The Mines Magazine 

Featuring—

- Introductory Remarks by Governor Hickey
- Wyoming Mining Association Convention
- Statement of Policy
- Wyoming Mining Assn. Looks Ahead
- A Look to the Future
- Underground Mining in Poorly Consolidated Formations
- Bentonite in Industry
- Uranium Concentration at Susquehanna-Western, Inc.
- The Wyoming Uranium Picture
- Old Timers Club Award

JULY 1960

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sulting engineer with address 418 Mims

Gardner's address is 40 Os­

Charles J. Curtis has moved from

H. E. Blackburn, Jr., receives mail

Newell H. Orr, Jr., has moved

Charles A. Kohlhaas has moved

Major W. Seery, 260 W. 1200

Michael C. Carr is now receiving

(Continued on page 8)

THE MINES MAGAZINE • JULY, 1960

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For the complete story on the advantages of CF&I Grinding Balls and Rods, get in touch with your local CF&I Sales Office.
CLASS NOTES
(Continued from page 4)
GUARDI DEL CASTILLO, a 17-year-old Mexican, was recently rescued by a United States patrolman in the Engineering Department, most likely as a prospective repair-discipline officer. His last day's rest was at Long Beach Naval Station where he was a ship's mechanic during 16 months. His address is 162 F. W. Van Sickler, 135 St Paul (CA-727), c/o Fleet Post Office, San Francisco, Calif.

CHARLES J. WIDEMAN lives at 1509 E. Hampton, Tucson, Ariz.

OLIN D. WHITE'S career has moved from St. Paul, Minn. to North Texas where he may be addressed c/o Pure Oil Co., Box 67.

MAURICE A. CHAFFER has accepted a position with the New Jersey Zinc Co. and is working at the company's Austinville, Va., lead-zinc mine as a mining geologist. Previous to this he was in the U. S. Army Corps of Engineers as a second lieutenant stationed with the 89th Engineer Regiment at Ft. St. John, Calif. His permanent address is 115 Fifth St., N. W., Washington, D.C.

BERT DAVIDSON advises that his mailing address is c/o Pan American Petroleum Corp., Worland, Wyo.

JOHN M. FROST is in the army with his mailing address, Army P. O. Box 388, Anaheim, Calif. His permanent address is 14414 38th Ave., Wheat Ridge, Colo. He is propulsion engineer for the Martin Co., P. O. Box 9, Santa Margarita, Calif.

ROBERT J. STODDARD, JR., geologist for Sunray Mid-Continent Oil Co. of America, has moved from Ft. Worth to Midland, Texas. His address is 719 Curtis, Lamar, Wyo.

E. W. Ison, '07
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THE MINES MAGAZINE • JULY, 1960
MINERAL INDUSTRIES

(Continued from page 5)

Uranium Pioneers Receive Achievement Awards

Industrial achievement awards were presented Feb. 26 by the Rivermont, Wy., Chamber of Commerce to the following persons and companies for their contribution to the industrial growth of the Wind River Basin, and carried over from 1958:


2. Pan-American Petroleum Corp., for development of new techniques in water flooding to increase oil production in the Beaver Creek and Windham Donna Dome oil fields and creation of a $25 million gas processing plant at Beaver Creek.

3. Western Nucor Corp., for pioneering Wyoming's uranium milling operations and developing the largest open pit uranium mine in the state.

4. Souquebundo Western for developing new uranium milling techniques that have enabled the Rivermont mill to get the highest uranium recovery in the nation and for building Wyoming's first sulfuric acid plant in Riverton.

5. Vitrco Minerals Corp., for contributions in developing early techniques of uranium exploration in the Gas Hills and for six continuous years of concentrating uranium which have seen Yigor grow into the state's largest independent uranium producer.

6. and 7. Glove Mining Co. and Federal-Gas Hills, partners for contributions to uranium mining growth in the area and for construction of uranium processing plants.


U. S. Steel's Columbia-Genova Steel Division has begun construction of an iron ore mining and beneficiating project near Riverton, Wy., some 26 miles south of Lander. After extensive investigations begun in late 1962, the extensive ore mining, concentrating and pelletizing operations will supply pellets to the Columbia-Genova Steel's integrated steel plant at Genova. The mill will produce ore for the Genova plant to supplement General's present source of iron ore from mines near Council and Dubois which will continue in operation.

Known as the "Atlantic City Project," the location is 8300 feet above sea level in Wyoming's rugged Wind River Mountain Range. It is destined to become the highest, large-scale open pit iron mining operation in the United States.

The ore body itself lies near the Continental Divide crossing of the old Oregon Trail—out from far Atlantic City and South Pass City, now typical Rocky Mountain ghost towns. Because of the pit mining operations, major units slated for construction include crushing and screening facilities, a concentrating plant, an extensive water storage and handling system, and local and regional shipping facilities. Several real and mine office buildings, maintenance and warehousing facilities, and laboratory will also be built, as well as a dispensary, fire and ambulance stations.

After operations begin, conventional open pit mining methods will be used to mine the ore which contains about 30 per cent iron. Next, the ore will be ground down and converted to the concentrating plant where it will be magnetically concentrated to more than 90 per cent iron.

Stanley H. Cohlymer will direct the design and construction activity of the project.

1959 Petroleum Issue

The November 1959 Petroleum issue is devoted to "Natural Gas Business in the United States," and it is supplemented with a discussion of the Pennsylvania Gas Company. The issue of this magazine is designed to be used as an additional source of information for those interested in the gas business.

To have our Spil Rock Mill be the first uranium processing mill in Wyoming, was an opportunity for which we are grateful.

To have our mill in operation by July, 1957, and by July, 1959, to have increased our capacity, permitting us to supply in excess of 12,000,000 pounds of uranium oxide (U3O8) by the end of 1960, is a record which we are proud to present.

To further increase our ability to provide material for nuclear energy, for the defense, and for industrial development in our country, is a challenge which we shall strive to meet, and we shall continue to develop and expand our operations.
Dr. R. F. Mohl Points Out Shortcomings of Metallurgy

The science and industry of metallurgy comes in for criticism nearly every time that one of the nation's top authorities in that field, Dr. Robert F. Mohl, a former director of the 37th Henry M. J. Heubner Memorial Lecture at a meeting of the Iron and Steel Division of the Metallurgical Society of AIME.

Dr. Mohl, who has received many high honors in academic and professional fields, and is the author of many distinguished papers, is, at present, consultant to the United States Steel Corp., in Zurich, Switzerland, and is on leave of absence from Carnegie Institute of Technology, Pittsburgh, where he is professor of metallurgical engineering, director of the Materials Research Laboratory, and head of Graduate Studies.

His lecture focused on providing the efforts and accomplishments of the metallurgy, but Dr. Mohr dwelled largely on what he regarded as shortcomings and needs. Industry and the university reviewed some of his critical comments.

Dr. Mohr said in part: "In large-scale engineering research and development, especially in the extraction of metals and the forming of metals, we have, in recent years, too little in- depth activity in this area. More emphasis should be placed on research and development. Large-scale equipment research and development have been in great under-motivated. The Russians, Germans, and Americans have done great things that we should have done...

"The newer metals have, for the most part, come from the efforts of the chemical engineers, not the metallurgical engineers. One wonders whether the field of metallurgy might pass out of the hands of the metallurgist and be taken over by the chemist and especially by the chemical engineers, for example, the field of chlorite chemistry. This is a real chal-

Ienge to the metallurgical profession. Industry has been lax, but has the univer-

ty. If the universities were to exert the leadership they should, the emphasis might pass out of the hands of the chemists and chemical engineers to other sections of physical scientists or to engineering in general, and in particular parts of the former sciences, in the hands of the chemical engineer, in teaching, perhaps some important developments will emerge.

"Some design, especially process design, must be introduced and featured among metallurgical work. This will enable the chemical engineers to work in the area.

"Dr. Mohr described the science of physical metallurgy as "so central" that he called it "a part of physical metallurgy now prowling research, reformed of undoubted quality, in great volume."

"In all branches of metallurgy, said the speaker, the question of manpower is so disturbing that "we hardly know where to stand." He deplored the fact that "attempts to increase college enrollment in the mat-

terurgical field, seriously, for nearly a score of years, have been for naught almost entirely." Dr. Mohr also expressed the desire that there is a serious situation in the "loss of good research men to administra-

tive work, to sales, to plant opera-

tions" and in the diversion of such men to "loss of good research men to adminis-

tative work, to sales, to plant opera-

tions."

"In large-scale engineering research and development, especially in the extraction of metals and the forming of metals, we have, in recent years, too little in- depth activity in this area. More emphasis should be placed on research and development. Large-scale equipment research and development have been in great under-motivated. The Russians, Germans, and Americans have done great things that we should have done..."
Governor of the State of Wyoming

By the Honorable J. J. Hickey
Governor of the State of Wyoming

Introduction Remarks

Wyoming appreciates the interest shown by the Colorado School of Mines Alumni Association in devoting this issue of their official organ, The MINES Magazine, to the mineral industry of our state. Such recognition is indicative of the importance which the Rocky Mountain area and the nation as a whole is attributing to the increased growth of our state as a resource contributor.

Wyoming has long known the importance of its natural resources. The scenic and recreational values of our state are nationally known and Wyoming accommodates several million visitors each year. Oil and uranium have also received national attention and it is now apparent that other minerals in Wyoming are being encouraged in this development to the greatest extent possible.

$60 Million Taconite Plant Being Built

It is impossible to read an article dealing with resources in any state without realizing that every state is blessed with an abundance of natural resources. Wyoming is no different, with the exception that recent events are beginning to underline this resource availability. In Wyoming it is indicative that a short while ago the Columbia-Geneva Steel Division of U. S. Steel Co. announced the construction of Atlantic City, Wyo., of a large taconite mining and processing plant. This plant will become the largest industrial plant in the state. It will cost in excess of $60 million dollars and will employ over 600 people when completed. Approximately 1200 to 1500 men will be employed in the construction of the upgrading plant, the dams and a 76 mile railroad spur. Even when this one announcement is considered, it is indicative of the interest in Wyoming's resources. However, within the past year other events directly associated with resource development have added to the increased interest shown in Wyoming development.

The same U. S. Steel Co. recently joined the Food Machinery Corp. in the construction of a demonstration coke plant at Kemmerer, Wyo., which will for the first time make coke from non-cooking Wyoming coals. The success of this plant would seem to be a foregone conclusion, and the size of the plants has certainly been encouraging in this regard without demonstration. Development of this process will provide even greater potential for utilization of Wyoming and all western ranked coals.

Five Uranium Mills Operating

Five uranium mills are now operating in Wyoming, three of them put into operation within the past year. A sixth mill application is now being processed. A sulphuric acid plant has been built in connection with one of the mills and this plant has recently been doubled in capacity. It is hoped that this sulphuric acid availability will lead to development of central Wyoming phosphate deposits.

The coal industry in the state has already been greatly revitalized with construction of the Glenrock plant of Pacific Power and Light Co. One 100,000 KW unit is on stream and a second 100,000 KW unit is over half completed. A third unit is in the planning stage. Construction has begun on the preliminary work for a 150,000 KW steam generating unit at Kemmerer, Wyo., with again two additional units of a similar size in the planning stage. For the first time in a number of years coal production in 1959 showed an increase.

Resource Development Encouraged

The absence of a corporate income tax, the absence of a severance tax and the presence of a sound and equitable tax structure has played an important part in these resource developments. A reasonable conservation policy and a sound program of water development conservation have also been important in this economic advancement.

No area in the state has been neglected in this development. North, east, south and west, resource development has occurred, and the prospect for additional development in all of these areas is encouraging. Wyoming recognized that resource development is not an immediate thing. Even with artificial encouragement, the uranium industry in Wyoming has taken a number of years to reach a peak and seek its level. We recognize that other developments take many months of exploration and endless investigation.

Our state government and our people stand ready to give any assistance possible and welcome all efforts to develop our resources.

Wyoming Mining Issue

The July issue, featuring the Wyoming Mining Association convention, may be purchased from The MINES Magazine, Golden, Colo. A recent publication, The July Issue, featuring the Wyoming Mining Association convention, may be purchased from The MINES Magazine, Golden, Colo. A recent publication, The July Issue, featuring the Wyoming Mining Association convention, may be purchased from The MINES Magazine, Golden, Colo.
The Fifth Annual Convention of the Wyoming Mining Association was held June 9-11 at Jackson Lake Lodge, Moran, Wyo., in scenic Grand Teton National Park. It was attended by some 200 mining men—executives, mine and mill operators, and representatives of equipment supply companies.

Registration began Thursday afternoon, and the Association’s annual business meeting at 8 p.m. carried a full agenda of reports by the secretary-treasurer, executive secretary, committees, adoption of the 1960-61 Budget, election of officers, and other business.

Newly elected officers are Roy Coulson, president; C. J. Paustian, vice president; H. E. Potter, secretary-treasurer. Directors in addition to Coulson, Paustian, and Potter are V. O. Murray, A. W. Rums, E. L. Stout, V. Hoover, A. V. Quine, G. E. Sorensen, Harry T. Thonson, Myron L. Sisson (immediate past president), and O. F. Tucker. R. W. Bowman was re-elected executive secretary.

Technical papers were presented all day Friday and Saturday morning. Excellent sound and color movies were shown of Utah Construction Co.’s “The Story of Toquepala, Peru,” U. S. Bureau of Land Management’s “Our Public Lands,” and Grand Teton National Park’s “Turn the Wheels West.”

Special luncheon meetings with featured speakers were held Friday and Saturday. A delicious Western barbecue dinner was served indoors Friday evening with cowboy and Western music as entertainment. On Saturday afternoon a geology tour of the Jackson Hole area was conducted by Dr. J. David Love of USGS, under the sponsorship of the Wyoming Mining and Metals Section, AIME. Grand finale of the convention was a cocktail party, dinner, entertainment and dance on Saturday evening.

The convention opened Friday morning with a welcome to the mining men from Harry Barker, Jr., state legislator and owner of the Circle H Dude Ranch, who urged visiting miners to take in the sights, go fishing, and to call upon the Jackson Hole Chamber of Commerce for information or assistance in any way.
"It is our wish that you'll have one of your most successful conventions, and the Jackson Hole valley is very proud and pleased that you're here," he concluded.

R. F. Lovc, superintendent of Intermountain Chemical Co., introduced R. L. Moran, attorney, as "the man who almost single-handedly got this organization off the ground." Mr. Moran welcomed Miners and told them it was regrettable that Governor Hickey would be unable to greet them. "However," he added, "Jack Love, secretary of state, educator and author, would act as the Governor's emissary of goodwill."

Mr. Love rose deliberately and drawled: "I don't think it's so all-fired unfortunate the Governor isn't here...I am indeed proud and happy to welcome you to this convention...We hope you'll spend quite a little time in our beautiful Jackson Hole area...just so you SPEND all right with us." He assured Wyoming's mining men that the State Land Board was eager to avoid the necessity of another legislative fight involving minerals that have been traditionally considered mining and which have been allowed administratively by the Department of the Interior.

While not attempting to predict the outcome of the Cannelton Case, he said that "if the Supreme Court should issue a broad and sweeping decision eliminating these procedures which have been traditionally considered mining and which have been allowed administratively by the Department of the Interior, then the industry may find it necessary to seek legislative relief. On the other hand, if the Court goes completely the other way...we will be faced...with renewed proposals from the Treasury to rewrite the law in this field. It is of course possible that the Court will reach a middle position which might avoid the necessity of another legislative fight involving depletion."

Vann Pyrum, a Wyoming state officer, U. S. Bureau of Land Management, reviewed problems relating to mining on the public domain—land status, development and operations tenure, etc.—concluding his remarks with a recent statement by Elmer F. Bennett, undersecretary of Interior: "In several respects, the 1972 mining laws are not adequate to do the job...If we are to meet the mining requirements of our expanding economy, we should find a legislative solution that will resolve these inadequacies."

The Friday luncheon, Richard J. Anderson, assistant to the director, Rapelje Memorial Institute, made his audience chuckle then roar with laughter at his absurd yet sage predictions of "The United States in 1975." (The May 1969 issue of THE MINES Magazine presented samples of his humor as a luncheon speaker at the National Western Junior Mining Conference in Denver, April 21-23.)

K. W. Lents, superintendent, Globe Mining Co., introduced Kenneth C. Kellar, attorney, who spoke on "Application of New Labor Legislation." Declaring that for 12 long years employers were persecuted by the Wagner Act, he analyzed provisions of the newly enacted Landrum-Griffith Labor Laws, characterizing them as steps in the right direction but vague and unsatisfactory in some respects. He said he hoped to see Wyoming as the 19th state passing right-to-work legislation.

Fred Chadholm, assistant manager, Technical Division, Magnet Cove Barium Corp., spoke on "Bentonite in Industry," the full text of which appears in this issue of the Magazine.

E. L. Shoup, resident manager of Intermountain Chemical, introduced C. H. Reynolds, moderator; John B. Byrrill, Steel Service Centers; and J. W. Peterson, Caterpillar Tractor Co., who read a paper, "Equipment Replacement Scheduling," prepared by Frank A. Ross, equipment director, U. S. Bureau of Mines, and Charles C. G. Smith, executive officer, U. S. Bureau of Mines. (Much of the material in Mr. Peterson's address was published in the July 1959 issue of "The MINES Magazine, pp. 16-18.)

A. V. Quine, chairman, presented a "Report by the Resolutions Committee," which was accepted by the members of the Association. (A condensed version of the Resolutions is in this issue of the Magazine.)

First speaker on the program Saturday morning was Michael J. Dunik, state inspector of mines in Wyo., introduced by Joseph E. Ward, Joy Manufacturing Co., representative in Denver. Mr. Dunik reported no fatalities and only three compensable injuries for almost 2 million tons of coal mined in 1959; five fatalities, 56 compensable injuries in mines other than coal during 1959, with all fatalities caused by mobile and heavy equipment. "Safety is not a one-sided affair; it is the responsibility of everybody..."
Wyoming Mining Association
Statement of Policy
Adopted at Jackson Lake Lodge, June 9, 1960

The economic and political strength of our Nation is based upon free enterprise and the private ownership of minerals. This foundation was laid upon this philosophy. For the development and use of our vast mineral resources it is essential that these principles be encouraged and maintained by the sound governmental policies. To maintain a healthy mining industry, the conservation and development of essential minerals will insure an adequate supply of metals, minerals and fuels vital to our national defense and welfare.

The mining industry, as well as many other industries, is faced with competition from foreign sources of lower costs of production. As other countries adopt modern production methods, this situation will become more critical. We urge that government, labor and management refrain from policies which are inflationary and thus further increase the cost of production and raise the price level for our goods. We urge that our Federal Government give immediate attention to the problem of inflation in the National Minerals Policy.

We call upon our Members of Congress for their efforts on behalf of the mining industry and particularly the Wyoming mining industry. We wish especially to express our appreciation for his many years of service to our industry, the late Senator, Michael J. O'Mahoney. We express our appreciation for his continued optimism to the Wyoming Mining Association.

We urge the CIEH to take such action as will enable the disposal of surplus coal and lignite in Wyoming, Utah, Colorado, and Montana. He declared that the long-term opportunities for coal in this region are infinite. He spoke about NCA's efforts to bring such unused coal to market as an important contribution to the growth of the electrical industry, as the country is faced with competition from foreign countries. He recommended that Congress pass legislation relating to the purchase of concentrates for the period of 1960-1962. He also urged the preservation of the system of Federal guarantees and that regular payments be made to the Federal Government.

We support the work of the Federal Government in providing electricity for farm and ranch customers at reasonable rates. We believe that the Rural Electrification Administration should continue to provide credit and technical assistance to rural electric cooperatives. We are opposed to the construction of nuclear power plants in Wyoming.
The fifth annual convention of the Wyoming Mining Association, held at Jackson Lake Lodge last month, was another milestone in the development of the mining industry in the state and served to emphasize the growing importance of the industry to the economy of Wyoming. The enthusiasm of those connected with the various types of mining activities was indicative of a growing confidence in the future of the industry.

The list of minerals produced in this state includes bituminous coal, lignite, iron ore, lead, zinc, copper, silver, gold, uranium, molybdenum, tin, fluorspar, and talc. Other minerals, common to many western states, have not been found in the state. As a result, problems peculiar to the industry tend to be somewhat different than in other states. This is especially true in such minerals as lead and zinc which are of major concern in a number of neighboring states.

Each mining association tends to take on a form and character dictated by the conditions within the state. It is affected primarily by economic factors. Distance to markets and transportation facilities are important considerations. The social structure, labor availability, and the political climate have an influence on the industry. When all such factors are taken together, it will be found that the association endeavors to bring about a cooperative effort to meet and adjust to the problems considered to be of major importance.

Until the discovery of uranium in Wyoming, the mining industry remained comparatively small in the dollar value of its products. A reasonably favorable economic climate enabled the industry to make some growth. Speculative movements in the uranium industry, the mining people of Wyoming quickly realized that some cooperative effort was necessary in order to work out adjustments to meet the problems which were certain to become common to all. Promising activities had resulted in unfavorable public relations for the industry. Exploration camps and mining camps were established in strictly rural areas. Open pit mines were located on long existing grazing lands. Promotional activities and exaggerated claims of quick and easy wealth were bound to have repercussions.

In such an atmosphere, the Wyoming Mining Association was formally organized in April, 1956. The impetus came from the infant uranium industry. The leaders in this industry recognized that legitimate operators would have to cooperate to give stability and character to the industry. The great majority of the operators of other types of mining enterprises gave their assistance. Thus, the Association resulted from the joint efforts of the people from all types of mining activities in the state.

Among the leaders in the organization of the Association were the members of the first Board of Directors. These were: R. W. Adams, Riverton attorney; Roy Conlon, Vice President Corp.; R. L. Line, Teton Exploration Drilling Co.; M. L. Simon, Colorado Fuel & Iron Corp.; N. C. Peterson, Magna Cove Barium Corp.; O. E. Sorensen, Kemmerer Coal Co., and N. E. McDougal, Intermountain Chemical Co.


Monarch Mine and its products have been known for many years. The mine now produces materials for the manufacture of various types of mining operations. The Association has acquired stature in the industry and has developed a fine cooperative relationship with many trade associations in the state. It looks forward to continued growth and effectiveness as a factor in building the Wyoming mining industry.

The Board of Directors, elected during the convention at Jackson Lake last month, will guide the activities of the Association during the coming year.

The subject of my paper, "A Look to the Future," could cover a lot of territory. I have divided it into two parts and will briefly discuss the future outlook of the various major segments of the mining industry in Wyoming.

In the second part I will briefly discuss some of the political and economic factors and other problems that will have to be met in the future.

**A Look to the Future***

By MYRON L. SISSON, '20

The subject of my paper, "A Look to the Future," could cover a lot of territory. I have divided it into two parts and will briefly discuss the future outlook of the various major segments of the mining industry in Wyoming.

In the second part I will briefly discuss some of the political and economic factors and other problems that will have to be met in the future.

**The Uranium Mining Industry**

Uranium represents the largest segment of mining in Wyoming. It is now well established, and the outlook is satisfactory through 1966. After that date, its stability depends largely upon the international situation and the intensity of research and development of peaceful uses of radioactive materials.

As the present open pit mines are worked out and the deeper deposits are to be recovered by underground mining methods, the mining problems are going to increase. You will all be faced with increased costs. In addition you will have water, ventilation, safety and recovery problems.

These are not insurmountable, but they are going to take a great deal of planning and technical skill in solving them. The future of uranium mining in Wyoming depends upon how well these problems are solved. They are all completely different and unrelated to most of the problems of open pit mining.

**Trona Mining in Southwestern Wyoming**

Trona mining in the southwestern part of the state has one established mine, operating at full capacity. In addition there has been much activity in additional prospecting and leasing which may lead to additional mines and processing plants in this field.

There are several operating by-product properties in various parts of the state. These are all producing and their future seems assured. Their products have a wide variety of uses. The largest consumer is the oil industry. So their future is tied very closely to the domestic oil industry, particularly the drilling of new wells.

The phosphate mining in the western part of the state is expanding and production will no doubt increase during the next several years. A new gypsum processing and wallboard manufacturing plant is a new industry and new mining operation in the Cody area.

**Coal Production Increases**

The new steam generating electrical plant being built near Kemmerer and the new unit of the Glenrock generating plant will increase the consumption of coal.

The construction of the pilot plant near Kemmerer for testing the production of coke from non-

**The Author**

Myron L. Sisson, superintendent of Colorado Fuel & Iron Corp.'s iron mine at Sunrise, Wyo., received his B.S. degree from the Colorado School of Mines in 1950. For the next four years after his graduation from Mines, he was employed by River Smelting & Refining Co., Placerville, Colo., as shift foreman and foreman in the zinc oxide plant and crushing and roast plant. In 1954 he served as mining engineer with Phelps Dodge Corp. at Morenci, Arz., and from 1954 to 1957 as mining engineer with Hayden Bro., Coal Corp at Haygro, Colo.

In 1957 he joined the Colorado Fuel & Iron Corp. as mine foreman, mining engineer, assistant superintendent, and superintendent since 1961 of the company's Sunrise Mine.

Mr. Sisson is a member of the Colorado School of Mines Alumni Association, AIME, and the Colorado Mining Association. He is a director and past president of the Wyoming Mining Association, is a member of the Governing Board of American Mining Congress, is president of the Wyoming Board of Mines, and is a director of the Western Governors' Advisory Council on Mining.
United States. If these tests prove economically feasible, the mining industry, not only in 'Wyoming but the whole coking coal, can have an enormous impact on the coal mine in the Atlantic City area and the construction of the Lake Desmet area, together with future development in the interior area.

Iron Ore Production

Recent press releases indicate the opening of a mine in the Atlantic City area and the construction of a beneficiating plant to utilize the low grade iron ore deposits which have proven in this district. This will greatly increase the iron ore production of the state.

To date the only iron ore of any appreciable size is the Sunrise Mine, which has been in production about a year. It is now working on a reduced production schedule, due to the national reduction in steel production. It would seem that this is of a temporary nature, and production should improve within the next few months.

The future looks promising.

This now brings me to the second phase of "A Look to the Future."

Political and Economic Trends

There are political and economic trends which threaten the future, not of mining but our whole economic structure. Some of those taxes, political expediency, pricing ourselves out of our domestic as well as international, markets.

One of the factors that has encouraged mining and new mining development in Wyoming has been a healthy tax climate. All mining companies realize taxes are necessary, but they must be kept equitable in all segments of the economy. Numerous attempts are being made, in the past, to impose severance and various other discriminatory taxes on the extractive industries. These have been defeated in the past.

"Equalization" Tax Proposed

The next session of the legislature will no doubt bring forth another crop of such bills. In fact, I know of one that is being proposed right now. Called an "equalization" tax, it is aimed at those extractive industries, or segments of the industry, which ship their product out of the state for processing.

This kind of tax legislation could very well force some of our miners to close down, as they are working lower grade material and are faced with high transportation costs and are working on a small margin of profit and demand. Equalization taxes are a way of mining methods, safety programs and many other problems require an administrator with technical skill and experience, and there is no provision for this under the present code.

Therefore I suggest that the new Board of Directors, which is technically qualified to prepare the present code, work upon the first project and work-up the proposed changes in the code, with the cooperation of all these interested, and present it to the next legislature.

Please don't get me wrong, I am not criticizing those who are working now, I am just saying that our inspector's work is not being done efficiently. I am not being unfair. I think our Inspection Department has done a good job. They have cooperated with the operators and with the Board of Directors in every instance possible.

I do not profess to have the answer to this mining code problem nor to the others mentioned in my presentation, but I think it is time for our state to turn the code over to the people of the state. If they can do it, I am sure they can do it better than we can.

This solution is going to take a lot of straight thinking with joint, cooperative action by everyone of us.
he become mine superintendent. In addition to his duties as mine superintendent, he is also in charge of operations at the Hazelwood Uranium Mine in northeastern Wyoming, Wyoming.

Our second speaker is presently pioneering underground mining in an area which may well present some of the most difficult mining conditions yet encountered in underground uranium mining in this country. Jack Bailey is a graduate of the University of California in 1949. He joined the Anaconda Mining Co. at Darwin, Calif., on graduation as an engineer, then worked as mine geologist and was assistant mine foreman when the operation was closed in 1954. At that time, the Anaconda organization and U.S. Steel were engaged in a coal drilling project at Orin, Colo. In 1956 he moved to the Lucky Joe project and has been in charge of the Minute House Basin area since its inception in 1957. He is presently project manager for Utah Mining Co. on that project.

**Clarence Kravig, Homestake Mining Co., and C. H. Reynolds, Continental Materials Corp., Grand Junction, Colo.**

Clarence Kravig, first panelist, makes the following remarks about "Underground Mining in Poorly Consolidated Formations" at the Homestake Gold Mine in Lead, S. Dak., at the Hazelwood Uranium Mine in Crow Canyon, Wyo., and at the Homestake uranium mines near Moab, Utah, and in the Grants District, N. M.:

At the Homestake Gold Mine in Lead, S. Dak., we do not have any problem with unconsolidated ground except for a few isolated shear zones or faulted areas with gouge, so we have to confine this paper to our problems in our various uranium mines. Roof support is the main mining problem in all the uranium mines but drilling, raising, dilution, controlled caving, haulage, and pumping all present special problems due to poorly consolidated ground.

At our Hazelwood Uranium Mine in Crow Canyon, Wyo., we have some problems with unconsolidated ground in certain sections of the mine. Here the ground is quite soft and we have to support the roof very carefully.

At the Grants District, roof support is the main mining problem in all the uranium mines; even so cav­­­­­­ening, haulage, and pumping all present special problems. Much of the ore production comes from mining, and in the Grants District the ribs as well as the roof problem.

**Shirley Basin underground mine of Utah Mining Corp. [Photo courtesy Desert Ranger]**

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possibly some 40,000 feet long. Other discoveries have been made elsewhere in the basin but reportedly have not been developed by drilling. The expectation is that a greatly portion of this reserve is too deep for practical mining operations, and any mining attempt would be expensive. Therefore, the reserves are not yet developed by mining.

2. Exploration and development drilling indicated a highly continuous, bedded type of deposition which would lend itself ideally to any mining method, especially considering the high grade type of mineralization. A further safety factor lay in the uniformity of overburden of chemical to radiometric age which approached to be at least 30 per cent in favor of chemical. This factor, if treated sparingly or ignored, could help develop very favorable mineralization.

3. Lithologic studies of the drill hole cuttings with comparison to similar work in the Gas Hills seem to indicate that the sediments in the Shirley Basin area were nearly lacustrine and therefore further justify the spiliting core continuity, as opposed to the fluvialite deposition in the Gas Hills with the highly brecciaed, thin bedded type of sedimentation and semi-erratic mineral deposition.

Further these Lithologic comparisons indicated that ground support for underground operations should be at least as good as that exhibited in the Gas Hills where the longhole drill was often so undermined and deteriorated that it was necessary to prevent a sand run. Only a solid core will do this since a concrete plug will not prevent a sand run.

4. Overall, the preliminary exploration results and engineering studies indicated that mining costs in Shirley Basin would be about equal to those experienced in other districts in either open pit or underground operations and combined with the extremely low water table would make a very inviting mining location.

At the Utah property, it was easily established that open pit mining was impossible with the low water table and with the extremely high (300 feet) of overburden. A shaft site was picked near the terminus of the formation, the majority of the known mineralization is found in a coarse, highly unconsolidated sand layer lying immediately above this clay.

Shaft sinking progressed rapidly, when considering the operation of constructing a 15,000-foot reinforced lining with an inside diameter of 125 feet, until excessive settlement was first encountered at about 360 feet. At this point an outside ring of spiling was required to hold out the soft running ground and progress slowed down. At 270 feet a light clay was encountered and below this a fine grained, silty pebbly sand horizon, just before penetration of the coarse grained ore bearing features, which apparently carried the majority of the water, a pump station was set up at 320 feet and AM-3 clay grout cemented used in the attempt to seal the water out down to the clayey clay. The ground support properly and the shaft sinking was stopped by excessive water at 365 feet. About 2000 GPM was being handled and the excessive pumping caused the sand to erode rapidly, therefore a concrete plug was placed to seal the shaft.

At this stage it was decided to begin development of the available ore horizons from the 320 level (original pumping station) and wait for the outbounding shafts to be developed in order to establish a profitable mining operation.

The majority of Utah reserves were based on gamma pictures—with the exception of course of the AEC timbered section. Actual core testing would be necessary to establish an exact position of a given reserve. As development progresses, it will be economically wise to establish a series of development sublevels which have proven the presence of a given reserve. Initial core testing would then confirm that the reserve exists before a large investment is made in development.

In summary, underground mining conditions are difficult as development progresses but as the water zones continue to be a troublesome factor as development progresses but as the water table information. Dotted lines show water table before and after pumping. With the exception of course of the AEC timbered section, the majority of Utah reserves were based on gamma pictures with the exception of course of the AEC timbered section. Actual core testing would be necessary to establish an exact position of a given reserve. As development progresses, it will be economically wise to establish a series of development sublevels which have proven the presence of a given reserve. Initial core testing would then confirm that the reserve exists before a large investment is made in development.

The principal advantage would appear to be the ease of building the ground with the attendant low cost for blast, rock and timber. This physical characteristic also serves to hold exploration costs to a minimum in that these data formations are usually complete and sharply drilled in contrast to more competent formations.

Cordial best wishes to our Fellow Miners...

From the "miners" at the FRONTIER REFINING COMPANY

THE FRONTIER REFINING CO.
4040 E. Louisiana
Denver, Colorado

Featuring "The Fastest Gas In The West"

In comparison, with some of the original concepts developed from exploration data, it is obvious that actual conditions differ a great deal. However, the excellent ore body, a great deal of hard work and an open mind to different techniques will combine to create a profitable mining operation.

"Excavation is done primarily with IR 59 clay spaders and 32 shovels in which the rotation pulp has been used in the total job to date."

A longhole program is carried on constantly to further establish the limits of ore bodies and to provide water drainage and 99 per cent of this work is done with a Thor air motor using light tubular drill steel, "Fish" tail bits, a wet spindle, and mounted on an air leg.

A Copec BHD 50 rockdrill and leg is used in 3½ inch sectional steel for those rare occasions when hard rock is encountered.

Production to date has almost entirely been from development drifts with a modified long wall retreat method of stoping planned as soon as development achieved drifts have reached the edge of the ore lenses. It appears that at least two rows of square sets can be held open for mining, and timber will be pulled behind the retreating face to bring down the back.

The dewatering program has held the active water table well below the working level, but small percolation water is handled through the 100-150 GPM and this surface is taken to a settling pond for future recovery of the high grade fines. This amount of water coming from the surface working places plus drains is not significant in any other type of ground but will make a great deal of difference in a working face of unconsolidated sandstone; therefore, the longhole is essential to keep any amount of water channelized back to the surface.

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Bentonite
In Industry

By FRED CHISHOLM

Introduction

In slightly over 70 years, the bentonite industry has developed from a modest production of less than 100 tons per year to an average of approximately 1,200,000 tons annually during the past 10 years. The first shipment of bentonite for commercial purposes was made in 1888, and, at that time, was called "taylorite" after William Taylor of Rock Creek, Wyo. In 1890 the name bentonite originated to designate the material found by its occurrence in the Fort Benton formation in the Rock Creek district. In mineral nomenclature, the name bentonite is very young. It is a rock term and contains largely of montmorillonite clay, a name proposed in 1947 for a plastic clay found in Montmorillon, France. Bentonites are defined as fine-grained clays containing not less than 85 per cent montmorillonite. A wide variety of clays found all over the world are included in this classification.

For many years following the earlier discoveries, bentonite was thought to be only the sodium high-swelling type mineral produced principally in Wyoming. However, by the broad classification, non-swelling montmorillonite clays also became known as bentonites. Domestically it is recognized that there are two broad divisions of bentonites: Wyoming or western bentonite, which expands in water and carries sodium as the principal exchangeable ion; and southern bentonite, which has negligible swelling. The dominance of calcium in most of clays found all over the world are included in this classification.

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The author

Fred Chisholm was born in Mississippi, but has lived in Texas all but 10 years of his life. He graduated from Hardin-Stammons University in 1926 with a B.S. degree in chemistry. After teaching school for one year, he was employed by Magnolia Petroleum Co. as a chemist. In 1944 he accepted a job with Magnolia Cove Barium Corp., as chief chemist, and is presently assistant manager of the Technical Division of this company.

Mr. Chisholm is a member of API, AIME, The API Southern District Study Committee on Drilling Fluids, and the API Committee on Standardization of Drilling Fluid Materials.

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Bentonite is found in many areas of the world and is commercially produced in some areas. The most prominent foreign bentonites are those produced in Europe and Africa. European bentonites are of the calcium type, while North Africa produces an iron-bearing bentonite. The surface of the platelets holds the water tightly, and the negative charges on the surface of the platelets exert repulsive forces which tend to hold the platelets apart. Both positive and negative charges occur on the edge of the platelets.

An understanding of the swelling of western bentonite is complicated by the facts that it is not a pure substance, has no definite chemical composition, and contains varying amounts of salts. There are a great many theories accounting for the swelling of bentonite, but whatever the mechanism may be, swelling is an increase in volume due to absorption or adsorption of a liquid. When agitated with water, a permanent suspension results unless enough soluble electrolytes are present to prevent dispersion.

Production and Processing

Following the original production of bentonite in Wyoming in 1888, an average of 60 tons per year were produced until 1896. In 1902, production increased to 1,200 tons annually, and by 1919 production was still below 1,000 tons per year. In 1935, production was reported as 14,850 tons; in 1939, 82,592 tons; and in 1950 reached an excess of 200,000 tons annually. From a quarter of a million tons in 1940, production picked up dramatically to almost a million tons in 1950. Since that time, the industry has maintained a production level of over a million tons per year (Figure 3). Since 1950, Wyoming's production has over 50 per cent of this quantity (Figure 4).

The price of Wyoming bentonite is presently quoted in The Oil, Paint, and Drug Reporter at $1.00 per ton in carloads, f.o.b. mill, 200 mesh mesh in bags (Figure 5). The average price of all shipments as reported by the Bureau of Mines was $1.58 per short ton in 1958, compared with $1.27 in 1957. (The average price of all shipments as reported by the Bureau of Mines was $1.58 per short ton in 1958, compared with $1.27 in 1957.)

The processing of Wyoming bentonite is comparatively simple with the basic steps involving mining, drying, grinding and packaging. As mined (Figure 6), the material contains approximately 30.42 per cent moisture, which has to be re-
moved by artificial drying down to 15-12 per cent to make fine grinding possible. The most widely used commercial form is the 200 mesh product, but bentonite is also produced in granular sizes.

Industrial Uses

The structure, chemical and physical properties of bentonite contribute to its many industrial uses. The well known swelling characteristics of Wyoming type bentonite create desirable properties in oil well drilling muds, and the greater surface area promotes adhesion of bond strength when mixed with inert material such as foundry sand (Figure 8). Drilling muds and foundry applications account for the majority of the bentonite produced, but there are a variety of minor uses that account for an appreciable amount of the total U.S. production.

Oil Well Drilling Mud

Mud on a business is little known outside of the eyes of the bit with considerable pressure, and then Burgs to the surface in the annular space between the drill pipe and the well bore. During drilling, mud usually travels at the rate of about 2 to 3 feet per second.

In the early days of rotary drilling, the primary function of drilling fluids was to bring cuttings from the bottom of the hole to the surface. Today it is recognized that drilling fluids have at least nine important functions:

1. To remove the cuttings from the bottom of the hole and carry them to the surface.
2. To cool and lubricate the bit and drill string.
3. To wash the hole with a low permeability filter cake.
4. To control the sub-surface pressure.
5. To hold cuttings and weight material, in suspension while circulation is interrupted.
6. To release sand and cuttings at the surface.
7. To support part of the weight of the drill pipe and casing.
8. To reduce to a minimum the adverse effects upon functions adjacent to the hole.
9. To insure maximum information from the formations penetrated.

The majority of drilling fluids may be classified as water-base muds which identifies any drilling fluid with a continuous phase of water containing unweighted solids. These muds range in composition from a slightly dirty water to heavily weighted, chemically treated muds ranging in cost to as much as $100 per barrel.

Water was first used as the circulating fluid in rotary drilling, but it was soon observed that mud-laden fluids helped to hold back sands and seal formation pores. Drillers then began to improve their muds by adding clays or sub-bentonite to the surface near the well sites. A lot of difficulties were experienced with these early drilling muds due to their high filtration rates and high solids content. The mud lost to the formation, because of this filtration, caused shales to swell and increase in volume. The filter cake that the mud solids left behind on the surface or the formation built up sufficiently thick to stick the drill pipe. As a result, fishing operations were impossible.

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The composition of drilling fluids varies widely and will depend upon the requirements of the particular drilling operation. Local geological conditions usually dictate the type of mud to be used. In some areas, water drilling can be started with water, and the clays and shales drilled will be dispersed in the water, resulting in a good mud system. In other areas, barite formations may be encountered that will not disperse in the water to form a suitable mud.

The first commercial use of western bentonite was tried in a California well in 1928. Almost overnight, bentonite was a success as it sealed the wells of the well bore and greatly decreased the fluid loss of mud, resulting in a thinner filter cake. The early practice of making muds with commercial clays soon proved the superiority of western bentonite.

In rotary drilling operations, the water for mud for almost 30 years remained more of an art than a science. As late as the 1950s, the difference between a good mud and poor mud was one of opinion. Drillers relied mostly on how a mud looked, how it felt, and how the well was drilling. The development of mud as a science had its beginning in the early 1930s with the work of petroleum engineers in the field and with portable laboratories to analyze and solve mud problems. To learn more about drilling fluids, prospective mud engineers now study drilling fluids in training classes widely offered by petroleum engineering schools.

The major properties of mud include:

1. Yield:
   - Yield is defined as the number of barrels of mud, or apparent viscosity, that can be mud to displace one cubic foot of oil (Figure 3). This property is determined by preparing a suspension of mud and determining the viscosity of the suspension. The measurement is read on a standard filter cell apparatus (Figure 11). Yield is defined as the number of barrels of mud, or apparent viscosity, that can be mud to displace one cubic foot of oil (Figure 3). This property is determined by preparing a suspension of mud and determining the viscosity of the suspension. The measurement is read on a standard filter cell apparatus (Figure 11). Yield is defined as the number of barrels of mud, or apparent viscosity, that can be mud to displace one cubic foot of oil (Figure 3). This property is determined by preparing a suspension of mud and determining the viscosity of the suspension. The measurement is read on a standard filter cell apparatus (Figure 11).
line, with the 15 centipoise line, is found the concentration of clay in pounds per barrel of water required for a 15 centipoise mud. The concentration (C) in pounds per barrel (gallons per 350 milliliters) of water required for a 15 centipoise mud is substituted in the formula:

\[ \text{Yield} \text{ (as received) in bbl/ton} = \frac{74.7}{C} - 2 + \frac{1}{2} \times 1000 \]

The use of bentonite in drilling mud has declined since 1956 (Figure 13). Between 1956 and 1958, bentonite requirements dropped 29 per cent, with the average number of drilling rigs and the total footage of wells drilled during this same period dropping. Since 1956, the average number of drilling rigs and the total footage of wells drilled during this same period dropped by 42 per cent. Following this step, water is added, after which the batch is milled for an additional four minutes. The milled batch is discharged from the mixer and cores are immediately run through a cylindrical steel mold two inches in diameter. The proper weight of mix for each core is determined by trial to produce a core exactly two inches high when given three ramming strokes. Specimens are stripped from the mold after ramming and immediately tested for green compression strength. Successive tests are run until three closely agreeing results are obtained. For dry compression strength, the cores are oven-dried at 105-110°C for two hours and cooled to room temperature in a desiccator, after which they are tested in compression. Three closely agreeing results are averaged.

The uniformity of foundry sands depends upon the proper utilization of raw materials and the uniformity of the foundry clay which makes up the sand. Because of the importance of uniform sands, the foundrymen of today prefer the best quality of bentonite available.

Oil Well Cements
For use in well cements, physical and chemical tests are conducted on bentonite in accordance with procedures described in API Standard 18A. Specifically, call for the determination of bentonite in foundry applications. More recently, it has been discovered that the purity of foundry bentonite used in different areas possesses properties that are somewhat different.

Green and dry compressive strengths are the industry's standards for evaluating the bending power of bentonite and are the basic measurements used for determining the continued uniformity of bentonite shippments. It has also been suggested that the Manual Viscosity be measured to test the quality of bentonite to augment tests on sand properties. In general, the higher the quality of bentonite, the higher will be the viscosity for a given per cent solids. Although laboratory evaluation of raw material performance is not a guarantee against production problems, it is important to conduct routine quality control tests on raw materials as a step toward avoid­

Fire Retardant
The Forestry Service, U.S. Department of Agriculture, has been conducting studies for several years towards finding more effective materials for stopping forest fires. This objective is related to increasing the efficiency of fire-fighting apparatus. (Figure 14). The efficiency of bentonite in fighting forest fires appears to be related to its ability to hold large quantities of water on the vegetation in front of the fire line. Research on the project started in 1954, and the most widely used chemical for this purpose has been calcium soda borate. More recent work has shown that a bentonite slurry applied in the same way, by aerial tanker drops, is equally effective, if not more so, than the borate slurry and at a much lower material cost (Figure 15). The efficiency of bentonite in fighting forest fires appears to be related to its ability to hold large quantities of water on the vegetation in front of the fire line. Research on the project started in 1954, and the most widely used chemical for this purpose has been calcium soda borate. More recent work has shown that a bentonite slurry applied in the same way, by aerial tanker drops, is equally effective, if not more so, than the borate slurry and at a much lower material cost (Figure 15).
Uranium Concentration At Susquehanna-Western, Inc.*

By J. E. QUINN, '48

The purpose of this paper is to give a general idea of the mill operation and the effect that it has had on the area.

Location

The mill is located two miles west of Riverton, Wyoming. The mill is on the north side of the highway and is accessible by a main road.

General

The mill is operated on a 100 per cent custom basis. All ore is treated in the mill and a basis for blending is provided.

Crushing and Sampling

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THE AUTHOR

James E. Quinn, a 1948 mining engineering graduate of the Colorado School of Mines, is manager of the Western Division of Denver Equipment Co. In addition to sales responsibilities in the western part of the United States, Mr. Quinn is responsible for the development of new equipment and for the selection of equipment for custom mills.

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operators to maintain tight contact between the belt and the hopper walls, thus virtually eliminating sticking on the sides of the belt feeders.

The bottom surface of the conveyor is covered with perforated rubber plates to reduce the dust content of the belt feed. The conveyor is equipped with conveyor scales which automatically weigh the material "hanging up" in the bins.

The feeders discharge to belt conveyors equipped with conveyor scales which automatically weigh the tonnage being mixed. From the fine ore bins the ore is treated separately in either the acid or carbonate section of the plant.

**Acid Section**

**Grinding**—The 16" x 16" Denver Rod Mill is equipped with a 40 HP motor. The mill discharge flows to a 24" Single Classifier for trap removal. The classifier overflow containing 30 to 40 per cent +35 mesh is pumped at 450 to 500 tons per 24-hour day. It is only desirable to break up slime floes and prevent solution entrainment underflows for best CCD washing. The repulpers discharge to the respective thickeners. Underflow from the No. 4 thickener and the un-}

**Leaching**—In general a sand-alime separation is made in a 10" cyclone on the leach agitator slurry with the -150 mesh sands being washed and cyclone-underflow discarded. The 20" rubber-lined cyclones at 35 PSI inlet pressure and the -150 mesh sands washed COD in four 40" x 10" thickeners. This circuit is clearly illustrated on the flowsheet drawing. The overflow from the cyclones and thickeners underflows are combined to wash the sand and lime efficiently. Approximately 150 GPM of fresh water is added to the No. 4 cyclone and pump as wash water. Water addition is controlled by a flow-meter.

The 40" x 10" thickeners have rubber-covered shells and are provided with overflow and discharge spouts. The feeders and under inflows are stainless steel 316. Wood tanks are utilized with polyethylene tubing and sheets to protect the hoops and lugs.

Four 44 Duplex Model "B" Denver Adjustable Stroke Diaphragm pumps are used to meter the thickeners underflows. These units have rubber covered bowls, molded rubber diaphragms and valve seats and stainless steel 316 pumps. Each diaphragm pump is driven by a 10 HP repulper. Discharge lines to the respective thickeners contain 3"-6" x 316 and the tanks are PVC lined.

**Clarification**—Each stage of thickening. Total clarification on the No. 1 thickeners is 90 per cent. The No. 1 thickener contains 0.2 pounds per ton of head feed to maintain an EMF of 450 millivolts for proper extraction.

Concentration of the 60" propellers after six months operation indicates no wear to date. Concentration cells and 56 cells in general a sand-alime separation is made in a 10" cyclone on the leach agitator slurry with the -150 mesh sands being washed and cyclone-underflow discarded. The 20" rubber-lined cyclones at 35 PSI inlet pressure and the -150 mesh sands washed COD in four 40" x 10" thickeners. This circuit is clearly illustrated on the flowsheet drawing. The overflow from the cyclones and thickeners underflows are combined to wash the sand and lime efficiently. Approximately 150 GPM of fresh water is added to the No. 4 cyclone and pump as wash water. Water addition is controlled by a flow-meter.

The 40" x 10" thickeners have rubber-covered shells and are provided with overflow and discharge spouts. The feeders and under inflows are stainless steel 316. Wood tanks are utilized with polyethylene tubing and sheets to protect the hoops and lugs.

Four 44 Duplex Model "B" Denver Adjustable Stroke Diaphragm pumps are used to meter the thickeners underflows. These units have rubber covered bowls, molded rubber diaphragms and valve seats and stainless steel 316 pumps. Each diaphragm pump is driven by a 10 HP repulper. Discharge lines to the respective thickeners contain 3"-6" x 316 and the tanks are PVC lined.
through successive stages while the carbonate stripping solution, amounting to 10 GPM, is sulfuric acid counter-current to preceding stages. The square foot of settling area per gallon per minute of combined pregnant organic and carbonate flow is used. Steam is added to the first stage of stripping at a temperature 130 degrees F., which gives better phase separation in the settling area.

An adjustable height "jackleg" is used to automatically control the level of the acid aqueous and carbonate sections of the extraction and stripping settler tanks respectively.

Once a week the assayman analyzes the barren organic solution from the 12' x 12' stripping holding tank and determines how much Amine and Iso Decanol must be added to maintain the percentage ratio. This is added manually to the barren return solution before the holding tank.

The cross section of the settler from the No. 1 settler in the stripping circuit contains 12 to 15 grams SUO per liter and is pumped to the 12' x 12" storage holding tank. The pregnant solutions are then diluted with water.

Carboxate Plant
Grinding — The 1/2" crushed ore is fed to the 7' x 5' Denver Overflow Ball Mill at a rate of 250 to 300 tons per hour. The ball mill is operated in closed circuit with a 100' cyclone with 7 psi intake pressure.这座磨机的尺寸从2/5英寸的磨机到5英寸的磨机不等,也从250到300吨的磨机尺寸不等。

Thickening-Leaching — The ground product averaging 15 percent + 65 mesh is pumped to a 50' x 12' Denver Thickener for dewatering ahead of the Pachuca leach section. The overflow carbonate solution from the thickener is used in the mill to avoid dilution with water.

Thickener underflow is metered at 58 percent solids by a 4" adjustable stroke diaphragm pump to a centrifugal pump which delivers the slurry to the Pachuca leach section.

The carbonate section contains 15 1/2" diameter by 67' high Pachuca tanks with 60" conical bottoms. Fifty-four hours contact time is provided. The tanks are covered and insulated, but not pressurized. In design it was found to be less expensive to extend the cylindrical section to ground level for support and to install a false conical bottom within the cylindrical section. Access doors are cut into the cylindrical section instead.

The center air-lift pipes are jacketed and steam from the sulphuric acid production plant and boiler plant is used to maintain 100° temperature in pipes.

Compressed air is added to the center air-lift, plus two 10' x 10' tank sides of the tank bottom. Air is also added to the bottom of the one to maintain solids suspension. Additional air is provided in the conical section for assist in start-ups if necessary. Tank elevations are staggered for gravity flow between tanks. A Wyman monsoon feeding system is used when oxidizing is required for extraction.

Precipitation
The filtrate from the No. 1 filtration stage is sent to final tailings. The cross section of the settler contains 3 grams UO₃ per liter. It is pumped through the pregnant carbonate solution from the 12' x 12' clarified pregnant carbonate tank ahead of precipitation.

Addition of the pregnant carbonate solution and the filtrate from the No. 1 filtration stage solution containing 15 to 15 grams UO₃ per liter from the acid plant solvent extraction section to the No. 1 precipitation tank is completed by flocculators and the combined filtrate will average 4 grams UO₃ per liter and amount to 60 GPM.

The precipitation section consists of three 16' x 16' Denver Vertical Turbine Agitators operating in series and dilutions of raw make-up solutions to maintain 100° F. temperature of solution. Caustic is added to the No. 1 unit to 4 grams per liter excess and the uranium (yellow cake) pregnant slurry produced.

The uranium precipitate is pumped through one of two precoat filters and washed with fresh water. Barren filter and wash water are sent to the 12' x 12' holding tank ahead of the reprecipitation tower. The precipitate is taken as a 6' x 8' Agitator and pumped to the 54" diameter 6-hearth dryer where all moisture is evaporated. This is collected in a hydro-filter dust collector. Spray water for the dust collector comes from the 18' x 10' clarified pregnant liquor storage tank in the acid circuit and the sludge from the dust collector returns to the same tank.

The dried cake containing 78 percent UO₃ is crushed in a hammer mill to 1/16", packed in drums, sampled by augers, weighed and shipped to a uranium customer.

Carbonation Tower — The barren solution after precipitation contains 4 grams per liter of caustic (NaOH). If this solution containing NaOH were returned in the grinding circuit the presence of caustic would precipitate uranium in the grinding and leaching stages which of course would be undesirable. Therefore the caustic has to be changed in the carbonation tower to sodium carbonate.

The carbonation tower is approximately 7' square and 12' high. The barren solution is introduced at the bottom of the tower and flows downward. Waste CO₂ boiler flue gas is passed upward through the tower and contacts with the barren solution to change the caustic (NaOH) to sodium carbonate (Na₂CO₃). The Pachuca leaching section of the plant dissolves the uranium carbonate solution produces some caustic. Consequently, 10 to 15 grams per liter of sodium bicarbonate must be produced in the carbonation tower to balance the caustic which is produced with any caustic formed during uranium dissolution and convert it to sodium carbonate. The bicarbonate is added to the tower as an excess CO₂ through the solution in the carbonation tower.

Tailing
The cyclone underflow and thicker underflow from the No. 1 stage are combined with the No. 3 stage repurified filter cake in an 8' x 8' Denver Turbine Thickener. The tailing pond at 40 percent solids by a 5' x 5' Denver Turbine Thickener. The tailings pond is 500' from the plant, and consists of a man-made dam. No overflow results from the tailing pond at 40 percent solids by a 5" x 5" Denver Overflow Ball Mill at a rate of 250 GPM. Water pressure and high pressure water lines are available in the mill. A 125,000 gallon high water tower provides water for the automatic sprinkler system installed in the mill for fire protection. The top portion of the tank is used as a 25,000 gallon potable water storage tank for mill use.

Boilers — Compressors — Vacuum Pumps
Steam for the plant is furnished by two 150 HP, 125 psi horizontal fire-tube boilers.

Vacuum is supplied to the filter section by a 40 HP, 8' x 8' filters. The filter section is furnished by three 60 HP, 24" x 11" horizontal single cylinder engines with one unit serving as stand-by.

Compressed air is available from two 125 HP horizontal single stage water cooled compressors.

Laboratory
The main laboratory building is 34' x 14' of concrete block construction. It includes lab offices, balance room, fluorometer room and concentrate room. The latest analytical equipment is installed.

Warehouse — Machine Shop
A 40' x 50' warehouse and 40' x 70' machine shop were erected at the mill site for servicing the plant and hauling equipment.

Mill Building
The main mill building is 70' wide by 280' long. It is of fabricated steel, two stories high with concrete floor and siding. The concrete is reinforced with 4-ply built-up roofing. Six 36" diameter ventilators are installed in the roof. A 20' x 15' insulated mill office and mill lab is included.

The mill is designed so that the entire mill operation from the feeders to concentrate dryer can be seen from the office area. Adequate room is provided around the process.
equipment for servicing. All tanks and pumps are below the main operating floor level.

All electrical wiring is in five control centers strategically located throughout the mill. These control centers are enclosed, dust tight and ventilated without outside air.

**H₂SO₄ Production Plant**

As mentioned, the company owns and operates a continuous H₂SO₄ plant, which produces sulfuric acid for use in sour gas. The process consists of three units. A small unit is utilized in sour gas. The contact process is used. Waste steam is utilized in mill circuits. This plant, rated at 300 tons per day capacity, furnishes all tanks and pumps are rated at 300 tons per day capacity, and one is presently under construction for servicing. All tanks and pumps are rated at 300 tons per day capacity, and one is presently under construction for two added to their capacity, and one is presently under construction for one additional.

**Wyoming Mining Convention**

(Continued from page 20)

Another interesting use for bentonite is in the production of sulfuric acid. About 1947, it was discovered that certain organic materials would react with bentonite and that the resulting product had the property of swelling and disintegrating in organic liquids. This organic bentonite product has been used in several years under the trade name "Bentonite," and it is the basic ingredient for preparing growth regulators. Sulfur dioxide is formed in excess of 100,000 man hours without a single lost-time accident. This was judged the best-paying uranium mining-concentrating and milling plant projects in the state during 1959.


The company worked an average of 426 man shifts per day underground, producing 600,000 tons of ore, resulting in 455,000 tons of favors. In 1959, 80,000 tons of ore were produced. Approximately, all of which were successful. The average frequency rate of 1.76 and a severity rate of 484.

References

1. "Bentonite" by Hugh S. Spencer, 1924.
The growth in Wyoming's uranium production has been slow, attributable to any one area although the major increases in 1960 came from the Basin and Range Province and the Gas Hills Areas. However, Homestake Mining has added to the reserve picture from its property in Crook County. It is not known when this evaluation will be completed. Most of whose properties are now controlled by Gas Hills Uranium Co.

For example, United States Energy Resources in its Project Four South area has resulted in more than 500,000 tons of ore being shifted from the "inferred" to "indicated" category with an attendant increase in grade from .29 to .38 percent.

In the Shirley Basin, Utah Construction has developed 1,350,000 tons of indicated and inferred uranium containing 57 percent UO₂. Utah Construction has been awarded a production quota from the AEC to the Lucky Mc mill of 254,000 annual tons of UO₂ to April 1963 with an increase to permit delivery of 500,000 annual tons of UO₂ through 1966.

**Shirley Basin Production Quotas**

Production quotas in the 1962-66 period in Shirley Basin have been set by the Federal, now stripping the Clyde A pit, is mining a new one on the Spook creek, Converse County which will ship to the Riverton mill. Hidden Splendor has a successful open pit operation on the Mountain Mesa in the west Gas Hills, but has encounters difficulty mining a shaft on the Peach claims in south central Gas Hills.

The AEC is presently calculating purchase of additional amounts of ore in excess of $344,000. This valuation will top $10,000,000 in the 1960 assessment. Obviously, the actual investment is much greater. Another illustration of the rapid growth of the uranium industry is the tax picture. Uranium now rates second only to oil as a taxable resource in Wyoming. In 1959, in Fremont County, uranium had a taxable valuation of over $345,000,000 dollars and paid taxes in excess of $1,000,000. This valuation will top $10,000,000 in the 1960 assessment. Obviously, the actual investment is much greater.

Several new mines have been opened in the past year. In Crook County, Homestake is now the largest single producer for the Mines Development mill at Eradicator and some steep, steeply dipping workings in winter, ships heavily in summer. The mine is underground. BDM Industries and Vorn Mank are the leading producers in Converse County.

Bob Adams is opening a new mine on the Spook Creek, Converse County which will ship to the Riverton mill. Hidden Splendor has a successful open pit operation on the Mountain Mesa in the west Gas Hills, but has encountered difficulty mining a shaft on the Peach claims in south central Gas Hills.

Federal, now stripping the Clyde A pit, is mining an open cut pit, mining a new one on the Spook Creek, Converse County which will ship to the Riverton mill. Hidden Splendor has a successful open pit operation on the Mountain Mesa in the west Gas Hills, but has encountered difficulty mining a shaft on the Peach claims in south central Gas Hills.

Federals, now stripping the Clyde A pit, has mined from the Buse A, the Superlith, D, and the T claims, mining a new one on the Spook Creek, Converse County, and the East Gas Hills. In the present month, April 1960, Federal has mined 1,300,000 tons of ore from the Buse A, the Superlith, D, and the T claims. This operation has increased the open pit development. Western Nuclear has removed over 1,000,000,000 cubic yards of waste from Jan. 1, 1959 through March 31, 1960.


Large-scale production is possible from the open pit of the Gas Hills. Federal has mined as high as 250,000 tons per month from the 2856 area of the East Gas Hills. In this present month, April 1960, Federal, now stripping the Clyde A pit, has mined 1,300,000 tons of ore from the Buse A, the Superlith, D, and the T claims. This operation has increased the open pit development. Western Nuclear has removed over 1,000,000,000 cubic yards of waste from the Buse A, the Superlith, D, and the T claims since that time. Some ore still remains on John 2, but it has been set in the Gas Hills Uranium Co.

Market for these additional ores has not been determined. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. The ABC sets its policy on subst...
Old Timers Club Award to Mines Student

By E. H. JENKS

(The Editor's Note: Presentation of the Old Timers Club Award to Mines Student Bernard L. Boho took place April 24, 1960, at the Colorado School of Mines Experiment Station near Lead, Coo. Other facts about this event were published in the Campus Headlines Section of the June 1960 issue of The Mines Magazine only.)

11 is a pleasure for me to be here on this occasion, as I have never before been in this part of the country. I have heard a lot about the Colorado School of Mines from our mutual friend, Dr. L. E. Young, and am very glad to get some first hand information. All that I have found to date has been good.

I am particularly pleased that you have someone present here tonight, who you can from your experience in the senior class, because there is always a place for new talent. I am proud to have been a part of the coal mining industry, as I have been, ever since I was graduated from college. Of course, for the first six or eight years I was a minor cog, as I was acquiring that very necessary first hand information. All that I have found to date has been good.

I was acquiring that very necessary first hand information. All that I have found to date has been good. Old Timers Club Formed

I am here today as a representative of the Old Timers Club. This is made up of 30 coal mining men, equally divided between operators of coal mines and manufacturers of coal mining equipment. I can speak for the whole of the Old Timers Club. We have not lost faith in the future of coal. In fact, we have so much faith that we think it would be a good idea to have an Old Timers Club formed.

The Old Timers Club was originally organized at a Mining Congress Meeting in 1938 and was primarily for the idea of promoting worthwhile activities to foster interest in the coal industry. Later, the feeling developed that we should do something more than just talk about the coal industry, and that is why we have the Old Timers Club.

There were predictions that there would be a coal shortage after the strike last year, but due to good management by the railroad and coal companies, we have been able to keep the mines open and coal being transmitted long distances to the consumers.

Coal Pipeline Installed

In the past year, one coal pipeline has been installed which is shipping 135,000 tons of coal per month through a 10 inch pipeline 110 miles long. This pipeline is operated by Consol, with which I am associated. I was very much surprised one morning a short time ago to read in a Wheeling, W. Va., paper that more than 200 million tons of coal had been shipped by pipeline in less than two years, and this was supposed to be a quotation from Consol's annual report.

The error was that the paper omitted one word, as the annual report said that the pipeline had moved over 200 million tons of coal from Cadiz to Cleveland. As the pipeline is 110 miles long, the omission of the word "miles" made quite a difference, which shows that you can't always believe all you read in the papers. Even Will Rogers can be wrong, as we can't always believe all we read in the papers.

Coal Offers Opportunities

I have tried to show that the future of the coal industry is very well insured, and offers opportunities for engineers for a lifetime career. Coal is not as glamorous as oil or some of the metals, and there is little likelihood of being a millionaire the next, but for an insured career, I think it is attractive.

On several occasions, I have quoted a statement made by the President of your School, and even though you may have possibly read it or heard it, I think it is worth repeating.

"Careers in any field of mining engineering after interesting work, a good livelihood, and a worthwhile purpose were considered by many as an advancement of engineering knowledge and science in the coal mining industry. If you were told that the students in coal mining engineering with
The June issue is another of which we may be proud. In my opinion it is another in the continuing list of improved issues that we have printed since April 1960. The July issue will also be a good one. My only regret is that advertising is not doing as well as we had hoped, but it does continue to show some improvement. With additional advertising, the size of The MINES Magazine can be further increased, but we have many more fine articles than we can use with the restricted space available under current revenues.

Membership and Income

At present about 70 per cent of our graduates are active members of the Association. If we could increase that by another 500 members, we would have no further active members of the Association. If we could increase additional advertising, the size of The MINES Magazine will again those 500 additional members.

Field trips will be one of the most important events of the executive manager's desk. A. L. Bement, '54, Awarded UM Graduate Scholarship

The grants include a teaching position and are renewable for three years.

A metallurgical engineer in physical chemistry joined the Manhattan Laboratory, General Electric Co., part of the Hanford Operations. Mr. Bement has worked at Hanford since 1954.

Utah Mines Men Active

In AIMME Committees

Mr. Shipman, a 1950 graduate of Mines, intends to examine the core samples from the various mining projects and to ascertain what mining conditions may be anticipated five or 10 years from now as a result of the extensive road building plans started this summer.

The trip—combining maximum age of six children, hence in addition to business if they did so.

THE MINES MAGAZINE • JULY, 1960

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E. W. Distler, 80, geologist and manager of exploration for Cities Service Oil Co. (Del.)

Mr. Distler, who has been serving as vice president and manager of Cities-Cities Service Petroleum Corp. for the past three years, is also vice president of Cities Service Asphalt, Inc.

The new exploration manager joined Cities Service Oil Co. in 1940 as a member of one of its geophysical crews. After serving in several administrative positions in the company's seismic section, he was named marine geophysicist in 1949. In 1955 he was transferred to Canada as exploration division manager of Canada-Cities Service Co. Under his direction the company's exploration and development program in Canada was accelerated and broadened. He was recalled to Bartlesville, Okla., headquarters of Cities Service Oil Co., in 1954 as assistant chief geologist.

In 1957 Mr. Distler returned to Canada as vice president and manager of Cities-Cities Service Co. with headquarters in Calgary.

Alumni Assn. Supplies Clues To Missing of Family Relatives

The CSM Alumni Association was recently supplied with information about Larry Salsbury who went missing during his summer vacation. Larry Salsbury is a student at the Colorado School of Mines, and he was last seen in Grand Junction, Colo., on June 7 to visit friends in Fresno, Calif., before returning home in Grand Junction, Colo., on June 11. Larry is 17 years old, five feet eight inches tall, weighs 125 pounds, has brown hair and blue eyes, and is wearing a blue shirt and blue pants.

Larry's father, Donald E. Salsbury, a 1940 geological engineering graduate of the Colorado School of Mines, died during the summer vacation and was given his degree posthumously. Larry was about three years old at the time his father died. Larry's mother re-
Gier, '58, Completes Advanced Flight Training

Marine 2nd Lt. Donald E. Gier, a 1958 mining engineering graduate of the Colorado School of Mines, received his designation as a naval aviator from Rear Admiral Duerfeldt at the Naval Air Station, Pensacola, Fla., on Jan. 27. He completed a period of advanced flight training.

K. P. Rhea to Study on Fullbright Award

Dr. Kiersch, '42, Participates in Geologist Program

Dr. Boris S. Voukovitch, a 1951 geological engineering graduate of the Colorado School of Mines, has entered into private business as a partner in Lucas-Voukovitch Consulting Engineers. In his new position he will be engaged in the exploratory investigation and analysis of geological laws and economics relative to petroleum exploration in foreign countries. Mr. Voukovitch has had extensive experience in the petroleum industry.

An interview with Mr. Voukovitch Mr. Voukovitch was with Geophysical Services, Inc., Denver, Colo., where he was a senior geologist. In his duties as a photogeologist and a field geologist Mr. Voukovitch has acquired extensive experience in the western United States, Canada, Cuba, the Philippine Islands and Libya.

Morales, '45, Vice President Of Tennessee Argentine

Rodrigo Morales, a native of McAllen, Texas, is in his first year.

K. P. Rhea to Study on Fullbright Award

Keith P. Rhea, a Colorado School of Mines graduate student, has been awarded a United States Educational Foundation in the Arts Grant. The grant will enable him to complete his graduate work in geology and geophysics. He was a geological engineering graduate student at Mines.

LOY TIMERS AWARD

The program is sponsored by a grant to the National Science Foundation.

Dr. Kiersch visited the University of California, Los Angeles, and participated in a series of lectures on engineering geology for the students and faculty of the university.

The lecture was entitled "Engineering Geology," and a second lecture was given on "Engineering Geology—Scope, Research Needs, and Growing Sub-Fields of Application." The third lecture was entitled "Engineering Geology—Scope, Research Needs, and Growing Sub-Fields of Application." The fourth lecture was given on "Engineering Geology—Scope, Research Needs, and Growing Sub-Fields of Application." The fifth lecture was given on "Engineering Geology—Scope, Research Needs, and Growing Sub-Fields of Application." The sixth lecture was given on "Engineering Geology—Scope, Research Needs, and Growing Sub-Fields of Application." The seventh lecture was given on "Engineering Geology—Scope, Research Needs, and Growing Sub-Fields of Application." The eighth lecture was given on "Engineering Geology—Scope, Research Needs, and Growing Sub-Fields of Application." The ninth lecture was given on "Engineering Geology—Scope, Research Needs, and Growing Sub-Fields of Application." 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Alumni support of the CSM Foundation, Inc., has been referred to as "seed" money, the "key to additional support," and a necessary element in the development of voluntary financial support of the School of Mines. During the 1958-59 fiscal period, for instance, AADF contributions of $228,828.10 led to support from industry, foundations, and other sources of $241,634.96—a ratio of 10 dollars for one. Although fiscal year figures are not available for the current period, the ratio and amount will be approximately the same.

The importance of annual alumni support is well established, both for its own good and for what it leads to in additional contributions.

Of particular significance to the School of Mines this year has been a series of grants to Mines faculty members from the National Science Foundation, totaling $32,400.

Dr. Robert M. Hutchinson was awarded a grant of $15,500 for a geologic study of portions of the Pikes Peak Region. The project is an outgrowth of three years of research and study supported by the CSM Foundation, Inc. In a similar situation, research in the "Role of Stress Waves in Fracturing of Rock," by Dr. John S. Ricketts, was supported by a National Science Foundation grant of $32,400.

A new type of endeavor for the School of Mines, a six-weeks institute in chemistry and geology for top high school students from all sections of the country, is supported by a National Science Foundation grant of $32,400. In the new type of endeavor for the School of Mines, a six-weeks institute in chemistry and geology for top high school students from all sections of the country, is supported by a National Science Foundation grant of $32,400.

2. The tax savings for your heirs that are made possible by such a gift?

Have You Seen Your Lawyer About:

1. Remembering the Colorado School of Mines Foundation, Inc., in your will?

2. Tax savings for your heirs that are made possible by such a gift?

3. The opportunities available in trusts and testamentary gifts to the Foundation in your own estate plan?
Calgary Section
Pres.: R. P. Elston, Jr., 42
V. Pres.: R. J. Amick, 40
Sec-Treas.: D. S. Hetherington, 41
Calgary Section meetings are held the third Monday of each month in Calgary Petroleum Club; visiting alumni welcome.

Lima Section
Pres.: R. F. G. Dunlop, 24
V. Pres.: Martin Obradovic, 33
Sec-Treas.: T. E. Johnson, 52
Ankara Section
Pres.: Francisco Joaquin, 26
V. Pres.: Rolando Espino, 41
Sec-Treas.: Edgardo Villavicencio, 40
VENEZUELA
Caracas Section
Pres.: William A. Austin, Jr., 29
V. Pres.: G. V. Atkinson, 40
Sec-Treas.: E. D. Johnson, 50

PHILIPPINES
Baguio Section
Pres.: Francisco Inap, 24
V. Pres.: Claude Ferre, 41
Sec-Treas.: T. E. Johnson, 52
Manila Section
Pres.: Anselmo Claudia, Jr., 41
V. Pres.: Claude Ferre, 41
Sec-Treas.: T. E. Johnson, 52

VENEZUELA
THE MINES MAGAZINE • JULY, 1960
THE MINES MAGAZINE • JULY, 1960

Salt Lake City Section
Pres.: Frank Ingalls, 48, and Kenneth H. Matheson, Jr., 48, took advantage of the fact that Col. W. W. Foret was attending the Western Mining Convention to invite him to a meeting of the Salt Lake City Section.

Guests were Frank Filchock, head coach of the Denver Broncos, and Brownie Meltzer, '50, the "permanent" entertainment chairman.

The Denver Section held their regular June luncheon meeting at the Denver Press Club on June 21. Thirty-three MINERS were present to hear Dean Griffin, general manager, and Frank Filchock, head coach of the Denver Broncos, our new professional football team. Mr. Griffin discussed some of the problems involved in starting a new Pro football league and bringing together a team of which Denver may be proud. He also said that he could not foresee any shortage of competent players, for there are about 1000 college football players graduated annually who are or may be interested in playing Pro ball. Under the former arrangement, not more than 40 were taken by the National League and possibly 100 went to the Canadian League. That left more than 2500 good candidates for another Pro league.

Mr. Filchock discussed some of the individual players who have been signed, and some of the prospects who will make up the 80 men who will report to the training camp here at Mines. In addition to those men, there are about 30 local players who are interested in trying out for the Broncos. All will be assembled at Golden when training starts on July 9th. Members of the coaching staff at the training camp are interested in players with the facilities available in the new gym, the football and track fields. Both expressed the hope that the selection of the Mines as the site of their training camp may be the first step in a long and mutually beneficial association. The public is invited to attend all practice sessions.

A question and answer period carried the meeting until 1:30 p.m., evidence that football still holds the interest of all Alumni.

MINERS attending the luncheon meeting were:

Frank Bowman, 01; Harvey Mathews, 48; Oran Pack, 26; F. M. Irigoyen, 50, and some of the prospects who have been signed, and some of the prospects who will make up the 80 men who will report to the training camp here at Mines. In addition to those men, there are about 30 local players who are interested in trying out for the Broncos. All will be assembled at Golden when training starts on July 9th. Members of the coaching staff at the training camp are interested in players with the facilities available in the new gym, the football and track fields. Both expressed the hope that the selection of the Mines as the site of their training camp may be the first step in a long and mutually beneficial association. The public is invited to attend all practice sessions.

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and the attempts that are being made to solve them. President Ingalls called upon Colonel Fertig to discuss the problems facing the Alumni Association. 

**CLASS NOTES**

**Great Lakes Section** [Chicago] Charles Finch, '49, writes that about 300 people attended the Great Lakes Section cocktail party held at the home of Harvey Purser, '49, on Sunday, June 12. He claims that we were able to secure the COOG beer from Purser through Buck's. A good time was had by all, according to Ray Watson, '43, has certainly done an excellent job in making this thing go.

Those attending the June 12 picnic were:

Mr. and Mrs. Mark B. Sanford, '28; John and Helen Savoie, '43; Robert and Jean Kanji, '51; B. E. Gilbert and his wife; Mr. and Mrs. Earl Bean, '51; Robert Greenhill; Bill and Bev Savoie, Charles and Valerie Purser, '49; Bill and Vivian Purser, '49; George and Jenny Miller, '59; George and Karen Gersch, '51; Paul and Nancy Campbell, '58; and Marcia Kyriakides, '58; Paul and Carol Johnson, '58.

**New York Section** H. D. Thomson writes that the New York Section held its spring meeting on Thursday, June 9, at the Brass Rail Restaurant in New York. The meeting was strictly an informal get-together, but members managed to reflect in bringing Miners to the attention of the people of U.S.A.

**Four Corners Section** At the meeting on Saturday, June 11, Four Corners Section met at the home of Bob and Nel Meize, '52, in Farmington, N. M. A barbeque dinner was served, and the meeting was strictly an informal get-together, but members managed to reflect in bringing Miners to the attention of the people of Utah.

**The Alumni Section** 

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**The Alumni Section** 

**CLASS NOTES**
CAMPUS HEADLINES

Science Training Program
For High School Students
July 11-Aug. 20 at Mines

Trips to Martin Co., and USGS are also planned.

Science Department
Changes Curriculum

Some topics will be made in the geology curriculum for the fall semester 1960-61. The changes, which are part of an all-school curriculum review, are believed to be an improvement over the curriculum now in effect.

Some of the changes are as follows:

- 172 hours will be required for graduation.
- Physical Geology increases from 3 to 4 hours. Historical Geology increases from 3 to 4 hours. Physical Chemistry will be changed from the Junior year to the sophomore year, and will include work in X-ray, detrital mineralogy, and other phases of advanced mineralogy. All geology majors will be required to have common courses throughout, but there will be more elective change to accommodate a student's special interest.

CAMPUS HEADLINES

Mines Training

Robert Armstrong-EHS-950 is an inert automatic welding flux designed specially for arc welding in Bulletin No. 12, Shell Oil Co., 145 S. 30th St., Chicago 6, Ill.

In addition to assuring peak operating efficiency by thoroughly shaking the filters, each time the dust collector is used, the self-cleaning devices eliminate waste loss and the possibility of a workman forgetting to manually shake the filters when using this flux. Automatic EHS-950 is available in 10 pound bags, or in a three, plastic-lined drum at extra cost. For more complete information, write Robert Bros., Coyo, Ohio.

Hydropress

Electric Drive Vehicles

Mines

Automatic Welding Flux

Filter Shaker

Magnets

Dr. J. L. HALL

Sponsored by the National Science Foundation, the Science Training Program for secondary school students is being held July 11-Aug. 20 at the Colorado School of Mines.

Dr. James L. Hall, director of the Science Training Program, is a former professor of geology for Colorado School of Mines and is a past president of the American Chemical Society; Dr. Arthur W. Davidson, internationally known chemist and professor of chemistry, University of Kansas; Prof. Harold P. Watson, University of Colorado, who is known for his work in uranium geochemistry and Harold Bloom of the CSM Foundation, a Summer Science Training Program for High School Students.

Colorado School of Mines

The Denver Broncos, our first Pro Football Team in this area, will begin their training period at MINES on July 9, 1960. Everyone is invited to watch the practice sessions, for Coach Flachholz said:

"We plan to start knocking heads on the first day. With a new team and new candidates for tryouts, number one, we feel those already signed must necessary to begin eliminations at once. With a new team in a new league, we will need all the time we have to turn out the Broncos as a team of which you may be proud, and which you will support."

Remember, practice begins on July 9. Come out and watch the Broncos at Brooks Field.

James G. Robinson, appointed director of the Colorado School of Mines.

The Orediggers will play five road games and four contests at home. The team will be included in a Gold Mountain Conference schedule. Last year's Mines team, Mines is being held only four of the RMG school.

The 1960 Mines football schedule:

Sept. 3—Mines at New Mexico Highlands (night)
Oct. 2—Mines at Onahs (night)
Oct. 9—Mines at Olds College (night—RMC)
Nov. 12—Panhandle A&M at Mines
Nov. 19—Adams State at Mines

Baldwin-Lima-Hamilton's Industrial Division has supplied two fully automatic welding flux systems for heavy steel pipe in a leading Midwest refinery. These systems have been in operation for over a year.

The machine measures the length and weight of the pipe, and will include scrapers, bottom and rear dumper, and collected tracts for dressing and loading. The electric drive, including generators, controls, and motors, will be engineered and manufactured by Electro Trucks Inc., 28th St., Milwaukee 46, Wis.

A new line of railroad vehicles has been turned on and off again. According to Electro officials, the new line of electric drive to railroad equipment is weatherproof, rustproof, and capable of meeting the most severe conditions of service in the most severe conditions of service in the most severe conditions of service in the most severe conditions of service in the most severe conditions of service in the most severe conditions of service.

The new line is primarily designed for railroad officials, the new line of electric drive to railroad equipment is weatherproof, rustproof, and capable of meeting the most severe conditions of service in the most severe conditions of service in the most severe conditions of service in the most severe conditions of service in the most severe conditions of service in the most severe conditions of service.

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Letters to the Editor

LESTER S. GRANT, '79, of Colorado Springs, Colo., writes:

"It is now some days since the big envelope with the Certificate of Honorary Membership in the Alumni Association of the Colorado School of Mines was received by me, and I have intended every day to write and thank you for it, but, it seems, too much has happened.

The Certificate of Honorary Membership is beautifully done and contains many and sundry papers and other graphic relics of my younger days as one of the main jobs that is yet to be done, when my wife became sick, and during her illness I have been unable to find the time to do the work. Just a few words on the subject of the Certificate and the greater number of whom I have been unable to find the time to do the work, which includes the re-editing of some 1000 colored slides and other photographic relics of my younger days as one of the main jobs that is yet to be done, when my wife became sick, and during her illness I have been unable to find the time to do the work.

It was almost equally pleasing to find that the signatures of the members of the Colorado School of Mines, so many of whom were my students, and some of whom I have not seen at Alumni Meetings, I thank you for your part in this and I hope your re-editing of the Alumni Association."

(Editors' Note. This letter will be submitted to the next Alumni Dinner and to the next regular meeting of the Alumni Association.)

NATHAN J. HOFFMAN, '51, writes:

"I am still a research engineer, metallurgy, for Buckeye, but I am going on an educational leave of absence for about 14 months to study metallurgy at the Graduate School of Technology, Metal, Iowa. I am leaving for Israel about the 10th of June.

Your or rather our Magazine has always been a most welcome feature in my office, but now it is shaping up to a fine technical magazine with the addition of a great deal more to the old MINES football cheer. 'Boom, yeaa whole damn MINES Magazine!'"

(Editors' Note. Thanks, Nath, for your kind words. We will try to continue to serve you."

DOUGLAS E. BROWN, '71, chief mining engineer, from Mining Department, Inland Steel Co., says: "Well, you have always MINES Magazine still!"

(Editors' Note. Thanks, Nath, for your kind words."

APRIL 17, 1959,

A. F. PEREZ SARPE may be addressed as Francisco R. Gamboa, M. D., 103 and Kamea Ave., Kansas City, Mo.

JOSEPH W. REESE may be addressed as 2500 W. 16th Ave., Colorado Springs, Colo.

HERON ENGINEERING CO.

SP. 7-4997

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"Again thanking you and all concerned and hoping that I will be able to present the Alumni Association company in person at the next Alumni Dinner, and with kind regards and best wishes to yourself and all working with the Alumni Association."

(Editors' Note. This letter will be submitted to the next Alumni Dinner and to the next regular meeting of the Alumni Association.)

Our company is certain that the graduating class of the Colorado School of Mines will maintain the school's reputation for fine engineering training. Congratulations!

CLIMAX MOLYBDENUM COMPANY

A Division of American Metal Climax, Inc.

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CLIMAX MOLYBDENUM COMPANY"
LOW COST PUMPING through

• Maintained High Efficiency
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• Individual Engineering on Every Application

Write, wire or phone for complete details.

Lower pumping costs plus increased output make Wilfley Sand Pumps the No. 1 choice of economy-minded plant operators.

If you require belt-driven, overhead V-belt driven, or direct driven pumps, Wilfley has them — available in 1", 1½", 2", 2½", 3", 4", 5", 6", 8" and 10" discharge sizes. They may be fitted with interchangeable electric furnace alloy iron, special application alloys or rubber-covered wear parts.

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