

UNIVERSITY OF MONTANA BULLETIN

BUREAU OF MINES AND METALLURGY SERIES

NO. 1

THE MONTANA STATE BUREAU OF MINES AND METALLURGY

**STATE SCHOOL OF MINES
BUTTE, MONTANA
MAY, 1919**

Entered at Butte, Montana, as second-class matter under Act of Congress,
August 24, 1912

THE UNIVERSITY OF MONTANA

Edward C. Elliott, Chancellor of the University

The University of Montana is constituted under the provisions of Chapter 92 of the Laws of the Thirteenth Legislative Assembly, approved March 14, 1913 (effective July 1, 1913).

The general control and supervision of the University are vested in the State Board of Education. The Chancellor of the University is the chief executive officer. For each of the component institutions there is a local executive board.

MONTANA STATE BOARD OF EDUCATION

S. V. Stewart, Governor.....	Ex-Officio President
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The University comprises the following institutions, schools and departments:

THE STATE UNIVERSITY AT MISSOULA

Established February 17, 1893, and consists of

The College of Arts and Sciences	The Biological Station (Flathead Lake)
The School of Law	The Public Service Division
The School of Pharmacy	Special War Courses—
The School of Forestry	Military Service Course (1 yr.)
The School of Journalism	Nurses' Preparatory Course (1 yr.)
The School of Music	Office Training Course (1 yr.)
The Summer Session	
	The Graduate Department
	E. O. Sisson, President

THE STATE COLLEGE OF AGRICULTURE AND MECHANIC ARTS AT BOZEMAN

Established February 17, 1893, and consisting of

The College of Agriculture	The Secondary Schools—(Cont'd)
The College of Engineering	Mechanic Arts
The College of Applied Science	Agriculture
The College of Household and Industrial Art	The Agricultural Experiment Station
Courses for Vocational Teachers	The Agricultural Extension Service
The School of Music	Special War Courses—
The Summer Session	Military Service Course (1 yr.)
The Secondary Schools—	Nurses' Preparatory Course (1 yr.)
Home Economics	Office Training Course (1 yr.)

James M. Hamilton, President

THE STATE SCHOOL OF MINES AT BUTTE

Established February 17, 1893

State Bureau of Mines and Metallurgy
Charles H. Clapp, President

THE STATE NORMAL COLLEGE AT DILLON

Established February 23, 1893, and consisting of

The Two Years Elementary Course	The Four Years Course
The Three Years Course	The Rural Teachers' Course

Joseph E. Monroe, President

For publications and detailed information concerning the different schools and colleges, address the President of the particular institution concerned. Communications intended for the Chancellor of the University should be addressed to the State Capitol, Helena, Montana.

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**STATE BUREAU OF MINES AND METALLURGY
STAFF**

CLAPP, CHARLES H. - - - - - Director and Geology
PhD., Massachusetts Institute of Technology, 1910

ADAMI, ARTHUR E. - - - - - Mining Engineer
E. M., Montana State School of Mines, 1907

PULSIFER, H. B. - - - - - Metallurgy and Safety
B. S., Massachusetts Institute of Technology, 1903;
Ch.E., Armour Institute of Technology, 1915;
M. S., University of Chicago, 1918.

FOREWORD

The purpose of this Bulletin is to call attention to the fact that the Legislative Assembly of the State of Montana, for the year 1919, established in the State School of Mines of the University of Montana a State Bureau of Mines and Metallurgy. The Bureau was established to aid in the development of the mineral resources of Montana. In much the same way that the Agricultural Experiment Station at Bozeman has furthered the agricultural industry of the State, the Bureau of Mines and Metallurgy will stand ready to assist and promote the mineral industry. The Bureau has been established primarily for service, and, as far as is reasonable, those interested may avail themselves of its services free of charge.

CREATION OF BUREAU AND APPROPRIATION

The bill creating the Montana State Bureau of Mines and Metallurgy, enacted by the Legislative Assembly of Montana for 1919 (Chapter 161, page 311), was introduced by Representative Arthur V. Corry, a Mining Engineer of Butte. The Bureau was established as a department of the State School of Mines of the University of Montana, and is under the direction of the State Board of Education, which appoints the director. The regular and special reports of the Bureau are to be printed and distributed as the State Board of Education may direct, and as the interests of the State and of science and industry may demand. All materials collected, after having served the purposes of the Bureau, are to be deposited either in State museums or in the collections of the State School of Mines, and duplicates of representative material are to be distributed to the various educational institutions of the State, so as to be of the greatest educational advantage.

A fund of \$20,000.00, necessary for the maintenance of the Bureau, was appropriated for the biennium ending February 28, 1921.

OBJECT AND DUTIES

The Bureau was established primarily for the purpose of promoting the development of the mineral resources of the State, and of increasing the safety and efficiency of mining and its allied operations. A bureau is the best medium for collecting information concerning the mineral resources and industry, and of disseminating such information by answering inquiries and by the publication of bulletins. It is also an efficient agent in the practical solution of the problems of conservation.

Conservation is now taken by most practical men to mean: "Utilization, with a maximum efficiency and a minimum waste." This definition applies particularly to conservation in the mining industry, for, unlike agricultural products, which are annually replenished, the product of the mines consists of only one crop, which must meet the future, as well as the present needs.

To conserve their mineral reserves, large organizations are forced by the stress of circumstances to mine, mill, and smelt their ores efficiently, and to conserve the services and lives of their employees they are forced to mine, mill, and smelt their ores safely. Individuals and companies operating small mines and prospects, of which there are several hundred within the State, do not fail to appreciate the need for efficient and safe operation, but can rarely give to these matters the attention and money necessary to achieve the best results. To assist these men by helping them mine more profitably, under

safer and more healthful conditions, will be a great factor in conservation.

The object and duties of the Bureau, as specified by law, are as follows:

1. To collect, to compile, and to publish statistics, relative to Montana geology, mining, milling, and metallurgy.
2. To collect typical geological and mineral specimens and samples of products; to collect photographs, models, and drawings of appliances used in the mines, mills, and smelters of Montana.
3. To collect a library and a bibliography of literature pertaining to or useful for the progress of geology, mining, milling, and smelting in Montana.
4. To study the geological formations of the State with special reference to their economic mineral resources, both metallic and non-metallic.
5. To examine the topography and physical features of the State with reference to their practical bearing upon the occupation of the people.
6. To study the mining, milling, and smelting operations carried on in the State, with special reference to their improvement.
7. To prepare and to publish bulletins and reports, with necessary illustrations and maps, which shall embrace both a general and a detailed description of the natural resources and geology, mines, mills, and reduction plants of the State.
8. To make qualitative examinations of rocks and mineral samples.
9. To consider such other scientific and economic problems as in the judgment of the State Board of Education are of value to the people of the State.
10. To communicate special information on Montana geology, mining, and metallurgy.
11. To co-operate with the other departments of the University of Montana, with the State Mine Inspector, and with other departments of the State Government as may be mutually beneficial; and to co-operate with the United States Geological Survey and with the United States Bureau of Mines, in accordance with the regulations of those institutions.

It might be wondered by some, why the Bureau should not undertake to make assays and chemical quantitative analyses free of charge. These matters, however, naturally fall to the private assayer and chemist, for the State should not enter into competition with the legitimate private business of its citizens. However, qualitative tests of samples can be made and many questions concerning the commercial value of the samples may be answered. Samples, ores, and other consignments should be shipped to the State Bureau of Mines and Metallurgy, Butte, Montana, preferably by parcel post, except in the case of large consignments.

ORGANIZATION

The Bureau is organized into four major departments—Administrative, Geology, Mining, and Metallurgy and Safety. The Administrative Department directs the work of the Bureau, sees that requests for information are referred to the proper departments for answer, supervises the co-operative work, oversees the printing, publication, and distribution of the reports of the Bureau, and prepares for the State Board of Education the biennial report to the Legislative Assembly.

The Geological Department undertakes the study of the geological formations and mineral resources of the State, collects geological and mineral specimens, makes qualitative examinations of rocks and mineral samples, and prepares geological reports.

The Mining Department makes the necessary surveys and prepares topographic and other base maps, studies the mining operations of the State, and prepares reports on mining operations.

The Metallurgical and Safety Department collects statistics with regard to the mineral industry of the State, studies the milling and smelting operations, engages in metallurgical research, and prepares reports on metallurgy and safety.

PLAN OF WORK

Work for which there is special and immediate demand will receive first attention, and that which is planned for the biennium 1919-1921 consists of the preparation of a report on the Mining Districts of Montana, giving location of districts, accessibility, valuable products, statistics of production, summary of geological features, and a bibliography of available maps and literature; and the preparation of reports on the various mineral products of current interest, such as oil and gas, gypsum, and road-building material.

The Mining Department is undertaking the preparation of a report on mining methods and timbering for prospects and small mines.

Besides collecting statistics on the mineral resources of the State, the Metallurgical and Safety Department will study conditions of safety, welfare, and hygiene in the appropriate industries and will prepare circulars on the advance of this phase of industry in other communities. It will also undertake to standardize small shipments of mineral products and ores; engage in research in the structure of copper and other metals, with a view of determining the relation of the structure of metals to the physical properties; and will prepare bulletins on the theory and application of flotation and the ball mill to small mining properties, and on the cyanide process as used in Montana.

Application has been made to the United States Geological Survey and United States Bureau of Mines to engage in co-operative work with the State Bureau. Much good should result from the proposed co-operation, for similar co-operation has been proved, in certain parts

of the United States, to be very successful and beneficial. Attention will also be drawn to the desirability of securing a United States Bureau of Mines Experiment Station in Butte.

PUBLICATIONS

The results of the work of the bureau will be made accessible to the public by the publication of bulletins and circulars. These will be sent free of charge to those requesting them. The publication of pertinent material through local co-operation with mining companies, chambers of commerce, and newspapers should be of direct and immediate benefit to the people of the State.

The demand for individual correspondence, such as heretofore has been carried on by the School of Mines, and which grew to such volume as to interfere with the regular work of the school, was one important factor leading to the establishment of the Bureau, and a large part of the work of the Bureau will consist in carrying on such correspondence in a more satisfactory way than has heretofore been possible.

HOW TO USE THE BUREAU

The Montana State Bureau of Mines and Metallurgy has been established for the use of anyone interested in the mining industry of Montana. Its success will depend largely upon how much service it is asked to give. The Bureau is accessible to all, and is located at the State School of Mines, in Butte. If possible, bring your problems to the Bureau in person; if not, send in your samples and questions by mail or express. All samples and letters should be addressed to the State Bureau of Mines and Metallurgy, Butte, Montana.

The Bureau is reliable and is well equipped to carry on many different kinds of investigations. So far as is reasonable, consistent with reputable practice, and within the limits of the available funds, all problems and questions will receive careful consideration. Ask for the reports and maps of the Bureau, and use them. Do not go ahead without obtaining the available information concerning the mineral resources of Montana. Let the Bureau help you develop the mineral resources and increase the safety and surety of the mining industry.

