

Fifth Annual
Catalogue

Throop
Polytechnic
Institute



PASADENA, CALIFORNIA
1896-1897

FIFTH ANNUAL CATALOGUE

OF

THROOP

POLYTECHNIC INSTITUTE

AND

MANUAL TRAINING SCHOOL

PASADENA, CAL.

1896-1897

FOUNDER

HON. AMOS G. THROOP

Born at De Ruyter, New York, July 22, 1811

Died at Pasadena, Cal., March 22, 1894

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CALENDAR

1896-1897

Entrance Examinations . Wednesday, Thursday and Friday, Sept. 16, 17, 18, 1896
Fall Term begins Wednesday, September 23, 1896
Thanksgiving Vacation . . From Wednesday, Nov. 25, to Tuesday, Dec. 1, 1896
Founder's Day Thursday, December 10, 1896
Fall Term ends Friday, December 18, 1896

HOLIDAY VACATION

Winter Term begins Tuesday, January 5, 1897
Winter Term ends Friday, March 26, 1897

SPRING VACATION

Spring Term begins Tuesday, April 6, 1897
Spring Term ends Wednesday, June 23, 1897

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HERBERT B. PERKINS, S. B.,
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ERNEST B. HOAG, A. B., B. S.,
Biology.

WILLIAM H. PARKER,
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CHARLES N. CHAMBERS, S. B.,
Joinery, Turning and General Wood Work.

CHARLES H. WRIGHT,
Smithing and Forging Shop Work.

LUCIEN H. GILMORE, A. B.,
Physics and Electrical Engineering.

FANNY F. STERRETT,
Freehand Drawing.

MARY M. SMITH,
Drawing, Clay Modeling and Wood Carving.

ALICE CAMPBELL,
Sewing and Cooking.

BONNIE BUNNELLE,
Principal of Sloyd Grammar School.

ARTHUR H. CHAMBERLAIN,
Director of Sloyd.

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EXECUTIVE COMMITTEE

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A. L. HAMILTON, Secretary.

W. K. GAYLORD.

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MRS. JENNIE COLEMAN.

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COLEMAN.

EDWARDS.

HAMILTON.

Music

CHAMBERS.

BUNNELLE.

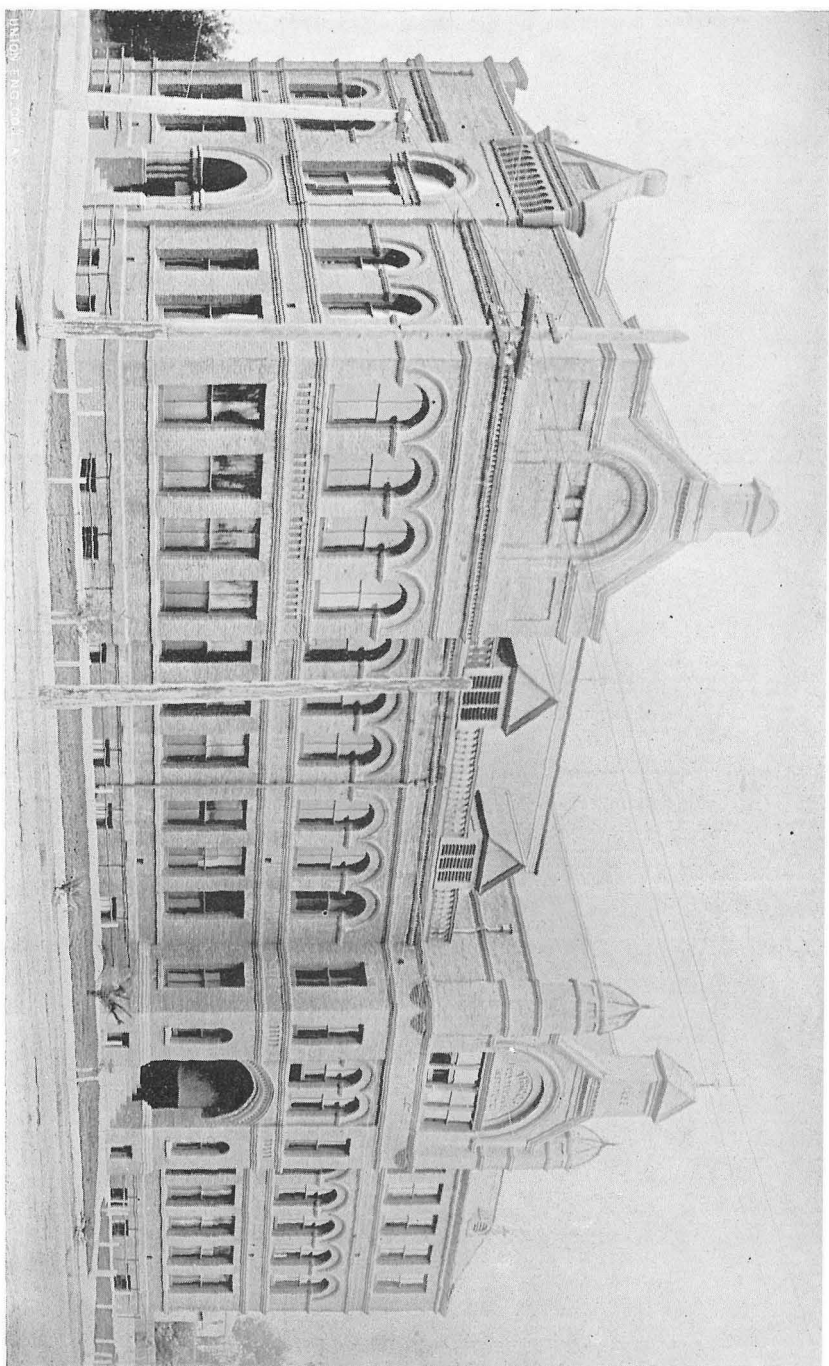
GAYLORD.

Athletics

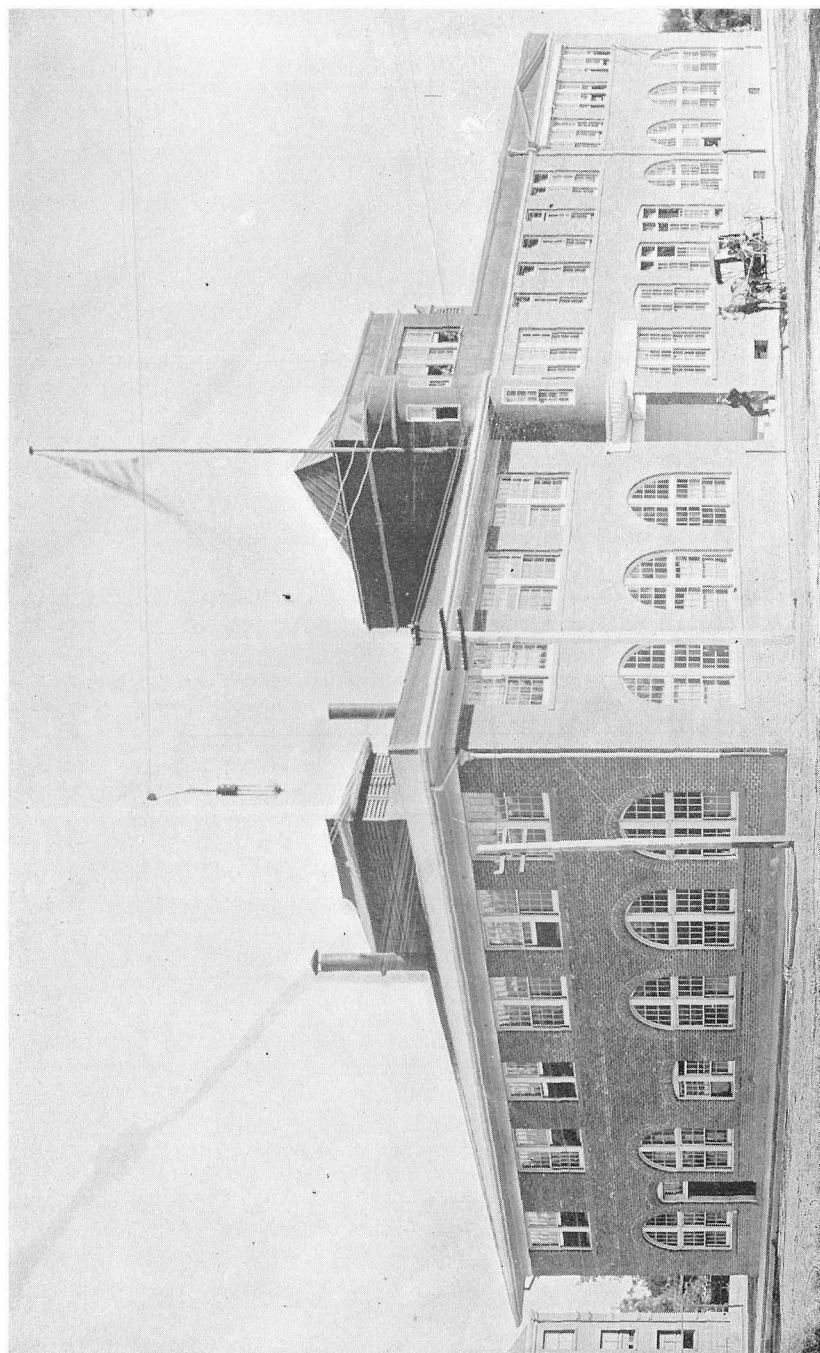
HAMILTON.

CHAMBERS.

CHAMBERLAIN.



EAST HALL.



POLYTECHNIC HALL.

Throop Polytechnic Institute.

Founding.

Throop Polytechnic Institute was founded by Hon. Amos G. Throop in 1891 and during the remainder of his life received his consecrated energy and hearty support, and at his death the greater part of the remaining accumulations of his life were bequeathed for its support. Articles of incorporation were filed September 23rd; the first Board of Trustees organized October 2nd. The doors of the Institute were opened to students November 2nd. It was established as an institution of learning that should furnish to students of both sexes and of all religious opinions, a liberal and practical education, which, while thoroughly Christian, should be absolutely non-sectarian in character.

During the first year the Wooster Block was used for school purposes. In 1892 it was determined to make manual and industrial education the characteristic feature of the school and the building now known as Polytechnic Hall was erected. In the following year East Hall was built.

Location.

Pasadena is generally acknowledged to be one of the most beautiful residence cities in California. It is situated within ten miles of the city of Los Angeles, at the head of the San Gabriel Valley and at the base of the picturesque San Gabriel Mountains. In beauty and healthfulness, in the culture of its homes, and in its high social and moral tone, Pasadena has no superior on the Pacific Coast. It is reached by the Santa Fe, Los Angeles Terminal, Southern Pacific, and the Pasadena and Los Angeles Electric railways. The last named passes in front of each of the halls. Students living at most points along these lines within fifty miles of Pasadena are enabled to make the daily trips to and from the Institute in seasonable hours and at reasonable rates.

Departments.

The Institute comprises four departments, the Sloyd Grammar School, the Sloyd Normal Course, the Manual Training Academy, and the College Department. Opportunity is afforded teachers to prepare for service as instructors in the Languages, Mathematics, and the Natural Sciences.

Libraries.

The books belonging to the Institute are located with reference to convenience to students, special libraries being placed in the various department rooms. These contain works bearing on English Literature, Latin and Greek, History and Civics, Physics and Electricity, Chemistry, Physiology, Botany, Bacteriology, and Zoology, while a general assortment is found in the main library room in East Hall. Students also have access to many works from the private libraries of the various instructors, as also to the Pasadena Public Library, situated near the Institute.

Polytechnic Hall.

Most of the shops and laboratories of the Manual Training Department are located in Polytechnic Hall, which is a two-story brick structure with a frontage of 148 feet on Fair Oaks avenue and 80 feet on Chestnut street.

Wood Shop.

The wood shop, which is located on the second floor, is provided with twenty work-benches, at each of which four students can work daily. The benches are provided with a drawer for each student, in which, under lock, are placed the planes, chisels and turning tools used by the student to whom that drawer is assigned. These tools are left to his care; for, to sharpen and keep tools in proper condition for use involves, probably, as much skill as does their actual use. Accordingly, no two students handle the same edged tools.

Each bench has, besides, a set of tools which are used in common by four students and comprise the following: One tri-square, one T bevel square, one foot-square, one marking gauge, one pair of inside calipers, one pair of outside calipers, one pair of compasses, one block plane, one hammer, one mallet, one oil can, one oil stone, one back saw, one rip saw, one screw driver, and one six-inch Coe's wrench. At the student's right hand, on the bench, is a fourteen-inch lathe, while at the opposite end of the bench is placed his bench-stop and lightning grip wood-worker's vise. The shop is supplied with a large band saw for cutting up stock, and also a fine fret saw. Besides these, the following, which are less often used, are at his disposal when needed: One combined rabbet, heading and slitting plane, one plow plane, braces and bits, cabinet scrapers and files, carving chisels and veniers. He is thus equipped with all the appliances and tools necessary to do thorough work in joinery, turning, inlaying and scroll-sawing. A special pattern-maker's lathe and well equipped bench is provided for the use of the instructor.

Forging Room.

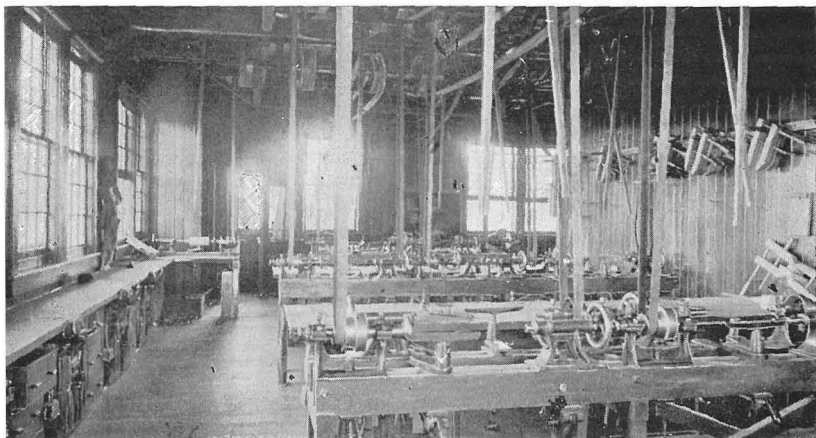
The forging room, situated on the first floor in the east wing of Polytechnic Hall, is equipped for twenty-three pupils.

The furnishing consists of five nests of Buffalo quadruple forges and three single forges. Each forge has a telescopic hood. The fires are urged by a No. 9 pressure blower and the room is kept reasonably free from smoke by a 60-inch exhaust fan.

The anvils are furnished with all necessary tools, such as hammers, hardies, swages, fullers, flatters, tongs and squares. In addition to these tools for individual use, special sets of sledges, heading tools, set hammers, hot and cold cutting chisels, punches, calipers, taps and dies, drills, etc., are provided for general use. A hand blower, double emery grinder, combined hand and power drill, and four blacksmith vises complete the furnishing of the room.

Pattern Shop.

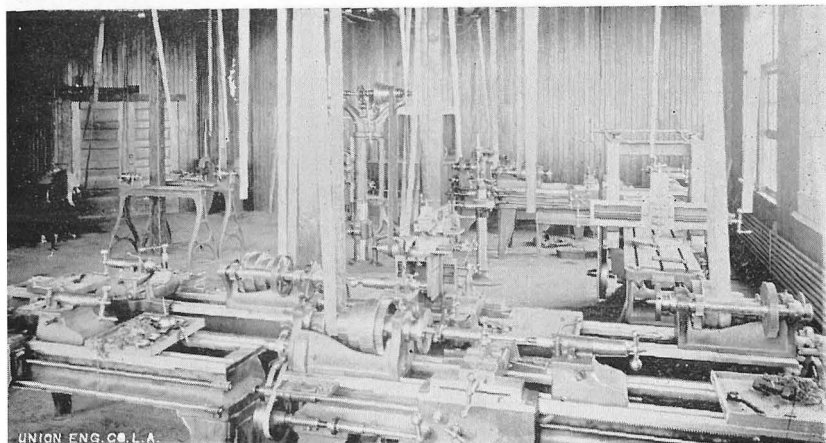
The equipment in this shop is similar to that of the wood shop. In addition, it is provided with a well equipped moulding bench where the students may test their patterns and gain some knowledge of the principles of moulding.



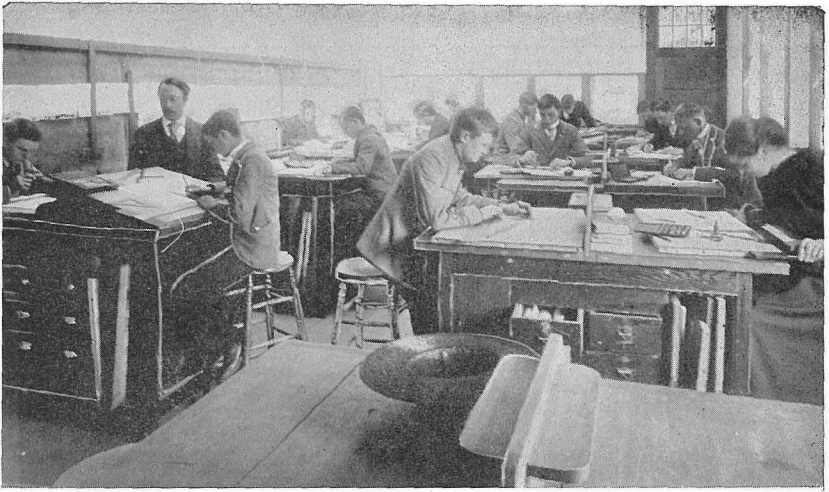
PATTERN SHOP.



FORGING SHOP.



MACHINE SHOP.



DRAUGHTING ROOM.



COOKING ROOM.



SEWING ROOM.

Machine Shop.

The machines in this shop, including a 55-horsepower engine, are of the latest style. They were obtained through the generosity of citizens of Pasadena, at a cost of nearly ten thousand dollars.

The shop contains the following machines: A 24-inch x 6-foot Powell planer; a Hendy shaper, 15-inch stroke; a 24-inch Prentiss Bros. drill; a Sigourney sensitive drill; Brown & Sharpe's No. 1 Universal milling machine, with overhanging arm and universal milling head; a two-wheel emery grinder; a grindstone; a 24-inch x 10-foot Reed lathe, with compound rest; a 16-inch x 8-foot Reed lathe; four 14-inch x 6-foot Reed lathes, one of which has a taper attachment; two 14-inch x 6-foot Prentiss Bros. lathes; a 14-inch x 6-foot Putnam & Sons lathe; a 14-inch x 6-foot Hendey Norton lathe which has the latest improvements for screw cutting, also a compound rest, and two 12-inch x 4-foot speed lathes. It contains a bench provided with six machinists' vises. In the tool room is an 8-inch x 32-inch Mosely & Company bench lathe, the countershaft having forward, reverse and polishing speeds and an overhanging grinding counter. The lathe is furnished with hand and slide rests, wire and drill chucks, several special tools and inside and outside grinding attachments.

The following is a partial list of tools in the tool room: One 24-inch, one 16-inch and three 12-inch four-jawed independent chucks; three 12-inch, two 9-inch and one 6-inch three-jawed universal chucks; milling and gear cutters, end mills and attachments for a milling machine; a set of twist drills from $\frac{1}{8}$ -inch to $1\frac{1}{4}$ -inches by 32nds; from $1\frac{1}{4}$ to 2-inches by 16ths; a set of hand reamers from $\frac{1}{8}$ -inch to $1\frac{1}{4}$ -inches by 32nds; a set of Rose reamers from $\frac{1}{8}$ -inch to $1\frac{1}{4}$ -inches by 16ths; a set of taps and dies from 7-64 to $\frac{1}{4}$ -inch by 64ths and taps from $\frac{1}{8}$ to 1-inch by 16ths; a full set of dogs and two sets of arbors. A revolving frame contains calipers, squares, etc.

A check system is used in giving out tools, the students in turn caring for the tool room.

Sewing and Dressmaking Room.

The sewing and garment-making room is located on the first floor. It is equipped with four large tables furnished with a sufficient number of drawers to accommodate three classes of sixteen members each in garment making. Seven sewing machines, a gas iron heater, pressing boards, together with necessary needles, scissors, thimbles, scales, tape-lines, etc., for the use of individual students, constitute the equipment of this department. Adjoining the main sewing-room, a retiring room for fitting purposes is provided.

Cooking Room.

The cooking room is located on the second floor and is supplied with tables, upon which are gas stoves. Each table is provided with drawers for the caps, aprons, sleeve-protectors, note books, etc., of the four students assigned to work at that table. Other drawers contain cooking utensils, mixing and measuring dishes, stirring spoons, kitchen knives and forks, etc., while in cupboards beneath is a full assortment of stove and kitchen furnishings. At either end of the table, towels, lid-lifters, etc., are hung. At each stove work two students, each participating in every process called for in the instruction. A large dust-proof cupboard, containing meal and flour bins, dish closets, etc., a large water heater,

a Lowe gas range, a large refrigerator and a cupboard for furnishings, are also provided.

Mechanical and Architectural Drawing Room.

This is an east room, situated on the second floor, and is well lighted. It is furnished with tables which have lockers for each student. This room is also provided with models and casts illustrating the five orders of architecture. A number of valuable imported models for work on machine design are in use.

Chemical Laboratory.

The Chemical Department occupies three rooms on the second floor of Polytechnic Hall. They are all well furnished with the usual tables, shelves, closets, hoods, etc., for convenient experimental work, and are supplied with a large assortment of glassware, apparatus and chemicals.

Among the special apparatus owned by the department may be mentioned the following: Steam heating and evaporating apparatus, water still, two Kipp gas generators, Erlenmeyer combustion furnace, apparatus for analysis of baking powders, apparatus for milk analysis, Lunge's nitrometer, analytical balance, Westphal specific gravity balance, etc., etc.

Physical Laboratory.

The Department of Physics and Electrical Engineering occupies three rooms on the first floor of Polytechnic Hall. The physical laboratory is a large, well-lighted room, fitted with tables, gas and water pipes, lockers and cases which contain the usual physical apparatus for both qualitative and quantitative experiments.

Adjacent to this laboratory is the lecture room, and adjoining this on the north is the testing laboratory. This has seven large piers built independent of the floor so as to be free from vibration. The equipment of this room consists of one Edison generator, one motor, two Brackett dynamometers and a storage battery, and such instruments as the Deprez D'Arsonval mirror, Thompson tripod, Queen horizontal reflecting, Universal tangent and Queen ballistic galvanometers; ordinary tangent galvanometers, post-office and ordinary resistance boxes, Queen testing set, earth inductor, Queen quadrant electrometer, $\frac{1}{2}$ microfarad, Weston volt meter, ammeter, Siemen's electro-dynamometer, Bunsen photometer, standard cells, slide meter bridges, scales and telescopes.

The electrical engineering students have the advantage afforded by a 55-horsepower McIntosh, Seymour & Co.'s engine, for supplying power and testing; a 60-horsepower horizontal multitubular boiler, and oil fuel apparatus, gauges, indicators, etc. These are in charge of an experienced steam engineer.

East Hall.

This building stands on Chestnut street and Raymond avenue, and cost, finished and furnished, nearly forty thousand dollars.

On the first floor are class-rooms for Latin and Greek, Mathematics, History and the Preparatory department. A double office is located at the left of the

main entrance, while at the rear are cloak and toilet rooms for both ladies and gentlemen.

On the second floor are the assembly hall, the general library, cloak and toilet rooms for ladies and gentlemen, and the quarters of the department of Biology.

On the third floor are located the rooms for modern languages, free-hand drawing and the museum.

Biological Laboratory.

The biological apartments are located on the second floor. Facing the north is the 19x50 laboratory lighted by nine large windows, with seven V-shaped tables, a sink, an aquarium, a glass-sided cage, and a rack for biological periodicals. Against the south wall are built seventy-four lockers, and four cases for books and reagents.

The laboratory is furnished with seventeen Bausch & Lomb compound microscopes, thirty dissecting microscopes, thirty sets of dissecting and microscopic tools, two microtomes, two camera lucidæ, injecting apparatus, culture dishes, a dry and steam sterilizer, and other apparatus used in bacteriological work. A Universal Bausch & Lomb stand is equipped with the appliances for work in bacteriology and other advanced work. A gas pipe, to which Bunsen burners can be attached, is located at the end of each of the microscopic tables.

An adjoining room contains cases for instruments and material and an herbarium of about 4000 species of plants ranging from the lowest algae and fungi to the highest flowering plants. This apartment is also fitted up as the instructor's private work-room.

South of the instructor's room is a large, well-lighted class-room. In it are placed a case for the student's herbaria and a case for alcoholic specimens. The windows are furnished with close fitting shutters, making it possible to quickly change the room into a dark chamber for the projection of microscopic objects by solar light. In the south side of the room is a bay window used for work in physiological botany. On the floor above is the museum room fitted with cases which contain the geological specimens belonging to the Institute.

Free-hand Drawing, Painting and Designing Room.

This room is fully equipped with all necessary appointments. Side light and sky light are both available. The equipment is as follows: Adjustable desks, which can be transformed into tables or easels, at any angle desired; stationary desks, suitable for the execution of large designs, which also contain drawers for students' supplies; a large table with water connection adapted for mounting designs and grinding colors; blackboards for class demonstrations of perspective principles; a full line of wooden models, type solids, from which first lessons in perspective are given; a case of bric-a-brac and objects of still life, furnishing material for sketching; a complete set of charts used in study of historic ornament and design; plaster casts of historic ornament, natural leaf forms, masks, heads and full length figures which serve as models in the rendering of light and shade in charcoal drawings.

Sloyd Room.

The Sloyd Department, located in the basement of East Hall, is equipped with twenty Sloyd working benches, each of which is provided with a set of high grade cabinet maker's tools. Charts, models, blackboards, and cases divided into compartments where students keep their work, material, drawing instruments, etc., are also provided.

Wood Carving and Clay Modeling Rooms.

The department of Wood Carving and Clay Modeling occupies two rooms, one of which is fitted with work tables, lockers with tools for students' use and cases for exhibition of work. The instructor's private room adjoins this and is used for special lines of advanced work. These rooms are fitted with a good selection of casts and charts showing the various styles of historic ornament. The Clay Modeling department is equipped with a fine selection of casts of ornaments, and a complete set of anatomical charts, besides the usual lockers, stands, etc., for clay work.

Sloyd Grammar School.

The urgent need of educational manual training in connection with the work ordinarily done in public schools inspired the establishment of a Sloyd department in the Institute. Pupils will be admitted to this department who have completed the usual third year of the public school. The work, as arranged for this department, consists of two lines:

- (1) The ordinary book work, and
- (2) That of Sloyd proper.

SCHEDULE OF WORK.

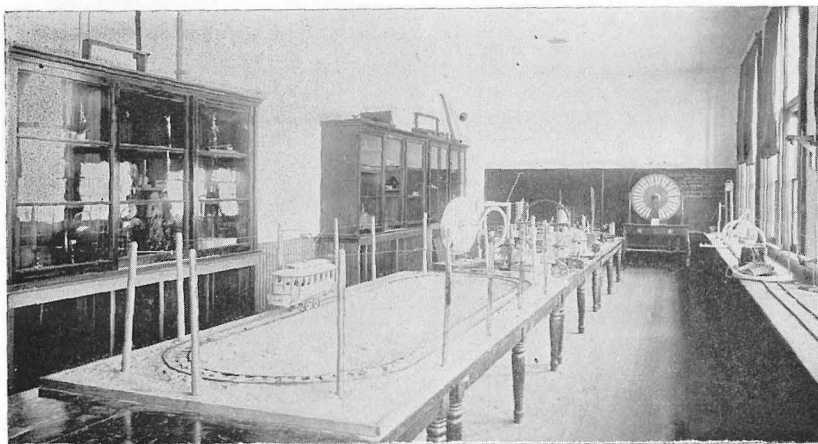
Group 1.	{ <ul style="list-style-type: none"> Arithmetic—Fundamental Operations. English. History and Geography. Science—Elementary Work on Plants and Animals. Sloyd and Form Work.
Group 2.	{ <ul style="list-style-type: none"> Arithmetic—Review Fundamental Operations. Factoring. Greatest Common Divisor. Least Common Multiple. Simple Work in Fractions. English. History and Geography. Science—Elementary Work on Plants and Animals. Sloyd.



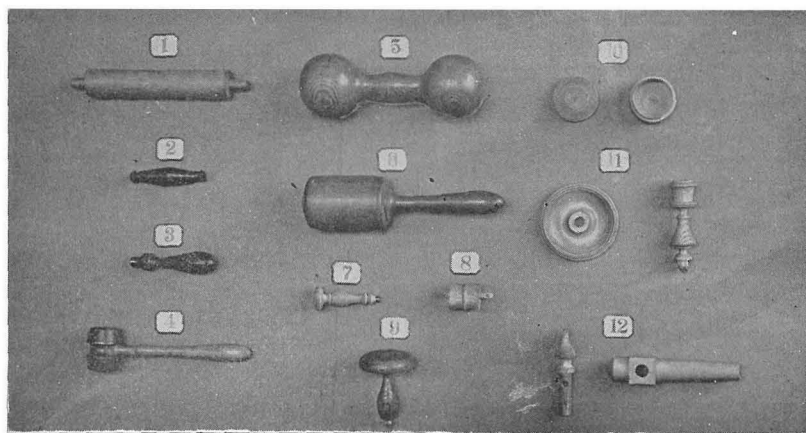
BIOLOGICAL LABORATORY.



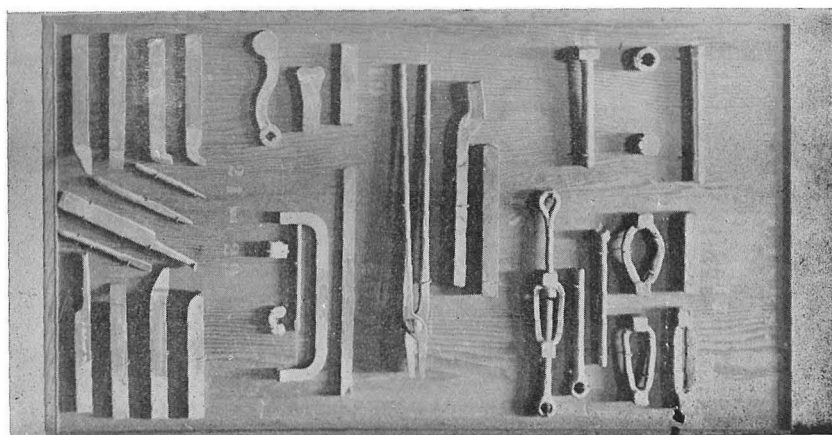
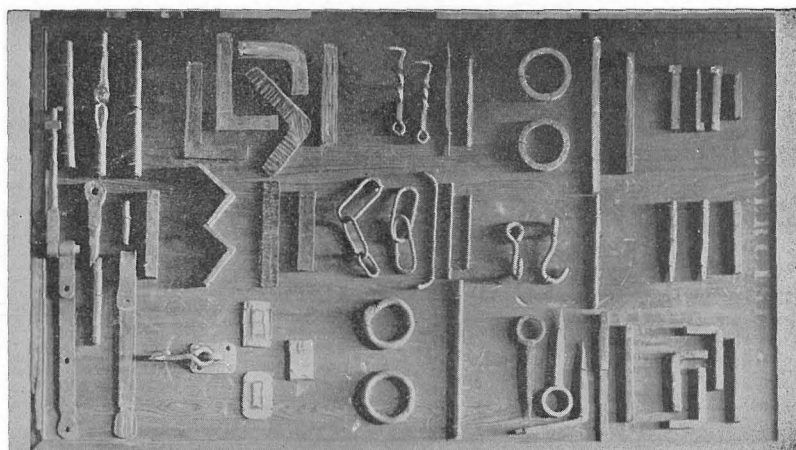
CHEMICAL LABORATORY.



PHYSICAL LABORATORY.



SLOYD MODELS—TURNING.



EXERCISES IN FORGING.

Group 3. { Arithmetic—Fractions. Denominate Numbers and Supplementary Work.
 English—Language Lessons. Hans Andersen's Fairy Tales—Wonder Book—Poets and Heroes.
 History and Geography—Eggleston's First Steps in United States History. Advanced Geography with Modeling.
 Science—Elementary Work on Plants and Animals.
 Sloyd.

Group 4. { Arithmetic—Applications of Percentage and Supplementary Work.
 English—Elements of Grammar and Analysis. Kingsley's Greek Heroes. Snow Bound. Six Selections from Sketch Book. Hiawatha.
 History and Geography—Fiske's United States History begun. Geography completed.
 Science—Simple Experiments in Physics.
 Sloyd.

Group 5. { Arithmetic Reviewed and Elementary Geometry.
 English—Grammar completed. Lady of the Lake. Evangeline.
 History and Geography—United States History completed. Geographic Reviews.
 Science—Simple Chemical Experiments.
 Sloyd.

1. The course in English includes a thorough drill in *writing, spelling and composition.*

2. The following materials are needed by every participant in Sloyd classes:

A drawing board, 18 in. x 24 in. x $\frac{1}{2}$ in., a T square, triangles, a set of drawing instruments, thumbtacks, drawing paper, pencils and erasers.

The Sloyd work is arranged in four courses. It proceeds from very simple to more complex forms, introducing the tools and exercises at proper intervals. There are 81 different exercises, involving the use of 46 tools.

This Sloyd course consists of drawing and wood work.

The drawing course embraces:

Geometrical constructions; Principles of representation; Representation by use of scales; Orthographic and isometric projections; Linear perspective.

The wood-work consists in the making of thirty-nine Sloyd models, of which the first fifteen constitute Course I, the next nine, Course II, the following ten, Course III, and the last five, Course IV.

Sloyd Normal Course.

This course is designed especially to fit persons for teaching Sloyd and Industrial Drawing. Admission to it can be gained by persons holding teachers' certificates and by graduates of High or Normal Schools or Colleges, or by others on passing the required entrance examinations.

The work is as follows :

Manual Work.

Drawing, including (1) Geometrical constructions ; (2) Principles of representation ; (3) Representation in reduced size by the use of scales ; (4) Orthographic and isometric projections ; (5) Linear perspective ; (6) Inking and tracing ; (7) Blue-printing and mounting ; (8) Free-hand drawing throughout the year.

Completion of thirty-nine Sloyd models.

Completion of twelve wood-turning models.

Sharpening and care of tools.

Theory.

The theoretical work includes, besides the mechanics of Sloyd, the History, Pedagogy and Psychology of the subject. The study of woods will also be taken up. For the reading course, the students in these classes are required to provide themselves with the following books :

The Theory of Educational Sloyd, by Otto Salomon, \$1.25.

Industrial Education, by Robert Seidel, \$1.00.

Linear Drawing and Projection, by Ellis A. Davidson, \$1.50.

Bench Work in Wood, by Goss, and Practical Perspective, by Ellis A. Davidson, are also recommended.

No student will be awarded a Sloyd teacher's diploma unless the entire course has been finished. To complete this work requires one school year, although the manual part of the course may be completed in a shorter time.

Academy.

Requirements for Admission.

Students holding a certificate of graduation from a California Grammar School, or any other school of equivalent grade, will be admitted to the Academy without examination. All other applicants will be subject to examination in Arithmetic, Grammar, English, Geography and United States History.

In Arithmetic the examination will be upon the following subjects :

Fundamental Operations, Factoring, Greatest Common Divisor, Least Common Multiple, Fractions, Denominate Numbers, Applications of Percentage, Involution, Evolution, Mensuration and the Metric System.

In Grammar and English, upon Elements of English Grammar and the Analysis of the Sentence, Snow Bound, Lady of the Lake and Evangeline.

Each candidate for admission by examination will be required to write a short composition, in order to show his ability to compose, spell and punctuate, and to use capital letters properly.

Courses of Study.

	Ancient Classical.	Modern Classical.	Literary.
First Year	English I. Mathematics I. Latin I. Drawing I. Shopwork I. or V.	English I. Mathematics I. Latin I. Drawing I. Shopwork I. or V.	English I. Mathematics I. { German I. or French I. Drawing I. Shopwork I. or V.
Second Year	English II. Mathematics II. Latin II. Drawing II. Shopwork II. or VI.	English II. Mathematics II. Latin II. Drawing II. Shopwork II. or VI.	English II. Mathematics II. { German II. or French II. Drawing II. Shopwork II. or VI.
Third Year	Latin III. Greek I. History I. Drawing III. Shopwork III. or VII.	Latin III. { German I. or French I. History I. Drawing III. Shopwork III. or VII.	English III. French I. or { German I. History I. Drawing III. Shopwork III. or VII.
Fourth Year	Latin IV. Greek II. History II. Drawing IV. Shopwork IV. or VIII.	Latin IV. { German II. or French II. History II. Drawing IV. Shopwork IV. or VIII.	Physics—Physiology. { French II. or German II. History II. Drawing IV. Shopwork IV. or VIII.
	English—Scientific.	Scientific—A.	Scientific—B.
First Year	English I. Mathematics I. Physical Geography. Drawing I. Shopwork I. or V.	English I. Mathematics I. Physical Geography. Drawing I. Shopwork I. or V.	English I. Mathematics I. Physical Geography. Drawing I. Shopwork I. or V.
Second Year	English II. Mathematics II. { Latin I. or German I. or French I. Drawing II. Shopwork II. or VI.	English II. Mathematics II. { Zoology or Botany. Drawing II. (F. H.) Shopwork II. or VI.	English II. Mathematics II. { Zoology or Botany. Drawing II. (F. H.) Shopwork II. or VI.
Third Year	{ Latin II. or German II. or French II. History I. Chemistry—Physics. Drawing III. Shopwork III. or VII.	{ Latin I. or German I. History I. Chemistry } Botany or Physiology Drawing III. (F. H.) Shopwork III. or VII.	German I. Mathematics III. Chemistry—Physics. Drawing III. (F. H. or Mech.) Shopwork III. or VII.
Fourth Year	{ English III. or Mathematics III. History II. Physics—Chemistry. Drawing IV. Shopwork IV. or VIII.	{ Latin II. or German II. History II. Botany—Chemistry or Physiology—Chemistry Drawing IV. } or Adv. Shopwork IV or VIII. } Science.	German II. History II. Physics—Chemistry. Drawing IV. } or Adv. Shopwork IV or VIII. } Science.

1. Roman numerals in above table refer to subjects outlined on pages 15 to 28.
2. A subject once elected may not be dropped after two weeks from the time of choice, and must thereafter be pursued until successfully completed. In special cases, for reasons satisfactory to the Executive Committee, this provision may be set aside.
3. If Latin, French or German be chosen it must be pursued for not less than two years to receive credits for the work. In the Modern Classical Course two years of Spanish may be substituted for two years of Latin.
4. Each student must, in order to complete a course, take not less than two years of English; two of Mathematics; two of History (except in Scientific Course B); four years of Drawing; and four years of Shop-work (except in Scientific Courses A and B).
5. For graduation from the Academy, thirty-six credits are required. Two credits are given for the successful completion of each annual subject except Drawing, for which one credit is given. Students entering the Academy after June 20, 1896, must complete one of the above courses in order to receive the diploma of graduation.

College.

The requirements for admission to the college department are as follows:

(1) The completion of one of the Academy courses outlined on pages 15 to 28; or (2) the completion of a course in an accredited High School or an approved Preparatory School; or (3) passing an examination upon English I and II, and Mathematics I and II, and any eight of the following subjects, as outlined on pages 15 to 28: Physical Geography, Botany I, Botany II, Zoology I, Zoology II, Physics I, Chemistry I, Latin I, Latin II, Latin III, Latin IV, German I, German II, French I, French II, Greek I, Greek II, History I, History II, Mathematics III, English III. Any applicant offering Latin, French or German must present at least two years of each.

The work in this department is entirely elective. Each student who is a candidate for a degree must choose a major subject which is the work of one professor, who shall prescribe the necessary or desirable collateral work. Such major and accessory work shall not constitute more than two-thirds of the work offered for a degree and the amount subject to prescription by the professor shall not exceed one-third. The remainder of the work may be chosen from any of the subjects offered with the exception of Mathematics I and II and English I and II and Physical Geography. The degree B. A. will be granted to students having satisfactorily completed four years' work of at least three recitation or lecture periods per day. Upon a basis of two credits for a year's work in each subject, twenty-four credits are required for graduation.

The institution reserves the right not to organize classes in any given subject, unless at least eight students elect said subject.

Candidates for admission to college classes should make application as early as possible, indicating the subjects they purpose electing.

Subjects and Methods of Instruction.

Mathematics.

I. Elementary Algebra. Fundamental operations: Special attention given to the reading of problems; to the subject of factoring; simultaneous equations; involution and evolution; radical and imaginary expressions, to Quadratics. This is first year work.

II. Plane Geometry. Regular work contained in such texts as Wentworth's New Plane Geometry. The work includes the original propositions and problems in the text book, supplemented by other original work. The subject comprises the mathematical work of the second year.

III. (a) Higher Algebra. Indeterminate equations, inequalities, theory of exponents, radical expressions and rationalization, imaginary expressions, square root of binominal surds, quadratic equations, theory of quadratic equations, with solutions by factoring, logarithms, variation, arithmetical, geometrical and harmonical progression, binomial theorem, undetermined coefficients, permutations and combinations, theory of limits, and continued fractions.

(b) Solid Geometry. The course given in Wentworth's New Plane and Solid Geometry, books VI—VIII, inclusive. This subject, supplemented by Higher Algebra, comprises the work of the third year in the regular course.

IV. (a) Trigonometry. The course comprises plane and spherical trigonometry. Problems from text books proven in the field, also problems solved by the class.

(b) Plane surveying. Survey with chain alone; with compass and chain; leveling with "Y" level; making profiles of elevations and grades. Adjustment of transit and level. Plotting of field work, also field work done from plottings.

Higher Surveying. Trigonometrical surveying. Running R. R. preliminary lines; setting slope stakes; plotting cross sections; calculating cut and fill, running grade lines for irrigating ditches, or roads.

(c) Field Engineering. Theory and Practice of laying out curves, side tracks, economic principles of railway location and construction. Carhart's Field Book will be used as a text book.

Land surveying, plotting field work, using various methods of representing topography, calculation of areas by latitudes and departures, also by use of the planimeter. Carhart's Field Surveying the text book.

V. (a) Analytic Geometry. This is studied chiefly in connection with its application to the study of the conic sections.

In addition to the ordinary methods given in American text books, methods of Abridged Notation are introduced sufficiently to give the student some idea of their advantages.

The text book was prepared for students of the Institute by the teacher of this subject, using chiefly German and English works.

VI. (a) Differential and Integral Calculus. Differentiation of algebraic and transcendental functions. Leibnitz's Theorem. Expansion of functions. Maclaurin's and Taylor's Theorems. Functions of several independent variables. Applications to curves. Maxima and minima of functions of one and of several independent variables. Various methods of integration with applications to the study of curves and certain volumes. Definite integrals. Osborne's text book is chiefly used.

In connection with the work in the integral calculus, there will be given some work in the integration of differential equations used in mechanics and electricity.

(b) Study of the strength of materials used in masonry, carpentry and metallic structures. Stresses and strains in framed structures and arches. Stresses computed analytically and also by graphical methods in the drawing room and results compared.

Construction of roofs, highway bridge trusses and railroad bridge trusses. The books chiefly used will be those by Merriman and by Du Bois.

English.

I. During this year a critical study of the following selections will be made: Irving's *Alhambra* and *The Sketch Book*; Longfellow's *Courtship of Miles Standish*; Addison's *De Coverley Papers*, and Scott's *Marmion*. Compositions based upon the above will be required weekly, in which careful attention will be given to sentence structure, paragraphing, spelling, capital letters and punctuation.

II. Composition work continued throughout this year, and a standard rhetoric systematically studied. The critical readings will include Shakespeare's *Merchant of Venice* and *Julius Cæsar*; also, George Eliot's *Silas Marner*. In each case the reading will be accompanied by such historical research as may be needed to make the selection interesting and instructive to the pupils.

III. From Milton to Tennyson will be the basis for work during the first term of the year. The reading of these poems will be accompanied by studies in biography, history and mythology; written reproductions and criticisms will be frequently required. Oration and Argument will occupy the winter term. From this, pupils are expected to secure a knowledge of modes of reasoning and to gain a deeper insight into causes of political disturbances. The spring term will be devoted to the study of the development of American literature.

IV. The work of this year will comprise a critical study of the development of English literature, placing especial emphasis upon the philosophic novel and the epic poem.

V. The English Drama; Shakespeare's life and time; his contemporaries and successors.

Ancient Languages.

Latin.

I. Collar and Daniels' *Beginners' Book*, through first and second terms. Special attention given to vocabularies; translation of the exercises from Latin into English and from English into Latin; conversations based upon the sentences and exercises translated will be held occasionally for memory-training.

Structure of Latin sentence and comparison with English sentence-structure. Paradigms will be mastered, not simply to be recited by rote, but that the pupil may be able to compare them and to see the laws which govern their formation.

Third Term, reading of easy Latin.

II. Introduction to Roman Literature. The readings comprise selections from various authors, including Eutropius, Nepos, Cæsar, Gellius, Cicero and Livy.

Critical study of text with translation into idiomatic English. Prose composition and sight-reading. Incidental study of history and geography.

III. Cicero's *Orations*. Textual study, as in Cæsar, sight-reading and composition; historical allusions investigated; the system of Roman government; powers of officers; customs and occupations of the people; geography involved in the text is made an incidental topic for study.

IV. Virgil's *Aeneid*. Structure of the poem, with the theory and practice of scansion of Latin poetry, especially of the hexameter; translation into idiomatic English; study of the superstitions and religious rites of antiquity, as well as of the myths and legends; minute word-study and analysis.

V. Horace. *Satires*, *Epistles* and *Odes*. The work will be similar to that done in the study of the *Aeneid*, except that more extended investigation will be made of Latin verse.

VI. The *Germania* and *Agricola* of Tacitus. Particular study of the author's style.

Cicero's *De Officiis*, *De Senectute* and *De Amicitia*.

VII. Plautus, Juvenal, Hymn Writers.

Greek.

I. The alphabet, inflections and simple translations will be studied the first term. The second term will have similar work, with the study of vocabularies. Composition exercises and conversations will be used for memory-training. The third term will be spent on the first four chapters of the *Anabasis*.

II. *Anabasis* completed. Careful translation into English; points of linguistic or historical interest studied; prose-composition will be a part of the work through the year, also sight-reading.

III. Homer's *Iliad*. Usual amount of college preparatory work. Plato's *Apology* and *Crito*.

IV. Selections from Greek Historians and Poets.

Modern Languages.

Spanish.

- I. (a) 1. Worman's First Spanish Book. 2. Knapp's Spanish Grammar and written exercises. 3. Conversational exercises (CORTINA.)
 (b) 1. Worman's Second Spanish Book. 2. Knapp's Spanish Grammar and written exercises. 3. Conversational exercises (CORTINA.)
 (c) 1. Knapp's Modern Spanish Readings. 2. Knapp's Spanish Grammar and written exercises. 3. Conversational exercises (CORTINA.)
- II. (a) 1. Knapp's Modern Spanish Readings. 2. Knapp's Spanish Grammar with oral and written exercises. 3. Conversational exercises (CORTINA.)
 (b) 1. Knapp's Modern Spanish Readings. 2. Knapp's Spanish Grammar with oral and written exercises. 3. Conversational exercises (CORTINA.)
 (c) 1. Historia de Gil Blas de Santillana. 2. Knapp's Spanish Grammar with oral and written exercises. 3. Conversational exercises (CORTINA.)

French.

- I. (a) 1. Keetel's Analytical and Practical French Grammar and conversational exercises. 2. SUPER'S *Preparatory French Reader*. 3. Special Study of the Four Conjugations of Regular Verbs. 4. Phonetic Study and Practice of Pronunciation.
 (b) 1. Keetel's Analytical and Practical French Grammar and conversational exercises. 2. SUPER'S *Preparatory French Reader*. 3. Special Study of Irregular Verbs. 4. Continued Phonetic Study and Practice of Pronunciation.
 (c) 1. Keetel's Analytical and Practical French Grammar and conversational exercises. 2. SUPER'S *Preparatory French Reader*. 3. Special Study of Irregular Verbs. 4. Continued Phonetic Study and Practice of Pronunciation.
- N. B. Written exercises from English into French will be required throughout the year.
- II. (a) 1. Keetel's Analytical and Practical French Grammar and conversational exercises. 2. *Madame Thérèse* (ERKMANN-CHATRIAN). 3. Lectures on the Rhetorical Structure of French. 4. Study of French Idioms (*Keetel*).
 (b) 1. Keetel's Analytical and Practical French Grammar and oral exercises. 2. *Madame Thérèse* (ERKMANN-CHATRIAN). 3. Lectures on the History of French Literature. 4. Study of French Idioms (*Keetel*) and Peculiarities of French Composition.
 (c) 1. Keetel's Analytical and Practical French Grammar and oral exercises. 2. *Les Trois Mousquetaires* (ALEXANDRE DUMAS). 3. Lectures on the History of the French Language and Literature. 4. Study of Idioms.
- N. B. Written exercises from English into French will be required throughout the year.
- III. (a) 1. Keetel's Collegiate French Course. 2. Special study of French Syntax and Idioms. 3. *Quatrevingt-Treize* (VICTOR HUGO). 4. Lectures on Comparative Philology as related especially to the French and other languages of Modern Europe.

(b) 1. Keetel's Collegiate French Course. 2. Special Study of French Syntax and Idioms. 3. *Contemporary French Writers* (par ROSINE MELLE, Diplômée de l' Académie de Paris et l' Université de France). 4. Lectures on the History and Characteristics of the French Novel.

(c) 1. Keetel's Collegiate French Course. 2. Special Study of French Syntax and Idioms. 3. HERDLER'S *Scientific French Reader*. 4. Lectures on the Etymology of Scientific Terms in French—especially their derivation.

N. B. Conversational and written exercises will be conducted throughout the year.

German.

I. (a) 1. Studien und Plaudereien (*First Series*). 2. German Grammar (*Joynes-Meissner*), and written exercises. 3. German conversation (*Meissner*).

(b) 1. Studien und Plaudereien (*First Series*). 2. German Grammar (*Joynes-Meissner*), and written exercises. 3. German conversation (*Meissner*).

(c) 1. Studien und Plaudereien (*Second Series*). 2. German Grammar (*Joynes-Meissner*), and written exercises. 3. German conversation (*Meissner*).

II. (a) 1. Studien und Plaudereien (*Second Series*). 2. German Grammar (*Joynes-Meissner*), and written exercises. 3. German conversation (*Meissner*).

(b) 1. Wilhelm Tell (*Schiller*). 2. German Grammar (*Joynes-Meissner*). 3. German conversation (*Meissner*), and written exercises. 4. Lectures on the History of the German Language and Literature.

(c) 1. Wilhelm Tell (*Schiller*). 1. German Grammar (*Joynes-Meissner*), and written exercises. 3. German conversation (*Meissner*). 4. Lectures on Swiss and Austrian History as illustrative of Wilhelm Tell.

III. (a) 1. *Goethe's Faust* (D. C. Heath & Co.'s Edition, edited by Prof. Thomas, of University of Michigan). 2. German Composition (*Harris*). 3. Lectures on the Distinctive Characteristics of the New High German Period contrasted with the Old High German.

(b) 1. *Goethe's Faust*. 2. German Composition (*Harris*). 3. Lectures on the Revolution in German Literature accomplished by Lessing, and on the peculiar features of the German Drama.

(c) 1. Course in Scientific German (*Prof. Hodges*, of Harvard University). 2. German Composition (*Harris*). 3. Special Lectures on the Careers and Works of Goethe and Schiller chronologically arranged.

History.

I. Greek and Roman History. Careful study of the chief epochs of Greek and Roman History, with special reference to the development of the institutions and the growth and influence of the arts and literature of each. Four weeks at the beginning of the year are devoted to the history and civilization of ancient eastern nations, and six weeks at the close of the year to mediæval history as far as the end of the Crusades. The text book used is Myers and Allen's *Ancient History*, but collateral reading will be assigned, especially in the literature of the period studied.

II. Mediæval and Modern History and Civics. This course will be required of all students before graduation. Particular attention is paid to institutional growth and the social life of the people. Some selected epoch and its influence on the history of the nineteenth century is made an especial study. The text book used is Myers' Mediæval and Modern History: The pupil is expected to familiarize himself with Emerton's Middle Ages and collateral reading from other works selected by the instructor.

The last half of the year will be devoted to civics. This course will consider the origin and trace the development of constitutional government, making a special study of the United States and California. The constitutional history of the United States and of the State of California will be studied from original sources. Pupils will be expected to prepare bibliographies and do collateral reading throughout the year.

III. English History. A study of social and institutional development for the first half year followed by a similar study of French History for the remainder of the year. In each of these courses pupils receive instruction in the preparation of bibliographies of each epoch studied and are expected to attain the same proficiency in this as in general work.

To those of approved ability, who desire higher work, courses are offered for investigating the following subjects: In Civics—The New Japan; The Leagues of Ancient and Mediæval Times; California's Birth and Growth as a State. In Mediæval History—On the Influence of the Epic in History; Social Life in the Middle Ages; The Era of Charlemagne; The Rise and Progress of Geographical Exploration. In Greek and Roman—Social Life in Rome, from Satirists; Aristophanes and the Common People of Greece; How to Use the Classic Authors and Historians.

Physical Geography.

A systematic study of the proximate causes of the common phenomena observable at the earth's surface. The planetary relations of the earth; its atmosphere; the sea; the land; life of the globe; the effect of latitude, elevation, topography, and relative situation on climate and products; influence of all these on industries and civilization.

Biology.

Botany.

I. General structure, physiology, and classification of plants; dissecting, drawing and describing individual plants, as types of groups; the first two-thirds of the year being spent upon the groups from the Protophytes to the Pteridophytes inclusive, and the remainder upon the Spermatophytes; collection, classification and preservation of one hundred plants, representing as nearly as possible all the plant groups; McClatchie's Guide in the Study of Plants as a laboratory guide, with readings from Campbell's, Bessey's, Johnston's, and Vine's Botanies, the current journals, and other works.

II. Vegetable anatomy, histology, and physiology, with the structure, life histories, and classification of algæ and fungi; microscopic methods, use of microtome, etc.; Oel's Plant Physiology and Bessey's and Campbell's Botanies as text books, with Sach's and Goodale's Physiological Botanies, Goebel's Outlines of Classification and Special Morphology, De Bary's Fungi, Whitman's Methods in Microscopy, the current journals, and other works, as reference books. Open to those who have taken Course I, or its equivalent.

Zoology.

I. General structure, physiology, and classification of animals; dissecting, drawing and describing typical forms; the first two-thirds of the year spent upon Invertebrates and the last third upon Vertebrates; Colton's Practical Zoology as a laboratory guide, with readings from Kingsley's Natural History, Claus and Sedgwick's Text-Book of Zoology, Hyatt's Guides in Science Teaching, Packard's Zoology, the current journals, and other works.

II. Comparative anatomy, histology, physiology, embryology and classification of Worms, Spiders, Insects, and Vertebrates; microscopic methods, use of microtome, etc.; Bell's Comparative Anatomy and Physiology, Parker's Zootomy, Hyatt's Insecta, Claus and Sedgwick's Zoology, Whitman's Methods, Packard's Guide in the Study of Insects, the current journals, and other works as reference books. Open to those who have taken Course I, or its equivalent.

Bacteriology and Embryology.

Culture and investigation of pathogenic and non-pathogenic Bacteria, by French and German methods; determination of Bacteria in water and milk supplies, in air, in soils, etc.; embryology of achegoniates and flowering plants. Open to students who have completed the Botany courses and have pursued chemistry one year.

General Biology.

A general course in Biology with special reference to nervous physiology, for teachers and other mature students who have done some work in Botany and Zoology.

Chemistry.

I. General Chemistry will hereafter be given regularly in two successive years.

(a) The first year's work will consist of the study of the non-metallic elements and the essentials of chemical theory. Its principal aim will be to develop the scientific method of observation and thought, to which the acquirement of the mere facts of chemistry is considered of secondary importance. The more important topics taken up will be chemical change, elements and compounds, physics of gases, atomic theory, Avogadro's Law, stoichiometry. Much time is spent in the laboratory and the experimental work is individual. Careful notes are required in this as in all the laboratory courses in chemistry.

Time required, three $1\frac{1}{2}$ -hour exercises per week throughout the year (alternating with Physics, Botany or Physiology. See schedule of courses, page 13).

(b) The second year's work will complete the subject of general chemistry by the study of the metallic elements. More attention will be given in this course to the acquirement of facts than in (a), and in the latter part of the year the principles of qualitative analysis will be taken up.

Time required, two $1\frac{1}{2}$ -hour exercises per week, throughout the year (alternating with Physics, Botany or Physiology. See schedule of courses, page 13).

II. Qualitative analysis follows I. It is taught by preliminary study of reactions with substances of known composition, followed by actual analysis of unknowns.

Quantitative analysis may be begun in the third term by those who make sufficient progress.

Time required, five $1\frac{1}{2}$ -hour exercises per week through the year.

III. In quantitative analysis a series of typical determinations is studied, with references to appropriate literature. Various special methods of analysis follow, differing in character according to the needs of the pupil or other circumstances. A high degree of accuracy is required with the purpose of fitting students for work as analytical chemists.

Time required, three $\frac{3}{4}$ -hour periods daily, throughout the year.

IV. To advanced students are offered opportunities for the study of analytical, organic, theoretical, and industrial chemistry. The arrangement of courses, etc., will be made by special consultation.

Physics and Electrical Engineering.

Physics.

I. Weights and measurements; theory and use of the spherometer, optical lever, etc.; determination of volume and density; laws of pendulums and determination of gravity by Borda's and Kater's pendulums; determination of tenacity, rigidity; Young's Modulus; determination of pitch and velocity of sound; nature and effects of heat, temperature, expansion, evaporation, latent heat, conduction, specific heat; use of Bunsen's photometer, mirror, telescope and scale; finding radius of curvature of reflectors, indices of refraction, magnifying power of lenses, and use of spectroscope. The construction of physical apparatus is required throughout the year.

Balfour Stewart's text, with lectures, followed by Sabine's Laboratory Physics.

Electricity.

II. Finding electrical resistance by various methods; study of the distribution of magnetism and the effect of temperature on magnets; determination of galvanometer comitants, measurement of current and electro-motive force, line faults, testing of insulation, magnetic induction, finding of permeability curves; dynamo testing and use of cradle dynamometer; Prony brake; use of electrometer and condensers.

Elements of mechanism including communication of motion by gears, belts, cams, screws and link work; parallel motions, epicyclic trains, quick return motions, etc. Dynamo electric machinery. The steam engine, including a study of details, slide valve, link motion; automatic cut-off gears and Zeuner diagram; use of indicator and calculation of horse power from indicator cards.

This course is open to students who have completed Course I. Text books: Stewart & Gee, Vol. II; S. P. Thompson's Elements of Electricity and Magnetism; Garnet's Treatise on Heat; Stahl & Wood's Elements of Mechanism and S. P. Thompson's Dynamo Electric Machinery.

III. Dynamo electric machinery; study of alternating currents; design of motors, dynamos, transformers; advanced electrical testing; standardizing of apparatus; testing of dynamos and motors; photometry; study and inspection of electric lighting and power plants; electrical designing with construction of apparatus and machinery.

Power transmission, dynamometers and Prony brakes, efficiency of motors; steam boilers; number and size of tubes and flues, thickness of plates, rivets, kinds of bracing, amount of grate and heating surface, steam and water gauges, safety valves, injectors; management, setting and economic operation of boilers.

Thermodynamics; gases; saturated and superheated steam; application to the steam engine; Hirn's equations, action of injectors, refrigerating machines and gas engines. Analytical Mechanics.

Shop Work.

Wood-Work.

I. This work consists of work in joinery, turning and cabinet work. It has been the desire to arrange a course which would be valuable, considering it from both an educational and industrial standpoint. The exercises have been designed so that there would be a gradual growth in the difficulty of construction, and at the same time the presenting of practical, useful and aesthetic elements. Such a series of exercises would naturally call forth a gradual development in the ability of the student and also cultivate a sense for beauty and proportion.

The work is given to the student by means of a blue print taken from a working drawing. From these he constructs his model. These drawings are made with the greatest care and accuracy. Helpful notes in reference to the work accompany each drawing. This method acquaints the student with the reading of accurate working-drawings, and the working therefrom. After the model has been made he then makes his own working-drawings from it.

The course in joinery is composed of eighteen progressive exercises, involving the construction of sixteen different joints, the drawing of analytical and free-hand curves, and the use of fifty different tools and machines.

The student is allowed to exercise his individuality in the exercises in inlaying and cabinet-work. These exercises are made from his own drawings and after his own designs, which are submitted to the instructor before the work is begun.

The course in turning consists of fifteen progressive exercises given in the following order: Center-work, face-plate work, chucked-work, and long-work.

The above problems in wood-work are taken in the order of joinery, inlaying, turning, and cabinet-work. This work is calculated to be finished by the average student in one school year, working one and one-half hours daily.

At the end of the year there will be held a written examination upon the methods employed and the technical terms used in the work.

Forging.

II. Forge. Mechanism and care of forge; preparation of forge for fire; building and managing fire.

Tools. Instruction in the care and use of tools.

Processes. The processes involved in the year's work are: Drawing, bending, upsetting, different kinds of welding, punching, drilling, fullering, swaging, cutting cold, chipping, cutting hot, splitting, twisting, filing, brazing, hardening, tempering, and ornamental iron work.

Tempering. Hardening in water and oil, tempering or drawing, temperatures and colors used, and processes in tempering tools for wood and iron work.

Ornamental Iron Work. At the close of the year each student will be required to design some special piece involving the various elements of forging mastered.

Pattern Making and Machine Shop Practice.

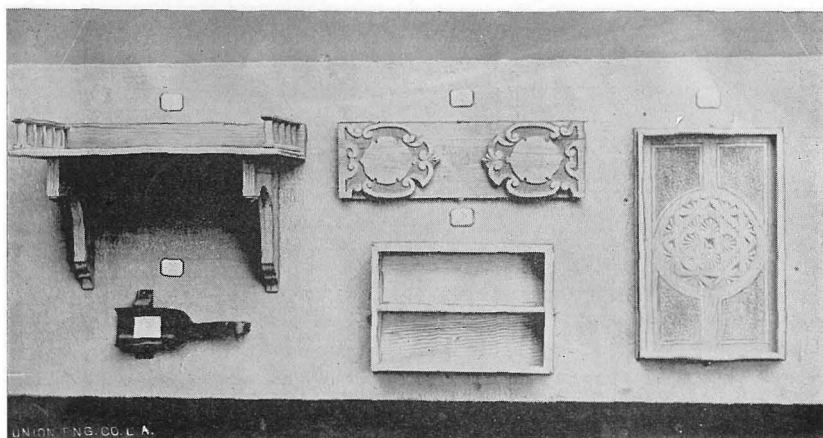
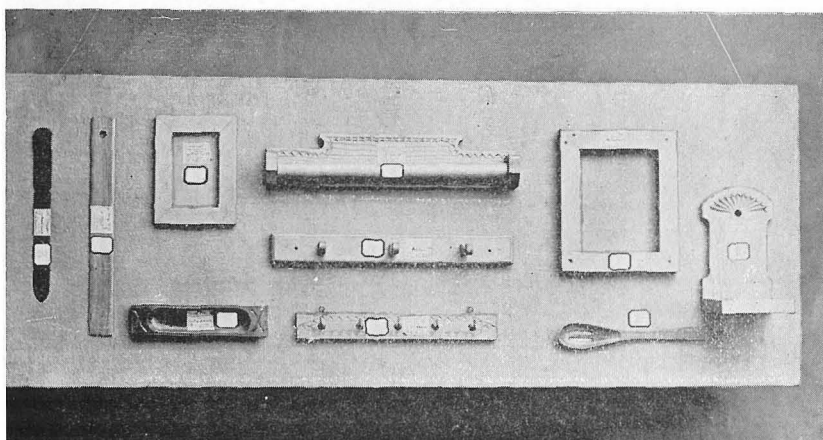
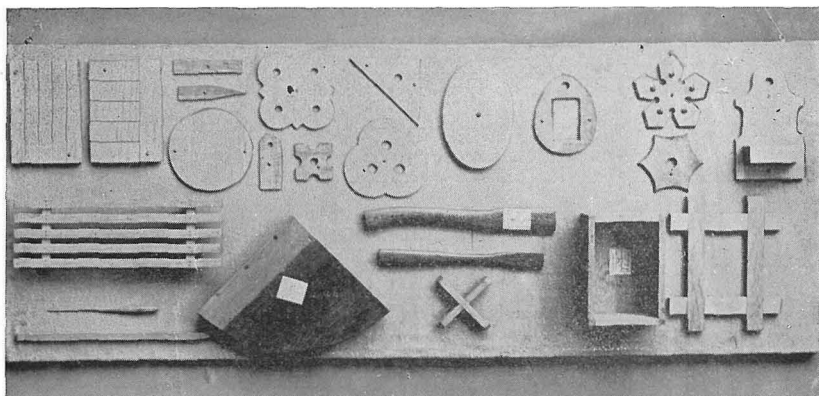
III. The work in pattern making alternates with that in the machine shop. The course commences with the simpler forms of pattern making embodying the fundamental principles of the subject, such as allowance for shrinkage, finish, core work, etc. A moulding bench is provided where the students test their patterns.

Work in the machine shop comprises chipping and filing, use of taps and dies, reamers, etc., hand-tool work in speed lathes, work on engine lathes, turning, boring, outside and inside screw cutting, use of planer, shaper, drill press and milling machine. All special tools are made by the students and tested with micrometer calipers. Special attention is given to accuracy in measurement, finish of work, care of tools and machines.

IV. In the fourth year each student is expected to make for himself or assist in making a complete set of patterns and to do the machine work on the castings from them. During the past year one student has made patterns for a bench lathe of 8-inch swing and 32-inch bed; another, a set of patterns for an engine lathe of 10-inch swing and 5-foot bed; another, patterns for a rotary engine. The class has made a set of patterns for a drill press for the forging shop. The machines which have already been completed are a 4 H. P. steam engine, a 2 H. P. steam engine, and a number of small tools. Those now in process of construction are a bench lathe, engine lathe, rotary engine, and drill press.

Plain Sewing.

V. (a) Five days a week, two periods a day. The fundamental principles of hand sewing, basting, running, hemming, hem-stitching, tucking, felling, sewing on lace, darning, etc.



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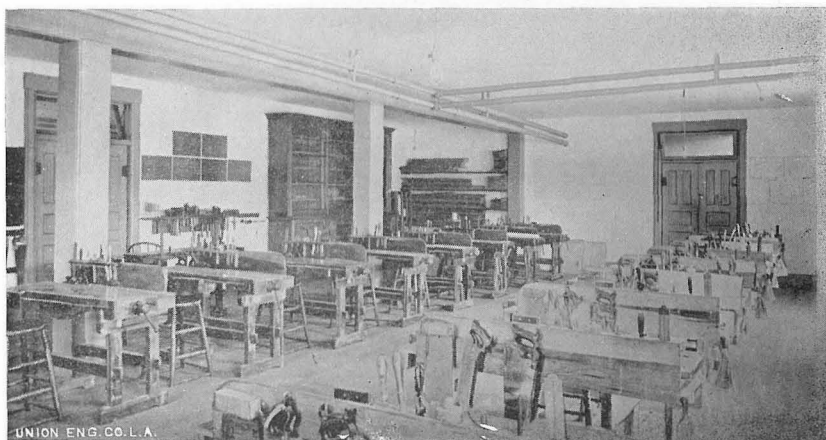
SLOYD MODELS.



FREE HAND DRAWING.—EQUIPMENT AND WORK.



CLAY MODELING AND WOOD CARVING EXHIBIT, JUNE, 1896.



SLOYD ROOM.

(b) Machine Sewing. Plain stitching, hemming, tucking and gathering.

(c) Continuation of Plain Sewing. Practical experience in shopping by each pupil.

During the year a complete suit of underwear must be made by each pupil; also a shirt waist, a cotton dress, and a wrapper or dressing sack. Some preliminary study in designing for the dressmaking course will be done. Neatness and accuracy demanded in all the work.

Wood Carving.

VI. (b) This work aims to give the pupil practical application of the principles gained in the study of drawing and modeling. The year's work includes preliminary exercises for the care and use of tools, horizontal and vertical decoration, plane and curved surface carving, incising and stamping, low relief in historic styles.

Instruction and practice are given in design, including elements of ornament, scroll patterns, surface decoration, borders, panels, and the application of these principles in designing and ornamenting pieces of furniture.

Students are required to make the working-drawings as well as the designs for the decoration of all work.

The course as outlined must be completed by the student to receive the credits for shop work, subject VI.

Students may elect to do more advanced work than that outlined in the required year's work.

Modeling.

VI. (a) This work supplements and aids that of wood carving, and is of great value as a means of comprehending and realizing good form and proportion.

The year's work includes the modeling of fruits, flowers and sprays of foliage from nature and casts; different styles of historic ornament from casts and photographs. If deemed advisable students may model from the mask and head, in the round, the first year. All work is individual. Each student is advanced as rapidly as his ability permits. Instruction is given in the making of plaster casts.

Cooking.

VII. (a) The fundamental principles of cookery and practice in the preparation of vegetables, soups, meats, cereals, biscuits, eggs; cost of materials; care of a kitchen; serving a simple dinner.

(b) Instruction in preparation of more complicated dishes; bread, fish, oysters, pastry croquettes, game, etc.; care of silver and glass; setting and serving a table; table etiquette.

(c) Entrees, salads, desserts, cake, jellies and creams; giving of entire breakfasts, luncheons and dinners; ordering; proportions of food needed; garnishing; short course in invalid cookery; carving.

(d) Presentation of the physiology of nutrition by special lecturer.

- (e) In connection with cookery, the following topics will be taken up :
- | | |
|--|---|
| Classification of foods. | Flour; composition, food value. |
| Water; boiling, simmering, its action on starch and albumen. | Adulteration of foods. |
| Practical application in cooking meats and vegetables. | Tea, coffee, alcohol; their effects on the system. |
| Composition of foods. | Disinfectants. |
| The cheapest and most wholesome foods. | Spices. |
| The greatest amount of nutriment obtained for 25 cents. | General plan of household work. |
| Digestion, assimilation. | House cleaning. |
| Study of yeast plant. | Care of every portion of a house. |
| Properties of carbonic acid gas. | Preparation of a dietary for six persons for one week, not to exceed \$10.00. |
| Fermentation; lactic, vinous, acetic. | Invalid cookery, dietary. |
| Baking powders, soda, cream of tartar. | Table etiquette. |
| | Duties of a cook. |
| | Duties of waitress. |

Special lectures on Chemistry of Cookery, Bacteriology.

Throughout the year Dietaries and Nutrition will be kept constantly in mind, the object being as much to study the scientific principles of foods as to prepare palatable viands.

Dressmaking.

VIII. (a) This course is devoted to the principles of dressmaking: Drafting a basque and sleeves from actual measurements; cutting, fitting and finishing a basque; cutting and making a skirt; choice of materials, quality, price and amount needed.

(b) Drafting continued: Cutting of fancy fronts to basques. Pupils are required to plan an entire dress with written description of it before beginning, including collar, trimming sleeves, etc.; making of dress.

(c) In connection with the dressmaking the cultivation of taste will be studied. The proportions of the human figure. Dress as appropriate to individuals, sketches for dresses made in pencil and color. Harmony of color in fabrics.

(d) With the foregoing, special attention to bearing of dress on health; how to dress to preserve health and strength; rational dress reform studied; presentation of physiology of dress by special lectures.

(e) During the year three gowns and a house jacket or waist will be required from each pupil.

Drawing, Designing and Painting.

Freehand.

I. Principles of perspective as applied in the drawing of simple type forms, beginning with cube, cylinder, sphere, etc., followed by objects based on type solids.

Parallel and angular perspective, convergence of lines, vanishing points and foreshortening are demonstrated on blackboard by the most simple and practical method.

Perspective drawings of wood and iron shop exercises.

Outline, shade, shadow and artistic rendering of line are developed in the execution of drawings of rooms, houses and machinery.

Drawings of scrolls, and their original adaptation in prescribed borders, spandrels, and geometric fields.

Original designs for ornamental iron work and wood carving.

II. Perspective as applied in the drawing of groups of objects; relative proportion and study of values; light and shade; the artistic grouping of objects of still life. Drawings of the same are made in pencil, pen and ink, sepia and charcoal. Small sketchy effects, in which impressions of light and shade are jotted down, are the outgrowth of the pencil and pen and ink work. Charcoal studies are executed on a larger scale, requiring careful study of details.

Specimens of fungi and insect life, from Biological Department, are reproduced in pencil and ink drawings.

Original adaptation of historic ornament in designs for tiles, book-covers and wall paper. Designing from natural plant forms, conventionalizing flowers, etc. Color is first introduced by flat washes of water color to these designs. Scheme for a room in which ceiling, side wall and carpet are made to harmonize, is finished in fresco colors.

III. Painting in water colors from groups of still life, using full palette of color in portrayal of fruit and flowers.

Study of the history of art, and leading styles of ornament.

Ornament, and its adaptation to different styles of architecture, is demonstrated by drawing the characteristics of each style, and arranging them on sheets of card board in pen and ink or sepia.

Pupils must pass a written examination on history of art, illustrating the same with memory sketches.

IV. Drawing of mask and head from plaster casts in pencil, pen and ink, and charcoal.

Drawing full length figure from cast, "Greek Slave," "Venus de Milo," etc.

Sketching from life and costumed model.

Study of composition, followed by pen and ink illustrations of characters and scenes from Shakespeare and other English literature.

Mechanical.

It is designed to make the course in mechanical drawing auxiliary to other work at the Institute. Those who are intending to pursue special lines of work will have such work as seems best adapted to their needs. Those who desire it, for instance, can take a course which shall involve much study of the laws of perspective, using one of the best treatises in English—Ware's *Modern Perspective*. Again, others may take work especially adapted to the needs of civil, mechanical, or electrical engineers.

When work not in the regular courses is taken by students, it will be credited as regular course work should the student desire to enter the regular course at some subsequent time, provided that in quality and quantity it is a fair substitute for regular course work. At all times endeavor will be made to adapt the work to the needs and ability of the individual student.

I. (b) Selection and use of drawing instruments; fundamental principles of orthographic projection with applications in making working drawings of articles

constructed in the wood shop, illustrating different constructions used in carpentering and cabinet-making. Rectangular and circular forms are chiefly used in these models and other forms involving more difficulty are gradually introduced. Tracing and blue printing of working drawings. For those who do not take the course in wood work models and copies are provided.

II. (b) Shop drawings of iron, brass and wood work; development of prismatic, pyramidal and conical surfaces, and projections of the intersections of various surfaces with each other; isometric and cavalier projections; simple constructions of shades and shadows; fundamental principles of perspective; simple constructions of shades and shadows in perspective; methods of coloring drawings.

III. (b) Drawings of plans, elevations and sections of machines; drawings of patterns to be made in the pattern shop; drawings in perspective of furniture, rooms and buildings from actual measurements by the methods practically used by architects and designers; drawings of architectural detail; drawing of involute and epicycloidal gearing from models and with odontographs; topographical drawing; laying out railway curves, profiles, etc.

IV. (b) Drawings of machines with practice in design, using the principles laid down by Unwin, Reauleaux and others; drawings of the architectural orders; methods of artistic rendering used by architects, applied to drawings of buildings; perspectives of curved forms with their shades and shadows; elements of graphic arithmetic, composition and resolution of forces, studied graphically with diagrams of stresses for roof and bridge trusses.

Scholarships.

Through the generosity of some of the citizens of Pasadena twenty-three free scholarships have been founded for the benefit of worthy and needy students. The trustees have, in addition to those who are now enjoying these scholarships, a list of worthy applicants, and any persons desirous of extending the influence of the school in this way may obtain full information from the Secretary.

The following list is published as an acknowledgement of the indebtedness of the Institute to the liberality of the persons named.

DONORS OF PERMANENT SCHOLARSHIPS.

Prof. T. S. C. Lowe (2).	John Wadsworth.
Mrs. L. A. Lowe (2).	B. F. Ball.
Mrs. A. M. Callender.	W. C. Stewart.
E. F. Hurlbut.	F. J. Woodbury.
Mrs. Mary E. Magee.	Thos. Croft.
H. M. Singer (2).	J. D. Lincoln.
Miss Olive Cleveland.	

DONORS OF FOUR-YEAR SCHOLARSHIPS.

William Stanton.	G. F. Foster.
G. B. Senter.	B. O. Clark (2).'

C. B. Scoville supports two annual scholarships.

General Information.

Applicants for admission to any department of the Institute will be required to furnish satisfactory evidence of good moral character and of honorable dismissal from the schools with which they were last connected.

Discipline.

It is taken for granted that students enter the Institute with serious purposes and that they will cheerfully conform to such regulations as may be made by the Faculty. The moral tone of the school is exceptionally good, and cases requiring severe discipline seldom occur. It is the aim of the Faculty to maintain in the Institute a high standard of integrity and a strict regard for truth; and the attempt of any student to present as his own the work of another, or to pass any examination or test by improper means, is considered a most serious offence, rendering the offender liable to immediate dismissal. Any conduct harmful to the moral standing of the school will, after due admonition, render a student liable to dismissal.

Finances.

A tuition fee of \$35 per term admits to membership in any or all classes for which the pupil is prepared. There are no extra charges for work in any of the industrial, manual, art, or language departments. A deposit of \$5 is required of every student to cover breakage, injury or other loss in libraries, laboratories, shops and studios, as well as to cover the actual cost of material used. Any unused part of the deposit is returned to the pupil at the end of the year. If the actual expense in any case exceeds \$5, an additional deposit must be made.

Term bills will be payable strictly in advance and students must submit the Secretary's receipt for the same to each instructor whose classes he may seek to enter.

Board.

Students can obtain good board in homes approved by the officers of the Institute at from \$4.50 to \$6 per week. Any change in boarding place must be immediately reported at the office.

Athletics.

Encouragement is given to athletics and the athletic organizations are under the immediate care of a committee of the Faculty. Membership in these organizations is subject to forfeiture for failure in any regular line of school work.

For further information address the President or the Secretary,

THROOP POLYTECHNIC INSTITUTE,

PASADENA, CALIFORNIA.

Students' Names.

Academy and College.

Alexander, Frank.....	Long Beach
Allen, Echo.....	Highland
Allen, William G.....	Pasadena
Andrews, Burton	Sierra Madre
Arnold, Ralph.....	Pasadena
Baker, Calvin.....	Pasadena
Baker, Ruth	Pasadena
Baldwin, Harry	Pasadena
Barker, James E.....	Pasadena
Becker, John M.....	Pasadena
Beery, Mary	South Pasadena
Bennett, Agnes M.....	Pasadena
Bent, Roberts J.....	San Diego
Bishop, Charles A.....	Alhambra
Bixby, William F.....	Sierra Madre
Blackman, Roy B.....	Los Angeles
Blanchard, Ada	Pasadena
Blick, Kate.....	Pasadena
Bonner, Ella L.....	Pasadena
Bowron, William L.....	Pasadena
Brand, Milo.....	Pomona
Briggs, Charles H.....	Pasadena
Brown, Eddy L.....	Los Angeles
Burr, Bessie.....	Pasadena
Butler, Merritt C.....	Pasadena
Canfield, Charles.....	Pasadena
Carhart, James.....	Los Angeles
Carper, Howard E.....	Los Angeles
Casterline, Blanche.....	Pasadena
Chittenden, Albert B.....	Pasadena
Clark, Addie O.....	Pasadena
Conger, Lulu N.....	Pasadena
Conger, Lyda.....	Pasadena
Conger, Ray E.....	Pasadena
Cook, Jay C.....	Pasadena

Cook, Jessie	Pasadena
Cooper, Bertha A.	Boston, Mass.
Creamer, Clifton	Alhambra
Daggett, John S.	Pasadena
Dalrymple, Lila	Pasadena
Dedual, Andrew G.	Pasadena
Dobinson, Mary	Los Angeles
Dodworth, Arthur	Pasadena
Doering, Edmund J.	Chicago, Ill.
Doty, George F.	Pasadena
Dunham, George E.	Los Angeles
Dunn, Harry H.	Fullerton
Eldred, Elisha	Pasadena
Farnham, Herbert H.	Pasadena
Farnsworth, John A.	Los Angeles
Farris, Edwin L., Jr.	Pasadena
Fish, Milton S. B.	Pasadena
Fisher, Pearl B.	Pasadena
Fisher, Walter C.	Pasadena
Folsom, Harry G.	Los Angeles
Fordyce, Mabel	Pasadena
Fowler, Emmett	Los Angeles
Friedendall, John F.	Pomona
Fushia, Fred W.	Pasadena
Garben, Charles P.	Pasadena
Gaylord, Harry D.	Pasadena
Gaylord, Horace A.	Pasadena
Gaylord, James M.	Pasadena
Gaylord, Robert H.	Pasadena
Giddings, Oscar P.	Santa Barbara
Glass, William	Pasadena
Graham, Robert H.	Garvanza
Gray, Roy W.	Pasadena
Green, Myrtle E.	Alhambra
Greer, William L.	Pasadena
Gregory, Mabel	Sierra Madre
Grinnell, Harold	Pasadena
Grinnell, Joseph	Pasadena
Griswold, Eugene	Covina
Groesbeck, Charles	Pasadena
Groesbeck, D. Sayre	Pasadena
Gunning, Marcella	Pasadena
Hamilton, Maggie E.	Pasadena
Hamilton, Myrtle L.	Pasadena

Haney, William P.....	Los Angeles
Hansen, Waldemar G.....	Pasadena
Hasse, Carl.....	Soldiers' Home
Hayes, William T.....	Monrovia
Hawley, Milton.....	Pasadena
Haynes, Dian M.....	Pasadena
Heald, Oscar L.....	Pasadena
Herr, Archie V.....	Pasadena
Hodge, Arthur.....	Pasadena
Holbrook, Lucy M.....	Pasadena
Jewett, Frank B.....	Lamanda
Jewett, Pauline.....	Lamanda
Johnson, Mark.....	Los Angeles
Johnston, Blanche.....	Pasadena
Jones, Allen.....	Pasadena
Jones, Philip.....	Pasadena
Judson, Harry F.....	Highland
Kenney, Charles E.....	Los Angeles
Keyes, Maud V.....	Pasadena
Kidder, Marie M.....	Pasadena
Kimble, Robert.....	Pasadena
Klokke, Ernest.....	Los Angeles
Knight, John O.....	Pasadena
La Du, John T.....	Los Angeles
Lamb, Ellen A.....	Pasadena
Lamb, Porter E.....	Pasadena
Latimer, Jennie.....	Pasadena
Lawson, Lawrence.....	Pasadena
Lee, Thomas R.....	Los Angeles
Lindley, Philo L.....	Los Angeles
Lines, Ellen C.....	Pasadena
Lockhart, Lewis L.....	Los Angeles
Loose, Robert F.....	San Marcos
Loree, Warren F.....	Pasadena
Macomber, Roy.....	Pasadena
McBurney, Francis A.....	Los Angeles
McClatchie, Anna.....	Pasadena
McClure, Arthur C.....	Los Angeles
McLaren, DeVer.....	Alhambra
McQuilling, William S.....	Pasadena
Menner, Ivy.....	Pasadena
Menner, Lottie E.....	Pasadena
Meskimons, James R.....	Pasadena
Miller, James E.....	Los Angeles
Monroe, Grace.....	Pasadena

Morrison, Lillie.....	Compton
Morrison, Margaret	Compton
Mortimer, James D.....	Chicago, Ill.
Neal, Brent B.....	Los Angeles
Nelmes, Jeannie.....	Pasadena
Nevin, Lowrie B.....	Los Angeles
Nixson, Frank H.....	Pasadena
Ogden, Edna	Pasadena
O'Harra, Lewis.....	Los Angeles
Olson, Albert L.....	Kingsburg
Owen, Virgil W.....	Los Angeles
Parker, George M.....	Pasadena
Parker, Harold A.....	Pasadena
Patten, Nellie.....	Pasadena
Pearson, Atlee R.....	Los Angeles
Pennell, Clara R.....	Pasadena
Pettingill, Stuart	Redlands
Pinger, Eva G.....	Pasadena
Poindexter, Charles.....	Los Angeles
Polkinhorn, Edward J.....	Los Angeles
Pomeroy, Walter.....	Los Angeles
Power, J. W.....	Pasadena
Prentiss, Bertha C.....	Pasadena
Price, Edward P.....	Pasadena
Purcell, Launcelot.....	San Gabriel
Randall, Herman P.....	Pasadena
Rankin, Jesse A.....	Caliente
Ratcliff, Walter H.....	Pasadena
Read, Archie L.....	Los Angeles
Reed, John O.....	Deer Lodge, Mont.
Reynolds, Duncan L.....	Pasadena
Richardson, Rachel E.....	Alhambra
Roche, Frank K.....	Pasadena
Russell, Emma	Pasadena
Sanders, Charles H.....	Pomona
Saunders, Florence I. B.....	Pasadena
Saunders, Jennie M.....	Pasadena
Senter, George Stanley.....	Pasadena
Shufflebotham, John G.....	Long Beach
Simpson, Harold G.....	Pasadena
Simpson, Ada L.....	Oil City, Pa.
Smith, Howard M.....	Scotia
Snyder, Blanchard M.....	Anaheim
Springer, Maud I.....	Edwardsville, Ill.

Sterrett, Roger J.....	Pasadena
Stevenson, Jessie M.....	Pasadena
Stimson, Charles W.....	Los Angeles
Strong, Robert M.....	Pasadena
Sulliger, Herman N.....	Santa Monica
Sutton, Walter E.....	Pasadena
Tanner, Rose L.....	Pasadena
Templeton, John.....	Pasadena
Turner, Edson.....	Pasadena
Tuttle, Anna H.....	Pasadena
Tuttle, Charlotte M.....	Pasadena
Tuttle, Jessie M.....	Pasadena
Vallette, Arline H.....	Pasadena
Van Trees, Paul.....	Los Angeles
Veuve, Erle.....	Jacksonville, Ill.
Vore, Jesse.....	Pasadena
Vose, Richard.....	Los Angeles
Waite, Marion P.....	Riverside
Wamsley, Edward.....	Glendora
Waterhouse, Lawrence H.....	Pasadena
Webber, Harrison O.....	East Riverside
White, Fred P.....	Chino
Wilder, Fred B.....	Pasadena
Williams, Bertram.....	Los Angeles
Wilson, Homer C.....	Pasadena
Winslow, Edward F.....	Faribault, Minn.
Wood, Clifford.....	Pasadena
Wood, Stella H.....	Pasadena
Wool, Ralph E.....	Santa Ana
Worthington, William.....	Ramona
Wright, Edna R.....	Pasadena
Wright, Mrs. C. H.....	Pasadena
York, John M.....	Pasadena
Young, Harold.....	Pasadena

Sloyd Normal Course.

Beckwith, Kate B.	Tulare
Burkhead, Ada H.	Orange
Chamberlain, Arthur H.	Pasadena
Getchell, Daisy.	Pasadena
Johnson, Annette.	Pasadena
Keyes, Helen B.	Pasadena
Mathews, Amanda.	Los Angeles
McLaren, Jennie.	Pasadena
Riggins, Ara.	South Pasadena

Sloyd Grammar School.

Bancroft, Worth.	Los Angeles
Barker, Mary D.	Pasadena
Barker, Huntington.	Pasadena
Barker, Parrish.	Pasadena
Beaton, Mary A.	Pasadena
Benedict, Harry J.	Los Angeles
Bennett, James.	Alhambra
Bixby, Howard E.	Los Angeles
Bixby, Stafford W.	Los Angeles
Blankenhorn, George S.	Pasadena
Blankenhorn, Mac.	Pasadena
Bond, Walter C.	Pasadena
Boothe, Earle Y.	Los Angeles
Boothe, S. Stirling.	Los Angeles
Brown, Templeman.	Los Angeles
Brown, Walter.	Pasadena
Bye, Randall A.	Pasadena
Chapin, Ethel.	Pasadena
Clark, Mary E.	Pasadena
Daggett, Maud.	Pasadena
Davidson, Leonard E.	Kingsburg
Davidson, Wilmar C.	Kingsburg

Davis, Blanche.....	Pasadena
Davis, Benjamin F.....	Pasadena
Dunlap, Walter S.....	Pasadena
Durant, Lawrence T.....	Pasadena
Dwight, C. Sherwin.....	Pasadena
Dwight, Russell S.....	Pasadena
Early, Jessie.....	Pasadena
Eaton, Harold.....	Los Angeles
Fordyce, Grace.....	Pasadena
Fowler, William.....	Los Angeles
Gaylord, Clarence.....	Pasadena
Gaylord, Florence H.....	Pasadena
Gaylord, William L.....	Pasadena
Giddings, Lawson H.....	Pasadena
Gray, Harry.....	Waverly, Iowa
Hallett, Hazel.....	Pasadena
Hallett, Homan.....	Pasadena
Hechtman, Judson O.....	Los Angeles
Howe, Eliot.....	Pasadena
Hull, Roy.....	Pasadena
Johnston, Joseph.....	San Diego
Kennedy, Roscoe.....	Los Angeles
Keyes, Charles Sumner.....	Pasadena
Keyes, Harold B.....	Pasadena
Keyes, Helen E.....	Pasadena
Langford, Mabel C.....	Pasadena
Lapp, Clemens E.....	Pasadena
Law, Elijah W.....	Buffalo, N. Y.
Law, Harry C.....	Buffalo, N. Y.
Mallory, Conroy.....	South Pasadena
Mapel, Charles E.....	Pasadena
Michener, Harvey.....	Pasadena
Milliken, Philip.....	Los Angeles
Moore, Hansen.....	Los Angeles
Naud, Louis E.....	Los Angeles
Nelmes, Thomas H.....	Pasadena
Packard, Ulysses G.....	Pasadena
Palmer, Frank.....	Pomona
Parker, Grace M.....	Pasadena

Pfeiler, Albert L.....	Hueneme
Phillips, Earl	Los Angeles
Potter, Alva P.....	Pasadena
Power, Charles P.....	Pasadena
Power, June.....	Pasadena
Ray, James C.....	Pasadena
Raymond, William A.....	Los Angeles
Richardson, Harry C.....	Alhambra
Robinson, Harry W.....	Los Angeles
Scott, Frank H.....	Anaheim
Senter, Helen S.....	Pasadena
Sherman, Henry Lancey	Pasadena
Shomate, John.....	Los Angeles
Shoup, John L.....	Pasadena
Smiley, Walter C	Pasadena
Smith, William S.....	South Pasadena
Stimson, George.....	Pasadena
Strode, Theodore	South Pasadena
Teal, Ellis H.....	Denver, Col.
Valiant, Alberto.....	Los Angeles
West, Fred	Pasadena
Whitmore, Ben L.....	Pasadena
Wright, Sidney A.....	Bangor, Maine

List of Graduates.

1895.

Academy.

Allen, Robert S.	Pasadena
Carlton, Don W.	Los Angeles
Doty, George F.	Pasadena
Ferguson, Clarence	Los Angeles

Sloyd Normal Course.

Daniels, Esther C.	Pasadena
Gower, Hattie F.	Los Angeles
Harris, Carolyn	Pasadena
Miller, Charles E.	Los Angeles
Simcoe, Benjamin F.	Los Angeles

1896.

College.

Haynes, Dian M.	Pasadena
Doty, George F.	Pasadena

Academy.

Arnold, Ralph	Pasadena
Conger, Lulu N.	Pasadena
Gray, Roy W.	Pasadena
Morrison, Margaret L.	Compton
Menner, Ivy	Pasadena
Snyder, Blanchard N.	Anaheim
Winslow, Edward F.	Faribault, Minn.

Sloyd Normal Course.

Burkhead, Ada H.	Orange
Chamberlain, Arthur H.	Pasadena
Johnson, Annette	Pasadena
Keyes, Helen B.	Pasadena
Mathews, Amanda	Los Angeles
McLaren, Jennie	Pasadena
Riggins, Ara.	Pasadena

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