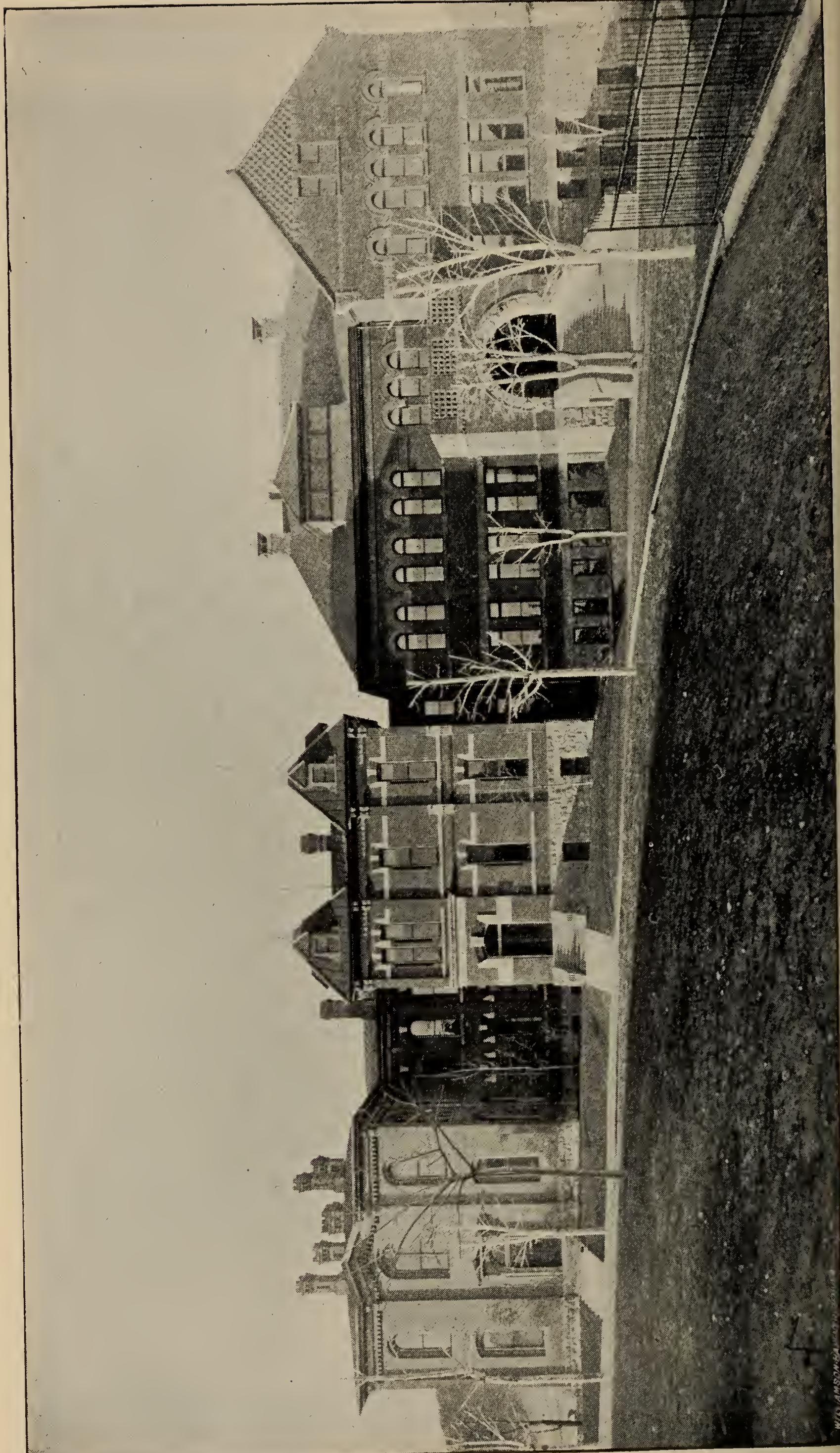
State School of Mines

Catalogue
1896-97

GOLDEN
COLORADO

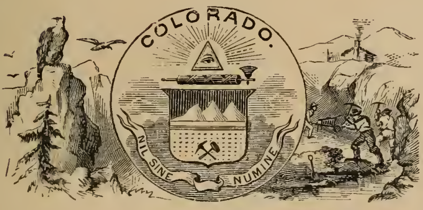


CATALOGUE

OF THE

STATE SCHOOL OF MINES

GOLDEN, COLORADO.



1896-97.

DENVER, COLO.
News Printing Company.
1896.

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CALENDAR.

1896-97.

First Term Begins Sept. 14, 1896, Ends Feb. 3, 1897.
(Christmas Holidays, Dec. 24–Jan. 3, inclusive.)
Second Term Begins Feb. 8, 1897, Ends June 9, 1897.
Commencement, June 10, 1897.

1897-98.

EXAMINATIONS FOR ADMISSION.

June 14, 15, 1897. Sept. 9, 10, 11, 1897.

First Term Begins Sept. 13, 1897, Ends Feb. 2, 1898.
(Christmas Holidays, Dec. 23–Jan. 2, inclusive.)
Second Term Begins Feb. 7, 1898, Ends June 8, 1898.
Commencement, June 9, 1898.

BOARD OF TRUSTEES.

OFFICERS OF THE BOARD.

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Registrar and Librarian.

STUDENTS, 1896-97.

POST GRADUATES.

Austin, Leonard S. (Ph. B., Yale.)	Denver,	Colorado.
Schneider, George W. (E. M., Colorado School of Mines.)	Central City,	Colorado.
Schumann, Enrique A. (B. S., Michigan School of Mines.)	Santiago de Cuba,	Cuba.

SENIORS.

Arkins, Chas. T.	(E. M.)	Denver,	Colorado.
Brown, Walter	(E. M.)	Erie,	Colorado.
Buck, Arthur H.	(E. M.)	Denver,	Colorado.
Bussey, Edwin E.	(B. S.)	Denver,	Colorado.
Canning, Herbert A.	(E. M.)	Aspen,	Colorado.
Cohen, Louis	(E. M.)	Denver,	Colorado.
Draper, Marshall D.	(E. M.)	Denver,	Colorado.
Febles, John C.	(B. S.)	Denver,	Colorado.
Gross, John	(E. M.)	Elyria,	Colorado.
Hazard, Wm. J.	(E. E.)	Denver,	Colorado.
Ingols, J. Augustus	(E. E.)	Denver,	Colorado.
Jarvis, Royal P.	(E. M.)	Crested Butte,	Colorado.
Kelley, Wm. A.	(E. M.)	Denver,	Colorado.
Lerchen, Frank H.	(E. M.)	Denver,	Colorado.
Logue, Nelson W.	(E. M.)	Aspen,	Colorado.
McLeod, J. Norman	(E. M.)	Fairbury,	Nebraska.
MacGregor, Geo. H.	(E. M.)	Estes Park,	Colorado.
Nelson, Harry E.	(E. M.)	Denver,	Colorado.
Nye, Robert	(E. M.)	Moline,	Illinois.
Powell, Geo. F.	(B. S.)	Leadville,	Colorado.
Roller, Arthur H.	(B. S.)	Salida,	Colorado.
Starbird, Harold B.	(E. M.)	Denver,	Colorado.
Warnecke, Carl M.	(E. E.)	Denver,	Colorado.
Weed, Floyd	(E. M.)	Denver,	Colorado.
Woods, Thos. H.	(B. S.)	Denver,	Colorado.

JUNIORS.

Barbour, Percy P.	(E. M.)	Edgewater,	Colorado.
Bertschy, Perry H.	(E. M.)	Appleton,	Wisconsin.
Blumenthal, Emil E.	(E. M.)	Denver,	Colorado.
Brown, George W.	(E. M.)	Petersburg,	Colorado.
Burdsal, Chas. S.	(E. M.)	Evanston,	Illinois.
Caldwell, Florence H.	(C. E.)	Cleveland,	Ohio.
Clarke, Winfred N.	(E. E.)	Paxton,	Illinois.
Corry, Arthur B.	(E. M.)	Butte,	Montana.
Church, Myron J.	(E. M.)	Milwaukee,	Wisconsin.
Davey, Wm. R.	(E. M.)	Lake City,	Colorado.
Dollison, James E.	(E. M.)	Golden,	Colorado.
Gleason, George B., Jr.	(E. M.)	Highlands,	Colorado.
Hamilton, Frank R.	(E. M.)	Denver,	Colorado.
Harrington, Orville.	(E. M.)	Denver,	Colorado.
Hartman, Fred. C.	(E. M.)	Sonora,	Mexico.
Jeffries, Edw. H.	(E. M.)	Denver,	Colorado.
Johnston, Fred.	(E. M.)	Denver,	Colorado.
Jones, Frank H.	(E. M.)	Dallas,	Texas.
Jones, Junius H.	(E. M.)	Norfolk,	Virginia.
Kraemer, Edw. L.	(E. M.)	Denver,	Colorado.
Laird, Eugene P.	(E. M.)	Parkersburg,	W. Virginia.
Lampe, Oscar A.	(E. M.)	Denver,	Colorado.
Lee, Murray	(E. M.)	Denver,	Colorado.
Lucy, Richard W.	(C. E.)	Denver,	Colorado.
Mills, Eben B.	(E. M.)	Denver,	Colorado.
Norman, J. Edward	(E. M.)	Denver,	Colorado.
Reid, Geo. D.	(E. M.)	Norwich,	Connecticut.
Rodriguez, Crisostomo	(E. M.)	Saltillo,	Mexico.
Smith, Harry C.	(E. M.)	Denver,	Colorado.
Stephens, Chas. N.	(E. M.)	Denver,	Colorado.
Tippett, J. Mellon	(E. M.)	McCoy,	Colorado.
Valentine, Malvern R.	(E. M.)	Highlands,	Colorado.
Whitaker, Orvil R.	(E. M.)	Durango,	Colorado.

SOPHOMORES.

Adami, Chas. J.	Helena,	Montana.
Baily, Frank S.	Denver,	Colorado.
Bauer, John F.	Mancos,	Colorado.
Benwell, Geo. A., Jr.	Linden,	New Jersey.
Bowman, Frank C.	Denver,	Colorado.
Bruce, Stuart S.	Cripple Creek,	Colorado.
Burdick, Edward	Chicago,	Illinois.
Cramer, Curtis P.	Sedalia,	Colorado.
Crowe, Thomas B.	Cascade,	Colorado.
Daily, Ross John	Denver,	Colorado.
Davis, Gilbert L.	Denver,	Colorado.
Deems, Mark	ColoradoSprings,	Colorado.
Glenn, Fred.	Golden,	Colorado.
Grant, Lester S.	Manitou,	Colorado.
Hodgson, Arthur	Aspen,	Colorado.
Hoyt, Willis J.	Denver,	Colorado.
Johnson, Gilbert, Jr.	Denver,	Colorado.
Kelley, Fred. G.	Grand Island,	Nebraska.
Kerr, Victor E.	Golden,	Colorado.
Malmstrom, Clarence C.	Denver,	Colorado.
Muir, David, Jr.	Rock Springs,	Wyoming.
Platt, Edwin H.	Denver,	Colorado.
Rising, Arthur F.	Williamsburg,	Mass.
Robey, Lloyd	Villa Park,	Colorado.
Royer, John L.	Berkeley,	Colorado.
Rudd, Arthur H.	Chicago,	Illinois.
Slater, Amos	Denver,	Colorado.
Steinhauer, Fred. C.	Denver,	Colorado.
Thompson, Jas. S.	Denver,	Colorado.
Tyler, Sidney B.	Denver,	Colorado.
Waltman, Will D.	ColoradoSprings,	Colorado.
Weiss, Andrew	Wels,	Austria.
Williams, Wakeley A.	Socorro,	New Mexico.

FRESHMEN.

Ames, Hugh S.	Highlands,	Colorado.
Andrews, Stephen	Como,	Colorado.
Ball, Louis R.	Dayton,	Ohio.
Barnes, David	Loveland,	Colorado.
Berrey, Max L.	Colorado Springs,	Colorado.
Bible, Harry	Denver,	Colorado.
Bowie, Alexander	Gallup,	New Mexico.
Brown, Archie D.	Ouray,	Colorado.
Bruce, Harry F.	Kansas City,	Kansas.
Bruce, James L.	Cripple Creek,	Colorado.
Campbell, Brayton	Denver,	Colorado.
Carter, Frederick T.	West Woolwich,	Maine.
Cary, John W.	Denver,	Colorado.
Connor, Naeisi	New York,	New York.
Corry, Clarence H.	Butte,	Montana.
Coulter, Lloyd B.	Pueblo,	Colorado.
Crowe, George F.	Cascade,	Colorado.
Crowe, William J.	Pueblo,	Colorado.
Drescher, Frank M.	Denver,	Colorado.
Elkins, John T.	Kansas City,	Missouri.
Ellis, Chas. W.	Aspen,	Colorado.
Evans, Harry R.	Jamestown,	Colorado.
Ewing, Charles Roberts	Del Norte,	Colorado.
Farish, William A., Jr.	Denver,	Colorado.
Finnerty, Thomas T. J.	Denver,	Colorado.
Frizzell, James A.	Manitou,	Colorado.
Garretson, William L.	Topeka,	Kansas.
Giddings, Donald S.	Denver,	Colorado.
Goody, Frank D.	Denver,	Colorado.
Gwynn, Guy	Alma,	Colorado.
Hahn, Alexander T.	Pueblo,	Colorado
Harrington, Daniel	Brighton,	Colorado.
Hayes, Annis C.	Denver,	Colorado.

FRESHMEN—Continued.

Hill, William H.	Trinidad,	Colorado.
Hippen, William	Pekin,	Illinois.
Johnston, John, Jr.	Chicago,	Illinois.
Jones, Fred.	Trinidad,	Colorado.
Keene, Claude E.	W. New Brighton,	N. Y.
Leiter, James W.	Leitersburg,	Maryland.
Lemke, Carl	Del Norte,	Colorado.
Lucy, Allen	Denver,	Colorado.
McConnell, John G.	Chicago,	Illinois.
McDaniel, Alexander K.	Cañon City,	Colorado.
McLean, Walter D.	Deadwood,	South Dakota.
Millard, Frank	Colorado Springs,	Colorado.
Miller, Frank C.	Denver,	Colorado.
Moynahan, A. Edwin	Alma,	Colorado.
Nichols, Ira B.	Express,	Oregon.
Nicolson, George W.	Idaho Springs,	Colorado.
Offutt, James H.	Greensburg,	Pennsylvania.
Olshausen, John A.	El Paso,	Texas.
Pearce, Herbert B.	Denver,	Colorado.
Pendery, John M.	Leadville,	Colorado.
Pinkney, Fred. C.	Denver,	Colorado.
Price, Lyttleton, Jr.	Hailey,	Idaho.
Prout, John	Golden,	Colorado.
Rayner, Beulah	Cleveland,	Ohio.
Rockwell, Frank E.	Junction City,	Kansas.
Schuler, Otto	Alcott,	Colorado.
Simonton, Will G.	Huntington,	Pennsylvania.
Smith, Claude H.	Chicago,	Illinois.
Smith, Wilbur F.	Monticello,	Iowa.
Songer, Fred. E.	Berkeley,	Colorado.
Steele, James H.	Denver,	Colorado.
Ulrich, Karl F.	Idaho Springs,	Colorado.
Wier, Claude E.	Santa Cruz,	California.
Woodhall, George	Denver,	Colorado.

Malmstrom
Picotte
Roby

SUMMARY.

Post Graduates	3
Seniors	25
Juniors	33
Sophomores	33
Freshmen	67
Total	161

SUMMARY BY STATES AND COUNTRIES.

Colorado	113	Iowa	1
Illinois	9	Maine	1
Kansas	3	Maryland	1
Montana	3	Massachusetts	1
Ohio	3	Missouri	1
Nebraska	2	New Jersey	1
New Mexico	2	Oregon	1
New York	2	South Dakota	1
Pennsylvania	2	Virginia	1
Texas	2	West Virginia	1
Wisconsin	2	Wyoming	1
California	1	Mexico	2
Connecticut	1	Austria	1
Idaho	1	Cuba	1

(Colorado, seventy per cent.; all others, thirty per cent.)

GRADUATES, JUNE, 1896.

Atkinson, Walter J.	(C. E.)	White,	South Dakota.
Barensheer, Wm. J.	(E. M.)	Denver,	Colorado.
Barnes, Corrin	(E. M.)	Jefferson County,	Colorado.
Beeler, Henry C.	(E. M.)	Denver,	Colorado.
Dwelle, Jesse E.	(E. M.)	Denver,	Colorado.
Griswold, Geo. G.	(B. S.)	Denver,	Colorado.
Hoyt, Geo. F.	(B. S.)	El Modena,	California.
Maynard, Rea E.	(E. M.)	Los Angeles,	California.
Mitchell, Geo. B.	(C. E.)	Denver,	Colorado.
Milliken, John T.	(E. M.)	Coal Creek,	Colorado.
Nance, Wm. H.	(E. M.)	Denver,	Colorado.
Newnam, Wm. E.	(B. S.)	Denver,	Colorado.
Paul, Wm. H.	(E. M.)	Denver,	Colorado.
Strout, Fred. McL.	(E. M.)	Ouray,	Colorado.

HISTORY AND ORGANIZATION.

The School of Mines of the State of Colorado was established by Act of the Territorial Legislative Assembly, approved February 9th, 1874.

Its first location was about one mile south of the City of Golden, where it occupied a rented building, and where its support was so slight that it was soon seen that removal to a better site, and the erection of a building for its exclusive use were conditions without which it could not hope to survive.

An appropriation was granted by the General Assembly, and lots were given by citizens of Golden on which to erect the building. No land, however, was then or has ever been granted by the State, so that subsequent additions have been made from the current income of the institution.

The building thus provided for was erected in 1880. It was, however, even for that time quite too small for any organized work to be carried forward in it, a fact evidently apparent to the next legislature, as an additional grant was made in 1881, and the building was enlarged so as to include space for laboratories, a few small rooms for lectures, and a larger hall for museum and other purposes. This building still forms a part of the group now occupied by the school, though much of the work has been transferred to the later additions to be mentioned.

The school now began to grow in numbers, but from 1886 to 1889 its growth was merely nominal, so far as the roll of students was concerned, though the standard of instruction was being constantly raised.

In fact, the space at its disposal during this period did not permit any expansion. Fifty was the average number of students, and more would have unduly crowded it. It was finally decided by the trustees to erect an important addition from the current income, which at that time was one-fifth of one mill of the State tax.

This addition was first occupied in the fall of 1890. It is described under "Buildings" in the present catalogue. With its erection the elimination of the "special" courses, hitherto the bar to progress in the development of either practical or theoretical lines, was begun. It is significant of the rapid rise in the educational demand of the State, that the prediction was very freely made at the time, that this abolition of partial and "optional" courses would materially reduce the number of students. However, in two years the number increased 100 per cent., and a number of former partial students returned to take advantage of the full course now offered.

Although the course adopted in thus drawing from the current funds to erect permanent and expensive improvements, was the only possible policy, and while it resulted in raising the efficiency of the institution in a marked degree, the strain upon its resources was very great, and the reduction of income from a fifth to a sixth of a mill, before the debt on this addition was cleared, still further obstructed all plans for proper equipment. Nevertheless, the close of the year 1892 found the school fairly in sight of freedom from debt. Meantime the rapid increase in numbers, and the no less marked advance in the demands made upon the management for the most modern methods, especially for electrical instruction, necessitated a still further addition to the "plant," and the Assembly of 1893 granted $20,000 for that purpose. With every effort on the part of the Trustees to hold the plans within that figure, it was found it would require almost exactly the sum originally asked for ($25,000) to complete the new edifice, without fatal hampering of its proposed uses. The building was first occupied in the fall of 1894, and may be fairly considered the best, though by no means the largest of the buildings.

The removal of three departments to the new building allowed a re-arrangement not only radical in its great advance in convenience, but providing for future expansion in numbers, a consideration of no small importance. This provision, however, was no more than has been proven necessary, the class of 1900, just entered, being fully up in numbers to its maximum possibility, with the present accommodations. The space needed in a technical school is necessarily far greater than in any other, proportionately to the number of students, since each and every student must be provided in addition to space in the lecture room, with laboratory, draughting room, physical testing and mechanical working spaces, the practical work absorbing far more space than that needed for all the lectures and recitations.

The organization of the School of Mines of Colorado is set forth in the pages following. It resembles that of the best technical schools of the United States, and the institution is now in fact what it has long been in intent, a "School of Applied Science," with the weight of instruction thrown to every branch having a more or less direct bearing upon mining and metallurgy.

With far greater confidence than ever before, the authorities of the institution now present its claims as a technical school of the first rank. They feel that with its many graduates occupying positions demanding responsibility and skill, it has fully passed its experimental stage, but they are very far from asserting that nothing remains to be done, and so far as future means will permit it is their intention that every department shall continue to meet the ever growing demands of the industries of the State and of practical science.

LOCATION.

The institution is located at Golden, sixteen miles west of Denver, on the Colorado Central Railroad, or thirteen miles by the Denver, Lakewood & Golden Railroad. It is at an altitude of 5,700 feet above sea level, and very close to the first foot-hills of the Rocky Mountains.

No place in Colorado has a better health record than Golden. The climate is invigorating and pleasant, with open winters and a large proportion of clear days.

The surrounding region is rich in illustrations of the geological formations of various ages, affording abundant opportunities for practical instruction as well as exercise.

Cheap commutation rates are given to students who desire to reside in Denver while pursuing their course in the school. It is recommended, however, to all students, to reside in Golden, the time taken by daily transit being a severe strain upon the demands of the course.

EXPENSES.

Tuition is free. Students are charged with material consumed or broken. Students in Assaying and Analytical Chemistry pay fifteen dollars ($15.00) per term for fuel, gas and ordinary chemicals. Expensive chemicals are charged as used.

A deposit of ten dollars ($10.00) is required of each student in qualitative analysis, and twenty dollars ($20.00) of each student in quantitative analysis, at the opening of his course. These amounts being credited, the student is charged with apparatus taken out for use, and again credited with all that he returns in good condition at the close of the year or term. Balance to his credit, if any, is then returned to him in cash. An additional deposit may be required at any time, if the apparatus called for is unusual or excessive.

Ten dollars ($10.00) a year is added to the bill of students in Surveying and Electrical Engineering, for the use and wear of instruments.

Members of the students' "Athletic Association" pay a fee of one dollar a term, which is reserved for the renewal and repair of gymnasium apparatus. A small deposit is required on keys issued to students for lockers and drawers. This is refunded upon return of the keys.

Each student also deposits a "damage fee," the amount of which is fixed by the Faculty. It has not hitherto exceeded two dollars per annum. From this fund, repairs necessitated by willful damage are paid for.

All fees and charges are payable in advance to the Registrar, whose receipt must be shown before any desk can be occupied.

Board and suitable accommodation can be obtained in Golden for from five to seven dollars a week.

It is estimated that the total expense of the school year, fees included, need not in any case exceed three hundred and fifty dollars ($350.00). Many students, however, have come very far within these figures by special arrangements and "clubbing," so that it is hardly practicable to name a minimum figure.

REQUIREMENTS FOR ADMISSION.

Candidates for admission must be at least seventeen years of age. They must sustain a satisfactory examination in English Composition, Geography, Arithmetic, and in the first elements of Algebra and Geometry.

In Arithmetic they must be ready in the use of decimals, and in "Ratio and Proportion."

In Algebra the fundamental operations, also factoring, fractions, and equations of the first degree, as in Wentworth's "Complete" Algebra, or an equivalent.

In Geometry the first three books of any standard text, i. e., triangles, etc., first book on the circle, ratio and similar figures.

The very slight requirement in Geometry indicates that it is not what the candidate has "gone over," but his appreciation of geometric reasoning that is regarded.

Thoroughness in the elements is far better preparation than the imperfect knowledge of a whole text-book.

Candidates for advanced standing will be examined upon all the studies of the course below the class they propose to enter, as well as upon the subjects required for admission.

June examinations for admission having now been instituted. candidates are recommended to attend at the earlier date. Any deficiency then discovered can usually be made good before the Fall term.

Certificates of proficiency from approved High Schools are received in lieu of examination for admission to the Freshman class. *The faculty reserves the right, however, to examine for admission to any higher standing than the first or Fall term of the Freshman year, irrespective of the certificate brought from another institution.*

COURSES AND DEGREES.

There are three full courses of study, viz: Civil Engineering, Mining and Metallurgical Engineering, and Electrical Engineering.

Each covers a period of four years. The studies, however, are identical during the first year of all courses, beginning to diverge at the opening of the second year.

The degrees given are:

Civil Engineering (C. E.)
Engineer of Mines and Metallurgy (E. M.)
Electrical Engineer (E. E.)

Students will not be admitted to the fourth year as applicants for the degree of "C. E." unless they have shown very marked ability in Mathematics. They must also have been connected with some survey or other active field operation in engineering lines, during one of the vacations of their course.

No special or partial students are admitted, except as Post Graduates.

There are no special *courses*. Post Graduate students attend lectures or practical work with regular classes, and are "specials" only in the sense that they may omit certain lines and are not confined to the course of any one class.

Fire Assaying is excluded from these "special" or partial Post Graduate courses.

EXAMINATIONS.

Regular examinations, which all students are required to attend, are held at the end of each term, on the various subjects pursued during the term. Upon the completion of any branch of study, the student will be subjected to a rigid examination upon the whole subject.

A student failing in more than two subjects at the June examination must repeat the year. A complete failure in one or two branches may subject him to the same condition. If conditioned in one or two branches the condition must be made up prior to the opening of the ensuing Fall term, at any regular examination date, i. e., in June or September, as announced in the catalogue.

A student failing in term examination (December or April), or debarred from same by absences, may, at the discretion of the Faculty, be excluded from the course.

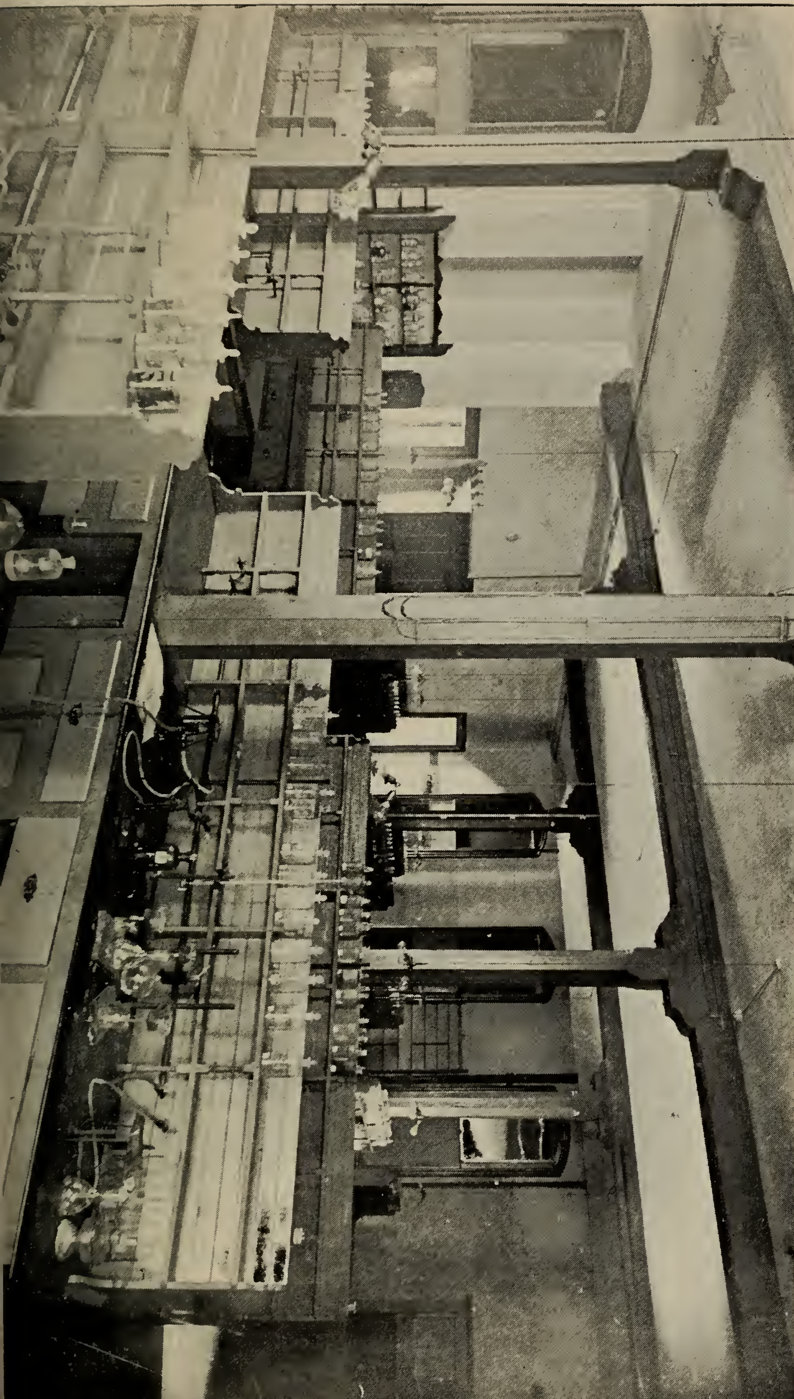
The attempt of any student to present as his own, the work of another, or to pass any examination by improper means, will render him liable to expulsion.

Absence from examinations, whether from illness or from any other cause, can be excused only upon presentation of satisfactory reasons to the President of the Faculty.

No student can present himself for examination in any subject who has not attended at least eighty per cent. of the lectures or other exercises on that subject. No re-examinations will be allowed except by special vote of the Faculty.

Students failing to attend examinations for the removal of conditions cannot be re-examined, but must repeat the year.

No student can enter the Senior class "conditioned."



MEMOIRS AND THESES.

Each student is required, during the summer vacation preceding his senior year, to execute a memoir on some subject assigned by the Faculty. The subject is chosen with direct reference to the practical end the student has in view in his course of study.

Careful inspection of mines, metallurgical works, etc., furnishes the student material from which to make his estimates and calculations. These memoirs and accompanying drawings must be completed and handed to the Faculty for acceptance on or before December 1st.

At the end of the third year the student is also assigned a subject for a graduating thesis. Such data are given as would be met with in practical experience. When completed, the thesis is presented to the Faculty for approval. It must be handed in on or before April 1st.

All memoirs, theses and drawings which constitute any regular part of the school work, may be retained by the institution, and preserved as a part of the permanent record of the student who executed them.

An important part of the work consists in visiting mines, smelters, power plants and other works where the processes lectured upon may be seen in actual operation. Short trips of this description are frequent, while once a year a longer one is arranged, usually to some important mining section.

Expeditions of this kind afford abundant opportunities for the student to collect material suitable for memoirs and theses.

SCHEDULE OF STUDIES.

FRESHMAN YEAR.

FOR ALL COURSES.

FIRST TERM.

Algebra, (Wentworth's "Higher") ------5 hours a week.
Geometry, (Chauvenet's) --------------2 hours a week.
General Chemistry, (Richter's) ---------4 hours a week.
Descriptive Geometry, (Church's) -------2 hours a week.
Descriptive Drawing-----------------6 hours a week.
Mechanical Drawing-----------------9 hours a week.

SECOND TERM.

Plane Trigonometry, (Chauvenet's) ------3 hours a week.
Geometry--------------------------2 hours a week.
Algebra ---------------------------3 hours a week.
General Chemistry ------------------4 hours a week.
Descriptive Geometry----------------2 hours a week.
Descriptive Drawing-----------------6 hours a week.
Qualitative Analysis ----------------12 hours a week.

COURSE IN MINING AND METALLURGY.

SOPHOMORE YEAR.

FIRST TERM.

Algebra	3 hours a week.
Analytical Geometry	2 hours a week.
Mineralogy	5 hours a week.
Physics	4 hours a week.
Physical Laboratory	2 hours a week.
Mechanism	1 hour a week.
Chemical Analysis	1 hour a week.
Quantitative Analysis	12 hours a week.
Mechanical Drawing	4 hours a week.

SECOND TERM.

Calculus	3 hours a week.
Analytical Geometry	2 hours a week.
Mineralogy	8 hours a week.
Physics	4 hours a week.
Physical Laboratory	2 hours a week.
Quantitative Analysis and Fire Assaying	8 hours a week.
Mechanical Drawing	3 hours a week.
Mechanism	1 hour a week.

COURSE IN MINING AND METALLURGY.

JUNIOR YEAR.

FIRST TERM.

Geology	3 hours a week.
Calculus	5 hours a week.
Statics	2 hours a week.
Surveying	3 hours a week.
Surveying, (Field Work)	9 hours a week.
Metallurgy	3 hours a week.
Machine Design	2 hours a week.
Machine Design, (Drawing)	8 hours a week.

SECOND TERM.

Geology	3 hours a week.
Dynamics	4 hours a week.
English	1 hour a week.
Metallurgy	3 hours a week.
Surveying	2 hours a week.
Surveying, (Field Work)	9 hours a week.
Graphics	2 hours a week.
Graphics, (Drawing)	3 hours a week.

COURSE IN MINING AND METALLURGY.

SENIOR YEAR.

FIRST TERM.

Metallurgy	4 hours a week.
Mining	2 hours a week.
Hydraulics	4 hours a week.
Technical Chemistry	2 hours a week.
Strength of Materials	2 hours a week.
Masonry Construction	1 hour a week.
Theory of Construction	2 hours a week.
Theory of Construction Drawing	2 hours a week.
Hydraulic Laboratory	2 hours a week.
Testing Laboratory	2 hours a week.

SECOND TERM.

Metallurgy	4 hours a week.
Mining	2 hours a week.
Power Transmission	4 hours a week.
Technical Chemistry	2 hours a week.
Steam Engine Laboratory	2 hours a week.

Thesis Work.

COURSE IN CIVIL ENGINEERING.

SOPHOMORE YEAR.

FIRST TERM.

Algebra	3 hours a week.
Analytical Geometry	2 hours a week.
Physics	4 hours a week.
Physical Laboratory	2 hours a week.
Mechanism	1 hour a week.
Mineralogy	5 hours a week.
Shop Work	3 hours a week.
Mechanical Drawing	10 hours a week.

SECOND TERM.

Calculus	3 hours a week.
Analytical Geometry	2 hours a week.
Physics	4 hours a week.
Physical Laboratory	2 hours a week.
Mechanism	1 hour a week.
Mineralogy	5 hours a week.
Shop Work	3 hours a week.
Mechanical Drawing	6 hours a week.

COURSE IN CIVIL ENGINEERING.

JUNIOR YEAR.

FIRST TERM.

Calculus ---------------------------------5 hours a week.
Statics ----------------------------------2 hours a week.
Surveying --------------------------------3 hours a week.
Strength of Materials --------------------3 hours a week.
Machine Design ---------------------------2 hours a week.
Machine Design, (Drawing) ----------------6 hours a week.
Surveying, (Field Work) ------------------9 hours a week.
Structural Drawing -----------------------3 hours a week.

SECOND TERM.

Applications of the Method of Least Squares ---------------------------2 hours a week.
Dynamics ---------------------------------4 hours a week.
Geology ----------------------------------3 hours a week.
Surveying --------------------------------2 hours a week.
Framed Structures, treated analytically and graphically ----------------------3 hours a week.
Surveying, (Field Work) ------------------9 hours a week.
Masonry Structures, (Lectures and Designing) ----------------------6 hours a week.

COURSE IN CIVIL ENGINEERING.

SENIOR YEAR.

FIRST TERM.

Framed Structures, (Complete Designs of Bridges and Roofs)	5 hours a week.
Hydraulics	4 hours a week.
Railroad Surveying and Economics	3 hours a week.
Hydraulic Laboratory	3 hours a week.
Testing Laboratory	3 hours a week.
Designing	9 hours a week.

SECOND TERM.

Water Supply and Sanitary Engineering	5 hours a week.
Steam Engine and Power Transmission	4 hours a week.
Irrigation Engineering	3 hours a week.
Steam Engine Laboratory	2 hours a week.
Designing	6 hours a week.

Thesis Work.

COURSE IN ELECTRICAL ENGINEERING.

SOPHOMORE YEAR.

FIRST TERM.

Algebra	3 hours a week.
Analytical Geometry	2 hours a week.
Physics	4 hours a week.
Physical Laboratory	4 hours a week.
Mechanism	2 hours a week.
Chemical Analysis	1 hour a week.
Quantitative Analysis	12 hours a week.
Drawing	6 hours a week.

SECOND TERM.

Calculus	3 hours a week.
Analytical Geometry	2 hours a week.
Physics	4 hours a week.
Physical Laboratory	4 hours a week.
Mechanism	2 hours a week.
Drawing	9 hours a week.
Shop Work	6 hours a week.

COURSE IN ELECTRICAL ENGINEERING.

JUNIOR YEAR.

FIRST TERM.

Dynamo Machinery	4 hours a week.
Dynamo Laboratory	8 hours a week.
Calculus	5 hours a week.
Statics	2 hours a week.
Strength of Materials	2 hours a week.
Masonry Construction	1 hour a week.
Machine Design	2 hours a week.
Machine Design, (Drawing)	8 hours a week.
Electrical Measurements	4 hours a week.
Testing Laboratory	2 hours a week.

SECOND TERM.

Dynamo Machinery	4 hours a week.
Dynamo Laboratory	8 hours a week.
Dynamics	4 hours a week.
English	1 hour a week.
Batteries	2 hours a week.
Applications of the Method of Least Squares	2 hours a week.
Electrical Design	3 hours a week.
Electrical Measurements	6 hours a week.

COURSE IN ELECTRICAL ENGINEERING.

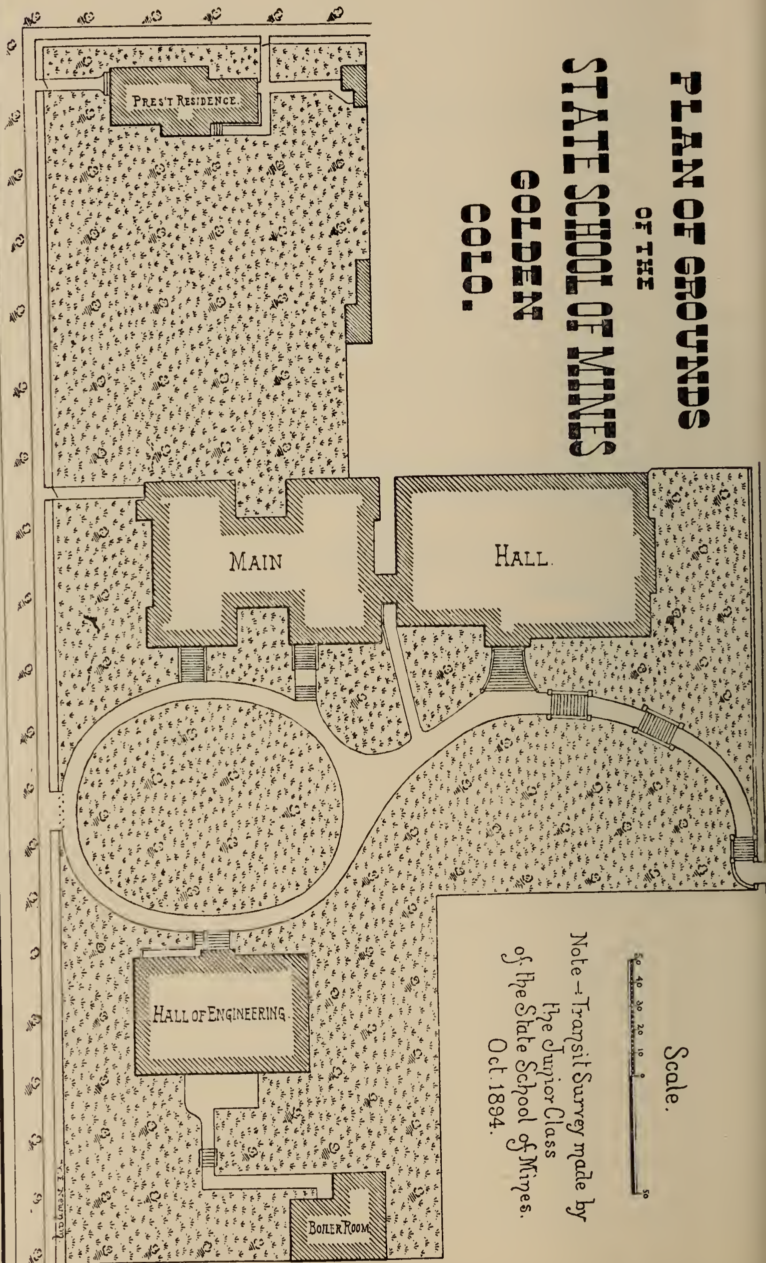
SENIOR YEAR.

FIRST TERM.

Hydraulics ----------------------------4 hours a week.
Transformers and Alternating Currents--5 hours a week.
Dynamo Laboratory -------------------8 hours a week.
Electrical Design----------------------6 hours a week.
Photometry and Electric Lighting-------2 hours a week.
Laboratory Work in Photometry--------3 hours a week.

SECOND TERM.

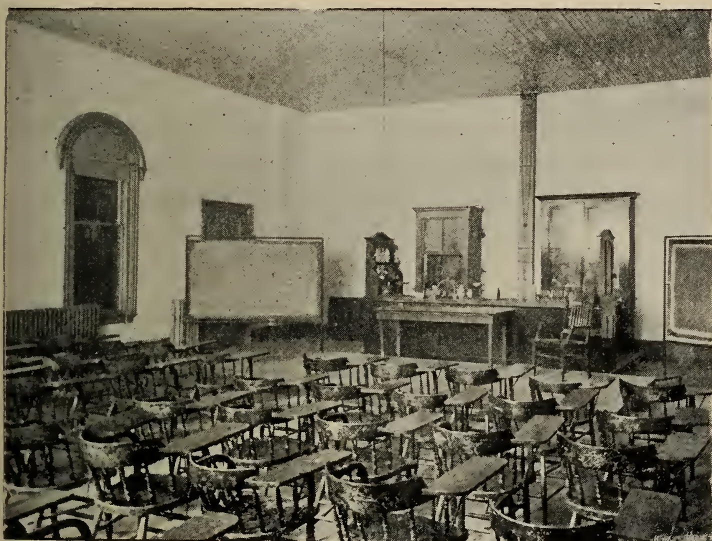
Power Transmission ------------------4 hours a week.
Electrical Transmission----------------3 hours a week.
Steam Engine Laboratory--------------3 hours a week.
Electrical Design----------------------6 hours a week.
Thesis Work ------------------------15 hours a week.


PLAN OF GROUNDS
OF THE
STATE SCHOOL OF MINES
GOLDEN
COLO.
PRES'T RESIDENCE.
MAIN
HALL.
HALL OF ENGINEERING.
BOILER ROOM
Scale.
Note — Transit Survey made by
the Junior Class
of the State School of Mines.
Oct. 1894.

DEPARTMENTS OF INSTRUCTION.

CHEMISTRY.

A large amount of time is devoted to Chemistry, general, analytical and applied.



CHEMICAL LECTURE ROOM.

Theoretical and Experimental Chemistry are taught during the first year. The course includes what is known as "general" Chemistry, its principles and nomenclature, and the use of symbols and equations to express them.

Lectures in Theoretical and Applied Chemistry begin in the Junior year, and continue during the Senior year. The lectures upon chemical theory are of a more advanced character than those in the course in "general" Chemistry.

Instruction in Analytical Chemistry begins with the second term of the first year. In this, and in the first term of the second year, qualitative analysis is pursued, the course including the reactions of the bases and acids, separation and identification of all the ordinary elements, and analysis of simple and complex compounds, ores, industrial products, slags and mattes.

The work is supplemented by lectures, in which the student is taught the theory of chemical equations, and details of manipulation. The laboratory is open every afternoon in the week except Saturday.

Instruction in Quantitative Analysis is given during the second year. The course includes the analysis of a number of salts of definite chemical composition; the gravimetric determinations of iron, copper, zinc, lead and other metals from their ores; the complete analysis of limestones, clays, slags, building stones, and of various types of ores.

Assaying (wet and fire methods), commences with the rapid volumetric methods used in the west, for the valuation of ores and furnace products, and includes the analysis of slag, coal and cokes, and general commercial work, followed by the course in fire assaying.

The principles underlying the fluxing of ores are first taught, followed by the application of these principles to typical ores, siliceous, calcareous, barytic and pyritic, etc. This is succeeded by a large amount of practice on checked samples, obtained from the various mills and smelters.

After attaining sufficient expertness, the student is given various furnace products, copper mattes, base bullion, doré bars, and black copper, which usually, even to experienced assayers, are exceedingly troublesome.

In the Fire Assay course, large numbers of samples are given for examination. It is believed, indeed, that no technic school in the country exacts such an amount of actual practice from its students as is here insisted upon before the student is pronounced fit for a practical assayer. Not less than fifty assays for copper, and several hundred for silver and gold, with very numerous cases for other metals, are required of every student. The best proof of the success of the institution in this direction is the fact that no term passes without application being made to it for assayers or chemists.

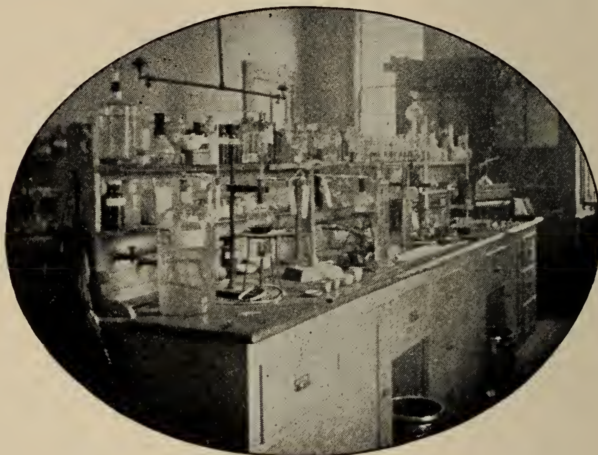
From smelting works and other establishments in the State, the school has secured very great numbers of well-checked samples, and may claim to be far more than usually well supplied with material for assays and analyses. Students are required to "check" with the results obtained by experienced workers, and that, too, with certainty and rapidity, before they can pass out of this department.

Each student receives individual instruction in the laboratory. If his progress exceeds that of his classmates, he may be promoted to a higher class of work, provided same does not interfere with the regular schedule of laboratory terms.

There are four laboratories for general chemical work, and two for fire assaying. The whole of the first floor of the old building is now devoted to practical chemistry, and much of the basement and second floor. There are two balance rooms, private laboratory and still room. The general laboratories are fitted with working desks, each student having the exclusive use of one, in which he keeps (under lock) the apparatus he has drawn from the school. The laboratory is furnished with gas (manufactured on the premises), and with sinks, hoods and all other necessary adjuncts. Apparatus is issued as called for, by the Registrar. (See "Expenses.")

No fee for chemicals less than that for a whole term can be accepted. Students are strictly prohibited from taking analyses or assays on their own account, whether for a fee or gratuitously. All work, of whatever description, performed by laboratory students must be at the suggestion and under the direction of the Professors of Chemistry.

Attendance in the laboratory on all days scheduled is as obligatory as that upon lectures or other exercises.



STOICHIOMETRY.

This subject is taught by lectures and recitations, with numerous exercises in calculation. It is not wholly confined to chemical calculation, but includes physical and metallurgical features.

The lectures begin with the second term of the first year, and end with the year. An advanced course, having reference mainly to slag calculations, and introductory to third year work in Metallurgy, is taken in the second term of the second year.

The entire course includes the metric system, specific gravity determinations, density and tension of gases, calculation of formulæ and analyses, slag calculations, and generally, all applications of elementary mathematics to chemical and metallurgical problems.

METALLURGY.

The study of Metallurgy begins with the Junior year, and continues through the remainder of the school course, the work being arranged as follows:

JUNIOR YEAR.

The general principles of Metallurgy, including the properties and thermal treatment of metals, the metallurgy of alloys, bronzes, brasses, etc., fuels, fluxes and the calculation of furnace charges, the general study and classification of furnaces and metallurgical processes.

Text-book, "Introduction to Metallurgy." Roberts-Austen.

Solid, Liquid and Gaseous Fuels—Their manufacture and use, principles and methods of combustion. The principles of furnace design and construction, draft, (natural and artificial,) chimneys, blast machinery, hot-blast stoves, etc. Refractory materials, acid neutral and basic, fire-clays, crucibles.

Ore Dressing and Concentration—The principles of concentration machinery and appliances. The selection and arrangement of machinery and the designing of concentrating mills.

Text-book, "The Art of Ore Dressing in Europe." W. B. Kunhardt.

The Metallurgy of Iron and Steel—Direct methods, blast-furnace practice, the manufacture of wrought iron, manufacture of steel by Bessemer, open hearth and other processes.

The Metallurgy of Antimony, Bismuth, Mercury, Nickel, Arsenic and Platinum.

Metallurgy of Tin, Zinc and Aluminum.

Copper Smelting and Refining, with the treatment of gold and silver ores by matte smelting.

Text-book, "Modern American Methods of Copper Smelting." E. D. Peters.

SENIOR YEAR.

Lead Smelting and Refining as applied to the treatment of gold and silver ores.

Text-book, "The Metallurgy of Lead." H. O. Hofman.

Metallurgy of Silver—Free milling, chloridizing, roasting and amalgamation, the treatment of silver ore by wet processes.

Text-book, "Metallurgy of Silver." M. Eissler.

Metallurgy of Gold—Free milling, combination processes, the treatment of gold ores by wet processes, chlorination, and the cyanide process.

Text-book, Rose's "Metallurgy of Gold."

Ore Sampling and Ore Buying—The selection of metallurgical processes, designing of metallurgical plants, practical problems.

Graduating Theses—The student is required to select the best method of treating the ore from some mine or district, and to make working drawings and specifications for the construction of a plant.

The course of Metallurgy as outlined above is taught by class-room lectures, aided by the study of the best works on the principal subjects, these works being used as text-books by the student. The school has the advantage of a remarkable collection of models from the workshop of Theodore Gersdorf, Freiberg, Saxony, illustrating the principal types of modern furnaces in this country and Europe.

Each model is made to a scale from the working drawings, and is complete in every detail. The following furnaces are represented in this collection:

Long hearth roasting furnace, for silver, lead and copper ores.

American lead-silver furnace, as used in Colorado smelters.

Round silver-lead furnace, as used in Germany and in Utah.

Small round silver-lead furnace, of type used with scant water supply.

Complete "plant" for refining "base bullion," including the following models:

Softening furnace in Parks' process, as used at Pueblo, Kansas City, St. Louis, etc.

Zinc pots as used in same.

Sweating furnace as used in same.

Lead pots as used in same.

Concentration cupel for making silver bullion.

Refining cupel for making fine silver.

Belgian zinc furnace, as used in Missouri, New Jersey, and Belgium.

Silesian zinc furnace, as used in parts of Europe.

Silver amalgamation pan (working model), as used in United States.

Copper reverberatory furnace, as used in Montana, Colorado, etc.

Gerstenhofer roasting furnace for fine copper and iron sulphides.

Tin blast furnace, as used in Saxony.

Bismuth smelting furnace, as used in Germany.

Large mercury furnace, as used in Almaden, Spain.

Fume furnace for making lead and zinc paints.

A handsome addition to these models is due to the liberality of Mr. John W. Nesmith, President of the Colorado Iron Works. It includes:

1. Working model of twenty-stamp mill, on scale of one and one-half inches to the foot.

2. Working model of ore rolls, same scale.

3. Model of modern blast furnace for lead-silver ores, with water jacket.

In addition to the above there is a large number of smaller models, being the complete set used in the famous Keyes and Arents lead-well suit.

In Colorado students have unusual opportunities for the practical study of metallurgical operations on a large scale. Denver is not only the mining center of the United States, but the business of treating silver and gold ores by lead smelting is carried on by large plants in Denver and Pueblo, on a scale unequaled in any other part of the world. In both cities large matte smelting plants, representing the most advanced methods in the art of metallurgy, are in operation for the treatment of gold and silver by this process.

In the State, within easy reach of students, metallurgical and mining work of every description is in active operation:

Coal mining, coke and charcoal manufacture.

Brick and tile works.

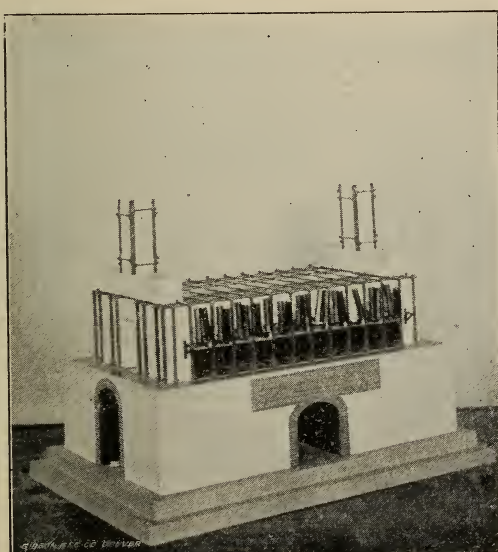
Iron blast furnaces, and Bessemer steel works.

Gold, silver and lead mining, gold placer mining, smelting processes of all kinds. Gold milling, concentration milling, silver chloridizing, lixiviation milling, wet processes for gold, ore sampling works, iron foundries and machine shops, with manufacturing establishments in great variety.

In the course of study, special attention is paid to those branches of Metallurgy now applied to Western ores, but the important fact is always kept in view that under the commercial conditions of the United States, a successful career is best assured to students by giving them a thorough training in all departments of Metallurgy. A student can never be certain in what line of metallurgical or mining work he will be occupied, since this usually depends upon the chances of his business career. It is therefore intended that the students shall leave their studies thoroughly qualified to undertake whatever kind of mining or metallurgical work they may find to do in after life.

The lectures throughout are richly illustrated by lantern exhibits of plans, views and designs of metallurgical appliances.

A fine collection of ores and economic products has been added to the department during the past year, and is used in both the Metallurgical and Mining courses.



MINING.

The students are taught the best methods of Mining as they have been developed in various parts of the world. Lectures on this subject are given during the entire Senior year, and include the following subjects:

Explosives and blasting. Hand and machine drilling.

Drills, Channellers, Quarry machinery, Coal cutters.

Air Compression, and the use of compressed air. Diamond Drill work. Deep boring by American drop-drill.

Methods of shaft sinking. Methods of driving tunnels, drifts, etc.

Hoisting machinery and hoisting methods. Surface works. Underground haulage and machinery. Surface transportation of ore and materials. Elevated and surface tramways, etc. Mine drainage and pumping machinery.

Ventilation and lighting of mines.

Mine timbering General methods of extracting and developing ore bodies.

Special Departments of mining work. Open air quarrying, Coal mining, Metal mining, Hydraulic gold mining. Details of special and typical mines.

The Costs of Mining.

Mining Laws of the United States.

Prospecting, Sampling mines. Expert examination of mines. Ore deposits.

Text-book, "Coal Mining." H. W. Hughes.

MATHEMATICS.

Euclidian Geometry, Algebra, Plane Trigonometry, and Descriptive Geometry are pursued during the first year.

In Geometry many problems not in the text are given, especially toward the close of the course. Much stress is laid upon clear comprehension of geometric reasoning, and upon ability to apply it to original solutions.

The student is made sufficiently familiar with determinants and special algebraic methods to make extensive use of them in Analytical Geometry and Calculus, which begin in the second year.

The problem of maxima and minima of analytical functions is treated in its widest sense, and, so far as the present theory of quantics allows, not only the necessary but also the sufficient conditions, are rigorously established in determinant form.

The course in the fourth year is subject to variation. It consists mainly of exercises and lectures in selected parts of Advanced Mathematics. In this way lectures on the following subjects have been delivered to students specially interested in pure mathematics:

Solution of the most general system of Algebraic Equations.

Introduction to Weirstrass' Theory of Analytic Functions.

Method of Least Squares.

Elliptic Functions.

Integration on Riemann's Surfaces.

Analytical Mechanics.

A full set of models is provided for instruction in Descriptive Geometry.

DEPARTMENT OF GEOLOGY AND MINERALOGY.

There is probably no technical school in the United States more favorably situated for the study of Geology and Mineralogy than is the Colorado State School of Mines.

GEOLOGICAL LECTURE ROOM.

Located immediately at the foot-hills west of Denver, there is ready access to an almost unsurpassed series of geological sections in which all the formations from the triassic up to the recent may be readily studied. In addition to this the crystalline schists of archæan are to be found exposed in great variety within a mile or two of the school, and the more recent volcanic rocks may be studied in the basalt and andesitic tufas of North and South Table Mountains, which form conspicuous features in the immediate landscape.

In the coal mines, stone quarries and fire-clay beds of the vicinity, there are excellent opportunities for the study of Economic Geology, while the paleontologist has a good field for study in the famous fossil leaf deposits of the cretaceous and tertiary formations to be seen almost at the very doors of the school.

A large variety of minerals may also be collected in the crystalline rocks of the neighboring foot-hills and in the cavities in the basalt flow capping both North and South Table Mountains.

In addition to these great natural advantages have been added very extensive geological and mineralogical collections which in number, variety, classification and value, far exceed any other collection to be found within the State of Colorado.

To the collections originally obtained by purchase from Ward & Howell of Rochester, New York, from J. Alden Smith, (formerly State Geologist,) from J. S. Randall of Georgetown, Colorado, and by gifts from various mines and individuals, has from year to year been added a large amount of material collected by the professor in charge and by others.

During the summer and fall of 1896 a very large amount of material has been collected in Colorado, Utah and Oregon, amounting in all to a gross weight of nearly two tons. About three thousand five hundred specimens have been added to the different collections, and the rest of the material is kept in reserve for purposes of exchange.

The department occupies at present three rooms.

First, museum; second, the lecture and working room; third, a room devoted to display of Colorado fossils.

In connection with the recent change of location, the collections have undergone a very thorough reorganization and rearrangement, necessitated by the large additions constantly being made. The various collections have been classified as follows:

First—A Type Collection, consisting of well characterized specimens to be used by the students for the purpose of study and comparison. This collection contains at present, specimens representing two hundred and seventeen species and sixty-one additional varieties. These specimens come from many countries, but Colorado minerals are specially well represented. The mineral species and varieties contained in this collection are given in a tabulated list to be found on pages 57–65.

Second—A Display Collection, mainly of large and fine specimens, to be found in the glass cases in the museum.

Third—A Supplementary Collection, containing the rarer and more expensive minerals not placed in one of the above mentioned collections.

Fourth—A Descriptive Collection, illustrative of the terms used in describing the various structural, physical, optical and other properties of minerals.

Fifth—A Student's Working Collection, consisting of several thousand unlabeled specimens, similar to those in the Type Collection, to be used by the student for study and determination.

Sixth—A Crystal Collection, consisting of natural crystals to be used in the determination of crystal forms.

Seventh—A Crystal Model Collection, containing a large number of glass and wooden models used in the study of Crystallography.

Eighth—A Blow-Pipe Collection, containing materials used in Blow-Piping.

Ninth—Rock Type Collection, containing (*a*) a collection of rocks from different countries of the world; (*b*) a series of Colorado rocks; (*c*) various rocks illustrative of structural features.

Tenth—*A Rock Working Collection*, containing miscellaneous, unlabeled rocks to be used by students in connection with the study of Lithology.

Eleventh—*A Collection of Fossils*, to be used in connection with the course in Historical Geology.

Twelfth—*Duplicates* of rocks, minerals and fossils, to be used for exchange with other institutions. See pages 66–68.

Thirteenth—*A Collection of Rocks* (the private property of Professor Patton), used in connection with the course in Lithology.

MUSEUM.

In this room is to be found the display collection arranged mainly in flat-top glass cases, of which there are twenty-one. As this room offers the greatest attraction for most visitors, a brief enumeration of their contents is here given. As the minerals in these cases are arranged purely for purposes of display, no thorough classification has been attempted. In some cases they have been arranged by localities and in others by mineral associations. In the list given below the cases are numbered consecutively, running around the walls from left to right, the cases in the center being given last.

Case 1—Light colored microcline, Florissant, Colorado.

Case 2—Green microcline or amazon stone, Florissant, Colorado.

Case 3—Smoky quartz, Florissant, Colorado.

Case 4—Varieties of crystallized quartz and chalcedony from various localities.

Case 5—Crystallized calcite and aragonite.

Case 6—Cerussite, rhodochrosite, smithsonite and wood opal, etc.

Case 7—Miscellaneous silicates, especially garnets from Salida, Colorado, and from Alaska; beryl from Bear Creek, Colorado; also calamine, tourmaline, etc.

Case 8—Choice specimens of crystallized galenite, sphalerite from Colorado localities, also other sulphides.

Case 9—Pink tourmaline in lepidolite from San Diego County, California, etc.

Case 10—Copper minerals from the Tintic Range, Utah.

Case 11—A fine display of opal and chalcedony from Ute Creek, Hinsdale County, Colorado.

Case 12—Azurite and malachite from Arizona (one very large and fine specimen of azurite); also selenite from Utah, Sicily and France; also conichalcite and brochantite.

Case 13—Miscellaneous minerals belonging to the private collection of Professor Patton.

Case 14—Apophyllite, chabazite and analcite from Table Mountain, Golden, Colorado.

Case 15—Thomsonite, mesolite, calcite, bole, etc., from Table Mountain, Golden, Colorado.

Case 16—A fine display of delicate, fibrous natrolite, from South Table Mountain, Golden, Colorado.

Case 17—Miscellaneous minerals, especially crystallized copper, fluorite, pyrite, etc.

Case 18—Casts of celebrated gold and platinum nuggets, dendrites, landscape marble, pyrophyllite, wavelite, pyroxene, chrysotile and realgar.

CASES IN CENTER OF ROOM.

Case 19—An open display of geodes, graphic granite, calcareous tufa, quartz, opal, chalcedony, contorted schists and veins, ripple marks, etc.

Case 20—Large glass case. First, cut gems; second, rough gems; third, native gold; fourth, native silver;

fifth, rare minerals, especially rich silver-bearing minerals e. g. proustite, stromeyerite, polybasite, freibergite, coselite, beegerite, chalcotrichite.

Case 21—Large glass case. First, crystallized sphalerite; second, a unique display of pyrite crystals from Gilpin County, Colorado; third, chalcopyrite, galenite, marcasite, boleite, azurite, goethite, johannite, chalcostibite, variscite, orpiment, pyrite; fourth, crystallized fluorite, amethyst, etc.; fifth, agate, Iceland spar, aragonite, also orthoclase crystals from Colorado.

Case 22—Large glass case. First, black and white mica; second, epidote, huebnerite, adamite, serpierite, barite, wulfenite, chalcanthite, fibroferrite, halotrichite, sulfoborite, kylindrite, caledonite; third, sixty-six specimens forming a rare display of tellurides of gold, silver, lead, etc., and of native tellurium, embracing tellurium, lionite, selen-tellurium, tetradymite, joseite, chilinite, auriferous hessite, petzite, hessite, altaite, coloradoite, sylvanite, calaverite, nagyagite, schirmerite, tellurite, roscoelite, auriferous selenide, tellur-pyrites, etc.; fourth, sulphur and celestite from Sicily.

On the tops of the cases of drawers in the lecture room are numerous large specimens of minerals, rocks and fossils among which are specially to be emphasized some large fossil palm stumps and palm leaves collected in the vicinity of Golden.

COURSE IN GEOLOGY.

This course is to begin, hereafter, with the Junior year and to continue throughout the year, extending, if necessary, into the Senior year. In addition to numerous excursions into the surrounding country, an average of three hours a week for one year is devoted to the subject. Special attention is paid to lithological, dynamical and structural geology, one term being devoted to the study of rocks alone. Lithological geology is taught by means of lectures, text-book and practical determinative work.

The Rock Type Collection, Rock Working Collection, and the other collections named on pages 50 and 51, come into constant use during this course, whose intent is to make of Geology a study of practical application in connection with mining and prospecting.

The surroundings are peculiarly adapted to further this intent. The vicinity of Golden is rich in rocks of various ages, including also many illustrations of Economic Geology. Building stone, clay, limestone and coal are mined or quarried within sight of the school, while the formations include the tertiary, cretaceous, jura-trias, archæan and eruptive rocks.

The remaining branches are taught by aid of a text-book (Le Conte's Elements of Geology) supplemented by lectures and excursions.

COURSE IN MINERALOGY.

Under this head are included Crystallography, Blow-Piping and Mineralogy proper.

The immediate object of this course is to give the student in a comparatively short time a thorough familiarity with the more commonly occurring minerals, i. e., with such as form the materials of rocks, or are likely to be met with in connection with mining operations.

It is quite possible so to train the powers of observation that, with the aid of a knife, a pocket lens and, perhaps, of one or two other simple accessories, which can easily be carried in the pocket, one can determine on the spot nine-tenths of the minerals he meets. In the study of minerals, therefore, attention is directed mainly to the physical properties, namely, to those that can be recognized by the aid of sight and touch.

The course in Mineralogy extends throughout the whole of the Sophomore year, five hours a week being devoted to this subject. The course opens with the study of Crystallography, which requires one-half of the first term. The remaining weeks of the term are devoted mainly to a short course in the use of the blow-pipe, in which only such reactions are studied as are likely to be made use of in determining minerals later in the year. Determinative Mineralogy is taken up about Christmas and extends throughout the rest of the school year.

Crystallography and Blow-Piping are taught by means of lectures and practical laboratory work. In Determinative Mineralogy, lectures are made to supplement the text-book used (Moses' and Parsons' Mineralogy, Crystallography and Blow-Pipe Analysis).

EXCHANGE MATERIAL.

The school has now on hand a considerable quantity of exchange material in the line of minerals, rocks and fossils, an itemized list of which will be found on pages 66–68. Any one wishing to arrange for a mutual exchange should communicate with Professor Horace B. Patton, Golden, Colorado, sending, if possible, a list of minerals, etc., offered in exchange.

SUMMARY OF COLLECTIONS WITH NUMBER OF SPECIMENS IN EACH.

Type Collection of Minerals	3,000
Working Collection of Minerals	12,600
Display Collection of Minerals	1,130
Supplementary Collection of Minerals	900
Crystal Collection	870
Display Collection of Fossils	260
Miscellaneous Collection of Fossils	920
Type Collection of Rocks	1,700
Working Collection of Rocks	4,200
Total Number of Specimens	25,580
Professor Patton's Collection of Rocks	1,600

MINERALS IN THE TYPE COLLECTION.

NOTE.—The minerals in this collection are arranged in accordance with the system adopted in the latest edition of Dana's System of Mineralogy. Each specimen has a double number; the first (the one given before the name of the mineral in this list) is Dana's species number, the second is the individual number of the specimen. Of the two numbers following the mineral name in this list, the first refers to the page in Moses' and Parsons' Mineralogy, the second to the drawer of the Type Collection.

I. NATIVE ELEMENTS.

I. AND II. NON-METALS AND SEMI-METALS.

1.	Diamond	(272.	Dr. 73.)
2.	Graphite	(273.	Dr. 73-74.)
3.	Sulphur	(268.	Dr. 74-75.)
7.	Tellurium	(270.	Dr. 75.)
8.	Arsenic	(190.	Dr. 75.)
9.	Allemontite	(	Dr. 75.)
10.	Antimony	(193.	Dr. 75.)
11.	Bismuth	(188.	Dr. 75.)

III. METALS.

13.	Gold	(222.	Dr. 76.)
14.	Silver	(214.	Dr. 76-77.)
15.	Copper	(200.	Dr. 77-78.)
16.	Mercury	(211.	Dr. 79.)
20.	Platinum	(224.	Dr. 79.)

II. SULPHIDES, SELENIDES, TELLURIDES, ARSENIDES, ANTIMONIDES.

I. SULPHIDES, ETC., OF THE SEMI-METALS, ARSENIC, ANTIMONY, BISMUTH; ALSO MOLYBDENUM.

26. Realgar ------------------------(191. Dr. 79.)
27. Orpiment ----------------------(191. Dr. 79.)
28. Stibnite ------------------------(311. Dr. 79-80.)
34. Molybdenite -------------------(197. Dr. 80.)

II. SULPHIDES, ETC., OF THE METALS.

B. Monosulphides, Selenides, Etc.

1. GALENITE GROUP. ISOMETRIC, HOLOHEDRAL.

42. Argentite ----------------------(215. Dr. 80.)
45. Galenite ------------------------(179. Dr. 81-82.)
46. Altaite --------------------------(Dr. 83.)

2. CHALCOCITE GROUP. ORTHORHOMBIC.

54. Chalcocite ---------------------(201. Dr. 83.)

3. SPHALERITE GROUP. ISOMETRIC, INCLINED HEM.

58. Sphalerite ---------------------(167. Dr. 83-86.)
63. Alabandite ---------------------(154. Dr. 86.)

4. CINNABAR-MILLERITE GROUP. HEXAGONAL AND RHOMBOHED.

66. Cinnabar -----------------------(212. Dr. 86.)
69. Wurtzite -----------------------(Dr. 86.)
70. Millerite ------------------------(163. Dr. 87.)
71. Niccolite------------------------(163. Dr. 87.)
74. Pyrrhotite ----------------------(139. Dr. 87.)

C. Intermediate Division.

78. Bornite -------------------------(201. Dr. 87.)
83. Chalcopyrite -------------------(202. Dr. 87-89.)
84. Stannite ------------------------(174. Dr. 89.)

D. Disulphides, Diarsenides, Etc.

1. PYRITE GROUP. ISOMETRIC. PARALLEL HEM.

85. Pyrite ---------------------------(139. Dr. 89-91.)
86. Hauerite-------------------------(Dr. 91.)
87. Smaltite ------------------------(161. Dr. 91.)
89. Cobaltite -----------------------(161. Dr. 91-92.)

2. MARCASITE GROUP. ORTHORHOMBIC.

96. Marcasite ....(141. Dr. 92.)
97. Löllingite ....(142. Dr. 92-93.)
98. Arsenopyrite ....(144. Dr. 93.)

3. SYLVANITE GROUP.

104. Sylvanite ....(223. Dr. 93.)

III. SULPHO-SALTS.

130. Jamesonite ....(181. Dr. 93.)
136. Bournonite ....(180. Dr. 93.)
144. Pyrargyrite ....(217. Dr. 93-94.)
145. Proustite ....(216. Dr. 94.)
148. Tetrahedrite ....(204. Dr. 94-95.)
149. Tennantite ....(204. Dr. 95.)
153. Stephanite ....(218. Dr. 95.)
158. Enargite ....(203. Dr. 95.)

IV. HALOIDS.

166. Halite ....(228. Dr. 97.)
169. Cerargyrite ....(219. Dr. 97.)
170. Embolite ....(220. Dr. 97.)
175. Flourite ....(239. Dr. 98-99.)
183. Cryolite ....(257. Dr. 100.)
193. Atacamite ....(206. Dr. 100.)
201. Carnallite ....(224. Dr. 100.)

V. OXIDES.

I. OXIDES OF SILICON.

210. Quartz ....(277. Dr. 100-109.)

A. Phenocrystalline or Vitreous Varieties—Rock Crystal, Amethyst, Rose, Smoky, Blue, Opalescent, Milky, Ferruginous, with enclosures.

B. CRYPTOCRYSTALLINE VARIETIES—Chalcedony, Carnelian, Chrysoprase, Heliotrope, Prase, Agate, Geyserite, Flint, Hornstone, Jasper.
C. SPECIAL VARIETIES—Tabular Quartz, Pseudomorphous, Silicified Wood, Agatized Wood, Quartzite, Itacolumite.

212. Opal .... (280. Dr. 109-111.)
VARIETIES—Precious, Common, Jasp-Opal, Wood-Opal, Hyalite, Tripoli, Diatomaceous Earth, Infusorial Earth.

III. OXIDES OF THE METALS.

A. ANHYDROUS.

I. PROTOXIDES.

224. Cuprite .... (205. Dr. 112.)
228. Zincite .... (168. Dr. 112-113.)

II. SESQUIOXIDES.

231. Corundum .... (258. Dr. 113-114.)
232. Hematite .... (147. Dr. 114-117.)
Also Var. Martite.
233. Ilmenite .... (146. Dr. 117.)

III. INTERMEDIATE OXIDES.

SPINEL GROUP. ISOMETRIC, MAINLY OCTAHEDRAL.

234. Spinel .... (253. Dr. 117-118.)
236. Gahnite .... (Dr. 118.)
237. Magnetite .... (142. Dr. 118-119.)
239. Franklinite .... (143. Dr. 120.)
241. Chromite .... (151. Dr. 121.)
243. Hausmannite .... (155. Dr. 121.)

IV. DEUTOXIDES.

248. Cassiterite .... (174. Dr. 121-122.)
250. Rutile .... (176. Dr. 122.)
254. Pyrolusite .... (155. Dr. 122.)
256. Diaspore .... (260. Dr. 122.)

B. HYDROUS OXIDES.

257. Goethite .... (147. Dr. 123.)
258. Manganite .... (156. Dr. 123.)
259. Limonite .... (147. Dr. 123-125.)
261. Bauxite .... (259. Dr. 125.)
262. Brucite .... (251. Dr. 125-126.)
269. Psilomelane .... (157. Dr. 126.)
Variety Wad .... (157. Dr. 126.)

VI. OXYGEN SALTS.

I. CARBONATES.

A. Anhydrous Carbonates.

1. CALCITE GROUP. RHOMBOHEDRAL.

270. Calcite ....(246. Dr. 128-136.)
   Varieties—Marble, Dr. 133, Chalk, Dr. 133, Stalactitic and Stalagmitic, Dr. 134-136, Tufaceous, Dr. 136.

271. Dolomite ....(248. Dr. 137.)
271A. Ankerite ....(241. Dr. 137.)
272. Magnesite ....(252. Dr. 137.)
273. Siderite ....(150. Dr. 138.)
274. Rhodochrosite ....(158. Dr. 138-139.)
275. Smithsonite ....(169. Dr. 139.)

2. ARAGONITE GROUP. ORTHORHOMBIC.

277. Aragonite ....(244. Dr. 140-141.)
279. Witherite ....(234. Dr. 141.)
280. Strontianite ....(236. Dr. 141.)
281. Cerussite ....(184. Dr. 142-143.)

B. Acid, Basic and Hydrous Carbonates.

288. Malachite ....(208. Dr. 143-144.)
289. Azurite ....(208. Dr. 144.)
296. Natron ....(Dr. 144.)
303. Zaratite ....(164. Dr. 144.)

II. SILICATES.

A. Anhydrous Silicates.

FELDSPAR GROUP. MONOCLINIC SECTION.

313. Orthoclase ....(283. Dr. 147-148.)
   Varieties—Adularia and Common Orthoclase.

313A. Perthite ....(284. Dr. 148.)

FELDSPAR GROUP. TRICLINIC SECTION.

315. Microcline ....(284. Dr. 148-149.)

FELDSPAR GROUP. PLAGIOCLASE SECTION.

316. Albite ....
317. Oligoclase ....
319. Labradorite ....
320. Anorthite ....

(284-286. Dr. 149-151 for all four species of plagioclase.)

LEUCITE GROUP.

321. Leucite ------------------(287. Dr. 151.)

PYROXENE GROUP.

A. ORTHORHOMBIC SECTION.

323. Enstatite ----------------(288. Dr. 151.)
324. Hypersthene --------------(288. Dr. 151.)

B. MONOCLINIC SECTION.

325. Pyroxene -----------------(288. Dr. 152-153.)
326. Acmite -------------------(Dr. 154.)
VARIETIES—Diopside, Hedenbergite, Augite.
327. Spodumene ----------------(289. Dr. 154.)
329. Wollastonite -------------(290. Dr. 154.)
330. Pectolite-----------------(290. Dr. 155.)
335. Rhodonite ----------------(290. Dr. 155.)

AMPHIBOLE GROUP.

338. Amphibole----------------(291. Dr. 156-159.)
VARIETIES—Tremolite, Actinolite, Nephrite, Asbestos, Mountain Cork, etc., Edenite, Pargasite, Hornblende.
341. Crocidolite --------------(Dr. 159.)

VARIOUS GROUPS.

344. Beryl --------------------(293. Dr. 159-160.)
353. Iolite -------------------(295. Dr. 160.)
357. Nephelite ----------------(295. Dr. 160.)
362. Sodalite -----------------(Dr. 160.)
369. Zunyite-------------------(Dr. 160-161.)
370. Garnet -------------------(296. Dr. 161-163.)
VARIETIES—A. Grossularite; B. Pyrope; C. Almandite; E. Andradite; F. Uvarovite.
376. Chrysolite or Olivine-------(298. Dr. 163.)
381. Willemite----------------(170. Dr. 163.)
383. Dioptase-----------------(210. Dr. 164.)
386. Meionite-----------------(Dr. 164.)
387. Wernerite ----------------(299. Dr. 165.)
393. Vesuvianite--------------(299. Dr. 165.)
394. Zircon -------------------(300. Dr. 166.)
397. Topaz --------------------(301. Dr. 166.)
398. Andalusite ---------------(303. Dr. 167.)
399. Sillimanite --------------(304. Dr. 167.)
400. Cyanite------------------(294. Dr. 167-168.)
401. Datolite -----------------(304. Dr. 168.)
406. Zoisite------------------(Dr. 169.)
407. Epidote -----------------(305. Dr. 169-170.)

408.	Piedmontite	(	Dr. 170.)
409.	Allanite	(306.	Dr. 170.)
410.	Axinite	(	Dr. 170.)
411.	Prehnite	(306.	Dr. 170.)
415.	Chondrodite	(307.	Dr. 171.)
423.	Calamine	(169.	Dr. 171-172.)
426.	Tourmaline	(307.	Dr. 173-175.)
428.	Staurolite	(308.	Dr. 175.)

B. Hydrous Silicates.

I. Zeolite Division.

435.	Apophyllite	(309.	Dr. 177.)
438.	Heulandite	(310.	Dr. 177-178.)
441.	Phillipsite	(	Dr. 178.)
442.	Harmotome	(	Dr. 178.)
443.	Stilbite	(311.	Dr. 178-179.)
445.	Laumontite	(	Dr. 179.)
447.	Chabazite	(312.	Dr. 179-180.)
450.	Analcite	(312.	Dr. 180.)
453.	Natrolite	(	Dr. 180-181.)
455.	Mesolite	(	Dr. 181.)
456.	Thomsonite	(	Dr. 181.)

II. Mica Division.

1. MICA GROUP.

458.	Muscovite	(313.	Dr. 181-184.)
460.	Lepidolite	(315.	Dr. 184.)
462.	Biotite	(314.	Dr. 184-185.)
462A.	Phlogopite	(314.	Dr. 186.)

2. CLINTONITE (BRITTLE MICA) GROUP.

464.	Margarite	(	Dr. 186.)
466.	Chloritoid	(	Dr. 186.)
467.	Phyllite	(	Dr. 186.)

3. CHLORITE GROUP.

468.	Clinochlore—Chlorite	(315.	Dr. 187.)
	Variety—Ripidolite.		
468A.	Penninite	(	Dr. 187.)
469.	Prochlorite	(315.	Dr. 187.)
480.	Jefferisite	(	Dr. 188.)

III. Serpentine and Talc Division.

481.	Serpentine	(315.	Dr. 188-189.)

Varieties—Common, Williamsite, Chrysolite, Picrolite.

483.	Genthite	(	Dr. 189.)
483A.	Garnierite	(164.	Dr. 189.)
484.	Talc	(316.	Dr. 189-190.)
485.	Sepiolite	(317.	Dr. 190.)

DIVISIONS IV. AND V.

492.	Kaolinite	(318.	Dr. 190.)
497.	Pyrophyllite	(318.	Dr. 191.)
504.	Chrysocolla	(209.	Dr. 191.)

TITANO-SILICATES, TITANATES.

510.	Titanite	(319.	Dr. 192.)
514.	Astrophyllite	(	Dr. 192.)
519.	Dysanalyte	(	Dr. 192.)

III. NIOBATES, TANTALATES.

525.	Columbite	(152.	Dr. 193.)
529.	Samarskite	(	Dr. 193.)

IV. PHOSPHATES, ARSENATES, VANADATES, ANTIMONATES.

APATITE GROUP.

537.	Monazite	(264.	Dr. 193.)
549.	Apatite	(242.	Dr. 193-194.)
550.	Pyromorphite	(183.	Dr. 194-195.)
551.	Mimetite	(184.	Dr. 195.)
552.	Vanadinite	(185.	Dr. 195.)
561.	Olivenite	(207.	Dr. 195-196.)

BELONGING TO VARIOUS GROUPS.

573.	Dufrenite	(	Dr. 197.)
574.	Lazulite	(263.	Dr. 197.)
597.	Vivianite	(149.	Dr. 197.)
601.	Erythrite	(162.	Dr. 197.)
611.	Variscite	(	Dr. 197.)
628.	Conichalcite	(	Dr. 197-198.)
639.	Wavellite	(262.	Dr. 198-199.)
642.	Turquois	(262.	Dr. 199.)

V. BORATES, ETC.

698.	Boracite	(268.	Dr. 199.)
704.	Colemanite	(267.	Dr. 199.)
707.	Borax	(266.	Dr. 199.)
708.	Ulexite	(267.	Dr. 200.)
711.	Uraninite	(195.	Dr. 200.)

VI. SULPHATES, CHROMATES, ETC.

716. Thenardite ---------------(230. Dr. 200.)

BARITE GROUP.

719. Barite --------------------(233. Dr. 200-202.)
720. Celestite -----------------(235. Dr. 202.)
721. Anglesite ----------------(181. Dr. 202-203.)
722. Anhydrite ----------------(240. Dr. 203.)

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725. Crocoite -----------------(185. Dr. 203.)
733. Hanksite -----------------(Dr. 203.)

HYDROUS SULPHATES.

746. Gypsum ------------------(241. Dr. 204-205.)
800. Alunite -------------------(261. Dr. 205.)

VII. TUNGSTATES, MOLYBDATES.

812. Wolframite ---------------(152. Dr. 206.)
813. Huebnerite ---------------(Dr. 206.)
818. Wulfenite -----------------(186. Dr. 206.)

VIII. HYDROCARBON COMPOUNDS.

P. 998. Ozocerite -------------(272. Dr. 207.)
P. 1002. Succinite ------------(272. Dr. 207.)
P. 1007. Copalite --------------(Dr. 207.)
P. 1015. Petroleum ------------(271. Dr. 207.)
P. 1017. Asphaltum -----------(271. Dr. 207.)
P. 1018. Elaterite --------------(Dr. 207.)
P. 1020. Albertite -------------(Dr. 207.)
P. 1020. Gilsonite -------------(Dr. 208.)
P. 1021. Anthracite ------------(Dr. 208.)
P. 1021. Bituminous Coal ------(Dr. 208-209.)
P. 1022. Cannel Coal ----------(Dr. 209.)
P. 1022. Lignite ----------------(Dr. 209.)
P. 1022. Jet ---------------------(Dr. 209.)

MATERIAL OFFERED FOR EXCHANGES.

I. COLORADO MINERALS.

SAN JUAN MOUNTAINS.

Zunyite, Zuni mine, Silverton. In small, sharp tetrahedrons, etc. Can be furnished in large quantity.

Guitermanite, Zuni mine, Silverton. Massive, thickly sprinkled with minute tetrahedrons of zunyite.

Huebnerite, Gladstone. Divergent aggregates of bronze colored crystals, one to two inches long, imbedded in quartz.

Sphalerite, Ute and Ulay mine, Lake City. In yellow cleavable masses with galenite and chalcopyrite.

Barite and pyrite, George III. mine, Carson. Thin reticulated plates of barite spangled with minute crystals of pyrite (very handsome).

Chalcedony, Ute Creek. Botryoidal and banded. Colors gray, white and green.

Milk opal, Ute Creek.

Rhodochrosite, Vallecita Basin. In deep pink, cleaveable masses.

Enargite, National Belle mine, Red Mountain. In cleavable masses and in clusters of small but very brilliant crystals.

Bornite, Red Mountain. In pure masses.

LEADVILLE.

Pyrite, R. A. M. shaft. Irridescent crystals, small but brilliant in clusters, lining cavities in massive pyrite.

Galenite and pyrite, Mahala mine. In handsome cellular, intergrown, branching aggregates.

SUMMIT COUNTY.

Pyrite and sphalerite, Wulfley mine, Kokomo. Branching aggregates of pyrite penetrating sphalerite.

Orthoclase, Kokomo. Loose crystals, one to two inches, simple and twinned.

Orthoclase, Robinson. Sharp, white crystals averaging one inch, simple and in Carlsbad and Baveno twins. Loose and in the matrix (rhyolite).

OTHER COLORADO LOCALITIES.

Corundum, near Salida. Flat crystals one-eighth to one-quarter inch, (basal plane and rhombohedron,) imbedded in quartz, etc., forming a corundum schist. Color deep blue, also gray and brown.

Sylvanite and other tellurides of gold and silver, Boulder County.

Native tellurium, Boulder County. In crystals one-eighth to one-quarter inch.

Graphic granite, Clear Creek. In masses up to two feet.

Zeolites, Table Mountain, Golden. Natrolite, chabezite, thomsonite.

II. TINTIC RANGE AND MERCUR, UTAH.

Olivenite, Centennial Eureka mine, Eureka. In aggregates of nearly parallel plates lining cavities in limonite.

Olivenite, Carissa mine, Mammoth. Small prismatic crystals, also in tufted, fibrous and velvety aggregates.

Conichalcite, Carissa mine, Mammoth. In handsome green coatings on limonite, etc.

Realgar, Mercur. Massive.

III. MISCELLANEOUS LOCALITIES.

Cyanite, Litchfield County, Connecticut. Green color.

Vivianite, Mullica Hill, N. J. A few rosettes and divergent aggregates.

Prehnite, near Duluth, Minnesota.

Copper, Lake Superior. Native, crystallized.

Copper, Lake Superior. In Calumet and Hecla conglomerate.

Garnets, Michigamme, Michigan. Partly altered to chlorite. Also the same in chlorite schist.

Pyrolusite, Virginia, Minnesota.

Calcite, Rockland, Maine. In flat crystals.

Willimite, Franklin Furnace, New Jersey. In rhombohedral crystals.

Rubellite and lepidolite, San Bernardino County, California. Handsome radiated and divergent prisms imbedded in lepidolite.

Hanksite, Borax Lake, San Bernardino County, California. In half-inch crystals.

Muscovite, Saratoga, Wyoming. Handsomely figured in red, brown, yellow and black colors by means of iron oxides.

ROCKS AND FOSSILS.

Spherulites, Silver Cliff and Rosita, Colorado. Remarkably fine roundish, mostly compound spherulites in all sizes from one inch to over a foot, found in rhyolite and obsidian. Also fragments of larger compound spherulites showing branching intergrowths of quartz and feldspar. (See paper by W. Cross on Spherulites in Acid Eruptive Rocks, Philosophical Society of Washington. Bulletin, Vol. XI, pp. 411-444.)

Obsidian, Silver Cliff, Colorado.

Hornblende andesite, Rico, Colorado.

Ryolite, Kokomo, Colorado. With and without phenocrysts of feldspar.

Tourmaline schists, Belcher Hill, Jefferson County, Colorado. Also same cut by sharply defined veins of mica and quartz, etc.

Andalusite schists, Vallecita Valley, San Juan Mountains, Colorado.

Crinkled mica schist, Van Bibber Creek, Jefferson County, Colorado.

Flint conglomerate, Green Mountain, Jefferson County,Colorado.

Basalt, Table Mountain, Golden, Colorado.

Potsdam sandstone, Portage Entry, Lake Superior. Showing well-defined ripple marks.

Gabbro, Duluth, Minnesota.

Melaphyre, Houghton, Michigan. Many varieties, showing amygdules of chlorite, calcite, epidote, etc.

Andesite, Crater Lake, Oregon. Mostly hypersthene A., but showing a great variety of structure and color from coarsely crystalline to obsidian.

Fossil leaves, Table Mountain, Golden. Tertiary leaves of many species.

Silicified wood, Green Mountain, Golden, Colorado.

MATERIAL DESIRED IN EXCHANGE.

The School of Mines can make good use of almost any pure mineral, especially if well crystallized. Sulphides, arsenides, antemonides, etc., are specially desired, and in considerable quantity, also loose crystals suitable for use in studying crystal forms. Those desiring to make exchanges are requested to submit lists of minerals or rocks offered. (See page 56.)

PHYSICS.

The course in Physics is given by lectures and recitations, accompanied by practical work in the laboratory. The course embraces molecular physics, gravitation, mechanics of liquids and gases, elementary machines, acoustics, the theory of heat and of the steam engine, and the general principles of light.

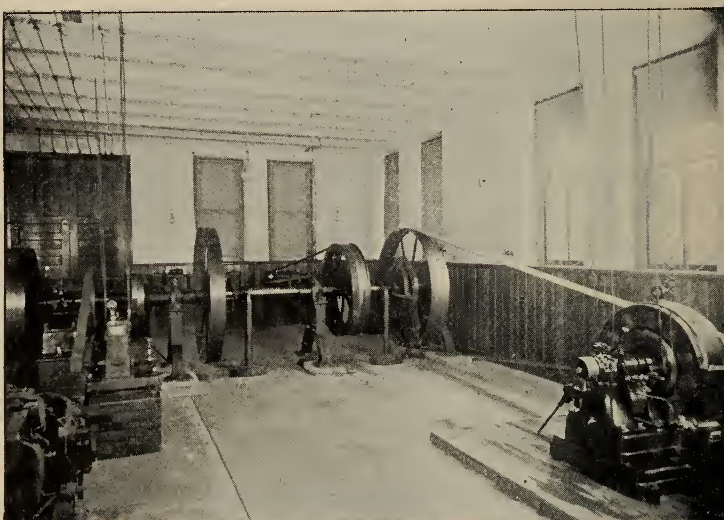
The second term is devoted chiefly to an elementary course in electricity and magnetism.

The object of the laboratory course is not original research, but the acquirement of a certain familiarity with the subjects which this work alone can give. During the first part of the course the student acquires facility in the use of instruments, and accuracy in measurement, which fit him for the other work in the laboratory. The experiments are quantitative, and are selected with the view of illustrating the fundamental principles of the subject rather than of devoting the student's whole time to the elaborate determination of a few constants.

The equipment of the laboratory is fairly complete. A fine Troemner and an excellent Sartorius balance belong to the laboratory, while a number of balances from the chemical laboratory are available during a part of the time. Forty micrometers and vernier callipers are provided, as well as spherometers, protractors, etc. Jolly balances, hydrometers of various kinds, thermometers, a fine Kater's pendulum, lenses, mirrors, galvanometers, resistance boxes, Wheatstone bridges, apparatus for the determination of the law of the pendulum and for the determination of Young's modulus, form part of the equipment.

ELECTRICAL ENGINEERING.

The course in Electrical Engineering is intended to cover both the theoretical and practical parts of the subject. It is adapted to the needs of the State by the devotion of much time to the applications of electricity to mining and metallurgy.



DYNAMO ROOM.

In the third and fourth years, work in Mechanical Engineering forms a considerable part of the course. Tests of steam engines, boilers and water wheels are made from time to time. The engine is fitted up for testing, as is the eighty horse-power boiler furnishing steam to Engineering Hall. The course in Electrical Units and Measurements consists of lectures on the theory and value of the units of the science and the modern methods of measurement. Four hours per week are devoted to work in the laboratory.

The course in the Distribution of Electricity embraces distribution for lighting and the various systems for the transmission of power.

Lectures on the theory and design of Dynamo-Electric Machinery will occupy the student five times a week during the fourth year. Two full afternoons per week, in addition, will be devoted to work in the laboratory and in the designing room. Alternate currents and alternate current transformers occupy a large portion of the time during this year.

The laboratory work of the fourth year consists of insulation and capacity tests, measurement and location of faults, determination of magnetization curves of iron and steel, determination of characteristic curves of various machines, and of tests of dynamos and motors, as well as standardizing and calibrating various instruments.

Besides the space occupied by the general lecture room and the Physical Laboratory, a large room is fitted up on the second floor for work in Photometry. In addition to the Bunsen photometer, a complete "Reichsanstalt" standard photometer, with all accessories, has recently been added to the equipment of this room. The various experimental machines are belted to pulleys on a jack shaft, driven by the engine in the dynamo room. The instruments for use in testing are in a smaller room adjoining, where the marble switchboard and the large resistance coils are also placed. Separate wires run to each room from both the alternate and continuous current circuits and also from the sixty-cell accumulator presented by the Carpenter Electric Storage Company. The rooms on the north side of the building, devoted to electrical measurements, have little iron used in their construction, while the room designed for magnetic measurements has none. These rooms are equipped with piers, non-inductive resistances, gas, water and direct connections to all the currents, besides the ordinary galvanometers, resistance boxes, balances and other instruments.

The department, in addition to these appliances, is well equipped with high-grade galvanometers and the ordinary apparatus for electrical measurements. Cradle and absorbtion dynamometers and Watt meters enable efficiency tests to be conveniently made. Kelvin balances, electrostatic volt meters, ammeters and volt meters of various makes, form part of the equipment.

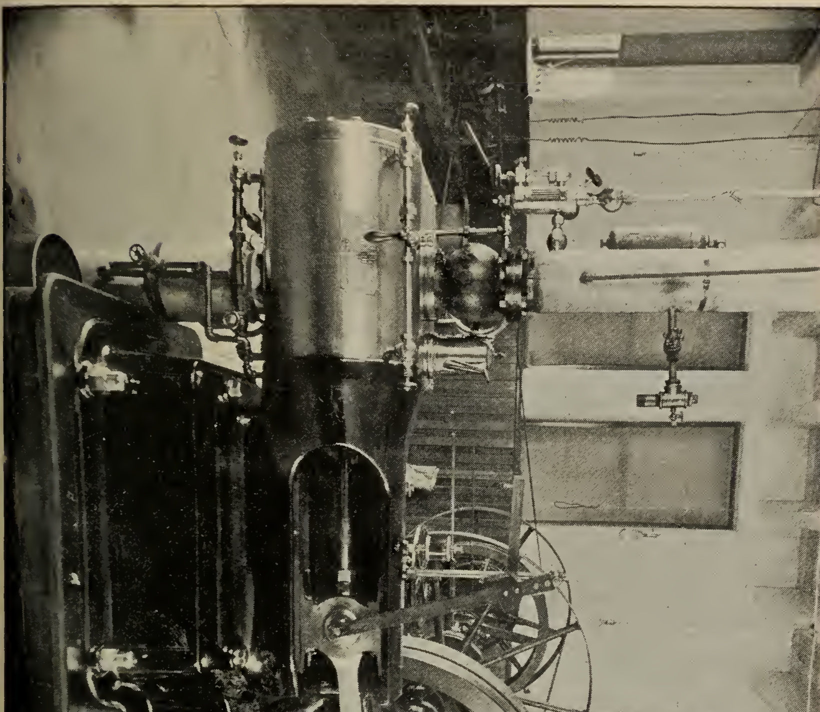
Through the kindness of Mr. Irving Hale, the department has been presented with a twenty-five horse-power motor.

To Mr. Paul Webster, a former student of the institution, the department is indebted for a small steam engine.

APPLIED MECHANICS.

Beginning with the third year, the study of Applied Mechanics is pursued in its various branches of Statics, Kinematics and Dynamics, for the purpose of giving the student a broad comprehension of the relation of forces acting upon matter at rest or in motion. Investigations concerning these are carried on by analytical and graphic methods, and the laws governing balanced forces, forces in motion, frictional forces and kindred subjects, are investigated.

A study of the strength of materials is pursued during the entire fourth year, comprising a careful study of the effects of stresses and strains and the proper limits of safety in their use. In connection with this, each student is required to make a series of definite tests of wrought iron, steel, cast iron and wood, in tension, compression and bending.



A Riehlé testing machine of one hundred thousand pounds capacity, cross breaking machine, cement testing and appliances, with various lathes and bench tools for preparing specimens, afford opportunities for independent research, as well as for class drill and illustration.

A portion of the fourth year is devoted to the study of Hydraulics, especial attention being paid to the flow of water through pipes, conduits and open channels. In this connection laboratory work is pursued by all students, and measurements made of the flow of water through pipes and orifices, and over various forms of wiers.

A study of Prime Movers and Power Transmission occupies the student's attention during a part of the fourth year, and efficiency tests are made of boilers, engines and motors.

CIVIL ENGINEERING.

The course of study in Civil Engineering has been planned to meet the professional needs of the mining engineer as well as those of the civil engineer. Thus, while the students in both courses take all the work in surveying, applied mechanics, graphics and structural designing, students who are candidates for the degree of Civil Engineer have special lines of work laid out for them from the beginning of the Sophomore year.* The full course of study begins in the Junior year with the study of applied mechanics, surveying, theory and practice of framed structures, and designing masonry structures. Two afternoons per week during the first term are devoted to making complete detail measurements and drawings of

*At this time they drop all chemical work and a portion of the mineralogy, substituting extra draughting.

some railway or highway bridge in order to familiarize the student with structural forms and details. Other afternoons are taken up in the draughting room with such subjects as tinting and shading, pen topography, colored topography, etc.

In connection with designing of masonry structures, the subjects of foundations of all kinds, cements, building stones, etc., are investigated and each student makes designs of stone arches, chimneys and retaining walls.

A large part of the fourth year is devoted to designing and investigation of framed structures, such as roofs, railway and highway bridges and long arch bridges of steel. A complete study is also made of the various systems of sewage disposal, water supply and sanitary improvements of cities and towns. The candidate for the degree of Civil Engineer is expected to show special aptitude in mathematics, and pursues a course of study in higher engineering problems.

Theory and practice are combined wherever possible, and the student placed on his own responsibility, so that our graduates, aided by such technical and practical training as they have obtained, will develop into useful investigators and constructors.

SURVEYING.

The instruction in this subject is both theoretical and practical, the aim being to convey to the mind of the student a broad understanding of the subject and its applications in the professional work of the Mining and Civil Engineer. As a means to this end, the institution is well supplied with the necessary instruments for field practice. Among these may be mentioned one complete mining transit with side telescope, two complete mining transits with combination top telescope and solar attachment, one triangulation transit, three complete engineer's transits with solar attachments, four engineer's levels, one needle compass, one three-hundred-foot steel tape, standardized, and all the necessary accompanying apparatus for field and office use, such as chains, tapes, stadia boards, level rods, etc.†

The classes are first instructed in the adjustments of the various instruments, and each student required to perform and thoroughly understand the underlying principle of each.

The subject of Land Surveying is then taken up and various problems solved, in the office and field, relative to areas, subdivisions of land and retracing of section and township lines of the government land surveys.

In Topographical Surveying, each class makes a complete survey and contour map of a portion of the City of Golden, using the transit and stadia method; in addition

†The surveying instruments are all of the best makes, and additions are constantly being made. Among the makers may be mentioned Buff & Berger, Heller & Brightley, Gurley & Sons and Troughton & Simms.

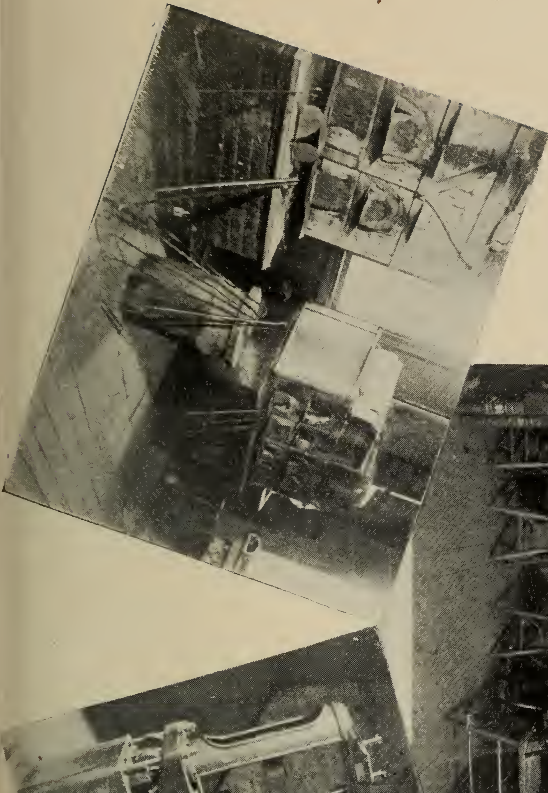
to this, contour maps are made of several promising reservoir sites, and from these, preliminary estimates of capacity made and compared. In City Surveying, classes are instructed in the laying out of cities and towns, surveys of new subdivisions, street improvements, giving of grades, etc., together with such applications of each in the field as time will allow.

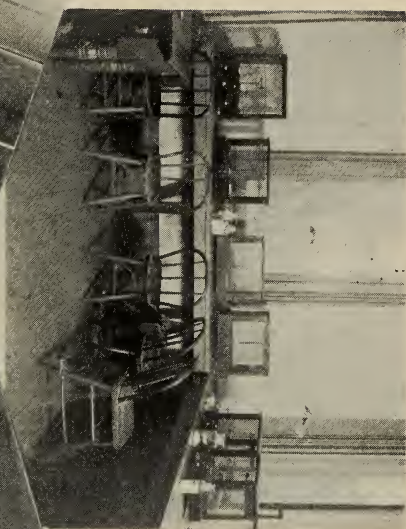
In Geodetic Surveying, classes are instructed in the outlines of that subject, the different kinds of triangulation, description of the U. S. Coast Survey base apparatus and the establishment of stations and signals. A base line is measured with a three-hundred-foot steel tape and all corrections made so as to eliminate errors of sag and pull. To this is hinged a system of triangulation of the neighboring peaks and all angles measured and adjusted, and distances computed.

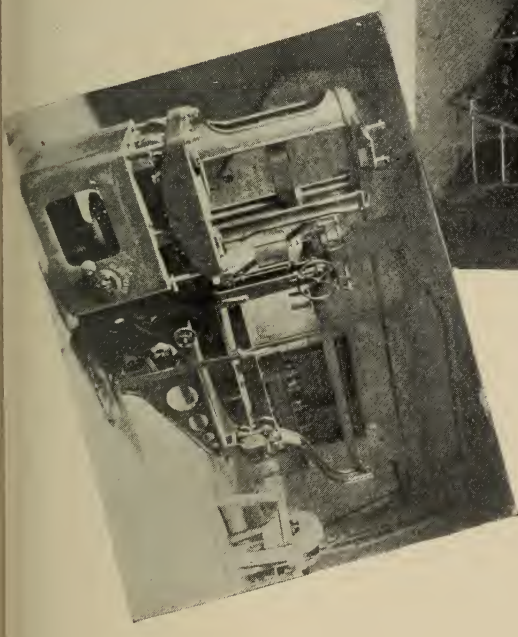
In Railroad Surveying, classes are instructed in the theory of curves of different kinds, running of levels and the measurement of earthwork. Considerable time is devoted in the field to a projected line with preliminary and location surveys, topography, cross-sectioning and preliminary and final estimates of earthwork.

In Mine Surveying, various problems relative to underground surveying are solved, especial attention being paid to those which present peculiar difficulties and require careful instrumental work and computations. A complete survey is made of some mine in the neighborhood and each student required to make all the computations and plat the field notes. Each student is also required to make a survey of several intersecting mining claims, together with such computations as would be necessary for a patent survey.

Each student, during the course, is required to make a determination of the true meridian by an observation on the pole star, and check the same by the methods of direct observation on the sun and solar attachment to the transit.







DRAUGHTING.

It is the object in this department to first give a thorough grounding in all the more elementary parts of Mechanical Drawing, and to follow this with their application in the most practical way possible in a technical school.

SOPHOMORE DRAUGHTING ROOM.

The student is first taught the proper way of using his instruments, preparing his sheets, etc., and then given the simplest of geometrical figures, to cultivate some skill in their use. At this time, individual instruction is given each student.

The work then leads into the more difficult elements of drawing, including line shading and tinting, together with lettering, and no student is allowed to proceed who cannot neatly execute at least two alphabets in free-hand.

Then follows all the more difficult work, in projections and intersections, interspersed with representative practical problems, to show the direct application to actual work. The elements of all the methods of representing objects upon one plane including true perspective, completes the purely elementary work.

In all this work, as in the more advanced, no grades are given. Each drawing must be up to a certain standard, such as would hold in any well regulated drawing office, before being accepted, it being considered that under these conditions all drawings are of the same rank, except as to artistic effect, which is not considered a requisite of pure Mechanical Drawing.

The advanced drawing is all of a practical nature. The elements which have been thoroughly mastered in the previous years are here combined, and none but the methods used in the best American drawing offices are followed.

To this end, the drawing rooms have been equipped with the most efficient appliances. The Freshmen have large, rigid drawing tables, with ample room for each individual, and the advanced classes have improved individual tables, adjustable in every way, the light being reflected from the perfectly white walls, giving a mild diffused light, much preferred to strong direct light.

The blue-print room is modern and complete in every way, and students are taught to make prints either from tracings or direct from the bond papers now so much used in many offices.

The work by years is as follows:

FRESHMAN YEAR.

Use of drawing instruments, mounting sheets, etc. This includes the proper selection of instruments, testing and care of pen points, and like details, all of great importance to the beginner. Plain geometrical problems, simple projections and intersections; plans, elevations and sections, exercises in lettering, both free-hand and with the instruments; line shading, tinting and shading with tints; with applications of each as in working drawings. The working of problems, as given in Church's Descriptive Geometry, including a large number of exercises relating to the first seventeen problems as there given; problems in intersections including the intersections of planes with cylinders, planes and cones, planes and surfaces of revolution; surfaces of revolution with surfaces of revolution, etc.; exercises in shades and shadows.

SOPHOMORE YEAR.

At the beginning of this year the study of Elementary Mechanism is taken up in the class-room and continues throughout the year. A part of the first term is used on the study of Isometric projection and true perspective.

Several sheets of drawing follow involving the continual use of the principles of Descriptive Geometry in the representation of actual machine parts.

The rest of the year is given over to problems in Mechanism. This includes the laying out of lobed wheels, spur wheels, beveled wheels, sprocket wheels, cams, special motions with link work, etc.

Blue printing is explained at the beginning of the year, and the student becomes practiced in the process by making prints of his own work from time to time.

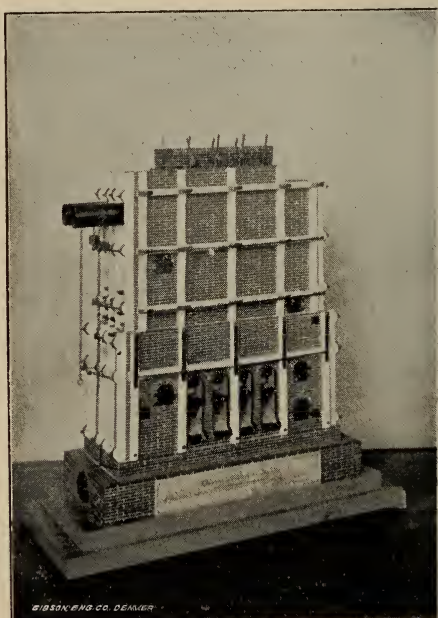
Special pains are taken all through this year to get the student in the way of making good working drawings according to the best American practices.

JUNIOR YEAR.

The study of Machine Design is taken up in the class-room at the beginning of this year and continues through the first term. The drawing for this term is all in connection with this study, and includes the designing of such parts of machines as follow: bolts and nuts; keys and cotters; pipes and pipe joints; shafting and shaft couplings; journals and journal bearings; arms, hubs, and rims of gear wheels, belt wheels, sheave wheels, etc. Rivets and riveted joints; horse power of belts and gearing, brackets and pillow blocks, with other devices, are all explained and drawn.

SENIOR YEAR.

The Draughting of this year is distributed among the several departments of Metallurgy, Engineering and Electrics. Designs assigned according to the special work of the student, are executed of metallurgical plants, masonry work and bridges, and of electrical machinery. The draughting of this year, in short, is not intended as instruction in draughting, but as applied work.



MINING AND METALLURGICAL EXCURSIONS

An important part of the work of the institution consists in visiting mines, smelters, power plants and other works, where the processes lectured upon may be seen in actual operation.

Trips of this description have been made in past years to Aspen, Leadville, Central and Idaho Springs, in Colorado, and to the Michigan copper and iron mines (Summer of 1893).

In the line of Coal Mining and Economic Geology, excursions have been made to El Moro and Trinidad, Canon City and the local mines (near Golden).

Metallurgical trips to the smelters at Denver and vicinity are quite frequent, while Pueblo and Leadville have also been included in longer trips, the iron and steel works at Pueblo being among those inspected.

The trip of 1896, lasting a fortnight, included Manitou, (geology); Pueblo (steel works, smelters); Florence (oil); Canon City (coal mining) and Leadville (mines and reduction works).

Geological excursions have also been frequent, and although chiefly confined to a radius of ten miles from Golden, have been extended to Boulder County, also to El Paso (Pike's Peak region), and to the southern portion of the State.

On these trips, low traveling rates are secured for the students, and they are strongly recommended to all, as presenting practical advantages too great to need any arguments in their favor.

LIBRARY.

The Library contains between four and five thousand volumes, mostly standard scientific and technical works, though history and travels are not neglected. Its cost per volume, as must be the case with scientific works, has been large.

Complete sets of the transactions of the institute of mining engineers, civil engineers, association of engineering societies, journals of chemistry, electricity and metallurgy, and technical cyclopedias in various lines, are among the recent additions.

The shelf and catalogue arrangements are upon the Dewey decimal system. Pamphlets are separately placed in special drawers, also under classification.

Students have free access to the library at all hours, whether for use as a reading room, or to select books for borrowing.

The authorities of the institution desire to acknowledge the generosity of Capt. Edw. L. Berthoud, formerly a trustee of the school, in presenting a number of valuable works.

APPARATUS AND MACHINERY.

The scientific apparatus in the various departments can hardly be named in detail in the catalogue. Reference should be made to the headings, "Departments of Instruction," under which some description will be found. The estimate for the year 1896 on value of apparatus and machinery is $30,000, which figure is *exclusive* of all furniture, fittings, desks, cases or ordinary school appliances.

BUILDINGS.

(1). BUILDING OF 1880-'82.

The combined building, 1880-'82, has the main dimensions of 100x70 feet, two stories, and basement extending under most of the space.

The Riehlé testing machine (see "Mechanics"), stands in the south basement, and is run by electric motor.

One of the two rooms for furnace assaying is also in this basement, which contains besides, rooms for testing of material and for the storage of laboratory supplies.

The main floor is wholly occupied by chemical laboratories, assay rooms, balance rooms, and rooms for the storage and issue of apparatus. (See "Chemistry.")

The second floor contains the lecture room for mathematics (excepting Freshman year). This room is at the north end of the building, dimensions 21x44 feet. The lecture room for general chemistry (35x35) is next in order, having an annex room for apparatus.

Special laboratories (50x25) are also upon this floor, the remainder of whose space is occupied by several small rooms for balances and apparatus of various kinds.

(2). BUILDING OF 1890.

This building is connected with that of 1882 by passages on every floor. Its length is one hundred feet, its width from fifty-seven to sixty-eight feet. Its basement contains the gymnasium (q. v.) lavatories, shower bath, work-shop, steam-heating, boiler and gas apparatus.

The first floor contains the offices of the Registrar, library and reading room, on one side of the main hall. The space on the other side (65x40), is occupied by the department of geology and mineralogy. It is divided into two rooms, one for the museum, the other is the working department and lecture room, containing all the collections used for instruction in geology, mineralogy, lithology and blow-piping.

The second floor is divided into: (1.) Lecture room for metallurgy and mining, containing also the collections and models for this department, and the arc lantern for exhibition of the numerous slides which have been prepared of working draughts for these courses. (2.) Lecture room for mathematics, chiefly devoted to Freshman work. (3.) Lecture room for engineering classes. (4.) Draughting room for Senior class. (5.) Office rooms for Professors.

This building stands upon ground overlooking the town, and presents a handsome appearance. It was first occupied at the opening of the fall term of 1890.

(3). BUILDING OF 1894 (HALL OF ENGINEERING).

The completion of Engineering Hall has placed the department of Physics and Electrical Engineering on a new footing. The space in the old quarters was entirely inadequate for a department of so much importance to a state in which electric power is so widely used in mining operations.

Engineering Hall is a three-story brick and stone structure, fifty by seventy-five feet. The lower floors are devoted to Physics and Electricity, while the upper floor contains two large draughting rooms, a blue-print room and a room containing the school's collection of drawings, tracings and blue prints, which is also used as a study by the instructor in drawing.

The second floor is devoted to Physics and to elementary work in Electricity and Magnetism. The lecture room, furnished with raised seats, will accommodate about seventy students. For experiments in light, the room can be quickly darkened. The photometer room is fitted for experiments in light and the measurement of arc and incandescent lamps. The room devoted to laboratory work in Physics and Elementary Electrical Measurements is well lighted and fitted with slate shelves and heavy tables. The balances, placed on separate slate shelves supported from the walls of the building, are in another room, connected with the main laboratory. Gas, air, water and electricity are supplied at various points in the laboratory.

The south half of the lower floor is divided into two rooms, the larger containing the fifty horse-power, high-speed engine, the dynamos and motors for testing purposes. All wires run from this room to the smaller, which contains the slate switch board, the measuring instruments for testing work, and the large resistance coil. A small workshop connects with the dynamo room. The battery room, floored with tiles, contains the sixty-cell accumulator and various primary batteries. Three light rooms furnished with piers, on the north side of the building, are devoted to advanced work in Electrical Measurements. Very little iron is used in the construction of the lower portion of the building, so that all the rooms are well adapted for electrical measurements.

The building is heated by the Sturtevant system. The boiler house contains the Sturtevant engine and fan, eighty horse-power boiler, feed pumps, heater, etc.

R. S. Roeschlaub, of Denver, was the architect of the buildings of 1890 and of 1894.

The total floor space in the three buildings is over forty thousand square feet.

GROUNDS.

The tenth General Assembly gave $5,000 for improvement of the grounds, the City of Golden permitting the absorbtion of the street formerly dividing Engineering Hall from the older buildings. Stone walks, terraces and grass plats now give to the entire premises a finish long lacking.

A final readjustment of the space in the buildings of 1880, 1882, and 1890, effected in the Fall of 1896, accompanied these improvements, and allows the utilization of all the space hitherto unavailable.

The site, well above the main part of the town, is admirable both for scenic and sanitary environment.

GOLDEN HIGH SCHOOL.

The courses of study in the Golden High School (Prof. Wm. Triplett, Principal,) are those recommended by the Colorado State Teachers' Association. They have been adopted as the preparatory course in all the higher institutions of learning in the State, having preparatory departments. These courses embrace Algebra, Plane and Solid Geometry, Physics, Chemistry and Biology. Four years of English, including Rhetoric, and four years of Latin. General History is also included in the course.

The entire upper floor of an eight-room building is used by the High School. This school offers ample opportunity for preparation to those wishing to enter the State School of Mines.

THE SCIENTIFIC SOCIETY.

In connection with the school is the organization known as the "Technical and Scientific Society of the Colorado School of Mines," composed of active members from the Senior and Junior classes, the Faculty and the Alumni of the School. Sophomores and Freshmen are associate members.

The object of the society is the presentation and discussion of papers on technical and engineering subjects, so that the special knowledge of one member may be shared by all. A secondary object is the benefit to be derived from addressing a public assembly, giving the members a confidence in themselves which may be of value to them in their careers.

A salient feature of the society is the delivery of lectures, from time to time, by professional men and members of the Alumni, who have had practical experience in their several branches of engineering.

Officers are elected each year from the Senior class.

The programmes are prepared by an appointed committee selected from the Senior and Junior classes. The meetings are held monthly in the school building.

Officers for the year 1896-'97 are as follows:

President	John Gross,	(1897).
Vice President	Harold B. Starbird,	(1897).
Recording Secretary,	Arthur H. Buck,	(1897).
Corresponding Secretary	Professor H. van F. Furman.	
Treasurer	J. Norman McLeod,	(1897).

ALUMNI ASSOCIATION.

The Association of the Alumni of the Colorado State School of Mines holds its annual meeting and banquet on the day following the commencement exercises, unless otherwise provided by the executive committee.

All graduates holding degrees are eligible to membership and are invited to the annual meeting and banquet.

The aim of the Association is to promote acquaintance and friendship among the graduates, to encourage them in aiding each other and to make an organized effort to elevate and uphold the reputation and standard of the Alma Mater.

The officers of the Association for the year ending June 12th, 1897, are as follows:

President	W. B. Milliken,	(1893).
1st Vice President	Clyde M. Eye,	(1895).
2nd Vice President	Latimer D. Gray,	(1895).
Secretary and Treasurer	Robert S. Stockton,	(1895).
Members of the Executive Committee	W. B. Lewis,	(1892).
	Geo. W. Schneider,	(1894).
	Geo. G. Griswold,	(1896).

DIRECTORY OF GRADUATES.

NAME AND ADDRESS.	OCCUPATION.
1882.	
Middleton, Wm. B. Cripple Creek, Colorado.	Mining Engineer.
1883.	
Wiley, Wm. H. Idaho Springs, Colorado.	Mining Engineer.
1886.	
van Diest, Edmond C. San Luis, Costilla County, Colorado.	Superintendent, Maxwell Land Grant.
Gehrmann, Charles A. Idaho Springs, Colorado.	Superintendent, Stanley Consolidated Mining Company.
1888.	
Ambrosius, Carl E. Guanacevi, Durango, Mexico.	Mining Engineer.
*Floyd, John A.	
Kingman, Jerry Los Angeles, California.	Chemist.
*Lorah, Bela I.	
1889.	
Bellam, Henry L. Anaconda, Montana.	Chemist, Anaconda Mining Company.
Craigue, Wm. H. Colorado Springs, Colorado.	Mining Engineer.
*Wertheim-Salomonson, F. M. G. A.	
1890.	
Comstock, Wm. H. Ithaca, New York.	Assistant Professor, Civil Engineering, Cornell University.

* Deceased.

1891.

NAME AND ADDRESS.	OCCUPATION.
Johnson, Edw. W. Pueblo, Colorado.	Chemist, Colorado Smelting Company.
Smith, Charles D. Monterey, Mexico.	Metallurgist, Fundicion International.

1892.

NAME AND ADDRESS.	OCCUPATION.
Aller, Frank B. Silverton, Colorado.	Chemist, Sampling Works.
Brown, Norton H. Cripple Creek, Colorado.	Surveyor.
Budrow, Wm. B. Aguas Calientes, Mexico.	Chemist, La Gran Fundicion.
Cole, Burt Los Angeles, California.	Engineer.
Hindry, Willis E.	
Kimball, George K., Jr. Russell Gulch, Colorado.	Mine Superintendent.
Kimball, Jos. S. Golden, Colorado.	
Lewis, Wm. B. Denver, Colorado.	Manager, Denver Sulphite Fibre Co.
McMahon, Charles H. Sierra Mojada, Coahuila, Mexico.	Mine Superintendent.

1893.

NAME AND ADDRESS.	OCCUPATION.
Collins, Phillip M. Georgetown, Colorado.	Dewey Bros., Sampling Works.
Hawley R. Howard Pueblo, Colorado.	Pueblo Sampling Works.
Jewell, Gilbert E. Chartres Towers, Queensland, Australia.	Metallurgist.
Milliken, Wm. B. Cripple Creek, Colorado.	Surveyor.
Osborne, Arthur H. Cripple Creek, Colorado.	Surveyor.
Stephens, Wallace A. Bingham, Utah.	Metallurgist.

NAME AND ADDRESS.	OCCUPATION.
1894.	
Atkins, Horace H. ——— Denver, Colorado.	
Bowie, James W. ——— Gallup, New Mexico.	Mine Superintendent, Caledonia Coal Co.
Post, George M. ——— Denver, Colorado.	Student.
Saint Dizier, Julius L. ——— Monterey, Mexico.	
Schneider, George W. ——— Pine Creek, Colorado.	Mine Surveyor.
Wheeler, Charles E. ———	
1895.	
Arthur, Edward P. ——— Cripple Creek, Colorado.	Surveyor.
Davis, Carl R. ——— Leadville, Colorado.	Mine Surveyor, Small Hopes M. and L. Co.
Dockery, Love Atkins ——— Sierra Mojada, Coahuila, Mexico.	
Durell, Charles T. ——— Eureka City, S. A. R., Africa.	Mine Surveyor, Sheba Gold Mining Co.
Eaton, Albert L. ——— Leadville, Colorado.	Assayer.
Eye, Clyde M. ——— Arastra, San Juan County, Colorado.	Mine Surveyor, Silver Lake Mining Co.
Field, Fred. M. ——— Virginia City, Montana.	Metallurgist, (Cyanide).
Gray, Latimer D. ——— Golden, Colorado. (Instructor Department of Electrics, School of Mines.)	Electrician, Golden Illuminating Company.
Hartzell, Lester J. ——— Butte, Montana.	Montana Ore Purchasing Company.

NAME AND ADDRESS.	1895.	OCCUPATION.
Kennedy, George A. Silverton, Colorado.		Surveyor and Assayer.
Limbach, Edmund C. Victor, Colorado.		Surveyor.
Maxwell, Fred. A. G. Krugersdorp, S. A. R., Africa.		Metallurgist, Porges Randfontein Mining and Milling Co.
Merryman, Herbert E. Durango, Colorado.		Assayer.
Parker, James H. White Oaks, New Mexico.		
Rowe, Edward E. Golden, Colorado.		Superintendent, J. B. and Wm. Church Brick Company.
Shetler, Waverly Sierra Mojada, Coahuila, Mexico.		Mine Surveyor.
Skinner, Lewis B. Durango, Colorado.		Chemist, Standard Smelting Company.
Stannard, Burt C. Colorado Springs, Colorado.		Chemist.
Stockton, Robert S. Golden, Colorado.		Assistant Professor of Mathematics, Colo. School of Mines.
Suhr, Otto B. Red Bluff, Montana.		Surveyor, Telluride Power Transmission Company.
Titsworth, Frederick S. Denver, Colorado.		Assayer, Omaha and Grant Smelting Company.
Wallace, Louis R. Bayard, Yavapai County, Arizona.		Rapid Transit Mining Company.
Young, Frank B. San Jose de Cruces, Chihuahua, Mexico.		Assistant Superintendent, Mining.

NAME AND ADDRESS. 1896.	OCCUPATION.
Atkinson, Walter J. White, South Dakota.	Civil Engineer.
Barensheer, Wm. J. Denver, Colorado.	
Barnes, Corrin Jefferson County, Colorado.	
Beeler, Henry C. Cambria, Wyoming.	Cambria Mining Company.
Dwelle, Jesse E. Scranton, Pennsylvania.	Chemist, Colliery Engineer Company.
Griswold, George G. Pueblo, Colorado.	Chemist, Pueblo Smelting and Refining Company.
Hoyt, George F. Stofel P. O., Nevada.	
Maynard, Rea E. Bumblebee, Arizona.	Mining Superintendent.
Mitchell, George B. Washington, D. C.	Civil Engineer.
Milliken, John T. Cripple Creek, Colorado.	Surveyor.
Nance, Wm. H. Victor, Colorado.	Assayer, Portland Mine.
Newnam, Wm. E. Aguas Calientes, Mexico.	Chemist, La Gran Fundicion.
Paul, Wm. H. Central City, Colorado.	Assayer.
Strout, Fred. McL. Ouray, Colorado.	Assayer.

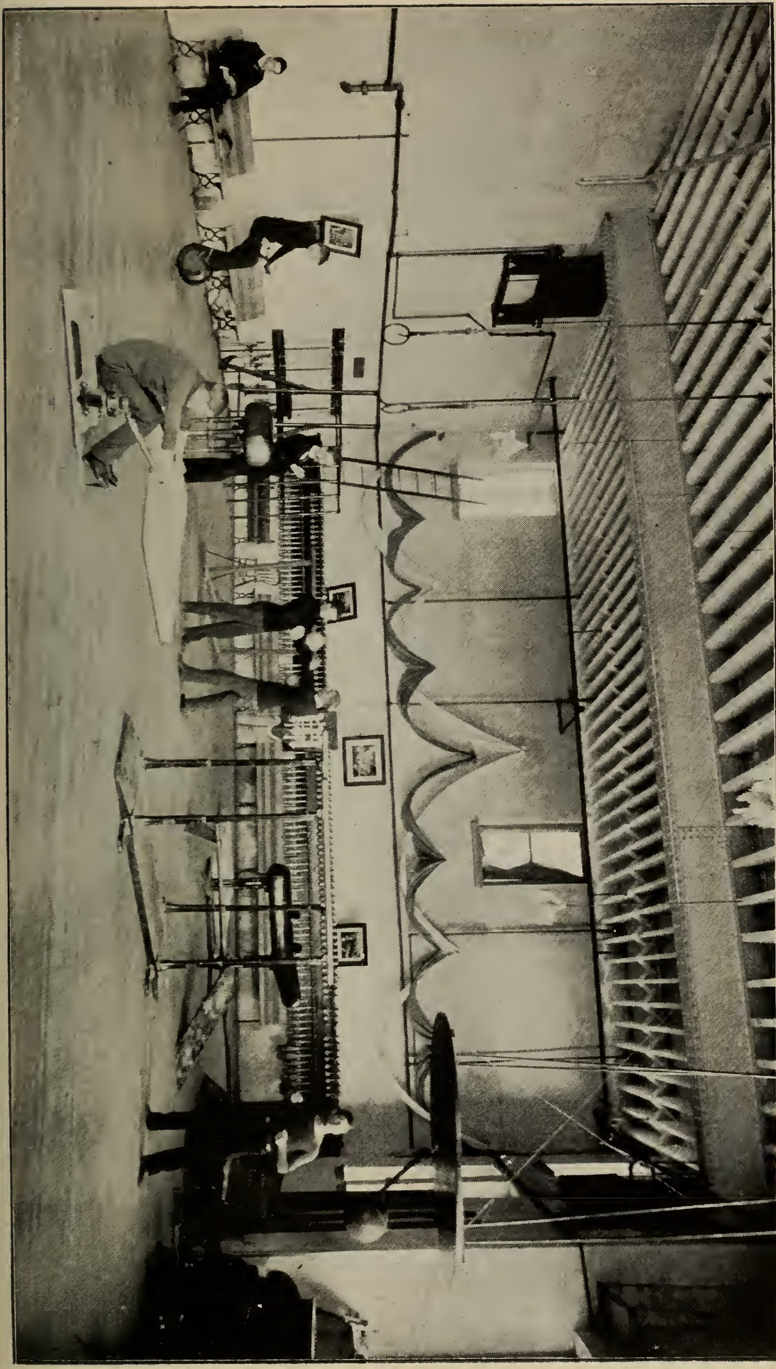
Alumni will confer a favor by notifying Prof. Stockton of errors or omissions in the above directory, which is known to be incomplete.

GYMNASIUM.

The Gymnasium is the most spacious and the best equipped of any college or school gymnasium in the State, and is a valuable adjunct to the school equipment. It is in the basement of the building of 1890, its floor (65 x 40) admitting drill exercise with ample space for apparatus, while its height of twenty feet allows the use of swinging appliances and perfect ventilation. Around the walls are pulling weights of every description, while among the other instruments are swinging ring, parallel bars, horse buck, quarter circle, "cage" with apparatus for development of every set of muscles, ladders, spring-board, complete sets of clubs and dumb-bells and many others.

The Gymnasium is open every school afternoon, also for systematic class-work and "free exercise" three evenings of each week. Instruction is given in gymnastic exercises on those evenings. Shower baths (hot or cold) adjoin the gymnasium. Each student pays a fee of one dollar a term for the use of gymnasium and deposits one dollar for his locker key, the latter being returnable. The gymnasium fee is used exclusively for repairs and renewals of gymnastic apparatus.

The Gymnasium is managed by the "School of Mines Athletic Association," composed of officers and students of the institution. The Directors of this Association are responsible to the school for the maintenance of order and care of apparatus.



TEXT BOOKS.

Richter's Inorganic Chemistry.
Prescott and Johnson's Qualitative Analysis.
Cairns' Quantitative Analysis.
Furman's Manual of Assaying.
Wentworth's Higher Algebra.
Chauvenet's Geometry, Byerly's Edition.
Chauvenet's Trigonometry.
Nichols' Analytical Geometry.
Osborne's Calculus.
Stahl and Woods' Elementary Mechanism.
Low and Bevis' Machine Drawing and Design.
Grant's Gear Wheels.
Church's Descriptive Geometry.
Morris' Geometrical Drawing.
Carhart's University Physics.
Stewart and Gee's Practical Physics.
Balfour Stewart's Principles of Heat.
Thompson's Dynamo Electric Machinery.
Thompson's Electricity and Magnetism.
Bedell and Crehore's Alternating Currents.
Fleming's Alternate Current Transformer.
Thompson's Polyphase Electric Currents.
Holmes' Steam Engine.
Johnson's Engineering Contracts and Specifications.
Nichol's Water Supply.
Wilson's Manual of Irrigation Engineering.
Johnson's Surveying.
Godwin's Field Book.
Merriman's Hydraulics.
Church's Mechanics of Engineering.
Green's Roof and Bridge Trusses.
Baker's Masonry Construction.
Johnson's Theory and Practice of Framed Structures.
Hughes' Coal Mining.
Austen's Introduction to Metallurgy.
Peters' Copper Smelting.
Eissler's Metallurgy of Silver.
Rose's Metallurgy of Gold.
Hofman's Metallurgy of Lead.
Le Conte's Geology.
Williams' Manual of Lithology.
Moses' and Parsons' Mineralogy, Crystallography and Blowpipe Analysis.
Patton's Crystallography.