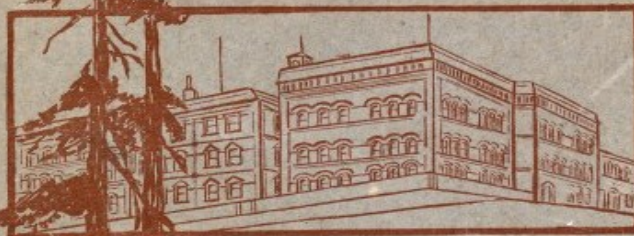


THE POLYTECHNIC
HIGH SCHOOL



Catalogue

... of ...

1904 1905

SAN FRANCISCO . . .
CALIFORNIA

STELLA V. WHITE
DESIGN 1903

CATALOGUE

OF THE

Polytechnic High School

Corner Bush and Stockton Streets

1904-1905



SAN FRANCISCO, CAL.

Superintendent of Public Instruction:

WM. H. LANGDON

BOARD OF EDUCATION:

ALFRED RONCOVIERI (President),
C. W. MARK,
LAWRENCE F. WALSH,
THOMAS F. BOYLE.

Secretary of Board of Education:

EMMET P. BARRETT.

Deputy Superintendents:

L. M. SHELLEY,
T. L. HEATON,
W. B. HOWARD,
A. A. MACURDA.

OPINIONS

OF

Professional and Business Men

AND

Graduates of the School

ON THE

VALUE OF MANUAL TRAINING.

MAYOR'S OFFICE,
CITY HALL.

MR. W. N. BUSH—

Principal Polytechnic High School, San Francisco:

DEAR SIR: I heartily indorse Manual Training High Schools. They prove that it is both practicable and desirable to blend manual training with the ordinary forms of educational activity in such manner as to give a development more valuable for our boys and girls than can be gained through the single ordinary form, and of nearly or quite equal value for all children.

The literary and scientific are so combined with mechanical branches of study as to be of equal educational value and to develop the boy into a practical working force in his community.

E. E. SCHMITZ, Mayor.

San Francisco, April, 1902.

OFFICE OF THE BOARD OF EDUCATION,
SAN FRANCISCO, May 17, 1902.

MR. W. N. BUSH:

DEAR SIR—I am glad that San Francisco, like all the larger cities of the East, has advanced from purely classical traditions in her schools, and now offers to her boys and girls, in the work of the Polytechnic High School, a scientific and solid training for the actual work of earning a livelihood.

ALFRED RONCOVIERI, School Director.

[Extract from Municipal Report of 1902, by School Director C. W. Mark.]

“It is universally agreed that, from a utilitarian standpoint, manual training is one of the necessities of education. In fact, this idea came first in justifying its rapid introduction in all the large cities of our country. To a casual observer the usefulness of this branch of instruction appeals first, but on a deeper study it is found that its educational value is more far reaching than its practical.

“The latter thought is well brought out by President Charles W. Eliot, of Harvard University, in the following quotation:

“‘I should like to see some form of manual training made part of the education at school of every boy who is to come to college. It not only trains the eye and hand, but develops the habit of accuracy and thoroughness in any kind of work. Moreover, it develops the mental faculties of some boys better than books do.’

“Manual training also honors labor, thus doing much to counteract the prevailing false idea among the young people that to labor for an honest living is undignified.”

OFFICE OF DEAN OF
MEDICAL COLLEGE, UNIVERSITY OF CALIFORNIA.

MR. WALTER N. BUSH,

Principal Polytechnic High School, San Francisco:

DEAR SIR—Training in work requiring manual dexterity is of great value to a student intending to practice surgery or dentistry. In surgery and dentistry success depends so much upon the use of

the hand in movements of precision that thorough drill in mechanical work is absolutely necessary.

The industrial pre-eminence of our country is due in large part to the mechanical skill of our craftsmen. The development of technical skill in mechanical pursuits, as is accomplished in polytechnic schools, is equivalent to increasing the material wealth of the country.

Very truly yours,

A. A. D'ANCONA.

UNION IRON WORKS,
SAN FRANCISCO, April 29, 1902.

WALTER N. BUSH, Esq.,

Principal Polytechnic High School,

Bush and Stockton streets, San Francisco:

DEAR SIR—Your favor of April 28th received, and in reply I beg to state that the matter does not seem to admit of any question, for certainly manual training greatly assists mental training, and they should always go together, as both are needed in the battle of life, and the man who has had the benefit of manual and mental training is better equipped than the man who has had only one, or, possibly, neither.

There is more in manual training than the simple training of the hands, as no person can take up a block of wood and make it a correct cube, for instance, without exercising his mind. He naturally wonders what constitutes a cube, and this train of thought brings into play the faculties of reason to enable him to determine the true plane and the accurate measurement. Thus manual training reaches out and assists almost every faculty of the human mind. It is much more efficient than oral teaching, and the lesson it teaches is more readily acquired and longer retained. Therefore, any child who is graduated from a grammar school should decide to attend the high school that affords the best manual training.

Trusting I have satisfactorily answered your inquiry, I remain

Respectfully yours,

IRVING M. SCOTT.

PACIFIC STATES TELEPHONE AND TELEGRAPH Co.,
OFFICE OF THE PRESIDENT, May 7, 1902.
SAN FRANCISCO.

MR. WALTER N. BUSH,

Principal Polytechnic High School, San Francisco:

DEAR SIR—I have had much experience in the employment of young men, and am convinced that the value of the manual training school, properly conducted, can hardly be over-estimated.

It has been my observation that young men who have taken advantage of the training these schools afford, acquire not only manual dexterity, but an insight into the many principles of applied science upon which all large industrial concerns are to-day established.

The aim of the manual training school is to train the eye, hand and brain, and the sooner a young man begins this training the more effective will he become in the actual experience of active industrial life.

Yours truly,

JNO. I. SABIN.

OFFICE OF MEESE & GOTTFRIED Co.,
SAN FRANCISCO, May 7, 1902.

MR. W. N. BUSH,

Principal Polytechnic High School, San Francisco:

DEAR SIR—Upon leaving the Polytechnic I went to the San Francisco Iron Works; thence to the Union Iron Works, and afterward to the Risdon. In all three I worked in the machine shop. I am now employed in the draughting-room of Meese & Gottfried Co., where I am in receipt of full wages paid to experienced journeymen.

I feel deeply indebted to the school for the practical and thorough course I pursued there, not only in the shops and drawing-rooms, but in mathematics, science and other branches as well.

Respectfully yours,

WILLIAM N. BUCKLEY, Class of 1899.

FACULTY.

1902-1903.

W. N. BUSH, A. B., Harvard, 1882. Principal Polytechnic High School from 1889. 1883 to 1886 Mathematics, Oakland High School. 1886-1889 Mathematics in Lowell High School, San Francisco.

CHARLES H. HAM, A. B., A. M., Dartmouth, 1871, Head of English and History Department. Elected to present position 1888. Thirty years' experience in the schools of California.

J. B. CLARKE, Ph. B., U. C., 1877. Head of Mathematical Department. Instructor, Assistant Professor, Associate Professor at U. C. fifteen years. Elected to present position 1896. For four years Principal of a Grammar School.

A. L. JORDAN, Head of Science Department. Student Assistant in Physics in University of California for three years. Elected to present position 1899.

F. A. GARDNER, B. S., Worcester Polytechnic Institute 1890. Head of Manual Training Department. Elected to present position 1892. Practical experience two years with Union Iron Works.

MISS A. G. DUFFY, Ph. B., University of California, 1896. Assistant in English and History. Elected to present position 1898.

R. C. DANIELS, B. S., U. C. 1899. Assistant in Science Department. Elected to present position September, 1899. Assistant in Chemistry U. C. one year.

MRS. L. N. HOWARD, Graduate University of California, Ph. B. Taught in private schools of California, Girls' High School and Polytechnic High School.

E. S. CARNIGLIA, Teacher in Machine Shop and Forging. Eleven years with W. T. Garrett & Co. Elected to present position 1897.

MISS MARRA VAN VLECK, Graduate from Art Students' League, New York, and New York Woman's Institute of Technical Design. Head Teacher of Free Hand Drawing and Industrial Art. With Tiffany & Co. of New York and teacher in Cogswell Polytechnic School of San Francisco. Elected to present position January, 1895.

MISS ROSA MURDOCH, Graduate of S. F. Normal School and Cogswell Polytechnic in 1892. Special training in S. F. School of Design, Assistant in Free Hand Drawing and Industrial Art. Elected to present position 1900.

KERNAN ROBSON, A. B., Ohio Wesleyan University, 1891. A. M., Harvard, 1894. A. B., Stanford, 1900. Teacher of German and Latin. Assigned to present position January, 1902.

PAUL J. MOHR, A. B., Oberlin College 1893. A. M. University of California, 1896. Assistant in Mathematics and German. Elected to present position 1903. Eight years' experience in High Schools of California.

H. C. BAGOT, Teacher Public Schools of Massachusetts. Five years in City Surveyor's office, Boston, Mass. Three years Steam Engineering Department, Navy Yard, Mare Island. Fifteen years' practical experience. Elected to San Francisco School Department 1903. Transferred to present position 1904.

MAUD J. COAN, Graduate Normal Course Pennsylvania Museum and School of Industrial Art, Philadelphia. With Insular Government school work, Ponce, Porto Rico, for three years. Elected to present position 1903.

HISTORY OF MANUAL TRAINING IN THE POLYTECHNIC HIGH SCHOOL.

In 1892 courses in instrumental drawing and woodwork were added to the curriculum of the Commercial High School. In 1894 the brick building on the corner of Bush and Stockton streets was erected, the name of the school changed to Polytechnic High, and a complete equipment added for machine and blacksmith shops, carpenter and wood turning shops, laboratories, free hand and mechanical drawing rooms, and rooms for clay modeling and wood carving.

In 1900 the school was re-organized on a strictly manual training basis. The commercial branches and many of the classical being transferred to other schools. The academic course was made the same for boys and girls. On the other hand the manual training course presented one line of work to boys and another to girls, the time devoted to it being, however, the same for both.

AIMS OF THE SCHOOL.

It was the aim of the Board of Education, in establishing this course, to correlate its work with that of the manual training of the Grammar School; to emphasize the educational value of manual training, as well as its great practical value to those who are to follow mechanical pursuits, and to offer the best possible preparation for pupils intending to enter the University of California or Stanford in the Colleges of Electrical, Civil, Mining or Mechanical Engineering, Colleges of Chemistry, Agriculture, Commerce or of Natural Sciences.

No attempt is made to develop a specialist or to teach a trade, yet in the fourteen exercises a week for three years devoted to shop practice and drawing, it is manifest that the pupil will have acquired a manual skill and constructive ability which will enable him to master the requirements of any trade.

It cannot be too strongly emphasized that graduates of this school are not expected as a body to enter upon mechanical pursuits. A-

inspection of the list of graduates from many manual-training High Schools shows that their careers are quite as diversified as those of other High Schools. The training of the shop and drawing-room in developing the general intelligence and accurate judgment of the student is of great value to him in any professional or commercial line.

HOME STUDY.

Much of the time of the school is spent in exercises in the shop and in the drawing-rooms, which afford a healthful relaxation from the confinement of the academic class-room. On this account it is not too much to require that the pupil devote at least two hours a day to home study, this time being sufficient for the average pupil to prepare three recitations.

REQUIREMENTS FOR ADMISSION.

Graduates of the Public Grammar School course or its equivalent are admitted to the school, which is an integral part of the City Public School system.

Non-resident pupils are admitted to the school under the same requirement as resident pupils, subject to the rules of the Board of Education.

EXPENSE.

Pupils furnish their own text books, but drawing instruments and all tools used in the various shops, as well as all materials used in class exercises in Manual Training are supplied by the school; a guarantee deposit returned to the pupils at the close of the year being the only expense in shop work met by the pupil.

ACCREDITED TO THE STATE UNIVERSITY.

Since 1894 this school has been accredited to the State University at Berkeley. Its graduates are now admitted upon recommendation of the Principal, without examination, to the Colleges of Mining, Mechanical, Electrical and Civil Engineering, to the College of Chemistry and Agriculture and College of Natural Sciences.

THE COURSE OF STUDY.

The course of study covers a period of three years. The **ACADEMIC BRANCHES**, namely, English, History, Mathematics, Science, French, German and Latin, are the same for boys and girls.

The **Manual Training** studies for boys and girls lie along different lines, boys devoting their time to Shop Practice and Drawing; girls to various exercises in domestic science, clay-modeling, wood-carving, and designing.

The course of study is presented under two heads, viz:

The College Preparatory Course, and
Mechanic Arts Course.

THE COLLEGE PREPARATORY COURSE.

Embraces all requirements for matriculation in the Colleges of Mechanics, Mining and Civil Engineering, which include Electrical and Sanitary Engineering; also, the requirements for the Colleges of Natural Science, Agriculture, Chemistry, and Commerce.

In this course as much time is devoted to Manual Training as is consistent with thorough work in these requirements.

Students completing the Manual Training of the College Preparatory Course are given credit at the University of California for the work done.

MECHANIC ARTS COURSE.

This course is intended for those who are to enter upon active industrial pursuits directly from the school. More time is devoted to shop practice, wood, iron, steam, and electrical work, machine drawing and construction, than in the former course. A thorough academic training is given, though requiring less of the student's time than the College Preparatory Course.

ATHLETICS.

There is an Athletic Association in the School. It is connected with the Academic Athletic League of California. It embraces a Basket Ball Team for girls, a Tennis Club, Baseball, Football, and Swimming Teams. Every year the Association holds an Interclass Field Day.

ENGLISH.

The course in English covers the entire three years. The literature studied is used as a warp into which is woven training in oral and written expression and instruction in composition and rhetoric.

The work includes sentence structure, synthesis, analysis, correlation, etc., paragraph writing, essay work, descriptive narrative and expository, and debate. The author's life, style, contemporaries, and the history of his times, are treated in connection with each selection.

The disciplinary effect of literature upon the observation and judgment is recognized, and by it the discriminating faculties are strengthened. Its broadening effect upon the mind is emphasized, and a love for the true and beautiful in it is developed.

BIBLIOGRAPHY.

The Lady of the Lake; The Alhambra; Sir Roger de Coverley; Classic Myths; Short Poems; Horatius; The Deserted Village; The Cotter's Saturday Night; Selections from Childe Harold; Winter, Winter Morning Walk; Snowbound; Tam O'Shanter; The Ancient Mariner; L'Allegro; Il Penseroso; The Merchant of Venice; Julius Caesar; Macaulay's Warren Hastings.

HISTORY.

The History course includes the requirements of the University of California for the Colleges of Agriculture and Chemistry, also the requirements for the Colleges of Mechanics, Mining and Engineering; and is thorough in the subjects covered.

TEXT BOOKS.

The American Government, Hinsdale's; Channing's Students' U. S. History.

GERMAN.

FIRST YEAR.

First term.—Thirteen Lessons in Collar's Eysenbach (Shorter course). About fifty pages of easy reading.

Memorizing half a dozen short poems.

Second Term.—Completion of Collar's Eysenbach—about seventy-five pages of reading. Continuation of memorizing poetry. Daily exercise in composition.

In the first year the terms that are in constant use in a language class-room are made familiar to the pupils by constant iteration.

SECOND YEAR.

First Term.—Die Traumereien. Immensee.

Second Term.—Die Nonne. Hoher als die Kirche. L'Arrabbiata. In this year it is the aim to do a good deal of reading. Grammar and Composition are studied in connection with the texts that are read. Some time each week is devoted to conversation in German.

THIRD YEAR.

First Term.—Mein Leben (Seume).

Second Term.—Minna Von Barnhelm.

In the last year, one period the first term and two periods the second term, per week, are devoted to a review of Grammar and to Composition. German is this year regularly used as the language of the class-room.

LATIN.

SECOND YEAR.

First Term.—Five periods a week. Text book, Tuell and Fowler. First thirty-three lessons. Thorough drill in forms and vocabulary. Rules of syntax with their applications. All translations in class to be oral and without books. Constant reviews.

Second Term.—Finish Tuell and Fowler, continuing as in first term. Take up indirect discourse thoroughly and slowly. Review. Graduation at sight.

THIRD YEAR.

First Term.—Five periods a week. Text-books, any Caesar; Daniell's Latin Prose Composition. Caesar, Books II and III. Translation into idiomatic English and careful study of grammar.

Attention to Geography and History in the narrative. Composition in Daniell based on text read. Nepos at sight.

Second Term.—Caesar, Books IV and I. Thorough study of subjunctive and indirect discourse. Composition in Daniell based on text read. Nepos at sight.

FRENCH.

FIRST YEAR.

First Term.—The twenty-first lessons of Grammar. A short story, *La Mere Michel et Son Chat*, about forty pages of easy reading. Memorizing idiomatic sentences and vocabulary. Great care is given to pronunciation.

Second Term.—The twenty following lessons of Fraser and Squair's Grammar. About seventy-five pages of reading. Oral and written drill on verbs. Formation of sentences.

SECOND YEAR.

First Term.—Completion of Fraser and Squair's Grammar. The Composition work of Francois' Introductory French Composition. *Le Voyage de M. Perrichon*.

Second Term.—Review of Fraser and Squair's. Dictation. Oral work bearing chiefly on the use of the verbs and idiomatic forms. The pupil is supposed to understand the use of French by the teacher in class-room work and discussion of familiar topics.

THIRD YEAR.

First Term.—Colomba. Composition work. Sight translation; Selections by Bruce.

Second Term.—*Le Gendre de M. Poirier*. Advanced Composition. Sight translation. General review of grammar and syntax. During the third year, French is used as the language of the class-room.

MATHEMATICS.

The Mathematical course proper begins with the elementary Algebra of the first or junior year and extends throughout the three years. The first few weeks are devoted, however, to a short review of the Arithmetic. This review is so conducted as to effect the double purpose of giving the pupil a proper perspective view of the Arithmetic itself and of blending the familiar concepts of this branch of Mathematics with the broader notions of the Algebra upon which he is about to enter, that the latter field may neither be entirely unfamiliar at the start, nor present too many difficulties in too rapid a succession.

Geometry is begun at the commencement of the middle year. Trigonometry and Surveying are added in the third or senior year.

ALGEBRA.

FIRST YEAR.

Definitions and notation, fundamental operations on integral and fractional expressions, factoring, remainder and factor theorems, synthetical division, binomial theorem for integral exponents of the binomial, theory of exponents, radicals, equations of the first degree, single and simultaneous, solution of equations by factoring, practical examples and problems on equations, solution of quadratics, theory of quadratics, complex quantities, elimination with equations higher in degree than the first, the three progressions, other simple series, determinants, exponentials and logarithms.

THIRD YEAR.

Theory of quadratics, complex quantities, elimination with equations higher in degree than the first, indeterminate equations and systems, determinants, the progressions and other simple series, elements of the theory of equations, exponentials and logarithms.

SECOND YEAR AND FIRST QUARTER OF THIRD YEAR.

The course in Plane and Solid Geometry comprises the ordinary propositions of Plane Geometry with an introduction to Modern Geometry and the most important propositions of Solid Geometry with their practical applications.

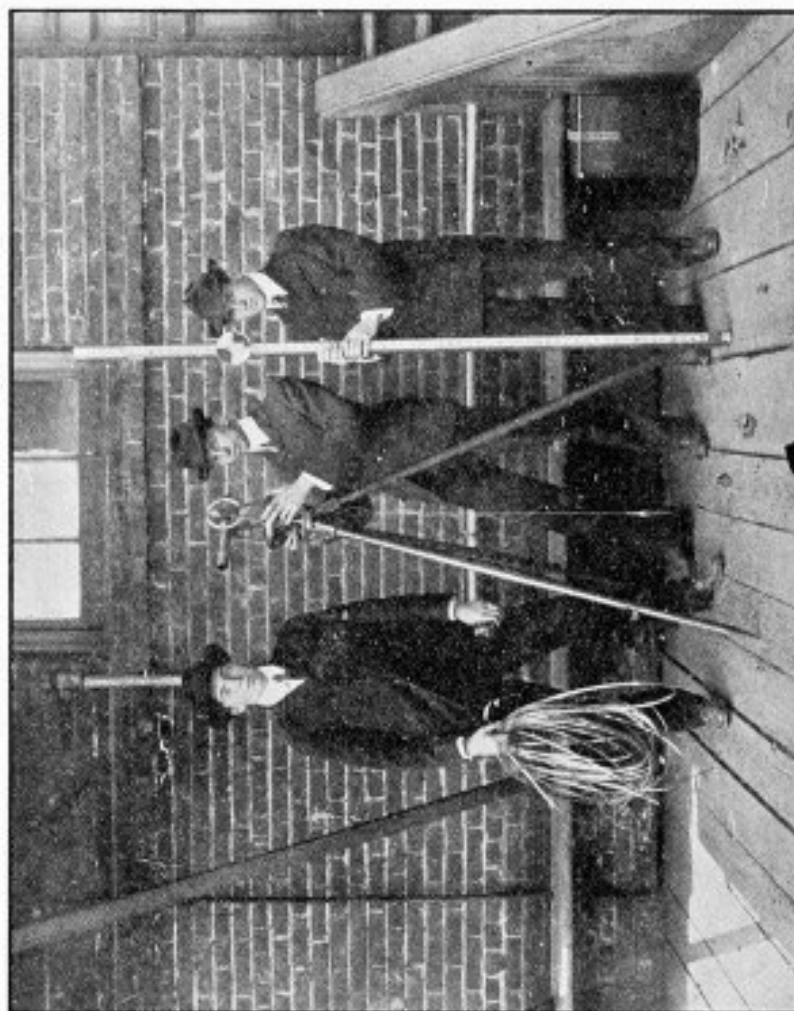
It is the aim from the very beginning of the mathematical course to emphasize modern methods of thought and treatment, to teach the pupil to generalize his ideas and to broaden his conceptions, and to keep the instruction throughout the course on a rigorously logical basis. At the same time the practical applications of the work are constantly kept in view and utilized wherever possible for illustrative problems.

SURVEYING.

In this course in the senior year, will be summed up and made of practical use, the mathematics of the preceding years. In connection with the subject of Trigonometry, in the first semester, will be given a course in the use and manipulation of surveying instruments—the chain, tape, level, transit, theodolite, etc.—dealing specifically with their care, adjustment, proper uses, the source of possible errors and how to guard against them.

Here also will be discussed the different kinds of surveying—ordinary land surveying, mine and tunnel work, railroad location, topographic and traverse work—the best ways of attacking problems as they arise and the different methods of arriving at the same results.

In the second semester this course will be continued by actual field work with these instruments, under direct supervision of the teacher. Our parks and the many country places so readily accessible both by boat and train, offer exceptional opportunities for such work. Here also we combine a pleasant, invigorating, outdoor excursion with actual practice in measuring distances, setting up and working with instruments, the correct interpretation of observations and learning the most convenient forms of keeping notes



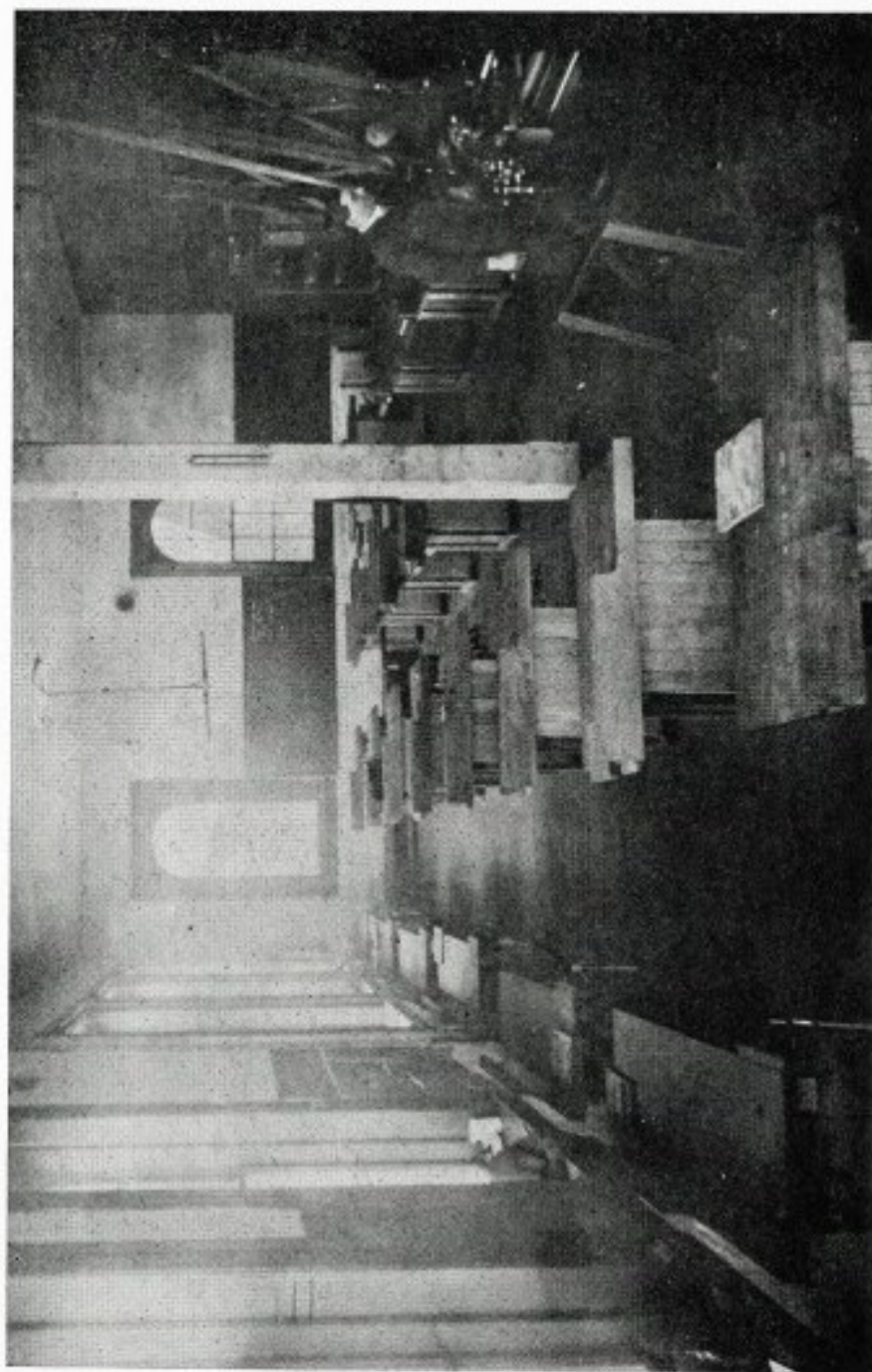
SURVEYING PARTY.

and records of readings and measurements. The pupil *does* the actual work with actual instruments, and the ideals of theory become nearer a reality than in any other possible way.

This work during the second semester furnishes the necessary data for all the trigonometric applications in the solution of triangles, and what might become an abstract, uninviting book-study, becomes a real, live, interesting subject, because the pupil is doing the actual, practical work himself. This field-work will also be made the basis for considerable work in the draughting-room, thus broadening the scope of that course.

Such a course, combining the theoretical with the practical, both in mathematics and instrumental work, is of the highest value to any pupil, and especially to those who are looking forward to the civil, mechanical, electrical, mining or other engineering professions.

The aim of the whole course is to make it useful, helpful and practical, to teach the student to rely upon himself and devise new ways of doing things as new conditions arise. It will suggest new ideas to him concerning his mathematics, train his hand in dextrous, accurate manipulation of instruments, his mind in clearness and keenness, and strengthen his judgment.



WOODWORK SHOP.

COURSES IN PHYSICS.

JUNIOR YEAR. FOR ALL PUPILS.

Dynamics of Fluids. Simple Machines and Elementary Heat.

(a) *Laboratory Work.*—Twenty-three or more experiments in Mensuration and the Dynamics of Liquids and Gases; four experiments on Simple Machines; fourteen on Elementary Heat.

(b) *Recitations.*—Properties of Matter, Density and Specific Gravity, Hydrostatics and Pneumatics.

Discussion of results of laboratory work.

Comment upon all work.—In recitation periods, experiments by the teacher illustrate the portions of Physics not covered by pupil's own experiments.

In laboratory work, emphasis is placed upon form-work and neatness of note books.

Frequent reference is made to books of Science Library.

LOW SENIOR TERM. FOR COLLEGE PREPARATORY PUPILS.

Electricity and Light.

(a) *Laboratory Work.*—Four expts. in Magnetism; twenty expts. in Electricity, including study of various Cells and Instruments; Electrical Effects; The Dynamo; ten expts. in Light, including the Photometer, Plane and Curved Mirrors, Lenses.

(b) *Recitations and Class Demonstrations.*—

1. *Magnetism.*—Magnetic action, Force-lines, and Magnetic Fields, Terrestrial Magnetism.

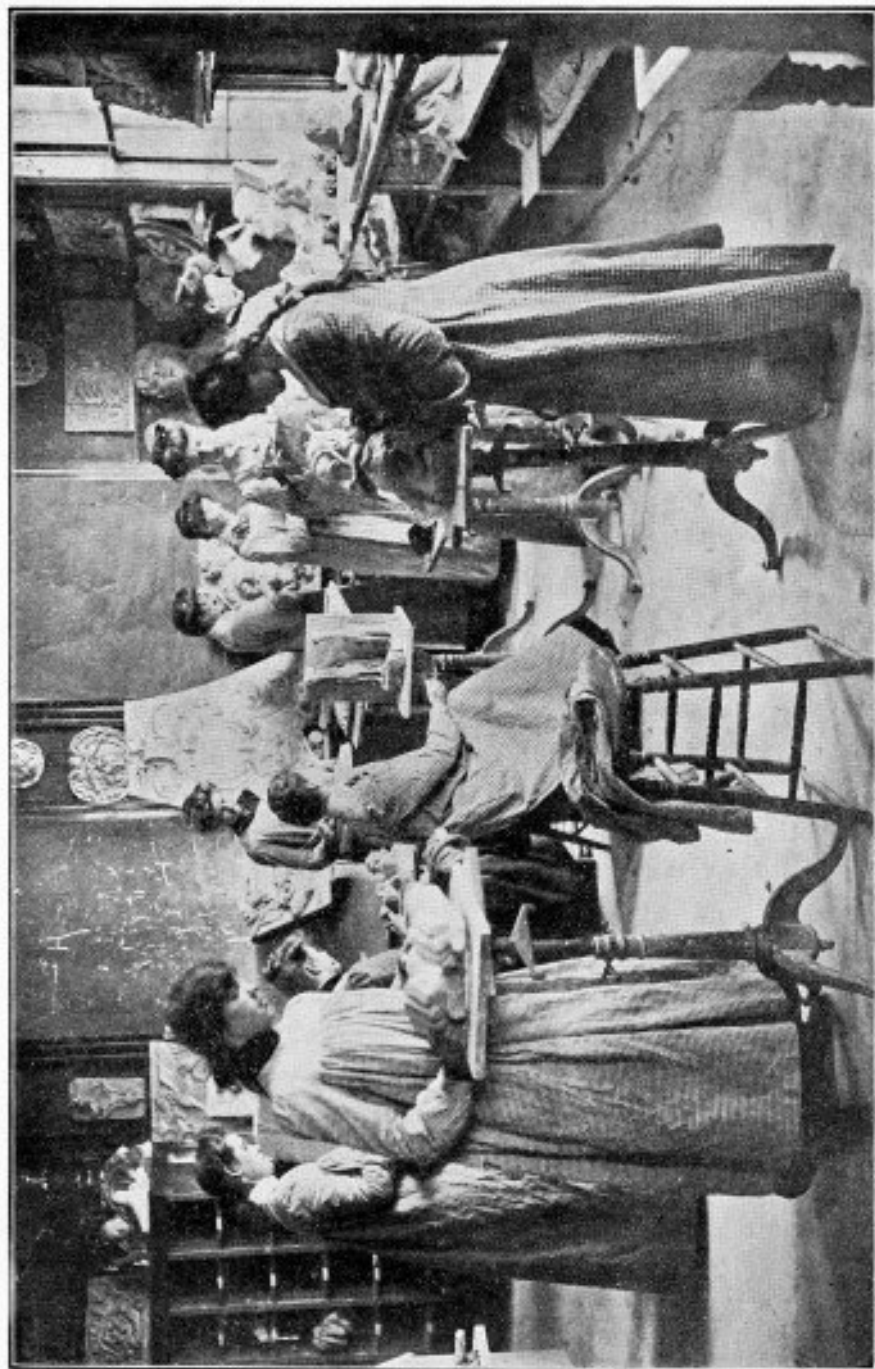
2. *Static Electricity.*—Electrification, Electric Potential, Machines, Atmospheric Effects.

3. *Current Electricity.*—Currents, Effects, Electrical Quantities, Laws of Resistance, Measuring Instruments, Electromagnetic Induction, the Dynamo, the Electric Light, the Telegraph and Telephone.

4. *Electric Waves.*—(Brief discussion of Wireless Telegraphy, etc.)

5. *Light.*—Nature and Propagation of Light, Photometry, Reflection and Refraction, Lenses, Dispersion, Color, Optical Instruments (Camera, Spectroscope, etc.)

(c) *Problems* throughout the term.



CLAY MODELING ROOM.

HIGH SENIOR TERM. FOR C. P. PUPILS.

Heat, Mechanics and Sound.

(a) *Laboratory Work.*—Ten expts. in Heat, including Calorimetry; nine expts. in Mechanics, including Parallel Forces, Concurrent Forces and Work; six expts. in Sound, including Laws of Strings.

(b) 1. *Heat.*—Thermometers, Expansion, Heat Quantities, Change of State, Transmission.

2. *Mechanics.*—Motion, Gravitation, Falling Bodies, Work and Energy, Heat and Work, C. G. S. System of Units.

3. *Sound.*—Transmission, Reflection, Refraction, Interference, Pitch and Quality, Musical Instruments.

(c) *Problems* throughout the term.

LOW MIDDLE TERM. FOR MECHANIC ARTS PUPILS.

Electricity.

Modification of Low Senior C. P. Course, with especial reference to practical application.

HIGH MIDDLE TERM. FOR MECHANIC ARTS PUPILS.

Heat and Mechanics.

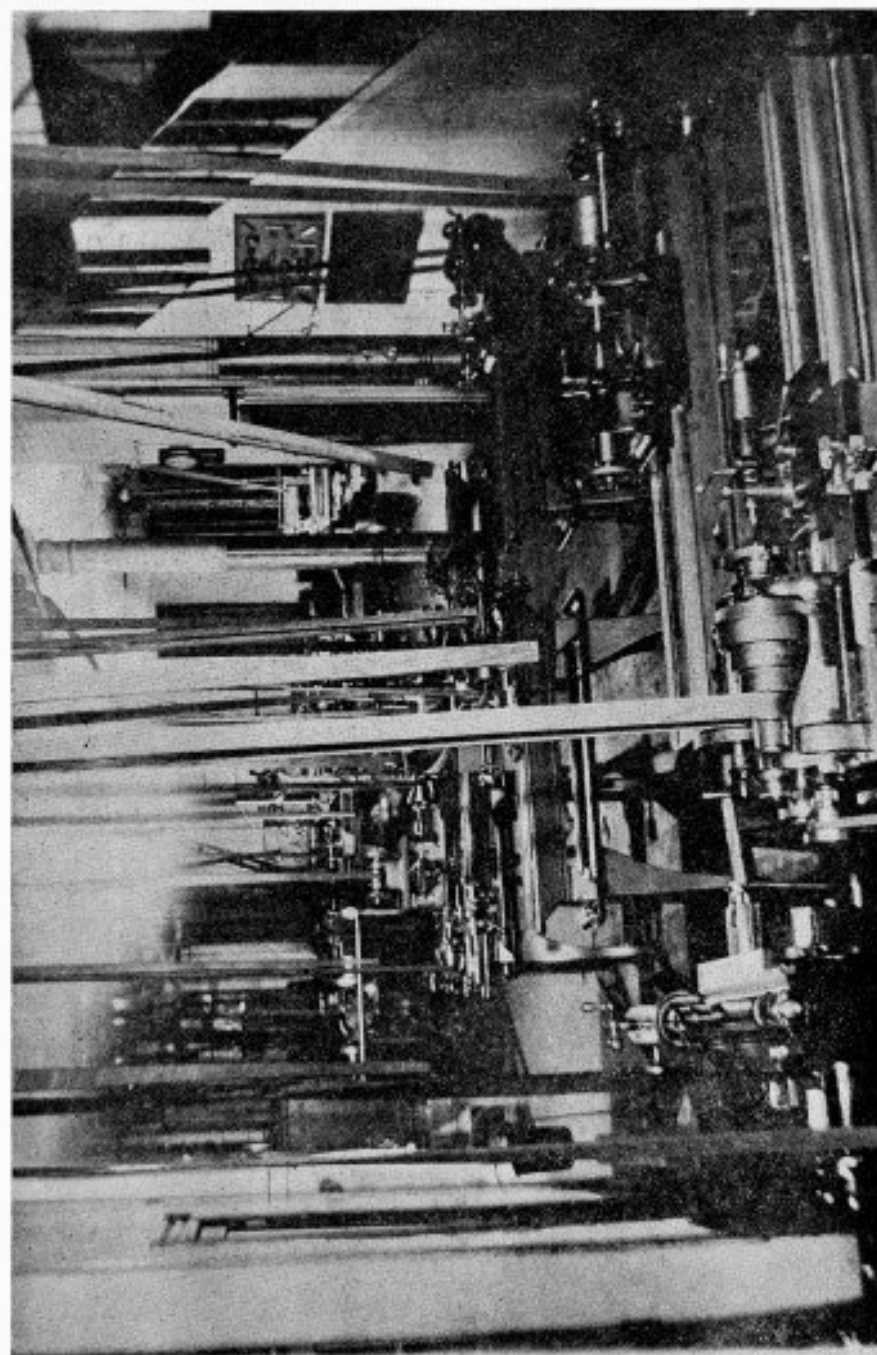
Modification of High Senior C. P. Course, with references to practical work.

LOW SENIOR TERM. FOR MECHANIC ARTS PUPILS.

Practical Electricity.

(a) *Laboratory Work.*—Twenty or more experiments in Electrical Measurements; Tests of Electrical Machinery, Incandescent Lamps, Storage Cells, etc.

(b) *Recitations.*—Advance work in *Magnetism*, Saturation, Flux, Magneto-motive Force. *Electricity*: Electrical Work and Power, Heat Losses. Electro-magnetism: Laws, Hysteresis, Permeability, Reluctance. Elementary theory of Dynamo. Transformers. Measuring Instruments (additional). Condensers. The Electric Motor. Elementary Theory of Alternating Currents. Arc and Incandescent Lighting. Power Stations and Transmission. Line Testing.



MACHINE SHOP.

HIGH SENIOR TERM. FOR MECHANIC ARTS PUPILS.

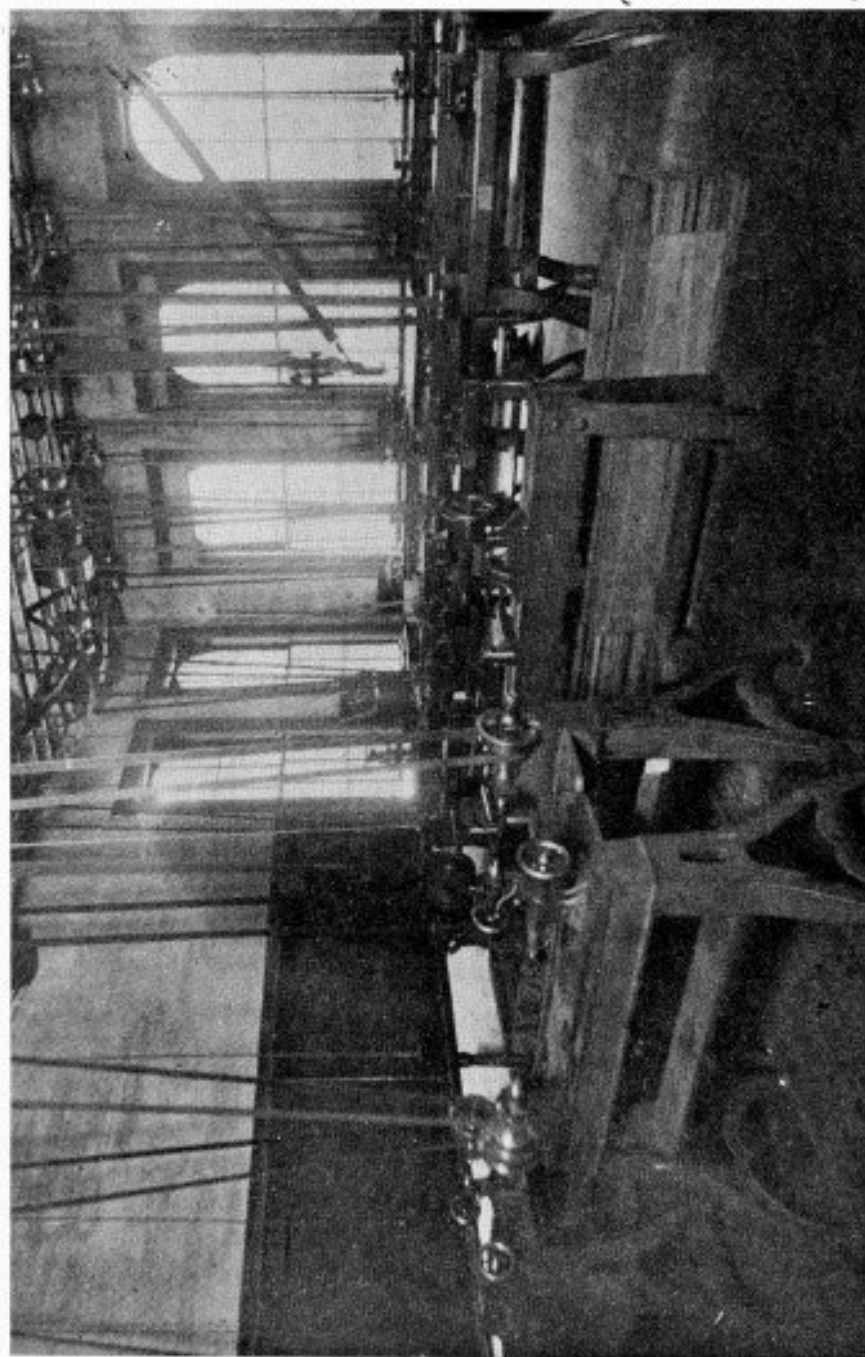
Experimental Mechanics and Calorimetry.(a) *Laboratory Work.*—

1. Measurement.—Metric and English Units, Use of Vernier, Micrometer, Spherometer and the Slide Rule. Liquid and Gas Pressure.

2. *Mechanics.*—Gearing and Belting, Friction, Efficiency, Strength of Materials.

3. Pressure of vapors; Pressure and Temperature of Steam.

(b) *Recitations.*—Theory of Instruments, Hydraulics, Pneumatics, Stresses and Strains. Kinetics, Efficiency of Machines. Refrigeration, Heating Systems, Gas Engines, Steam and the Steam Engine, the Indicator Diagram, Horse-power of Engines.



PATTERN MAKING SHOP.

COURSE IN CHEMISTRY.

TWO TERMS.

First Term.

(a) *Laboratory Work.*—Experiments with some of the non-metallic elements, e. g., hydrogen, oxygen, nitrogen, chlorine, bromine, iodine and fluorine, and with some simple compounds, water, acids, bases and salts.

(b) *Class Demonstrations and Recitations.*—Explanations of difficulties in laboratory work and the development of the principles involved.

Elementary chemical theory, e. g., the laws of combination in definite and multiple proportions, reactions and the atomic theory.

Second Term.

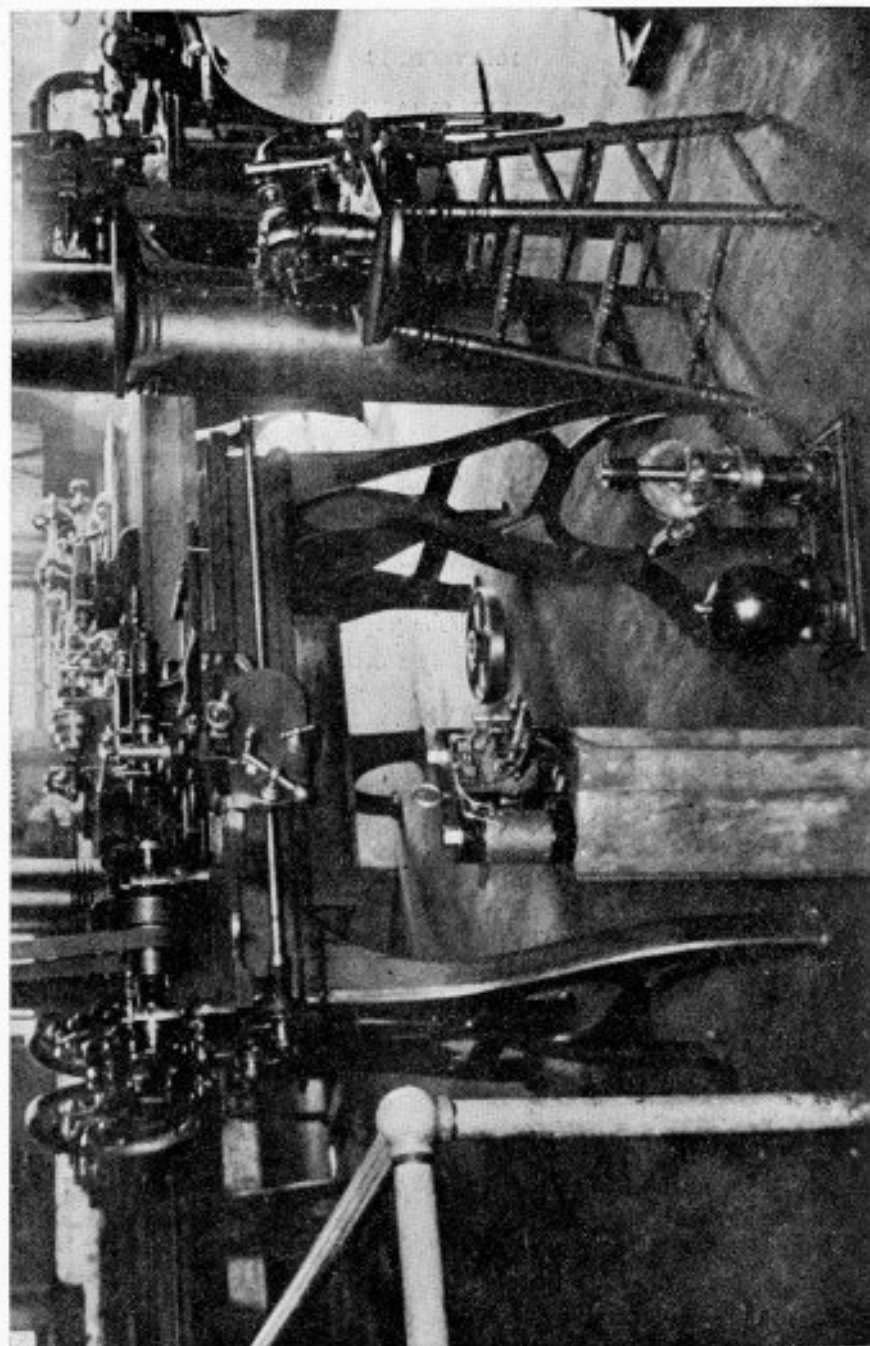
(a) *Laboratory Work.*—Further experiments with non-metallic elements, e. g., carbon, sulphur and phosphorus; and with the common metals and their compounds. Some simple organic processes, fermentation, bread and soap making.

(b) *Class Demonstrations and Recitations.*—Explanations of laboratory work and further development of the chemical theories of valence, nascent state, Avagadro's law, the periodic law and electrolysis.

(c) *Chemical Arithmetic.*—Numerous problems involving both weights and volumes of the products of various chemical reactions.

GENERAL COMMENT.

The instruction in chemistry extends over one year and occupies five periods a week, three of which are given to laboratory work and two to class demonstrations and recitations, with reference to the usual standard works. The constant aim of the instruction is to make the bearing of the work on the phenomena and industries of every-day life as direct as possible, taking illustrations from the methods of mining, gas making, soap works, acid and powder works and smelters.



MANUAL TRAINING.

Aim of Course.

Shopwork is taken primarily for its disciplinary and educational value—for the intellectual stimulation resulting from physical activity along some line of work requiring constant mental effort.

Incidentally, though in no sense trade teaching, it furnishes a valuable foundation for many mechanical occupations, as is shown by the success of those graduates who have chosen to engage in manufacturing pursuits.

The instruction is aimed to follow the best shop methods as closely as can be done without sacrificing the educational feature. Carefulness and accuracy are insisted upon from the start, since otherwise exact thinking and mechanical progress are alike impossible. All exercises must agree in form and dimensions with a drawing or blue print furnished the pupil.

The course is designed to embody a definite mechanical principle in each exercise, and to introduce successively the different shop tools.

The method of doing the work is first explained by the teacher, and the pupil is then required to perform the exercise as instructed.

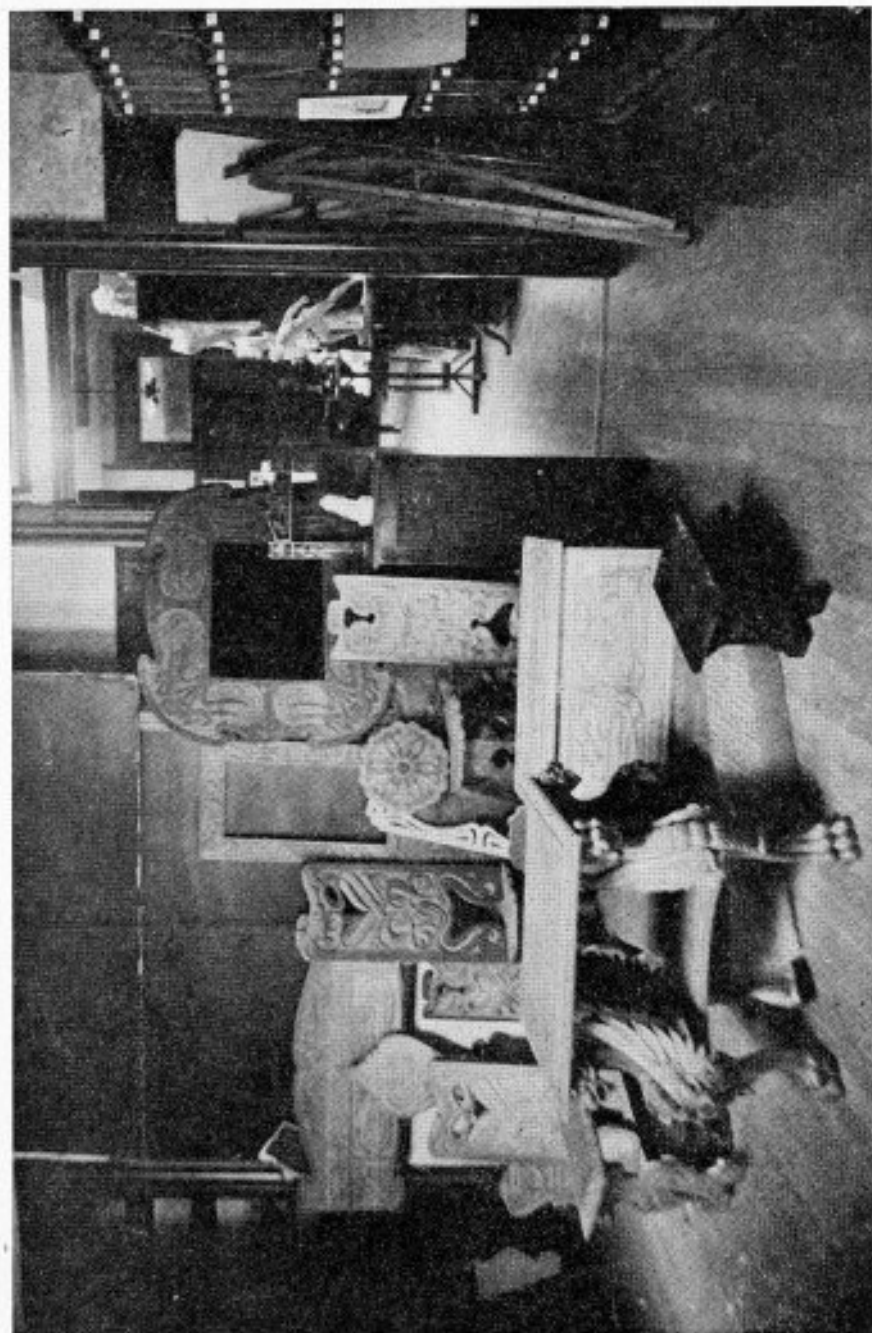
Occasional talks are given on the nature and uses of materials, and the care of tools.

EQUIPMENT.

The equipment of machinery, tools and drawing instruments for work in manual training is very complete and of the best quality.

The elementary wood-working shop is furnished with twenty-five individual benches, each provided with a Towles quick-action vise and full sets of individual and common tools.

The shop for advanced woodwork is equipped with twenty-eight benches, each furnished with a quick-action vise, three sets of individual and one set of common tools; also with a full line of wood-working machinery, consisting of double circular saw, band saw, two jig saws, cylinder and buzz planers, sixteen wood turning lathes



STUDENTS' WORK.

and one pattern-makers' lathe, a trimmer, grindstone and a foot-power mortising machine, and foot-power shaper. The power is furnished by a fifteen horse-power Crocker-Wheeler motor, which also runs the blowers for the blacksmith shop.

In the blacksmith shop are twelve Sturtevant forges and one hand forge, with exhaust and pressure blowers, anvils and complete sets of tools for forging.

The machine shop is supplied with fourteen screw-cutting engine lathes of various makes, one speed lathe, two Brown & Sharp milling machines, three shapers, a planer, drill grinder, wet and dry emery grinders, two drill presses, a boring mill, buffing wheel, power hack saw and a grindstone. The benches are fitted with twenty machinists' vises and the tool-room is well supplied with all necessary cutters and machinists' tools of all kinds. A twenty horse-power Otto Gas Engine furnishes power for the shop.

The mechanical drawing-room contains fifty adjustable drawing stands, the same number of sets of instruments, and boards sufficient for the needs of all the pupils, also many useful reference books.

COURSE.

FIRST YEAR.

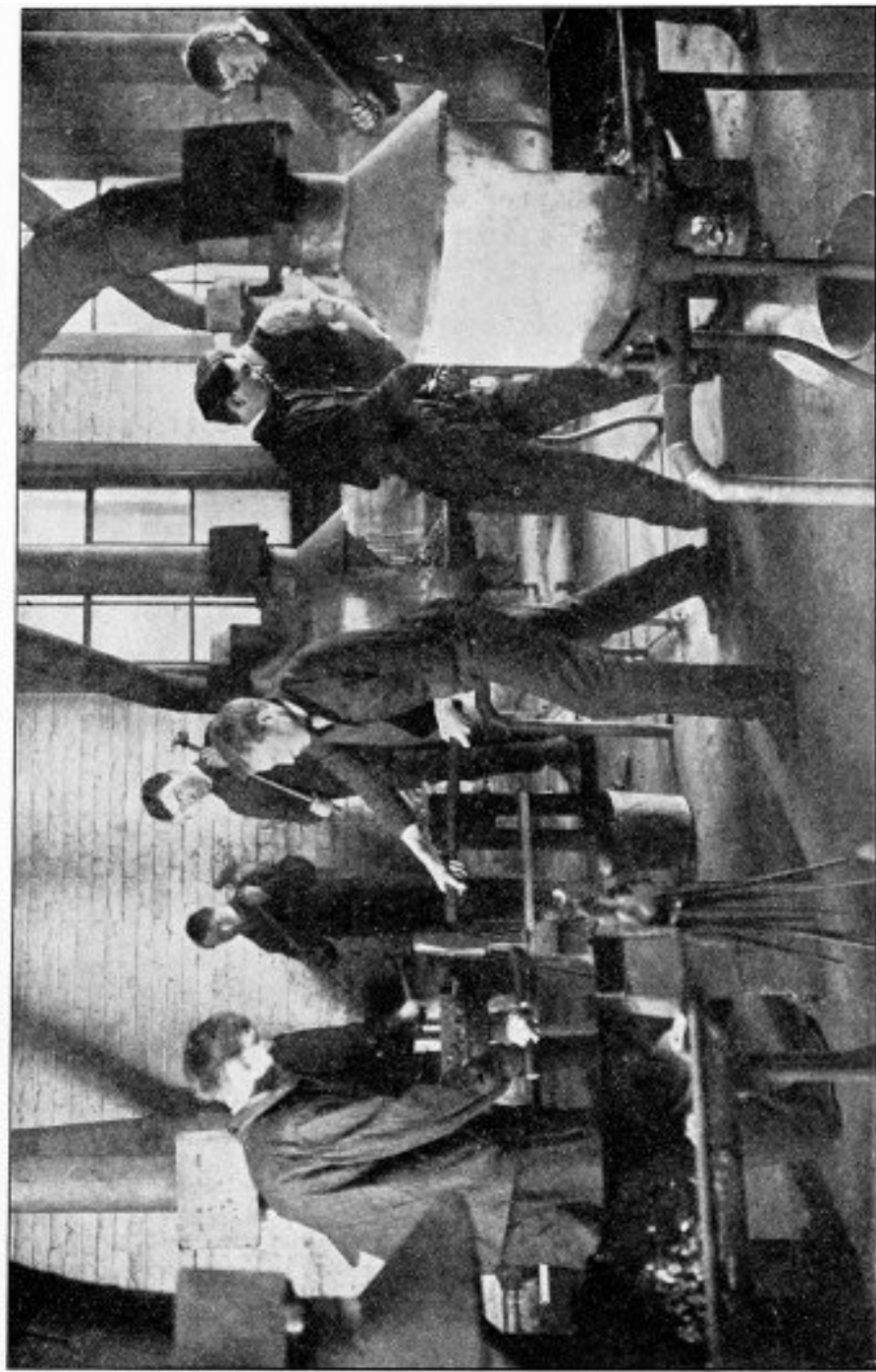
First Term.—Care and use of tools, joinery, wood-turning, wood-carving and forging.

Second Term.—Cabinet and pattern making, and forging.

Forging is taken once a week, two periods, through the first year and first half of the second. The exercises involve the operations of drawing, bending, upsetting, welding, tempering, etc., and aim to carry the student to a point where he can make, dress and temper his lathe tools used in the shop during the remainder of the course, besides giving a fair general knowledge of blacksmithing.

During the second term the pupils are taught the use of all the common woodworking machines in the construction of various projects, such as book cases, cabinets, taborets, cases of drawers, etc.

These are often elaborately carved and may become the property of the student upon his paying for the material used. Much of the equipment of the school is the work of students.



FORGE ROOM.

In pattern-making no set series of exercises is pursued, as the pupils work to the shop drawings, made by the senior students, of projects to be constructed in the machine shop during the last two years. Castings are afterwards made from these patterns and the finished machine built in the machine shop.

SECOND AND THIRD YEARS.

During the first half of the second year all students take forging once a week, two periods, and the mechanic arts pupils pattern-making once a week, two periods. The entire remaining time for the course is devoted to metal work and machine tool practice.

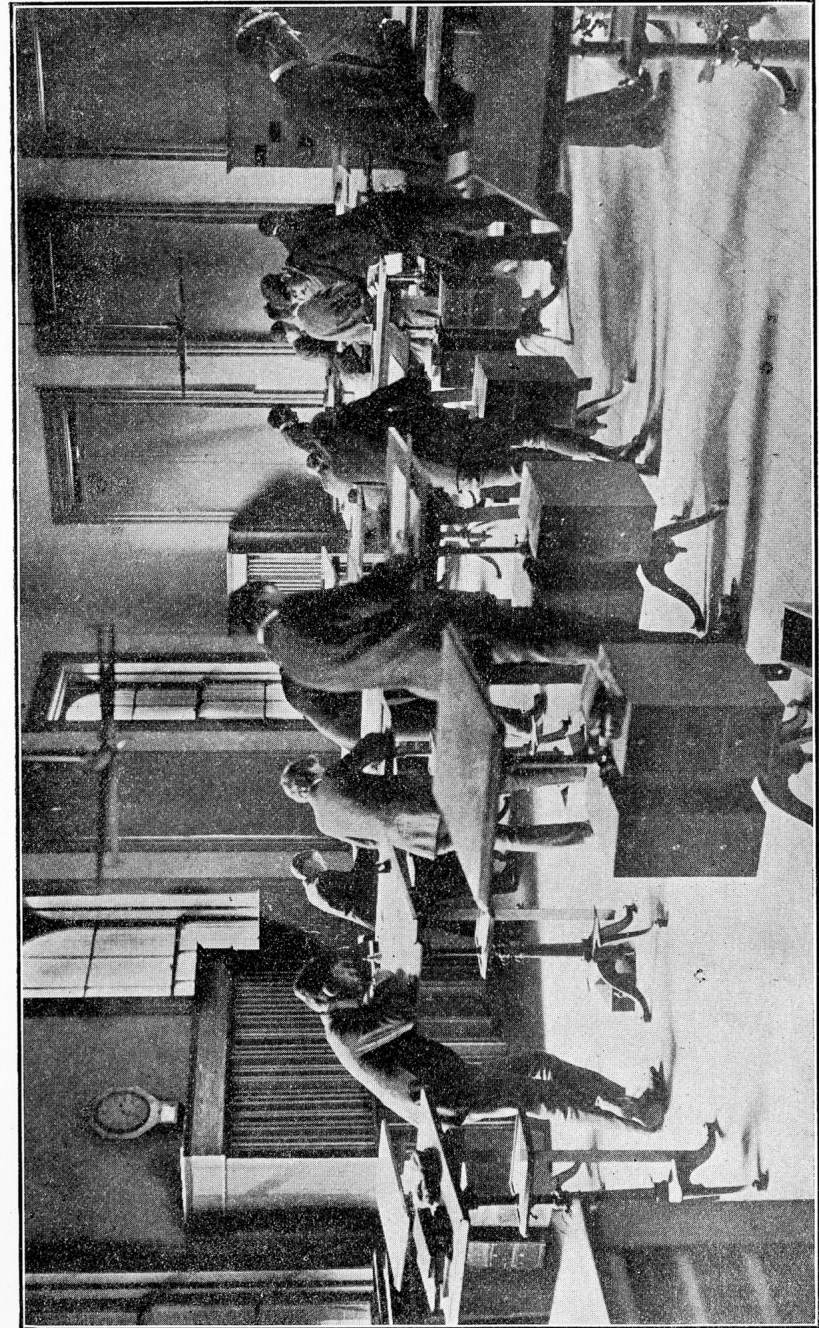
The pupil is first given a series of preliminary exercises in chipping, filing and fitting, straight and taper turning, screw-cutting, milling gear, cutting and planing in the planer or shaper. After developing a reasonable degree of accuracy he is put to work on some project of value to the school or himself.

A list of projects already completed includes a screw-cutting engine lathe, feed pump for gas engine, buffing wheel, and countershaft, wine pump, valves, two gas engines and electric motors and generators of various sizes and types; also in connection with the woodworking department of considerable apparatus for Physics and Chemistry laboratories.

A 14-inch engine lathe is nearly completed, and the projects under way for construction during the coming year include a brazing furnace, two speed lathes and a five horse-power steam engine. This engine will be arranged for experimental steam engine practice, to give the students experience in the calculation of horse-power by the use of the indicator and planimeter, and the determination of an engine's efficiency by the study of indicator cards.

MECHANICAL DRAWING.

The course in mechanical drawing is designed to conform to the admission requirements of the University of California and also to meet the needs of those pupils whose future employment is to be in the shop or drafting room.



MECHANICAL DRAWING ROOM

With this idea in mind the work is made as practical in its nature and applications as possible, and many graduates of the school are now holding responsible and profitable positions in engineer's and architect's offices.

FIRST YEAR.

Care and use of instruments, geometric figures and constructions, lettering, orthographic projection of lines, plane and solid figures.

SECOND YEAR.

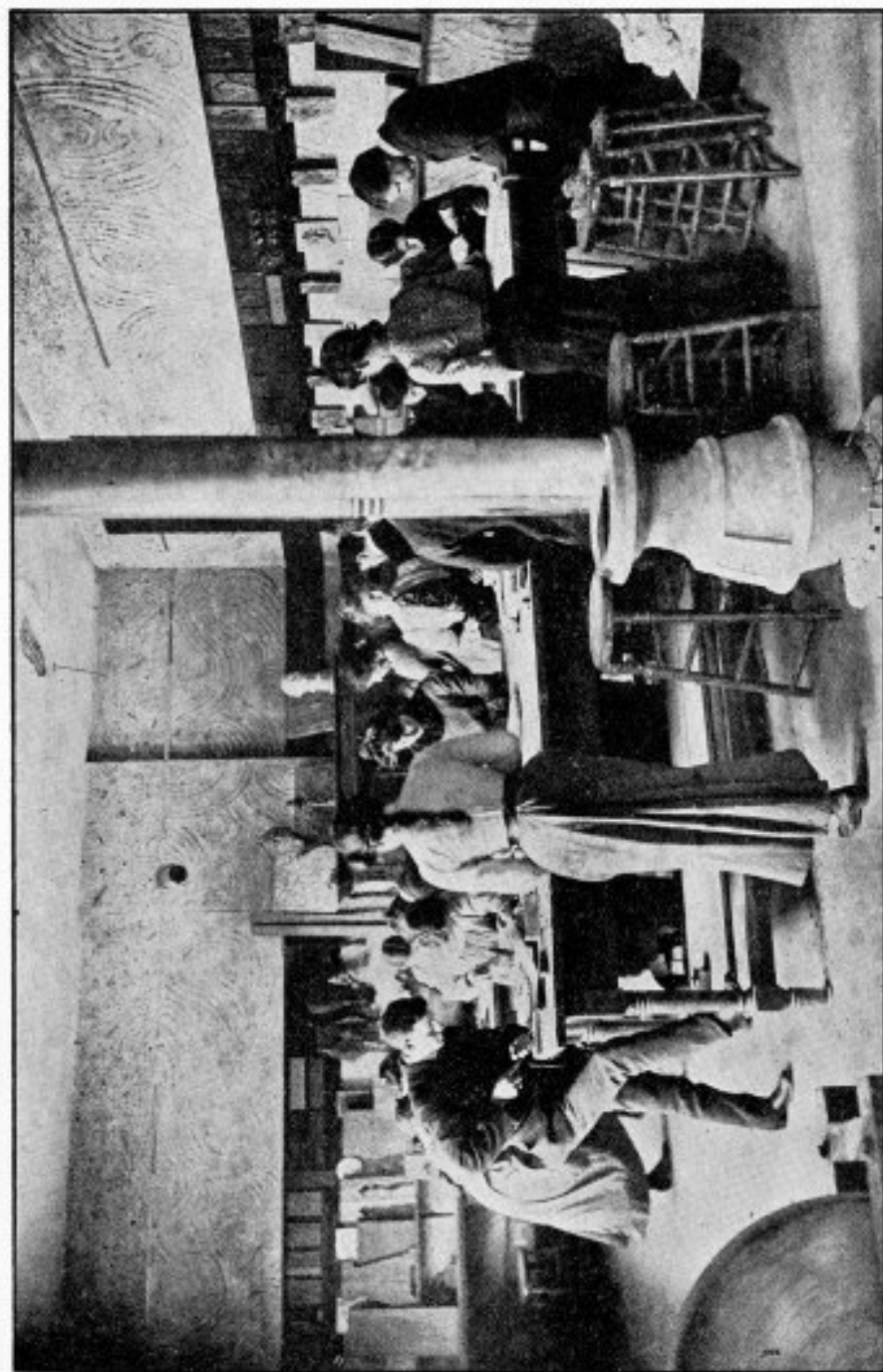
Sections and intersections of solids and development of surfaces. Isometric, simple working drawings for shop, tracing and blue printing. Elements of machines. (For architectural students, details of construction.)

THIRD YEAR—MECHANICAL.

Working and general arrangement, drawings of machines in the shop from sketches and measurements, also designs for some machine as a lathe, gas engine, emery grinder, or electric motor to be built later in the shop.

THIRD YEAR—ARCHITECTURAL.

Study of orders, perspective, elevations and detail drawings of a house or other building.



WOOD CARVING ROOM.

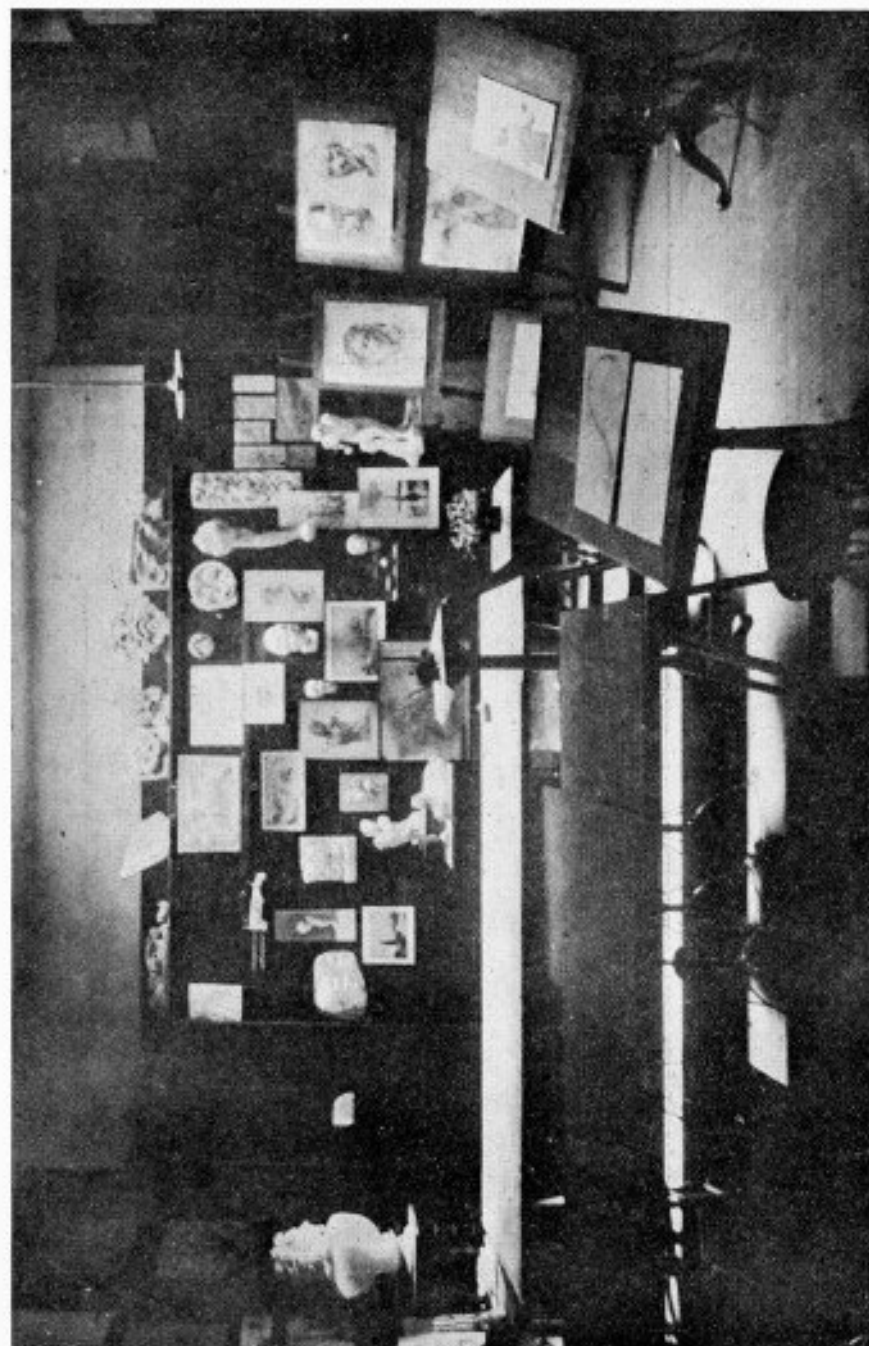
NOTES ON THE COURSE OF INSTRUCTION IN THE
DEPARTMENT OF FREE HAND DRAWING
AND DECORATIVE DESIGN.

This course is planned for general students and is a part of the regular curriculum of the school. It is broad in its nature and embraces both the practical and æsthetic lines of study. Throughout the whole work of the department, the aim is to encourage practical as well as artistic expression along original channels. The work is not arranged for the benefit of pupils of special talent only, but is so planned as to come entirely within the scope of the average High School student. Pupils are trained in correct perception and in expression through the mediums of pencil, charcoal, pen and ink, color, modeling in clay and carving in wood. The powers of expression and execution are cultivated along lines that have a direct relation to the life and interests of the pupils.

The girls are given the benefit during the first and second years of a thorough course in sewing, with the fundamental principles of garment-making, embracing not only theory but much practical work.

The course for girls is divided into Elementary, Intermediate and advanced.

- | | | |
|------------------|---|--|
| ELEMENTARY..... | { | <ul style="list-style-type: none"> (a) Free hand Drawing from still life and casts in light and shade. (b) Elementary principles of design. (c) Clay modeling from casts and nature. (d) Sewing. |
| INTERMEDIATE.... | { | <ul style="list-style-type: none"> (a) Free hand drawing from casts and flowers. (b) Study of historical ornament. (c) Pen and ink from copy, for technique. (d) Still life in monochrome. (e) Modeling from the flat. (f) Elementary wood carving. (g) Sewing. |



FREE HAND DRAWING ROOM.

- ADVANCED..... {
- (a) Free hand drawing from the antique and from life.
 - (b) Applied design in color for textiles.
 - (c) Original designs applicable to all the industrial arts.
 - (d) Historical ornament in color.
 - (e) Illustrations in pen and ink and wash.
 - (f) Architectural carving.

The course for boys includes Free Hand Drawing, Lettering, Wood Carving and Illustrative Design.

- ELEMENTARY..... {
- (a) Free hand drawing of geometrical solids and machine fragments.
 - (b) Free hand lettering, Reinhardt system.
 - (c) Elementary wood carving.
- INTERMEDIATE.... {
- (a) Free hand elementary machine drawing.
 - (b) Free hand working drawings of tools and machines.
 - (c) Wood carving continued.
- ADVANCED..... {
- (a) Still life and antique in charcoal.
 - (b) Decorative and illustrative work in pen and ink.
 - (c) Finished drawings of machinery in the wood work and machine shops.

In order that the school and the home may co-operate in realizing the highest aims of this branch of our school work, it is the custom of the school to make semi-annual exhibits of work for the special benefit of the parents of the pupils. In addition to these, representative work of all kinds is constantly on view.

The fact that the instruction given is technically correct and is a direct practical help is attested by the fact that many gradu-

ates of the school are now holding positions for which they have been directly fitted by this work. There are now ten Polytechnic graduates employed as artists on the newspapers and magazines in San Francisco, as well as several in New York, Denver, and other cities, while a large number are supporting themselves by means of the practical application of their knowledge of decorative design to the Arts and Crafts.

THE POLYTECHNIC HIGH SCHOOL COURSE.

1903-1904.

This course is three years in length, and presupposes completion of the Eighth Grade. For the boys, the course includes work in wood and in metal; for the girls, work in clay modeling, wood-carving, pen and ink sketching, and designing.

During the first year a comprehensive course in Domestic Art is included in the curriculum for girls. The course is correlated with that of Industrial Art, and is carefully graded, impressing on the pupil the value of order, accuracy and economy in domestic affairs. The work is thoroughly practical and is conducted upon methods that lead pupils to grasp the artistic and scientific principles involved in careful, studious work. The course in Domestic Art comprises Hand and Machine Sewing, Talks on Color and Textiles as applied to Dress, and an advanced course in Millinery.

All first year pupils (Juniors) take the same course as prescribed below. At the beginning of the second year pupils are given the option of taking the College Preparatory Course or the Mechanics' Arts Course. The College Preparatory Course prepares students for the Engineering, Chemistry, or Natural Science Colleges of the University of California, for Stanford University and Advanced Technical Schools. In the Mechanics' Arts Course more time is devoted to Shop Work and less to Modern Languages and Mathematics than in the College Preparatory.

FIRST YEAR (JUNIOR).

	<i>Periods per week.</i>
English Language and Literature.....	5
Algebra	5
Physics	2
German or French.....	5
Drawing, Free Hand and Instrumental.....	4
Shop Work (boys)	10
Domestic Art (girls)	10

SECOND YEAR (MIDDLE).

College Preparatory.

	<i>Periods per week.</i>
Eng. Language and Literature.....	5
Plane Geometry and begin Solid.....	5
German or French	5
Latin	5
Drawing, F. H. and Constructive.....	4
Iron Work (boys) or Industrial Art (girls).....	6

Mechanic Arts.

	<i>Periods per week.</i>
Eng. Language and Literature.....	5
Plane Geometry and begin Solid.....	5
German, French or Latin (girls).....	5
Physics (boys)	5
Drawing, F. H. and Constructive.....	6
Shop Work (boys)	10
Industrial Art (girls).....	10

THIRD YEAR (SENIOR).

College Preparatory.

	<i>Periods per week.</i>
U. S. History and Civil Govt. and Comp.....	5
Solid Geometry, Advanced Algebra, Trigonometry and Surveying	5
Chemistry	5
Advanced Physics	5

Periods per week.

Latin	5
Drawing, F. H. and Constructive.....	6
Shop Work (boys) Industrial Art (girls).....	4

Mechanic Arts.

U. S. History and Civil Govt. and Comp.....	5
Solid Geometry, Trigonometry and Surveying (for boys)	4
French, German or Latin (girls).....	5
Chemistry	5
Advanced Physics (boys).....	5
Drawing, F. H. and Constructive.....	6
Shop Work (boys).....	10
Industrial Art (girls).....	10

ADDRESSES OF GRADUATES ENGAGED IN NEWSPAPER
ILLUSTRATING AND DESIGNING.

- Dorgan, Thos. A. ("Tad")—*N. Y. Journal*—Artist.
 Henrici, Ilse—*San Francisco Bulletin*—Artist.
 Igoe, Herbert—*San Francisco Examiner*—Artist.
 Flinn, E. F.—*New York Sun*—Artist.
 Lindsley, Maud Palmer—*San Francisco Bulletin*—Artist
 Fulton, Donna—*San Francisco Examiner*, now with *Bulletin*
 —Artist.
 Thompson, E. Damian—*San Francisco Call*—Artist.
 Brown, Pauline—Designer—Special work for Morris & Co.,
 Art Dealer, San Francisco.
 Boye, Adelaide—Interior Decorations—Assistant Designer,
 Boye & Co.
 Boye, Bertha—Special Designer for O'Hara & Co., San Fran-
 cisco.
 Adams, Nonie—Designer—San Francisco.