 degrees of the revolution. Find the distance between the centers of the rotating parts if the arm of the shaft is 8" (No. 9) long.

10. Find the train for a 30-day clock, the barrel to carry 24 turns of weight cord; escapement to have 30 teeth, and pendulum to vibrate 60 times per minute. Assume sizes for wheels and pinions.

Senior Electrical Engineering, Alternating Currents, June, 1901

PROFESSOR RIGGS

I. Explain fully illustrating by example, the following: (1) Maximum, average, and effective values of C or E. (2) Reactance; impedance. (3) Reactive and active pressures. (4) Apparent and true power—p. f.

II. A laminated wrought iron ring whose A=10 sq. cms. mean circumference=1,256 cms., wound with 500 turns, is traversed by an alternating sinusoidal current whose maximum value=70.72 working permeability of the core=500, f=127.5; resistance of coil=10 ohms. Find (1) Inductance of coil. (2) The time constant. (3) Reactance. (4) Impedance of coil. (5) Reactive drop. (6) Ohmic drop. (7) Impressed pressure. (8) Phase angle. (Illustrate graphically 3, 4, 5, 6, 7, 8.)

III. A 60 cycle, 2 phase, syn. motor, situated 15 miles from the generator, is supplied with 90 K. W. at 10,000 volts. Allowable energy lost in the line 9 per cent. of the delivered power—p. f. of load 90 per cent. Find (1) Nearest size B. & S. for the transmission lines. (2) With wire selected, calculate the actual energy lost in the lines. (3) Eff. of transmission in terms of delivered power. (4) Line impedance. (5) (Graphically) Voltage at generator terminals (either phase).

IV. A 1,000 volt, 127.5 cycle generator is used for lighting a town. Ten arc lights, each having an L==.0075, and a resistance of 7 ohms, are arranged in series on a No. 10 B. & S. circuit 10,000 ft. around. In parallel with the arc line is a similar circuit containing ten series inc. lights, each having a resistance of 9 ohms. Find for each circuit (1) Impedance. (2) Current. (3) True and apparent power. (4) p. f. of each circuit. (5) Efficiency of each circuit. (6) What detrimental effect has the self induction of the arc lamps?

V. An induction motor "A," whose apparent L==.0125 and R==20 is operated in parallel with an overexcited syn. motor "B," which acts like a circuit having a capacity of 500 m. f. and 15 ohms resistance. The distance between generator and motor is 5 miles, and the circuit is of No. 3 B. & S. wire, run 12" between centres. f=63.7 voltage at the load terminals 1,000 volts. Find for each circuit the following: Za
VI. Explain fully the construction and operation of an induction motor.  
Problem: A 60 cycle induction motor has a 6 pole stator winding; the slip at full load is 10 per cent. Find motor speed at full load.

VII. Explain the operation of a syn. motor, showing how it can take current to meet its load demands, in operating at a constant speed and field excitation. Problem: The self-induction of a syn. motor =.0075 and resistance=2.5 ohms. Terminal voltage of motor 1,000 volts. Motor excitation is adjusted to 1,100 volts. Input current=100 amp. Find graphically the following: (1) Necessary resulting E. (2) Ø₁, Ø₂. (3) Power input and p. f. (4) Power converted by motor. (4) Elec. eff. (5) Would it improve the p. f. to diminish the motor's excitation to give 800 volts instead of 1,100?

VIII. Explain (1) the star and mesh 3 phase armature connections. (2) Problem: A 60 K. W., 4,000 volt generator having a star connected armature is reconnected as a mesh. (a) What will be the terminal voltage in the latter case? (b) What the relative heat loss in the armature conductors at full load?

IX. A 4-pole, 60-cycle, single, two or three-phase rotary converter has a multiple wound armature of 500 conductors. The flux per pole is 1,000,000 lines. Diagram the connections between the collector rings and armature windings for each conversion. (2) Calculate the D. C. voltage, and the single, two and three-phase voltage at the collector rings.

X. Explain action of a transformer (1) With secondary open. (2) With sec. loaded. (3) What is meant by the exciting and the magnetizing currents in a trans.? (4) What is meant by “ageing”—the cause and remedy? (5) State relative advantages of open and closed magnetic current trans. Problem: With the sec. circuit open, 10 amps. flow in the primary of a 100 K. W. trans. under a terminal pressure of 1,000 volts. A Watt metre connected in the primary circuit reads 1,000 Watts. (1) Compute the wattful component of the exciting current. (2) Find graphically the magnetizing comp.

XI. A 5 K. W. trans. has the following net Effs.: At full load, 95 per cent.; at ¾ load 94 per cent.; at ½ load, 92 per cent.; at ¼ load, 90 per cent. Iron losses at all loads 75 watts, and heat loss in primary due to exciting current when sec. is open 5 watts. This trans. is operated for 5 hours at full load, 5 hours at ¾ load, 2 hours at ½ load, 2 hours at ¼ load, and the remaining hours of the 24 at no load. Find its all-day efficiency.

XII. Practical Questions: Discuss briefly the relative advantages of high and low frequency for light and power. (2) what is the relative amount of copper required for a single phase, two phase 4 wire, two phase 3 wire, and three phase 3 wire system? (3) What are the objections to making a large polyphase syn. motor self-starting?
(4) How are trans. rated, and what allowance must be made in their capacity for work on an induction load? (5) What is a balance polyphase system?

Junior Electrical Engineering, Second Term

PROFESSOR RIGGS

1. (a) Show that the heat loss in a conductor of resistance $R$, carrying a current of $C$ amperes is $C^2R$; (b) Prove that a mechanical horse power $= 746$ watts.

2. Briefly outline the construction and operation (a) of an open arc lamp; (b) of an enclosed arc lamp; (c) of an incandescent lamp; (d) give practical rule for connecting arc light carbons properly in the circuit.

3. Explain fully the generation of E. M. F. in a dynamo, describing the essential parts of the machine, and explaining fully the function and operation of the commutator.

4. Explain fully the operation of an electric motor; the generation of C. E. M. F. in the armature of the motor and the effects.

5. (a) Explain three methods of exciting the fields of dynamos. (b) Define the following terms: Electrical, gross, and net eff.

6. $125-10$ amp. $2,000$ (nominal) c. p. open arc lamps requiring each 450 watts are placed in a series circuit of No. 8 B. & S. wire 5,000 feet around; Armature resistance $= 1$ ohm; series field $R. = 2$ ohms. Find: (1) Necessary p. d. at generator terminals; (2) E. M. F. of generator; (3) Eff. of line trans.; (4) Electrical eff. of generator; (5) Electrical eff. of line and generator together.

7. $508-20$ c. p. $3.2$ watts $= 108.3$ volts incandescent lamps are situated in barracks, which is 590 ft. distant from the power station. The maximum allowable loss in trans. is 5 per cent. Find: (1) nearest size (or sizes) B. & S. wire that should be used; (2) with this wire the necessary p. d. at the generator terminals; (3) Eff. of trans. attained.

8. A shunt generator furnishes to a bank of incandescent lamps 300 amp. at 120 volts. Mechanical losses in generator $= 1$ H. P.; iron losses in arm. core $\frac{1}{2}$ K. W.; Arm. $R. = 0.1$ orm; shunt field $R. = 30$ ohms. Find: (1) Net eff.; (2) Elec. eff.; (3) Necessary H. P. that must be applied to generator pulley; (4) Net eff. of generator at an output of 50 amp.

9. A shunt motor is supplied with 102 amp. at 500 volts. Motor's iron losses $= 200$ watts; mechanical losses $\frac{1}{2}$ H. P.; Arm. $R. = 0.1$ ohm; shunt field $R. = 250$ ohms. Find: (1) C. E. M. F.; (2) Net eff. of motor; (3) H. P. at motor pulley.

10. Find the relative cost of copper for trans. 500 K. W. with a limiting loss of 10 per cent., a distance of 5,000 ft., copper being worth $.20 per lb. (use nearest size or sizes B. & S.), (1) at 10,000 volts; (2) at 5,000 volts; (3) at 1,000 volts.

11. The Textile School motor is rated at 30 H. P. $= 220$ volts $= 85$ per cent. net eff. Its distance from the power plant is 1,000 ft. The line of one-half
this distance is composed of two No. 1 B. & S. wires in parallel; the other half of the line is of a single No. 0000 B. & S. wire. Find: (1) line drop; (2) p. d. at generator terminals.

12. It costs in the Clemson power plant about $.05 per K. W. hour, to produce power. The pumping station is situated 2,500 ft. from the plant, and the motor therein is connected to the plant by a No. 000 B. & S. wire. The switch board instruments show that the motor line is furnished with 50 amp. at 230 volts, for about 8 hours per day for 300 days of the year. Would it pay the College to borrow money at 7 per cent. interest and run an additional No. 0000 B. & S. wire in parallel with the first in order to reduce the line losses, copper being worth $0.20 per lb., and the additional line construction, say $50.00 per thousand feet of distance?

Senior Civil Engineering, June, 1901

PROFESSOR BRODIE

BRIDGE ENGINEERING.—A through Pratt, single track, railroad bridge, with span of 144 feet, has six panels and a depth of 26.9 feet. It is designed to carry a live load of two coupled, consolidation locomotives, 139 tons each, followed by 1.6 tons per lineal foot of train load. (Weights and spacing of wheels as shown on diagram.)

Compute maximum live load stress in:
I. First diagonal.
II. First panel of lower chord.
III. Third diagonal.
IV. Second vertical.
V. Counter diagonal in third panel.

Compute for uniform live load of 44 tons per panel per truss:
VI. Second diagonal.
VII. Counter in second panel.
VIII. First vertical.
IX. Find the uniform load per linear foot that will cause the same maximum bending moment in a beam of 20 ft. span as the drivers of a passenger locomotive, each weighing 40,000 pounds, and 8 feet apart.

X. Prove that for maximum moment from wheel loads \( P = \frac{-W}{m} \), or

that the weights on the segments of the span are proportional to the lengths of the segments.
Junior Textile Industry, June, 1901

PROFESSOR BEATY

No. 1. Most modern mills use the English system of drawing, i.e., the corded slivers are run through 3 heads of drawing, doubling 6 into 1 at each head. Some of the older mills use a railway head and 2 heads of drawing. Discuss fully the advantages and disadvantages of each system.

(b). Drawing frames have, generally, four lines of drawing rolls. On some drawing frames the top rolls are covered with leather, while in other drawing frames metallic top rolls are used. Compare the meritorious features of the two systems.

Also give approximate setting distances of each of the above rolls, running on 1½" American cotton.

(c). In carded slivers the composing fibres are disposed in all directions. In the finished yarn, the fibres are supposed to approach something like a parallel order, with regard to each other. Name the machine or machines in which this parallelization of the fibres is effected.

Describe by sketch and word how this parallelization is effected.

(d). Give a full discussion as to the necessity of drawing slivers, before they are subjected to the twisting processes.

No. 2. Sketch the "compound" or "differential" motion on a roving frame, and describe (1) its purpose; (2) how this purpose is accomplished; (3) what parts of the mechanism of the frame directly govern the workings of the differential, and (4) what motions in the frame are directly governed by the action of the differential?

No. 3. Let R=Large end of driving cone.

\[ T \text{ R } d \quad \text{rd}_2 \quad T \]

\[ X= \frac{\text{rd}_2}{\text{Rd}} \quad \text{and } x= \frac{\text{rd}_2}{\text{Rd} + \text{rd}_2} \]

when X and x represent the diameters of the two cones respectively at any points, corresponding to each other in the length, and that \( d_2 \) is the diameter of the bobbin at that point in its build where the position X is the correct one for the cone belt. Substitute the other values from the first part of example No. 3.

No. 4. Briefly outline the automatic action of the traveller in winding the yarn on the bobbin, in the process of spinning.

(B). Compare the winding of yarn, by the spindle and traveller, in spinning, with the winding of roving, by the spindle and flyer, in roving frames.
No. 1. (A). Prove that \( \frac{12.5 \times \text{yards}}{\text{weight in grains}} = \text{worsted counts} \).

(B). If you have 100 pounds weight of 3-ply yarn, made from 80s, 40s and 30s worsted, what would be the counts of the 3-ply?

(C). Twist together a 10 run wool, a 20 cut wool and a 60s cotton yarn. What would be the weight in grains of 120 yards of the resultant yarn? What would be its equivalent in worsted counts?

No. 2. (A). Why is it necessary to give attention to the proper mixing of cotton?

(B). State fully your objections to using from a small mixing?

(C). What are the advantages derived from breaking up cotton as it is received in the bales, and letting it stand in an open stack for some time, before using? How far does this aid in the subsequent operation of opening?

No. 3. (A). What is the primary function of a lapper? Describe how this function is performed?

(B). What is the secondary function of a lapper? Describe how this function is performed?

(C). State the necessity of having a “piano motion” on a lapper, and describe how it performs its work?

(D). If a lapper produces \( 12,000 \) pounds of laps per week (60 hours), how many lappers are required for a mill containing \( 90,000 \) mule spindles, spinning \( 60s \) cotton, and producing \( 23 \) hanks per spindle per week, waste not considered?

(E). If you were making a 35 pound lap at the breaker lapper and wished to alter the feed so as to make a 40 pound lap, how would you do it?

No. 4. (A). Name and describe the dual operation performed by the licker-in teeth?

(B). What effect would changing the draft gear have on the speed of the doffer?

(D). Describe the action of each part of the card, on the cotton fibres, as they pass through, from the feed roll to the coiler can?

(D). A card is producing a 50 grain sliver; the change gear has \( 18 \) teeth; the draft constant is \( 1,500 \); allowing 4 per cent. for waste, what is the hank lap entering the card?

No. 5. (A). Suppose you began with a drawn sliver \( .160 \) hank and produced a slubbing \( .1.6 \) hank; two ends of slubbing put through the intermediate frame gives \( 3.5 \) hank, and two ends of intermediate roving through the fine roving frame gives a \( 9 \) hank;
what are the drafts in the intermediate and fine roving frames respectively?

(B). Yarn number 40s is being spun from a double roving with a 40 tooth draft gear, each end of roving being a 6 hank; with what draft gear can the same number be spun from a 4.5 hank, using single roving?

(C). If the diameter of a cotton thread No. 30s is 1.143", what is the diameter of No. 60s cotton yarn? The diameters of cotton yarn varying inversely as the square root of the numbers.

(C). Give sketches showing the difference in the principle of the traverse mechanism of a ring spinning frame for spinning filling yarn and one for spinning warp yarn.

(D). Describe the "elastic top" spinning spindle and outline the principle upon which it depends for its action?

(E). Describe the twisting and winding action of the spindle, in the mule spinning frame?

What is meant by "the jacking motion;" "twisting at the head;" "backing off;" "carriage gain?"

No. 5. Find the average counts of yarn to produce a piece of shade cloth, weighing 6.15 yards per pound, if the cloth is constructed with 56 ends of warp per inch and 44 picks of filling per inch, and the width of the cloth is 40" on the loom. Allow 8 per cent. for take-up in width, and 10 per cent. for sizing and take-up in length.

No. 6. You wish to produce a 40s yarn on spinning frame from a 12.5 oz. lap at the card (using 1" American staple). Lay out the drafts and doublings from spinning frame back to the card, which, in your judgment, will give satisfactory results on the desired counts.

Indicate the revolutions per minute of the front rollers of each machine to conduce to the best results on the above counts and staple. Also give the hank roving of the product of each machine.

No. 7. Under how many general heads may all sizing ingredients be classed? Name them? Give an example of each, and state the specific purpose for which each ingredient is used in a size-mixture?

(B). Give a receipt for a size-mixture, which will give good results on a cloth which is to be bleached?
### Post-Graduate Students

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### Senior Class

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Total: 500
Clemson College

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Section Marchers

Second Term

A. Senior ........................ D. H. Sally and J. M. Burgess
T. Senior ........................ B. C. Cromer and H. B. Jennings
1 E. Senior ........................ F. M. Gunby and F. M. Jordan
2 E. Senior ........................ W. W. Coleman and G. E. Bamberg
3 E. Senior ........................ B. H. Barre and A. B. Carr
4 E. Senior ........................ S. C. Stewart and Graeme T. McGregor
C. Senior ........................ C. L. Reid and H. T. Cantey
A. Junior ........................ T. B. Young and S. W. Epps
1 E. Junior ........................ W. E. G. Black and W. H. Barnwell
2 E. Junior ........................ T. M. Harvey and T. S. Gandy
3 E. Junior ........................ V. Livingston and B. H. Lawrence
4 E. Junior ........................ G. F. Norris and H. C. Tillman
1 T. Junior ........................ C. B. Hagood and D. E. Earle
2 T. Junior ........................ C. W. Legerton and C. W. McSwain
A. Sophomore ........................ J. R. Connor and S. O. O'Bryan
1 M. Sophomore ........................ C. Dew and V. Baker
2 M. Sophomore ........................ J. N. Drake and V. B. Hall
3 M. Sophomore ........................ A. E. Holman and J. R. London
4 M. Sophomore ........................ C. Norton and O. M. Roberts
5 M. Sophomore ........................ J. P. Tarbox and W. L. Templeton
1 Freshman ........................ W. S. Beaty and L. E. Boykin
2 Freshman ........................ W. W. Dukes and F. G. Eason
3 Freshman ........................ R. B. Gandy and T. R. Ellison
4 Freshman ........................ B. O. Kennedy and T. E. Keitt
5 Freshman ........................ J. G. Parks and C. H. Newman
6 Freshman ........................ L. P. Slattery and S. Sorrentrue
7 Freshman ........................ R. M. Watson and W. S. Weston
1 Subfreshman ........................ D. G. Adams and B. D. Carter
2 Subfreshman ........................ J. E. Johnson and D. W. Elliott
3 Subfreshman ........................ W. T. Parrott and J. J. Rauch
4 Subfreshman ........................ T. E. Stokes and J. E. Williamson
Regimental Organization, June, 1902

For instruction in infantry tactics and military and police discipline, the cadets are organized into a regiment of two battalions of three companies each, under the Commandant of Cadets, each battalion being commanded by an instructor of the College detailed for this duty.

The officers and non-commissioned officers are selected from those cadets who have been most studious, soldier-like in the performance of their duties, and most exemplary in their general deportment. In general, the officers are taken from the Senior Class, the sergeants from the Junior Class, the corporals from the Sophomore Class. The figures indicate relative rank.

**COMMANDANT OF CADETS**

*Commissioned Staff*

- T. R. Phillipps: Lieutenant and Adjutant
- G. F. Norris: Lieutenant and Quartermaster
- F. M. Jordan

*Non-Commissioned Staff*

- T. S. Perrin: Sergeant-Major
- T. B. Young: Quartermaster-Sergeant
- N. D. Walker: Color Sergeant

**FIRST BATTALION**

*Company A*

- Captains:
  - B. H. Barre

*Company B*

- Lieutenants:
  - C. N. Gignilliat
  - G. E. Barber

*Company C*

- First Sergeants:
  - J. C. Wylie

*Company G*

- Sergeants:
  - W. E. G. Black

**Corporals**

- F. T. Hamlin
- L. H. Bell
- I. H. Morehead
- R. E. Miller

- A. M. Henry
- Geo. T. McGregor
- W. L. Templeton
- W. O. Self

- H. C. High
- J. R. Connor
- W. P. Walker
- C. Dew

- R. J. Coney
- J. M. Monroe
- R. H. Breese
- J. P. Tarbox
## Clemson College

### Second Battalion

#### Company D

- **Captains**
  - H. G. Stokes

- **Lieutenants**
  - D. Kohn
  - S. M. Ward

- **First Sergeants**
  - T. S. Gandy

- **Sergeants**
  - J. T. Robertson
  - J. H. Wyse
  - M. M. Mitchell
  - D. E. Earle

- **Corporals**
  - J. G. Barnwell
  - V. B. Hall
  - J. Gelzer
  - S. I. Felder

#### Company E

- **Captains**
  - E. B. Boykin

- **Lieutenants**
  - W. E. Chapman
  - W. G. Templeton

- **First Sergeants**
  - J. P. Glenn

- **Sergeants**
  - J. P. Cummings
  - H. C. Tillman
  - L. W. Fox
  - B. H. Gardner

- **Corporals**
  - C. Norton
  - W. L. Mauldin
  - H. E. Phillips
  - W. B. Sparkman

#### Company F

- **Captains**
  - J. H. Spencer

- **Lieutenants**
  - F. M. Gunby
  - J. E. Gettys

- **First Sergeants**
  - C. W. Legerton

- **Sergeants**
  - C. V. Sitton
  - F. K. Rhodes

- **Corporals**
  - O. M. Roberts
  - J. A. Wier
  - F. C. Wyse
  - A. E. Holman

### Artillery Detachment

- **Captain**
  - C. L. Reid

- **Lieutenant**
  - B. C. Chomer

- **First Sergeant**
  - W. H. Barnwell

- **Sergeants**
  - V. Livingston
  - B. H. Lawrence
South Carolina Experiment Station

Board of Fertilizer Control

Hon. J. E. Tindal  Hon. J. E. Wannamaker  Hon. A. T. Smythe
H. M. Stackhouse, Secretary

Officers of Experiment Station

Henry S. Hartzog, President of College.............................Director
J. S. Newman .............................................Vice-Director and Agriculturist
M. B. Hardin .............................................Chief Chemist
F. S. Shiver, Ph. G. .......................................Assistant Chemist
C. C. Newman .............................................Horticulturist
R. N. Brackett, Ph. D. ......................................Assistant Chemist
G. E. Nesom, B. Sc., D. V. M. ................................Veterinarian
*C. C. McDonnell, B. S. .....................................Assistant Chemist
Haven Metcalf, A. M. .......................................Botanist
*B. F. Robertson, B. S. ....................................Assistant Chemist
C. M. Conner, B. S. ......................................Assistant Agriculturist
C. E. Chambliss, B. S., M. Sc. ................................Entomologist
D. H. Henry, B. S. ........................................Assistant Chemist
O. M. Watson ...............................................Poultryman
J. S. Pickett ...............................................Experiment Station Foreman

John N. Hook, Secretary and Librarian

Extracts from the Act of Congress, known as the "Hatch Act," approved March 2, 1887, for the establishment of Agricultural Experiment Stations in connection with Colleges established in the several States under the provisions of the Congressional Act, approved July 2, 1862, and known as the first "Morrill bill."

Section 1. **That in order to aid in acquiring and diffusing among the people of the United States useful and practical information on the 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 department of colleges in each State or Territory established, or which may hereafter be established, in accordance with the provisions of an Act approved July 2, 1862, entitled "An Act donating public lands to the several States and Territories which may provide colleges for the benefit of agriculture and mechanic arts," or any of the supplements to said Act, a department to be known and designated as an "Agricultural Experiment Station." **

Sec. 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 for the same; the chemical composition of useful plants at their different

*Engaged in fertilizer analysis.
stages of growth; the comparative advantages of rotative cropping as pursued under a varying series of crops; the capacity of new plants or trees for acclimation; the analysis of soils and waters; the chemical composition of manures, natural or artificial, with experiments designed to test their comparative effects on 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 industry 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.

Sec. 3. * * * It shall be the duty of each of said stations, annually, on or before the first day 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. * * *

Sec. 4. That bulletins or reports of progress shall be published at said stations at least once in three months, one copy of which shall be sent to each newspaper in the States or Territories in which they are respectively located, and to such individuals actually engaged in farming as may request the same, and as far as the means of the station will permit. 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, under such regulations as the Postmaster General may from time to time prescribe.

Sec. 5. That for the purpose of paying the necessary expenses of conducting investigations and experiments and printing and distributing the results as hereinbefore described, the sum of $15,000 per annum is hereby appropriated to each State, to be specially provided for by Congress in the appropriations from year to year, and to each Territory entitled under the provisions of Section 8 of this Act, out of any money in the treasury proceeding from the sales of public lands, to be paid in equal quarterly payments, on the first day of January, April, July and October in each year, to the Treasurer or other officer duly appointed by the governing boards of said colleges to receive the same, the first payment to be made on the first day of October, 1887: 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 per centum of such annual appropriation may be so expended.

Sec. 7. That nothing in this Act shall be construed to impair or modify the legal relation existing between any of said colleges and the government of the States or Territories in which they are respectively located.

Sec. 8. * * * And in case any State shall have established under the provisions of said Act of July 2 aforesaid an agricultural department or experiment station in connection with any university, college or institution not distinctively an agricultural college or school, and such State shall have established or shall hereafter establish a separate agricultural college or school, which shall have
connected therewith an experimental farm or station, the Legislature of such State may apply, in whole or in part, the appropriation by this Act made to such separate agricultural college or school, and no Legislature shall by contract, express or implied, disable itself from so doing.

Sec. 9. That the grants of money authorized by this Act are made subject to the legislative assent of the several States and Territories to the purpose of said grant: Provided, That payments of such installments of the appropriation herein made as shall become due to any State before the adjournment of the regular session of its Legislature meeting next after the passage of this Act shall be made upon the assent of the Governor thereof, duly certified to the Secretary of the Treasury.

Sec. 10. Nothing in this Act shall be held or construed as binding the United States to continue any payments from the treasury to any or all the States or institutions mentioned in this Act, but Congress may at any time amend, suspend or repeal any or all the provisions of this Act.

General Statement

The work of the Experiment Station is classified under two general departments: The Chemical and the Agricultural.

The Agricultural is sub-divided into the following divisions: the agricultural division, the horticultural, the dairy, the veterinary, the botanical, the entomological, and the poultry division. The work of the Experiment Station during the past year included investigations of the chemical composition of various rice products; the inspection and analysis of commercial fertilizers, and the analysis of waters, phosphate rocks, ores, minerals, marls, clays and sand;—variety, fertilizer, rotation and cultural experiments; plant breeding, especially cotton and corn; studies of forage plants for hay and pasturage; cotton boll rot and other plant diseases; diseases of animals, tuberculosis, Texas fever, and glanders; comparisons of soiling and pasturage; experiments in feeding pigs, and in pasturizing milk; entomology, insects injurious to the cotton plant; and in horticulture, experiments in the repression of injurious insects and fungi, studies of frost-resisting varieties of fruits, methods of pruning grape vines, and forcing fruits and vegetables.

This Station has recently been provided with an expert poultryman, and investigations will now be directed in such lines that will develop the greatest practical benefit to our people, showing the best breeds for all the various purposes of poultry raising, the advantages of cross-breeding, the utility and value of capons, and stimulating such interest in, and attention to, the possibilities of this profitable industry as its importance demands.
Publications of the South Carolina Experiment Station

(Numbers marked thus * are exhausted.)

Bulletins of the Station are sent free to all citizens of the State requesting them.

Old Series

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No. 19. Dairying.
No. 20. Analyses commercial fertilizers.
No. 21. Technical.
No. 22. Colic in horses and mules.
   Annual report.
No. 23. Lameness in horses.
No. 24. Analyses commercial fertilizers, in two parts.
No. 25. Distemper in horses and mules.
No. 26. Founder in horses and red water in cattle.
No. 27. Wounds and their treatment.
   Annual report.
No. 28. The sweet potato as a starch-producer.
No. 29. Analyses commercial fertilizers.
No. 30. Determination of starch in the sweet potato.
No. 31. Hog cholera and swine plague.
No. 32. Protection and improvement of worn soils.
   Annual report.
No. 33. Test of dairy methods and apparatus.
   Comparative tests of butter-fat.
No. 34. Sugar beets.
No. 35. Analyses commercial fertilizers.
No. 36. Diseases of plants.
No. 37. Wheat
No. 38. Asparagus rust in South Carolina.
No. 39. Suggestions to auxiliary clubs.
No. 40. Farm manures for cotton.
No. 41. Rice blast and a new rice smut.
No. 42. Varieties of cotton.
No. 43. Analyses of commercial fertilizers.
No. 44. Corn.
No. 45. Analyses of commercial fertilizers.
No. 46. Cotton.
No. 47. A chemical study of the Sea Island cotton plant.
No. 48. Broad and narrow tires.
No. 49. Strawberries.
No. 50. Tuberculosis of cattle.
No. 51. Silo construction and silage.
No. 52. Pig feeding.
No. 53. Analyses of commercial fertilizers.
No. 54. Analyses of commercial fertilizers, Part II.
No. 55. Feeding rice meal to pigs.
No. 56. Wheat.
No. 57. Fungicides.
1896
No. 22. Colic in horses and mules.
Annual report.
No. 23. Lameness in horses.
No. 24. Analyses commercial fertilizers, in two parts.
No. 25. Distemper in horses and mules.
No. 26. Founder in horses and red water in cattle.
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No. 51. Silo construction and silage.
No. 52. Pig feeding.
No. 53. Analyses of commercial fertilizers.
No. 54. Analyses of commercial fertilizers, Part II.
No. 55. Feeding rice meal to pigs.
No. 56. Wheat.
No. 57. Fungicides.
1898
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No. 38. Asparagus rust in South Carolina.
No. 39. Suggestions to auxiliary clubs.
No. 40. Farm manures for cotton.
No. 41. Rice blast and a new rice smut.
No. 42. Varieties of cotton.
No. 43. Analyses of commercial fertilizers.
No. 44. Corn.
No. 45. Analyses of commercial fertilizers.
No. 46. Cotton.
No. 47. A chemical study of the Sea Island cotton plant.
No. 48. Broad and narrow tires.
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The departments cannot undertake to analyze stomachs or other parts of poisoned animals, make tests for poisons, nor to make bacteriological examinations.

All inquiries and requests should be addressed to the President, giving explicit account of conditions, difficulties, etc., as far as possible, and the matter will be referred promptly to the proper department for further correspondence. Before sending samples of any kind for examination or analysis, it is best to write for instructions, and thus avoid trouble and delay.
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