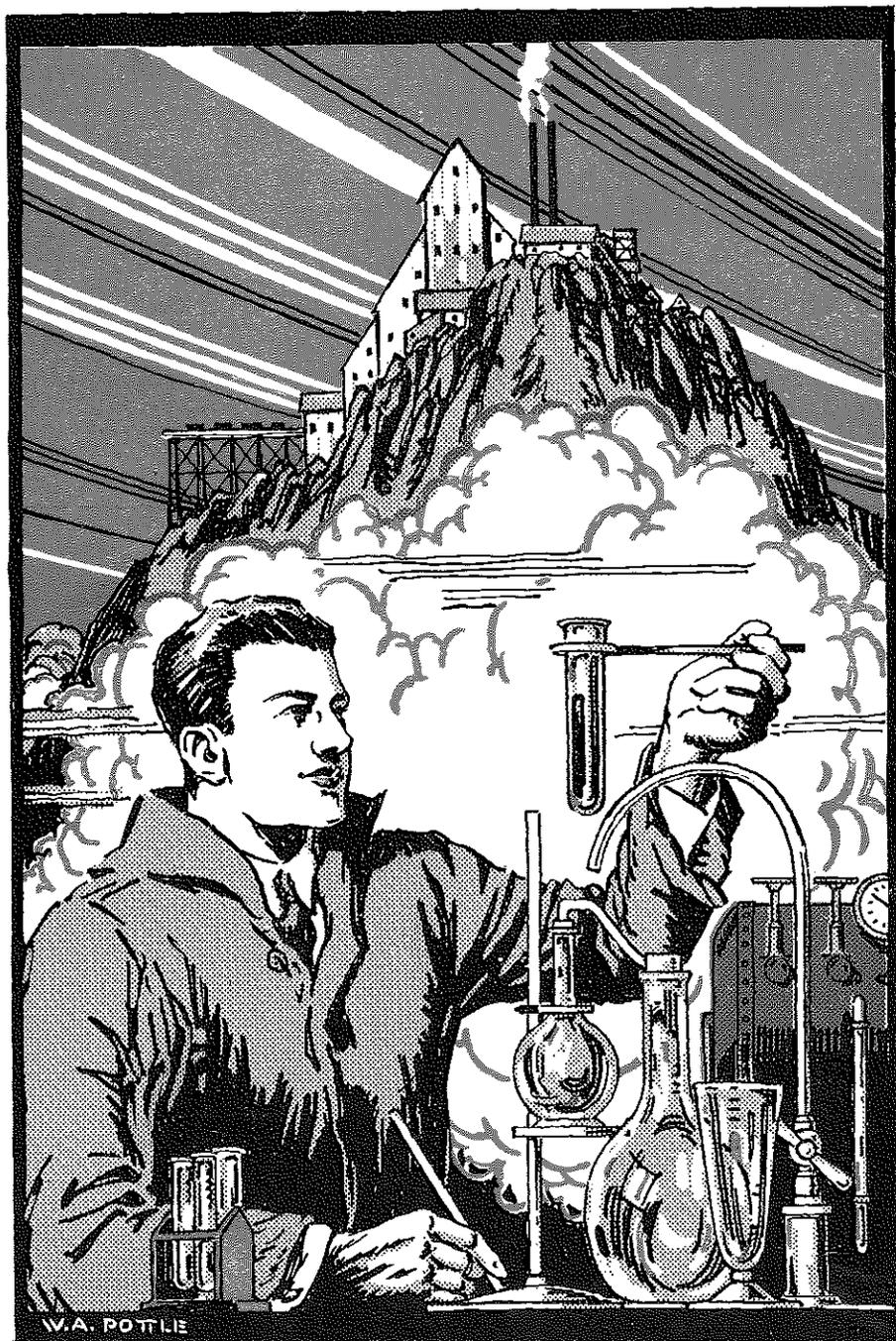


The
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MAGAZINE

Volume 20 No. 2

February 1930

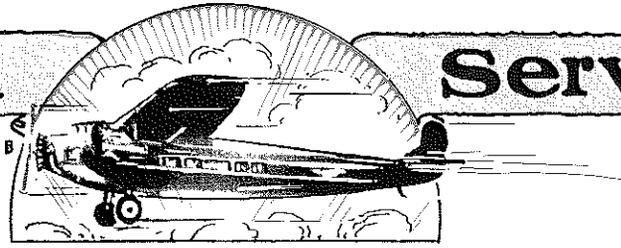


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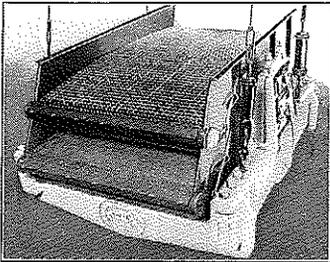
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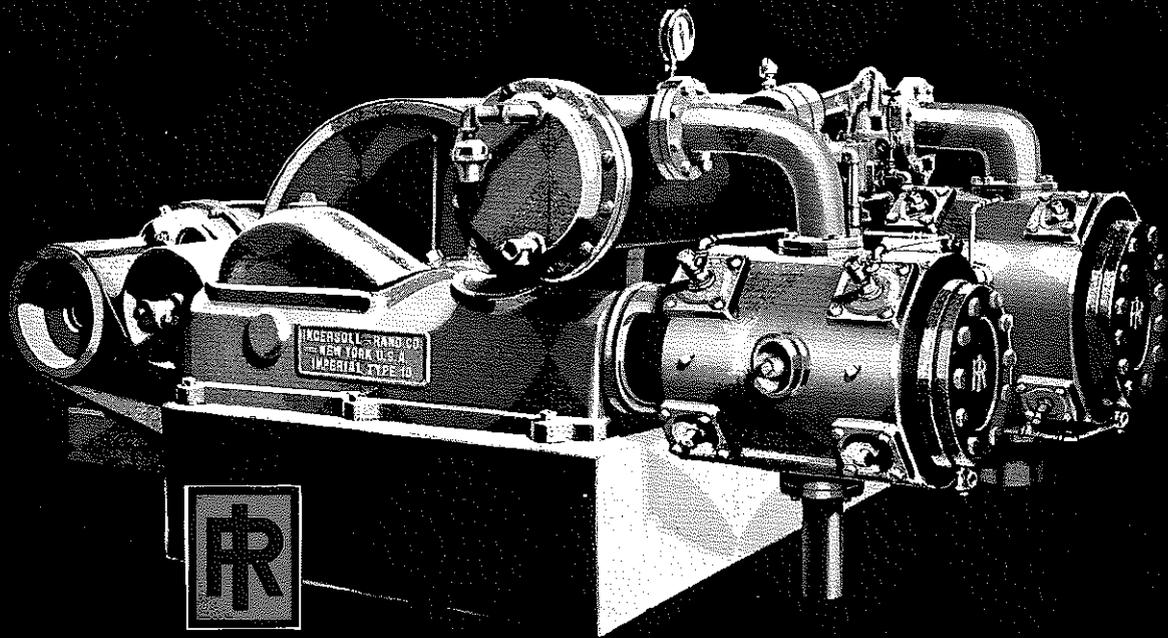
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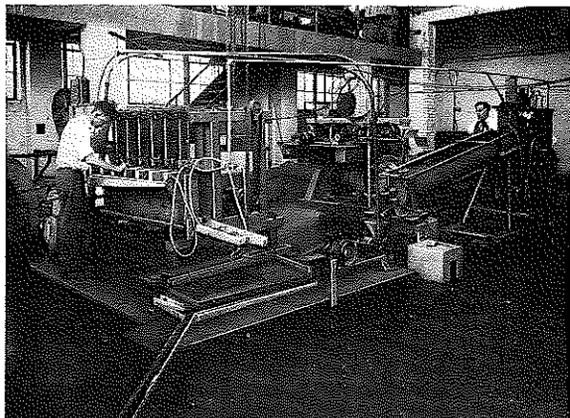
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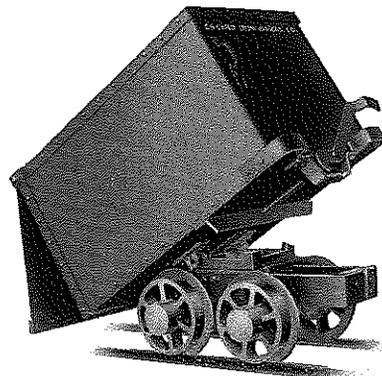
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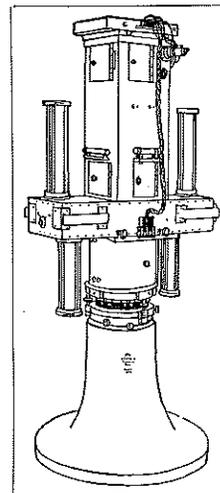
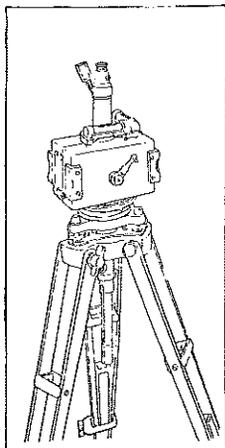
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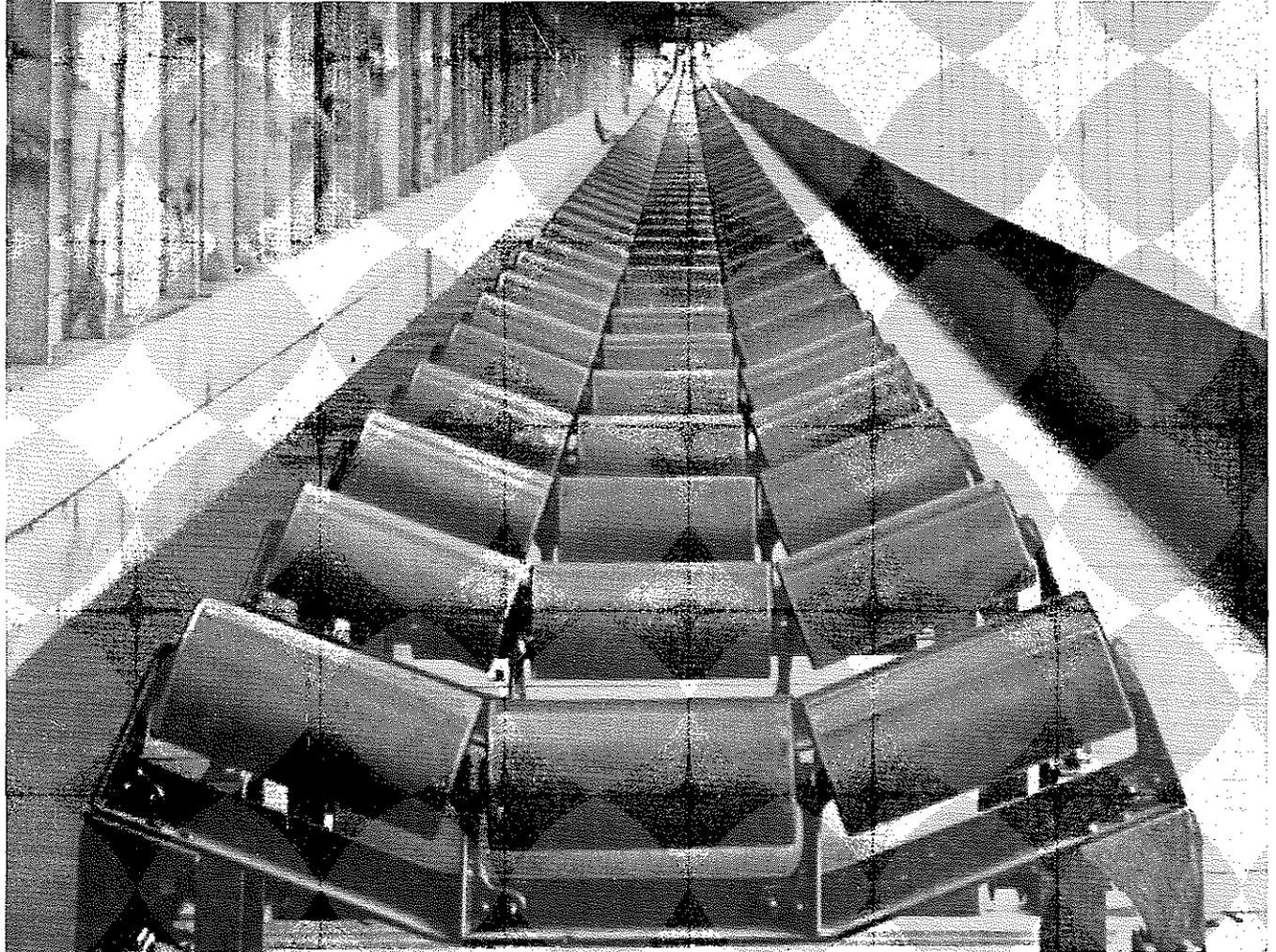
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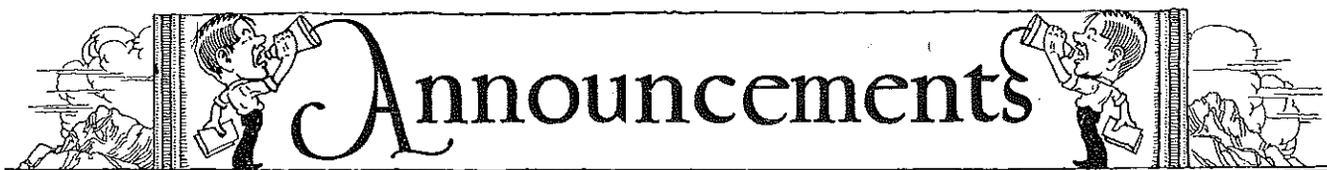
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A Series of Articles on Hydro-Metallurgy

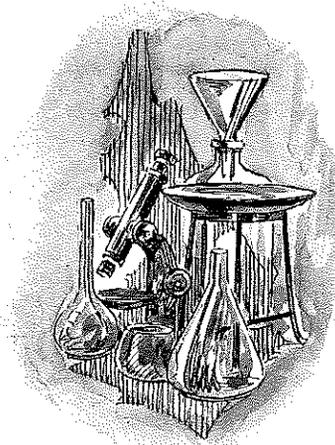
A series of articles on hydro-metallurgy will be started in the March issue of the Colorado School of Mines Magazine. These articles will be written by Thomas P. Campbell, Associate Professor of Metallurgy at the School of Mines. The series will continue throughout the year, and will be of much interest to many metallurgists.

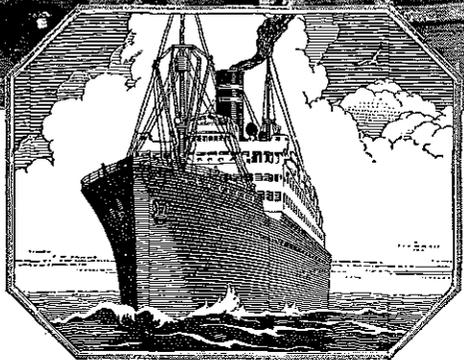
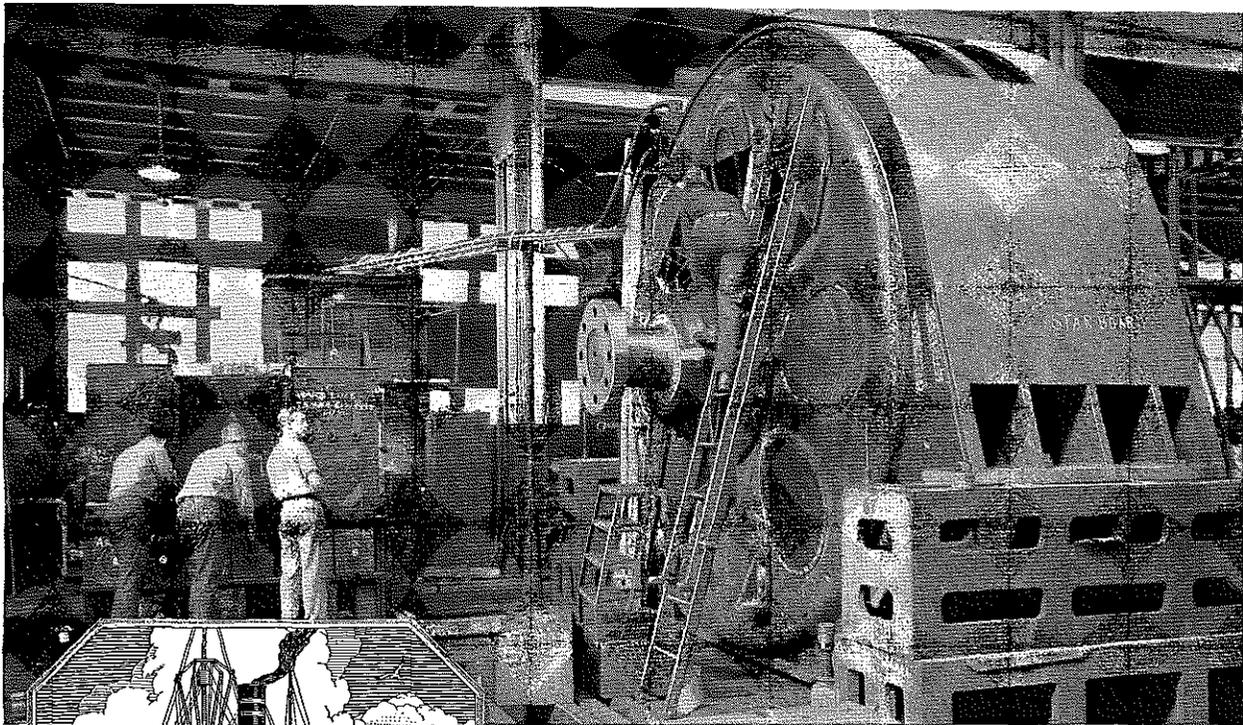
This series will run under the following title:

Principles of The Hydrometallurgy and Electro-deposition of the Metals

In his introduction, which will be published in March, Professor Campbell calls attention to the fact that metallurgy is one of the oldest arts. The discovery of metal was by pure chance, it seems, and took place at least five thousand years ago. It has influenced civilization—in fact, the increasing uses of metals have made possible what we are pleased to call civilization today.

The entire series will constitute a complete treatise on hydro-metallurgy, and will, when grouped together, provide a valuable source of information.





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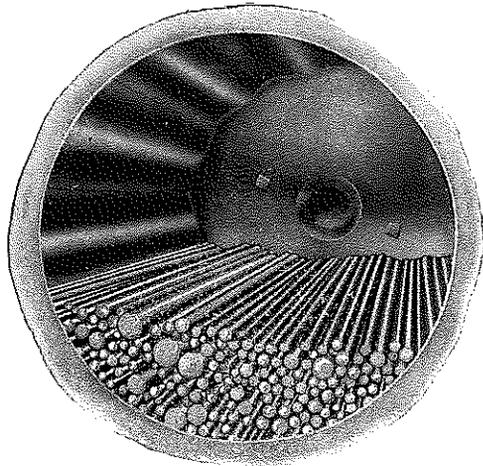
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Editorial & Comment

The Meaning of Education

OUR attention is attracted by Everett Dean Martin's definition of an educated person, and we feel as though it should be passed on to our readers:

"An educated person is not merely one who can do something, whether it is giving a lecture on the poetry of Horace, running a train, trying a lawsuit, or repairing the plumbing. He is also one who knows the significance of what he does, and he is one who cannot and will not do certain things. He has acquired a set of values. He has a 'yes' or 'no', and they are his own. He knows why he behaves as he does. He has learned what to prefer, for he has lived in the presence of things that are preferable. . . . He has learned enough about human life on this planet to see his behavior in the light of a body of experience and the relation of his actions to situations as a whole. . . . He is being transformed from an automaton into a thinking being."

Misplaced Emphasis?

A SUCCESSFUL football season will do more to line up a solid Alumni backing than any other one thing, judging from the reactions of various Alumni bodies throughout the country. Is this misplaced emphasis? The fact that research in flotation, geophysical prospecting, petroleum, or what not, conducted at the Colorado School of Mines has given impetus to the industry is received with much less enthusiasm by our Alumni than an athletic victory over Denver University. Is this misplaced emphasis?

We are not expounding a new code of blue laws, and we rejoice over a victorious season in sports. Well, just a thought to leave with you—Is it misplaced emphasis?

A Denver paper, following the annual National Stock Show, comments as follows: "Cattle winnings both here and outland have given the Colorado Agricultural College more advertising than any football team." Which interpreted into the language of a mining engineering school means: "Contributions to the progress of the mineral industries gives more prestige to the Colorado School of Mines than victories on the football field."

It cannot be denied that the Old Grads want to follow a winning team at Mines. This is natural and, in itself, is not bad—all of us are hoping for a football championship. But to believe that the School is slipping because its teams do not win is not merely a mistake, but a vicious mistake!

Just a Thought

IN this day and age, when there is so much to be done, and so many technically trained men capable of doing it, publicity attached to one's name is highly important. There are not too many trained men, and too small a number of jobs. Many engineers today have so large a practice that they cannot accept new projects offered to them every day. Such men are said to have a "reputation."

In order to have this reputation, an engineer must be thoroughly trained in his particular line—Colorado School of Mines graduates are so trained. He must distinguish himself in the projects that he works upon, and in order to have the opportunity of so distinguishing himself, he must bring his name before the public and keep it there. Even after success, his name must be kept before the public in the same manner as brands of nationally known products manufactured on a large scale and consumed daily everywhere throughout the world.

Successful engineers attract through the press a great deal of attention to themselves by their successes. And they insert their professional cards in publications which reach those individuals who may need the services of such an engineer.

This Magazine accepts no professional cards other than those of Mines Alumni and men connected with the School of Mines. These cards bring Alumni names before a selected group of mining men—Alumni and non-Alumni. The most valuable acquaintances are your own fellow alumni. They are the ones to whom you should keep your name known. Think it over and carry a professional card in the Magazine.

Honor and Success

RECENTLY the American Association of Civil Engineers conferred a medal upon a Mines Alumnus for writing the best article on transportation for the past year.

More recently the Colorado Engineering Council conferred upon another Mines Alumnus its first gold medal for meritorious engineering work.

The news of such honors paid to our fellow members should be received with enthusiasm. Every Alumnus so honored reflects much credit upon the School of Mines. Success is its own reward, but when success is recognized by one's fellow men with a medal personifying honor and glory, it must make one feel that his efforts have been tremendously worthwhile.

SOME months ago, a series of articles on Mill Operation and Control was published in the Magazine. This series was accepted by men in the industry with much enthusiasm. One engineer, not a graduate of the School, wrote us, deploring the fact that these articles were not published in such and such journal so that more engineers could have had the information. This is an example of how we are trying to serve. There was no objection on our part to the publication of these articles in the trade journals—In fact, we invite these publications to help us give to the men in the industry whatever information that may come out of the Colorado School of Mines. It is theirs to reprint.

Mining Education

THE trend of mining education seems to be a paradox. It is toward greater specialization and against greater specialization. Such a great body of knowledge has been accumulated around the mineral industries that it is no longer considered possible to turn out a completely polished mining engineer. Not that completeness in anything is ever achieved; but we glance back a quarter of a century when the student was given a bit of instruction in coal mining, metal mining, geology, assaying, and a few fundamentals of math, chemistry and physics, and his mining education was considered complete. Today the student must, after getting the fundamentals, concentrate in one of the special branches of metallurgy, mining, geology, fuel or petroleum, and his mining education is then considered still far from complete.

The trend seems to be to encourage a more liberal education along with mining. Languages, economics and more English mixed with business law and other subjects are demanding the attention of curriculum committees in the mining schools. This is certainly a trend against greater specialization. Now where are we? A graduate is no longer a Mining Engineer, but he is either an Engineer of Mines or a Petroleum Engineer—perhaps a Geological Engineer or a Fuel Engineer. Surely this is a trend toward greater specialization.

A Collective Viewpoint

LESS than a year ago the Editor had an occasion to boast of having "burst into twelve point type" on this page. At that time such a thing was a rare pleasure and an event. Lately it has become habitual. Perhaps it has been noticed that the quality of the editorials has not been so excellent. That is because the Editor has been writing them.

What we want is a collective viewpoint. We need to see through the eyes of the Alumni members; not through the eyes of an Editor who can't see very well anyway. The field is open. Sign your editorials and send them in for the March issue.

Our Column

The press informs us that Dean George B. Pegram of the Engineering School of Columbia University reports to President Nicholas Murray Butler plans to develop the School of Mines at Columbia into a national center of research.

* * *

Dean Pegram maintains that the knowledge and experience gained from the immediate contact with mining operations is distinctly not the type of knowledge for which the student of mining spends his years in an engineering school.

* * *

We quote here from Dr. Clinton H. Crane, President of the St. Joseph Lead Company: "I wish to stress the desirability of making a direct contact with the privates in the ranks—the workmen who form a foundation of all enterprise—of working with them (after graduation) doing their jobs, and competing with them. . . . We need men with an engineering point of view supplemented by practical experience."

* * *

We believe, as does Doctor Crane, that the successful executive needs not alone a great fund of specialized knowledge, but he must be human. It is, therefore, necessary for the executive to experience some of those things experienced daily by those who work under him. This human equation cannot be ignored!

* * *

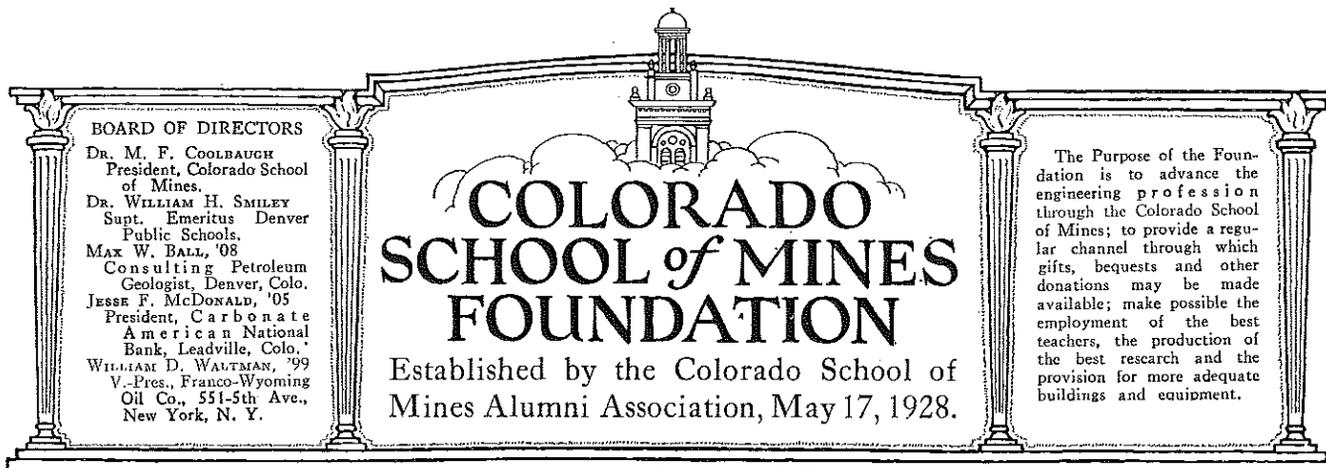
Engineering Schools are not Trade Schools, it is true. Too much emphasis must not be put upon practical experience; yet it seems that contacts with practical operations should be an important part of a mineral industries school curriculum! A school of Mines located in a mining area, close to such practical operations, enjoys an advantage, unhappily denied to similar schools far removed from mining activity.

* * *

Speaking of research in metallurgy, we cannot resist the urge to ask how widely known are such names as Palmer, Weinig, Campbell, Warren? In so far as flotation is concerned, there is already a center of metallurgical research unquestionably established, and this center is, in a Western State.

* * *

Dean Pegram's report carries the statement that many of the State supported schools of mining have sprung up more in response to local pride than to any compelling need. We have no right to speak for all the schools so indicted, but the State supported School of Mines in Colorado has justified a thousand fold whatever pride Colorado and the West may have in it!



Scholarships and Loan Funds Assist Worthy Students

REGISTRAR DOOLITTLE recently gave out the information that the student loan fund at the Colorado School of Mines had reached the \$11,000 mark. This fund has grown from an initial \$1,000 given to the School by Thomas Walsh in memory of his son Vincent, who was mortally injured in an automobile accident some twenty years ago. Additional gifts have added to the loan fund from time to time, the latest being a sum of \$2,000 in memory of John Logan Yates, an alumnus of the School who was suddenly stricken with a heart attack in June, 1929. And the interest on the funds available for student loans has added its mite.

It is pleasing to note that the student loan fund has now passed the \$10,000 mark, yet when one stops to consider, such a sum is a paltry figure for the largest mining school in the world! Through the Colorado School of Mines Foundation it is possible to increase this fund to an amount of which such an institution could be quite proud.

Contributions by individuals interested in the education of American youth have been increasingly numerous during the past decade, and the schools of engineering throughout the country have not escaped the favor of those able to contribute. The amount of gifts for buildings, professorships and general endowment has exceeded by far the amount given to scholarship and loan funds, yet such funds are needed and should not be ignored.

Recently a gift of \$25,000 was made to the School of Engineering at Cornell University as a scholarship fund. The fund was in memory of the donor's husband whose name it bears; and it would seem that there are few ways of commemorating the name of a loved one more noble than the assistance of worthy and needy students to an education.

This particular scholarship fund is designed on a generous scale. It may be held for four years and during that time will pay most of the scholar's expenses at college, amounting, at the present rate of tuition, to an average of more than \$1,000 a year. The provisions which the donor made and which were gratefully accepted include these clauses:

"The fund shall be kept invested and the income thereof shall be used by Cornell University to maintain a scholarship to be known as the Martin J. Insull Scholarship.

"It is the donor's wish that this Scholarship be used to enable a deserving student or students to pursue a regular undergraduate course of study in the College of Engineering of Cornell University; that the persons eligible to the Scholarship be young men of good character who have presented acceptable credentials for admission to the entering class of the College of Engineering, whose preparatory work has given evidence of capability for advanced technical training, and whose parents or guardians cannot afford the cost of a college education; and that the scholar be supplied, from the income of the fund, with an allowance sufficient to pay tuition and fees, to buy the books and instruments that are required by his studies, and to live in decent circumstances during his undergraduate course of study at the University.

"The donor proposes that for the present the cost of such living be estimated at \$20. a week or \$760 for the school year of thirty-eight weeks and that the Scholar receive in the freshman year an allowance for living computed at that rate, but that, in order to inculcate a habit of industry and thrift, an allowance for living shall be paid to the Scholar in the sophomore year at the rate of only \$15. a week and in each of the subsequent years of the course at the rate of only \$10. a week, in the expectation that the Scholar will supplement the reduced allowance by his own earnings. The donor proposes that the allowance for books and instruments be \$100. a year."

Here is a need and an opportunity for all those who may have interested themselves in the Colorado School of Mines Foundation. Although the School of Mines grants a number of scholarships to students of high standing in the United States and in various foreign countries, there is a great need of endowed scholarships and fellowships at Mines. Any number of worthy and capable young men each year find it impossible to train themselves as engineers simply because they have not the funds to attend Mines.

Geophysical Investigation at Caribou, Colorado*

Relationship of Topography, Geology, and Magnetic Disturbance

By C. A. HEILAND† and J. A. MALKOVSKY‡

AT the beginning of 1927 the United States Bureau of Mines decided to begin a study of geophysical methods of prospecting, with the special object of determining which geophysical method or methods would be the most economical and successful in a particular district.

To determine to what extent geophysical methods would be applicable to mining, it was decided to try out the different methods in making geophysical measurements above a deposit with sufficiently known geologic conditions. For this purpose it seemed most advisable to select a deposit that in part, or as a whole, was so exposed at the surface as to enable a thorough study to be made of the relationship of geologic factors to the physical effects produced by them. Such measurements have sometimes been adversely criticized by geologists¹ as having no practical value. The objection to this criticism is that a successful interpretation of geophysical data obtained above hidden deposits is possible only if the effect of the different geologic factors upon geophysical data is thoroughly understood. This is not possible by theoretical consideration only; it is absolutely indispensable that measurements first be made above sufficiently known geologic conditions. Geologic conditions are, however, well known only when the disturbing formations lie directly in the surface. Information on subsurface conditions may, of course, be obtained by drilling, but on account of the great expense drilling generally can not be used to furnish information except for certain separated localities; to construct the behavior of the formations between these localities sometimes leaves very much to the imagination of the geologist. The geophysical data are, however, not discontinuous to such an extent as the geologic data, since stations for any method may always be so spaced as to guarantee alteration of the particular physical element along the surface with any desired accuracy. In order, therefore, to get empirical data—that is, to study the relationship of geologic formations to geophysical elements—it is necessary that both geologic and physical data be comparable; in other words, for both data a certain continuity must be guaranteed, which will be exactly possible only when the studied geologic formations are exposed.

As is generally known, the applicability of geophysical methods depends upon whether or not the geologic unconformities to be detected possess different physical properties

from their surroundings. For the application of the torsion balance it is necessary to have a sufficient difference in specific gravity of deposit and country rock; for the magnetic method the deposit must be more magnetizable than its surroundings; for the electrical method the deposit sought must be a good conductor.

The titaniferous magnetite deposits in the Rocky Mountains at Caribou, Colo., were proposed as suitable for test measurement, as the magnetite was pronouncedly different from the country rock in specific gravity, magnetism, and electric conductivity; the deposits are outcropping, and their geology and petrology had been previously described in a United States Geological Survey report.²

The geologic map (fig. 1) mentioned shows four intrusions of basic material into the monzonite and monzonite porphyry which constitute the primary formation at Caribou. The titaniferous magnetite deposits associated with the basic intrusions, the gabbros, very probably were formed by magnetic segregation. The deposit selected for this investigation was that farthest north; it had approximately a lenticular shape and a strike of about N. 45° W. The advantage of working on this deposit was that its surface was mostly bare of grass and trees and in places was opened by trenches and pits to a depth of several feet.

GEODETTIC WORK

Maps are the first requirement for all geophysical work. Their correctness must correspond to the purpose for which they are needed; that is, the error must be taken into account with which geophysical data, such as lines of equal magnetic or gravity anomaly and equipotential lines, gravity gradients, curvature values of equipotential surfaces of gravity, magnetic disturbance vectors, or

directions of the electromagnetic field, can be determined and plotted.

The only available plan of the area, the United States Geological Survey map in a scale of 1/62,500, was not adequate from the viewpoint of the geophysicist, so that it was decided to make a geodetic survey of the area.

The survey was commenced at station A (see map, fig. 2), located at the junction of the two roads. The south road was followed with 12 points, B to N. From N a traverse having seven points (O to W) was run downhill in a northerly direction. After the north road was reached it was followed back to A with 19 points, X to SS. The

The geophysical work described in this report was done by C. A. Heiland and J. A. Malkovsky, of the Colorado School of Mines, who were in charge of the geodetic, topographic, torsion balance, and magnetometer observations, and by E. H. Denny, supervising engineer of the Bureau of Mines at Denver, who gave valuable help in the electric and geodetic phases of the investigation and who was also in charge of administrative affairs. B. S. Butler, of the United States Geological Survey in Golden, and Charles W. Henderson, of the Bureau of Mines in Denver, together with the writer, mapped the geology of the deposit. The Colorado School of Mines furnished all equipment required for the magnetic and torsion balance measurements. Other reports contained in this Technical Paper which are not reprinted here are: The Geologic Report by Charles W. Henderson, and a section on Earth-Magnetic Measurements.

* Extracts taken from Technical Paper 439 of the United States Bureau of Mines by C. A. Heiland, Charles W. Henderson and J. A. Malkovsky.

† Head of the Department of Geophysics, Colorado School of Mines.

‡ Instructor in Geophysics, Colorado School of Mines.

¹ Reish, H., Erdmagnetismus und glaciales Diluvium; Berlin, 1927.

² Bastin, E. S., and Hill, J. M., Economic Geology of Gilpin County and Adjacent Parts of Clear Creek and Boulder Counties, Colo.; U. S. Geol. Survey Prof. Paper 94, 1917, 379 pp.

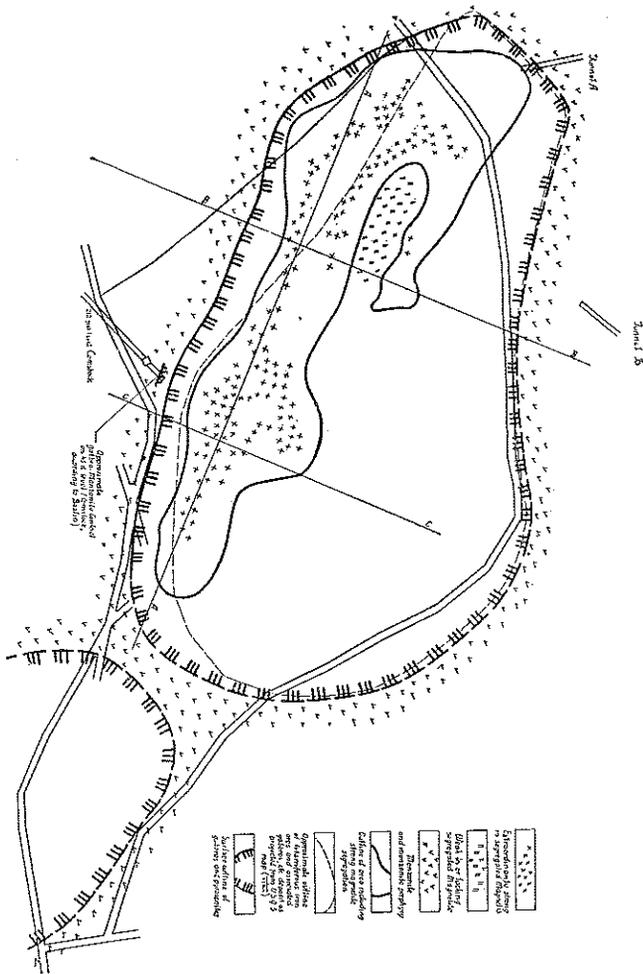


FIGURE 1—Geologic map of northern magnetite deposit, Caribou, Colorado. (Turn to one side).

total error of closure at A was 3.9 feet. The total surveyed line is about 3,600 feet long and contains 39 points, so that the error of closure is 0.1 per cent of the total distance. The error of closure in elevation was about 0.5 per cent of the difference between highest elevation and lowest depression. These accuracies were more than sufficient for our purposes.

Determination of Astronomic North Direction—The north direction for the entire system was determined at station W by observing the polaris at a time very close to its upper culmination. This determination was checked by an observation of the polaris at station A. No time correction was applied to these observations, as only one direction, that determined at station W, was used for the entire system. Even if this direction should be somewhat in error, it can have no effect on any of the geophysical results. However, the middle error between the astronomic north directions at A and W was 30 minutes only, which was small considering the fact that the comparison of the directions at these two points, being at the extreme ends of the surveyed loop, were made by plotting only and not by computation.

Various geophysical apparatus by which the direction of certain physical forces is found have to be set up in a determined direction to which the direction of the physical force must be referred. Such a determined direction is usually the astronomic north. For most practical purposes it is sufficient to determine the magnetic north by means of

a compass and to derive from this direction the direction of astronomic north, using Government maps showing the normal value of magnetic declination for any point in the country. The torsion balance, for instance, is oriented north by means of a compass, and the induction coil used in electric prospecting is oriented in the same way.

Because the strong magnetic attractions vary rapidly from one place to another, orientation by the method just mentioned failed to work entirely at Caribou. It would have been necessary to determine the astronomic north direction on every station. This would have affected only torsion-balance and electric observations, because magnetic measurements using, as is nowadays the rule, only the vertical intensity or both the vertical and horizontal intensities, are not affected by disturbances in declination. The variation of the magnetic meridian (which is not the same as the variation in declination in this connection) is, of course, always taken into account by determining the magnetic meridian with a compass and by observing the horizontal intensity always in the magnetic meridian and the vertical intensity at right angles thereto. On the other hand, the more data of the earth-magnetic field are known the better it is for interpretation of the results; therefore, because the magnetic disturbances were so strong the writer thought that it might be advantageous to observe the declination also, as the observation could be made with a simple compass. To do this it was also necessary to know the astronomic north direction at every magnetic station.

Arrangement of Stations—As 100 to 200 magnetic stations were planned, at each of which the north direction should be known, the question whether or not stations should be established and surveyed before geophysical observations were made, or vice versa, could be decided in a positive sense at least for the magnetic stations. The stations were all arranged in astronomic north-south and east-west lines, their distances being small enough to sight from one to another. If the next station north was not visible on account of a steep slope, the next station east or west could easily be substituted.

Despite the rugged topography, the arrangement of stations was made exact enough by the following procedure: From station W, where the astronomic north direction was known, this direction was transferred, by sighting and back sighting, to stations X, Z, AA, BB, CC, DD, FF, and HH on the north road. From these points north lines were staked out in the terrain. At approximately every 100 feet on these lines two stakes within about 10 feet of each other marked a future intersection with the east-west line. These east-west lines were obtained by transferring the east-west direction from station W to stations U, T, S, R, P, O, N, H, and G. The telescope on each of these points was adjusted east-west; the rod man determined the intersection by moving along a string stretched between the two mentioned points on the north-south line, as well as by keeping in the cross-web of the transit-telescope. Thus, the first 90 magnetic stations were established.³ Afterward the magnetic measurements made at these stations showed that in various places intermediate stations had to be located. Thus, the total number of stations was increased to 182. (See fig. 2.)

The location of the torsion-balance and electric stations was not determined in advance, as both types of stations could not be arranged north-south or east-west. The location of the former depended on the terrain conditions, that of the latter on the behavior of the electrical field. Through

³The topographic data obtained on these first stations only were used by Eve and Keys in their report (Technical Paper 434, Bureau of Mines, Geophysical Prospecting; Some Electrical Methods).

the arrangement and the closeness of the net of magnetic stations, however, not only could the location of such stations after they had been occupied be easily determined by tying in with neighboring stations, but also the astronomic meridian on any of them could be found very readily by sighting to and back sighting from the next magnetic station. As to the electric measurements, the plane of the induction coil itself allowed an accurate enough sighting. For the torsion balance a telescope had been attached to its top parallel to the longitudinal axis of the case.

The locations of torsion-balance stations I to X are also shown in figure 2.

TOPOGRAPHIC SURVEY

A plane survey of area and stations could not have been sufficient for geophysical prospecting work for three reasons: (1) In profiles showing geophysical results the stations must be plotted in their true location on a slope in order to consider for the interpretation their correct distance from the geologic disturbance, (2) the terrain and cartographic correction to be made for torsion-balance results requires a very good knowledge of the terrain conditions, and (3) an exact topographic survey might reveal certain relationships of topography to the geologic and geophysical conditions. It was therefore decided to undertake the laborious task of making a detailed topographic map of the area under survey. The relative system of elevations thus established had to be converted into an absolute one because for the cartographic correction the topographic map of the United States Geological Survey had to be used in conjunction with our topographic maps. For this purpose it was entirely sufficient to compute the absolute elevations by tying in with a station through which a contour line of the Geological

Survey map was running; no stations with an absolute mark were close enough to our area. The 10,000-foot altitude contour line of the Geological Survey map was going through our station B; consequently, all other stations were tied in to this point.

A topographic map was prepared by Malkovsky. (See fig. 2.) The contour lines were drawn in 2-meter intervals. The area under survey as a whole has the appearance of a fairly steep hill which is situated north of a still larger hill, named "Caribou Hill."

RELATIONSHIP OF TOPOGRAPHY, GEOLOGY, AND MAGNETIC DISTURBANCE

The fact alone that the gabbro intrusion forms a hill which is so strikingly separated as an independent topographic feature from Caribou Hill indicates broadly that there must be some relationship between the topography and geology of the area. If this is so, then the magnetite deposit proper should also be separated in a topographically evident way from the gabbro from which it has been segregated. Some evidence of such separation is apparent, particularly to a person going over the ground and watching for small ridges. The part of the magnetite deposit that is situated on the northwestern slope of the hill forms a slightly noticeable apparent ridge. However, the topographic indication is by no means very strong, probably because the difference in hardness of the titaniferous magnetite and gabbro is much less pronounced than the difference in hardness of basic intrusion and acidic country rock. The slight indication which is noticeable in going over the ground seems to fade almost entirely on the topographic map. Some distortions appear in the contour lines but are not easily

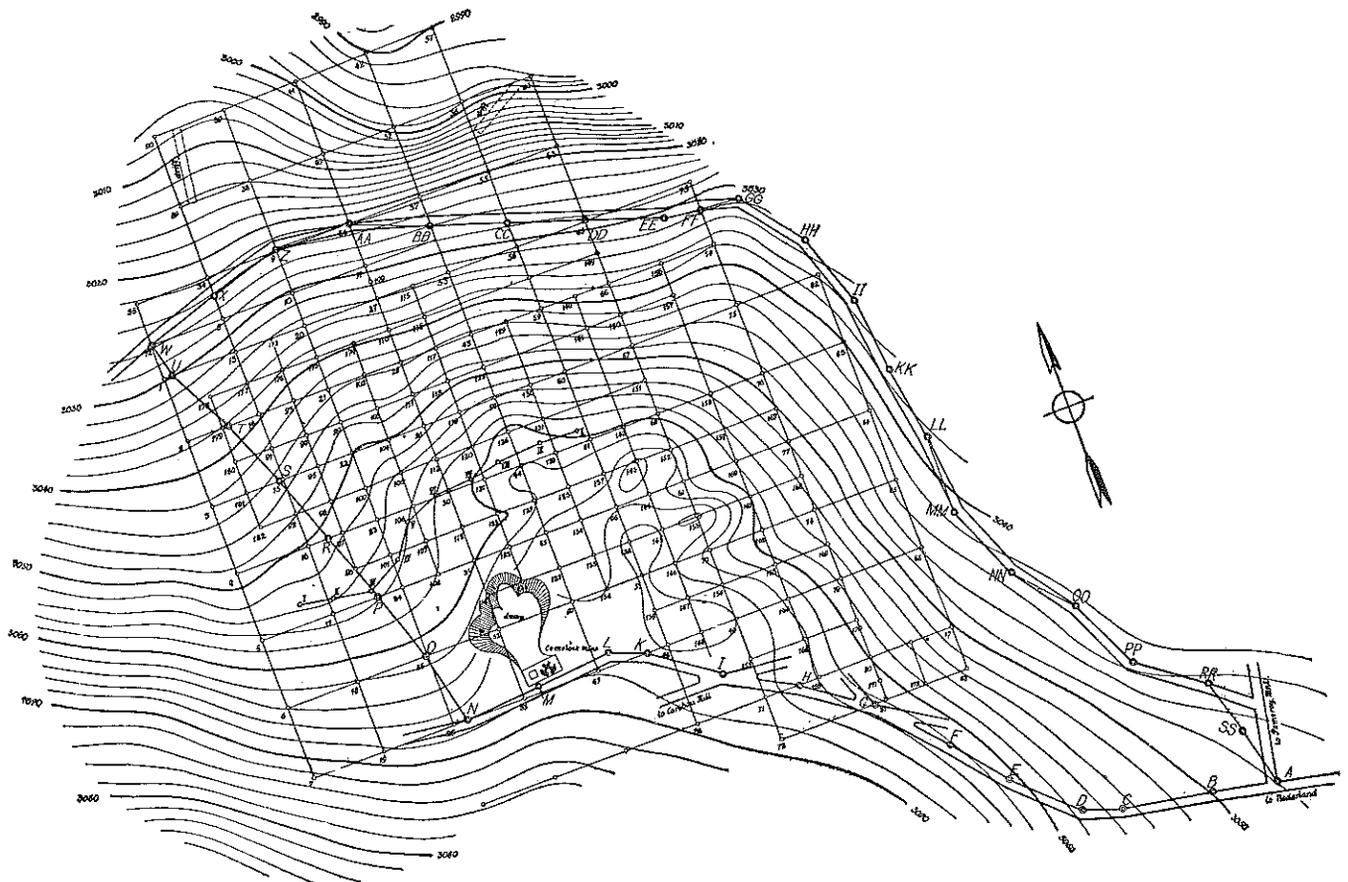


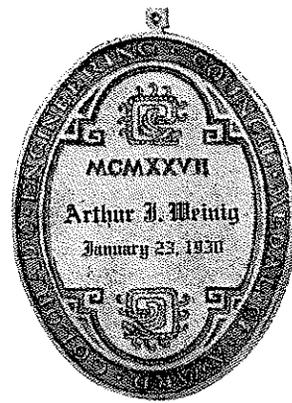
FIGURE 2—Topographic map and plain of magnetometer and torsion balance stations on the northern magnetite deposit.

Arthur J. Weinig

Awarded Gold Medal

School of Mines Alumnus Is Internationally Known Metallurgist

The Colorado Engineering Council's Gold Medal for Distinguished Service in Engineering



THE honor of receiving the first Gold Medal Award of the Colorado Engineering Council for meritorious engineering service to the State of Colorado was conferred upon A. J. Weinig, internationally known metallurgist and an Alumnus of the Colorado School of Mines. The presentation of the award was made at the Annual Engineers' Day held January 23 at the School. E. C. Reybold, president of the Colorado Section of the American Institute of Mining and Metallurgical Engineers, presented the medal, and he praised Mr. Weinig's work very highly.

As Director of the Experimental Oredressing and Metallurgical Plant, Mr. Weinig has attracted world wide attention to the Colorado School of Mines and its Experimental Plant. He has, through the success of his experimentation and outstanding work in ore separation, achieved not only State wide recognition but a fame that is national in scope. His contributions to the development of selective flotation have attracted the attention of metallurgists throughout the world.

It is interesting to note that, although Mr. Weinig has won renown in the milling of ores, he began his career as a metallurgist in a smelter. He specialized at the Colorado School of Mines in pyrometallurgy. Following his graduation, he took a position in the Durango Smelter, and it was only by accident that he drifted into milling.

One of the concerns shipping ore to the smelter inquired of the management for a man capable of bringing their refinery up to date. Mr. Weinig was chosen for the task, and his work was successful beyond all expectations. Following this, Weinig worked out a method for treating concentrates at the Company's plant which eliminated all smelter shipments. He was then placed in full charge of the mill and he worked out economical processes leading to exceptionally high recoveries.

It was during this period that Mr. Weinig did his first work in flotation. Many of the present fundamental conceptions of flotation were developed by him at that time, nearly a decade ago. Today, Arthur J. Weinig is an undisputed authority on flotation. His experiments on the floating of certain Colorado ores have made it possible for mining companies to operate in this state where, possibly,

such operations would have been economically impossible but for his work. Again, he has increased the production for many other companies in the State by affecting economies in their flotation processes.

Mr. Weinig is co-author with Irving A. Palmer of "The Trend of Flotation," a valuable handbook for the mill operator. This book has gone through three editions and has been distributed to more than 15,000 men interested in milling. In addition to this book Mr. Weinig has written numerous magazine articles and pamphlets.

In the capacity of consulting engineer, Mr. Weinig has assisted in the solution of problems confronting some of the largest companies of the world. He was for a number of years connected with the Metals Exploration Company, operating in Colorado and elsewhere, in designing mills and in a research capacity. His work for the Climax Molybdenum Company has brought him renown; and his various successes have attracted the attention of metallurgists throughout this country and others.

Arthur J. Weinig is a native of Colorado and was born in Durango in 1883. He attended the Colorado School of Mines and was graduated with an Engineer of Mines degree in 1908. Six years ago he was chosen Director of the

Experimental Oredressing and Metallurgical Plant. Since that time he has been closely associated with the School and the mining industry of this State. The honor accorded him by the Colorado Engineering Council distinguishes him as the outstanding engineer of all engineers in his home State.

A. J. Weinig's Acceptance of Medal

"On this occasion my first thoughts reflect the honor which, thru me, you have conferred upon my Alma Mater, The Colorado School of Mines; to my engineer friends, associates and assistants, who have shared so largely in the solution of such problems as you have cared to cite; to our mine managers, superintendents and operators who have offered such splendid cooperation in formulating definite objectives; and last, but not least, to those who placed a great faith in the resources of this great State and in addition gave of their material wealth that these objectives might be gained. All these share this honor. I did not achieve by myself alone.

"Members of the Colorado Engineering Council, I am overwhelmed with this honor and I shall ever cherish this memento. To me you have been exceedingly kind. But in accepting this I prefer not to look upon it wholly as a reminder of the past but rather as a challenge to carry on where there is honor for all who practice in the great engineering professions.

"I thank all of you heartily."

C. M. Lightburn Tells Purpose of Engineers' Day

THE Colorado Engineering Council acknowledges the hearty welcome extended by the honored head of this institution and expresses the gratitude of the engineering fraternity of the State for the occasion thus afforded the Council to perform two of its principal functions.

"The first of these functions is the recognition and encouragement of technical skill and excellence. The second is the bringing to public notice and appreciation, the merits and advantages of applying science and engineering generally to the development of our resources.

"Colorado, we maintain, is fortunate in having among her institutions of learning one of premier standing in the field of mining, and doubly so in having capable men to direct the work of this School of Mines into those channels wherein the greatest amount of good will find its way to the people of the State.

"The Engineering Council comprises fourteen technical and engineering bodies representing nearly 2000 scientists and engineers. It is the constant endeavor of this representative body to be alert in developing any situation wherein lies an opportunity to be of service to the people of our State. To its members therefore, the occasion of this Engineer's Day at the School of Mines seems to afford such an opportunity to an unusual degree.

"The bringing together of student and practicing engineer at any time would seem to be a mutually desirable objective. If this can be done through hearty cooperation of the students, the faculty, and the practicing engineers, as it has

"The bringing together of student and practicing engineer at any time would seem to be a mutually desirable objective."

been done here today a more worthy object thereby is attained. Today we have come to visit you. We have come to learn and we hope to

be made better acquainted with your good selves and with what you are doing to maintain this very enviable reputation you enjoy. We want to see your home and your work, but first, we ask you to bear with us while we carry out our part of the program.

"Although it has been a custom of several years standing for the Council to make suitable awards to outstanding engineering students and while it has been the intention, as well, to make an award of merit to an engineer or scientist who has rendered outstanding service to his state, previously, no such award has been made. This Engineer's Day is of singular moment, therefore, in that it affords the Council its first occasion to make this award. It is appropriate at this season when mining men are gathered from all parts of the state, that attention be directed to the worthy things that are going forward to help the mining industry. What better can we do than to give due notice to the world, particularly to the mining world which knows best how to measure and appreciate values, that we have among us a man who has brought fame to himself, to this institution and to the State through signal achievement?

"In order that this may better be done, that this notice may best be given, and that the honor may be more fittingly bestowed, I shall call upon the Chairman of the Colorado Section of the American Institute of Mining and Metallurgical Engineers to present the Council's medal of award. Mr. E. C. Reybold, Jr."

Engineers' Day Enjoyed by Many Students and Visitors

THE annual Engineers' Day sponsored by the Colorado Engineering Council was held at the Colorado School of Mines, January 23. A feature of the program was the awarding of a gold medal by the Council for meritorious engineering service to the State. This was the first gold medal award to be made to a Colorado engineer by the Engineering Council, and the recipient of this medal was an Alumnus of the School of Mines, A. J. Weinig, Director of the Experimental Oredressing and Metallurgical Plant.

Henry McAllister, a prominent Denver Attorney, gave the address of the day. Mr. McAllister's acquaintance with the intricacies of mining law enabled him to speak with authority upon those phases of mining closely related to his own profession. He was, during his early practice of law, very close to the development of the great gold camp at Cripple Creek during its boom days, and his reminiscent remarks regarding mining litigation in the early '90's provoked much amusement and applause from the students and engineers who attended the program. Mr. McAllister stated that there were two requisites for success in the engineering profession. These requisites, as pointed out by him, were industry and character.

"After graduation, if you are unable to obtain a position, apply for a job and work hard at it," he stated. "Without

hard work, without industry, one cannot expect to hold a responsible position. Success depends in part upon one's training, more upon one's industrious application to his work." But Mr. McAllister pointed out that sincerity and honesty in any profession is the essential required of one who wishes to attain the heights in his particular calling. He recalled an incident of a nationally known mining engineer who sold his honor and lost his prestige as a professional man.

More than two hundred students and as many engineers from various parts of the State attended the exercises in the afternoon and heard Mr. McAllister's address. President Coolbaugh welcomed the visitors, and C. M. Lightburn, President of the Engineering Council, responded. He in turn introduced E. C. Reybold, Jr., head of the Colorado Section of Mining and Metallurgical Engineers, who awarded the Council's first gold medal to Mr. Weinig. At the close of the exercises in Guggenheim Hall the visitors were conducted by the Junior members of the American Institute of Mining and Metallurgical Engineers through various exhibits prepared by the School. The following exhibits were inspected: Geophysical instruments and the Geophysical Laboratory; Experimental Plant, showing pilot mill in operation; the Petroleum Laboratory and Petroleum Research; ceramics materials; Electrical

and Testing Laboratories; and rare volumes in the Library. The Faculty ladies served tea to the visiting ladies at the home of Mrs. F. M. Van Tuyl while the men were being conducted through the various exhibits.

The program for the day was brought to a close with a banquet served at the Berrimoor Hotel. Charles W. Henderson of the United States Bureau of Mines in Denver shouldered the responsibilities of Toastmaster with much success. After dinner talks were given by President Coolbaugh, C. M. Lightburn, Henry McAllister, A. J. Weinig and others.

Committees arranging for the program and the banquet were: For the Colorado Engineering Council: Charles W. Henderson, Chairman; E. C. Reybold, Jr.; and C. M. Lightburn, President of Colorado Engineering Council. For the Colorado School of Mines: H. F. Lunt, Chairman; A. P. Little, B. B. Boatright, J. Burns Read, and C. A. Heiland.

The Engineering Council which made Engineers' Day possible consists of the following societies:

Colorado Section of the American Society of Civil Engineers; Colorado Section of the American Institute of Mining and Metallurgical Engineers; Denver Section of the American Institute of Electrical Engineers; Rocky Mountain Section of the American Water Works Association; Rocky Mountain Section of the Society of American Foresters; Engineers' Club of Fort Collins; Colorado Section of the American Institute of Mechanical Engineers; Colorado Scientific Society; Colorado Chapter of The American Institute of Architects; Colorado Society of Engineers; Teknick Club; Colorado Section of the American Chemical Society; The Rocky Mountain Association of Petroleum Geologists, and the Pueblo Engineers' Society.



HENRY McALLISTER

Henry McAllister, Speaker Engineers Day

HENRY McALLISTER has been a resident of Colorado for 55 years. He was born in Philadelphia 58 years ago and, after receiving his Bachelor of Law degree at Swarthmore College, came west to share his fortune in a new land wherein opportunity loomed in the very growth and development of the country. Assiduously following a bent for doing things well and possessed of an astounding capacity for hard work, he found and made much of the opportunities promised by the virile state with which he had cast his lot.

At Colorado Springs, his first residence,—he soon gathered a circle of friends among whom were numbered many acknowledged leaders of the mining industry, and at whose insistence he responded to his first call to public duty, serving with characteristic energy as assistant district attorney and as district attorney of the Fourth District of Colorado from 1895 until 1900.

Cripple Creek, proudly acclaimed by the citizens of Colorado as the "greatest gold camp on earth", was then enjoying the heyday of its success. Contact and the consequent friendship with men of affairs who recognized the outstanding qualities of the young district attorney, made for rapid progress in a career already assured, and in 1908 he became a partner in the firm of Vaile, McAllister and Vaile, successor of the firm, Wolcott and Vaile, long historic in Colorado's development.

In 1916 Mr. McAllister became General Counsel of the Denver and Rio Grande Railroad, and after fourteen years of continuous service in such capacity with that road and

its successor he is found invested with ever growing responsibilities as legal and financial advisor of transportation, communication, mining and other interests of prime magnitude in the West. Of late, Mr. McAllister's connections have been extended more actively into the field of mining, and the manner in which his every assignment has been rewarded by a national reputation for effectiveness is as enviable as it is unostentatious.

Never given to oratory or to the grandiloquent, but possessed of a sincerity and modesty that is appealing to all who meet him and particularly to those who know of his work, he may be hailed one of the foremost citizens of our State.

Mines Alumni Perfect Electromagnetic Hammer

C. Donald Beeth, Jr., '24, and Ben H. Parker, '24, have recently secured a patent from the United States Government for an electro-magnetic hammer. This hammer is adapted particularly for use in connection with hammer type rock drills, riveting machines, chiseling machines and so forth.

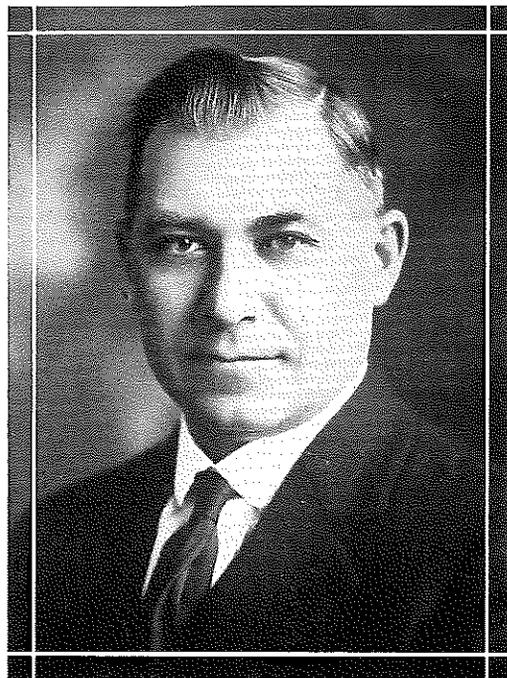
The new invention, according to the patent papers, provides a reciprocally mounted hammer arranged for actuation by a series of electro-magnets and embodies a pneumatic cushioning construction adapted to arrest the return stroke of the hammer. Other advantages of this hammer reside in certain special construction features, which are fully described in U. S. Patent No. 1, 720, 854.

The Colorado Engineering Council's Medal of Award

THE design of the Colorado Engineering Council Medal of Award was inspired by an appreciation of the Aztec and Mayan art. This art may be truly called an American style, as it was developed upon this continent and apparently not derived from any antecedents abroad. It seemed appropriate to the Engineering Council after much study had been given the matter that a medal design typical of the Mayan art would not only serve its purposes well, but arouse interest due to its originality in character.

The figures and symbols embodied in the design of the medal are true representations of the Mayan period of civilization. The standing figure, a Mayan chieftain, is presenting incense in a censer to the seated figure. The presentation of incense being a ceremonial custom among the Mayans when great honor was conferred. In the left hand he holds a breast ornament which is also to be given the honored one.

The seated figure holds a knotted rope, a symbol of the engineering profession, and he probably may have been known as a rope stretcher, as the Egyptians so called their surveyors. The square symbols at the bottom of the medal are representative of the sun, the star Venus and the moon. Intertwined and forming the border of the medal is the feathered serpent, the fair, golden-haired God of the air, a divinity who during his residence on the earth instructed the Mayans in the art of government, the use of metals and in agriculture. These feathered serpents also occur in the design of the obverse side of the medal in the square patterns shown. On the obverse side, space is provided for a special inscription for each medal conferred by the Engineering Council.



ARTHUR J. WEINIG, '08, *Honored Engineer*

First Gold Medal presented to Arthur J. Weinig for his application of the theoretical to the practical in metallurgical practices, and his contributions to improvements in flotation.

Colorado Local Section Broadcasts Program

ONE of the features of the program of the Colorado Section of the School of Mines Alumni Association's regular annual meeting held in Denver, January 17, was a broadcast by KFEL of a five minute talk by President Coolbaugh and a number of musical numbers. The Colorado Section extended greetings over the air to other Alumni groups throughout the nation. The broadcast was made possible through the courtesy of the Puritan Pie Company who gave their regular hour over to the Mines Alumni.

President Coolbaugh in his five minute talk over the radio stressed the importance of the mineral industries and the necessity of having an outstanding institution in order to train engineers to continue further operations in these industries.

Among those on the committee who arranged such a successful program was Howard A. Storm, '29;

Since this was the annual meeting of the Section, election of officers for the coming year was in order. The results of this election are as follows: Charles O. Parker, '23, president; Donald Dyrenforth, '12, vice-president; J. E. Norman, '98, Secretary-Treasurer; and Erle O. Kistler, Honorary, executive committeeman.

Parker is a member of the firm of Burlingame and Parker, Chemists and Assayers of Denver. He has been a

very active worker in the Alumni Association and bids fair to be a progressive leader for the coming year. Mr. Norman is one of the oldest members of the Alumni and has ever been an untiring worker in the interests of the Association. He is a Mining Engineer residing in Denver. Dyrenforth is a member of the class of '12, and connected with the Dorr Company in the Sales Department. He has supported the Association heartily and has always shown interest in the activities of the School since his graduation. Erle O. Kistler is the first and only honorary member of the School of Mines Alumni Association. He was elected to membership at the last annual meeting of the parent Association. His interest in the School has been shown in numerous ways. He is a prominent Denver business man.

B. W. ("String") Knowles, '08, who is vacationing in Colorado was the speaker of the evening. He spoke of the various operations in British Columbia where he is Mine Superintendent of the Hedley Gold Mining Company. His reminiscent remarks about the Old Football Days were received with much applause led by A. J. Weinig, who was a classmate of Knowles and a player on the teams in those days.

The various Local Sections throughout the country were notified of the meeting and invited to tune in on the program broadcasted. The minutes of this meeting may be found under "News from the Chapters."

Engineer Should Quit His Poverty Complex*

By W. E. WICKENDEN
President, Case School of Applied Science

AMERICAN industry, in all its major branches, is under-recruited with engineers and scientists. One job in fifty needs a man of professional training and barely a third of these are adequately filled. Leaving out all engineers in private practice and public employ, industry alone needs twice as many recruits as the engineering colleges are graduating. That is why the recruiting line forms at the colleges, with demand always in excess of supply, and why starting salaries have trebled in twenty-five years.

The graduate engineer has made good. Thirty-five years ago, scarcely one-quarter of the engineering profession was college-trained; among the new men coming into its ranks this proportion is exactly reversed. Relatively few engineers, 15 per cent, drift away into remote fields of work. Progress for the majority means a steady advance toward administrative posts. On leaving college 70 per cent begin in technical forms of work, and 39 per cent in managerial, commercial and clerical posts; fifteen years later the proportions have reversed. In his lifetime the graduate engineer earns a handsome profit for himself and society on the cost of his training. If we arrange 100 typical graduates in the order of their prospective life earnings, the tenth from the bottom can look forward to \$100,000, the twenty-fifth from the bottom to \$130,000, the median or average man to \$200,000, the man twenty-fifth from the top to \$360,000, and the tenth from the top to \$640,000. The average high school boy without higher training can expect only about \$88,000. The average A.B. man about \$160,000, the average graduate in business administration about \$200,000, and the average graduate of both college and law school about \$240,000. It is time for the engineer to quit his poverty complex and use better salesmanship in the greatly undersaturated market where he sells his services.

More than one name in ten in "Who's Who" is that of an engineer, a much higher ratio than that of physicians and dentists. In addition to Herbert Hoover, these names include ten present or former governors thirteen members of congress, two members of the cabinet, 23 college presidents, heads of 68 banks and presidents of 1128 industrial corporations.

There are some who complain that the engineering profession fails to receive its due meed of public recognition. Yes, but the minute an engineer steps over the line of the most narrowly conceived technical duties, the proceed to disown him. An Engineer is just as much an engineer as he ever was. If for the moment he happens to be president of a bank, director of a great manufacturing company, governor of his commonwealth, or president of the United States, not only do they find their life opportunity and responsibilities within the area of the profession, not only do they provide a very large share of the recruits of higher administrative position, but let me add another point. They earn a very handsome part on the investment which society has given them.

The Engineer's job is to solve any kind of concrete problem by using the resources of science under strict economic control. What has brought the engineer to the fore, what has made Hoover president, is the effectiveness of his method of work. Six steps are involved: (1) mastering the Laws which govern the problem; (2) getting the facts and

defining the problem; (3) analyzing the ways of solving the problem; (4) counting the cost and estimating the returns of the possible solutions; (5) selecting the plan which promises the best ratio of utility to cost; (6) getting it done. No one dares to set a boundary to the field of engineering 25 or 50 years hence. In fact, the only possible limits are those fixed by that degree of mastery of science which leads to economically predictable results. What men are asking is that engineers extend their methods to vastly wider fields. If engineering is good for manufacturing and mining, why not for farming and housekeeping? If it can cut production costs, why not the costs of distribution? If it solves the problem of fuel, why not that of food? The time is at hand to incorporate the biological sciences into engineering. The Germans are hard at work adding psychology to engineering, building a technical science of human work.

BEGIN WITH GRANDFATHER

Some have feared lest the profession might be dehumanized by a materialistic science and an impersonal economics. Undoubtedly its hardest task is that of forecasting the social consequences of research and invention and controlling them for man's happiness and well-being. The old laissez faire doctrine presupposed that technical mastery and moral progress would move forward in step, but now we see that one leaps where the other limps. Can machine civilization survive if its builders are insensitive to human instincts and social values? I doubt it.

We recall Emerson's method of producing a great man—to begin with his grandfather. "Born that way" explains the human limitations of many engineers, competent, useful, diligent men, but scarcely stuff out of which the architects of civilization can be made. The problem is not one of excluding mediocrity, but of attracting talent. The technical callings need the one-talent man, as well as the five- and ten-talent geniuses.

Academic educators have told us that the way to solve this problem is to let them keep the able boy until he is 20 or 22, and then hand him over to us for a strictly professional discipline—fine, if the boy wants it that way, but as a general rule it simply fails to work. The engineering schools which have tried this seductive scheme have nearly gone out of business. Our ideal is not a divorce of culture from technique. A good engineering education is integral. It is like a rope of four strands, one scientific, one humanistic, one economic, and one technical, running its entire length. Very well, our academic friends say, then you ought to have a five- or a six-year course. The fact those friends overlook is that engineering is a calling of many levels. For every place that needs a five- or a six-year man, there are four or five that need only a four-year man and ten or twelve that might be even better filled with two-year men definitely trained for the higher practical pursuits. If there were any known way to get these three groups into distinct types of schools our problem would be two-thirds solved.

The big task before engineering educators is not to keep all the boys longer in college, but to hand over a larger part of their training to the realm of adult education. Experience the world around shows that most engineers ought to get into practical life by the age of 23. Few of them can

*From The Case Alumnus.

(Continued on page 45)

The Plaster on the Wall

By A. M. TURNER, '21

Gypsum, the Lowly Mineral That Has Many Uses

As we sit at home, in our place of business or in some public building, probably few of us think of the history or interesting romance connected with the objects which are around us.

The key to our story, an object constantly before us, and a material with a surprising romance, but probably one you have overlooked, is the plaster on the wall.

Practically all walls, and most ceilings of buildings are plastered or covered with plaster board, and in either case the material from which the product originated is the same, namely, gypsum.

From now on our story will tell the general history of the processes involved in making plaster and other gypsum products from the raw material.

Gypsum is a mineral which occurs ordinarily in large horizontal veins averaging 4 to 20 feet in thickness and usually lies so close to the ground surface that it is more economical to work the deposit by quarry method rather than by underground mining. Gypsum is comparatively soft, being not quite so hard as limestone. Its color varies between the shades of gray, pink, and white but the most common color is white.

The chemical composition is $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$. The water of crystallization amounts to approximately 21%, and is the compound which serves as a basis of changing gypsum to the various products which are used for commercial purposes.

Gypsum deposits are of sedimentary origin. The accepted theory is that during past ages saline waters were trapped in lakes and as time elapsed the water evaporated leaving behind the salts previously held in solution. The calcium sulphate or gypsum salt precipitated out when the water reached a certain concentration. Other salts precipitated at still different concentrations, and this physical action accounts for the fact that the gypsum was isolated rather than mixed with other salts which it was in solution with in the sea water.

The mineral we are discussing occurs extensively throughout the world and in the United States is found abundantly in practically all states except those south of Virginia and east of Texas. There is so much gypsum that it is only valuable when close to a market and good transportation facilities.

MANUFACTURE OF PLASTERS

The first step in the manufacture of plasters is the extraction of the crude material from the earth. If the quarry method is used the overlying earth is usually stripped off by means of drag lines or steam shovels, and hauled away. After the top of the gypsum is sufficiently cleaned the face of the deposit is shot loose with powder. The broken rock is loaded into cars by hand or with mechanical shovels and hauled to the crushing mill. In the event mining is employed to recover the mineral the method employed is the room and pillar system, commonly used in coal mines.

The next step in converting the gypsum is the grinding process. Lumps taken from the deposit vary in size, some being two or three feet in diameter. These must be reduced to a powder. To do this a series of crushers, and grinding machinery is used. A typical gypsum crushing mill flow



Gypsum quarry in which development had been in progress only a short time. Loaded cars are hoisted by a cable up the track, shown in the center of the picture, to the crushing mill.

sheet would run as follows. Roll, and gyratory crushers for primary grinding, and hammer mills, air separators, and buhr stones or tube mills for secondary grinding. The fineness of the product which leaves the grinding mill varies from 50 to 90 percent thru a 100 mesh sieve depending on the product to be made from the ground material.

The next step in the process is the cooking or calcining of the powdered gypsum. The finely ground rock is run into cylindrical kettles or pots which hold 8 to 18 tons. These kettles are treated by applying heat to their bottom, sides, and thru large flues on the inside. A vertical shaft with arms attached rotates in the kettle and keeps agitating its contents while the cooking takes place.

After the powdered gypsum has been heated a certain length of time, and the temperature has reached 335 degrees fahrenheit part of the 21 percent water of crystallization is driven off in the form of steam, and the resulting product is a stable compound containing 6.2% water of crystallization, called stucco. (This term should not be confused with the commercial stucco used on the outside of houses as it is not similar.) Describing the calcination process by chemical formulae we have the following equation: $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ (Gypsum) plus heat equals $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$ (Stucco) plus H_2O (Steam).

The stucco is now conveyed from the kettles, classified into various sizes by screens, and then stored in bins. From these bins the stucco is taken, and treated or mixed with various materials to be made into finished products.

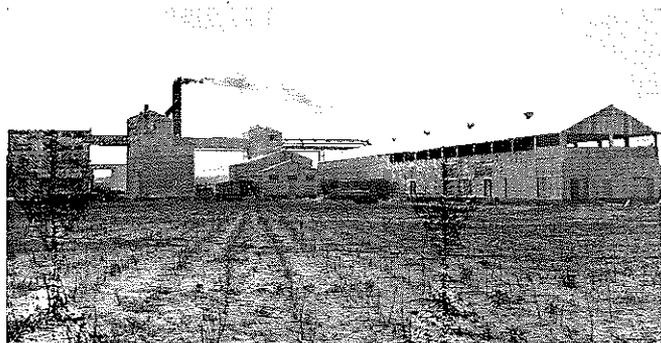
PLASTER OF PARIS

Since wall plaster is a most generally known product of gypsum we will first describe converting stucco (commonly known as plaster of Paris) into wall plaster. If water were mixed with stucco it would recrystallize and within 30 minutes combine with the same amount of water which was expelled. Chemically expressed $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$ (Stucco) plus H_2O (Water) equals $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ (Gypsum). In other words the stucco when mixed with water recrystallizes and forms gypsum similar in character to the rock we started with. This recrystallization is called setting in plastering terms. However since stucco sets in 30 minutes it would be impossible to mix it with sand and water and apply it to the wall before it hardened, so for this reason stucco is mixed with a material called retarder which slows up recrystallization and in this way the setting time can be regulated to suit the needs of the plaster mechanic. Re-

tarder is a material made from lime, caustic soda, and ground hair or other slaughter house refuse. To prevent plaster from pushing thru the lath and falling between the studs, fibre is mixed with the stucco as well as retarder. The fibre is a binding agent and holds the plaster together so it laps over the back of the lath and forms a key instead of falling into the partition. The kind of fibre used is usually goat hair or sisal cut in lengths of two to six inches.

Definite amounts of stucco, fibre, and retarder are placed in a machine and mixed thoroughly. The resulting product is plaster, and is packed in 80 or 100 pound paper or jute bags by means of a packing machine which automatically weighs the sacks. The sacked plaster is either trucked by hand or carried by a belt conveyor into cars where it is loaded in 15 to 50 ton lots. From the factory the plaster is shipped to lumber yards where it is retailed to plasterers who use the material.

Plaster is prepared to apply on walls by mixing it with sand and water. The sand serves two purposes. First, it is usually cheaper than plaster and enables one to cover



Gypsum mill nearing completion. The buildings as seen from left to right are: crusher plant, calcining mill, department for mixing, loading, and packing plaster, and plasterboard plant. This is a mill in Texas which is nearing completion. The stubble in the foreground is cotton stalks. Picture on right shows the opposite side of the same buildings.

the maximum wall surface with the minimum cost. Second, the sand is used to gauge the plaster and thus avoid cracks in the wall which occur if straight plaster is used. The water serves as an agent to form a plastic mixture which can be easily applied to the lath and also supplies the water necessary for recrystallization into gypsum again. These minute crystals form around the grains of sand and interlock into a solid mass on the wall.

Plasterboard, the next most common gypsum product, is made by mixing stucco and water together and putting the mixture between two layers of paper. The edges of the paper are folded so the stucco will not squeeze out, and by running the two sheets of paper with stucco between, thru two large rolls placed at a definite distance apart the plaster board is made into a definite shape. A continuous line of this board is carried by a belt or series of rolls along to a knife which cuts the desired length of plasterboard. At this step in the process the stucco is set sufficiently hard between the paper so it will maintain its shape and can be handled without fear of damage. The board is now run thru a drying kiln on sections of rollers where it is thoroughly dried. The board comes out of the kiln as a finished product. It is tested, inspected, and if found satisfactory in every way is shipped to market.

VARIOUS USES

Possibly the most interesting part of our story will be the following statements concerning other gypsum products besides wall plaster and plasterboard.

Hollow gypsum tile or block play an important part in

building construction where they are used extensively to build partitions.

Powdered gypsum, and a form of gypsum which forms a cellular structure when it sets after being mixed with water find an important use as insulators for partitions, over ceilings, around vaults, and refrigerators.

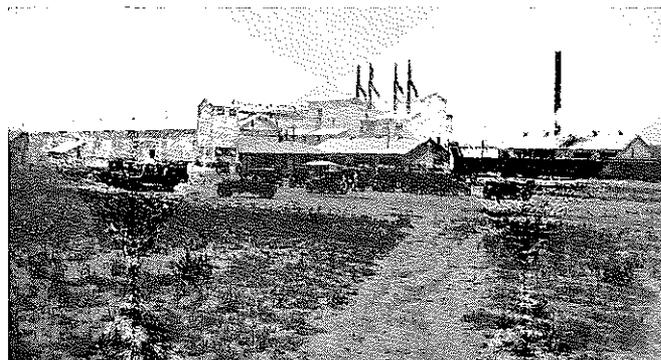
Statuary, and artificial decorative work on the walls, and columns of public buildings are made from moulding plaster. Also this plaster is used extensively for making moulds in the pottery industry.

Casting plaster is sold extensively to the moving picture industry where it is used for building temporary structures.

Highly refined plasters are used in dentistry in various ways. There was a time when dental plaster was used for taking the impression of the mouth preparatory to making plates but this practice has been discontinued because the patients swallowed too much of the plaster.

Orthopedic plaster is used by surgeons to make casts in which to set broken bones.

There are numerous other uses for calcined gypsum such



as a filler in tooth paste, and in paint, bedding in which to set marble, used in the manufacture of corn cob pipes, a dehydrating agent in the soap industry, and used in the manufacture of plate glass.

Ground gypsum not calcined also has several uses.

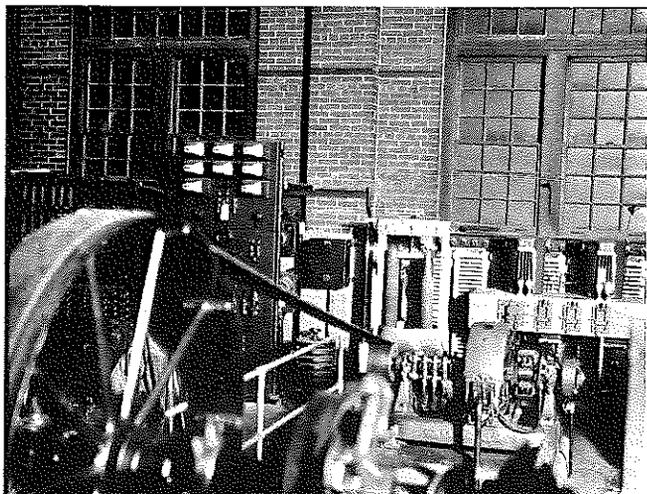
From two to four per cent of gypsum is used in Portland cement. Its function is to retard the setting time of cement.

Finely ground gypsum is used as a fertilizer, and is of particular value when used on black alkali soils. It is the sulphur content which serves as the fertilizing agent.

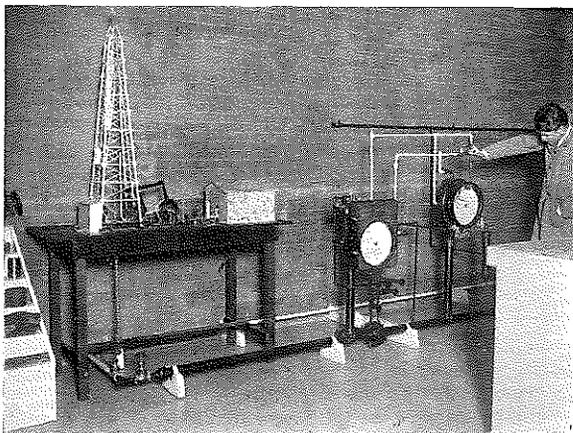
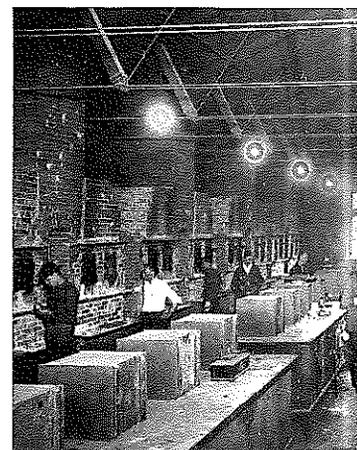
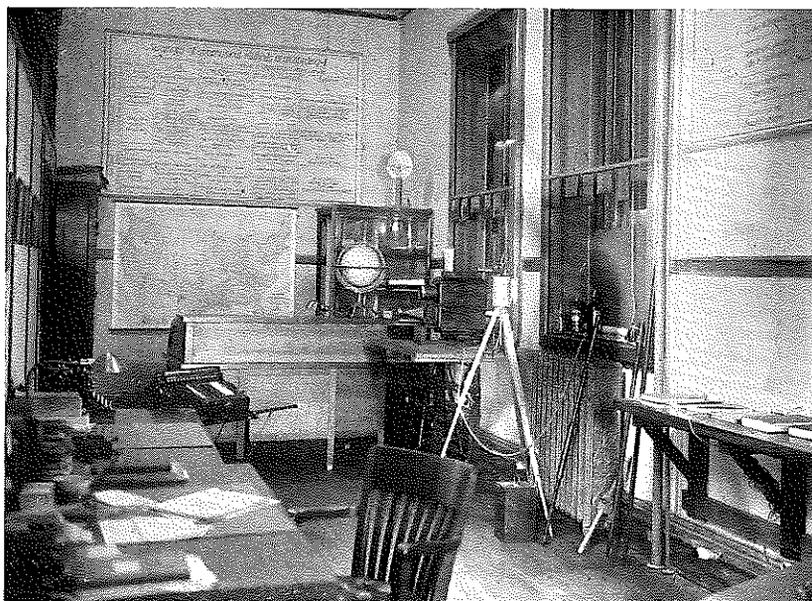
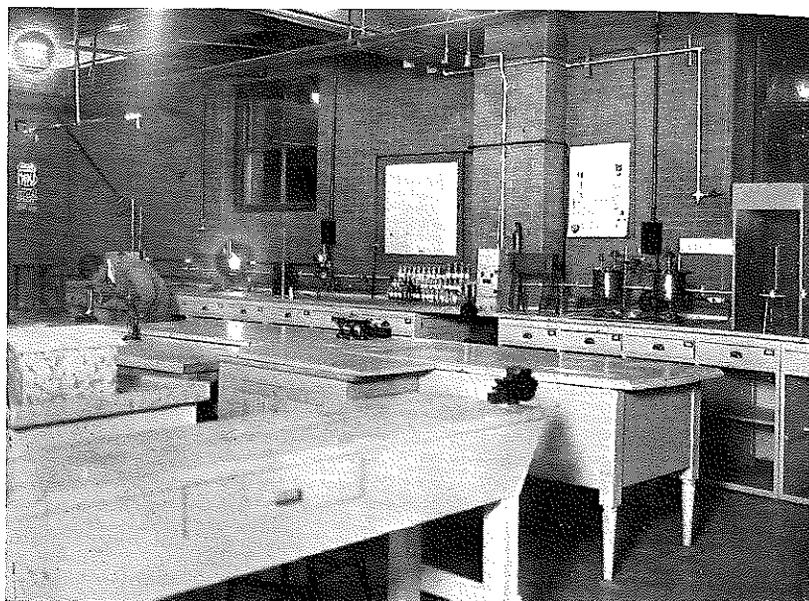
Last and possibly the most unique use for gypsum is its use as artificial snow in the motion picture industry.

In a study of falls of roof and coal as they influence accidents in coal mines, mining engineers of the Pittsburgh Experiment Station of the United States Bureau of Mines, have opportunity to contrast the different methods used for the support of the mine roof. In many mines where a systematic method is followed it is found that the relative cost for timber ranges from 1 to 2½ cents per ton of coal mined, whereas in the absence of systematic methods of timbering there are many falls of roof which obstruct haulageways, and the handling of the rock material costs 15 to 20 cents per ton of coal mined. Although some timbering is done in the latter class of mines, the timber is often not installed until the roof material begins to show signs of breaking or sagging. Where the safest timbering is done, there is always the highest degree of supervision and the workmen are studied to insure that they are amenable to discipline.

Inside The Colorado School of Mines



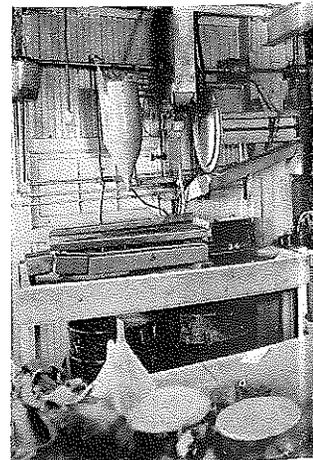
A beautifully engraved solid gold case determines in no way the precision of a watch: it is the works within. And thus it is with college buildings: the question is, what is inside? Let us enter the Electrical and Testing Laboratories. Many motors, switches, condensers and all sorts of electrical apparatus on all sides. We select a synchronous converter (above), and click goes our camera. We go into the Petroleum Laboratories. It is difficult to choose a picture, there are many possibilities. Finally we select a corner with spotless white work benches (right) where the students work.



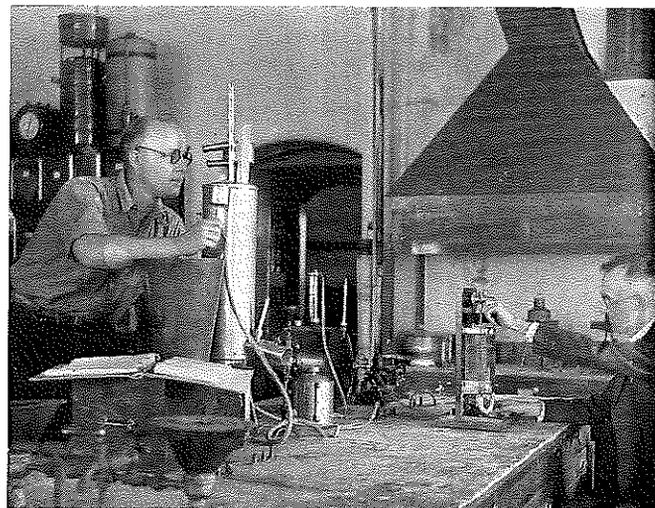
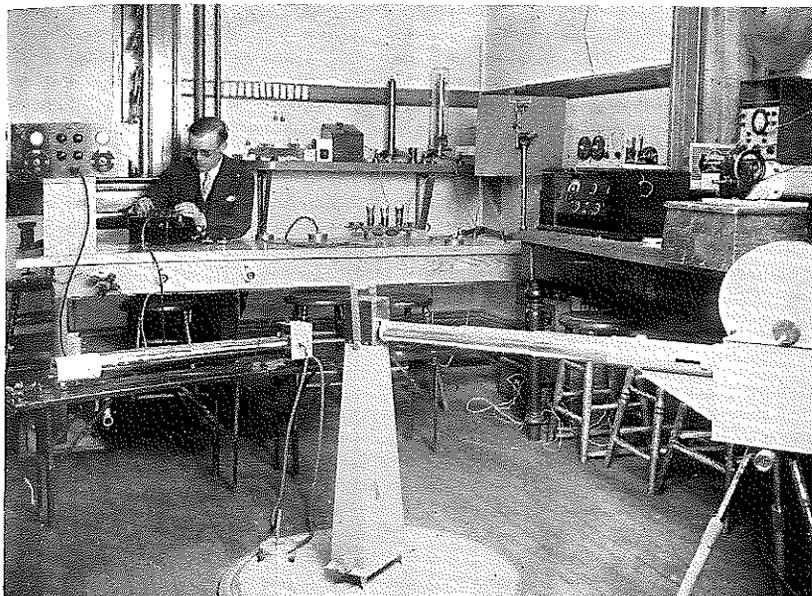
What is all this? Down a long aisle lined on both sides with furnaces. There is someone taking out a lot of white hot "dishes". Whatever he is cooking must be done for he is smiling. We walk over to see. Buttons? What, pure Gold? Yes, it was put into the furnace as a mass of powdered this, that and the other. The heat took everything up the chimney but the bit of shiny gold, and there it was, a tiny globule, a "button". So this is the Assay Laboratory. The camera is put to work. Click, and now you see the result (above right).

That Petroleum Laboratory was interesting. Let's go back. There is another picture which we want. Over in that corner where we saw the little oil derrick and that clock-faced dodad—oh, yes, that is called an orifice meter (left).

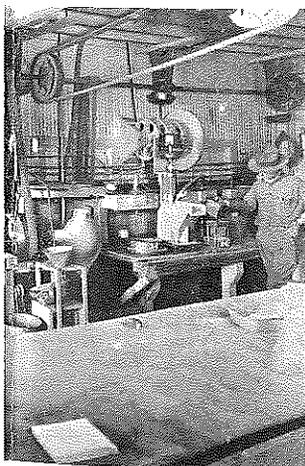
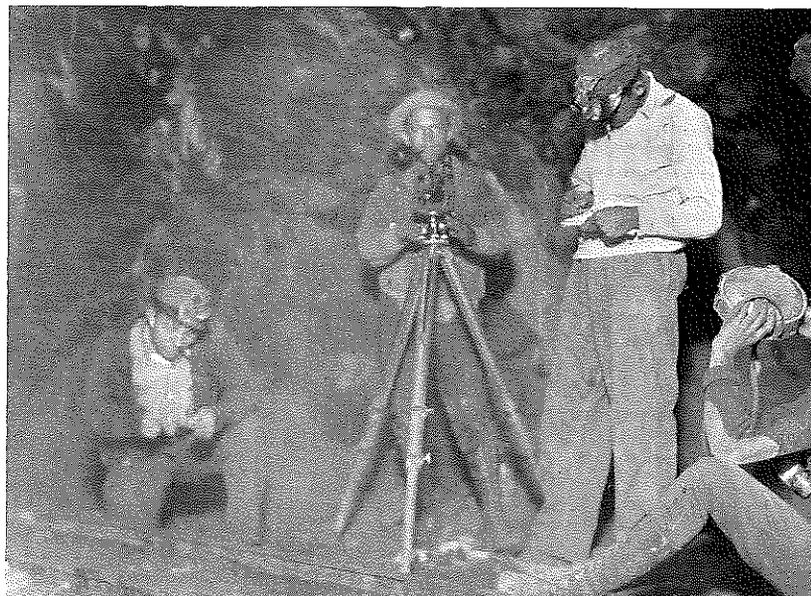
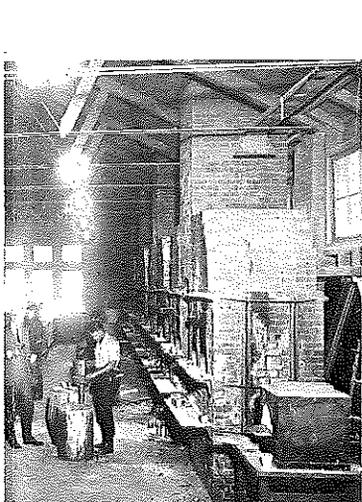
Here we have the headquarters of the Geophysics Department (above). This is an office full, and there is one of those strange instruments, a seismograph, which detects earthquakes. No, it isn't used for that at the School of Mines—it is used to detect geological secrets that did not crop out on the surface.



School of Mines Laboratories



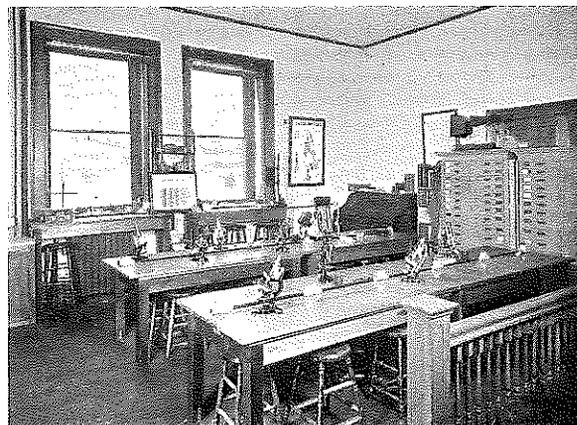
One wants to know what is behind those ivy-covered walls. The old chemistry group, original School of Mines buildings. These old buildings, softened by age, house mysterious apparatus that produce miracles (above). Elements, ions, acids and pungent fumes. It is difficult to snap a picture of any of these things. Perhaps they could do it over in the Physics Lab. But speaking of mysterious things, let us look into the Geophysics Laboratory. An old science with newly discovered applications. Imagine discovering oil and ore with radio tubes and ear phones! Well, look for yourself (left).



Mining, Metallurgy and Geology. That was a delightful trip up to Idaho Springs where the Colorado School of Mines' experimental mine is located. The Director of the Mine seemed quite surprised when he learned that my camera and I wished to go under ground. "That must be your Sunday suit", he said. To tell the truth, the suit did get a little soiled. We snapped a group of students in mine surveying (above) and saw a number of interesting things in the meantime.

The Experimental Oredressing and Metallurgical Plant is one place that offers an interesting picture at every turn. We took one of a compact little laboratory (left) where some of the experimentation on flotation processes for Colorado ores is carried on. It seems that there isn't anything known about flotation which isn't known at the Colorado School of Mines; and a lot of the things that are known were discovered at the Experimental Plant.

Over in the Geology Laboratory. We passed up a lot of fossils to take the picture shown on the right. It is a view of a lab where microscopes are used to examine minerals and not germs.



Colorado and Its School of Mines

PART VIII—*The Cornerstone is Laid*

By M. R. BUDD, '24

HUNDREDS of Golden citizens, including church-goers, miners, city officials, educators; scores of well-wishers from Denver and neighboring cities; and high church and state officials of Colorado, wended their way to the present site of the State Industrial School, a mile south of Golden on Monday, August 8, 1870. The mission was an important one—the laying of the cornerstone of the first building of the Colorado School of Mines, which was then not a strictly state institution, but an orphan under the care and guidance of Bishop Randall.

At five o'clock in the afternoon the exercises commenced with an opening prayer. Following a selected reading from the Scriptures, the multitude lustily sang sacred and patriotic songs. Bishop Randall then made the address of the occasion and put the cornerstone in place, after which the services closed with a benediction.

The Transcript reports the following list of articles which were placed in the stone:

Newspapers, Documents, etc.—Colorado Transcript, Golden City; Daily Tribune, Denver; Colorado Herald, Central City; New York Times; Bishop Randall's tract on confirmation; Bible; Prayer Book; photograph of Bishop Randall; Catalogue of Episcopal Academy of Connecticut, 1869; cards of various individuals present.

Coins, etc.—There were deposited a fine collection of coins of different nationalities and dates, some twelve or fifteen pieces; also specimens of copper from Gen. Thomas Lode, Golden City, quartz crystals, petrifications, etc.

Because the address made on that momentous occasion is so filled with educational ideals, especially as applied to a school of mines, it is printed herewith exactly as it was delivered that afternoon in August before a considerable portion of the population of Golden in 1870.

ADDRESS BY RT. REV. G. M. RANDALL

"Less than a year ago, we met on this ground to lay the cornerstone of Jarvis Hall. Before that edifice was completed a wind from the mountains demolished its walls. But its foundation was not moved. That cornerstone remained where we laid it. From the same foundation, has risen that edifice which you now behold—more substantial, more beautiful than before. God grant that these walls may remain for ages to come, and no tornado from the desert, no lightning from the clouds, no consuming flame, no convulsion of nature may destroy them.

"I venture to say, that it entered no man's mind to predict or to hope that before that first edifice should be occupied, we should again be here, to lay the cornerstone of a second. In the sun-light of God's blessing, we have seen our way hither to begin the work of another building in connection with this collegiate institution. To God do we give thanks, for the Providence which has made such a provision for us in the infancy of our undertaking. The Legislature of Colorado, at its last session, appropriated the sum of \$3,872.45 towards the erection of an edifice in connection with Jarvis Hall, to be used for a School of Mines. By this act of wise liberality, the members of that Body expressed the appreciation of the cause of good learning, and for this timely act of their forecasting wisdom merit the thanks of all friends of the best interests of the people.

"This appropriation, while it marks an epoch in this history of Colorado, inaugurates, I trust, an educational policy which shall be pursued by all future law-makers of the land, encouraging the cause of a higher order of schools.

"The interests of education are the legitimate subjects of legislation. The promotion of that learning which fits every member of the community for the duties of his station, thereby elevating the masses, is a first duty of the State. Nor is it less obligatory upon the legislators of a commonwealth, to exercise the same fostering care in encouraging and promoting institutions which aim at an elevated standard of literary culture—adequate to the increasing demand of professional learning, whereby an advancement in science and arts is steadily maintained.

"The history of the States of this Union has shown the patriotic wisdom of the policy which places the educational interests of the people foremost among those which are to be cared for and promoted. Where most has been done by the State, in this direction, the people have risen highest, in all that constitutes the social and political distinction of a community.

"At no period in the history of our country or of any country, has the condition of things demanded wiser legislation, in this direction. This duty has its difficulties, as well as its responsibilities. It is no easy matter to do altogether and only wisely in meeting the educational exigencies of the age. But in a frontier Territory, like this, where society is in a formation state, and is rapidly taking on its abiding condition, there must be no delay, and there should be no mistakes. Our great duty is to lay the foundation. To lay them broad and deep and strong, so they shall sustain any superstructure which may in all time to come, be built thereon. In doing this we are to have regard to a measure of National development, which will have no product in the annals of the past.

"A prominent feature of modern institutions of learning is seen in the provisions which are liberally made for the prosecution of specific departments of practical learning. We now have scientific schools, polytechnic institutions, agricultural colleges and schools of mines. Since the discovery of gold on this part of the continent mining has become a business of such permanent and increasing importance as to call general attention to it as a science, and to lead to the establishment of schools, wherein may be learned all that is necessary to know in order to follow the successful prosecution of operations for the discovery and development of mineral wealth. Mining is a science and not a haphazard labor. As a paying pursuit it cannot rely upon good luck—it must depend upon the application of scientific knowledge, good common sense, and that persevering industry that has in it the elements of courage and patience.

"There are studies that must be mastered by the accomplished miner if he would work to the best advantage. I hardly need to say that he should understand the principals of geology, mineralogy, metallurgy, chemistry and kindred sciences.

"The Creator hath hidden in the heart of the mountains boundless beds of mineral riches, that treasure He has

(Continued on page 41)

Mining Convention Held in Denver

Prosperity in the Industry Forecast for 1930

THE Mining and Petroleum men of Colorado held their annual meeting January 20 and 21 in the Auditorium of the Continental Oil Building. This meeting is sponsored by the Colorado Mining Association and the local section of the American Mining Congress. Good cheer and optimism were apparent everywhere, and the prosperity of the hard rock miners was apparent in the spirit of the gathering and in the talks given by the officers and other speakers.

More than 300 delegates from all sections of the State attended the convention. Each member attending was confident that present indications pointed to greater activities in 1930; and this confidence was supported by the report made to the delegates by John T. Joyce, State Commissioner of Mines.

The mining organizations sponsoring the convention reported a prosperous and successful year for 1929. The annual report of the Colorado Mining Association showed that membership has increased to a considerable extent. Both the Mining Association and the local section of the American Mining Congress are looking forward to a better year in 1930.

SOWBELLY DINNER AT THE COSMOPOLITAN

The delegates to the Mining Convention and their friends crowded the banquet room at the Cosmopolitan Hotel the night of January 21 for the annual Sowbelly Dinner. Ghost of vanished days of Colorado's Mining Glory stalked the room as memories of Leadville, Cripple Creek, San Juan and the Mosquito Range were passed about over crockery strewn tables.

Bearded prospectors passed stacks of sour-dough bread and heavy crocks of beans to smooth shaven mining school graduate engineers. When the feast was finished everyone relaxed, loosened his belt, and lit cigar, pipe, or hand rolled

cigarettes from flickering candles stuck in bottles of pre-Volstead days. The Colorado School of Mines Band provided music while the banqueters enjoyed their meal.

John T. Barnett was the toastmaster for the occasion. The meeting was called to order by the "Big Boss", Governor Jesse MacDonald. He introduced the "Boarding House Manager", Art Sweet. The toastmaster then took over the conduct of the meeting, introducing many "Muckers" from various mining districts throughout the State. Echoing these greetings, Will Nash of the Junior Chamber of Commerce of Denver gave a mining camp harangue.

The main speech of the evening was given by W. W. Grant, Jr., prominent Denver attorney. He divided his address between the needs of the Colorado mining industry and President Hoover's proposal to transfer control of public land to the individual states.

Following the main address was the presentation of the champion liar's medal. Interspersed throughout the program were musical and dancing numbers, with the Colorado School of Mines doing its stuff regularly.

The older method of crowding into the curriculum a little of everything connected with the mineral industries, on the other hand, left little time in a college course for any business or liberal arts subjects. Today, although we have narrowed the student's technical field, we have broadened his general college course by the addition of certain business and cultural electives so that he specializes less in the general vocational field than formerly. Thus engineers are being better fitted for the demands that experience indicates industry is likely to make upon them. Engineers not only do but should, in the course of their work, come to occupy posts of business and administrative responsibility, and the new curricula recognize this.

Vast Purchasing Power of Mining Industry

Second Among Fundamental Industries of the Country

The American Mining Congress reports that the contribution of the mining industry to the economic situation in 1930 will be represented by the purchase of materials, equipment and supplies to the value of 350 millions of dollars. The report gives an analysis of the purchasing power of the various branches of the industry, including coal, copper, iron, lead and zinc, gold and silver, and non-metallic mining.

It is interesting to note that the estimated total purchase of the coal properties is put at \$213,390,927, which is more than four times the amount estimated for the next largest, the copper companies. The number of coal properties figuring in this total are 6,749, while the copper companies number slightly over two hundred.

The report places the mining industry second among the fundamental industries of the country stating that it contributes 22 percent of our federal income, 54 percent of all freight on the railroads, and represents an investment of more than 12 billion dollars.

The far flung outposts of the mining industry, hold tremendous sales possibilities for manufactured products of every description, according to the report. This is a wide spread and large market, extending to "an empire of towns and cities, mines and mills, railroads, steamships and smelters." In this market are more than 10,000 mining properties, consuming all sorts of manufactured products and upon which over twelve million individuals are dependent for their livelihood.

"Here is the purchasing power of more than ten thousand mining properties, a power almost unlimited in its ability to absorb products, be they rope or railroads, diamonds or ships. To manufacturers of mining machinery and equipment the mining industry offers a gigantic non-seasonal market. Production, sales and administration have reached new high standards of efficiency in mines operated by able executives ever on the alert for new processes with which to speed up output and reduce costs," states the report.

C. S. M. Only School With Regular Geophysics Department

The following is an extract from an article reviewing the progress of geophysical prospecting which appeared in *Mining and Metallurgy*, January 1930.

The proper training for young men who plan to follow geophysical prospecting is still a somewhat debatable subject. The majority of workers in applied geophysics seem to believe that the time available in undergraduate years should be devoted entirely to proper preparation in mathematics, physics and geology and other fundamental studies, with specialization left for graduate instruction and or to actual training in the field. Geophysical prospecting is presented in general terms in connection with geologic or engineering courses in a number of institutions, but thus far only the Colorado School of Mines has created a department devoted exclusively to the subject. The need for adequately endowed research and instruction in the field of pure geophysics in the United States is serious, and advance in practical applications is likely to be retarded or to be unsound until provision for studying the basic underlying problems in a broad way is provided.

In final analysis, applied geophysics is essentially the measurement of phenomena determined by various physical properties of geologic bodies, whereby relations of significance can be deduced for scientific or practical purposes. In the present phase of the development of geophysical prospecting the perfection of instruments and technique of observation and the elaboration of the theoretical basis of the methods necessarily emphasize the importance of the physical aspects of the subject. In interpretation of the observations and in use of the results, however, the work becomes fundamentally geological in character. With increasing perfection of the physical side, it is reasonable to expect that eventually the geologists will accept the methods wholeheartedly and consider them as essential a part of their procedure of investigation as the study of thin sections with the petrographic microscope is now regarded.

A review of progress in geophysical prospecting cannot be closed without reference to the valuable abstracts of the abundant literature made by C. A. Heiland that appeared in the first issue of the Annotated Bibliography of Economic Geology, and those by F. W. Lee that are published from time to time as Information Circulars of the Bureau of Mines. Both perform an invaluable service for the busy worker who is anxious to keep abreast of recent work in the field. The most noteworthy recent publication of general interest is the new book by Eve and Keys of McGill University, entitled "Applied Geophysics," which presents the basic physical theories underlying the various methods in a most clear and serviceable way.

Metal Mining in Colorado, 1929

The total value of all ore mined in the State of Colorado for the year 1929 was \$15,276,766, according to Charles W. Henderson of the United States Bureau of Mines at Denver. Of this total gold contributed the largest figure, \$4,369,632 being the value of the output of this metal. The next in order were zinc, \$3,944,248; lead, \$3,159,189; silver, \$2,308,689, and copper, \$1,495,008. San Juan County leads the districts of the state with a total output exceeding four million dollars in value. Second comes Lake County, third Teller County and fourth Summit.

The Summer School, a Letter from Dean Morgan

The Summer Session at the Colorado School of Mines has become a permanent institution. The reasons for this permanency are obvious. No institution can successfully continue without a constant demand for its services. This continued and increasing demand for the courses given in the Summer Session at the Colorado School of Mines is the reason for the permanency of the summer session.

The benefits of the Summer Session at Mines are three-fold; those to the engineering student, to the mineral industries, and to the School of Mines. Many students become irregular in their courses usually for legitimate reasons. The Summer School offers the opportunity to such men to become regular in their work. During the Summer Session of 1929 not only our own students attended for this purpose but many advanced standing students from colleges located in twelve different states and from one foreign country took advantage of the opportunity to become regular in their college work.

The list of subjects for entrance at Mines may seem somewhat stereotyped yet the fundamental preparation necessary to do the freshman work must be peculiarly adapted to the engineering courses which follow. For this reason we have maintained preparatory courses in Mathematics, Chemistry and Physics in the summer session for the past few years and last year an unusually large number attended from cities as distant as San Francisco and New York.

Many of the large companies are constantly inquiring about opportunities for certain men on their staff who are ambitious to take advanced work in courses pertaining directly to the job in hand or possibly to review work on courses already taken years before. For such young men who wish to keep in touch with modern engineering methods, the summer session offers the opportunity.

The benefits to the School of Mines are readily discernible. Because of attendance at the Summer School many of our entering students are better prepared and there is a greater percentage of regularity in courses. Through the summer sessions the institution is able to give greater educational service which extends over the larger portion of the year. In this way the entire educational plant is in operation practically throughout the year with no additional expense to the state.

Many engineering schools do not offer summer sessions. These schools have expressed their appreciation of the services offered at the Mines' Summer School and more and more each year are taking advantage of our services.

The Colorado School of Mines' Summer Session is the only Engineering summer school in the Rocky Mountain region. While the primary reason for summer work is to obtain certain courses desired yet many students combine this wish with a summer vacation under the ideal conditions which exist in Colorado for such a combination of work and pleasure. While the policy of the administration is not to increase the numbers materially in the regular session yet for reasons mentioned we are ambitious to double the enrollment of our summer school and to make it outstanding not only for the Rocky Mountain region but for the entire United States.

JESSE R. MORGAN,
Director.

Mines Alumnus is Making Good in Far Away Africa

An account of the success of Daniel W. Butner, '15, was recently published in the Colorado Springs *Gazette and Telegram*. This paper conducts a column headed, "How Springs Men Make Good," and it was in this column that the following story appeared.

After graduating from the Colorado Springs High School, Daniel W. Butner chose to prepare for an engineering career at the School of Mines. He was graduated in 1915 with the degree of Engineer of Mines.

Butner's first position was in Utah, where he was engaged in lead mining. From Utah he went to Mexico and worked in the silver mines there. Later, returning to Tucson, Arizona, he built the first electric smelter used in the Southwest. Butner left Arizona to accept an engineering position for a large eastern steel corporation in Cuba, and returned to the States when this country entered the World War.

He enlisted in the Engineer Corps stationed at Fort Meade, and was for a time given the task of assisting in the training of new recruits. He was overseas and was stationed with the engineers in front of the Argonne when the Armistice was signed. Upon his return to the United States, Butner was recalled to France to participate in the deliberations of the American mining engineers commission to assess damages to the mines of the devastated regions. This was a high compliment paid to his engineering ability and it is undoubtedly a great honor. Butner is, like all others who participated in the World War, reticent concerning his army experiences.

Another trip home from the war-torn battlefields and a cablegram was awaiting him from a large Belgian corporation asking him to engage in their employ in the copper mines of the Belgian Congo. He accepted for a period of three years.

Each three years white men working in Africa are sent on a long ocean voyage or to their homes in the United States, or to some other more invigorating climate, and so, following the custom of the white man, he left the Dark Continent at the end of this period and visited his family in Colorado Springs after which he returned for another three years. Completing his second contract with the Belgian Corporation, Butner again visited in Colorado. He went back to Africa again, but this time to northwest Rhodesia in southern Africa for a huge British syndicate, the Bwena Copper Mining Company, Ltd. Since he has been in this company's employ he has visited home and is now on his second three years for the British concern. When this period is completed Butner will have put in 12 years in the mining regions of the Dark Continent.

On his last visit to the States Mr. Butner brought his wife and family. Mrs. Butner is a former Michigan girl, daughter of a prominent mining engineer in Africa. Travel throughout Europe on their way to Colorado was recorded pictorially with a fine motion picture apparatus. Twenty-one reels of film were brought to the United States by Mr. Butner and shown to members of his family and friends during his visit.

"Let us consider how wonderfully we stand upon this world. Here it is we are born, bred, and live, and yet we view these things with an almost entire absence of wonder to ourselves respecting the way in which all this happens. So small, indeed, is our wonder, that we are never taken by surprise."—*Faraday*.

Frank W. Lee Believed Drowned Missing Two Years

A report from the American Consul at Tampico, transmitted to Senator Waterman through the state department, offers a solution to the mystery surrounding the disappearance of Frank W. Lee, '11, in September, 1927. The story of Lee's fate will probably never be known. Although the Tampico Consul is of the opinion that Lee was drowned on September 9, 1927 while swimming, certain mysterious circumstances which have never been explained have cast some doubt upon the correctness of this theory.

The consul's report shows that Lee was employed as an engineer by the Huasteca Petroleum company from Oct. 16, 1924, to Aug. 17, 1925. His connections after the latter date are not disclosed. Harnden reports that inquiries made in Mexico City, according to the consulate general there, reveal that Lee was known to a number of people there up to three or four years ago, and that these acquaintances were informed from "various sources" that he met his death at Tampico by drowning.

The records of the Civil hospital at Tampico were inspected by Harnden and disclosed the entry of an unknown man who died from drowning on Sept. 9, 1929. The body was taken to the hospital and is recorded as that of a man 40 years of age and of American nationality.

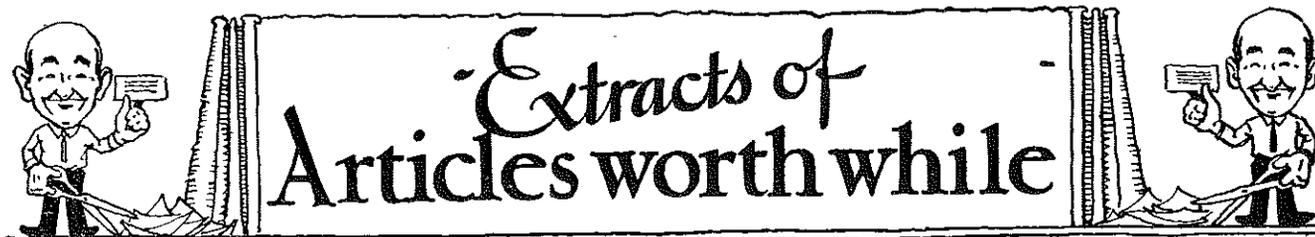
"This office is of the opinion that while the dates and description would seem to lend color to the assumption that the unknown man was Frank W. Lee, no proof is obtainable and exhumation if effected would probably fail to identify the body," said the consul's report.

Fuel Utilization

It has been demonstrated that steam may be produced consistently at an efficiency of 90 per cent. A 5000 bbl. per day hydrogenation plant is now under way. There has been an enormous increase in the utilization of natural gas, a decided increase in coke-oven-gas production, a decrease in water-gas production, and a continual increase in the number of waterless holders for the storage of gas at relatively low pressures. The outstanding feature of a majority of recent boiler installations is the almost universal use of furnace-wall cooling by means of air or water, with the trend apparently in favor of the latter. Fears of incomplete combustion due to cooling of the reacting products have not been realized.

A keener competition between stokers and pulverized-coal firing is reported, the stokers, regaining some of the lost ground. The use of air preheaters as a final heat-absorbing medium is widespread, and consequently stokers have had to be adapted for use of preheated air. The most practical heat-liberation rates are still 12,000 and 25,000 B.t.u. per cu. ft. per hr.

Roller mills and ball mills are more extensively used for pulverization than other types. Experiments have continued on the problem of the marine use of pulverized fuel, and in most cases have been highly successful. An oil-burning locomotive of the Kansas City Southern Railroad has been equipped with a unit system of pulverized-coal firing and has given excellent results. The fuel consumption is 25 per cent less than with a similar hand-fired furnace, the steaming capacity is equal to that of an oil-fired boiler, and the fuel cost is only 40 per cent of the cost of oil firing. *Mechanical Engineering*, January 1930, p. 13—Reviewed by R. W. M.



The articles abstracted and the books reviewed in this department are selected with your interests in view. We strive to cover a wide range of material. The reviews are written by William J. Hazard, '97, J. Harlan Johnson, '23, R. A. Baxter, '23, and Professor R. W. Morton.

Handbook of the Geology of Great Britain edited by J. W. Evans and C. J. Stubblefield. Thomas Murby and Co. London. 556 pp., 24 tables, 67 figs. incl. maps. 1929 (24 shillings).

This book is a new and extended edition of the volume dealing with the British Isles of the "Handbuch der Regionalen Geologie" published in English twelve years ago in Heidelberg. The series was intended to describe the Stratigraphical Geology of the whole world, and to consist of eight volumes. The general Editors, Professor G. Steinmann and Professor O. Wilckens, arranged with Dr. J. W. Evans to produce the section dealing with the British Isles, and he was able to secure the cooperation of a number of leading British Geologists.

By agreement with the various contributors, the royalties due from the sale of this work were used for the purchase of the copyright with a view to issuing at a later date a new edition in England. In the production of this second edition, the former contributors have again taken part, and Dr. Evans has also been able to enlist the services of additional authorities.

The general plan of this work is essentially similar to that of the first edition, each contributor having the greatest latitude in the presentation of his subject. Advances made in Stratigraphical Geology have been so marked as to necessitate considerable revision, and in many cases the entire rewriting of individual articles. For example, modern views on the stratigraphical relationships of the Devonian Series, of the Permo-Triassic Systems, and of the Bovey Tracey Beds are fully discussed; an account of recent zonal work on the Upper Carboniferous is also included; similarly the sub-divisions of the Jurassic and Cretaceous Systems, rendered more exact by the intensive studies of the distribution of the ammonites, are focussed in text-book form.

The book represents an authoritative summary of present knowledge of British stratigraphy. A general bibliography is given at the end of the book. The index includes nearly 5000 headings.

—J. H. J.

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Canadian Oil Book, 1929. Thos. Skinner of Canada, Ltd., Montreal, Canada. 157 pp. \$3.

This reference volume is similar to the other well-known Skinner manuals. It records 769 companies that have been formed to search for oil and gas in Canada since 1900, of which 130 are now defunct. More than half the others are in Alberta. A directory of directors of Canadian oil companies is a feature of the work.

Geology of Ste. Genevieve County, Missouri by Stuart Weller and Stuart St. Clair. *Missouri Geological Survey*, Vol. 22, Second Series. 360 pages, 15 plates, 4 figs. Maps. 1929.

Ste. Genevieve County is situated in southeastern Missouri along the Mississippi River. Its northernmost point is about 35 miles south of St. Louis. The total area is about 481 square miles.

Within the borders of the county is exposed a greater stratigraphic succession than any other county in the state and one of the most pronounced belts of faulting in the Upper Mississippi Valley passes through the county from northwest to southeast. Therefore, both stratigraphically and structurally it is a most important area for study, and correlations made in this county may be considered as a key to the succession throughout that portion of the Ozark region bordering on the Mississippi River.

A number of formations outcrop within the area that do not outcrop at any other point in the state. Rocks belonging to the Pre Cambrian, Cambrian, Ozarkian, Ordovician, Silurian, Devonian, Mississippian, and Tertiary Systems are described. Since there is such a complete succession of the Paleozoic series considerable space has been given in the report to correlation and to the geologic history.

The economic products of the area include:—lime, stone, copper, lead, zinc, sand, feldspar, iron, onyx, and underground water.

Altogether the report is a splendid piece of work and will be of value not only to those interested in Missouri geology but to those interested in the Ozark region in general.

—J. H. J.

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An Epochal Light Source. M. Luckiesh. *Electrical World*. October 26, 1929. The new type S-1 tungsten-mercury arc of the General Electric Company supplies radiant energy for health as well as light for vision. It is a combustion of tungsten filament and a mercury arc between tungsten electrodes that approximates very closely the midday sun. The filament furnishes 7%, arc 25% and the electrodes 68% of the total light, but these proportions are readily revised by the lamp designer.

—W. J. H.

* * *

Fifty-fifty shares in Boulder Dam Power. *Electrical World*. October 26, 1929.

Outline of Secretary Wilbur's proposed plan for distribution of the power generated. A list of 23 applicants for power and the amounts needed is included.

—W. J. H.

Alumnus Contributes to Symposium

Theodore Marvin, '22, outlines the creation of increased markets to use a surplus in zinc production by the American Zinc Institute in a symposium published in the November issue of the Mining Congress Journal.

Notwithstanding a large increase in the per capita consumption of zinc since 1921, Mr. Marvin points out that the potential and quickly available supply of zinc far exceeds the natural demand for the product. This has brought about decreased prices, resulting in part time employment, idle mills and machinery and reduced profits in the zinc industry. Mr. Marvin points out that 38 other industries of the country have been confronted with conditions similar to those of the zinc industry and that they were solved by market broadening plans and research. "The chief objective of the program of market broadening is that of increasing the sale of zinc and zinc products so that increased consumption, without entailing enlarged industrial investments, will lower costs and increase profits," he says. In pointing out the need for market surveys, Mr. Marvin states that at present little is known of the ultimate destination of zinc after it leaves the fabricating and converting plants. Zinc mining and smelting companies have been asked to join in this technical and market research activity which is intended to bring about economical stability and increased prosperity to the zinc industry.

Books on Economics

Federal Income Taxation. By Joseph J. Klein. John Wiley & Sons, Inc., New York. 1929. 2353 pp. \$10.00. The most comprehensive analysis of our Federal system of income taxation yet published. Not only of interest to lawyers, accountants and educators, but also to taxpayers who wish to acquaint themselves with the principles and practices of our Federal taxation system.

* * *

Foreign Banking Systems. Edited by H. Parker Willis and Benjamin H. Beckhart. Henry Holt & Co., New York. 1929. 1305 pp. \$7.50. A concise, complete description of the banking systems in the following countries: Australia, Austria, Belgium, Canada, Denmark, France, Germany, Holland, Italy, Japan, Norway, Russia, South Africa, Sweden, Switzerland and Great Britain.

* * *

Handbook of Financial Mathematics. By Justin H. Moore. Prentice-Hall, Inc., New York. 1929. 1216 pp. \$10.00. Mr. Moore's book is an invaluable presentation of methods by which financial calculations may be made rapidly, accurately and easily. The author, who is counsellor on economic conditions for the Irving Trust Company, has worked out a series of formulas which can be applied, without intricate mathematics, to any financial problem.

* * *

Recent Economic Changes in the United States. Report of the Committee on Recent Economic Changes of the President's Conference on Unemployment, including the reports of a special staff of the National Bureau of Economic Research. McGraw-Hill Book Co., New York. 1929. 2 volumes. 950 pp. \$7.50. An analysis of post-war developments in American economic life, particularly since the depression of 1920-1921. We consider this one of the most important studies in recent years concerning fundamental conditions in the United States.

Alumni Write Books on Geology in China and Philippines

Geology of Nanchang, Tangyang, and Yuan-An Coal-fields, Northwestern Hupeh. H. M. Meng, '25. Published as part of *Memoir No. 8 of the Chinese Institute of Geology.* 38 pages, one map, 3 prints, 19 figures. October 1929.

The report is based on field work done in the fall of 1928 as part of a survey of the mineral resources of Northwestern Hupeh on behalf of the Bureau of Reconstruction of that province. The report is published in both Chinese and English.

Under stratigraphy good discussions are given of the various formations which range in age from Ordovician to Tertiary, and columnar sections are given for several localities. Other subheadings are: Structure, General Topography and Hydrographical Systems, Coal fields, and Metallic deposits.

Structurally the area is one of folds. Some of these have been intensely folded and locally faulted. A number of cross sections illustrating the structure are given. The coal seams range in age from Pennsylvanian to Jurassic but the more important ones mentioned occur in the Pennsylvanian and Permian strata. The coal has a wide distribution. The deposits have not been highly exploited and most of the mining is by primitive hand methods. Large reserves of coal are known to exist.

Limestone in the district contains some metallic deposits which include chalcocite and malachite. Some small veins of lead, zinc, and copper ores and some barite deposits occur but none of these metallic deposits appear to be of much value.

The report is a valuable and interesting contribution to the geology of a portion of China on which very little has herewith been published.

—J. H. J.

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A Geological Study of the Angat Novaliches Region. A. D. Alvir, '20. Published by the Bureau of Science of the Philippine Government. Nov. 1929.

The study of the geology of the Angat Novaliches region was undertaken primarily for the purpose of supplying the Metropolitan water district with geological cross sections along the proposed tunnel line between the Ipo dam site on the Angat river and the Novaliches reservoir site. The paper prepared gives a detailed study of the geology of the region with special emphasis on the structure. The work done sheds some light on important points in the geologic history of the Philippines. Altogether the paper is an important contribution to Philippine geology. The comprehensive bibliography given at the end of the paper will give additional value to anyone interested in the geology of the Philippines.

—J. H. J.

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Grounding and Short Circuiting Transmission Lines. H. A. Holmes, *Electrical World.* January 25, 1930.

The unreliability of grounding chains for the protection of workmen on a line is discussed by the author and examples of danger cited. In one case a lineman was killed by a "dead" line which was shorted and grounded by a chain. The Chain was ineffective because of poor contacts of the links. Mr. Holmes recommends chains only for the preliminary grounding of the line, which should then be thoroughly grounded by effective clamps and flexible copper cable.

Athletics

Basketball Results

After a strenuous pre-season campaign in which the Mines quintet showed nothing sensational, the regular schedule was taken up January 10 at Golden.

MINES SURPRISES AGGIES

The Miners went into this first conference game as the under dogs and, much to their own surprise, and to the surprise of all the sports' followers, defeated the Aggies by the decisive score of 40 to 35. Every player registered at least one field goal with Dickey and Morris tying for high scoring honors with 12 points each. It was quite an upset, and gave the Mines' fans hope for more success as the season advanced.

MINES DEFEATS REGIS

Following a strenuous final week during which time the basketball team had little practice, the Miners took the Regis Rangers into camp by a 35 to 24 score. The Miners led at the half, 18 to 16, and retained the advantage until the final whistle. The Mines five did not show up as well as in their game with Aggies but coaches Hinds and Moles laid the blame to final week just completed.

Dickey counted six goals from the field for the Miners to lead the individual scoring. Bond dropped three field goals and as many fouls. Morris, Eads, and Austin showed up well under fire, and Hendrickson and Benedict played fine floor games.

But reverses were due to come in time.

UNIVERSITY WINS

The Silver and Gold swamped the Orediggers in a one sided affair ending 46 to 9. The Miners missed innumerable set-up shots at the start of the game, which demoralized them to such an extent that Boulder was able to pile up a 22 to 5 lead by the end of the first half.

In place of the expected comeback in the final period, the Miners began the half by missing two beautiful tries. Even on their free throws, they were off, converting only three out of nine.

This victory for the University and their win over Wyoming at Boulder three nights later put the Varsity five well on the way toward another championship of the Eastern Division of the Conference.

MINES LOSES TO TEACHERS

Colorado Teachers continued their winning ways by defeating Colorado School of Mines on the basketball court at Greeley 32 to 18.

The Bears held the upper hand from start to finish. They took a commanding lead early in the fray and when they were in front by a margin of 16 to 5, Cooper rushed in his secondary outfit. Teachers led at the half, 18 to 5.

Mines was able to pull up on the short end of a 14-20 count in the second half, at which point Cooper sent back his regulars. Mines caged another basket and a free throw and were trailing by only 17-

BASKETBALL SCORES

January 10—Mines	40,	Aggies	35
January 18—Mines	35,	Regis	24
January 22—Mines	9,	Colorado	46
January 25—Mines	14,	Teachers	33
January 28—Mines	14,	Denver	45
February 1—Mines	9,	Colorado	59

20. At this juncture the Bear passing attack began to function again and a barrage of baskets followed.

DENVER TAKES ONE

The Miners dropped their fourth conference game to Denver University by the one sided score of 45 to 14. The boys seemed dead on their feet, allowing D. U. to pile up a 24 to 1 lead during the first half. The game was a little rough towards the closing minutes.

RETURN GAME AT BOULDER

The Miners were again turned back by the University when they went up to Boulder for a return game. This time the Varsity boys tried their best to reach Montana State's traditional score of sixty. They were disappointed however, and were forced to be satisfied with a mere 59. This was just fifty more points than Mines was able to score.

Intramural Sports

Intramural boxing and wrestling was scheduled to begin January 31, at which time the preliminaries were held. February 6 and 7 were the dates set for the semi-final bouts; the finals February 10. Results of this year's bouts came too late to announce here. Last year's champions were:

Wrestling:

- 115 pound class—Allen, Barb
- 125 pound class—Towle, S. N.
- 135 pound class—Wilkerson, S. A. E.
- 145 pound class—Brierly, Barb
- 158 pound class—McClure, S. A. E.
- 175 pound class—Burrell, K. S.
- Heavy—Coolbaugh, Beta.

Boxing:

- 115 pound class—Northrop, Barb
- 125 pound class—Leslie, Barb
- 135 pound class—Wilkerson, S. A. E.
- 145 pound class—Hayward, S. N.
- 158 pound class—Kithil, S. N.
- 175 pound class—Jkick, Met.
- Heavy—Eads, S. A. E.

Aggie Football Captain Dies

Frank John Prince, captain of the Aggies football team last year, died at his home in Pueblo, January 7.

Prince had been visiting his family over the holidays. He was a senior at Aggies and president of the junior class last year. He was also president of the Sigma Nu fraternity.

Rifle Team Schedule

The Mines Rifle Team has five matches scheduled for this year. They are:

- North Carolina State College,
- Corps Area Intercollegiate Match,
- Mississippi A. & M.,
- University of Cincinnati,
- University of South Dakota.

From the result of the firing shown to date it appears that the following men will have an excellent opportunity for making the rifle team:

- Hoalst, McFarland, S. L. Smith, Draney, Padilla, True, Rice, Zwick, Heindel, Montgomery, Stark, Wilmot, Hintze, Markardt, Schofield, Hayes, Golden, Wilkerson, Fishman, Higgs, Condit, Freyermuth, Gumm, LeRoy, Percy, Morrison, Schumaker, Thomas and Wallis.

Either a rifle team letter or individual medals will be awarded to the ten high members of the rifle team, and a rifle will be presented by the military department to the high score member of the team.

Aggies 30—Teachers 19

Colorado Aggies polished off the Colorado Teachers 30 to 19 after taking defeats from Mines and Wyoming.

The Teachers didn't seem to be able to get going while the Aggies, altho exhibiting no startling prowess, maintained their superiority thruout the game.

At the half the Aggies led, 20 to 5.

Aggies beat the Teachers to the tipoff in nearly every instance and were in possession of the ball during the greater part of the game.

Dutch Clark to be Married

From galloping ghost to amateur dishwasher seems to be the fate of Earl "Dutch" Clark, famous Colorado College Tiger athlete. The Dutchman has signified his intention of taking the fatal step "sometime in the next three or four months." Miss Dorothy Schraeder is the lucky lady.

Clark has been the outstanding athlete of the Rocky Mountain region for the last three years. All-conference football and basketball for the past three seasons is no record to be sneezed at. He climaxed his career in 1928 when he was named quarterback on a number of All-American selections.

Football Rules Unchanged

At the annual convention of the National Association of Football Coaches in New York City on December 30, it was decided by a decisive vote to leave the rules unchanged.

The report of the rules committee of the Coaches' Association marshalled an array of facts and statistics against the extra point after touchdown. Searching of records for the 1928 season showed the committee that an average of seven plays was necessary to score each point registered during the season and it seemed out of proportion to have one play yield one point after touchdown.

The two other changes proposed classifying penalties so that if two fouls were called on the same play, one major and the other minor, instead of the ball reverting to its original position the difference between the two penalties be assessed. The other proposal would have given a team in possession of the ball within five yards of the sidelines the option of putting it in play 15 yards from the sideline with the loss of a down.

Coach Dan McGugin, of Vanderbilt, declared that criticism of college athletics found in the recent Carnegie report will be answered by the steadily increasing high standard of scholarship among athletes. The Vanderbilt coach suggested that coaches should be responsible only to administrative heads of colleges and universities.

William A. Alexander, Georgia Tech, was elected president of the association, succeeding Hugo Bezdek, Penn State. J. F. (Chick) Meehan, New York University, was made vice president, and Clarence W. Spears, University of Minnesota, second vice president. W. H. Cowell, University of New Hampshire, is the new secretary and treasurer.

Coaches named to sit as an advisory committee with the football rules committee are: Robert C. Zuppke, Illinois; Glenn Warner, Stanford, and J. B. Sutherland, Pittsburgh.

One Time Champions Meet Up With Difficulties

Colorado College is having a tough time trying to convince the other colleges of the conference that they know something about the cage game. None of the other schools are taking the Tigers as a serious threat and are knocking them off no matter where they find the game to be played. It wasn't such a long time ago that the Tigers were considered unbeatable on their home floor. The Bengals even dropped the Cats from Montana State on their home floor and this is the only eastern division team that has turned this trick since the beginning of the Cats' reign.

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Southern Conference Takes Sensible Stand Regarding Help for Athletes

The definite stand taken by the Faculty members of the Southern Conference, at their annual meeting last December, in favor of legitimate aid for athletes created no little excitement among sports-writers and college people throughout the country. Following the Carnegie Report, this decision of the Southern Conference faculty representatives provided editorial writers with just the sort of material needed to bring out a valuable flow of criticism for and against the Carnegie Report and the Southern Conference.

The Southern Conference seems to have made a good move. In case the various comments appearing in the press have perverted the true purpose of the Conference's action, here is reprinted the resolutions that were passed:

"Be it resolved that the Conference as a whole and as individual members has no objection to athletes receiving legitimate aid from the institution in which they are enrolled but reiterates its absolute opposition to any form of subsidizing, especially created for athletes as a class.

"Be it further resolved that the Conference herewith appends as addenda to Section D, Rule, Article 13, of the by-laws, of the Southern Conference, which shall be an interpretation of the rule, the following:

"First: An athlete may hold any scholarship that is formally established by the institution in which he is a student and which is controlled and awarded by regularly controlled authorities.

"Second: An athlete may hold any scholarship that is open to students who are not athletes.

"Third: An athlete may benefit from any loan fund that is regularly administered by university authorities or by a formal committee recognized and sanctioned by the university authorities.

"Fourth: An athlete may hold any position for which he received a reasonable emolument provided such position is recognized by the university authorities and be not reserved solely for athletes.

"Fifth: Any athlete may receive pay direct from the Athletic Association of his institution for work that he does for that association provided he is paid at a reasonable rate not to exceed 50 cents per hour for each hour of service actually rendered.

"Sixth: No athlete, whose way through the university is being paid directly by an alumnus, or who is the beneficiary of any loan fund not known to or recognized and approved by the university, or who holds any position not open to other students shall be eligible to represent any school in the Southern Conference."

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The Question of Larger Enrollment

In spite of the fact that some schools hailed a large increase in enrollment with much rejoicing this year, many schools were greeting a decrease with something akin to glee. If comment in alumni publications is any indication of the policies of the colleges which they represent, a decrease in entering numbers is not only greatly to be desired when it just happens, but is something to be striven for. Certainly many schools are limiting their freshman class, not only because of limited facilities for taking care of them but because of a growing desire to obtain more quality in their student body.

Such a divergence of opinion must indicate widely different aims. The idea that everybody ought to have a college education, prevalent since the War, seems already to be losing adherents. Colleges are beginning to discover that the polish so laboriously put on a lump of coal is only semi-permanent.

The Colorado School of Mines is known to favor quality rather than quantity in so far as students are concerned. Mines is now running at practically full capacity (minus about 35 students); and this is a condition that has prevailed for several years now. The noticeable improvement in the quality of students entering Mines during this period is something to rejoice over with glee.

A. I. M. E. Scholarships Awarded

Don Peaker, popular Junior and well known halfback, was awarded the A. I. M. E. Women's Auxiliary scholarship.

In awarding the various scholarships the Women's Auxiliary divides the country up into several sections each including several engineering schools. Each man wishing to apply gives all recommendations—including scholarship, athletic achievements, character, etc., to the head of his district, Peaker being in the Denver district. After considering all these items, the district heads pick one man for recommendation to the New York office. Then out of these representatives of the various districts, the officers pick the final winners, so in this way a district representative is not necessarily a scholarship winner. The scholarship is valued at approximately \$450 per year with the proviso that each man pay back at least half after he is out of school.

The Trend of Flotation

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Colorado School of Mines Quarterly
Vol. XXIV, No. 4

Write to the
DIRECTOR OF PUBLICATIONS
Colorado School of Mines
GOLDEN, COLORADO



Campus

Military Ball Soon

The Military Ball will be next on the social program at Mines. This affair is one of the events looked forward to by all students, nearby alumni, and friends of the school.

Although no definite date has been set for the dance it is being rumored that around Washington's birthday is the favorite time. The dance as usual will be held in Guggenheim Hall. As commander of the Battalion, Ted Sess will act as chairman of the committee. The other members of the committee are to be announced later.

Professors Pledged by Theta Tau

On December 17, 1929, Gamma chapter of Theta Tau was honored by the successful pledging of Professors S. P. Warren and Byron B. Boatright. Both of these men have been prominent in their chosen profession. Warren, in addition to his professorial duties at school, is recognized as a consulting metallurgical engineer. Boatright has recently returned to school as a member of the faculty after a number of successful years in the oil production industry. Both men are popular with the students and faculty and Theta Tau is proud to announce their pledging.

New Oredigger Editor

At the meeting of the Publication Board on Thursday, January 9, Frank Hayward resigned as editor of the Oredigger. Hayward has been editor since the beginning of the semester, being appointed to the position by the Student Council.

"Jiggs" Kinney, at one time assistant editor and also editor-in-chief has been appointed to carry the paper through the second semester. Kinney edited the Oredigger last year for a short while, but was unable to continue due to sickness. Kinney will now continue his interrupted term as editor-in-chief.

Ralph Keeler was appointed as assistant editor, having given two years of conscientious work toward the paper.

405 Register at Mines for Second Term

Figures on registration for the second semester at the Colorado School of Mines were placed at 405 students by Dean Morgan.

The total registration for the year shows a 10 per cent increase over last year, Dean Morgan stated.

Twenty-four students of last year who did not return the first semester are back in school for the second term, he announced, and several transfer students from other schools have registered for the second semester.

Beckstrom Signs with Soviet Government

Prof. R. C. Beckstrom, formerly on the faculty of Colorado School of Mines, but now of the University of Tulsa, is now in Berlin, enroute to the U. S., after a busi-

ness trip to Russia. While in Russia, Prof. Beckstrom signed a contract with the Russian Government, which position makes him the highest paid engineer in Russia. He will return to Russia in June to assume his new duties. Mrs. Beckstrom and daughter, Barbara, are with him on this trip. They left Tulsa early last fall.

Petroleum Exhibit Engineers' Day

One of the most interesting and uniquely displayed exhibits shown at Mines on Engineers' Day was the Petroleum Engineering display in the basement of Stratton Hall. Professor Fancher was in charge of the exhibit.

One of the most interesting of the individual exhibits was a miniature oil derrick, run by a tiny motor and working like a regular old veteran of the oil fields. Apparatus used in petroleum testing were displayed on the spotless clean benches. Among these were various flash testers for the volatility of various lubricants and fuels. These flash testers are used in determining the safe temperatures at which lubricants may be used. Other various equipment were shown, such as volume control machine, flow meters for measuring flow speed of oils, etc., dead weight tester for determining accuracy of gauges, Edwards gas balance, Saybolt viscosimeter, very important in determining viscosities of oils, and apparatus for determining the colorific value of oils.

On a separate display stand were shown various equipment and tools used in petroleum production in the fields. These couplings, pumps, valves, drills and rods proved a very interesting portion of the exhibit.

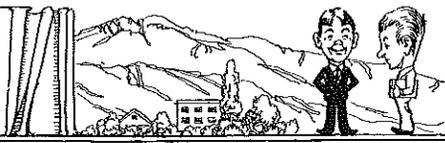
However, probably the most interesting and important piece of equipment was the fractional apparatus. This is a permanent part of Mines P. E. equipment, and was designed and built by Professor Fancher. Although this apparatus is in use in petroleum repairing, Mines is the only school to own one. This apparatus runs a 3 liter sample and an average fraction of 100 cc is obtained. The small apparatus operates at atmospheric pressures while the larger is a vacuum apparatus to prevent breaking down of crude products.

The P. E. exhibit was one of the most complete and most interesting of the departmental displays and as a result was well patronized by those interested in any of the exhibits.

Another Universal Language

The latest effort at a universal language is "Panoptic English" which has been devised by a self-constituted group of scholars and scientists of Cambridge, Mass. English is the basis and it consists of only about 500 words and the whole language is exhaustively explained in a very small book of two or three pages. The claim is made that it is so simple a person of any nationality could learn it in a few months at the most and persons who are quick at such things could master the new language in a few weeks.

Topics



Beta Theta Pi Holds Initiation

The Beta Phi chapter of Beta Theta Pi fraternity held initiation Friday, January 24, 1930. The class initiated were Harry Mack, Wallace White, John M. Gardner, James L. Morris, William Rump, James D. Sullivan, Earl Sackett, Philo D. Grommon Jr., Ralph Corlew, George Woodward.

Philo D. Grommon Sr., of the class of 1907, assisted in the initiation of his son, Philo Grommon Jr., of the class of 1933. Tom Gardner of the Denver University chapter also assisted in the initiation of his brother, Marcus Gardner, into the Mines chapter.

Following the initiation a delightful stag banquet was held in the chapter house, honoring the new members.

Guests of the evening included Art Hewett, '05, J. M. Kleff, '06, W. E. Gricith, '22, P. D. Gromman, '07, Wayne H. Denning, '26, J. A. Willson, B. W. Knowles, '02, F. P. Bicknell, '12, W. P. Huleatt, '19, L. W. Hartkemeier, C. B. Carpenter.

Sigma Nu Holds Initiation Sunday

The Sigma Nu fraternity held their first semester initiation at the chapter house January 26. Those initiated were:

Lloyd Jones, Long Beach, Calif.
Dave Blevins, Midland, Texas.
U. S. Jones, Maplewood, N. J.
Theodore Harding, Canon City, Colo.
W. C. Boundy, Grove City, Penn.
S. W. Johnson, Hollywood, Calif.
N. G. Glanding, Norristown, Penn.
John Ross, Kansas City, Mo.
J. D. Vincent, Whittier, Calif.
Frank Lindeman, Adel, Iowa.
L. E. Shumaker, Omaha, Nebr.
John Wilmot, Plainfield, N. J.
Leslie LeRoy, Moor Park, Calif.
Lawton Patterson, Los Angeles, Calif.
George Fancher, Downey, Calif.

Attempt to Revive Ancient Blue Law

Back in 1861, when Colorado was nothing but a word found in Spanish dictionaries, a group of rough, bearded miners and frontier lawyers organized themselves into a territorial legislature and begat the first piece of blue legislation born west of the Mississippi.

The territory was nothing but a few scattered mining camps, a few thousand Indians and scenery. But the legislature was determined to protect civic virtue and perpetrated a typically ambiguous law that still lives with us under the title of section 3740 of the compiled laws of 1921.

And it is under this ancient statute that the district attorney of the tenth judicial district, J. Arthur Phelps, is asking the state supreme court to hold that Sunday operation of theaters in Colorado is a misdemeanor.

In those days nothing was known or dreamed of movies, talkies, revues, stock companies and the other forms of modern amusements. There were road shows, troupes that wandered thru the country in their wagons giving performances whenever a handful of settlers were encountered, and it was these, attorneys argued Monday, that the old blue law was intended to affect.

It was not intended to apply, they contended, to the modern theater owner, an established and responsible member of his community, with his large investment in his theater, subject to the regular taxes.

The State of Repair

"A man, sir, should keep his friendship in constant repair", said old Samuel Johnson.

Cathedrals and other great structures are constantly being repaired.

A university education needs constant repairing.

You, as a university graduate, who spent some of the best years of your life at this campus—your education is in constant state of repair, and has been ever since you left.

Your new ideas and ideals have replaced old ones. Your old beliefs you have worked over. You face the new day with new doubts, new confidence.

But is it enough merely to keep the education of yours in repair?

Isn't your education worth improving? Several thousand other graduates think enough of their educations not only to "keep them up" but to improve them, to enrich them, round them out, and get the most out of them, with membership in the Alumni Association.

—Which includes subscription to the alumni publication.

—Bringing you again to springs of inspiration, of help, of encouragement.

To all of which you're entitled.
To all of which you're welcome.

—The Michigan Alumnus.

Files of General West's Paper Presented to Historical Society

Files of the *Colorado Transcript*, Colorado's oldest weekly newspaper, were presented to the State Historical Society January 17. The presentation was made by Mrs. Vera West Parsons, present owner. Governor "Billy" Adams responded to Mrs. Parson's address, accepting the *Transcript* files for the State.

The *Colorado Transcript* was founded in 1866 by General George West a few months after his honorable discharge from the Union Army in which he served during the Civil War. It was General West who first gave publicity to the idea of a School of Mines for Colorado, and he has become a figure in the early history of the School.

Coming to Golden, Colorado, early in 1859 with the Boston company, of which he was one of the founders, the organization built a log structure. The lower part

was used as a general store and on the second floor General West established the *Western Mountaineer*, which continued publication for two years.

When President Lincoln issued his first call for 75,000 men to quell the rebellion at the beginning of the Civil war, West, with a small army of volunteers from Golden, trekked his way across the plains, and enlisted. He served with distinction until the close of the war, and then came west once more.

Early in November he founded the *Colorado Transcript*, naming his publication after the *Boston Transcript* where he served his apprenticeship.

The paper was published every Wednesday and subscription rates were \$7.00 a year. Advertising was sold on a cash in advance basis. His first publication was seven columns, 13 ems wide and 22 inches deep, and the news contained in them consisted mainly of a digest of Eastern papers which arrived in Golden about two months later.

The type was stuck by hand, and the paper ground out on a Washington hand press.

West was the compositor who set up Horace Greeley's famous message for *The Rocky Mountain News* which caused such a sensation in the east when it confirmed the fabulous stories of the discovery of gold in Colorado.

General West died in 1906.

Mining practices at a 100 per cent mechanized mine working the Pittsburgh or No. 8 coal bed in eastern Ohio are described in Information Circular 6200, by W. F. Hazen and E. J. Christy, recently published by the United States Bureau of Mines, Department of Commerce. This is one of a series of papers being prepared by the Bureau of Mines on mining practices, methods, and costs in the various mining districts of the United States. The purpose of assembling this data is to place before those interested in the mining industry the methods employed and the cost data on the items involved in the winning of the coal and its removal to the railroad car at the tippie.

The circular contains information in regard to geology and topography, character of coal bed and overburden, and methods of development and mining. A summary of costs is also given.

The Capability Exchange

conducted by the Alumni Association is performing a service, free of cost, for the mining and petroleum companies in securing competent engineers for them.

For information write:

C. LORIMER COLBURN, Secy.
Colorado School of Mines
Alumni Association
509-17th St.
DENVER, COLO.

La Porte, California,
January 8, 1930.

Dear Mr. Colburn—

Am sending check to cover my dues and Magazine subscription for this year. Owing to deep snow we receive our mail with the greatest irregularity, and I'm hoping I miss no copies of the magazine.

Today was a bright day in our lives—the mail carrier came to camp. Although we've been snowed in only four days, and prior to that time received our mail nearly every day, it seems like months since we've seen a newspaper, and if the rest of the winter, until we're able to drive around in automobiles, is anything like these four days, there's a long cold winter ahead of us. As a rule the roads are closed by the first of November, but even the two months' grace we enjoyed this year can't satisfy us. Such is life!

It's a crime that cries to heaven for vengeance to subscribe to a magazine knowing that someone will have to carry it from town on his back, but I could do worse—the Saturday Evening Post is much heavier, and comes every week. I've noticed, while carrying mail, that Sears Roebuck and Montgomery Ward always send out their catalogs this time of year, too. Old Man Ward should try riding a pair of slick skis down an ice-crust mountain with twenty or thirty of his gems of literature on his back. The sensation is unique.

I don't like to predict, but if the Mines Magazine continues to improve as it has in the past, even Sears Roebuck might look to their laurels for circulation.

Wishing you, the Association and the Magazine the best of success this and every other year, I remain,

Yours truly,

FRANK E. DELAHUNTY, '25

Dear Mr. Colburn—

A meeting of the Great Lakes Section was held at the Cafe Louisiane in Chicago on Thursday, January 30th.

This was a special meeting held in honor of Dr. F. W. Traphagen who is visiting here. The following members were present: Messrs. Lynne, Macartney, Dakin, Belleau, Shields, Hardy, Holmes, Crampton, Frank, Solomon and Stronck.

All enjoyed a short talk by Dr. Traphagen on his wet chlorination process for the treatment of zinc. The card shark, Archie Lynne, elucidated the Doctor's talk, whereupon all were confused. "Houdini" Crampton spoke of the homecoming while working his way out of trick knots tied by the ex-cadet Holmes.

Hoping this reaches you in time for your next issue, I am,

Respectfully yours,

MORTON E. FRANK

Suggestions for nominations are wanted by the Committee. The annual election will be in May, and a ticket is to be made out soon. Write in your suggestions for 1930 officers.



Gary, Indiana,
January 22, 1930.

Dear Mr. Colburn—

Just a few hours ago I received the Alumni Magazine and quit my reading when I found that there is nothing left to read. Thanks very much. I was glad to read article by R. A. Baxter and glad to know that Prof. Beckstrom is going to Russia.

Since I left Golden the past May I was working at Coke Oven Plant of Illinois Steel Company as a heater's helper, then I carried on research work around the coke ovens, then I have been working for a few months in Engineering Department and at the present I am Foreman in the Gas House of Open Heart Furnaces No. 3 on the Steel Plant of the same company. I am glad to say that for a short period I was able to get a varied experience in my profession (Fuel Engineering).

I did not ask at all Mr. R. G. Travis to tell you about my marriage, though he is right that I am happily married.

With best wishes for you and for everyone, I am,

Sincerely yours,

L. A. WOROSHILOFF, '29.

Fort Worth, Texas,
January 20, 1930.

Dear Colburn—

Have intended dropping you a note for some time, but having practically nothing to speak of did not want to waste your time forcing you to read a notation concerning nothing. However, I take great pride in being able to relate a conversation which I had with a certain gentleman recently (a graduate of the Missouri School of Mines). In the course of this conversation I disclosed the fact that I was a graduate of the Colorado School of Mines and was highly complimented upon being able to finish from a school of such high standing. He advised me that the United States Government has a scholastic standard based upon the entrance and graduation requirements of Massachusetts Institute of Technology and using this as their high standard they classify approximately twelve schools of the United States as being on par with M. I. T. Among these twelve schools are such schools as California Institute of Technology, Carnegie Tech, Case School of Applied Science, Columbia School of Mines, Michigan School of Mines, Missouri School of Mines and Colorado School of Mines. I was delighted to hear from a man of sound judgment and good repute, the fame which the Colorado School of Mines carries throughout.

While in Midland, Texas, recently, I saw Prentice Brown and while in San Angelo, Texas had lunch with C. P. Butcher and M. K. Barrett. I also ran into Tex Woods. The above men all have good positions and are connected with Fisher & Lowrie, Cranfill & Reynolds, Skelly Oil Company and Vacuum Oil Company respectively.

Recently received a letter from Earl Foster, Cananea, Sonora, Mexico in which he states that at the time of writing his letter he was sober, but after reading the letter I rather question the statement. He reports numerous Mines men in that vicinity, all of whom seem to be progressing nicely.

Although I realize that the above has practically no information and of very little interest, am forwarding it to you with my kindest personal regards.

Sincerely yours,

L. DAVID WOSK, '24.

Memilla, Spanish Morocco,
January 6, 1930.

Dear Colburn—

Yesterday I received the first copy of the Magazine that I have had in Africa. All last year it came to me in St. Louis and Kansas City and I began to plan my Fall vacation for Golden and Denver.

But you know what happened—or perhaps you don't, for I'm not real sure myself, so fast did the changes come. At any rate I feel sure of my address for three years and the Magazine will be one of my best contacts with the States and the MINES SPIRIT as well as with those names appear in it to bring back memories.

We left New York on November 4th on the "Roma" and while we had plenty of weather, we beat the terrible storms of the last month or so, landed at Gibraltar and from there went to Malaga in a good American Buick over a good, but treacherously narrow, road along the Mediterranean Sea. An overnight trip in a 1000 ton ship then took us to Melilla, Morocco from which the mine is about 17 miles by good road in a southeasterly direction.

Melilla is a military town of about 60,000 people, of which we two families are the only English speaking. Our office at the mine, and most of the other old buildings here, are forts which have seen very active service and above whose walls it was once damnable risky business to stick one's head. These Moors are darn good shots even if they do use muzzle loaders and flint locks! However, that is all past and nearly forgotten. The Moors work along side the Spaniards and are admittedly, even by the Spaniards, very good workmen.

Altogether we have 1500 to 2000 men working here loading by hand—this we hope to reduce to 450 or 500 when the plant is completed in about a year. Until that time we face the task of increasing production under the present methods in addition to building the plant. So there is plenty to do and little time to do it in. Production is now about 20,000 tons a week maximum, and seldom reached, as against what we plan the plant to produce—35,000 tons a week average, and costing about 40% less per ton.

That's about enough for this time. Best of luck and success to yourself and the Magazine.

Sincerely,

JOHN ALAN RILEY, '23.

Colorado Section Annual Meeting

The annual meeting of the Colorado Chapter was held on the 17th day of January, Nineteen Hundred and Thirty.

The meeting was called to order at the Auditorium Hotel at 6:30 P. M. by President F. E. Briber. Toastmaster Carl Blaurock was then introduced and assumed charge of the meeting.

All the members were asked to introduce themselves. The toastmaster called upon several members:—Chas. M. Rath spoke on the Foundation, as did also A. E. Perkins and W. B. Millekin. C. L. Colburn had just gotten a good start when he was interrupted by the tune Hail, Hail! the Gang's All Here, coming over the air, played by the Colorado School of Mines Band. We listened to an hour's program broadcast by station KFEL received at the meeting through the means of a Majestic Mighty Monarch of the Air Receiving Set donated for the evening and installed by Chuck Gorden, 1519 East Colfax Ave. The broadcast was made possible through the courtesy of the Puritan Pie Company and donated through the generosity of J. H. Winchell. On this program, President M. F. Coolbaugh spoke explaining the aims of the mining courses given at the Colorado School of Mines.

Rock Springs, Wyoming, Lead Belt, Tulsa, Utah, White Pine, New York, Jerome, Globe and Ruth Sections were notified and invited to tune in on the program.

A motion was made and seconded that the Chapter extend a vote of thanks to the Puritan Pie Company and Mr. Winchell for their courtesy and generosity in donating their time to the Chapter.

A motion was made and seconded that the Chapter extend a vote of thanks to Chuck Gorden for the use of the receiving set.

The secretary was instructed to prepare such letters.

Motion was made and seconded that a vote of thanks be extended the outgoing officers for their efforts in behalf of the Chapter.

The election of officers followed. Harry McNeil, W. N. Traver, and C. S. Auther were appointed tellers.

The nominating committee submitted the following nominations: President: Axel Anderson and C. O. Parker; Vice President: Don Dyrenforth and Dewey Dutton; Secretary-Treasurer: J. E. Norman and J. L. Emrich; Executive Committee: E. O. Kistler and Chas. M. Rath.

The tellers reported that the results of the ballots indicated the election of C. O. Parker for President; Don Dyrenforth for Vice-President; J. E. Norman for Secretary-Treasurer; E. O. Kistler for Committee-man.

The holdover committee-men are L. B. Eames and John Bucher.

String Knowles '08, Mine Superintendent of the Hedley Gold Mining Company

of Hedley, B. C. spoke giving a very interesting talk on athletics situation during the year 1907. He also told of achievements of Mines Graduates connected with various British Columbia Mining Companies.

The report of Secretary J. H. Winchell was most unusual in that it showed a balance of \$19.85 in the treasury.

The incoming officers were installed in office.

A pair of cuff links was presented to Mr. Winchell in appreciation of the faithful and efficient service he had rendered the association during his time in office. A beautiful diamond pin was presented to the retiring President F. E. Briber.

Those present at the meeting were: M. F. Coolbaugh; Jesse R. Morgan; Harry L. McNeil, '24; H. T. Reno; John William Bucher, '02; W. B. Milliken, '93; F. C. Stienhauer, '99; C. O. Parker, '23; J. P. McMenemy, '22; John H. Rabb, Jr., Ex-'18; John H. Turner, '14; C. S. Arthur, '13; W. M. Traver, Jr., '16; C. H. C. Braden, Assoc-'29; J. E. Norman, '98; Wm. P. Simpson, '01; Hugh W. A. Stewart, '12; A. E. Perkins, '10; Chas. M. Rath, '05; C. Lorimer Colburn, '07; Harvey Mathews, '14; A. J. Weinig, '08; J. W. Winchell, '17; F. E. Briber, '16; B. W. Knowles, '08; Carl Blaurock, '16.

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Personal Notes



Edward P. Arthur, '95, attended the annual convention of the Colorado Mining Association in Denver, January 21st and 22nd and Engineers' Day at Golden the 23rd.

Burt C. Stannard, '95, General Superintendent, American Smelting & Refining Company at Selby, Calif., sends in his residence address as 2364 Woolsey Street, Berkeley, Calif.

Joe Bradley, '01, "Chuck" Bell, '06, and "Art" Sweet, '11, all attended the annual convention of the Colorado Mining Association in Denver in January.

Roger H. Downer, '01, recently moved from Goldfield, Nevada to Home, Oregon.

Harry J. Wolf, '03, recently received an appointment as Consulting Engineer and Investment Counsel for a New York Stock Exchange firm and has moved his offices back to 42 Broadway, Suite 1627.

Axel E. Anderson, '04, Technical Representative, E. I. duPont de Nemours & Company, left recently for a three months trip to South America where he will stop in Peru, Ecuador, and Colombia and at Panama on the return trip.

Fred C. Carstarphen, '05, has again broken into print several times lately, having articles in the Mining Congress Journal and the E. & M. J.

E. R. Richards, '05, was recently in Denver. He was attending strictly to business, which is the job of designing a new mill for a lead-zinc property in Mexico. Mr. Richards' present address is Santa Barbara, Chih., Mexico.

J. Marvin Kieff, '06, Mining Engineer of Leadville, Colorado, spent the week of January 19th in Denver. He is a member of the Board of Directors of the Colorado Metal Mining Fund and besides attending meetings of this Board he also was present at the annual convention of the Colorado Mining Association and the Colorado Chapter of the American Mining Congress. He was in Golden for Engineers' Day, January 23rd, and also the evening of the 24th to the initiation of the Beta Theta Pi fraternity.

Hugh R. Van Wagenen, '06, Consulting Mining Engineer of Los Angeles, has moved his office to 318 West 9th Street, Room 605.

Philo D. Grommon, '07, was in Golden, January 24th to see that his son, Philo Jr., was properly initiated into the Beta Theta Pi fraternity.

Benjamin W. Knowles, '08, Mine Superintendent, Hedley Gold Mining Company, Ltd., Hedley, B. C., Canada, is spending a several months vacation at his home in Denver.

A. J. Weinig, '08, is given credit for metallurgical development of the Liberty Bell Mill by Charles A. Chase in an article in the Engineering and Mining Journal for January 23.

Karl V. Geib, '11, is engaged on mine examination work at Ouray, Colorado. His present address is 350 So. Lincoln Street, Denver.

Edward T. Hager, '12, who has been located in California for some time has removed to Niagara Falls, New York, where his address is 451 Third Street.

S. Power Warren, '12, recently returned from a business trip to Nova Scotia.

Harold L. Bicknell, '16, recently sent in a change of residence address to 120 South Euclid Avenue, Oak Park, Illinois.

Eugene O. Binyon, '23, formerly Engineer for the C. & A. Mining Company at Valedon, New Mexico, is now associated with the Anita Copper Company at Fordsburg, New Mexico.

J. Harlan Johnson, '23, presided for the Rocky Mountain Association of Petroleum Geologists at the Engineers' Luncheon, January 28 which was held in Denver.

C. W. Ryan, '23, is abroad for the duration of several months.

John Beville, Ex-'26, Engineer for the Oklahoma Natural Gas Corporation, has moved his residence to 119 East Latimer Avenue.

A. S. Adams, '27, was the principal speaker at the Engineers' Luncheon, Jan. 28. His paper on "The Beginnings of Science" dealt primarily with the scientific achievements of the Ancient Greeks.

Harold W. McCullough, '27, Engineer for the Goodman Manufacturing Company, has been transferred to Huntington, West Virginia, his residence address there being Denning Apartments, 817 Tenth Avenue.

Louis C. Rubin, '27, is at present located in the Whiting Plant of the Standard Oil Company of Indiana.

Harvey Wendell Mathews, '28, has been made Assistant Petroleum Engineer for The California Company with headquarters at Westbrook, Texas.

V. P. Pentegoff, '28, has resigned as Chief Geologist for the Radiore Company to accept a position with the International Geophysics Company, Ltd., with headquarters in Los Angeles.

Gerald G. Goergen, '29, went with the International Smelting Company the first of the year. He is doing some work for them in the testing laboratory at Tooele, Utah.

Charles H. Jenkins, '29, has accepted a position as Mining Engineer for the Anglo-Chilean Consolidated Nitrate Corporation at Tocopilla, Chile.

Paul S. Lewis, '29, Geologist for the E. W. Marland Company, Inc., recently sent in a change of his residence address to 2021 Gatewood Street, Oklahoma City, Okla.

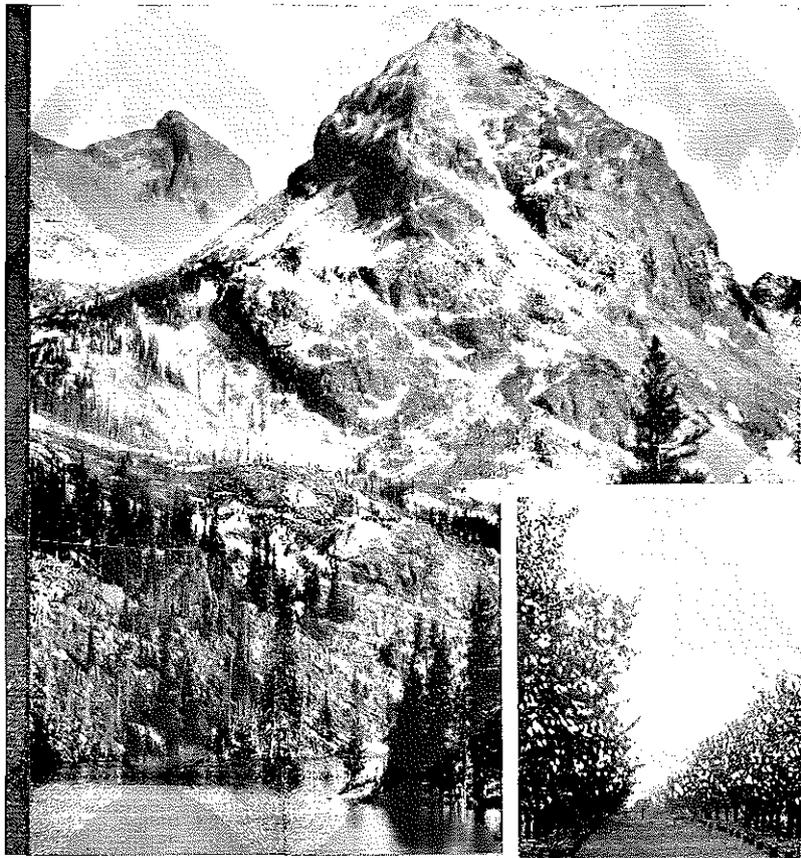


Cormack-Harris

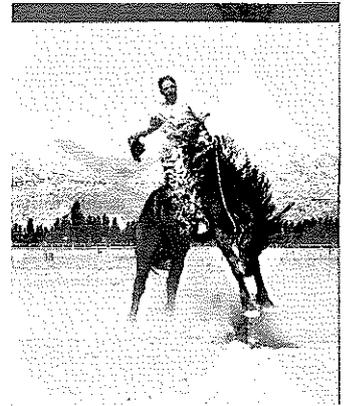
Miss Evelyn Harris of Norwood, North Carolina became the bride of William W. Cormack, '26, January 4, 1930. Miss Harris formerly attended Stetson University, DeLand, Florida and is a member of Delta, Delta, Delta Sorority. Cormack is a member of the Sigma Nu and Theta Tau Fraternities. The couple are making their home in Richmond, Virginia where Cormack is connected with the Richmond Public School System.

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Warrior Peak in San Isabel Nat'l Forest. Below: Rodeos are a summer attraction. Colorado's orchards yield abundantly.



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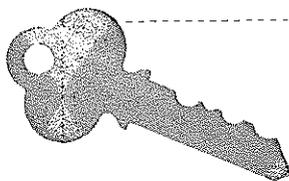
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Geophysical Investigation

(Continued from page 16)

which the outline of the terrain changes at that particular station.

The diagram (fig. 4) illustrates this clearly. The top part shows a cross section of an irregular terrain in the s (or x or y) direction, positive from left to right (from south to north, or from west to east). The second drawing shows the gradient of the elevation, in the direction s , $\frac{dh}{ds}$

—, and the third shows quantity $\frac{d^2h}{ds^2}$; it is very evident

that there are no deflections where there are no edges of an unconformity. The lowest drawing shows the results

in plan form. The arrows representing $\frac{d^2h}{ds^2}$ are turned 45°

in this drawing to prevent an interference of one with another. Arrows in a positive direction (pointing north or east) signify lower edges of the unconformity or areas of relative depression, whereas arrows in a negative direction (pointing south or west) denote upper edges of the discontinuity or relative ridges.

APPLICATION OF METHOD AT CARIBOU

Malkovsky has computed the values of $\frac{d^2h}{ds^2}$ for all sec-

tions shown on the map (fig. 3) (854 points) and has plotted the results that had a clear numerical value. In this map the arrows are so shifted that the station lies always in their center. At the dump of the Comstock mine the topographic conditions have been assumed as if the dump did not exist. The direction of the arrows in this map indicates very clearly the areas of relative depression and relative uplift. For instance, arrows pointing south or west mean upper edges in a north-south or east-west section through the terrain, whereas arrows pointing north or east signify relative depressions in such profiles. Ridges or upper edges are indicated, for instance, at magnetic stations 36, 37, 55, and 63, whereas lower edges show most clearly at stations 3, 4, 16, 17, etc.

A geologic unconformity is not necessarily indicated by both a lower and upper edge (or by a depression and a ridge). It may happen that only the depression has enough deviation of its contour from the normal shape of the terrain, whereas the ridge may not have it, and vice versa; in this case the unconformity may be indicated either by an area of depression or by a ridge, as it is for the entire southwest site of the gabbro intrusion.

The south edge of the deposit is hardly marked by any topographic features, although the north side is clearly distinguished by a number of ridges. The majority of the ridges correspond fairly well to the areas of strongest magnetite concentration, as is indicated on the geologic map. The best agreement of ridges and crosses is found from stations 21 to 112 at the southeastern end of the deposit, at stations 154, 49, 147, 51, 138, 46, and others. However, the extension of this area of crosses farther to the northwest is not indicated by crosses, which is not absolutely necessary, because after the upper edge has been passed there may be strong concentrations of magnetite inside the boundary of the deposit and yet the terrain must not necessarily deviate from the normal shape. It must be borne in mind that this method reveals only the edges of a formation of different hardness imbedded in another formation; if this imbedded formation has a fairly homogeneous constitution,

its surface will have no deviation from the normal shape. Therefore, it is necessary that crosses in the geologic map shall only coincide or be inside areas bounded by ridges or, if the ridge is absent, bounded by depressions; but crosses should not be found in depressions, nor are they on the Caribou map. Although a coincidence could not be found for the narrow area of crosses from stations 19 to approximately 100 and part of its continuation to the south-east, it may be stated that the agreement of details of surface geology and topography is fairly good.

Agreement between topographic anomalies and earth-magnetic disturbances. A remarkable relation exists between these topographic features and the strongest disturbances of the magnetite vertical intensity, as should be expected from the agreement of topography and geology discussed in the previous paragraph. The strongest positive anomalies are indicated on the map (fig. 3) by crosses. It is not surprising that of the 19 crosses 12 are located directly on ridges and 4 in places that by the relative situation of ridges (or in absence of ridges, of depressions) are shown to be inside the boundary of the deposit (see above); only 3 crosses are in depressions, where they evidently do not belong. Beyond any doubt, therefore, the agreement of topographic anomalies and earth-magnetic disturbances is remarkable. The strongest negative magnetic disturbances are also plotted to find an explanation for them. The majority seem to lie outside the boundary of the deposit. All, with the exception of one, lie neither in depressions nor on ridges. Three of the six minus anomalies lie in zones of transition of lower and upper edge. Another remarkable coincidence is that only the northeast and east edges of the magnetite deposit are sharply marked by topographic anomalies and that 13 of the 19 strong magnetic disturbances are located on the same side of the deposit; however, of the geologically strongest magnetite concentrations (according to the geologic map) it can not be said definitely that they prefer the northeast side. On the other hand, the torsion balance seems to indicate that there is in shallow depth more accumulation of magnetite on the northeast than on the southwest edge of the deposit.

Without the described new method of topographic analysis it would probably have been impossible to draw so many interesting conclusions as to the relationship of topography, geology, and geophysical data. Yet the conditions at Caribou were not very favorable for use of the method, which may be expected to prove very helpful in places where the topographic irregularities are more pronounced.

Operation of aerial tramways of the Pittsburgh Coal Company at its Warden and Banning mines, which carry 5,000 tons of coal per day to two preparation plants, is outlined by Fred C. Carstarphen, '05, consulting engineer of Denver, appears in the December *Mining Congress Journal*. The plans for the project were simple in design and were prepared by the company's staff, being largely assembled from standard equipment. Mr. Carstarphen says the art of washing bituminous coal has advanced toward perfection in these plants.

WANTED!—WANTED!

The Nominating Committee wants suggestions for 1930 officers of Alumni Association.

WRITE SUGGESTIONS TO SECRETARY

Colorado and Its School of Mines

(Continued from page 26)

hitherto kept a secret from all the world. In our day He has seen fit to reveal his treasure. The providential discovery is both an invitation and a command to come and take what has so long been concealed. The world needs it—the race may be improved and God glorified by its use, and it is by the same good providence that we are here. Then here and now is the time for doing all that may be done for securing in the largest measure the wealth which the Almighty first laid up and then laid open.

"In this view, a school for the pursuit of studies which pertain to the work of bringing these metals to the surface becomes a necessity. This country is destined to be, to a very considerable extent, a mining country for ages to come. Here, then, is the place for a school of mines, in the neighborhood of unlimited facilities for a practical illustration of the sciences which are taught.

"The spot chosen for this school is a locality most happily chosen for this purpose; on the plain at the foot of the mountains, within the easy reach of some of the largest mines yet developed. In every direction the student under the guidance of his instructor, may find ample demonstration of the principles taught in the lecture room.

"The structure which, with God's blessing, is to be erected on this foundation is to be of substantial material and will afford accommodations for a laboratory, ample for our present needs, a spacious lecture room, suitable provisions for a cabinet and a library room.

"The students of Jarvis Hall will enjoy facilities for the prosecution of scientific studies which will be of incalculable advantage in fitting them for the practical pursuits of life. I have no doubt that the people will show their appreciation of what the Territory has done, and what eastern friends have so generously contributed for the education of the boys of this Territory, and in improving these privileges, show their appreciation of the gift, and by a liberal patronage contribute to the enlargement of this Institution, so that growing with the growth of the state, it shall rise, by the blessing of God, to an equality with any university between the two oceans that bound the continent of the GREAT REPUBLIC."

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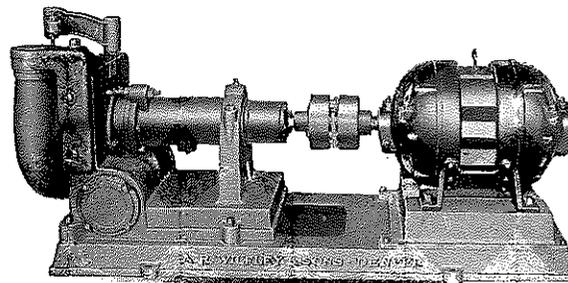


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Oiled Roads Discussed at Petroleum Geologists Meeting

By DART WANTLAND, C.S.M. Instructor

A symposium on Oiled Roads was the feature of the program of the Rocky Mountain Association of Petroleum Geologists, which met in Denver, January 16. The President of the Association, Prof. J. Harlan Johnson of the Colorado School of Mines introduced the first speaker, Mr. H. E. Dailey, asphalt and oil representative of the Midwest Refining Company.

Mr. Dailey described the different types of oiled roads in use. The good riding qualities, and the low maintenance expense of this type of road was pointed out. Average figures for Wyoming show that after five years a road coated with six inches of gravel will have cost \$8,830 per mile. This figure is made of (1) original cost of gravel \$4,000 dollars, (2) annual renewal of one inch of gravel which is blown or worn away \$666.00 and (3) bladeing, \$300.00. In contrast an additional \$2,000 for oiling, and \$1,100 for reoiling after three years, plus an annual maintenance cost of \$100.00 per mile, make an oiled road after five years cost only \$7,500 per mile. Furthermore, the speaker pointed out, a graveled road is only "a graveled road" and never so good as an oiled road—some of which have been in use in Fresno County California for over 25 years. Good roads advertise the state. They are paid for whether we have them or not; and they promote the revenue from gasoline taxes.

The second speaker, Mr. W. A. Norris, Superintendent of Road Oiling Department of the Levy Construction

Company, Cheyenne, Wyoming, illustrated his talk with pictures, showing the development of various types of roads and actual construction methods used in the building of oiled roads. To give an idea of the size of the problem, Mr. Norris cited figures showing that out of some 3,016,000 miles of public road in the United States, 306,000 miles are designated roads in the state highway systems, and 2,710,000 are local or county roads. Of the designated roads comprising seven to ten per cent of the total, 37 per cent is not even surfaced while 41 per cent is improved with sand clay or gravel and 22 per cent is paved.

The cost of various types of road per mile given by this speaker were: gravel \$10,000, macadam \$15,000; Bituminous Macadam \$25,000; Bituminous concrete \$30,000; Portland cement \$35,000 and Brick \$40,000.

Mr. R. J. Randall, office engineer, Colorado State Highway Department, was introduced and remarked on the fact that the public watched closely and with interest all state highway work. He said beginning in 1928 Colorado built several stretches of oiled road on which so far maintenance costs had been low, though not enough time had elapsed to get an accurate figure.

Mr. W. D. Ross, Materials Engineer, U. S. Bureau of Public Roads, Denver, Colorado, described an experimental oiled road built in conjunction with the California Highway department near Truckee, California. This road was divided into twenty sections, on which various types of oil were applied. A similar road in Nebraska in a sand country is divided into three sections, each subdivided into three parts where oils of varying asphalt content will be applied on two of the subsections—one being untreated. These experiments are designed to test the results of various treatments and give data for future practice.

In the discussion that followed the main speakers, Mr. A. K. Vickery, City Engineer, City and County of Denver, spoke of the paving and oiled road work of the city on its 990 miles of streets and that the results of oiling streets recently completed in Estes park was being watched with interest, as it might be applicable in Denver in districts where paving was not practicable.

Dr. S. H. Diggs, Research Chemist of the Standard Oil Company of Indiana, presented the idea that, in addition to being less costly, the oiled road had an advantage in not having a permanent hard surface, but that it could be scarified and remoulded from time to time and kept smooth and in better shape than a more permanent hard surfaced, or paved road.

Mr. Nevitt of the White Eagle Oil Company told of cost figures that his company was gathering on oiled roads, which though not complete show these roads have low per year maintenance cost for a smooth road.

The question was raised by Mr. H. A. Aurand of the possibility of applying oil directly to roads which so often run thru a shale area. It was brought out that good results were based on avoiding shale or clay as a sub grade with oiled roads as the water, often held in shale or clay, tended to work up thru the oiled covering and bring the oil to the surface and in many cases a road so built would go to pieces, or the clay by its shrinkage when dry would tend to destroy the effectiveness of the oiling and break up the road.

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This year has been a good one for dirigibles. The successful circumnavigation of the world by the Graf Zeppelin has given the lighter-than-air ship almost as much publicity as the airplane got through Lindbergh's flight to Paris.

In August a new type of airship took the air. It was the "metalclad" 200,000 cu. ft. dirigible ZMC-2 of the United States Navy, built at Detroit. This is a single structure unit in which the surface plates carry a considerable portion of the direct stress. This surface is made of a light-weight metal, Alclad, less than one-hundredth of an inch thick, and is assembled over a rigid frame. It serves also as the helium-gas container. The 142 sheet-metal rings of the surface are sewed together by means of a special riveting machine which drives three rows of rivets along the seam simultaneously at the rate of 140 per minute.

The ZMC-2 was delivered at Lakehurst, N. J., on September 12, and on September 19 it completed successfully its final test.

Carl B. Fritsche, president of the Aircraft Development Corporation, described this remarkable airship at the Third National Meeting of the A.S.M.E. Aeronautic Division, St. Louis, Mo., in May, 1929. An abridgment of the revised paper, brought up to September 20 is "The Metalclad Airship"; Mechanical Engineering, December 1929.

Dr. Clinton H. Crane Named on Committee

Clinton H. Crane, Hon. '29, is a member of an investigating committee to check the present waste of mineral resources due to over-production in the industry. This committee has been appointed in accordance with a resolution adopted by the Board of Directors of the American Mining Congress, at the Washington meeting in December.

In addition to a study of the waste of the mineral resources, the committee will survey the situation in relation to the waste of capital and labor involved in such over-production. The entire situation as to the evils of over-production and the hurried exhaustion of the natural resources of the country will be gone into.

In addition to Doctor Crane, who gave the commencement address at the Colorado School of Mines, May 1929, the following are named on the committee: Ralph M. Roosevelt of the American Zinc Institute of New York; C. E. Bockus of the National Coal Association of New York; F. H. Brownell of the American Smelting and Refining Company of New York; S. L. Mather of the Cleveland-Cliffs Iron Company, of Cleveland; S. D. Warriner of the Lehigh Coal and Navigation Company of Philadelphia and E. E. Reeser of the American Petroleum Institute of Tulsa.

The advertisement features several mine locomotives from different companies: DAYROCK MINING CO., BELMONT COPPER MINING CO., VERDE CENTRAL MINES INC., THE CENTURY ZINC CO., MCINTYRE-FORQUHAN MINES LTD., and CONAURUM MINES LIMITED. Two industrial facility photos are included: one for a foundry in Benton Harbor, Mich., and another for main works in Chicago, Ill. The text at the bottom of the advertisement reads: "BUILDERS OF METAL MINE LOCOMOTIVES FOR 40 YEARS. GOODMAN MANUFACTURING COMPANY".



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JOHN EDWARD NORMAN, '98
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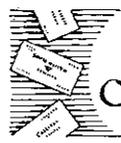
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Colorado School of Mines Alumni Association
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Engineer Should Quit Complex

(Continued from page 21)

have any valid basis for specialization beforehand. Another ten years and we shall see large numbers of young engineers coming back to college, some for full time, some for half time, some in the late afternoon or evening, some in correspondence divisions; some for higher work in science; some for advanced technique, some for business courses and some for broader cultural training. This is as it should be. Once sure that these opportunities will exist in an adequate degree, we could broaden the scientific and humanistic bases of our undergraduate courses, cut down specialization, relieve over-crowding and show the world the best balanced and best integrated of all undergraduate disciplines.

To speed this day, we need help from the organized profession, now without an educational policy or any code of educational qualifications. Lack of such a code does more than all else to hold down public appreciation of our profession. State license laws have excluded a few shysters, but have done little in a positive way to raise the prestige of the profession. I am for certification by the professional body, with the highest standard well beyond the level of graduation from college as a strong incentive to further education.

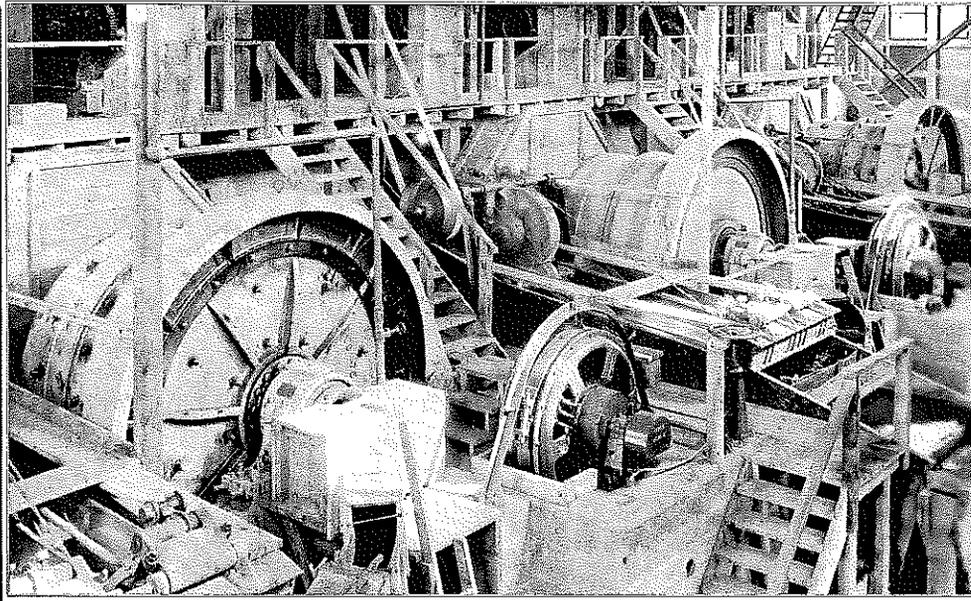
A NEW CIVILIZATION

We shall have a more inspired conception of engineering education when we awake to the fact that we are training the architects of a new civilization. Three momentous experiences of the race have broken up the older order of society in the last three centuries. The first was the beginning of a recorded, and hence a growing science; the

second, the birth of invention as a deliberate process; the third the turning away of the western world from the search for wealth through conquest, piracy and the looting of new continents to the homelier processes of production. Through the successive ages of the cave-man, the nomad, the priest, the soldier, the slaveowner, and the explorer, humanity has arrived at the age of the engineer. Twenty years ago, when a sagacious leader was needed, the choice usually fell on a lawyer. Nowadays, farseeing young men of ability are founding their mental lives on the spirit of science, rather than that of precedents. Many who earlier would have sought out the arts college and law school, now seek out the engineering college to prepare for the high adventure of forging out utterly new solutions for the yet unforeseen problems of business, government and social service, with tools which have not yet been invented. That is why the engineering colleges are striving as never before not merely to supply a technical discipline, but to make men masters of nature, by which we mean—as Huxley so aptly put it—"not merely things and their forces, but men and their ways."

Touchdown Song

Come men and stand and cheer for Miners,
Cheer when the team in blue appears,
For not avails the strength of Boulder
When they hear our mighty cheers,
RAH! RAH! RAH!
Fight, fight, fight for Miners
As they rush on down the field—
TOUCHDOWN TOUCHDOWN Miners
And the old Silver strength must yield.



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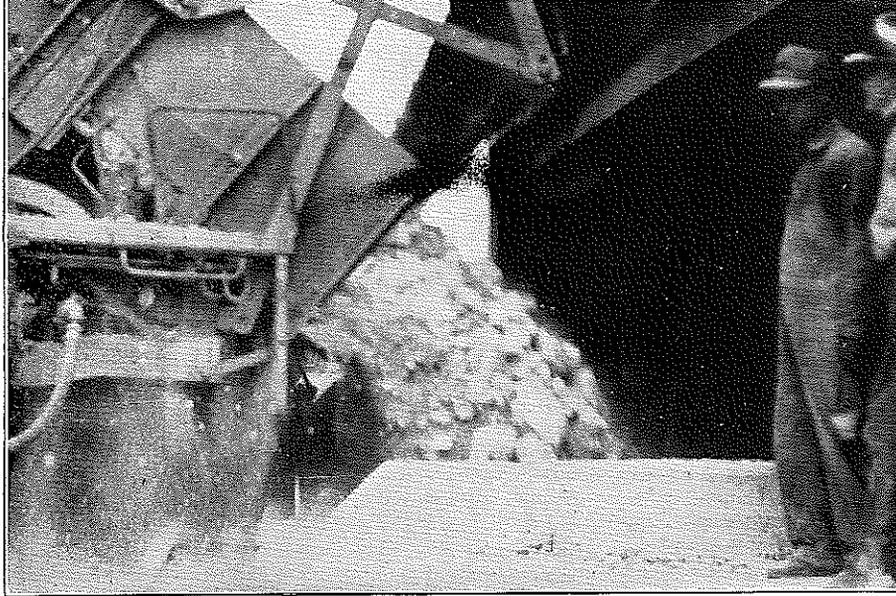
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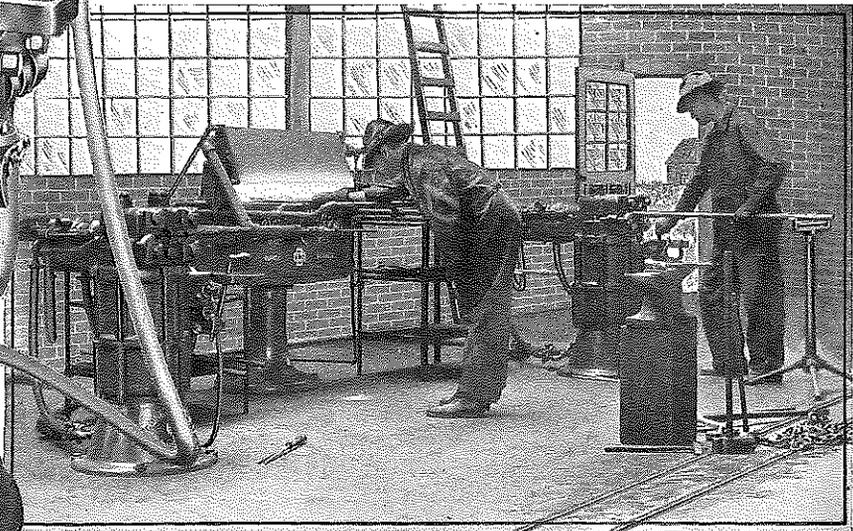
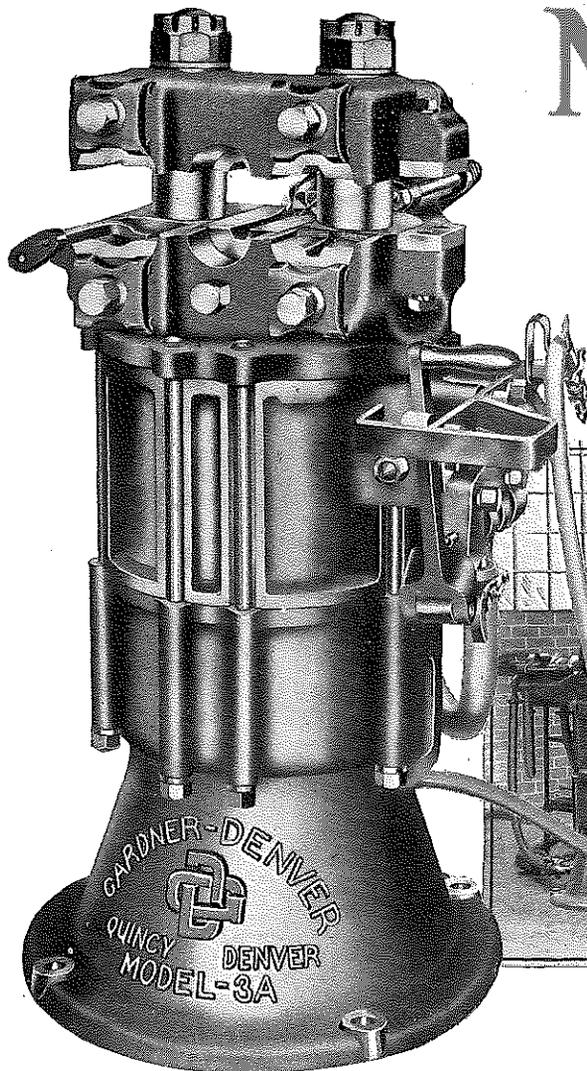
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