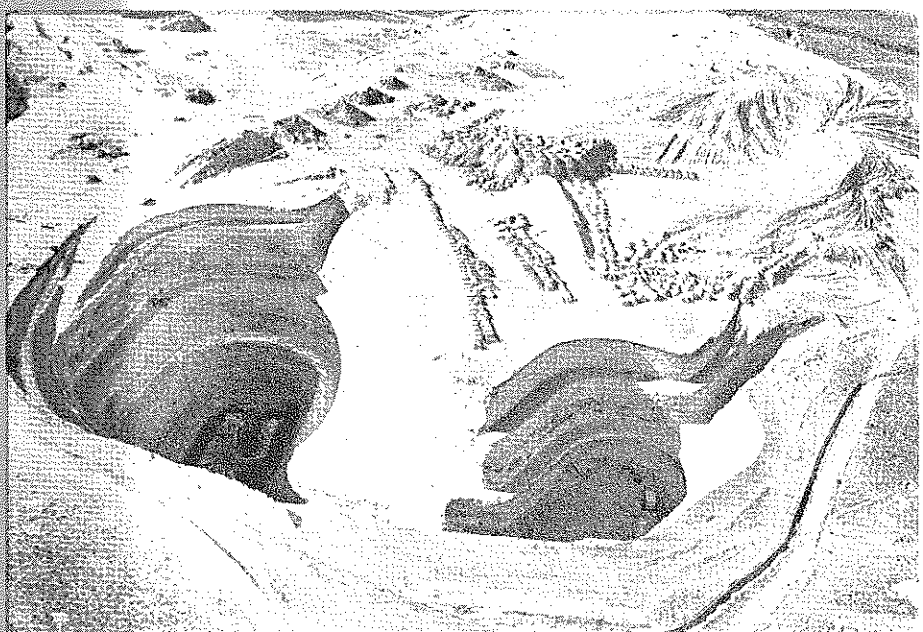
THE MINES MAGAZINE

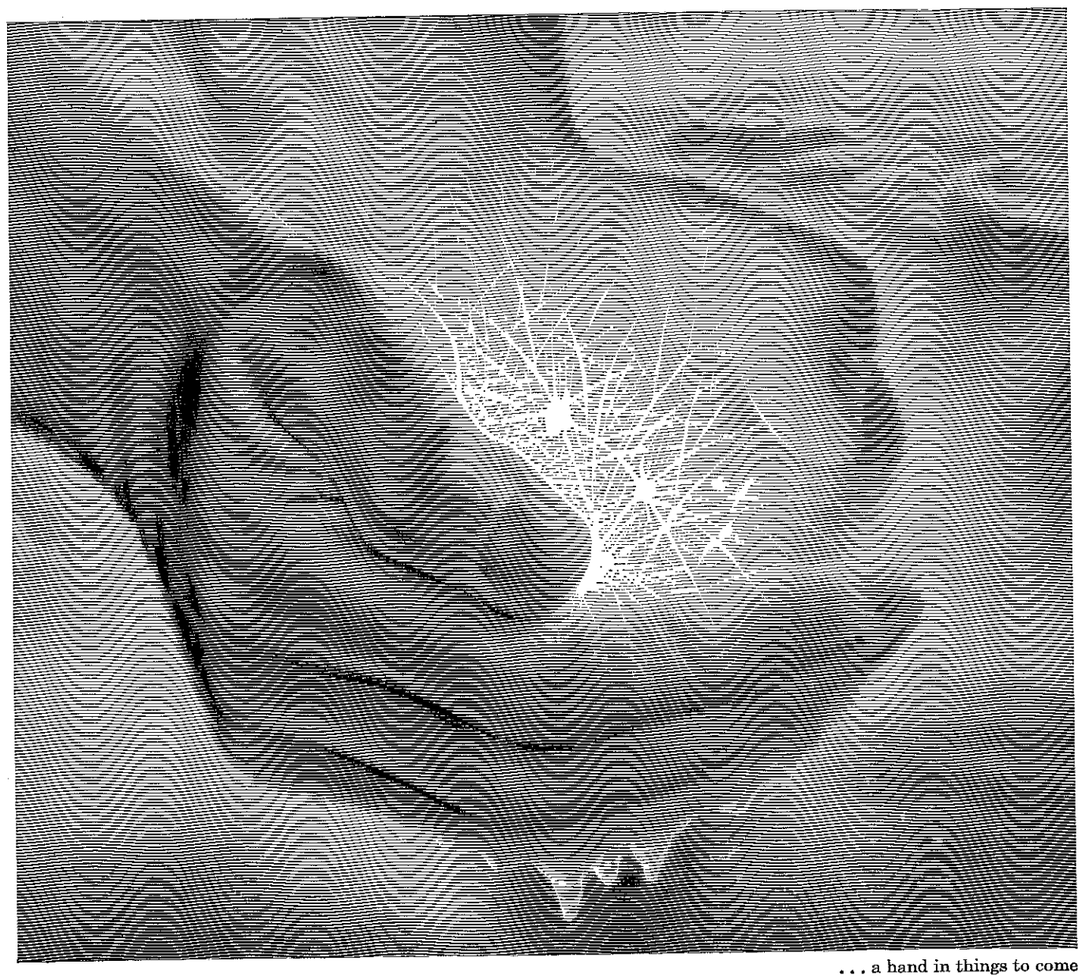
JULY 1960

PRICE $1.50

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





. . . a hand in things to come

Creating a strange world of cold

The coldest natural temperature ever recorded—100 degrees below zero—occurred in the Antarctic. But the people of Union Carbide are producing temperatures all the way down to minus 450 degrees . . . approaching absolute zero!

Startling things are being done at this unearthly cold temperature. Many types of living tissue are being preserved, and research is now well under way in freezing whole blood. Certain metals become perfect conductors of electricity—a rare quality which may bring greater efficiency to electronic equipment. And, for over fifty years, Union Carbide has used these ultra-low temperatures to turn air into liquid . . . then extract oxygen, argon, nitrogen and other atmospheric gases in their pure form. They are produced on a mammoth scale to meet the great demand from industry.

Working with such extreme cold is still a young science known as cryogenics. It is only one of many areas in which the people of Union Carbide are striving to make tomorrow a better world.

Learn about the exciting work going on now in gases, carbons, chemicals, metals, plastics, and nuclear energy. Write for "Products and Processes" Booklet K, Union Carbide Corporation, 30 East 42nd St., New York 17, N.Y. In Canada, Union Carbide Canada Limited, Toronto.

UNION CARBIDE

. . . a hand in things to come

CLASS NOTES

1882-1930

AUGUST H. CHATIN, '16, picks up his mail at P.O. Box 586, Walsenburg, Colo.

NEIL E. JOHANSON, '22, has moved from Golden, Colo., to 1693 Reed St., Apt. 2, Denver 15, Colo.

WU HEN YU, '22, may be addressed c/o Hsinchu Coal Mining Co., Hsinchu, Taiwan (Formosa).

NORMAN E. SEARS, '24, lives at 244 Jefferson, Twin Falls, Idaho.

FRANCIS X. CORBETT, x-'26, may be addressed at 1080 Sherman, Denver 3, Colo.

R. B. MAHAN, x-'29, has moved from Nelson, B. C., to Hixon, British Columbia, Canada.

WILLIAM E. WALLIS, '30, and family have moved from Stamford Conn., to Turtleback Rd., New Canaan, Conn.

1931-'40

LT. COL. ALLAN P. NESBITT, '38, formerly stationed in Tehran, Iran, receives mail at San Francisco Field Office, EIG, 700 Montgomery St. Bldg., Washington & Montgomery Sts., San Francisco 11, Calif.

RICHARD V. SAUSA, '39, is living at 438 Youngfield Dr., Youngstown, N. Y.

LAWRENCE H. BELL, JR., '40, lives at 37 W. Thomas, Phoenix, Ariz.

1941-'45

EVERETT L. CAMPBELL, '43, is resident manager of Namco International, Inc., with mailing address Box 677, Tripoli, Libya.

RICHARD LEE SCOTT, '42, lives at 1810 S. St. Paul, Denver 10, Colo.

LUIS G. MORALES, '45, is exploration manager for Tennessee Argentina, S. A. His address is 11 Arthur Araripe Gavea, Buenos Aires, Argentina, S. A.

GEORGE S. SMITH, '45, lives at 3508 NW 25, Oklahoma City 7, Okla.

1946-'50

T. J. BARBOUR, '47, is sales engineer for C. W. Dean & Associates. His mailing address is 1270 W. Perkins Rd., Memphis 17, Tenn.

ZOILO TOLENTINO, JR., '47, is living at 276 S. Sherman St., Denver 9, Colo.

WILLIAM G. CUTLER, '48, has moved from Salt Lake City, Utah, to 3218 Donegal Rd., El Paso, Texas.

CURTIS L. HORN, '48, has changed his address from Bellaire, Texas, to 12206 Pebble Brook Dr., Houston 24, Texas.

COL. WILMOT R. McCUTCHEN, '48, U. S. Army officer in the Corps of Engineers, has been transferred from Carlisle Barracks, Pa., to Alexandria, Va., where his address is 2422 Taylor Ave.

ROBERT M. FROST, '48, is living at 2220 Shawnee Rd., Lima, Ohio.

ALAN L. STEDMAN, '48, has moved from Arvada, Colo., to 1007 W. 21st St., Cheyenne, Wyo.

EDWIN T. WOOD, '48, has left Moab, Utah, for 1657 Millbrook Rd., Salt Lake City, Utah.

MANUEL DE B. DIAS, '50, receives mail at P.O. Box 47, Quelimane, Mocambique, Portuguese East Africa.

CLIFFORD M. CHAPPELL, '49, unit head, Martin Co., lives at 3603 S. Hudson, Denver 22, Colo.

GLENN DIAL, JR., '49, receives mail at P.O. Box 7674, Lakewood 15, Colo.

RAYMOND B. FRANKLIN, '49, is assistant division geologist for Texaco with mailing address P.O. Box 252, New Orleans, La.

HARRY D. HALL, '49, lives at 12 Johnson Pl., Elliot Lake, Ontario, Canada.

DAVID C. JONES, '49, has moved from Denver, Colo., to 2332 Ash St., Billings, Mont.

ROGER D. JUDSON, '49, is staff geophysicist for Chevron Oil Co. with mailing address P.O. Box 22227, Houston 27, Texas.

ROBERT C. McCAIN, '49, geologist for Petrobras, lives at Caixa Postal 585, Salvador, Bahia, Brasil.

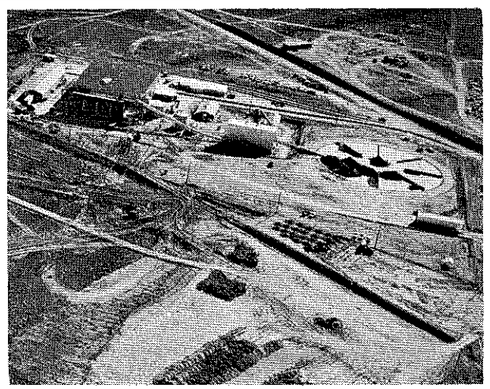
THOMAS A. ALLAN, '50, owner of Allan Pump & Supply Co., has moved his business address to 1721 Lincoln St., Great Bend, Kans.

JOHN H. CHURCH, '50, geologist for El Paso Natural Gas Co., lives at 5212 Danny Dr., El Paso, Texas.

HERBERT D. CRONIN, '50, is manager of fabrication for National Research Corp., Cambridge, Mass. He lives at 285 Wilson Rd., Nahant, Mass.

C. M. McDANIELS, '50, is living at 133 Wyoming Ave., Billings, Mont.

F. T. QUIETT, '50, is living at 1362 Harol St., El Cajon, Calif.



Federal-Gas Hills Partners uranium mill

MINING AND THE FUTURE

Because man must look to natural resources for basic progress, the mining industry has an unlimited future for expansion and an unlimited opportunity for individuals seeking a satisfying career.

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RIVERTON, WYOMING

BROOK D. TARBEL, '50, is engineer, evaluation, property acquisition and secondary recovery, Helmerich & Payne, Inc., with mailing address 600 First National Bldg., Tulsa 3, Okla.

1951

LARRY E. O'BRIAN's new address is 449 Cy Ave., Casper, Wyo.

PAUL A. HEAD lives at 2351 N. Hampton, Tucson, Ariz.

R. B. OWEN has moved from Corpus Christi to 2012 W. Harvey, McAllen, Texas.

EVERETT M. PATTERSON, general foreman for Inland Steel Co., lives at 1604 Lake St., Whiting, Ind.

WILLIAM A. PRESTRIDGE is consulting engineer with address 418 Mims Bldg., Abilene, Texas.

LT. COL. JOHN E. VEATCH may be addressed c/o Clarkson College of Technology, Potsdam, N. Y.

1952

H. E. BLACKBURN, JR., receives mail at Rte. 2, Box 2Y3, Las Animas, Colo.

CARL E. BOCHOW, process engineer for Howe-Baker Engineers, lives at 313 W. Fourth St., Tyler, Texas.

CHARLES J. CURTIS has moved from Arlington, Va., to 701 Sideburn Rd., Fairfax, Va.

JACK D. CUTTER, petroleum engineer for Pan American Petroleum Corp., may be addressed P.O. Box 873, Midwest, Wyo.

KARL KNUTSON's address is 40 Oswald Ave., Pittsfield, Mass.

WALTER J. LOCHMANN, metallurgical engineer for Shell Oil Co., lives at 476 Hamilton Blvd., Wood River, Ill.

GEORGE E. TARBOX, 6006 Vernon Ave., Lubbock, Texas, sent in the addresses of three miners whom we were carrying under "Address Unknown." Data cards were mailed to Robert H. Dunwoody, '49; Paul M. Bollheimer, '51, and John J. Freeburg, '52, and we hope to have their full addresses by the time the 1960 Directory goes to press.

ROBERT G. WILSON, 2606 E. Poplar, Victoria, Texas, is working for Union Carbide Chemicals Co. as an instrument engineer at the Seadrift plant in Port Lavaca, Texas.

FORREST S. WOODSIDE, JR., geologist for Sunray Mid-Continent Oil Co., has moved from Wheat Ridge, Colo., to 1050 N. Yale Ave., Wichita 8, Kans.

1953

BERNARD F. BURFORD, geologist, has moved from San Antonio to 1037 Harrison, Corpus Christi, Texas.

JOHN G. UNDERWOOD is laboratory metallurgist for Algoma Steel Corp., Ltd., with mailing address 170 Palace Dr., Sault Ste. Marie, Ontario, Canada.

1954

JOHN C. CAPSHAW, petroleum engineer for John W. Mecom, lives at 429 Hawthorne, No. 6, Houston 6, Texas.

DR. F. K. KABBANI is assistant director for mineral affairs, Saudi Arabian government. His address is Airport-Palace Rd., Jidda, Saudi Arabia.

JAMES H. NIENABER, formerly with American Overseas Petroleum in Ankara, Turkey, advises that his new address is 4104 Ranier Ct., Ft. Worth, Texas.

NEWELL H. ORR, JR., has moved from Pittsburgh to R. D. No. 2, Wexford, Pa.

S. W. TOWLE has moved from Tucson to Douglas, Ariz., where his P.O. Box is 376.

1955

RICHARD J. KEHRWALD's new address is 1804 Amhurst, Casper, Wyo.

JOHN P. McKENZIE, JR., technical sales representative, Chicago District, Shell Chemical Co., lives at 212 S. Central Ave., Clayton 5, Mo.

DAVID H. McMURRIN, petroleum engineer for Sinclair Venezuelan Oil Co., may be addressed c/o Sinclair Venezuelan Oil Co., Apartado 1706, Caracas, Venezuela.

CHESTER NORSTROM's address is 920 S. 555 W, Cedar City, Utah.

ROBERT E. SMITH, county engineer for Los Angeles County, lives at 7458 Cleon, Sun Valley, Calif.

1956

K. WILLIAM JEFFERS has moved from Norfolk, Va., to 2504 N. Kenilworth, Arlington 7, Va.

CHARLES A. KOHLHAAS, formerly of Hobbs, N. M., lives at 2442 Lark Dr., Apt. 8, Colorado Springs, Colo.

RONALD L. LEWIS has moved from Electra, Texas, to 2836 Newsom Circle, Wichita Falls, Texas.

MAJOR W. SEERY, 260 W. 1200 North, Bountiful, Utah, is senior accountant for Kennecott Copper Corp.

1957

MICHAEL E. CARR is now receiving mail at P.O. Box 5667, Eldorado, Texas. He was living in Odessa, Texas.

(Continued on page 8)

NEWS OF THE MINERAL INDUSTRIES

Geochemical Research Laboratory Established

The CSM Geology Department has received approval and funds for the establishment of a Geochemical Research Laboratory. The laboratory is being set up by the school as a cooperative effort between the Geology and Chemistry Departments and will be located in the Chemistry Building. Organization of the laboratory is under the direction of Dr. M. A. Klugman.

Initial investigations will involve preliminary work on sulfides and on trace element dispersion around ore bodies. A joint project with Dr. Ray Bisque of the Chemistry Department will investigate the calcium-magnesium ratio variation away from mineralization in carbonate rocks.

In addition to both basic and applied research, the laboratory is expected to become an important part of the Geology Department's graduate program. Graduate students will have the opportunity to utilize the laboratory facilities in research and thesis work related to ore deposition.

Wyoming Mineral Production $395.3 Million in 1959

Mineral production in Wyoming was valued at $395.3 million in 1959, a 7 per cent increase over 1958, according to the Bureau of Mines, United States Department of the Interior. Although all three mineral groups—fuels, nonmetals, and metals—contributed to this growth, mineral fuels continued to supply the bulk of the value.

No beryl, copper, feldspar, or gold were reported produced in 1959, and small decreases in output were recorded for cement, iron ore, and natural gas. However, the loss in income from the lack of, or decrease in, output of these commodities amounted to only $2.3 million. The continued gain in output of petroleum was one of the more important contributing factors to the increased value of output in Wyoming because this commodity accounted for 81 per cent of the total value in 1959. No Office of Minerals Exploration (OME) contracts were written during the year.

Geochemical Prospecting Courses Being Taught

University professors who have introduced academic courses on geochemical prospecting include Dr. H. E. Hawkes of the University of California, Harold Bloom of the Colorado School of Mines, Leo Mark Anthony of the University of Alaska, and Dr. Morris F. Stubbs of New Mexico Institute of Mining and Technology.

Each of these courses can trace its origin back to Dr. T. S. Lovering's Geochemical Exploration Branch of the USGS at Denver Federal Center where a short course in geochemical prospecting is open to the public for about two weeks each year.

Mr. Bloom and Dr. Hawkes give academic credit for their courses which consist of lectures of straight geochemistry using textbooks such as Mason's and Rankama and Sahama's, and laboratory periods using geochemical prospecting techniques.

John D. Sargent of Casper, Wyo., recently taught an eight-weeks' course on Geochemical Prospecting at Casper College.

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FRONT COVER—

Picture of the Rim Pit on claims operated by Western Uranium Corp. in East Gas Hills, Wyo. (Photo courtesy Riverton Ranger)

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CLASS NOTES

(Continued from page 4)

GUIDO DEL CASTILLO, x-'57, is with Cerro de Pasco in Peru, S. A.

ROBERT R. STODDARD, JR., geologist for Standard Oil Co. of Calif., lives at 112 W. Jeffrey, Apt. G, Bakersfield, Calif.

GORDON P. TAYLOR, 290 M St., Salt Lake City 3, Utah, is mining engineer in training with U. S. Smelting, Refining & Mining Co.

CHARLES R. WOOD, now living at 161 N. Clinton St., Doylestown, Pa., is hydraulic engineer, Ground Water Branch, USGS, 100 N. Cameron, St. Harrisburg, Pa.

1958

WILLIAM C. BAGBY has moved from Cambridge, Mass., to 3642 Locke Lane, Houston 27, Texas.

DONALD A. BEATTIE, geologist for Colombian Petroleum Co., lives at Apartado Aereo 3434, Bogota, Colombia, S. A.

IAN ACHONG BOISSELLE, exploitation engineer, Cia Shell de Venezuela, lives at Apartado 19, Maracaibo, Venezuela.

J. RANDALL BURKE's address until Sept. 22 will be 5201 Wharton Dr., Ft. Worth 15, Texas.

WHITLOCK JONES is civil engineering assistant for San Luis Obispo County Flood Control and Water Conservation District. He lives at 2428 J. St., Santa Margarita, Calif.

BOBBY G. KERR, senior computer for Chevron Oil Co., may be addressed c/o Chevron Oil Co., P.O. Box 388, Anaheim, Calif.

GREGORY C. MEYER has moved from Brigham City, Utah, to 8715 W. 38th Ave., Wheat Ridge, Colo. He is propulsion engineer for the Martin Co.

NORMAN S. SMITH, engineer for Kennecott Copper Corp., lives at 456 East 1st South, Salt Lake City 1, Utah.

GERALD E. VAN SICKLE has just recently reported to th- USS St. Paul for duty in the Engineering Department, most likely as prospective repair division officer. His last duty station was at Long Beach Naval Shipyard where he was a ship superintendent for 16 months. His address is LT. JG G. E. Van Sickle, USNR, USS St. Paul (CA-73), c/o Fleet Post Office, San Francisco, Calif.

CHARLES J. WIDEMAN lives at 3520 E. Hampton, Tucson, Ariz.

OLIN D. WHITESCARVER has moved from Ft. Worth to Midland, Texas, where he may be addressed c/o Pure Oil Co., Box 671.

1959

MAURICE A. CHAFFEE 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 84th Engineer Battalion at Ft. Ord, Calif. His permanent address is 131 Fifth St., N. W., Pulaski, Va.

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

JOHN M. FROST is in the army with mailing address: Pvt. J. M. Frost, 18580699, Det. A, Stu. Bn., USAINTC (Field), Ft. Holabird, Baltimore 19, Md.

CHARLES J. GUNTNER, assistant chief metallurgist with the Bureau of Standards, Boulder, Colo., lives at 819 2nd St., Golden, Colo.

C. HOWARD HAMILTON, 13003 Elmcroft, Norwalk, Calif., is research metallurgist, Missile Division, North American Aviation, Downey, Calif.

DAVID R. HIATT, trainee with Columbia Geneva Steel, lives at 2495 W. Center, Provo, Utah.

FRANK D. HOTTER has moved from Durango, Colo., to 5301 E. 33rd Ave., Denver, Colo.

PHIL HOWELL has moved from Marfa, Texas, to 223 W. 5th, Irving, Texas.

FRED A. KUMPF has left Odessa, Texas for 208 N. Turmer, Dumas, Texas.

ROBERT A. LAME has moved from West Covina, Calif., to Lamar, Colo., where his P.O. Box number is 523.

JOHN M. LANGSKOV's address is c/o U. S. Bureau of Agriculture, Shoshone National Forest, Cody, Wyo.

GEORGE A. LAWRENCE is engineer trainee for the Dorr-Oliver Co., Ltd., Bombay 1, India. His mailing address is c/o Dorr-Oliver Inc., Westport, Connecticut.

DONALD E. MICHELS has moved from Englewood, Colo., to 17250 W. Colfax, Golden, Colo.

WALTER L. PERRYMAN, JR., is engineer, Medicine Bow National Forest, Forest Service, U. S. Department of Agriculture. His address is 719 Curtis, Laramie, Wyo.

JERRY D. RICHARDS is junior engineer for Sunray Mid-Continent Oil Co. of Tulsa, Okla. His address is 24816 Newhall Ave., Apt. C, Newhall, Calif.

EBERHARD G. ROTHER, assistant mine engineer for Cerro de Pasco Corp., may be addressed c/o Cerro de Pasco Corp., Cerro de Pasco, Peru.

(Continued on page 56)

MINERAL INDUSTRIES

(Continued from page 5)

Beryl Use Rises; Production Drops

Domestic consumption of beryl in 1959 was the greatest recorded, but domestic production was the smallest since 1948, according to the U. S. Bureau of Mines.

Final figures for hand-sorted beryl, in short tons, were: Consumption, 8172 tons; domestic mine production, 328 tons; imports, 8038 tons; world production, 7300 tons (lowest since 1951); and end-of-year consumer stocks, 3871 tons. The price of domestically produced beryl was $520 a ton and imported beryl was $292 a ton at foreign ports of exportation.

The General Services Administration bought domestically produced hand-sorted beryl for the government through its program for encouraging domestic production of beryl; the cumulative total rose to 2487 tons since the program began in 1952.

Uranium Pioneers Receive Achievement Awards

Industrial achievement awards were presented Feb. 26 by the Riverton, Wyo., Chamber of Commerce to the following persons and companies for their contribution to the industrial growth of the Wind River Basin:

1. Neil McNiece and Lucky Mc Uranium Co., for discovery of uranium in September, 1953 and for continued expansion in the uranium industry.

2. Pan-American Petroleum Corp. for development of new techniques in water flooding to increase oil production in the Beaver Creek and Winkleman Dome oil fields and erection of a $2½ million gas processing plant at Beaver Creek.

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

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

5. Vitro Minerals Corp. for contributions in developing early techniques of uranium exploration in the Gas Hills and for six continuous years of uranium mining, which have seen Vitro 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 mills.

U. S. Steel Develops Iron Ore Project Near Lander, Wyo.

U. S. Steel's Columbia-Geneva Steel Division has begun construction of an iron ore mining and beneficiation facility in Fremont County, Wyo., some 26 miles south of Lander. After completion in late 1962, the extensive ore mining, concentrating and pelletizing operations will supply pelletized iron ore to Columbia-Geneva Steel's integrated steel plant at Geneva Works, near Provo, Utah. The ore will supplement Geneva's present source of iron ore from mines near Cedar City, Utah, 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 Mountains. 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—not far from Atlantic City and South Pass City, now typical Rocky Mountain ghost towns.

Besides open pit mining operations, major units slated for construction include crushing and screening facilities, an ore concentrating plant, a pelletizing plant, an extensive water storage and handling system, and loading and shipping facilities. General and mine office buildings, maintenance shops, warehouse, and testing laboratory will also be built, as well as a dispensary, fire and ambulance station.

After operations begin, conventional open pit methods will be used to mine the ore which contains about 30 per cent iron. Next, the ore will be crushed, then conveyed to the concentrating plant where it will be magnetically concentrated to more than 60 per cent iron.

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

1959 Petroleum Issue

The November 1959 Petroleum issue is still available, altho in short supply. This issue was devoted to "Natural Gas Business in the United States." In addition to coverage of this important theme, the magazine contains a separate map showing the Major Natural Gas Pipelines and Sources. Map is in three colors and reflects elevations. This map in itself is worth the price of the Magazine—Price $3, The MINES Magazine, Golden, Colo.

TECHNICAL SOCIETIES and ASSOCIATIONS

Meet Competition Head-On U. S. Steel President Advises

Leslie B. Worthington, president of United States Steel, has called upon the steel industry to hit competition from all areas head-on, application by application, customer by customer.

Moreover, he pointed out that rising standards of living in other countries, like those experienced by this country in the past century, will provide a "tremendous" steel demand for manufactured goods and construction.

Speaking before the annual meeting of the American Iron and Steel Institute in New York on May 26, Mr. Worthington said he anticipated "new kinds" of selling technique in meeting the challenge of competition.

Mr. Worthington, in outlining the direction the steel companies should take stated, "First, member companies must organize—sometimes reorganize—to do this job."

He emphasized that "Steel companies should establish and maintain contact with customers beyond the purchasing agents —with design groups . . . engineering departments . . . research organizations . . . even with the styling studios . . .—in fact everyone who has something to do with the purchase of steel."

Discussing the serious aspect of competition from foreign imports, Mr. Worthington stressed that "Foreign competition is likely to be with us from now on. It may hurt a little less one year than another, but it won't go away like a bad dream and it will make itself felt in more and more steel products. We will be under pressure from more and more foreign producers.

"No one with sense thinks that meeting and beating foreign competition is an easy job. It isn't. The foreign product is almost always priced less than the American product, even though an opportunistic price put on it may occasionally be higher than the domestic price, as during the recent strike. Some day wage rates abroad may approach ours — but we shouldn't count on that for years to come."

Mr. Worthington said the steel industry can meet this competition by selling much harder those things that the foreign producer cannot offer, service . . . quality . . . availability. These services, he said, are "our triple line of attack against competition from foreign producers. Notice I have said nothing about tariff protection, because this does not, in my opinion, provide a permanent or basic solution for the problem which confronts us."

Drilling and Blasting Symposium Oct. 17-19

The 10th Annual Symposium on Production Drilling and Blasting will be held Oct. 17-19 at the Colorado School of Mines, Golden, Colo. The symposium is sponsored by the Colorado School of Mines, the University of Minnesota, and Pennsylvania State University.

Papers to be presented will pertain to current developments in applied drilling and blasting and to current researches in these fields. Registration starts Oct. 15, and further information may be obtained by writing to L. J. Parkinson, Head, Dept. of Mining Engineering, Colorado School of Mines, Golden, Colo.

GSA and Associated Groups Meet Oct. 31-Nov. 2, in Denver

Annual meetings of the Geological Society of America, Mineralogical Society of America, the Paleontological Society, the Society of Vertebrate Paleontology, Society of Economic Geologists, and the Geochemical Society will be held Oct. 31-Nov. 2 at the Denver Hilton Hotel, Denver, Colo.

Program Committee consists of Steven S. Oriel, chairman; Paul H. Price, GSA; John Imbrie PS; Brian H. Mason, MSA; G. Ed. Lewis, SVP; M. L. Jensen, SEG; R. M. Denning, GS; Edwin D. McKee, chairman, local committee; Hollis D. Hedberg, president ex-officio; Leonard H. Larsen, program chairman for 1961 meeting.

The following 10 field trips, ranging from one to three days in length, have been arranged: Geology of West-Central Colorado; Geology of South-Central Colorado; Tectonics and Economic Geology of Central Colorado; Quaternary Geology of the Front Range and Adjacent Plains; Geology of Laramie Range and Laramie Basin; Mineral Deposits of the Climax District; Stratigraphy of the Colorado Springs-Canon City Area; Engineering Geology of the Colorado-Big Thompson Project; Precambrian Geology of Central City-Idaho Springs Area, Front Range; Fossil Vertebrates and Sedimentary Rocks of Front Range Foothills."

Arrangements for luncheons, breakfast, cocktail parties, or other get-togethers are being made through G. D. Robinson, USGS, Federal Center, Denver, Colo. Exhibits, local excursions, a ladies' program, and many special functions are being planned.

John D. Haun, associate professor, and Robert J. Weimer, assistant professor, Geology Department, Colorado School of Mines, are in charge of preparation of a guidebook entitled, "Guide to the Geology of Colorado."

Minnesota School of Mines Alumni Reunion Oct. 7-8

The Third Quinquennial Alumni Reunion of the Minnesota School of Mines and Metallurgy, Institute of Technology, will be held Friday and Saturday, Oct. 7 and 8.

An open house and a technical session is scheduled for Friday afternoon at the new Mines and Metallurgy Building. In the evening there will be a cocktail hour followed by a banquet and dance at the Nicollet Hotel, at which Outstanding Achievement Awards will be given to several Alumni.

Saturday will be open house followed by the Northwestern vs. Minnesota football game. Make reservations for tickets and hotels early by contacting E. P. Pfleider, Mines and Metallurgy, University of Minnesota, Minneapolis 14, Minn.

Dr. R. F. Mehl Points Out Shortcomings of Metallurgy

The science and industry of metallurgy came in for criticism recently when one of the nation's top authorities in that field, Dr. Robert F. Mehl, delivered the 37th Henry Marion Howe Memorial Lecture at a meeting of the Iron and Steel Division of the Metallurgical Society of AIME.

Dr. Mehl, 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 Metals Research Laboratory, and dean of Graduate Studies.

His lecture found frequent occasion to applaud the efforts and accomplishments of American metallurgy, but Dr. Mehl dwelled largely on what he regarded as its shortcomings and needs. Industry and the university reieived some of his critical comments.

Dr. Mehl 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 to boast about in this country. More comes from abroad than one likes to contemplate. Really large-scale steel mill research and development have been in general undernourished. The Russians, Germans, and Austrians have done great things that we should have done . . .

"The newer metals have, for the most part, come from the efforts of the chemical industry, not the metallurgical industry. One wonders whether the field of extractive metallurgy might pass out of the hands of the metallurgist and be taken over by the chemist and especially by the chemical engineer, for example, the field of chloride chemistry. This is a real challenge to the metallurgical profession. Industry has been lax. So has the university . . .

"If the universities were to exert the leadership they should, the emphasis would change, away from thermodynamics and solution theory to other sections of physical chemistry, and to inorganic chemistry and to pertinent parts of the field process design now in the hands of the chemical engineer; in teaching, perhaps some realignment of courses will be necessary.

"Some design, especially process design, must be introduced and fostered among metallurgists, else surely the chemical engineers will engulf us."

Dr. Mehl described the science of physical metallurgy as being "in a state of bursting health." He said that "the physical metallurgist now produces research, often 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 turn." He deplored the fact that "attempts to increaee college enrollment in the metallurgical field, seriously pursued for nearly a score of years, have been almost entirely sterile."

Dr. Mehl also expressed distress that in industry there is a serious situation in the "loss of good research men to administrative work, to sales, to plant operations" and in the diversion of such men "to unchallenging technical jobs of all sorts."

Dr. Mehl urged more activity by the metallurgy professor in writing books that are much needed in the profession. He suggested that "perhaps government funds should be allocated to this type of effort, for in a different way, it is as important as research itself."

Dr. Mehl noted:

"The role that governmental agencies have played in university research, starting with the splendid standards of the Office of Naval Research shortly after World War II has been essential in the great development of metallurgical research in the last 15 years. And the current effort of the Department of Defense to supply special funds for research equipment, now so dreadfully lacking, and at the moment to supply funds for a series of university material research centers, may well open a new and spirited era. None of this will suffice, however, unless university administrations somehow find the means to improve faculty living standards."

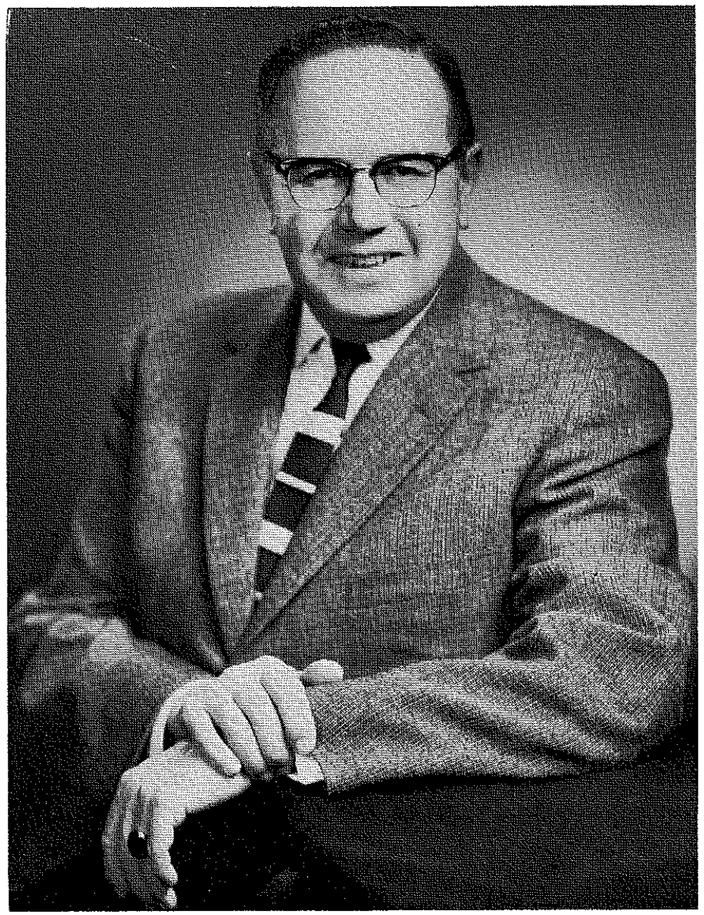
9th Annual X-ray Conference Aug. 10-12

Ninth Annual Conference on Applications of X-ray Analysis is being held Aug. 10-12 at the Park Lane Hotel, Denver, Colo.

Sponsored by the Metallurgy Division, Denver Research Institute, University of Denver, the conference will feature papers on such subjects as "Performance of Norelco Autrometer Using Bureau of Standards Spectrographic Steel Standards," "Fluorescence Analysis of Trace Amounts of Hafnium in Zirconium Using a Silicon Crystal," "Electrocrystallization of Cobalt and Cobalt-Nickel Alloys," "Industrial Application of X-ray Methods for Measuring Plating Thickness," "X-ray Studies in the Ti-O System," and "Use of Computer Techniques to Plot Pole Figures."

Introductory Remarks

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



GOVERNOR JOSEPH J. HICKEY

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

We, in Wyoming, have long known the importance of our 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 from our state will become of national importance.

Our state agencies are devoted to the principal of multiple use management. To that extent, our forests, our minerals, our agriculture and our other resources 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 noting 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 at 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 only 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 increasing 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-coking 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.

Coal production is expected to achieve consistent increases each year during the next decade.

Trona and Phosphate Exploration

In the southwestern part of Wyoming almost a dozen major chemical companies are engaged in the exploration of trona and phosphate. It is estimated that over 3 million dollars has been expended in drilling exploration for trona in southwestern Wyoming in the past three years. Several companies have met with state officials, and it is anticipated that at least one and perhaps additional trona mining operations will be announced later this year. In addition, Food Machinery Corp. recently announced an expansion of the existing trona plant in the area.

Northwestern Wyoming has not been overlooked in mineral development. 1959 brought an announcement that a gypsum board plant would be built in Cody. Construction has begun on this multi-million dollar operation, and it is expected the plant will be in operation early in 1961.

These 1959 and early 1960 events are only indicative of what should come in the future.

Coal Reserves Unequaled

The coal reserves of Wyoming are equaled by no other state in the Union with the coal reserves measured in the trillions of tons. At the present time several national companies are investigating the possibilities of utilizing these coals in chemical industries. Several sections of the state are being investigated. Wyoming phosphate deposits are currently under investigation by a number of national companies. Wyoming trona, phosphate and sulphur may well be used in some integrated operations.

Development continues in oil and gas in the state, and the future outlook is for additional exploration and production in these areas. A recent establishment of a gas extraction plant at Opal is considered the forerunner of additional plants in the state.

U. S. Steel's taconite plant should result in some increased usage of Wyoming bentonite, which is used in this operation. Additional sources of iron development are possible with the continued exploration and investigation by the Union Pacific Railroad Co. of titaniferous magnetite deposits near Laramie. The company has expended large sums of money in investigation and processing experimentation during recent months.

On the state level, through the University of Wyoming, the Natural Resource Board and other state agencies, Wyoming expects to lend every assistance possible to municipalities, county agencies and to individual companies in their efforts to promote the utilization of the raw materials of our state.

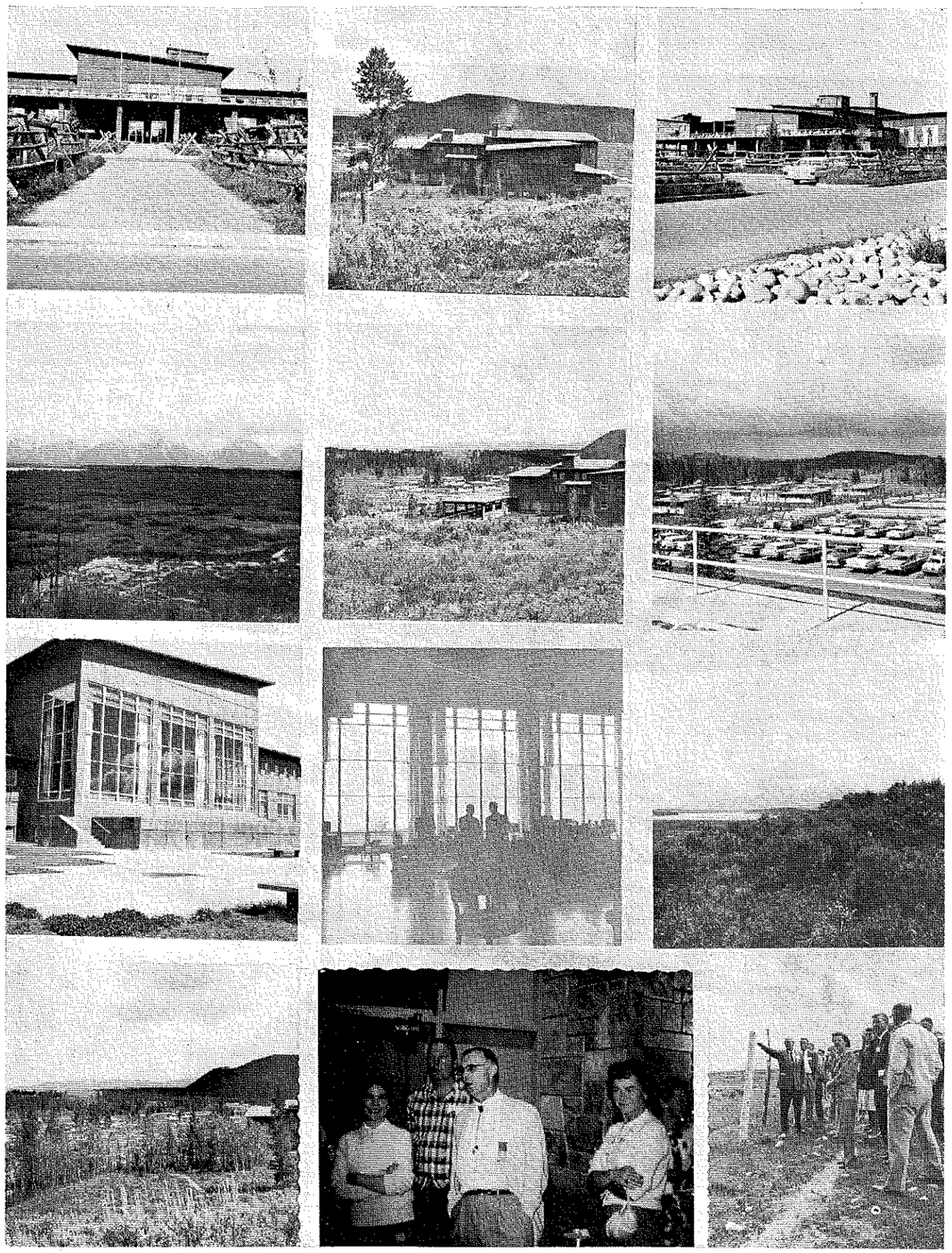
Resource Development Encouraged

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.



▼ First row, top of picture: three different views of Jackson Lake Lodge; 2nd row: Grand Tetons and two views of Lodge; 3rd row: exterior and interior of Lodge lobby and view of Jackson Lake and Grand Tetons; 4th row: view of Lodge "village," group singing led by Al Quine, supported by Mrs. D. Hand and Frances Ford, husbands and wives on geology tour conducted by Dr. J. David Love.

5th Annual

Wyoming Mining Assn. Convention

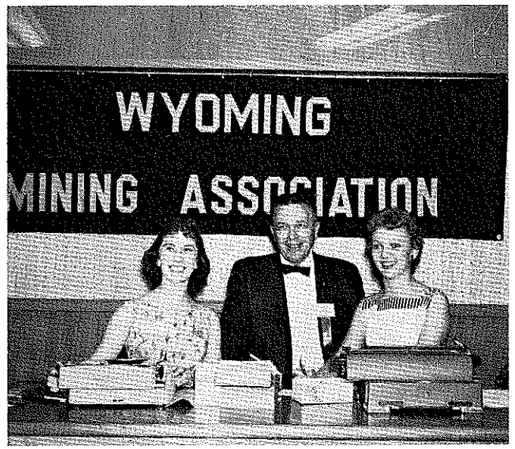
The Fifth Annual Convention of the Wyoming Mining Association was held June 9-11 at Jackson Lake Lodge, Moran, Wyo., in scenic Grand Teton National Park. It was attended by some 200 mining men—executives, mine and mill operators, and representatives of equipment supply companies.

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. Runge, E. L. Stout, V. Hoover, A. V. Quine, G. E. Sorensen, Harry T. Thorson, Myron L. Sisson (immediate past president), and O. F. Tucker. R. W. Beamer was re-elected executive secretary.

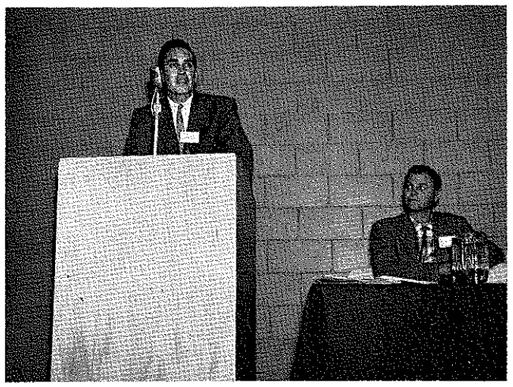
Technical papers were presented all day Friday and Saturday morning. Excellent sound and color movies were shown of Utah Construction Co.'s "The Story of Toquepala, Peru," U. S. Bureau of Land Management's "Our Public Lands," and Grand Teton National Park's "Turn the Wheels West."

Special luncheon meetings with featured speakers were held Friday and Saturday. A delicious Western barbeque 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.

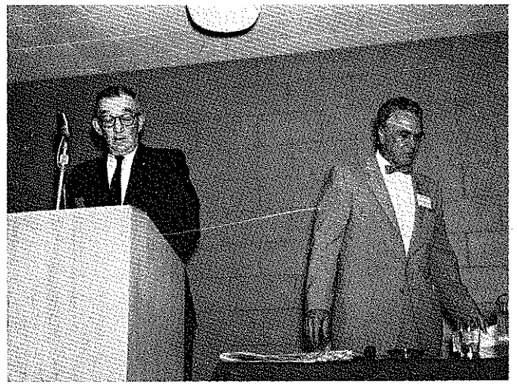


▼ Registration desk. Left to right: Mrs. Olivia Burgess, "Russ" Beamer (executive secretary of Wyoming Mining Assn.), and Miss Caroline Hahn.

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



▼ Harry Barker, Jr., state legislator from Teton County, and Robert F. Love, superintendent, Intermountain Chemical Co.

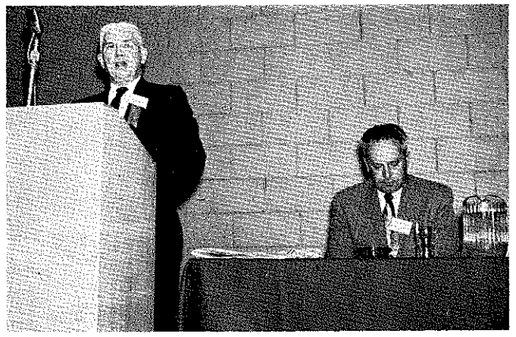


▼ Jack R. Gage, secretary of state for Wyoming, and Robert L. Moran, first president of the Wyoming Mining Assn.

"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. Love, 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 Gage, secretary of state, educator and author, would act as the Governor's emissary of goodwill."

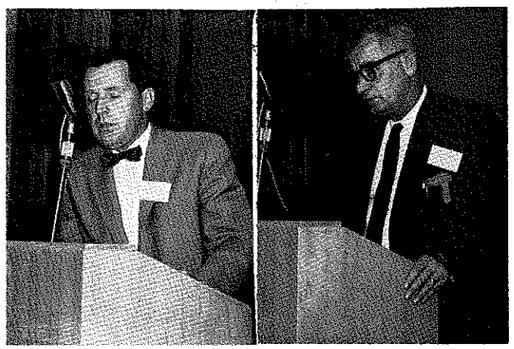
Mr. Gage rose deliberately and drawled: "I don't think it's so all-fired unfortunate the Governor isn't here. . .I am indeed proud and happy to welcome you to this convention. . .We hope you'll spend quite a little time in our beautiful Jackson Hole area. . .just so you SPEND is all right with us." He assured Wyoming mining men that the State Land Board was eager to assist and cooperate with them in solving their problems.



▼ Myron L. Sisson, 1959-60 Wyoming Mining Assn. president and Ray Lindlof, project manager, Federal-Gas Hills Partners.

Ray Lindlof, project manager of Federal Gas Hills Partners, introduced Myron L. Sisson, a 1920 CSM graduate and retiring president of the Wyoming Mining Association, who spoke on the subject of "A Look to the Future." (The full text of his address is published in this issue of the Magazine.)

Brice O'Brien, tax specialist, American Mining Congress, speaking on "Percentage Depletion," said that an adequate depletion allowance is necessary for two basic reasons:



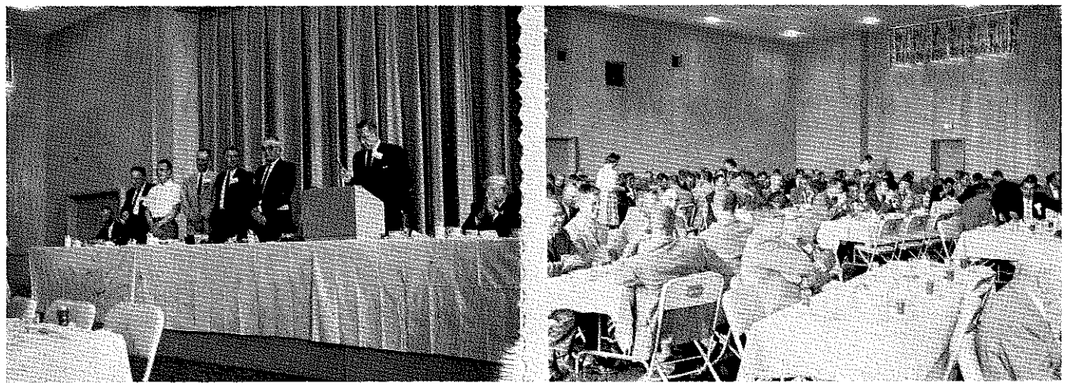
▼ Brice O'Brien, tax specialist, American Mining Congress, Washington, D. C., and Val Payne, area minerals officer, U. S. Bureau of Land Management, Denver, Colo.

"(1) The search for and production of minerals is an extremely speculative business with inherent risks far greater than those found in other private enterprise; consequently the need for special tax treatment must be recognized, not only from the standpoint of fairness but also to assure our Nation of a supply of minerals essential to the maintenance of a dynamic and expanding economy.

"(2) The amounts received from sale of minerals produced from mining deposits are in substantial part return of capital and not ordinary income from doing business such as we think of in a manufacturing, wholesale, or retail business."

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 those processes which have been traditionally considered mining and which have been allowed administratively to mineral producers, 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."

Van Payne, area minerals 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



▼ First picture, left: Eugene B. Hotchkiss, toastmaster, introduces guests at the head table at the Friday luncheon meeting in the Explorers Room of Jackson Lake Lodge; 2nd picture: some of the mining men attending the Friday noon luncheon.

remarks with a recent statement by Elmer F. Bennett, undersecretary of Interior: "In several respects, the 1872 mining laws are not adequate to do the job. . .If we are to meet the mineral requirements of our expanding economy, we should find a legislative solution that would resolve these inadequacies."

At the Friday luncheon, Richard J. Anderson, assistant to the director of Batelle Memorial Institute, made his audience chuckle then roar with laughter at his absurd yet sage predictions of "The United States in 1975." (The May 1960 issue of The MINES Magazine presented samples of his humor as a luncheon speaker at the National Western Mining Conference in Denver, April 21-23.)

K. W. Lentz, 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 Wagoner Act, he analyzed provisions of the newly

▼ Lobby of Jackson Lake Lodge, Moran, Wyo.

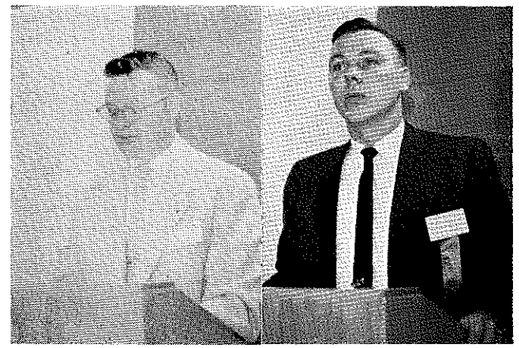
enacted Landrum-Griffith Labor Laws, characterizing them as steps in the right direction but vague and unsatisfactory in some respects. He said he hoped to see Wyoming as the 19th state passing right-to-work legislation.

Fred Chisholm, 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. Stout, resident manager of Intermountain Chemical, introduced C. H. Reynolds, moderator; Jack H. Bailey and Clarence Kravig, speakers, at a panel discussion of "Underground Mining in Poorly Consolidated Formations," the text of which appears in this issue of the Magazine.

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 are in this issue of the Magazine.)

First speaker on the program Saturday morning was Michael J. Duzik, state inspector of mines in Wyo., introduced by Joseph E. Ward, Joy Manufacturing Co. representative in Denver. Mr. Duzik reported no fatalities and only three compensable injuries for almost 2 million tons of coal mined in 1959; four fatalities and 56 compensable injuries in mines other than coal during 1959, with all fatalities caused by mobile and heavy equipment. He declared: "Safety is not a one-sided affair; it is the responsibility of everybody. . .

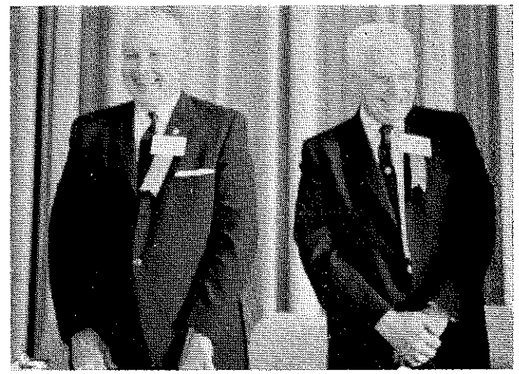


▼ Robert W. MacCannon, mining engineer at CF&I's Sunrise, Wyo., iron mine, and J. W. Peterson, Caterpillar Tractor Co.

By thinking safety, practicing safety, and using safety, it becomes a habit. . .We have been getting good results and good cooperation from the employees and management, both from surface and underground operations. . ."

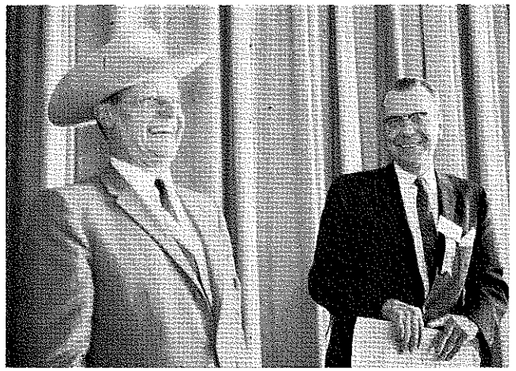
James Lamont, Industrial Distributors, introduced Robert MacCannon, a 1951 Mines graduate employed as a mining engineer at CF&I's Sunrise, Wyo., property. Mr. MacCannon explained how management operates the accident prevention and safety program at Sunrise. (Mr. MacCannon's informative paper will be presented in full in an early issue of the Magazine.)

Harry T. Thorson, president of Black Hills Bentonite Co., introduced J. W. Peterson, Caterpillar Tractor Co. engineer, who spoke on the subject of "Seismic Analysis to Determine Methods of Overburden Removal." His discussion concerned methods of overburden removal as applied to any number of surface mining operations. (Much of the material in Mr. Peterson's address was published in the July 1959 issue of The MINES Magazine, pp. 16-18.)



▼ M. J. Ankeny, director of the U. S. Bureau of Mines, and Myron L. Sisson, superintendent, Sunrise Mine.

V. P. Noonan, Moss Equipment & Supply Co., presented Homer S. Shaw, Utah Construction & Mining Co., who read a paper, "Equipment Replacement Scheduling," prepared by Frank A. Rozza, equipment director, Utah Construction & Mining Co. Mr. Rozza's paper dealt with the three general problems of proper control of capital investment in construction or mining enterprises: 1. To obtain or rent new equipment for a



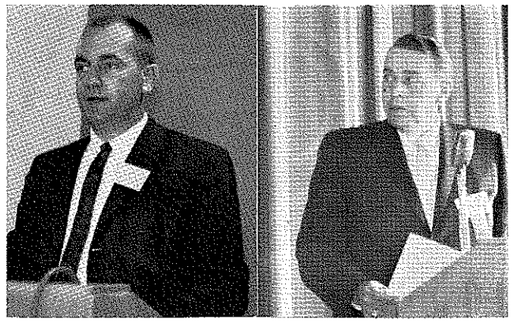
▼Stephen F. Dunn, president of the National Coal Association, and G. E. Sorensen, Kemmerer Coal Co. of Frontier, Wyo. Dunn, who was making his first trip west of the Mississippi, was presented with a Stetson hat.

new undertaking; 2. Replacement, or overhaul, of equipment which is in continuous use; 3. Sale or storage of equipment which has become idle. His conclusions were:

". . .We must utilize administrative, statistical and engineering experience, and have complete familiarity with equipment and its problems, in order to provide good management and precise direction to all company equipment activities. Constant studies must be made on replacement programs, cost controls, preventive maintenance, fleet efficiency and fleet adequacy." Mr. Rozza's paper will be presented in an early issue of the Magazine.)

G. H. Bryant, superintendent, Susquehanna-Western, Inc., introduced Duane W. Riggert, executive director of the Wyoming Taxpayers Association, who presented facts and figures concerned with "Wyoming Fiscal Operations and Problems." In conclusion, Mr. Riggert counseled his audience to follow their local budgets and expenditures for counties, cities and schools; not to be afraid to criticize or complain about government, but to do it constructively and to give a pat on the back for a job well done.

At the Saturday luncheon meeting, V. N. Hoover, Wyoming manager, Pacific Power & Light Co., introduced Stephen F. Dunn, president of the National Coal Association, Washington, D. C. Mr. Dunn pointed out that one third of the nation's recoverable reserves of bituminous coal and lignite are in Wyoming, Utah, Colorado, and Montana. He declared that the long



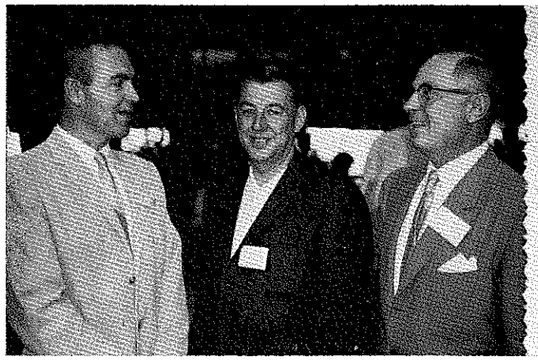
▼G. H. Bryant, mill superintendent, Susquehanna-Western, Inc., and V. N. Hoover, manager, Pacific Light & Power Co.

▼Roy Coulson, 1960-61 president of the Wyoming Mining Assn., presents the Safety Award for Underground Operations to R. L. Stout, resident manager of Intermountain Chemical Co.

term opportunities for coal in this region are infinite. He spoke about NCA's efforts to curb such unfair competition as excessive imports of residual oil and dump sales of natural gas to industrial markets, and he sounded an optomistic note with the statement that long distance transmission of electricity is continually making coal-by-wire a more fetching bargain.

Annual Safety Award for Surface Mining for 1959 was presented by President Coulson to Weldon I. Leonard, plant manager, Great Western Aggregates,

(Continued on page 42)



▼First picture, left: "talking it over" are Roy Peck, co-publisher, Riverton Ranger; Bud Blonder, Wyoming Nuclear Co., Lander; Cotter Ferguson, Federal-Gas Hills Uranium Co., Laramie; 2nd picture: Eugene B. Hotchkiss, executive vice president, Vitro Minerals Corp., and M. J. Ankeny, U. S. Bureau of Mines director.

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 individual freedom. Our security is founded upon this philosophy. For the development of our natural resources, it is essential that these principles be encouraged and sustained by sound governmental policy. To maintain a healthy mining industry the consistent support of these principles will insure an adequate production 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 countries which have 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 early establishment of a National Minerals policy . . .

We commend our Members of Congress for their efforts on behalf of the mining industry and particularly the Wyoming mining industry. We wish especially to express to Sen. Joseph C. O'Mahoney our appreciation for his many years of service to Wyoming in the Congress of the United States . . .

Congressman Keith Thomson is especially commended for his continued opposition to the proposed Burns Creek power project . . .

To Governor J. J. Hickey, we extend our thanks for his continued interest in the development of the mining industry. His cooperation in solving the problems of the industry is of utmost importance. Under his leadership, Wyoming can maintain an economic climate that will encourage investors to risk their capital in Wyoming mining enterprises.

We commend the American Mining Congress for its efforts to promote the healthy growth and development of the mineral industries in the Western States. . .

Mine Safety

We advocate and urge the continued cooperation of employers and employees in the development of mine safety programs. We offer our continued cooperation to the State agencies in maintaining and improving our safety codes . . .

We commend the U. S. Bureau of Mines, the U. S. Public Health Service and the Atomic Energy Commission for their work in studying health and safety hazards in the mining industry and for the information which is made available to those responsible for maintaining adequate health and safety standards . . .

To our Inspector of Mines, Michael J. Duzik, and his deputies, we express our appreciation for their untiring efforts on behalf of those employed in the mining industry . . .

Minerals Research

Technological progress and national defense demand that the United States maintain an adequate minerals research program . . . We urge that the Congress make available adequate funds to the USGS so that this important work may be accelerated in our State.

Exploration

To maintain adequate known reserves of essential minerals, there must be constant exploration work in progress. The Office of Mineral Exploration in the Department of the Interior is making an important contribution to such exploration activities. We urge that the Federal Government further encourage private initiative by allowing the full deduction of exploration costs for income tax purposes.

Solid Fuels

Wyoming coal deposits offer a tremendous potential for the economical production of electric power . . . We urge that the State of Wyoming encourage the growth of the electric industry under the private enterprise system, which has helped make our Nation so great.

We are opposed to the construction of uneconomic, tax-free hydro-electric plants, or steam-electric plants, with Government funds, computed at extremely low interest rates . . .

We support the work of the Rural Electrification Administration in providing electricity for farm and ranch customers . . . However, we do not believe that REA Co-ops are entitled to any Government subsidization whenever they compete for urban and industrial customers with the private, tax-paying electric utilities.

Uranium

We commend the Atomic Energy Commission for its efforts to encourage private industry to undertake scientific research and experimental development in the nuclear reactor program and in other programs involving the use of nuclear energy for the betterment of mankind.

The AEC is commended for its announcement of the policy regarding the purchase of concentrates for the period 1962-1966. This important announcement permits producers to effectively plan production programs . . .

We ask that the Atomic Energy Commission give consideration to a greater degree of flexibility in the fulfilling of ore allocations in those areas where an allocation system is in effect . . .

Public Lands

We urge the preservation of the system established by the General Mining Laws for the location and patenting of mining claims as the most desirable means of encouraging and providing for the development of public land mineral resources. We support the efforts being made to amend the mineral laws to permit claim location by geophysical and other scientific methods . . .

Resource Development

We favor the development of the resources of the Western States in an economically sound and orderly manner. Such development should be accomplished through private enterprise, cooperative groups or by the state which receives the direct benefits. Federal participation should be limited to the very large projects which involve the interests of two or more states . . .

Labor Relations

We commend the efforts of Congress to achieve a proper balance between labor and management . . .

Industry Relations

The growth and development in Wyoming of the mining industry, as well as other industries, has created new problems and has required many adjustments. We appreciate the spirit of cooperation that has been shown by associations, groups and individuals . . .

Established Industries

We recognize the necessity for, and recommend the promotion and use of, all finished products of established industries, which are a part of, or utilize the product of the Wyoming mining industry . . .

Taxation

We urge that the Federal Government make every effort to bring its budget into balance, that expenditures do not exceed income and that regular payments be made on the national debt . . .

Due to constantly increasing exploration costs, additional tax relief to the mining industry is warranted. We, therefore, recommend that Congress revise Section 615 of the Internal Revenue Code to: (1) increase the total limitation on exploration expenditures; (2) increase the annual limitation on such expenditures; and (3) remove the four-year limitation in order to permit the taxpayer to take deductions in as many years as necessary to reach the maximum allowable limitation.

We support the position of the American Mining Congress with regard to redefining "gross income from mining" for percentage depletion purposes.

We recommend the revision of Section 613 (c) (2) of the Internal Revenue Code by changing from 50 to 100 miles the amount of transportation allowable from mine to treatment plant . . .

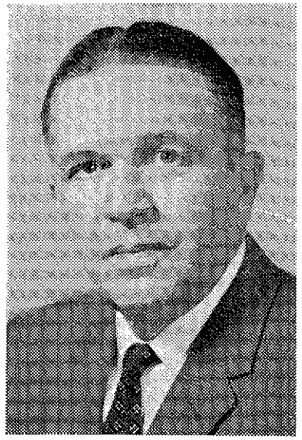
We support the mining industry in its position that the concentration of ores is an ordinary treatment process under Section 613 (c) (4) (D) for depletion purposes . . .

The present percentage depletion allowance rates as outlined in Section 613 (b) of the Internal Revenue Code have proven effective . . . We recommend that these rates be maintained.

We believe that the present tax structure for industrial plants and mineral production in Wyoming is as fair and equitable as may be expected.

Wyoming Mining Association Looks Ahead

By R. W. BEAMER
Executive Secretary, Wyoming Mining Assn.



R. W. BEAMER

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 an indication of a growing confidence in the future of the industry.

The list of minerals produced in this state includes bentonite, coal, iron ore, limerock, phosphate, sand and gravel, shales, trona, and uranium. Other minerals, common to many western states, have not been found in quantity. As a result, problems peculiar to the industry tend to be somewhat different than in other states. This is especially true in the case of 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. When serious problems arose 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. Prospecting 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. L. Moran, Riverton attorney; Roy Coulson, Vitro Minerals Corp.; R. K. Lisco, Teton Exploration Drilling Co.; M. L. Sisson, Colorado Fuel & Iron Corp.; Paul R. Peterson, Magnet Cove Barium Corp.; G. E. Sorensen, Kemmerer Coal Co., and N. E. McDougall, Intermountain Chemical Co.

Others who have served on the Board since that time are: R. W. Adams, Western Nuclear, Inc.; Duncan Williams, Monolith Portland Midwest Co.; C. J. Paustian, Wyo-Ben Products Co.; Harry T. Thorson, Black Hills Bentonite Co.; H. D. Hand, Globe Mining Co.; R. F. Love, Intermountain Chemical Co.; V. N. Hoover, Pacific Power & Light Co.; A. V. Quine, Lucky Mc Uranium Corp.; Jack Mullinax, Mullinax Concrete Products Co.; O. F. Tucker, Casper Concrete Co.; H. E. Potter, Monolith Portland Midwest Co.; T. L. McCorkle, Du Pont Co.

Through the leadership of these prominent men from the industry, it has been possible to establish a substantial organization which can effectively represent the board interests of the widely varied 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.

A Look To the Future*

By MYRON L. SISSON, '20

MYRON L. SISSON

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.

Uranium Mining Well Established

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 interim 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 Southwest

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 bentonite 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 wall board manufacturing plant is a new industry and new mining operation in the Cody area.

Coal Consumption 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-

* Address at the Wyoming Mining Association Convention, Jackson Lake Lodge, Wyo., June 10-11, 1960.

THE AUTHOR

Myron L. Sisson, superintendent of Colorado Fuel & Iron Corp.'s iron mine at Sunrise, Wyo., received his E.M. degree from the Colorado School of Mines in 1920. For the next four years after his graduation from Mines, he was employed by River Smelting & Refining Co., Florence, Colo., as shifter and foreman in the zinc oxide plant and crushing and roast plant. In 1924 he served as mining engineer with Phelps Dodge Corp. at Morenci, Ariz., and from 1924 to 1927 as mining engineer with Hayden Bros. Coal Corp at Haybro, Colo.

In 1927 he joined the Colorado Fuel & Iron Corp. as mine foreman, mining engineer, assistant superintendent, and superintendent since 1945 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.

coking coal, can have an enormous impact on the coal mining industry, not only in Wyoming but the whole United States. If these tests prove economically feasible, coal mining will again become one of the principle industries of the State.

There is the possibility of developing alumina in the Lake DeSmet area, together with future development of coal in the area.

Iron Ore Production

Recent press releases indicate the opening of a mine in the Atlantic City area and the construction of a beneficiation 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 mine of any appreciable size is the Sunrise Mine, which has been in production about 60 years. It is now working on a reduced production schedule, due to the nation-wide reduction in steel production. It would seem that this is of a temporary nature, and production should improve within the next few months.

This briefly covers the future outlook for the various segments of the Wyoming mining industry. As a whole, 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 only of mining but our whole economic structure. Some of these are taxes, political expediency, pricing ourselves out of our domestic as well as foreign markets.

One of the factors that has encouraged mining and new mining development in Wwoming 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 have been 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 prepared, which is called an equalization tax. It appears to be 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 mines to close down, as they are working low grade materials and are faced with high transportation costs and are working on a small margin of profit. It is not economically feasible to process all the products of our mines within the state. Therefore unrealistic taxes can very well increase the cost of production from our mines to the point that they are no longer competitive. When that condition exists our mines will be closed down, and the processing plants will purchase their raw materials from other states or foreign sources. This is particularly true of the iron ore, as large tonnages are being imported from South America and Canada at the present time.

Inflation Threatens Economy

Our economy is threatened by continued inflation. Inflation is a threat because of the deficit spending and huge national debt. In addition we have built-in inflationary factors. Nearly all labor contracts now have an increase-in-cost-of-living clause. And the cost of living cannot go in any direction except up. This tends to force all prices up, is called creeping inflation, and is supposed to be okay. But it seems to me that if it continues to creep, the final results are just as fatal as runaway inflation.

Our nation has been expanding the functions of the national government into all fields. A great many of the functions have been adopted on the basis of political expediency rather than the hard cold facts of economics. A continuation of this trend can only lead to more difficulties in the form of continued inflation, more deficit spending with a greater national debt. If it continues far enough, it could lead to eventual economic collapse.

People Must Shake Complacency

However, I don't believe we will allow things to reach this chaotic stage. I think the American people will shake their complacency. Business, labor and government will get together and solve these problems on an economic basis. But in order to effect this program, the American people are going to have to exercise their franchise as citizens and elect men with business experience and demand government on a sound business basis and sound economics.

Each and everyone of us must take an active interest and part in the selection and election of candidates well qualified for the office they seek. Also we must keep our legislators and congressmen informed of our stand on proposed legislation by letters and telegrams.

Mining Code Revision Necessary

There is one other problem facing our industry in this state that I would like to mention briefly. That is the mining code for mines other than coal. The present code was adopted in 1957 after a lot of work on the part of your Association, its officers and others in the mining industry. It was a step in the right direction, but with the increasing number of mines and the numerous problems that are arising, it is inadequate. The Board of Mines was set up under the code as an advisory body for the State Mine Inspector and the Governor. There is no provision within the code for Technical Administration at the state level.

Many technical problems are presenting themselves, such as radiation-dust sampling, particularly in underground uranium mines and mills. Evaluation of mining methods, safety programs and many other problems require an administrator with technical skill and experience. There is no provision for this under the present code.

Therefore I suggest that the new Board of Directors of the Wyoming Mining Association make this their first project and work-up the proposed changes in the code, with the cooperation of all those interested, and present it to the next legislature.

Please don't get me wrong, I am not criticizing those who are administering the code as it is written. I think our Inspection Department has done a good job. They have cooperated with the operators and with the Board of Mines to the fullest extent.

I do not profess to have the answer to this mining code problem nor to the others mentioned in my paper. However they can and will be solved. The solution is going to take a lot of straight thinking with concerted and cooperative action by each and everyone of us.

Panel Discussion of Underground Mining In Poorly Consolidated Formations*

C. H. REYNOLDS, Moderator
C. N. KRAVIG and J. H. BAILEY, Panelists

Acting as moderator, C. H. Reynolds—general superintendent of Continental Materials Corp., Grand Junction, Colo.—introduced both the subject to be discussed and the two members of the panel, as follows:

With underground mining our subject today, I am reminded of the old mining story about the green hand who was rustling the salty old mine foreman for a job on the Plateau a few years ago during the transition of the uranium boom from prospecting to mining. Questioned by the foreman as to whether he was a miner, the young man stated quite confidently that he was. The foreman said, "All right, you go over to No. 3 Incline and tell the hoistman to let you down. When you get to the bottom turn left into the north drift and go to the face. Start on the muckpile there and I'll be along to see you a little later."

As the young fellow started off, the foreman called, "Hey, have you got a lamp?"

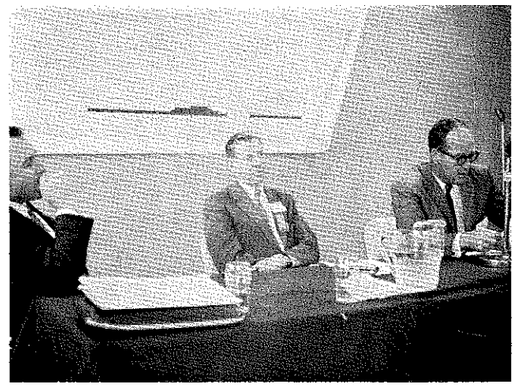
The young man turned and replied, "I won't need one will I? I'll be through before dark."

Well, we expect to be through before dark too, but we also hope to throw a little light on our subject.

Man has been mining various raw materials from poorly consolidated formations for a very long time, and the various problems involved are certainly not unique to the mining of uranium. However, it so happened in this country over the past several years that by far the largest portion of our discovered uranium reserves occur in sedimentary formations which are quite poorly consolidated. This is in contrast to our traditional base and precious metal mining in the West where we are usually mining in fairly competent host rocks.

In the evaluation of any mining venture under a given set of economics and after discovery of the commodity in question, the mining engineer is called on to determine first, the feasibility of extracting the commodity from its environment, and second, to determine if it can be extracted at a profit—for under our economic system the definition of ore is "mineralized material which can be extracted at a profit."

These determinations involve a great many interrelated and complex factors, many of which are indeterminate from the limited data which the engineer may have at hand.



▼ Left to right: Jack H. Bailey, C. N. Kravig, and C. H. Reynolds.

The factors on which the engineer must base his feasibility and economic predictions are usually quite poorly defined when he is faced with opening an underground mine in a completely new area and formation—that is, one in which no previous work has been done and consequently no experience factors have been empirically developed. This is the situation which has faced the engineer in three of the major reserves of this country—the Big Indian district in Utah, the Ambrosia area in New Mexico, and the Central Wyoming basins.

To discuss how some of these problems have been met and solved in these various areas, we have two men who have been busily solving them for a number of years.

After the presentation of their two papers, we will open the panel for questions, and I am sure Mr. Kravig and Mr. Bailey will do their best to answer them.

First, I will introduce Mr. Clarence Kravig of the Homestake Mining Co. of Lead, S. Dak. Mr. Kravig is a graduate of the University of Minnesota in 1929. Soon after graduation he joined the Homestake organization as a geologist. In 1940 he became assistant mine superintendent of Lead, and in 1951

* Panel presented at the Wyoming Mining Assn. Convention at Jackson Lake Lodge, Wyo., June 10, 1960.

he became mine superintendent. In addition to his duties at Lead, he is also in charge of operations at the Hauber Uranium Mine in northeastern 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, he joined the Utah organization and was engaged on a coal drilling project at Craig, Colo. In 1955 he moved to the Lucky Me project and has been in charge of project work in the Shirley Basin area since its inception in 1957. He is presently project manager for Utah Mining Co. on that project.

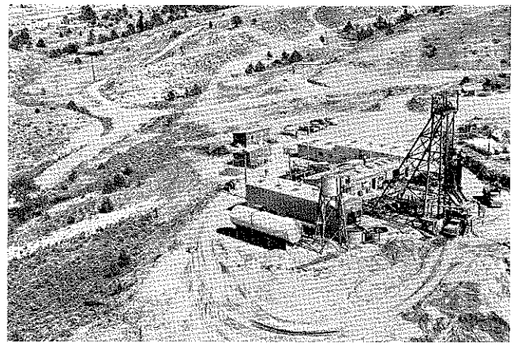
▼ Clarence Kravig, Homestake Mining Co., and C. H. Reynolds, Continental Materials Corp., Grand Junction, Colo.

Clarence Kravig, first panelist, made the following remarks about "Underground Mining in Poorly Consolidated Formations" at the Homestake Gold Mine in Lead, S. Dak., at the Hauber Uranium Mine in Crook County, 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 drifting, raising, dilution, controlled caving, haulage, and pumping all present special problems due to poorly consolidated ground.

At our Hauber Uranium Mine in Crook County, Wyo., the ground as a whole is pretty fair, but we do have mudstones that give trouble both in the back and in the floor. Some weak sandstones as well as loose or "drummy" slabs in hard sandstone also are troublesome. This condition also exists in the Homestake uranium mines near Moab, Utah, and in the Grants District of New Mexico.

Considerable costs are continually incurred in roof support in all the uranium mines; even so caving occurs which requires special timbering and even steel sets. In the Grants District the ribs as well as the roof need support; there have been several accidents from rib falls as well as from roof falls. The Hauber Mine and most of the mines in the Grants District are very wet and seeping water tends to



▼ Aerial view of Hauber Uranium Mine, New Haven, Wyo., owned and operated by Homestake Mining Co. (Photo courtesy Riverton Ranger)

loosen sandstone or mudstone both in the back and in the rib.

Any type ground that will hold together reasonably well is usually rock bolted as a first step. Expansion shield type rock bolts are used for the most part. In the month of March, 18,165 rock bolts were used in the Homestake mines in the Grants District; this was at the rate of one bolt for each three tons of ore extracted. A variety of head plates or washers are in use in all the mines and include standard rock-bolt washers, wire-mesh or chain-link fencing, steel plates, steel strips, expanded metal and wood slabs. In the Grants Mines, 15″ x 9′ steel plates are commonly used for additional bearing area.

Adequate anchorage of the rock bolts, of course, is a requirement. If proper anchorage is unattainable with conventional bolts, then timbering or cemented bolts are necessary.

A safety problem is present while installing rock bolts. It often is difficult to detect loose ground, and roof falls occur with little or no warning; therefore, it is necessary to scale down several times during a shift and in some cases a light-weight safety jack is used for protection until the back can be bolted or timbered. In some cases booms and a safety shed must be carried ahead of the timbered area to protect the miners while timbering.

A continual education program is necessary to teach miners to scale down the back and ribs several times during a shift. At our Hauber Mine, part of the shaft station caved in without warning, though we thought the back was good in this area; fortunately, no one was hurt as it was lunch time, but one ore truck was badly smashed. We installed steel posts and I-beams in this area for a permanent solution to the roof problem.

Where rock bolt anchorage is poor, as is the case in mudstones, bolts are cemented into place. "Perfo" bolts have been used and have been satisfactory from the standpoint of anchorage but are expensive to install. We found that we could cement plain bolts into drill holes more cheaply than using the "Perfo" bolts.

This is done by filling a pipe with mortar and inserting the mortar-filled pipe into the drill hole; a piston is then inserted into the end of the pipe to hold the mortar while the pipe is withdrawn from the hole, thus leaving the mortar in the drill hole. A bolt or reinforcing rod, threaded on one end, is then driven into the mortar to the bottom of the drill hole. The mortar is allowed to set and then the washer and nut are installed.

Where mudstone is encountered in the back, the drifts are generally timbered. This is done by using a 6″ x 8″ timber cap supported by hangers or stirrups in the rib; this requires a firm sandstone in the rib. The caps are placed on 3-foot or 6-foot intervals, as required, and are lagged, and cribbed to the back. Tight cribbing, as soon as possible, after blasting keeps the mudstone from slaking and continuing to fall.

Drilling in poorly consolidated formations generally presents no difficult problem except when drilling in mudstones. Special bits with wide wing section are at times required. The center hole usually has to be plugged. A V-cut is used almost entirely, but experimentation is necessary to determine the correct amount of dynamite required for various types of "springy" or "rubbery" ground.

A dilution problem is always present in weak formations. Much of the ore production comes from drifting, and where the ore lies near the bottom of the drift and barren material occurs in the top half of the drift with mudstone in the back, dilution can be serious. In such cases we drill out the entire round but blast only the lower half; the ore is then shoveled before blasting the top half. A definite cycle of drilling and blasting is difficult because of various amounts of timbering and rock bolting required, due to ground conditions, so several working faces are kept available for working and this permits blasting at lunch time and at the end of the shift.

In stoping, the main problem in weak formations is premature caving. In the retreat phase of mining, it is necessary to cave the overlying strata as soon as the ore is removed. Previous to caving, panels of ore are extracted and pillars are left between the panels. The pillars are then cut in two or smaller pillars and finally the smallest pillars are extracted immediately before caving. Care must be used so that too much ground is not opened by panel mining. This may cause excessive weight on the small pillars which begin to fail, which in turn causes premature caving with considerable safety and also loss of ore.

Before removing the pillars closest to the caved area, a row of stulls are placed alongside the next pillar and caving holes are drilled in the back. As soon as the pillars closest to the cave are extracted, the caving holes are blasted to bring the cave close to the stulls adjacent to the next pillar to be extracted. Occasionally, random stulls and cribs have to be installed to prevent roof falls and premature caving in the panels before the pillars can be extracted. With two horizons of ore, stoping becomes more difficult; in the Grants District cut-and-fill stoping will be tried.

The problem of ground support in weak formations is difficult in raising. Unless the ground is particularly weak, a crib raise can be driven safely. If the ground is too weak, or the distance is too great, large diameter drill holes with steel casing have been used in place of raises.

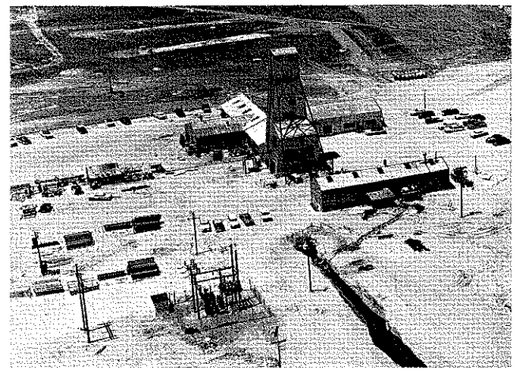
The haulage problem when using trackless equipment, especially in a wet mine, is mainly one of maintenance. The equipment requires a good roadbed as preventative maintenance. If a weak sandstone or mudstone occurs in the bottom of the haulageway, deep ruts and mud holes develop quite rapidly in a wet mine; this is hard on tires and equipment. Crawler type air and diesel loaders dig up the bottom to form mud holes in weak rock formations and maintenance costs become excessive. We abandoned all crawler type equipment in favor of rubber tired, front-end loaders, and maintenance costs and production delays are much less.

At the Hauber Mine it is necessary to build corduroy roads in many sections and where grades are steep the planked roadbed is covered with expanded metal for proper traction. In one case, in the Grants District, roof pressure on several small pillars actually caused them to settle into the soft clay and mudstone bottom and as a result the roadbed heaved and buckled.

Some shaft timbering had to be relieved because of weak ground in one of the Grants mines. Excessive slaking of the shaft walls caused a downward drag and pressure on the shaft timbers. The slaked rock was removed, the shaft sets were reblocked, and the walls were bolted with chain-link fencing. A final coat of gunite is to be applied.

Poorly consolidated material in a wet mine with trackless equipment causes much mud and sand to wash into the pump sumps with resulting high maintenance costs; this requires settling sumps. At the Hauber Mine and the wet Grants mines, all the water with its load of sand and mud runs by gravity into a small box sump. A slurry pump transports all the water, sand, and mud into one of two settling sumps, about 10′ x 10′ x 75′ each, where the water is decanted and the sand and slime settles to the bottom. When the sump is full, the alternate sump is used while the first one is shoveled out with a front-end loader. This material often carries sufficient values to shovel it for ore. The overflow from the settling sump goes to the pump sump where it is pumped to the surface. The mine water is discharged into a settling basin or pond where ore values in the slime will settle out for future recovery.

In conclusion it can be said that mining in poorly consolidated formations has presented us with a variety of problems not commonly encountered in tough, hard rock.



▼ Shirley Basin underground mine of Utah Mining Corp. (Photo courtesy Riverton Ranger)

Jack H. Bailey, second member of the panel, spoke as follows about "Development and Mining in Poorly Consolidated Sandstone at the Shirley Basin Mine of Utah Construction & Mining Co."

The Shirley Basin Uranium district located about 65 miles south of Casper, Wyo., has one of the largest poundage reserves in the nation. The major reserves, discovered to date, are situated in a general northwest-southeast trend averaging about 3,000 feet wide and

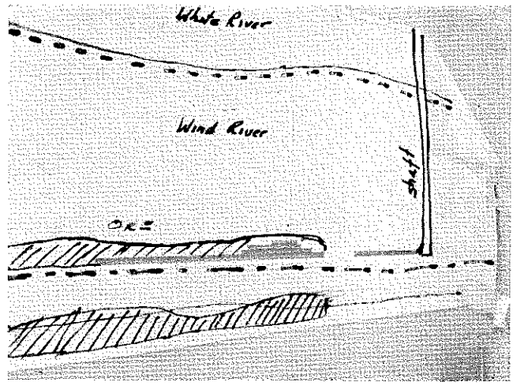
possibly some 40,000 feet long. Other discoveries have been made elsewhere in the basin but reportedly have yet to be outlined or developed by drilling. Unfortunately a great portion of this reserve is too deep for open pit mining under the small production quotas allocated to each property by the current ore purchase policies of the Atomic Energy Commission. Therefore, a considerable portion of the scheduled production will be obtained by underground mining methods, and Utah's operation began shipments in late March of this year.

In review of the many reports that have been associated with the exploration of this district, the following assumptions were made in planning mining operations:

1. The host rock for mineralization is the Wind River Formation of Tertiary Age which is composed primarily of coarse to fine arkosic sand horizons with thin lenses of sandy to silty clays inter-bedded at random or irregular intervals. Geologists have termed the only thick clay as being the basal member of the formation, and the majority of the known mineralization is found in a coarse, highly unconsolidated sand layer lying immediately above this clay.
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 uniformly out of balance chemical to radiometric ratio which appeared to be at least 30 per cent in favor of chemical. This factor, if treated sparingly or ignored, could help develop very favorable mining economics.
3. Lithologic studies of the drill hole cuttings with comparison to similar work in the Gas Hills seem to indicate that the sedimentation in the Shirley Basin area was nearly lacustrine and therefore further justifying the opinions of ore continuity; as opposed, to the fluriatile deposition in the Gas Hills with the highly braided stream channel 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 clay and/or mudstone lenses often were sufficiently hard as to required extensive blasting during stripping operations.
4. Overall, the preliminary exploration results and engineering studies indicated that mining costs in Shirley Basin should compare very favorably with those experienced in other districts in either open pit or underground operations and combined with the extremely high grade ore, made a very rosy picture—with the exception of course of the AEC purchase limitations.

At the Utah property, it was easily established that open pit mining was impossible with the low quota available and the high thickness (about 300 feet) of overburden. A shaft site was picked near the edge of the largest ore body and at the low-point of the main ore lense. Construction of surface facilities began in June of 1959 and shaft sinking shortly thereafter.

Because of the high water table and doubts of some as to the ground conditions for sinking, two wells were immediately drilled, each within 35 feet of the shaft center and 75 H.P. submergible pumps



▾Utah Mining Corp.'s Shirley Basin operations. The diagrametric sketch illustrates the target horizon, depth of overburden, and water table information. Dotted lines show water table before and after pumping.

rated at 600 GPM with a 400 foot head were installed to draw down the water table. As pumping commenced and sinking became tough because of water, additional wells were drilled and pumps added until now a total of eight units are pumping with a combined output of approximately 4500 GPM, and an additional three units are scheduled with many of these later units primarily located to facilitate drifting and mining activities.

Shaft sinking progressed rapidly, when considering the operation of constructing a 12-inch minimum reinforced lining with an inside diameter of 12½ feet, until excessive water was first encountered at about 160 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 tight clay was encountered and below this a fine grained tightly packed sand horizon, just before penetration of the coarse grained ore bearing facies, which apparently carried the majority of the water, a pump station was cut at 330 feet and AM-9 chemical grout used in an attempt to seal the water out down to the basal clay member. The grout did not function 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 upper ore horizons from the 330 level (original pumping station) and wait for the outlying wells to deplete the water reservoir which was feeding the lower sand. Apparently this might well be that part of the formation from the outcrop some 12 miles south and for a good distance on either side. However, water table measurements indicate a good draw down cone has been established which is gradually broadening and a year or so of pumping could make sinking and subsequent development work in the coarse sand relatively easy.

The 330 level development in the relatively dry sand progressed well but somewhat slowly because of the necessity for back spiling and occasional side spiling ahead of timbering; 12 x 12 timbers are used primarily because a good stock was available from another Utah job. Actually 10 x 10 or possibly 8 x 8 timber would be sufficient since the ground does NOT contain significant bentonite (to cause swelling).

The first ore lense was encountered in March and sublevel square set drifts were immediately started to outline and develop this particular body. Again because of the extremely unconsolidated sand, spiling is often needed in the square set work and extreme care is always necessary to prevent a sand run. Occasionally this will develop through holes as small as 2-4 inches or ahead of the spiling in the drift face. All openings created above timber are immediately cribbed.

Excavation is done primarily with IR 59 clay spades and IR 38 stopers in which the rotation palls have been removed. Not more than 3 tons of powder have been used in the total job to date.

A longhole program is carried on constantly to further outline the ore limits and to provide water drainage and 90 per cent of this work is done with a Thor air motor using light tubular drill steel, "Fishtail" bits, a wet spindle, and mounted on an air leg. A Copco BBD 50 rockdrill and leg is used with ⅞ inch sectional steel for those rare occasions when hard rock is encountered.

Production to date has almost entirely been from drift or sublevel headings with a modified long wall retreat method of stoping planned as soon as development sublevel 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 perched water zones continue to be a troublesome factor as they are drained. Total water production from the level is in the neighborhood of 100-150 GPM and this is taken to a settling pond for future recovery of the high grade fines. This amount of water coming from the several working places plus drain holes is not significant in any other type of ground but will make a nice "Cream of Wheat" slurry in a working face of unconsolidated sandstone; therefore, the longholes are essential to keep any amount of water channeled back to the timbered section.

In summary, underground mining conditions are difficult as development progresses but as the water is drained by the development work stoping problems will be relieved. Relatively high cost "square setting" will probably continue to be the only useable mining method; but this is not without its blessing in that dilution can be kept at a minimum and the safety factor is high because of the constant timber cover.

The most obvious factor insuring the success of this and future operations in the Shirley Basin District, either underground or open pit, is the information now available from bulk sample analyses which indicate that actual chemical grade approaches twice that indicated by gamma probes (calibrated to standard samples and used for exploration drilling). The majority of Utah reserves were based on gamma probing of drill holes and these records were interpreted conservatively. Mining to date (although still confined to a small area) has indicated that the poundage content of drilled reserves might well be twice that originally expected.

It is also quite obvious that stripping ratios can be increased considerably because of the unconsolidated ground and open pit mining would undoubtedly be the predominate mining method if an unlimited market were available.

In comparison, with some of the original concepts developed from exploration results, 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.

Panel Moderator Reynolds made the following summary remarks about the problem of mining in poorly consolidated formations:

To briefly summarize the remarks of our two panel members, it can be said that mining in poorly consolidated formations has both advantages and disadvantages from an economic viewpoint.

The principal advantage would appear to be the ease of breaking the ground with the attendant low cost for bits, steel and powder. This physical characteristic also serves to hold exploration costs to a minimum in that these softer formations are quite easily and cheaply drilled in contrast to more competent formations.

Some of the disadvantages of mining in these poorly consolidated formations are:

1. Relatively high ground support costs;
2. If wet, pumping costs may be high due to contained abrasive solids in the water;
3. Haulageway maintenance may be costly due to soft bottom.

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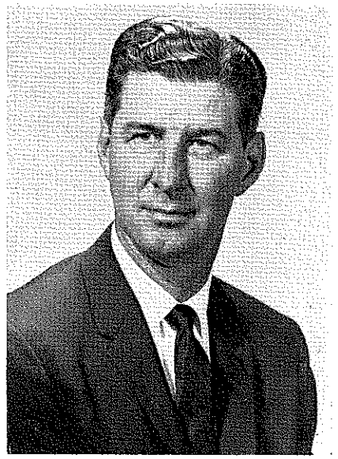
Bentonite In Industry*

By FRED CHISHOLM



FRED CHISHOLM

THE AUTHOR

Fred Chisholm was born in Mississippi, but has lived in Texas all but 10 years of his life. He graduated from Hardin-Simmons University in 1936 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 Magnet Cove Barium Corp. as chief chemist, and he 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.

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 1,250,000 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 1898 the name bentonite originated to designate the material from 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 consists largely of montmorillonite clay, a name proposed in 1847 for a plastic clay found in Montmorillon, France. Bentonites are defined as fine-grained clays containing not less than 85 per cent montmorilloite. 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 properties and carries calcium as its principal exchangeable ion. There are many intermediate gradations. Thesodium bentonites are preferred for drilling mud and the calcium bentonites for various oil refining purposes. Both types are used as a binder in molding sands.

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 intermediate grade approaching, but not equalling, the western or Wyoming bentonite. In the spring of 1959, it was reported that a rich deposit of betonite was discovered in the Orange Free State of Africa. It is

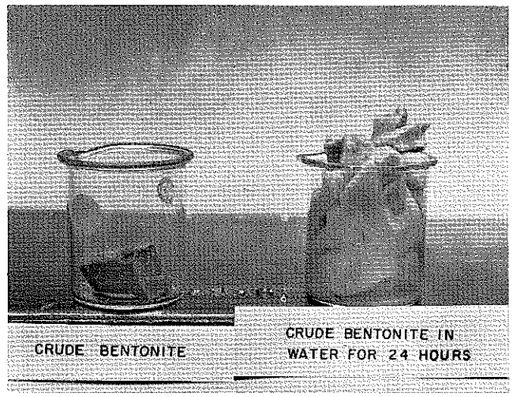
▼ Cat and Can stripping operations at Magnet-Cove Barium Corp.'s bentonite mine near Greybull, Wyo. About 35 feet of overburden must be removed to reach the barite. (Photo courtesy Riverton Ranger)

said to be of a higher quality than the Wyoming-type mineral, but this has not been confirmed.

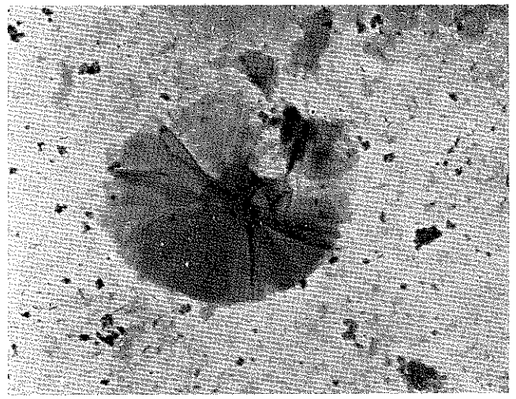
Properties of Bentonite

The montmorillonite group of clay minerals is one of the most widely occurring of all mineral materials, and, likewise, the group contains minerals of widely varying chemical composition. The exchangeable ions are usually calcium or sodium with calcium predominating. The dominance of calcium in most montmorillonites is due to its widespread availability and its preferential fixation where the ion is available. These two bases produce rather different physical effects upon wetting. Calcium clays do not disperse readily, but instead break down to fine aggregates and give a minimum of material in permanent suspensions. On the other hand, sodium clays disperse to give permanent gel-like suspensions. Some calcium clay may be caused to give permanent suspension improvement by treatment with a sodium salt.

Western bentonite is usually light-colored, ranging from cream to olive green, and has a waxy luster which may become dull or powdery upon drying. Bentonites of the western or Wyoming-type are most readily recognized for their ability to swell when placed in water. The increase in volume may be as much as 10 to 15 times the original volume (Figure 1).



▼ Figure 1. Bentonite swelling illustration.



▼ Figure 2. Photomicrograph—Wyoming bentonite, 25,000 X.

A greatly magnified particle of Wyoming bentonite appears similar to a fan or a deck of cards (Figure 2). When a particle is placed in fresh water, the water enters between the micaceous bentonite platelets and separates them. 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.

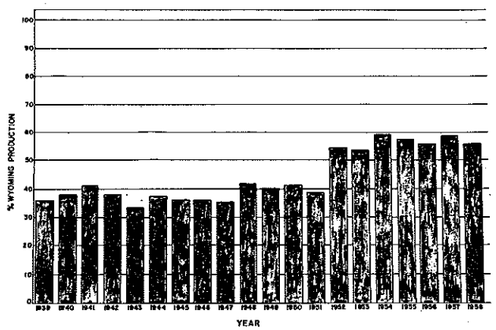
An understanding of the swelling of western bentonite is complicated by the fact that it is not a pure substance, has no definite chemical composition, and

BENTONITE PRODUCTION AND INDUSTRIAL USES

YEAR	TOTAL TONS	PRODUCTION BY STATES *					INDUSTRIAL USES		
		WYOMING	MISSISSIPPI	TEXAS	SOUTH DAKOTA	OTHER STATES	FOUNDRIES AND STEEL WORKS	DRILLING MUD	OTHER USES
1939	219,720	76,133	–	18,132	31,328	93,927	53,872	35,880	129,968
1940	251,022	91,716	–	14,299	40,481	104,426	76,135	45,396	131,601
1941	354,028	145,574	–	11,593	57,129	139,722	–	–	354,028 **
1942	274,567	109,410	–	17,651	88,149	129,757	169,384	48,912	176,671
1943	480,202	159,252	–	25,078	124,528	171,344	181,412	68,841	229,949
1944	546,768	196,138	–	24,081	169,992	156,656	182,410	121,237	243,121
1945	573,998	199,392	–	24,500	178,374	171,828	163,907	162,418	349,673
1946	601,429	212,530	–	21,576	186,707	180,615	165,064	231,252	205,132
1947	763,889	259,084	–	18,628	186,450	299,727	205,920	237,913	320,056
1948	921,160	382,815	–	29,926	186,701	321,118	226,799	330,395	347,366
1949	867,243	350,644	–	27,598	137,376	351,625	178,867	315,083	375,293
1950	973,825	394,929	–	24,574	192,593	361,729	251,716	257,315	364,902
1951	1,218,868	465,254	–	28,425	246,585	468,604	282,753	460,261	475,854
1952	1,317,979	693,853	–	31,286	205,934	387,806	322,746	705,280	289,953
1953	1,269,971	670,756	189,311	47,887	205,303	156,814	367,056	585,372	329,542
1954	1,278,793	742,403	180,554	109,744	–	244,642	296,909	548,200	433,796
1955	1,480,208	825,810	224,952	155,126	–	272,415	419,152	595,471	465,582
1956	1,370,510	847,206	219,316	160,723	–	343,405	408,299	428,146	534,065
1957	1,450,867	822,163	220,313	126,635	–	281,756	367,833	556,889	526,145
1958	1,291,414	702,237	177,041	121,106	–	291,030	361,799	425,621	503,994

* From Bureau of Mines Minerals Yearbooks ** Distribution Not Determined All Figures Shown in Short Tons

▼ Figure 3. Bentonite production and industrial uses (1939-1958).



▼ Figure 4. Wyoming bentonite production (percent of total, 1939-1958).

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

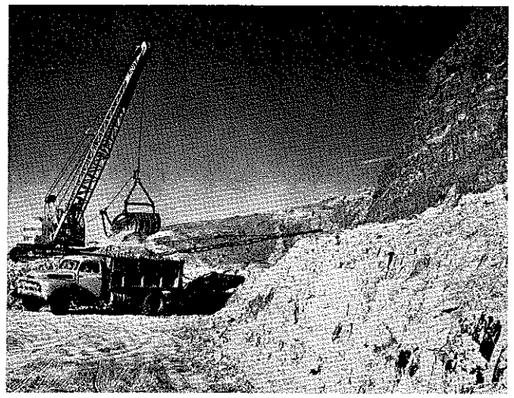
Following the original production of bentonite in Wyoming in 1888, an average of 60 tons per year were produced until 1896. In 1902, production increased to 1,200 tons annually, and by 1919 production was still below 1,500 tons per year. In 1925, production was reported as 14,850 tons; in 1930, 82,593 tons; and in 1939 reached in 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 well over a million tons per year (Figure 3). Since 1952, Wyoming alone has produced 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 $14 per ton in carloads, f.o.b. mill, for 200 mesh material in bags. The average price of all shipments as reported by the Bureau of Mines was $11.86 per short ton in 1958, compared with $12.27 in 1957.

The processing of commercial grades of western bentonite is relatively simple with the basic steps involving mining, drying, grinding and packaging. As mined (Figures 5 and 6), the mineral contains approximately 30-42 per cent moisture, which has to be re-

* Address at the Wyoming Mining Association Convention, Jackson Lake Lodge, Wyo., June 10-11, 1960.

▼ Figure 5. Bentonite mining pit.



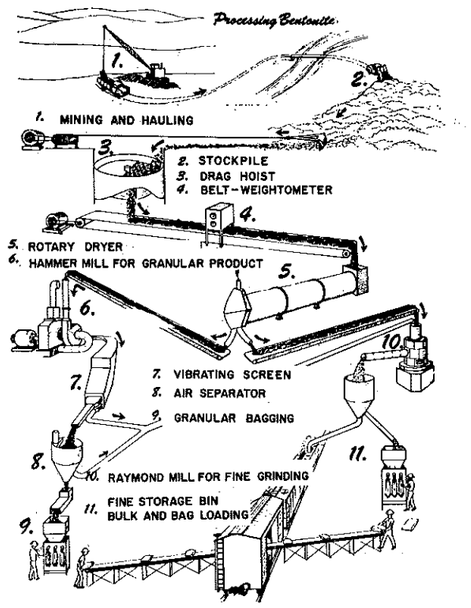
▼ Figure 6. Loading truck with bentonite at mine.

moved by artificial drying down to 10-12 per cent to make fine grinding possible. The most widely used commercial form is the 200 mesh product, but bentonites are also produced in granular sizes.

Clay from the stockpile (Figure 7) is normally fed through a slicer or hammermill, carried by conveyor belt to a rotary dryer, and then to dry storage for the grinding stage. Raymond roller mills are widely used to pulverize the dry clay, and cyclone dust collectors extract the 200 mesh product and deposit it in a product bin. Hammermills and screens are used to produce the various granular sizes of product. Valve-type bagging machines or bulk loading apparatus are used for loading product for shipment to bentonite users.

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 mud 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.



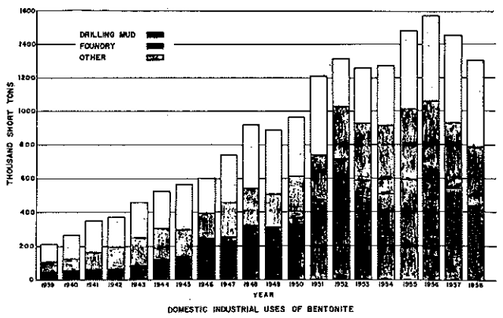
▽ Figure 7. Processing bentonite—flow diagram.

Oil Well Drilling Mud

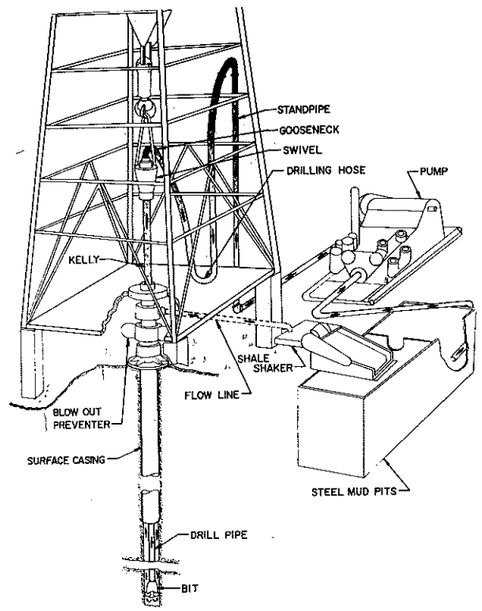
Mud as a business is little known outside of specialized fields. Mud is a general term for circulating fluids used in the rotary drilling of oil wells (Figure 9). In circulation it is pushed along by reciprocating pumps and flows in a continuous circuit from the mud pit to well bottom and back again. It travels down the inside of the drill pipe, is forced through the eyes of the bit with considerable pressure, and then surges back 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 wall the hole with a low permeability filter cake.



▼ Figure 8. Industrial uses of bentonite (1939-1958); drilling mud, bottom; foundry, middle; other, top.



▼ Figure 9. Mud circulating system in rotary drilling.

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 indentifies any drilling fluid with a continuous phase of water containing undissolved solids. These muds range in composition from a slightly dirty water to heavily weighted, chemically treated muds ranging in cost to as much as $30 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 unconsolidated surface sands and to seal formation pores. Drillers then began to improve their muds by adding clays or sub-bentonites dug at the surface near the well sites. A lot of difficulties were experienced with these early drilling muds due to their high filtration rate and high solids content. The water lost to the formation, because of this filtration, caused shales to swell and slough into the hole. The filter cake that the mud solids left behind on said formations built up sufficiently thick to stick the drill pipe. As a result, fishing jobs and loss of holes were common. Some areas were famous for their heaving shale, which seemed impossible to drill.

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, 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, hard formations may be encountered that will not disperse in the water to form a suitable mud. Under such conditions, it is frequently necessary to supplement formation solids with sufficient bentonite to obtain desirable mud properties.

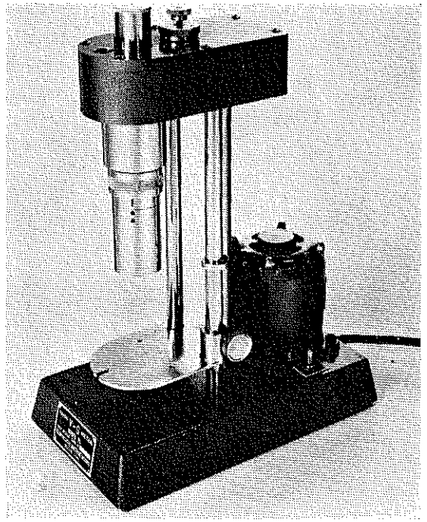
The first commercial use of western bentonite was tried in a California well in 1928. Almost overnight, bentonite was a success as it sealed the walls of the well bore and greatly decreased the fluid loss of mud, resulting in a thinner filter cake. The early practice of making muds with commercial clays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

In rotary drilling operations, the use of mud for almost 30 years remained more of an art than a science. As late as the 1920's, 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 when mud service companies put mud engineers in the field 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 and service companies. Mud engineers must be acquainted with a wide variety of mud materials and mud problems, and work at the well site to assist drilling crews. It is the job of the mud engineer to know the properties required for each mud system, to be able to make field tests, to determine the properties of mud, and to be able to recommend proper treatment. As a result of the efforts of mud engineers, oil men have recognized the value of good mud and to use it.

Fundamental studies on drilling fluids started in about 1910, with the first attempt to weigh mud being recorded in 1915. Viscosity was discussed in the industry for years, but it was not until 1931 that the Marsh funnel was adopted as the standard method of measuring viscosity in the field. A little later the Stormer viscosimeter came along and has been widely used. Until 1936, weight and viscosity were the only measurements made on mud. In that year, the first filter press was developed making it possible to check water loss and filter cake thickness. In the same year a sand content test was developed, and soon after it was recognized that alkalinity or pH was an important property of mud.

The API Code RP 29 identifies the standard tests for evaluating drilling fluids and also recommends procedures for testing drilling fluid materials. To test the performance characteristics of clays, the properties of moisture content, sand content, pH, yield and fluid loss are measured. Each of these properties has some significance, but for drilling mud use, yield and fluid loss are the most important. Viscosity measurements for yield determination are now more commonly made using a Fann direct indicating viscometer (Figure 10) developed in 1953, and fluid loss is determined by using a standard filter cell apparatus (Figure 11).

Yield is defined as the number of barrels of mud, having an apparent viscosity of 15 centipoise, that can be made from one ton of clay (Figure 12). This property is determined by preparing two suspensions of mud, one having a viscosity of just below 15 centipoise and the other slightly above 15 centipoise, and measuring the viscosity of each. The measurements are then plotted on semi-log paper, drawing a straight line through the two points. From the intersection of this



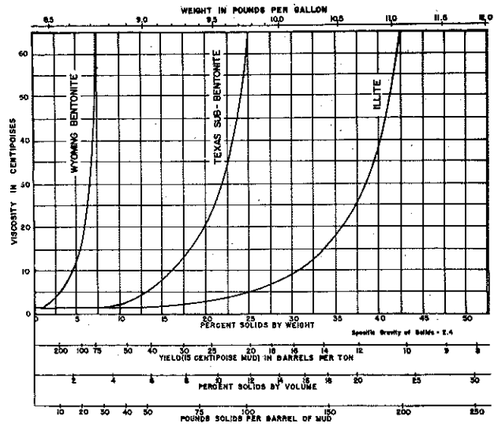
▼ Figure 10. Direct indicating viscometer.

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 (grams per 350 milliliters) of water required for a 15 centipoise mud is substituted in the formula:

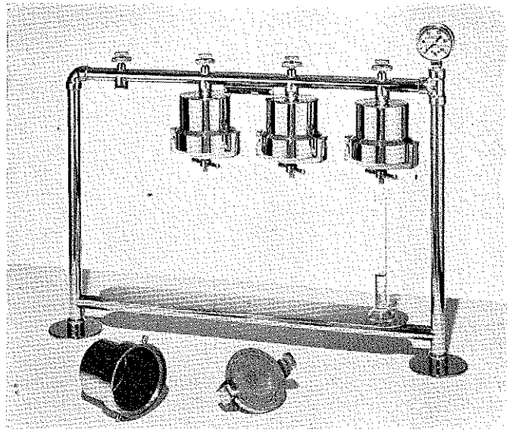
$$\text{Yield (as received in bbl/ton} = 2 + \frac{2000}{C}$$

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 about 16 per cent. This greater percentage decline in bentonite requirements is probably due to changes in drilling mud formulations. Drilling activity is still down but is expected to pick up slowly. This should have an attendant effect on bentonite sales.

Today oil men are devising new equipment and methods for drilling deeper in this country and



▼ Figure 12. Yield curves.



▼ Figure 11. Filter press.

abroad under widely diversified conditions. Improvement in drilling fluids is keeping pace with the oil industry's progress, and most of the limitations to drilling deeper wells are mechanical rather than mud limitations. Record depths below 25,000 feet have been reached and bottom hole temperatures have been recorded as high as 460° F.

Foundry

The foundry industry uses western bentonite primarily as a binder in a variety of molding sands. Some years ago, it was believed that all western bentonite had essentially the same qualities for foundry applications. More recently, it has been discovered that the purity of bentonites vary and that bentonite mined in different areas possesses properties that are somewhat different.

Green and dry compressive strengths are the industry's standards for evaluating the bonding power of bentonite and are the basic measurements made for determining the continued uniformity of bentonite shipments. It has also been suggested that a Marsh funnel viscosity be made 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 avoiding problems.

U. S. DRILLING ACTIVITY 1939 - 1959 •

YEAR	AVERAGE NO. OF DRILLING RIGS	TOTAL WELLS DRILLED	PERCENT DRY HOLES	TOTAL FOOTAGE OF WELLS DRILLED
1939	3683	25,987	24.62	–
1940	4193	28,124	23.55	–
1941	4406	29,070	24.01	–
1942	3041	18,151	30.47	–
1943	3041	17,884	35.70	–
1944	4190	23,106	30.34	–
1945	4387	24,667	30.29	–
1946	4353	26,991	29.82	–
1947	4741	30,842	31.16	114,061 ••
1948	4950	37,508	32.42	137,392
1949	4290	37,656	34.12	138,003
1950	4517	42,030	35.17	159,288
1951	4844	43,136	38.70	172,331
1952	4857	44,339	39.89	187,190
1953	4801	48,017	38.51	198,839
1954	4635	52,919	36.36	218,986
1955	4867	55,922	37.11	226,270
1956	4845	57,111	38.25	233,882
1957	4791	52,777	39.21	221,950
1958	4115	47,758	39.40	197,384
1959	4178	48,328	–	206,162

From Petroleum Facts & Figures – Centennial Edition 1959 – American Petroleum Institute
Thousands of Feet

▼ Figure 13. U. S. drilling activity.

Experience has shown that variation in sand can have considerable effect on test properties, so it is particularly important to conduct control tests using a standard sand. The standard green and dry compression tests call for a washed and dry round silica sand, known as 50-70 sand, where 95 per cent of the sand passes a No. 50 sieve and is retained on a No. 70 sieve.

For testing batch proportions, the sand and clay are mixed by hand and then put into a Simpson laboratory muller mixer and mulled for two minutes. Following this step, water is added, after which the batch is mulled for an additional four minutes. The mulled batch is discharged from the mixer and cores are immediately rammed into 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 blows in the AFA Standard Ramming Apparatus. 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 tests are averaged.

The uniformity of foundry sands depends upon the proper utilization of raw materials and the uniformity of the raw materials which make 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 oil well cements, physical and chemical tests are conducted on bentonite in accordance with procedures described in API Standard 10A. Specifications call for a sodium montmorillonite-type bentonite, which after drying and grinding but otherwise untreated in processing, conforms to the following physical and chemical requirements:

Moisture Content—12 per cent maximum

Dry Screen Analysis—100 per cent through U. S. Std. No. 40 sieve

Wet Screen Analysis—95 per cent minimum through U. S. Std. No. 325 sieve

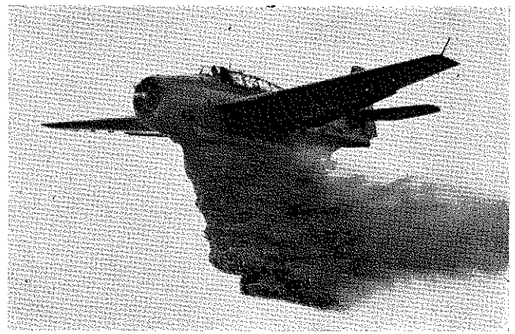
Sand Content—2 per cent maximum

Yield—90 bbl/ton, minimum (moisture content of sample as received)

pH—9.5 maximum

Filtration Properties—15.0 ml, maximum and 2/32 in. cake thickness for 15 cp. mud sample (viscosity shall be determined in a Stormer-type viscosimeter).

Performance requirements for bentonite used in oil well cements specify that when a Class A Portland cement slurry containing 8 per cent bentonite is mixed with 88 per cent water, the consistency of the slurry within the 15-30 minute test period shall not be more than 20 poise higher than a neat slurry (without bentonite) of the same cement mixed with 46 per cent water.



▼ Figure 14. Fire retardant bentonite slurry drop.

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 effectiveness of water in stopping the progress of fire by placing it on vegetation just ahead of the fire line. Research on the project started in 1954, and the most widely used chemical for this purpose has been calcium sodium 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 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. When any forest fuel is treated with bentonite slurry, the water in the slurry must be driven off as water vapor before the vegetation can be heated to its ignition temperature. If the heat energy of the advancing fire front is insufficient to drive off all the water, the fire's spread will be stopped.

In order to be effective, the wetted area must be sufficiently wide to prevent the fire from breaking through, and, in most cases, a width of 40 to 50 feet is required to accomplish this objective. A surprisingly small amount of slurry placed at the right spot on the fire line is very effective at stopping a fire. Aerial tankers are used to drop the slurry, from an elevation just above the trees, about 100 feet in front of the fire line.

Bentonite meets several requirements of the ideal fire retardant: it is comparatively low in cost; provides a good drop pattern; penetrates the vegetation canopy satisfactorily; coats different fuel types well; and, is non-corrosive, non-abrasive, and non-toxic.

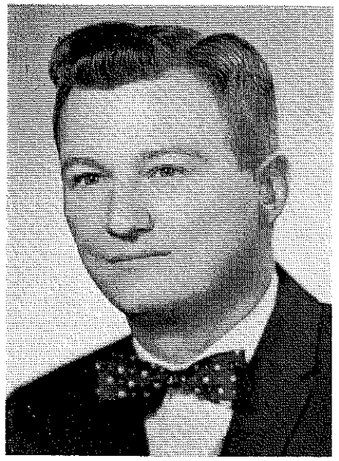
Other Uses

A considerable tonnage of bentonite is employed annually to seal irrigation ditches, earthen works and dams. Bentonite's high water adsorption and low permeability make it the very best material available for this application. Properly applied as a blanket, or when mixed with soil, and contacted with water, it swells to fill the tiny voids in porous ground or sand formations, reducing the normal water seepage. One pound of bentonite per square foot of area is usually adequate to correct a normal water seepage problem.

(Continued on page 42)

Uranium Concentration At Susquehanna-Western, Inc.*

By J. E. QUINN, '48



JAMES E. QUINN

In the years 1957 and 1958, the uranium boom in the United States reached its peak in the state of Wyoming. Sufficient ore had been developed in this state to justify the installation of additional concentrating mills. Early in 1958 agreement was reached between the United States Atomic Energy Commission and Fremont Minerals, Inc., for the installation of a 550 ton per day uranium milling plant at Riverton, Wyo., for treating custom ore.

Since the commencement of operations the company's name has been changed to Susquehanna-Western, Inc. This more closely affiliates the operation to the parent company, The Susquehanna Corporation, with main offices in Chicago.

Construction of the new custom mill commenced in February, 1958, and the mill went into operation on Nov. 28, 1958. General contractor was the Western Knapp Engineering Co. of San Francisco. Mill design was under the direction of H. L. Hazen, consulting metallurgist for Susquehanna-Western, Inc., and John White, now chief engineer for Susquehanna-Western, Inc.

General

The purpose of the mill installation was to provide a market for the many ore producers in the Gas Hills, Pryor Mountains, and Riverton, Wyo., areas. In view of the large number of shippers and the varied types of ore it was essential that the milling process be flexible to efficiently process virtually all types of ores in the district.

Preliminary metallurgical studies showed that a "two-circuit mill" with both "acid" and "carbonate" circuits was required to provide the necessary flexibility. This two-circuit mill essentially allowed for processing ores containing less than 6 per cent lime on the acid side and greater than 6 per cent lime on the carbonate side. It provided the added metallurgical advantage of being able to use a portion of the pregnant carbonate solution for stripping solution in the solvent extraction process on the acid side.

The company erected a 100 ton per day sulphuric acid production plant at the mill site in order to take care of their own sulphuric acid requirements and the requirements of other mills operating in the district.*

* This article appears here with the permission of the DECO TREFOIL (Denver Equipment Co. publication), in which it was published in the May-June-July 1959 issue.

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 heads the company's world-wide Uranium Processing Equipment Sales Division.

A native of Denver and a 1943 graduate of a Denver high school, Mr. Quinn served a quick hitch in the Navy before enrolling at the Colorado School of Mines. Soon after his graduation from Mines, he joined Denver Equipment Co. as an engineer in the Pricing and Estimating Division. Subsequently he gained experience in the Export Sales and Domestic Sales divisions. Last year he was promoted from field engineer in the Western Division to Western Division manager.

Location

The mill installation is two miles west of Riverton, approximately one mile off Wyoming State Highway 789. Riverton is a town of 6,000 people, is at an elevation of 5000 feet and is largely supported by agriculture, uranium mining operations, and oil and gas production. In addition it is well known for excellent hunting and fishing.

The mill location was selected near the town due to its central location to the mining areas and in view of the readily available sources of power and water. Equally important is that the town provides the necessary mill personnel and eliminated the need for the erection of housing facilities and transportation of workers.

The mill and acid plant installation employs 103 people, each working 42 hours per week. This, of course, has proved to be a valuable help to the economic growth of Riverton.

Mining

The mill is operated on a 100 per cent custom basis. Ore is received from approximately 25 shippers in the area. Normally, amenability tests are run on the ore in advance of shipment to the mill so the mill operators will know in advance as to the type of ore to expect.

* This has been increased to 200 tons of sulphuric acid per day by recent additions to the original plant.

The amenability tests confirm that the ore can be processed by the mill and provide a basis for blending. The amount of lime present, the grindability, type of mineral, availability and other factors are used to determine whether the ore will be treated in the carbonate or acid circuit of the mill.

Most mining in the area is from open pits. The ores average 0.23 per cent U_3O_8 and contain an average of 6 to 7 per cent moisture. Depending on the time of year and the mine location, the moisture content will vary from 4 per cent to 15 per cent.

Ore as received at the mill is stockpiled until a 200 ton lot is accumulated. Grab samples are taken from the trucks on arrival to determine moisture content.

Crushing and Sampling

The crushing and sampling plant is operated on the eight-hour day shift only. It has a capacity of 150 tons per hour. Ore from the 200-ton lot is moved to the coarse ore bin by a 2½ yard front end loader; 12" ore passes through a grizzly and is conveyed to the 4' x 8' vibrating screen ahead of the impact crusher. The screen removes the —1½" material and the +1½" material is crushed in open circuit to a —1½" product in the 30" x 42" double impeller impact breaker equipped with two 75 HP motors.

The impact crusher was selected due to the sticky nature of the ores. Before installation it was modified to enable the operator to keep the ore from building up on the end walls. The unit has performed very well to date. The rotors are hard faced each day with alloy welding rod.

The —1½" product is conveyed to a sampling plant which takes a 10 per cent primary sample and provides for secondary samples and intermediate crushing between samples.

The secondary sample is dried to less than 5 per cent moisture on a company designed steel belt dryer. The material passes to a 5" x 6" Denver Type "H" Jaw Crusher which produces a —¼" product. A 20" Vezin Sampler takes a third-stage or final sample of 5, 10, 15 or 20 per cent as desired.

Vibrating screens remove the fines ahead of all stages of crushing. To date, ores containing up to 12 per cent moisture content have been readily processed. When the moisture exceeds 12 per cent, additional labor is required to process the material through this section of the plant.

All rejects from the sampling plant are sent either to the fine ore bins, or to a truck hopper for diversion to a stockpile, if desired. The sampling equipment is thoroughly cleaned between lots. All sample cutters, chutes, crushers, screens, and feeders are designed for ease of cleanup.

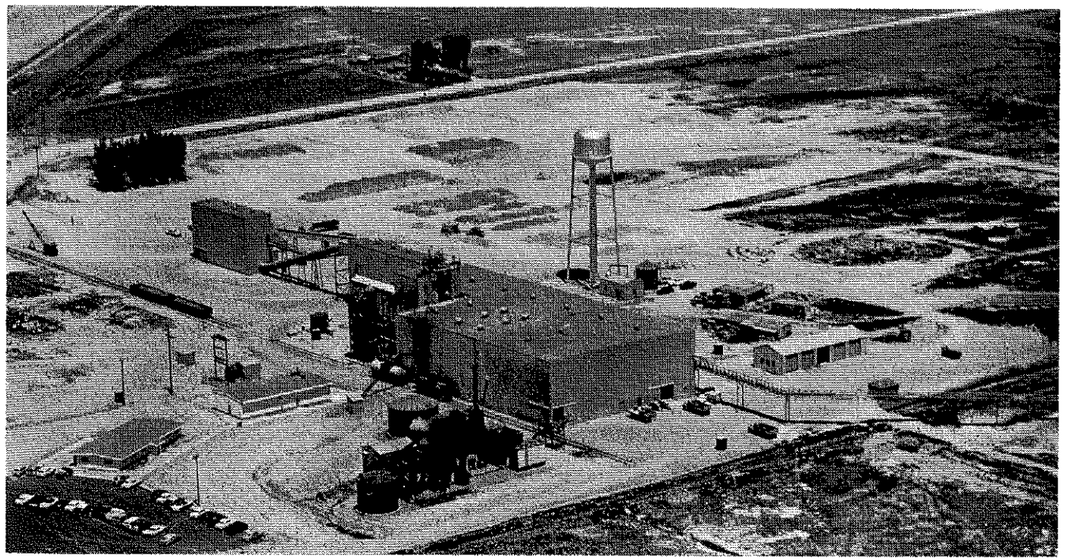
Dust is controlled in the crushing and sampling plant with a chemical compound spray system with spray nozzles located at transfer, grizzly, and screening points. The dust control system is used only when ore is dry.

Sample Preparation—The final sample weighing at least 150 pounds per ore lot is delivered to the sample preparation room where it is crushed through a No. 2 Denver Cone and Ring Crusher to 10 mesh. The sample is mixed thoroughly and passed over a Jones Type Splitter to produce a 10 lb. sample. The 10 pound sample is dried for 24 hours at 110 degrees C. After cooling, the sample is ground to —35 mesh in a pulverizer and blended for 20 minutes in a blending machine. The sample is again cut to 2 lb. with a Jones Type Splitter.

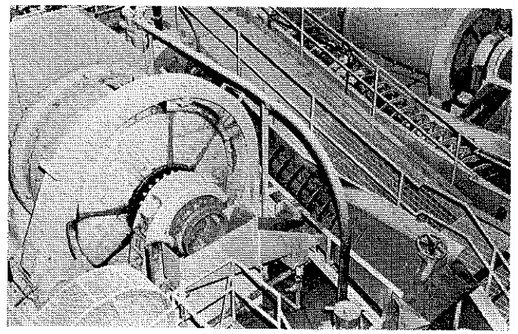
The 2 lb. sample is further pulverized to minus 120 mesh, blended by rolling and six ounce samples prepared for distribution per contract.

Fine Ore Storage—Crushed ore is stored in three conical bottom specially designed ore bins, each having 250 tons live storage capacity.

The bins are discharged with 36" wide belt feeders equipped with variable speed gearmotors. The belts ride on steel plates instead of idlers which allows the



▼ Aerial view of Susquehanna-Western, Inc. uranium mill with main office building in left foreground. Between office and main mill building is the laboratory. Sulphuric acid plant is in center foreground while crushing plant is at upper left.



▼ General view of carbonate and acid plant grinding circuits. In foreground 7′ x 5′ Denver Ball Mill is operated in closed circuit with a 10″ cyclone. A spiral classifier removes tramp oversize ahead of cyclone. The 4′ x 8′ Denver Rod Mill in background discharges to a spiral classifier (not shown) for tramp removal ahead of leach section.

operators to maintain tight contact between the belt and the hopper skirts, thus virtually eliminating leakage around the sides of the belt feeders.

The bottom discharge hoppers have tapered openings. This, combined with the wide belt feeders, allows for handling the moist ore without experiencing difficulty in feeding or having the material "hang up" in the bins.

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

One bin furnishes ore to the acid section and the other to the carbonate section of the plant. The third bin is designated with two discharge feeders to send ore to either the acid or the carbonate circuits.

Acid Section

Grinding—The 1½″ crushed ore is fed to a 4′ x 8′ Denver Rod Mill equipped with a 60 HP motor. The mill discharge flows to a 24″ Spiral Classifier for tramp removal. The classifier overflow containing 30 to 40 per cent +35 mesh is pumped at 55 per cent solids direct to an automatic sampler for mill heads.

Mill feed to the acid circuit at the present time, because of contract commitments, is running between 450 to 500 tons per 24-hour day. It is only desirable to grind the ore to grain size for efficient leach extraction in the acid circuit.

Waste steam from the sulphuric acid plant is used to heat the rod mill dilution water to 130 degrees F. which assists in the subsequent leaching of the uranium.

Leaching—Slurry from the grinding circuit at 55 per cent solids and 30 to 40 per cent +35 mesh is leached in four only 16′ x 16′ Denver Heavy Duty Agitators equipped with 60″ diameter Denver Turbine Type Propellers. Each unit is equipped with a 20 HP motor and operates at 67 RPM. Shafts and propellers are rubber covered. Tanks are of 4″ wood and 8′ diameter rubber covered wearing pads are used on the tank bottoms.

Leach extraction is in excess of 94 per cent Concentrated sulphuric acid at the rate of 100 to 150 pounds per ton of head feed is added to the No. 1 agitator. A continuous reading pH meter controls the acid addition to maintain a pH of 0.7 in the No. 4 agitator.

Solid chlorate is added as an oxidant to the No. 1 agitator at an average rate of 3 pounds per ton of head feed to maintain an EMF of 450 millivolts for proper extraction.

Examination of the 60″ propellers after six months operation indicates no wear to date.

Classification and Thickening—In general a sand-slime separation is made in a 10″ cyclone on the leach agitator slurry with the + 150 mesh sands being washed counter-current in four 10″ rubber-lined cyclones at 15 PSI inlet pressure and the —150 mesh slimes washed CCD in four 40′ x 10′ thickeners. This circuit is clearly illustrated on the flowsheet drawing. The overflow from the cyclones and thickener underflows are combined to wash the sand and slime most efficiently. Approximately 150 GPM of fresh water is added to the No. 4 cyclone feed pump as wash water. Water addition is controlled by a flow-meter.

The 40′ x 10′ thickeners have rubber-covered shafts, rake arms and discharge cones. Rake blades and feed well are stainless steel 316. Wood tanks are utilized with polyethylene tubing and sheets to protect the hoops and lugs.

Four 4″ Duplex Model "E" Denver Adjustable Stroke Diaphragm pumps are used to meter the thickener underflows. These units have rubber covered bowls, molded rubber diaphragm and valve seats and stainless 316 exposed hardware. Each diaphragm pump discharges at 35 per cent solids into a 4′ x 5′ Denver Repulping Agitator where it is mixed with the overflow from the proper thickener and cyclone underflows for best CCD washing. The repulpers break up slime floes and prevent solution entrainment and thereby provide better washing efficiency. The repulpers discharge to the respective thickeners.

At the present tonnage rate of 450 to 500 tons per day the soluble loss in the thickener circuit is high. Due to plant limitations it is not possible to utilize additional wash water to reduce the soluble loss. When operated at design tonnage of 275 tons per day, the soluble loss runs less than 1 per cent.

Separan is added to each stage of thickening. Total consumption is 0.2 pounds per ton of head feed. Under normal feed rates the separan consumption would be lower. Experimental work is being conducted using less expensive glue as a settling agent.

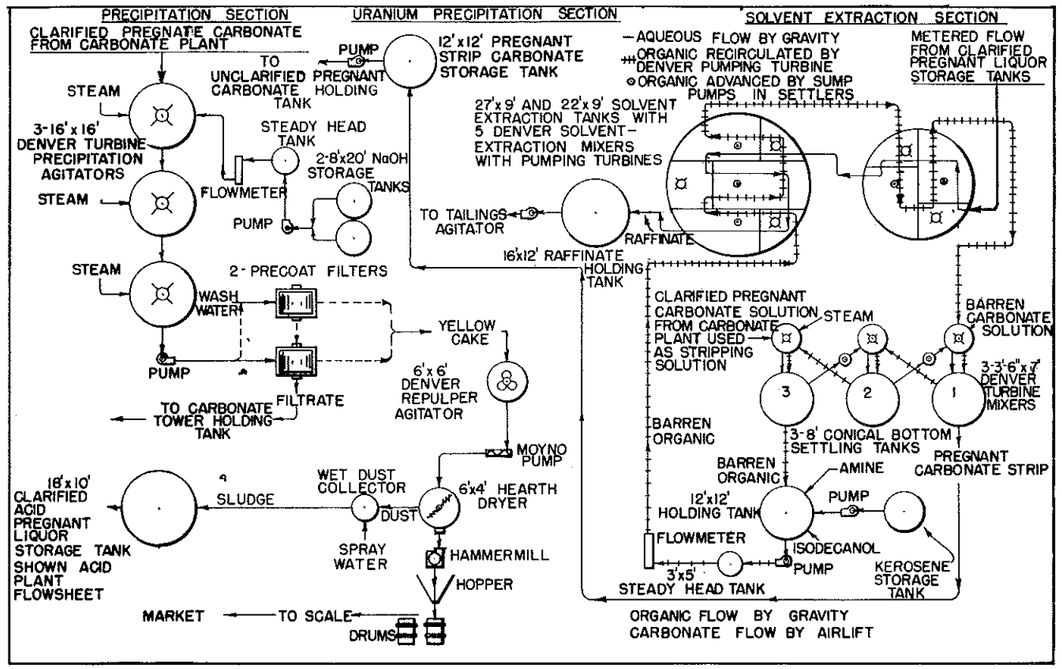
This sand-slime circuit is important as it deviates from the conventional practice of using mechanical classifiers on coarse sand. A large saving in initial installation costs resulted from the installion of cyclones and pumps. To date, maintenance for the entire CCD washing circuit has been less than 10 cents per ton of ore milled and the operation has been completely satisfactory.

Underflow from the No. 4 thickener and the underflow from the No. 4 cyclone are sent to final tailings. The overflow from the No. 1 thickener is uranium pregnant aqueous containing 1.0 grams U_3O_8 per liter and is sent to an 18′ x 10′ holding tank.

Solvent Extraction Recovery System

Unclarified pregnant aqueous is pumped through a precoat filter and stored in the 18′ x 10′ clarified liquor storage tank as feed to the solvent extraction circuit. The solvent extraction circuit uses the latest amine process.

Basically, the solvent extraction process consists of properly mixing the uranium pregnant aqueous solution with an amine-decanol-kerosene mixture termed organic. The organic has greater affinity for the uranium than the water solution and picks up the uranium from the solution. The mixture of organic and aqueous flows to a settling chamber where the organic, being



lighter than water, rises to the top. This is known as the extraction circuit and transfers the values from a large volume flow to the smaller volume of organic.

The organic, which now contains the uranium values is mixed with a portion of the clarified pregnant carbonate solution from the carbonate plant containing 3 to 4 grams U_3O_8 liter. The sodium carbonate has a greater affinity for uranium than the organic and picks up the uranium. Barren carbonate solution containing 4 grams/liter excess caustic is added to the No. 1 strippers to maintain 9.0 pH. This is referred to as the stripping cycle. The mixture flows to a settling tank and again the organic, being lighter, rises to the top. This separation produces a barren organic for recycling and a high grade pregnant carbonate solution containing 12 to 15 grams U_3O_8 per liter.

The organic used in the solvent extraction process is a mixture of Tri Fatty Tertiary Amine with Iso Decanol and high flash point kerosene in volume ratios of 3 per cent, 3 per cent and 94 per cent. Organic loss is less than ½ gallon per 100 gallons of pregnant aqueous treated. Uranium recovery is 99.9 per cent. The raffinate assays less than 0.001 per cent U_3O_8.

The extraction is performed in five stages. To accomplish this with minimum expenditure in acid proof piping, valves, etc. a 27′ x 9′ deep wood tank and a 22′ x 9′ deep wood tank are utilized. These tanks are partitioned off with three mixer-settler chambers in the larger tank and two each in the smaller tank. The staves of the tanks are drilled for water circulation to prevent kerosene from drying out the wood.

The pregnant aqueous amounting to 150 GPM flows through the tanks by gravity. The organic flow of 40 GPM is advanced by PVC lined pumps inserted in the settlers.

In operation it is desirable to recirculate up to 200 GPM of organic within the mixer chambers. In preference to the use of expensive pumps, the Denver Turbine Mixers were designed with special lower pumping turbines to recirculate the organic at little additional cost and horsepower consumption. The sketch illustrates how the recirculation was accomplished.

In actual operation it has been found best to operate the first two extraction mixers "Aqueous Continuous" within the mixers. This means a greater ratio of aqueous as compared to organic and results in an aqueous-free organic overflow from the No. 1 settler.

On the same basis the No. 3, 4, and 5 extraction mixers are operated "organic continuous" within the mixers. This means a greater ratio of organic as compared to the aqueous and results in a more organic-free aqueous (raffinate) discharge from the No. 5 settler to tailings.

Five Denver Vertical Turbine Solvent Extraction Mixers of stainless steel 316 with two 10 HP, two 7½ HP, and one 5 HP motors are installed in the mixing chambers of the extraction section. The horsepowers are different as the liquid level in each of the compartments varies due to the gravity flow of pregnant aqueous. Power input is approximately ½ HP per 100 gallons of mixer volume. Each settler provides 1½ square foot settling area per gallon per minute of pregnant aqueous.

The stripping section consists of three stages of mixers and settlers. The mixed tanks are 3′-6″ diameter by 7′ deep. The mixers are of stainless steel 316 and the tanks are PVC lined.

The settlers are 8′ diameter conical bottom tanks. The 40 GPM pregnant organic containing approximately 5 grams U_3O_8 per liter flows by gravity

through successive stages while the carbonate stripping solution, amounting to 10 GPM, is airlifted counter-current to preceding stages. One square foot of settling area per gallons per minute of combined pregnant organic and carbonate flow is used. Steam is added to the first stage of stripping to a temperature 120 degrees F. which gives better phase separation in the settler.

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

Once each week the assayer analyzes the barren organic solvent returning to the 12′ x 12′ organic 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 solvent returning to the holding tank.

The pregnant carbonate strip from the No. 1 settler in the stripping circuit contains 12 to 15 grams U_3O_8 per liter and is pumped to the 12′ x 12′ storage tank ahead of precipitation. The aqueous tailings termed raffinate from the No. 5 extraction settler is pumped to waste.

Carbonate Plant

Grinding—The $-\frac{1}{2}$″ crushed ore is fed to the 7′ x 5′ Denver Overflow Ball Mill at a rate of 250 to 300 tons per day. The ball mill is operated in closed circuit with a 10″ cyclone with 7 psi intake pressure. Tramp oversize is removed from the cyclone feed by 24″ Spiral Classifier.

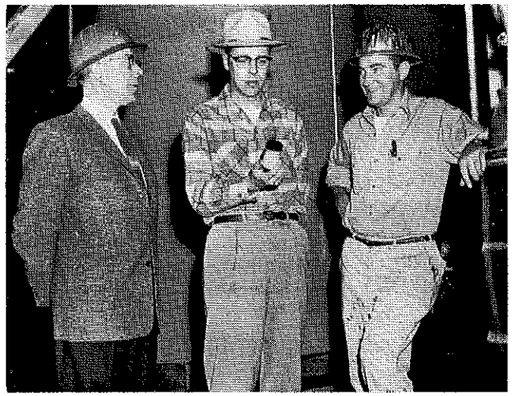
Thickening-Leaching—The ground product averaging 10 per cent + 65 mesh is pumped to a 50′ x 12′ Denver Thickener for dewatering ahead of the Pachuca leach section. Overflow carbonate solution from the thickener is used in the ball mill to avoid dilution with water.

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

The carbonate leach section consists of three 15′ diameter by 62′ 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 cyllindrical 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 below the conical bottom.

The center air-lift pipes are jacketed and steam from the sulphuric acid production plant and boiler plant is added to maintain 180° temperature in pulp. Compressed air is added to the center air lift, plus two oxidizing liners down the tank sides to the tank bottom. Air is also added to the bottom of the cone to assist in maintaining solids suspension. Additional air taps are provided in the conical section for assist in start-ups if necessary. Tank elevations are staggered 1′ for gravity flow between tanks. A copper ammonia reagent feeding system is used when oxidizing is required for extraction.

Filtering—Slurry discharge from the No. 3 Pachuca tank flows by gravity to a 12′ x 12′ heat exchanger holding tank equipped with a Denver Turbine Type Agitator. The tank sides are jacketed and used to preheat fresh mill water. This also cools the slurry to 150° and prevents "flashing" in the vacuum system of the filters.



▼ Yellow cake production is examined by Allen D. Gray, '52, president; G. H. Bryant, '53, mill superintendent, and A. W. Runge.

Slurry from the holding tank is split to the two counter-current filter sections. Each section includes three only 11′-6″ diameter by 12′ face rotary drum filters for three stage filtration.

Each filter is equipped with a 2 HP repulper and slurries between stages are pumped to the 6′ x 6′ Denver Turbine Type Agitator holding tanks which even out the flow between filter stages. Steam is added to these 6′ x 6′ Agitators to maintain 150° slurry temperature.

Separan is added to each stage of filtration at a total rate of 1.0 pounds per ton of head feed in order to flocculate the slimes and improve filter rates. Here again specific types of glue are being tested to reduce the flocculating agent cost.

The filtrate from the No. 1 stage of filtration contains 3 grams U_3O_8 per liter and is sent to the 12′ x 12′ unclarified pregnant carbonate storage tank. Filtrate from the No. 2 stage of filtration is stored in a 12′ x 12′ holding tank used to dilute the feed to the grinding circuit and to dilute the feed to the dewatering thickener ahead of the Pachuca circuit as required. The filtrate from the No. 3 stage of filtration is stored in a 12′ x 12′ holding tank and used as wash solution and dilution on the No. 1 stage of filtration and repulpers.

Wash and dilution solution for the No. 2 stage of filtration is the barren carbonate solution from the carbonation tower.

Solution from the vacuum system moisture traps and condensate trap plus fresh make-up water are used as wash and dilution water in the No. 3 stage of filtration.

The filter cake contains 25 per cent moisture and 20″ of vacuum is maintained. Nylon 120 filter cloth has been found most satisfactory. The filter grids are of hard rubber and stainless steel banding wire is used to resist corrosion.

The repulped filter cake from the No. 3 filtration stage is sent to final tailings. Overall plant recovery in the carbonate section varies between 92 and 94 per cent.

A double moisture trap system with an intermediate condensor is used to protect the three (1 standby) 60 HP vacuum pumps. Cold water is added to the condensor to condense any steam drawn from the filters.

Precipitation

The filtrate from the No. 1 filtration stage is the unclarified pregnant carbonate containing 3 grams U_3O_8 per liter. It is pumped through the precoat clarifying filter and stored in the 12′ x 12′ clarified pregnant carbonate tank ahead of precipitation.

Addition of the pregnant carbonate solution and the pregnant carbonate strip solution containing 12 to 15 grams U_3O_8 per liter from the acid plant solvent extraction section to the No. 1 precipitation tank is controlled by flowmeters and the combined flows will average 4 grams U_3O_8 per liter and amount to 65 GPM.

The precipitation section consists of three 16′ x 16′ Denver Vertical Turbine Agitators operating in series and equipped with steam coils to maintain 160° F. temperature of solution. Caustic is added to the No. 1 unit to 4 grams per liter excess and the uranium (yellow cake) precipitation takes place.

The uranium precipitate is pumped through one of two precoat filters and washed with fresh water. Barren filtrate and wash water are sent to the 12′ x 12′ holding tank ahead of the recarbonation tower. Moisture content in the filter cake is 50 per cent. The cake is repulped in a 6′ x 8′ Agitator and pumped to the 54″ diameter 6-hearth dryer where all moisture is evaporated. Dust 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 yellow cake assaying 78 per cent U_3O_8 is crushed in a hammer mill to $-\frac{1}{4}$″, packed in drums, sampled by augers, weighed and shipped to market.

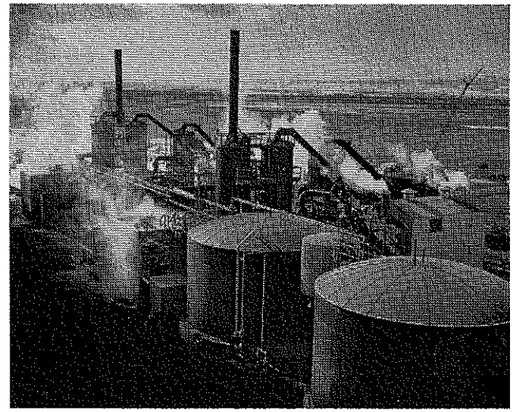
Carbonation Tower—The barren solution after precipitation contains 4 grams per liter of caustic (NaOH). If this solution containing NaOH were reused in the grinding circuit the presence of caustic would precipitate uranium in the grinding and leaching stages which of course would be undesirable. Therefore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

The carbonation tower is approximately 7′ square and 52′ high. The barren solution is introduced at the top and cascades over baffles downward. Waste CO_2 boiler flue gas is passed upward through the tower and reacts with the barren solution to change the caustic (NaOH) to sodium carbonate (Na_2CO_3).

In the Pachuca leaching section of the plant dissolution of uranium in the carbonate solution produces some caustic. Consequently, 10 to 15 grams per liter of sodium bicarbonate must be produced in the carbonation tower as the bicarbonate will then react with any caustic formed during uranium dissolution and convert it to sodium carbonate. The bicarbonate is produced by passing an excess CO_2 through the solution in the carbonate tower.

Tailings

The cyclone underflow and thickener underflow from the acid plant are combined with the No. 3 stage repulped filter cake in an 8′ x 8′ Denver Turbine Agitator. The slurry is sampled and pumped to the tailing pond at 40 per cent solids by a 5″ x 5″ Denver SRL Pump. The tailings pond is 500′ from the plant, and consists of a man-made dam. No overflow results due to evaporation. If any water percolates from the pond it is picked up in a nearby shallow well and pumped back as mill water.



▼ Sulphuric acid production plant, using contact process, furnishes acid for company mill and for other uranium processing mills in the district.

Water

Mill water is supplied at the rate of 250 GPM from a 400′ deep well with a 60 HP pump and 150 GPM from a 60′ shallow well with 10 HP pump. Water is pumped to a 30,000 gallon storage tank. Low pressure and high pressure water lines are available in the mill.

A 125,000 gallon 100′ 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.

Power

Power is delivered to the mill site by the Pacific Power and Light Co. and transformed to 3-phase, 60-cycle, 440 volts. Average rate is 0.9c per KWH and consumption averages 66,000 KWH per month.

Boilers—Compressors—Vacuum Pumps

Steam for the plant is furnished by two 150 HP, 125 psi horizontal fire-tube boilers.

Vacuum used in the carbonate filter section is furnished by three 60 HP, 24″ x 11″ horizontal single cylinder units 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 74′ of concrete block construction. It includes lab offices, balance room, fluorometric room and concentrate room. The latest analytical equipment is installed.

Warehouse—Machine Shop

A 40′ x 35′ warehouse and 40′ x 70′ machine shop were erected at the mill site for servicing the plant and haulage equipment.

Mill Building

The main mill building is 70′ wide by 280′ long. It is of fabricated steel, two stories high with corrugated galvanized iron siding. The roof is light-weight concrete with 4-ply built-up roofing. Six 36″ diameter ventilators are installed in the roof.

An insulated mill office and mill lab is included. The mill is designed so that the entire mill operation from ore feeders to concentrate dryer can be seen from the office area. Adequate room is provided around

equipment for servicing. All tanks and pumps are below the main operating floor level.

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

H_2SO_4 Production Plant

As mentioned, the company owns and operates a complete H_2SO_4 production plant, using molten sulfur produced from sour gas. The contact process is used. Waste steam is utilized in mill circuits. This plant, rated at 100 tons per day capacity, furnishes acid for the mill and for other uranium mills in the area.

The following number of personnel operate the mill and H_2SO_4 acid plant. The mill and acid plant operate 24 hours per day and each employee averages 42 hours per week. Note, the company maintains its own construction personnel for various projects.

Mill and office staff	18 men
Crushing and sampling	12 men
Maintenance	12 men
Utility	12 men
Warehouse	3 men
Operation foreman	4 men
Operation and control	20 men
Product man	1 man
Mill trainee	1 man
Lab chemist and technician	5 men
H_2SO_4	8 men
Project crew	7 men
Total	103

The operating staff at Riverton is headed by Gerrett H. Bryant, '53, mill superintendent; Arthur Runge, manager of sales and ore procurement; Paul V. Bethurum, '54, mill foreman; C. H. Coleman, employee relations manager; R. F. Stoker, plant engineer; C. W. Lembke, chief chemist; A. W. Legard, maintenance superintendent, and Bill Logan, warehouseman. R. L. Beseda, '52, is also employed at Susquehanna's Riverton plant.

The main office of Susquehanna-Western, Inc., is maintained in Denver, Colo. Staff members in Denver include Allen D. Gray, '52, president; Stuart S. Merwin, '52, manager of raw materials division; John White, manager of engineering division; Tom Vogenthaler, manager of administrative division; Paul Cheney, purchasing agent; Carl Broadbent, executive assistant; H. L. Hazen, consultant.

BENTONITE IN INDUSTRY

(Continued from page 35)

Another interesting use for bentonite is in the preparation of high quality greases. In about 1947, it was discovered that certain organic materials will react with bentonite and that the resulting product had the property of swelling and disbursing in organic liquids. This organic bentonite product has been produced for several years under the trade name "Bentone," and it is the basic ingredient for preparing greases of exceptional quality. Bentone greases are reported to have superior and mechanical stability, water and heat resistance, and longer life in contrast to soap-base greases.

Other uses for bentonite are in asphalt emulsions, ceramic bodies and glazes, paper, pharmaceutical and cosmetic preparations, detergents, ore pellets and briquettes, polishing agents, and horticultural sprays.

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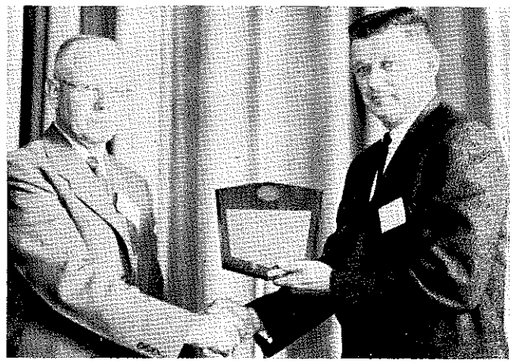
WYOMING MINING CONVENTION

(Continued from page 20)



▼ President Roy Coulson presents Safety Award for Open Pit Mining Operations to W. I. Leonard, Great Western Aggregates, Laramie, Wyo.

Inc. (a wholly-owned subsidiary of Ideal Cement Co). The plaque read: "Wyoming Board of Mines Annual Award, 1959, For Outstanding Safety Performance in Surface Mining, Presented to Great Western Aggregates, Inc., Laramie Plant."

During the calendar year of 1959, employees of Great Western Aggregates worked in excess of 108,000 man hours without a single lost-time accident. This was judged the best record of all surface mining-manufacturing and plant operations in the state during 1959.

President Coulson presented the Annual Safety Performance in Underground Mining Award to Edgar L. Stout, resident manager, Intermountain Chemical Co. The plaque read: "Wyoming Board of Mines Annual Award—1959, For Outstanding Safety Performance in Underground Mining, Presented to Intermountain Chemical Co., Green River, Wyo."

The company worked an average of 428 man shifts per day underground, producing 806,000 tons of ore, resulting in 465,000 tons of finished trona. In 838,000 hours of exposure, there were six lost-time accidents, all of which were temporary. This gave a frequency rate of 7.16 and a severity rate of 484.

The Wyoming Uranium Picture*

By ROY PACK
Co-Publisher, Riverton Ranger, Riverton, Wyo.

During the past year we have seen the near-fulfillment of the April 2, 1958 program of the AEC as outlined by the joint Atomic Energy Committee of Congress. This program granted an increase of milling tonnage in Wyoming of about 1700 daily tons, based on ore reserves as outlined as of Nov. 1, 1957.

Under this April 2, 1958 program, Wyoming's uranium industry is now served by five mills within the state and two outside of Wyoming, the Mines Development mill at Edgemont, S. Dak., and the Trace Elements mill of Union Carbide Nuclear at Maybell, Colo. About 40 per cent of the 400-ton a day capacity at Mines Development comes from eastern and northeastern Wyoming. Only a very small amount of Trace Elements' ore is received from southwestern Wyoming.

Five Uranium Mills in Wyoming

Of the five Wyoming mills, two were new in 1959, two added to their capacity, and one is presently negotiating with the Atomic Energy Commission for a revised contract into 1966.

The Federal-Radorock-Gas Hills Partners mill in central Gas Hills, about 50 miles east of Riverton, went on stream in November 1959 with a daily tonnage capacity of about 522 tons. Of this capacity about 389 tons is its own captive ore with the remaining 133 or so tons allocated for independent or custom producers.

The new mill of Globe Mining Company, a division of Union Carbide Nuclear, went on stream in January 1960. It has a daily tonnage capacity of just under 500 tons, 492. All ores in the Globe mill are captive. The mill is located about 61 miles east of Riverton in the Gas Hills, just over the Fremont County line in Natrona County. Wyoming's other four mills are located in Fremont County.

The capacity of Western Nuclear's mill, the first in Wyoming, was increased from 444 tons to 845 tons a day. This mill is located at Jeffrey City, about 22 miles south of the Gas Hills. A little more than half of Western Nuclear's ore is captive. Western Nuclear closed its mill for about a month in the summer of 1959 at which time modifications were made to increase the capacity of the mill.

The Lucky Mc mill, originally contracted for about 833 tons a day, was granted an increase to a capacity of around 1,000 tons a day or a little under. About 70-75 per cent of the Lucky Mc capacity is captive ore. The Lucky Mc mill is located in the heart of the Gas Hills, 51 miles east of Riverton. The mill is named after Neil McNeice, the discoverer of the Gas Hills in September 1953. It is owned by Utah Construction and Mining Corp.

The Susquehanna-Western, Inc. mill, located about two miles from Riverton, has a capacity of 550 tons a day. It is a completely custom mill. Susquehanna-Western has been negotiating for about six months with the Atomic Energy Commission on an extended contract into 1966. It is the only Wyoming mill which has not had its contract written to '66.

The sulfuric acid plant located at the site of the Riverton mill and operated by Susquehanna-Western was increased from a daily capacity of 125 tons of acid to 250 tons of acid, with the new acid plant going on stream in December 1959. New markets in the uranium milling industry and broadened sales of acid in the petroleum industry and other markets led to the doubling of this acid capacity. Molten sulfur is trucked to Riverton from the sulfur plants at Worland, 90 miles north. Excess steam from the acid plant is utilized in the Susquehanna-Western uranium mill.

Utah Construction's Shirley Basin Mine

First commercial quantities of uranium ores were received in March of 1960 from the Utah Construction underground mine in the Shirley basin. The ore is trucked to the Lucky Mc mill in the Gas Hills.

The Utah Construction Shirley Basin shaft has been bottomed for the present at about 365 feet. Development work is continuing. Utah Construction has had considerable problems of waterand unstable rock to overcome in the development of the mine which has caused a revision upward of mining cost estimates.

Ore encountered so far has been of good grade with first shipments estimated at over .35 U_3O_8. The main ore body which is not yet developed will probably run double or triple this grade.

The merger of Lucky Mc Uranium Corporation into Utah Construction and Mining Corp. was a major development in the past year with final stockholder approval of both corporations received in February 1960. Utah Construction had previously owned 60 per cent of the stock of Lucky Mc.

Ore Reserves Steadily Increase

Wyoming's ore reserves have shown a continued growth. Measured, indicated, and inferred reserves, as of Jan. 1, 1960, according to the AEC were 15,800,000 tons with an average grade of .34 U_3O_8. On July

* Address at the National Western Mining and Energy Conference, April 21-23, 1960, in Denver, Colorado.

1, 1959 the AEC estimated Wyoming's reserves at 15 million tons of .34 U_3O_8. On Jan. 1, 1959 Wyoming had reserves of 11,500,000 tons of .31 U_3O_8, and on July 1, 1958 the AEC set Wyoming reserves at 11,-100,000 tons of .30 U_3O_8.

During this period of growth in uranium reserves no comparable market increase has been reflected. The AEC is presently calculating purchase of additional concentrate in the 1962-66 period under the terms of its Nov. 24, 1958 announcement.

The growth in Wyoming's ore reserves is not attributable to any one area although the major increases have been noted from the Shirley Basin and Gas Hills areas. However, Homestake Mining has added to the reserve picture from its property in Crook County of northeastern Wyoming and there have been increases in reserves in the Converse County area of eastern Wyoming north of Douglas.

For example, recent work by Lucky Mc 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 per cent to .38 per cent.

In the Shirley Basin, Utah Construction has developed 1,350,000 tons of indicated and inferred uranium ore containing .57 per cent U_3O_8. Utah Construction has been awarded a production quota from the AEC to the Lucky Mc mill of 256,000 annual pounds of U_3O_8 to April 1962 with an increase to permit delivery of 350,000 annual pounds of U_3O_8 through 1966.

Shirley Basin Production Quotas

Production quotas in the 1962-66 period in Shirley Basin, in addition to those already allowed Utah Construction, are under consideration by the AEC. Under a possible "stretch-out" system, some of this production may be allocated before 1962.

Although nothing is official yet, a "calculated guess" would place additional (not including Utah Construction) Shirley Basin production quotas in the pre-1962 period at about 500-600,000 annual pounds, with from 700-800,000 pounds awarded in the 1962-66 period over and above the Utah quota.

Major participants in this additional Shirley Basin production are Tidewater Oil, Kerr-McGee, and Sasso Simons. A small portion of the as-yet unallocated production will go to independent operators most of whose properties are now controlled by Gas Hills Uranium Co.

The Atomic Energy Commission emphasizes that it is still evaluating data from the Shirley Basin. It is not known when this evaluation will be completed and final production quotas set for the Shirley Basin.

Market for these additional ores has not been determined. The AEC is weighing considerations of mileage costs in transporting Shirley Basin ores to existing Wyoming mills. Discussions for a mill in Shirley Basin have been held and are continuing with the major ore reserve holders carrying on these preliminary discussions.

It seems certain that the cost of haulage must be absorbed in the mining cost as would the cost of amortization of a mill for Shirley Basin. In other words, all costs of mining, haulage, and milling will probably be absorbed in a flat $8 per pound price for the concentrate.

The final decision for the market for presently unallocated Shirley Basin ores appears to be one of economic determination balanced against presently available milling capacity and amortization costs of a new mill which would have to be absorbed within the $8 price established for yellow cake.

Clearly there is an imbalance in Shirley Basin between large ore reserves and small allocations. A further imbalance may exist where allocations are applied to ore reserves that are uneconomic to mine, while other properties with economic ore have no allocation.

The Wyoming uranium industry experienced its most productive year in 1959 and if the first quarter of 1960 is an indication, mining and milling will reach all-time peaks in '60.

During 1959, with some lap over into 1960, 28,-938,796 cubic yards of overburden (waste) were moved in the Gas Hills. The growth of Wyoming's uranium industry is clearly indicated when the 1959 figure is compared with 1957, just two years ago, when 4,365,940 yards of waste were removed.

A complete mining picture was not available, but a close estimate places ore mined in Wyoming in 1959 at about 825,000 tons. It is expected that about 1,300,000 tons will be mined in 1960.

Gas Hills Uranium Production

The average stripping ratio of waste to ore is about 20 to 1 in the Gas Hills. Cubic yardage in 1959 appears larger than this ratio because several companies are at present stripping for mining, but have not yet mined.

Some amazing individual company records have been set in the Gas Hills. Western Nuclear has removed over 13,000,000 cubic yards of waste at its Frazier-Lamac mine which joins the Lucky Mc 4-C mine to the west. Lucky Mc moved nearly 8,000,000 yards in the year ended March 31, 1960. Federal has removed over 3,000,000 yards, and Vitro Minerals, the largest independent producer in the Gas Hills, moved 2,338,796 yards of waste from Jan. 1, 1959 through March 31, 1960.

Proof of the tremendous ore values in the Gas Hills may be illustrated by the John 2 claim of Vitro. Mining began on the John 2 claim May 1, 1955. Mining has been pretty much continuous on this single claim since that time. Some ore still remains on John 2, but to date 364,000 tons of uranium ore have been mined off this one claim.

Large scale production is possible from the open pits of the Gas Hills. Federal has mined as high as 1250 tons a day from its Buss pit, 135 feet deep, in the East Gas Hills. In this present month, April 1960, Federal will move over a million yards of waste in open pit development. Western Nuclear has removed overburden at an even greater rate from the Frazier-Lamac at times, plans to move altogether 25,000,000 cubic yards from the Frazier-Lamac mine.

Considerable drilling continues in the Gas Hills, in Shirley Basin and other parts of the state, although most of it is in the nature of development drilling. Last year Lucky Mc did surface drilling totalling 449,698 feet, drilled 60,572 feet in mine control, and drilled 282,788 feet of blast holes—a total of 793,058 feet—hardly a standstill drilling program. Federal has operated two to three drilling rigs almost continuously in 1959, Western Nuclear drilled over 300,-000 feet in 1959 working four to five rigs, Vitro drilled over 60,000 feet, Utah Construction has completed over 400,000 feet of drilling in Shirley Basin —and so on.

Employment in uranium is at a peak. It is estimated that in the Gas Hills area 1177 men are directly employed by the uranium industry and another 202 men in contractual capacities such as stripping and drilling. These figures include the Crooks Gap area south of the Gas Hills where Continental Uranium operates a 300-foot deep underground mine and Green Mountain Uranium (Phelps-Dodge) is now mining underground. Green Mountain made its first shipments from its new underground workings early this year. Another 100 men are employed in the Shirley Basin and a similar number in mines in eastern and northeastern Wyoming, bringing total men employed in uranium to a minimal figure of 1600 men. Obviously there are many more people employed in jobs tributary to the uranium industry.

Uranium Important Tax Source

Another illustration of the rapid growth of the 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 $8¼ million dollars and paid taxes in excess of $344,000. 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 Edgemont. Homestake mines and stockpiles in winter, ships heavily in summer. The mine is underground. B&H Mines and Vern Mrak are the leading producers in Converse County.

Bob Adams is opening a new mine on the Spook claims in Converse County which will ship to the Riverton mill.

Hidden Splendor has a successful open pit operation on its Sunset claims (Mountain Mesa) in the west Gas Hills, but has encountered difficulty sinking a shaft on the Peach claims in south central Gas Hills (Lisbon property).

Federal, now stripping the Clyde A pit, is mining from the Buss A, the Sagebrush D, and the T claims.

Lucky Mc has opened mines on the Green River and Four Corners Uranium properties in West Gas Hills. During the year Lucky Mc also mined a small ore body on the Noble claims just east of the Lucky Mc camp. A small amount of ore was taken from the Sun Dog claims in Crooks Gap (Harrower Brothers-Heald property) by Lucky Mc. But by far the greatest amount of Lucky Mc ore came from its several mines in central Gas Hills.

Western Nuclear produced from the Bull Rush and Day-Loma mines in West Gas Hills during 1959. A new pit mainly on Western Nuclear's Bull Rush, but partly on Federal's Cal claims is in the planning stage. When this pit is opened it will necessitate moving the Gas Hills-Jeffrey City road, probably to a new route farther south.

Leading independent producers in the Gas Hills continue to be Vitro, Dale B. Levi, Western Uranium, Fairfield-Anderson-Beach, Hidden Splendor, Western Mining (working on Two States-Valley Dean)—all actively producing ore.

The Little Mountain-Pryor Mountain area in northern Wyoming and southern Montana continues small shipments of high-lime ore to the Riverton mill, but its production is far below expectations. Hidden Splendor is the leading shipper from this area.

No shipments have been received for some time from Copper Mountain. The Little Mo property is tied up in litigation at present. Utah Construction has a small ore body blocked out in the Copper Mountain area but has no immediate plans for development.

Allocation System in Wyoming

The allocation system in Wyoming went into effect on July 1, 1959. While it is still a little early to properly evaluate this system of providing a market for central Wyoming ores, several trends are indicated.

Of the some 45 properties given allocations, only 23 actually have produced any ore since July 1, and in about half of these cases the ore was far below the allocation. At present only 15 of these properties are in active operation. In a few instances, future production is planned. Some properties have been combined and will produce at a combined allocation lower than the total of the original allocations.

Two principal factors are responsible for this lack of production under the allocation system. First, some of the ore bodies may not produce economically. Second, some of the ore bodies are not amenable to milling, i.e., high sliming, asphaltic, etc.

In many instances, the grade of ore produced from some of the properties given allocations, and for which milling capacity has been built, has been low, making the ore uneconomic to mine or mill.

No immediate hardship has been worked on Wyoming mills because of these factors. The AEC allows for some substitutions of ore in the pre-1962 period and all mills are running at capacity and probably will as long as substitutions are possible. There is no shortage of ore in Wyoming, and reserves are as great or greater than originally estimated, but the ores are now found to be distributed in a manner somewhat dissimilar to the allocation system as set up in the summer and fall of 1958.

Ore Substitution Policy

Unless the AEC softens its policy on substitutions of ores in the 1962-66 period several dangerous situations will develop. First, most mills will be forced to operate at considerably below their contracted capacity. Second, some virtually uneconomical mines will be forced in production to keep mills running while other economic ore bodies lie untouched.

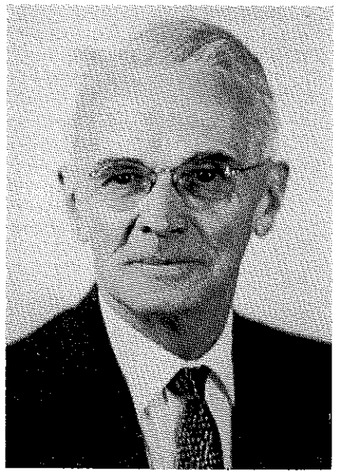
So far, the AEC has been cooperative in working out the problems attendant to the allocation system. But as the industry approaches the 1962-66 period a noticeable hardening in AEC policy toward substitution of ores is apparent.

Further clarification of the AEC's Nov. 24, 1958 policy will be necessary in the near future from an interpretative viewpoint. It is to be hoped that the AEC will not force damaging policies on to the industry causing long-range injury to Wyoming's uranium industry in order to satisfy immediate budget limitations and short-term objectives.

In conclusion, I would not like to leave the impression that we in Wyoming are in any way gloomy about the future of uranium. On the contrary, we are most optimistic. In the past we have joined together to work with the AEC and the joint Atomic Energy Committee to find an equitable solution to our problems. There is no reason to believe that future problems cannot be solved in the same cooperative manner.

Old Timers Club Award to Mines Student

By E. H. JENKS



E. H. JENKS

(Editor's Note: Presentation of the Old Timers Club Award to Mines Student Bernard L. Bobo took place April 24, 1960, at the Colorado School of Mines Experimental Mine near Idaho Springs, Colo. Other facts about this event were published in the Campus Headlines Section of the June 1960 issue of The MINES Magazine.)

It 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 late friend, Dr. L. E. Young, and others, 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 some prospective coal mining men 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 very minor cog, as I was acquiring that very necessary practical education, which is mandatory to complement the formal education. At all times, I have enjoyed my work, and felt I was in an active, progressive industry which was moving ahead in many directions and one which had great possibilities for continued progress and expansion.

Coal Industry Labeled "Sick"

Not too many years ago, the coal industry was widely labeled as being "sick" and needed a "Moses" to lead them out of the wilderness. The strange part of this is that we did have Harry Moses to help, particularly in the line of labor relations. When Harry Moses went to Washington, as cheif negotiator for the operators with United Mine Workers of America, major strikes were the usual procedure and large users of coal felt that they were in serious trouble unless they had a stock pile equivalent to at least six months consumption.

Our relations with labor has improved to such an extent that we have not had an industry-wide strike since 1950. Admittedly, our wage scale is high. In fact, wages have almost doubled since 1948, but we have been permitted by the United Mine Workers of America to capitalize on our improved equipment and methods. Labor rates have increased from about $13 to $25 per day and Miners Welfare has increased from 10c to 40c per ton, which means that in 1948 the Welfare Fund was equal to about 65c per man day, whereas it now is the equivalent of $5 per man day and, of course, the cost of welfare is a direct labor charge, the same as daily wages.

In spite of this increase in labor cost, the selling price of coal in the railroad car at the mine is practically the same per ton as it was 12 years ago. In fact, it is less, rather than more. This has only come about by increased efficiency in operation and management with the cooperation of the United Mines Workers of America.

Inflation Held in Check

We have no featherbedding. We have held the line against inflation. You have heard that the power companies also held the line against inflation. In fact, many times on radio and TV you have heard that the cheapest thing in the family budget is electricity, but we have materially helped the power companies hold the line, for the largest part of the cost of electricity is fuel and the cost of electricity to the consumer is controlled by the cost of fuel. The power companies have also increased their efficiency materially. For example, in the 1920's it required about 2½ pounds of coal to produce a kilowatt of electricity; now it requires less than 1 pound.

The coal industry has always stood on its own feet and has never asked for government subsidies of any kind, and has seldom lobbied for favorable legislation. Early in 1959, the National Coal Policy Conference was formed, which is made up of representatives of the coal mining companies, United Mine Workers of America, coal-carrying railroads, manufacturers of coal mining equipment, and large producers of electricity. The purpose of this conference is to organize a national fuel policy to meet future economic and national defense requirements in an orderly way.

Some Markets Lost

We in the coal mining industry have lost markets. Railroads for many years were our best customers, both as to quantity and price. This market has practically vanished. Coal for home heating has gradually decreased. The foreign export market last year dropped 36 per cent below 1958. The Niagara Falls-St. Lawrence Seaway Hydro-Electric Development will absorb the increased power requirements for northern New York until it is completely developed by 1965, after which date coal will probably start on the increase in that area.

The steel strike last year naturally affected the coal market. In spite of all the adverse happenings in 1959, coal production held up to the 1958 level, and the continuing increased use by the utility companies and chemical companies will greatly increase the market. The forecast for electric requirements for 1975 is that this industry alone will use as much coal as was produced in 1959, which would require a national production of from 650 million to 700 million tons as compared to 400 million tons in 1959. The present maximum capacity from mines now open is about 520 million tons. To maintain this capacity due to abandonment of mines and closing of non-economical mines requires an expenditure of from 120 million to 200 million dollars per year, and to expand to the 1975 forecasted requirements will require an expenditure of some 600 million to a billion dollars.

Coal Reserves Ample

The known coal reserves are ample to supply even the most optimistic forecast for at least 300 years. Estimates of either gas or oil reserves are some place in the neighborhood of 30 years. Although each year new gas and oil fields have been developed, the known reserves are still far below the known reserves for coal.

Nuclear energy is and will increase as a power source, but it is very far away from being competitive with coal for ordinary uses. Great Britain is developing nuclear power plants to produce electricity, but only because the cost of coal is so much above ours. This is natural, when you realize that British mines produce 1.7 tons of coal per man day as compared with our 12½ tons per man day. Further, the coal industry is much closer to producing liquid fuels economically than nuclear energy is to producing electricity that might be competitive with coal-produced electricity.

Rail Service Improved

Transportation has always been a large part of the cost of coal to the consumer. Seventy-eight per cent of the coal consumed is transported by rail, and in the past, many times the freight rate has been determined by conditions other than the cost of service. This is not altogether the fault of the railroad, but due to the Interstate Commerce Commissions' rulings. Recent legislation has given the railroads a much freer hand and many coal rates have been adjusted, giving consideration to the cost of service and volume of business.

In the past car service has been a problem but even that is improved. There were predictions that there would be a car shortage after the steel strike last year, but due to good management by the railroad and cooperation of the shippers and receivers of coal, that prediction did not materialize. When rail shipments are not adequate, they have been supplemented by truck and water movements. Development of high voltage transmission lines has placed many power plants at the source of fuel, with electricity being transmitted long distances to the consumer.

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 millions 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 ton-miles of coal from Cadiz to Cleveland. As the pipeline is 110 miles long, the omission of the word *miles* made quite a difference, which goes to show that 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 prospector one week and 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 have probably heard or read it, I think it is worth repeating:

"Careers in any field of mining engineering offer interesting work, a good livelihood, and a worthwhile way of life. It is understood that the individual's attitude and personal qualities are of prime importance. Mineral engineering is not for those who expect to receive a great deal without giving in return much intelligent and hard work. It is not for those who shun responsibilities or are afraid of challenging assignments."
I think this quotation applies not only to mineral engineering but can be reworded to apply to any successful career.

No Shortcuts to Success

There are no shortcuts. The basis of any successful career is serious application and hard work. In the next few years you may feel that you have not had the opportunity to utilize your capabilities, but if you learn all you can from your associates, keep your eyes and ears open, and grasp every opportunity to do any job that needs to be done, you will come closer to making use of your capabilities and will probably be recognized by your superiors.

Another requisite for a successful career and a happy living is that you enjoy your work. After all, most of your lifetime, work will take the greater part of your time and probably will be the predominating influence. If work is all drudgery, there is only one answer and that is to find other employment. The fact that you have enrolled and completed courses in the mining field shows that you have some interest; and the field is broad enough that I am sure that you can find some phase which will be enjoyable and hold your interest.

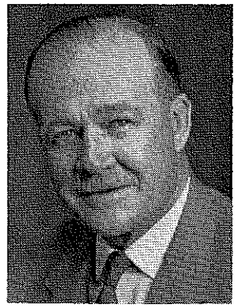
Old Timers Club Formed

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 each of us feels that we should be missionaries to recruit new talent for the industry.

The Old Timers Club was originally organized at a Mining Congress Meeting in 1938 and was primarily a social club with the idea of promoting worthwhile activities toward improvement of the coal industry. Later, the feeling developed that we should do somthing more than talk about improvement. Therefore, in 1946, the Old Timers Club was incorporated under the laws of West Virginia as a non-profit corporation. In the Articles of Incorporation, the principal objects and purposes were listed as advancement of engineering knowledge and science in the coal industry and making awards to students in coal mining engineering with

(Continued on page 51)

FROM THE EXECUTIVE MANAGER'S DESK



COL. WENDELL W. FERTIG

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, for 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 worries about finances this year. Since February, we have gained 358 new members (members who have not been active in 1959 or 1960), but that seems to be about the limit that I can win by direct mail appeal. I have written more than 800 letters, and still have not reached the goal I hoped to attain. So far our membership drive has been confined mainly to an effort by this office. Now I am going to turn to you active members and ask that you bring in some of those who are not members. Without a question each of you knows at least one man who is not active at present. Persuade him to join; show him The MINES Magazine; preach the gospel that MINES is the finest school of Mineral Engineering in the world and that anyone who manages to graduate not only is fortunate but something special. With your help we can gain those 500 additional members.

In fostering the membership drive, do not overlook the need for advertising. Pressure from MINERS will produce more results than all the letters we can write from here. Patronize those who advertise with us, and then persuade those who don't that it would be good business if they did so.

School Spirit and Patriotism

It has become fashionable to forget our country and to accept rebuke and criticism without defending it. Unfortunately many educators have lost themselves so completely in the idea of ONE-WORLD that they are no longer proud of being an American, nor do they see the need of impressing the young with the importance of love of country. In the same manner it has become unfashionable to be proud of your alma mater; rather to say half-apologetically, "Oh, yes, I'm from a little mining school out West." Let's stand up to be counted. Say, "Yes, I graduated from the Colorado School of Mines. That's just the best there is in the field of Mineral Industry education." Say it, and keep saying it. Soon everyone will recognize that it must be an excellent school. Then your stature as an alumnus will automatically increase; also and most important, your paycheck should show the same response.

Not too long ago, two of our alumni were talking to the Dean of another engineering school. When asked where they were from, they replied, "MINES." He did not question what School of Mines, but merely replied, "You insufferable egotists; but it is a fine school."

Office

Yes, we have moved into our offices in Guggenheim Hall. After my first day here, I remarked that for the first time I felt that I was working for a progressive concern. My new office does not have much furniture, but that will come. Now it is clean and inviting, altho still cluttered by the accumulated impedimenta of the past. Give us time, and we will clear that out.

Reminder

Homecoming will be on October 29th. Unfortunately, we play Idaho State, but be there to boost the Miners. The class of 1950 will hold their 10th reunion. It will be a good show, so plan on seeing MINES play on Saturday, Oct. 29th, and the Denver Bronchos whip DALLAS on the 30th. Then to satisfy your conscience, if required, attend the Geological Society of America Convention on Monday, the 31st—all in October.

Directory

You may not have received your copy of the 1960 Year Book and Directory of Mines Men, but you should before the first of August. Just at a time when we thought that the revision was well in hand, Ted Roberts, who is the Editor, was completely swamped by an inundation of transfers, change of address, and mass movement of many Alumni. Seemed that everyone decided to migrate with the birds this Spring and in order to have the Directory somewhat current, we decided to sacrifice speed for accuracy.

The Directory is a new format this year, measuring 6¾" x 9½". This is somewhat larger than last year's, but the change was mandatory when it was decided to include advertising. This new size is the same as that used by the American Association of Petroleum Geology and some of the other technical societies. However, there is still the question as whether it might be wise to return to the old size, which is that of our standard magazine. This would certainly simplify advertising problems and will be considered for the 1961 Directory unless there are too many objections. We would be pleased to have your opinion of the 1960 Directory as soon as you have time to look it over.

ALUMNI BUSINESS and NEWS

Budget and Finance Committee Members Are Appointed

Robert H. Waterman, '28, chairman of the Budget and Finance Committee, has asked the following men to serve with him on the committee and they have agreed: Edward F. Kingman, '34; John W. Hyer, Jr., '42; Charles H. Jenkins, '29; Harry W. McNeill, '24.

Edward F. Kingman Named Nominating Committee Chairman

Edward F. Kingman, '34, has been appointed chairman of the Alumni Association's Nominations Committee. Members of this committee will be reported in the Magazine as soon as they are named by Mr. Kingman.

Alumni Association Offices Moved to Guggenheim Hall

Alumni Association offices were were moved June 8-9 from the red brick residential building at 1612 Illinois St. (occupied since October 1958) to the second floor of Guggenheim Hall.

The spacious new offices, best the Alumni Association has had in many years, were extensively redecorated and remodeled. Walls were painted a pastel green, floors were retiled, and division walls were erected for the executive manager's and editor's offices.

After a month of occupancy, the appearance of the offices is somewhat improved; but piles of material are still being filed, thrown away, or placed aside for storage in the attic.

Shipman, '50, Takes Family On Summer Trip to Alaska

The Mark K. Shipman family left their home in Grand Junction, Colo., on June 7 to visit friends in Fresno, Calif., for a week, then started north via the Redwood Highway, the John Hart Highway through central British Columbia, and the Alcan Highway to Alaska.

Mr. Shipman, a 1950 graduate of Mines, intends to examine two mining properties 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.

He writes: "We will be taking the six children, hence in addition to business we certainly anticipate pleasure along the way. Our kiddies range from 5 to 17 years old, therefore, this summer is the opportune time to make the trip—combining maximum age of our children and yet availability for a family trip."

Schedule of Social Events

Denver Local Section will host a dinner for MINES MEN and their wives during the AIME Petroleum Engineers Convention being held Oct. 2-5 at the Denver Hilton. Exact date and place of the dinner will be announced later.

OCTOBER 29—Homecoming Game—2:00 p.m.—Idaho State vs. MINES.

10th Anniversary of the Class of 1950

Denver Local Section will host a luncheon for MINES MEN during the Geological Society of America Convention being held at Denver-Hilton, Oct. 31-Nov. 3. Exact date and place of the luncheon will be announced later.

Miners and Geologists

Have a big show in October. Be here for Homecoming (Oct. 29). See the Denver Bronchos tangle with Dallas (Oct. 30) and attend the GSA Convention (Oct. 31).

A. L. Bement, '54, Awarded UM Graduate Scholarship

Arden L. Bement, Jr., a 1954 metallurgical engineering graduate of the Colorado School of Mines, has been awarded a Ford Faculty Development Scholarship in the College of Engineering, University of Michigan. He will enter the university this September on leave of absence to continue studies toward a Ph.D. degree in metallurgical engineering.

The grant includes a teaching position and is renewable yearly for three years.

A metallurgical engineer in physical metallurgy at the Hanford Laboratories (General Electric Co.'s Hanford Atomic Products Operation, Richland, Wash.), Mr. Bement has worked at Hanford since 1954.

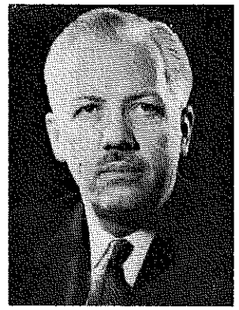
Utah Mines Men Active On AIME Committees

Utah MINES men active in the affairs of the Society of Mining Engineers of AIME are Douglas R. Cook, D.Sc. '52, and Blair T. Burwell, Jr., E.M. '47

Mr. Cook is a member of the Program Committee of Geochemists Committee, Mining and Exploration Division.

Mr. Burwell is a member of the Operating Control Committee of the Minerals Beneficiation Division.

E. W. Dissler, '40, Named Manager of Exploration For Cities Service Oil Co.



E. W. Dissler, a 1940 geological engineering graduate of the Colorado School of Mines, was recently appointed manager of exploration for Cities Service Oil Co. (Del.)

Mr. Dissler, who has been serving as vice president and manager of Canada-Cities Service Petroleum Corp. for the past three years, is also vice president of Cities Service Athabasca, 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 1950 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. Dissler returned to Canada as vice president and manager of Canada-Cities Service with headquarters in Calgary.

Alumni Assn. Supplies Clues To Location of Lost Relatives

The CSM Alumni Association was recently able to supply information which led to reuniting Larry Salsbury with his father's long-lost family.

Larry's father, Donald E. Salsbury, a 1940 geological engineering graduate of the Colorado School of Mines, died during his summer course and was given his degree posthumously—when Larry was about three years old. Larry's mother re-

married, and he grew up in a little town in northern California.

A few months ago, Larry wrote the CSM Alumni Association for clues as to the whereabouts of his father's relatives. Contact was finally made with Larry's grandmother, who was residing in Long Beach, Calif., just a few miles from Lawndale, where Larry lives.

Larry's wife, Barbara, writes: "It was a very big thrill for both Larry and his grandmother when we visited her last week. Larry is just the same age now as was his father 23 years ago. So now after 23-odd years, we have found the family that should have been his all along."

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., as Lt. Gier's wife looked on. He received his "Wings of Gold" April 27 upon completion of advanced flight training.

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 Exchange Award, under the Fulbright Act.

Rhea will study geology at the Victoria University of Wellington, New Zealand. He is one of 900 graduate students who will study abroad next year under the Department of State auspices.

A 1959 graduate of the Massachusetts Institute of Technology, Rhea's undergraduate degree is in geology and geophysics. He was a geological engineering graduate student at Mines.

Rhea is a native of McAllen, Texas.

Kaylor, '53, Attends Sales Executive Sessions

Howard C. Kaylor, who received his P.E. degree in 1953 from the Colorado School of Mines, attended the eighth annual session of National Sales Executives' Graduate School of Sales Management and Marketing in Syracuse, N.Y., June 7-23. Mr. Kaylor is sales manager of Parkersburg Rig & Reel Co., Houston, Texas.

Held each summer on the campus of Syracuse University, the Graduate School is one of the country's leading executive development programs. Designed for middle and top management executives, the School conducts an intensive program in the techniques, theory and methods of sales and marketing management.

The full course consists of five weeks, consisting of two sessions of two and one-half weeks each, held on successive year. Mr. Kaylor, who lives at 12102 Boheme, Houston 24, Texas, is in his first year.

National Sales Executives with 30,000 members organized in more than 247 clubs in 28 countries throughout the world, is a non-profit organization devoted to the advancement of sales and marketing management in all phases. Its members include the marketing executives of most of the major companies in the United States.

Dr. Parker, '24, Speaker At AAPL Convention

Dr. Ben H. Parker of Denver, Colo., was one of the featured speakers June 24 at the American Association of Petroleum Landmen convention at Los Angeles, Calif. Dr. Parker, who received his E.M. degree in 1924 and his D.Sc. in 1934 from the Colorado School of Mines, is president of the CSM Board of Trustees and served as president of Mines from 1946 to 1950. He is vice president of Frontier Refining Co. and president of the American Association of Petroleum Geologists.

Voukovitch, '51, Forms Consulting Geologist Firm

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 Geologists.

In his new position he will be engaged in the exploratory investigation and analysis of geology, laws and economics relative to petroleum exploration in foreign countries. Mr. Voukovitch expects to devote a great deal of his time to Mediterranean and North African geology.

Before joining Lucas-Voukovitch, Mr. Voukovitch was with Geophoto 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.

Mr. Voukovitch is a member of the American Association of Petroleum Geologists, Rocky Mountain Association of Geologists, Petroleum Exploration Society of Libya (charter member). He is also a captain in the U. S. Army Reserve.

Morales, '45, Vice President Of Tennessee Argentina

Luis G. Morales, who received his Geol. E. degree in 1945 from the Colorado School of Mines, has been named vice president of Tennessee Argentina, S.A. Mr. Morales was named exploration manager of Tennessee Argentina last year. His mailing address continues to be c/o Tennessee Argentina, S.A., 11 Arthur Araripe Gavea, Buenos Aires, Argentina.

The company is involved with exploration and development drilling on the island of Tierra del Fuego under contract with the Argentine oil agency, Yacimientos Petroliferos Fiscales.

Dr. Kiersch, '42, Participates In Visiting Geoscientist Program

Dr. George A. Kiersch, who received his geological engineering degree in 1942 from the Colorado School of Mines, was one of the nationally recognized geoscientists selected this year to serve as a participant in the American Geological Institute Visiting Geoscientist Program. The program is sponsored by a grant to the AGI by the National Science Foundation.

Dr. Kiersch visited the University of Alaska for five days in late April and participated in a series of lectures and meetings with the Alaska School of Mines faculty and students, local business men and Chamber of Commerce officials. Two of Dr. Kiersch's lectures concerned "Regional Geologic Surveys, the Basis for Development of Natural Resources and Industry" and a third lecture was entitled "Engineering Geology — Scope, Research Needs, and Growing Sub-Fields of Application."

Last summer Dr. Kiersch spent a month in Norway at the Technical University at Trondheim, giving a series of lectures on engineering geology to the students and faculty of the civil engineering department. His trip and visit was sponsored by the Arctic Institute of North America.

Visitors to the Alumni Office

COLONEL E. M. J. ALENIUS, '23, U. S. Army, Corps of Engineers, Retired, who is now living at 1918 W. Ashland Ave., Phoenix, Ariz., was in Denver early in June to visit his family who is still living in Denver. Although almost a native Arizonian, "Al" admits that Phoenix gets rather warm in summer. Of course he won when he asked casually, "Bad winter in Colorado last year?"

CHARLES (Scotty) BRUCE, '57, is an independent geological engineer with headquarters at P. O. Box 125, Evergreen, Colorado. Come back and see us now that we have moved to our new offices.

EDGAR W. DAVIS, '52, who has been working on his Master's degree here at MINES this winter, has accepted a position with Susquehanna-Western Uranium Corp. His new address will be 415 E. Spruce St., Riverton, Wyo.

GEORGE T. McCALL, '50, consulting mining engineer, 1004 Skyway Blvd., Colorado Springs, Colo., came up to talk with the Mining Department. Glad to have you come any time.

HARVEY P. O'BRIEN, '58, has been in Denver on his vacation and called to tell us that he is returning to his position with ORINOCO Mining Co., Tuerto Ordaz, Estado Bolivar, Venezuela.

RALPH L. (MOON) MULLEN, x-'30, 411 Azalea Way, Los Altos, Calif., was in Golden between planes. Moon has retired again, and his new business card reads:

No Phone No Address
R. L. "Moon" MULLEN
(Retired)
No Business No Money

(Editor's Note: No charge, Moon, for this professional card. WWF)

LT. COL. ALLAN P. NESBITT, Corps of Engineers, U. S. Army, stopped over en route to his new assignment in the Inspector General's Office, Corps of Engineers, 710 Montgomery St. Building, San Francisco, Calif. Colonel Nesbitt has just finished a tour as construction engineer in Iran. His wife and children are certainly happy over the new assignment and an opportunity to live near "The City."

(Editor's Note: That last keeps me in good with the Bay Area's Local Section. WWF)

CARL C. OLIN, '40, dropped in to tell us that he had resigned from his position with the Colorado State Highway Department. He has made no decision on his next move.

IVAN B. ROBINSON, '51, and his lovely wife, came to call. Although we were in the new offices, they were still a mess. Ivan is still doing research for ALCOA and his home address is 2769 Hastings Ave., New Kensington, Pa. The Robinsons were here on vacation.

CHARLES A. SORVISTO, '54, and his pretty young wife called the day after I returned from the Wyoming Mining Convention. The Sorvistos live in Morenci, Ariz., where their mail address is P. O. Box 191. Charles is working for Phelps-Dodge Corp. They too were here for a Colorado vacation.

STEWART W. TOWLE, '54, brought his wife Doris, and their two children, Karl 3½ and Heidi 1½. They are also on a Colorado vacation from Douglas, Ariz., where he is metallurgist at the Phelps-Dodge smelter.

BORIS S. VOUKOVITCH, '51, independent geologist, has joined with Mr. Lucas to form a new company, LUCAS-VOUKOVITCH, consulting geologists, 431 S. Marshall St., Denver 26, Colo. Good luck in your venture!

OLD TIMERS AWARD

(Continued from page 47)

high academic standing. We have made 95 awards since 1949 at 12 colleges and universities. The University of West Virginia is the only institution which has had a candidate for an award each year since 1949. Colorado School of Mines had the first award in 1951 and has had an award every year since that time, except in 1955, which makes this the 9th award at this institution.

Award Presented to Student

At this time, I would like to call forward Bernard L. Bobo, who has been selected for the award from the Class of 1960. The fact that you have been selected for an award by the instructors and professors with whom you have worked in the past four years is in itself an accomplishment. This watch, which I now present to you is a token, and you are now an Old Timers Watchman.

The Old Timers Club, and each member of that Club, has an interest and an obligation in the success of your career. If, at any time, you would like to have advice or help from any member of the Old Timers Club, you may feel free to call upon him, either by mail or for a personal interview, and you will be welcomed and helped by that member to the best of his ability.

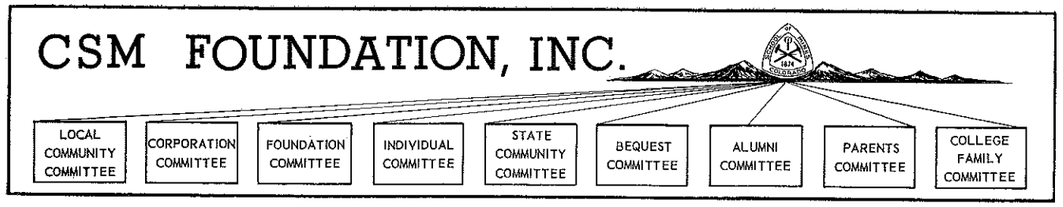
There is no actual obligation on your part by the acceptance of this award; but we are interested, and if each year some time in April you will write a letter to the Secretary of the Old Timers Club, telling him where you are, what you are doing and the progress you are making, we will very much appreciate it.

As I stated before, the Old Timers Club is made up of 30 members, and only vacancies in the Club are either caused by resignation or death of a member. We know there will be vacancies, and I hope that as time goes by, at least part of that new membership will be made up from our list of Watchmen.

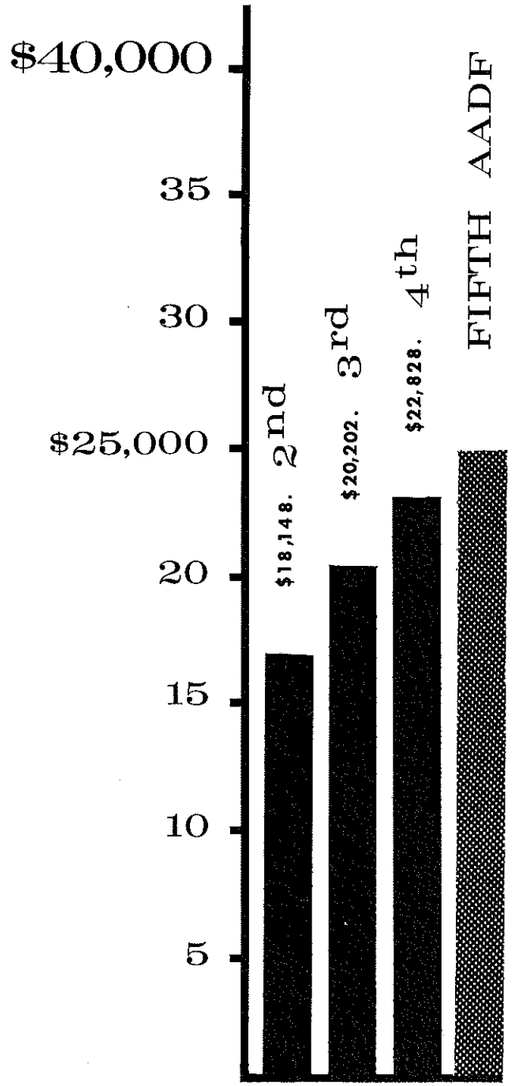
50th Anniversary Issue

The 50th Anniversary Issue, October 1960, celebrates 50 years of service and progress in the minerals industry and in the field of mineral engineering education.

Reserve your copy now (price $3) from The MINES Magazine, Golden, Colo., or order a year's subscription for $5 beginning with this 50th Anniversary Issue.



ALUMNI SUPPORT LEADS TO LARGE GRANTS



▼Chart shows steady growth of Annual Alumni Development Fund.

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 program of developing voluntary financial support of the School of Mines. During the 1958-59 fiscal period, for instance, AADF contributions of $22,828.10 led to support from industry, foundations, and other sources of $234,634.96 —or a ratio of 10 dollars for one. Although final fiscal 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 $85,620.

Dr. Robert M. Hutchinson was awarded a grant of $15,600 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. Rinehart, was supported by a National Science Foundation grant of $32,400.

In 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 being supported by a $17,820 grant. Directed by Dr. James L. Hall, the institute, which began on July 11, brought more than 50 students from all sections of the country. Dr. Hall was also the recipient of a $19,800 grant to cover a three-year basic research project on the use of acetontrile as a solvent for inorganic reactions.

Thus, a new and major source of support has been realized largely because of the faculty research program established by voluntary support. And, the alumni contribution, now being devoted entirely to faculty improvement, not only provided the first opportunity for basic research but has carried the program to new levels each year.

Have You Seen Your Lawyer About:

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

FROM THE LOCAL SECTIONS

Minutes of Section Meetings should be in the Alumni Office by the 15th of the Month preceding Publication.

ALABAMA

Birmingham Section
Pres.: Joseph Hohl, '25
Sec.: Richard White, '42
249 Flint Dr., Fairfield

ARIZONA

Arizona Section
Pres.: Bob Thurmond, '43
V. Pres.: Gene Klein, '43
Sec.: John H. Bassarear, '50
c/o Pima Mining Co., Box 7187, Tucson
Annual meetings. First Monday in December; 3rd Sunday in May (annual picnic).

Four Corners Section
See New Mexico for officers

CALIFORNIA

Bay Cities Section
Pres.: John D. Noll, '51
V. Pres.: Ralph D. Eakin, '48
Treas.: Herbert D. Torpey, '51
Sec.: Charles G. Bynum, '26
2810 Loyola Ave., Richmond

Southern California Section
Pres.: R. E. "Ray" McGraw, '53
Treas.: J. R. Leonard, '42
Sec.: H. David Squibb, '34
2215 E. Sycamore St., Anaheim

COLORADO

Denver Section
Pres.: Ronald F. Lestina, '50
V. Pres.: Hugh Wallis, '28
Sec.-Treas.: Patrick C. Brennan, '53
1893 S. Leyden, Denver 22
Office: AC 2-2060
Luncheon meeting every third Tuesday each month, Denver Press Club, 1330 Glenarm Pl.

Four Corners Section
See New Mexico for officers

Grand Junction Section
Pres.: John Emerson, '38
V. Pres.: Tony Corbetta, '48
Sec.-Treas.: Joe Hopkins, Ex-'37
1235 Ouray Ave., Grand Junction

DISTRICT OF COLUMBIA

Washington, D. C. Section
Pres.: Charles T. Baroch, '23
V. Pres.: Vincent G. Gioia, '56
Sec.-Treas.: Thomas E. Howard, '41
9511 Nowell Dr., Bethesda 14, Md.
Luncheon meetings held every 2nd Thurs. noon at Sphinx Club, 1315 K St., N. W.

ILLINOIS

Great Lake Section (Chicago)
Ray Watson, c/o Standard Oil Co., 910 So. Michigan Ave., Chicago 80, Ill.

KANSAS

Kansas Section
Pres.: Francis Page, '39
Sec.: James Daniels, '51, AM 5-0614
205 Brown Bldg., Wichita
Meetings: Called by Sec. Contact Sec. for date of next meeting

LOUISIANA

New Orleans Section
Pres.: George Burgess, '49
V. Pres.: Emory V. Dedman, '50
Sec.-Treas.: Thomas G. Fails, '54
6334 Essex Ct., New Orleans 14

MINNESOTA

Iron Range Section
Pres.: Paul Shanklin, '49
V. Pres.: Leon Keller, '43
Sec.-Treas.: James Bingel, '53
50 Garden Dr., Mt. Iron, Minn.
Exec. Com.: Wm. Gasper, '43 and Robert Shipley, '52

MISSOURI

St. Louis Section
Pres.: Earl L. H. Sackett, '33
Sec.-Treas.: E. W. Markwardt, X-'32
621 Union Ave., Belleville, Ill.

MONTANA

Montana Section
Pres.: John Suttie, '42
V. Pres.: John Bolles, '49
Sec.-Treas.: Wm. Catrow, '41
821 W. Silver St., Butte

NEW MEXICO

Four Corners Section
Pres.: Dick Banks, '53
V. Pres.: Tony King, '57
Sec. Treas.: Tom Allen, '41
2104 E. 12th St., Farmington

NEW YORK

New York Section
Pres. & Treas.: Ben F. Zwick, '29
Sec.: H. D. Thornton, '40
Union Carbide Olefins Co.
30 E. 42nd St., New York City

OHIO

Central Ohio Section
Pres.: Roland Fischer, '42
Sec.-Treas.: Frank Stephens, Jr., '42
Battelle Mem. Inst., Columbus

Cleveland Section
Pres.: Charles Irish, '50
Treas.: Theodore Salim, '53

Pennsylvania-Ohio Section
See Pennsylvania for officers

OKLAHOMA

Bartlesville Section
Pres.: R. C. Loring, '37 and '39
V. Pres.: C. T. Brandt, '43
Sec.-Treas.: W. K. Shack, '51
4726 Amherst Dr., Bartlesville

Oklahoma City Section
Pres.: Lynn Ervin, '40
V. Pres.: Clayton Kerr, '30
Meetings the 1st and 3rd Tuesday of each month at the Oklahoma Club

Tulsa Section
Pres.: Chester H. Westfall, Jr., '52
V. Pres.: Brook Tarbel, '50
Sec.-Treas.: Charles J. Diver, '52
528 S. New Haven, Tulsa 12

PENNSYLVANIA

Eastern Pennsylvania Section
Pres.: Samuel Hochberger, '48
V. Pres., Sec-Treas.: Arthur Most, Jr., '38
91 7th St., Fullerton

Pennsylvania-Ohio Section
Pres.: L. M. Hovart, '50
Sec.-Treas.: George Schenck, '52
7130 Thomas Blvd., Pittsburgh
Meetings upon call of the secretary

TEXAS

Houston Section
Pres.: Jack Earl, '53
V. Pres.: John C. Capshaw, '54
Sec.-Treas.: Nick Shiftar, '40
5132 Mimosa St.,
Bellaire, Texas

North Central Section
V. Pres.: Howard Itten, '41
Sec.-Treas.: Harley Holliday, '42
4505 Arcady Ave., Dallas 5
Sec.-Treas.: John Thornton, '50
609-B Scott St., Wichita Falls

Permian Basin Section
Pres.: Van Howbert, '51
c/o Honolulu Oil Co., Box 1391 Midland.
V. Pres.: Hal Ballew, '51
No luncheon meetings scheduled during summer.

South Texas Section
Pres.: James Wilkerson, '31
V. Pres.: Edward Warren, '50
Sec.-Treas.: Richard Storm, '53
1007 Milam Bldg., San Antonio

UTAH

Four Corners Section
See New Mexico for officers

Salt Lake City Section
Pres.: Robert B. Ingalls, '48
Vice Pres.: Edwin T. Wood, '48
Sec.-Treas.: Major W. Seery, '56
260 W. 1200 North, Bountiful, Utah

WASHINGTON

Pacific Northwest Section
Pres.: Wm. Douglass, '11
Sec.: C. Ted Robinson, '53
16204 S.E. 8th, Belleview

WYOMING

Central Wyoming Section
Pres.: M. Rex Curtis, '45
Vice Pres.: Martin Hegglund, '41
Sec.-Treas.: James F. Huff, '53
806 W. 13th St., Casper

LOCAL SECTIONS OUTSIDE U. S. A.

CANADA

Calgary Section

Pres.: R. F. Zimmerly, '47
V. Pres.: J. S. Irwin, Jr., '54
Sec.-Treas.: G. L. Gray, '50
1304 4th St. S.W., Calgary
Luncheon meetings held 3rd Monday of each month in Calgary Petroleum Club; visiting alumni welcome.

PERU

Lima Section

Pres.: Richard Spencer, '34
V. Pres.: Martin Obradovic, '53
Sec.-Treas.: Norman Zehr, '52
Casilla 2261, Lima
Meetings first Friday of each month, 12:30 p.m., Hotel Crillon (April through December), or on call.

PHILIPPINES

Baguio Section

Pres.: Francisco Joaquin, '26
V. Pres.: Claude Fertig, x-'27
Sec.: P. Avelino Suarez
Balatoc Mining Co., Zambales

Manila Section

Pres.: Anselmo Claudio, Jr., '41
V. Pres.: Rolando Espino, '41
Sec.-Treas.: Edgardo Villavicencio, x-'40

TURKEY

Ankara Section

Alumni visiting Turkey contact either: F. Ward O'Malley, '42, Explr. Mgr., Tidewater Oil Co., Kumrular Sokakb, Yenischir Ankara; Tel. No. 21328.

Ferhan Sanlav, '49, Turkiye Petrolleri A. O. Sakarya Caddesi 24, Ankara; Tel. No. 23144.

VENEZUELA

Caracas Section

Pres.: William A. Austin, Jr., '27
V. Pres.: G. V. Atkinson, '48
Sec.-Treas.: T. E. Johnson, '52
c/o Phillips Petr. Co.
Aptdo 1031
Asst. Sec.-Treas.: R. L. Menk, '51
c/o Creole Petr. Corp.
Aptdo 889

Suggestions have been made to the Executive Secretary that Local Sections be started in Pueblo, Colo.; Riverton, Wyo.; Moab, Utah, and Carlsbad, N. M. We would like to have an expression of interest from these areas if they feel that a local section would be successful. The plan being used in many places now is to arrange a monthly luncheon to be held on a specific day each month so that visiting Miners can meet those who live in the local area. Your reaction to this suggestion would certainly be appreciated. Do not feel that the list of prospective locations is limited to those given above. Let's hear from you.

Calgary Section

G. L. Gray, '50, secretary-treasurer, writes that Calgary has quite an active Mines Alumni group which meets for a noon luncheon the third Monday of the month at the Calgary Petroleum Club. In addition, an annual dinner party is held that is always a great success, largely due to Sol Meltzer, '50, the "permanent" entertainment chairman.

Central Wyoming Section

The Central Wyoming Section at Casper held a luncheon meeting June 8 at the Gladstone Hotel, when 21 Miners gathered to meet with the Executive Manager. Although the original suggestion for the meeting had been handled by Walter F. Forbes, '50, he was unable to attend and other Miners carried on.

Since an election had not been held for more than a year, advantage was taken of the meeting to conduct one with the following results: M. Rex Curtis, '45, president; Martin Hegglund, '41, vice president; James F. Huff, '53, secretary-treasurer.

After the new officers were installed, the Executive Manager presented the developing program of the Alumni Association and the problems which must be solved. It was pointed out that in the Casper Section nearly everyone is concerned with petroleum rather than mining. As a result, they are much more interested in the Annual Petroleum Issue of The MINES Magazine than in any other. However, Colonel Fertig explained that it was his intention to add a geology issue to the Magazine and to include additional articles on petroleum and geology in various issues. The meeting adjourned in time for the men to return to their offices.

Those attending the meeting were:

M. M. Butler, '19; A. C. Austin, '29; H. B. Gernet, '30; Willis H. Fenwick, '36; Martin Hegglund, '41; Joe Fusselman, '42; M. Rex Curtis, '45; L. B. Myers, '48; Gene Simons, '49; Clyde Kerns, Lou Amick, Jerry F. Davis, Glenn J. Poulter, '50; Dave Lohr, '51; Bob Garland, Richard C. Johnson, '52; Eugene O'Brien, James F. Huff, '53; Richard Veghte, '54; Ron Evenson, '56; Jim Petersen, '57.

(Editor's Note: Colonel Fertig was pleased with the attendance [as little notice had been given] and expressed the feeling that it certainly appeared that the local section was in good hands with the new officers.)

1960 Mining Issue

The May 1960 MINES Magazine, covering the National Western Mining Conference, April 21-23, is still available from The MINES Magazine, Golden, Colo., price $2.50 postpaid.

Denver Section

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 Griffing, general manager, and Frank Filchock, head coach of the Denver Bronchoes, our new professional football team. Mr. Griffing 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 3000 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 50 local players who are interested in trying out for the Bronchos. All will be assembled at Golden when training starts on July 9th. Members of the coaching staff of the Bronchos are certainly pleased with the facilities available in the new Gym, the Fieldhouse and Brooks Field. Both men expressed the hope that the selection of 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, '13; Oran Pack, '26; M. E. Chapman, '27; S. M. del Rio, Hugh A. Wallis, '28; George D. Volk, '35; Bill Cullen, '36; Ron Lestina, '38; John J. Roche, x-'38; H. K. Schmuck, Bill Manning, '40; Walt Crow, '41; S. E. Geffen, x-'42; Douglas Ball, '43; John Bernstein, '47; John Flynn, Vern Atkinson, '48; Don Siljestrom, Don Galbraith, Daniel A. Rowland, '49; Frank J. Piro, Jim Taylor, Ed Karn, R. L. Boyers, R. G. Martin, Ron Lestina, '50; D. L. Lee, J. E. Stroh, '52; Arthur Todd, x-'52; R. V. Mendes, Isao Uchi, '53; George Welch, '59.

Guests were Frank Filchock, head coach, and Dean Griffing, general manager of the Denver Bronchos.

▼ First row (top), left to right: Frank Harris, '13; John Selters, '60; LeRoi Rice, '58; Charles R. Passavant, '49; Ken Matheson, '48; Ben H. Slothower, '50; 2nd row: Bob Olund, '37; John Greenwood, '15; C. D. Michaelson, '32; W. F. Koch, '11; E. T. Wood, 48; R. B. Ingalls, '48; Phil A. Pelton, '35; 3rd row: Frank Harris, '13; R. D. Brace, '49; R. B. Ingalls, '48; John Greenwood, '15; R. B. Coleman, '49; A. G. Dempster, '58; Wally McGregor, '52.

Salt Lake City Section

Robert B. Ingalls, '48, and Kenneth H. Matheson, Jr., '48, took advantage of the fact that Col. W. W. Fertig was attending the Wyoming Mining Convention to invite him to a meeting of the Salt Lake City Section. Twenty-five Miners assembled at the Aviation Club at 6:30 p.m., Monday, June 13. After a few cups of cheer, a fine steak dinner was served, and when everyone was in the proper frame of mind, Ken Matheson called the meeting to order and announced that nominations for the office of President of the Local Section would be considered.

Mr. Robert B. Ingalls, '48, was elected president and as such assumed charge of the meeting. Edwin T. Wood, '48, was elected vice president, and Major W. Seery, '56, was elected secretary-treasurer.

After completing the local section business, President Ingalls called upon Colonel Fertig to discuss the problems facing the Alumni Association and the attempts that are being made to solve them. The report was well received, and the Salt Lake Section agreed that they would support the program as presented and, as local effort, would promote the Colorado School of Mines among the Utah high schools with the idea of encouraging the top high school graduates to consider Mines as their choice in continuing their education. The meeting adjourned at 10:30 p.m.

Miners attending the meeting were:

W. F. Koch, '11; Frank B. Harris, '13; John H. Greenwood, '15; H. J. Vander Veer, '30; C. D. Michaelson, '32; M. A. Lagergren, '33; J. H. Baker, P. A. Pelton, '35; R. L. Olund, '37; W. P. Gillingham, '47; Robert B. Ingalls, K. H. Matheson, Jr., E. T. Wood, '48; R. D. Brace, R. B. Coleman, C. R. Passavant, Jr., '49; Ben Slothower, '50; Wally McGregor, '52; W. E. Saegart, '53; Donald O. Rausch, '54; R. G. Pinkerton, Major W. Seery, '56; A. G. Dempster, Le Roi H. Rice, '58; John J. Selters, '60.

(Editor's Note: Colonel Fertig was particularly pleased by the large attendance on such short notice; particularly since those in attendance represented classes from 1911 to 1960. The enthusiasm shown will certainly be reflected in bringing Mines to the attention of the people of Utah.)

Four Corners Section

At 6 p.m., 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 with everyone bringing his own steak. COORS and condiments (salad and dessert) were furnished by the Section.

Seven couples of MINERS attending the meeting were:

Mr. and Mrs. Dick Scanlon, '38; Mr. and Mrs. P. K. Hurlbut, '40, of Albuquerque; Mr. and Mrs. Burleigh Shepard, '51; Mr. and Mrs. Dick Banks, '53; Mr. and Mrs. Neal Harr, '54; Mr. and Mrs. Jim Winston, '60, of Shiprock.

Plans were made for a summer meeting and for election of officers with the date to be decided later.

Dick Banks, '53, president

The lanky cowboy strode into the elegant ladies' shop and headed for the lingerie department. He approached the salesgirl and announced, "I'd like to buy a girdle, ma'am."

"Playtex?" she suggested.

"That's mighty kind of you, ma'am," the cowboy gallantly answered, "but not right now, I'm double parked."

Great Lakes Section (Chicago)

Charles Fitch, '49, writes that about 30 people attended the Great Lakes Section cocktail party at the home of Henry Parfet, '49, on Sunday, June 12. He adds that "we were able to secure the COORS beer from Peoria through Buck's help. A good time was had by all, and our leader, 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. Danford, '28; John and Lee McAnerney, '35; Hilary and Peg Raab, '37; Joe R. Gilbert and his mother, '42; Ray and Vonnie Watson, '43; Mr. and Mrs. Ernie Baugh, '44; George and Dorlis Bodine, Mike Zangara, '48; Bill and Bev Savin, Charles and Valerie Fitch, Buck and Vivian Parfet, '49; George and Jenny Miller, '50; George and Ramona Coker, '53; Fred and Sally Campbell, '54; Max and Sharron Moskal, Mr. and Mrs. Arthur Silberberg, Steve and Marcia Kyriakides, '58; Paul and Bea Ellis, '59.

New York Section

H. D. Thornton 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 were privileged to have Harry Wolf give them a short talk on his recent trip to British Guiana.

The next meeting of the Section will be in the fall at the call of the secretary, and a portion of the session will be devoted to the election of officers for the coming year.

Fifteen members and two visitors attended the June 9 meeting. They were:

Harry Wolf, '03; E. A. Strong, '14; Norman Malm, '27; Ben F. Zwick, K. C. Stansmore, '29; Tom Manhart (from Tulsa), W. E. Wallis, '30; George Speirs (from Argentina), '31; T. P. Turchan, '35; B. W. Geddes, '37; J. G. Cox, '38; F. R. Fisher, H. D. Thornton, '40; Ralph Hennebach, '41; L. I. Railing, '47; Herb Goodman, '48; T. B. Reifsnyder, '49.

Permian Basin Section

Tom McLaren, '52, secretary-treasurer, writes that the Permian Basin Section had its last meeting on May 6 until next Sept. 1. He says the section had a successful year and brought up its roll to some 50 per cent of active members of the 64 alumni in the area. The section closed out its year on Saturday, May 21, with its annual spring family picnic and COORS party, with 28 miners, their wives and something near an average of two children per family for an estimated attendance of 110. Hogan Park in Midland was the place, and everyone enjoyed the outing.

CLASS NOTES

(Continued from page 8)

OZBEK SARAN has moved from Golden, Colo., to 1050 Sherman St., Apt. 206, Denver 3, Colo.

RICHARD J. WHITTINGTON's address is 1310 W. Indiana, Midland, Texas.

1960

MOHAMMED HASSAN ALIEF's address is P.O. Box 342, Golden, Colo.

LAUREN B. AMES may be addressed c/o DuPont Mfg. Section, Yerkes Film Plant, Station B. Buffalo 7, N. Y.

KEITH E. ANDERSON, 1425 Childs St., Wheaton, Ill., is engineer in training for Northern Illinois Gas Co.

JOSEPH L. ANJIER's address is 2126 Monteagle, Colorado Springs, Colo.

GERALD L. ASKEVOLD's address is East Shore, Polson, Mont.

GEORGE BEATTIE's address is N. J. Zinc Flat Gap Mine, RR 1, Box 4, Treadway, Tenn.

DONALD L. BENNETT may be addressed c/o Bennett Motors, Santa Rosa, N. M.

HASSAN BEYKPOOR may be addressed c/o Mr. Farshchi, Ashikhehadi Ave., Amrong No. 39, Tehran, Iran.

RICHARD E. BLODGETT, JR., lives at 1220 Arapahoe St., Golden, Colo.

BERNARD L. BOBO's address is 200 E. Washington Blvd., Grove City Pa.

RONALD L. BREDEHOFT lives at 506 Elwood St., Sterling, Colo.

MIGUEL A. CARRIZALES, x-'60, is general mine foreman for Cerro de Pasco Corp. His address is Mahr Tunnel, Peru, S. A.

ALVA M. CASTER may be addressed c/o North Dakota Geological Survey, University Station, Grand Forks, N. Dak.

EDWIN H. CRABTREE, III gives his address as P.O. Box 465, Golden, Colo.

WILLIAM E. CRISTIANO's address is Ogg Meadow Rd., Orange, Conn.

RICHARD A. DANIELE lives at 1530 Commercial St., East Weymouth 89, Mass.

RICHARD B. EGEN is employed by Atlantic & Refining of Dallas, Texas. His mailing address is 1130 North, Hastings, Nebr.

MELVILLE C. ERSKINE, JR., lives at 11155 Canon Vista, San Jose 27, Calif.

RONALD W. EVANS' address is 3276 S. Delaware, Englewood, Colo.

NEIL R. EVERETT's address is 314 S. Nadine St., Kimball, Nebr.

JOHN F. EVERS may be addressed at P.O. Box 7, Green River, Wyo.

ROBERT L. FERRITER lives at 1921 Claremont Ave., Pueblo, Colo.

WILLIAM H. GERDES' address is R.D. No. 3, Freehold, N. J.

GLENN C. GRAHAM lives at 1604 N. Corona St., Colorado Springs, Colo.

ROBERT E. GREEN's address is Silver Bell, Ariz.

ALBERT S. GRIFFIN, JR., gives his address as c/o National Tank Co., P.O. Box 1710, Tulsa, Okla.

LENNOX HAGEMANN's address is 18 Locust Ave., Staten Island 6, N. Y.

S. BRUCE HEISTER's address is 7430 Sierra, Fontana, Calif.

(Continued on page 57)

IN MEMORIAM

Philip F. Shannon

Philip F. Shannon, professor and head of the Department of Petroleum Engineering at the Colorado School of Mines from 1924 to 1928, died May 7 at Phelps Memorial Hospital, Tarrytown, N. Y. In 1939 he was awarded an honorary doctor's degree in engineering from Mines.

A graduate civil engineer of Kentucky University (1907), Mr. Shannon spent most of his life in the oil industry and had wide experience in the production of oil. After serving with the AEF in France during World War I, he became superintendent of Continental Oil Co.'s producing operations in the Rocky Mountain Area and held that position for six years.

He left the CSM faculty to become assistant manager and then manager (1928-1944) of producing operations for The Tropical Oil Co. (International Petroleum Co. and Standard Oil Co. of New Jersey) in Colombia, S. A. During this period he was also director of Sociedad National del Carrarr, a joint company with Colombian capitalists.

From 1944 to 1946 Mr. Shannon was president of Royalite Oil Co. and manager of producing operations for Imperial Oil Co. Ltd. in western Canada. He served from 1946 to 1952 as a member of Producing Coordination Committee of Standard Oil Co. of New Jersey in New York City, and as regional representative for Canada, Peru, Equador, Colombia and Venezuela (except Creole).

Since 1953 Mr. Shannon has been acting as senior petroleum consultant for Chemical Bank New York Trust Co. in New York Ciyt, and he has been doing other consulting work including reports on Canada.

Survivors include his widow, Mrs. Philip F. Shannon of Scarborough, N. Y.; a daughter, Janet, and two sons; James who is a surgeon at Marblehead, Mass., and Phil who is in the advertising business.

Earl C. Maund

We have just learned of the death of Earl C. Maund, a 1938 petroleum engineering graduate of the Colorado School of Mines. Mr. Maund was general manager of Union Iron Works of California, Inc., San Francisco, Calif., when he passed away in 1958 as a result of a heart attack. In the early 1940's he was an active member of the Chicago Section of the Alumni Association.

Col. Leland Davis Breckenridge

Col. Leland Davis Breckenridge, a 1921 mining engineering graduate of the Colorado School of Mines, died May 10 in Alexandria Hospital, Alexandria, Va. He was associated with the real estate firm of Frederick W. Berens Sales, Inc.

A native of Equality, Ill., Colonel Breckenridge served overseas as a captain with the Marine Corps during World War I. When World War II broke out, he saw duty in Europe with the Army Air Force. Between wars he was in the real estate business in Coral Gables, Fla.

Besides his wife, Sophie, of 1561 Mount Eagle Pl., Alexandria, Va., he leaves a son, Leland D., Jr., of New York, and two daughters, Miss Carol Breckenridge of New York and Mrs. Sophie B. Fitz-Giggon of Upper Montclair, N. J.

Andrew J. Dickson, Jr.

Andrew J. Dickson, Jr., a petroleum engineering graduate of the Colorado School of Mines this spring, was killed June 11 when his Volkswagen collided headon with a semi-trailer truck one mile east of Ft. Morgan, Colo., on U.S. 6. He was employed by Continental Oil Co. in Ft. Morgan, and had occasionally worked on the sports desk of the Denver Post.

Dickson was a member of Who's Who in American Colleges and Universities, Saber and Blade, and Blue Key. A guard in basketball and a third baseman on the Mines baseball team, the 23-year-old Dickson had served as CSM student body president in 1958-59.

Survivors include his parents, Mr. and Mrs. Andrew J. Dickson, Sr.; three brothers, Stephen, Paul, and Mark; and a sister, Linda Kathleen, all of Denver, Colo.

Ernest E. Bunte

Ernest E. Bunte, who received his E. M. degree in 1920 from the Colorado School of Mines, died May 20 in St. Luke's Hospital, Bethlehem, Pa., after a two weeks' illness.

A friend and former classmate at Mines, Thomas G. Foulkes, '22, writes of him: "Ernie was beloved by all who knew him and left behind a host of friends. He was interested in meeting CSM alumni and was active in the Eastern Pennsylvania Section of the Alumni Association."

Born 63 years ago in Denver, Colo., Mr. Bunte graduated from North Denver High School before attending Mines. He held membership in Sigma Alpha Epsilon fraternity, Tau Beta Phi Honorary Society, and the Bethlehem Steel Club.

A resident of Bethlehem, Pa., for over 30 years, he was assistant superintendent of the open hearth at Saucon Valley Plant of Bethlehem Steel Co.

Surviving are his wife, the former Mary V. Howard, of 1826 Easton Ave., Bethlehem; a daughter, Mrs. William Stevens, of Sherman Oaks, Calif.; a sister, Berenice, of Denver, Colo., and two grandchildren.

CLASS NOTES

(Continued from page 56)

ROBERT B. HOFFMAN is living at 1525 Holly St., Denver, Colo.

ROBERT F. JENKINS, JR., 1107 16th St., Golden, Colo., will be in Denver after September.

GEORGE C. KANE gives his address as Box 155, Poncha Springs, Colo.

ROBERT H. KARLSSON may be addressed c/o Donald Alden, 3 Laurie Lane, Jamestown, N. Y.

ARVI KIVI lives at 2910 Ivy St., Denver 7, Colo.

RONALD A. KRIZMAN's address is 132 West 3rd St., Leadville, Colo.

F. SPARKS LANGHER, JR., lives at 5602 St. Clair, North Hollywood, Calif.

CARLOS A. LARES gives his address as 2 DA Ave. Qta "Jo-Gre-Her" 41, Urb. Montecristo-Los Chorros-Edo., Miranda, Venezuela.

KENNETH L. LARNER's address is 1082 N. Ave., Higland Park, Ill.

GEORGE A. LINDROTH may be addressed c/o Crucible Steel Co. of America, 6301 Colorado Blvd., Denver, Colo.

J. DONALD LONGENECKER lives at 310 Cheyenne St., Golden, Colo.

QUENTIN T. McGLOTHLIN is living at Manzanola, Colo.

ALBERT E. MILLER lives at 1550 Depew St., Denver 15, Colo.

CURTIS L. MILLER's address is 518 Collins St., Pueblo, Colo., where he is employed by CF&I as a mining engineer.

JAMES K. MOLDEN, employed by Universal Oil Products of Riverside, Ill., may be addressed at 536 S. Bluff St., Janesville, Wis.

TED L. MYERS may be addressed c/o D. J. Conces, Personnel Dept., Inland Steel Co., East Chicago, Ind.

DENNIS B. O'NEIL's address is Box 307, Kelseyville, Calif.

ROGER H. OSBORNE lives at 727 Lake St., Fort Morgan, Colo.

RICHARD J. PITNEY, employed by Columbia Iron Mining Co. of Cedar City, Utah, gives his mailing address as 815 S. High St., Denver 9, Colo.

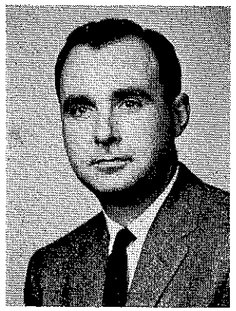
DEAN H. POSPISAL's address is 14835 W. Colfax, Golden, Colo.

WILLIAM M. RAMSBURG is junior engineer for Superior Oil Co. at Cortez, Colo.

(Continued on page 62)

CAMPUS HEADLINES

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



DR. J. L. HALL

Sponsored by the National Science Foundation, a Summer 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 six-weeks program on the Mines campus, said courses are being taught by himself; Dr. Walter H. Dumke, '29; Dr. Charles M. Shull, Jr.; Dr. W. D. Compton; Dr. Fred E. Moore; and Delmar Brown. Supplemental lectures will be given by Dr. John C. Bailar, Jr., professor of chemistry at the University of Illinois and past president of the American Chemical Society; Dr. Arthur W. Davidson, internationally known chemist and professor of chemistry, University of Kansas; Prof Harold F. Walton, University of Colorado, who is known for his work in uranium geo-chemistry; and Harold Bloom of the CSM geology department, who will talk on geochemical prospecting.

Purpose of the institute is to provide an opportunity for high school students who have shown unusual ability and interest in chemistry and geology to study these subjects at a level beyond the normal scope of the secondary school. It is hoped that such a program will inspire and encourage a student to advance his training and to enter one of the sciences as a career.

Of 1200 inquiries from every state in the Union, about half made applications to attend the institute. From these applications 58 students (including three girls) were selected to study geology and chemistry on the Mines campus during the six weeks period. Students will have about 20 hours of class work each week besides a geological field trip each Saturday. Trips to Martin Co., and USGS are also planned.

Topics to be discussed in chemistry include: atomic and molecular structure, chemical bonding, coordination compounds, and radiochemistry. Laboratory experiments are designed to teach fundamental techniques as well as to correlate topics discussed in lecture.

The structure, classification, and identification of crystals, minerals and rocks will be studied with emphasis on chemical and physical properties. Some geological processes and principles to be considered are: geologic time (related to fossils), structure and movements of the earth's crust, steam erosion and deposition, glaciers, ground water, oceans, mountains, and mineral resources.

Denver Bronchos Train At Mines; Public Invited

The Denver Bronchos, 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 Filchock said:

"We plan to start knocking heads on the first day. With a total of 130 candidates for tryouts, this number includes those already signed, it is 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 Bronchos as a team of which you may be proud, and which you will support."

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

James G. Robinson Appointed Public Relations Director

James G. Robinson, former college relations director at Hillsdale (Mich.) College, has been appointed assistant to the president for public relations and development at the Colorado School of Mines.

Robinson, 35, replaces Troy F. Crowder as director of the mineral engineering college's overall public relations and development programs. Crowder will assume a similar position July 1 at Montana State University, Missoula.

A 1950 journalism graduate of the State University of Iowa, Robinson was a reporter-photographer for the Wisconsin (Madison) State Journal for five years. Following two years as a public relations employe for the Dow Corning Corp., he went to Hillsdale College in 1958.

Geology Department Changes Curriculum

Several changes will be made in the geology curriculum for the fall semester 1960-61. The changes, which are part of an all-school curriculum revision, 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 will become a junior course and Physical Chemistry will be changed from the Junior year to the sophomore year. Crystallography and Mineralogy are being combined and reorganized into Mineralogy I and Mineralogy II.

All Mines students will be required to take Mineralogy I. Mineralogy II will be a junior course and required of all geology majors; it 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 hourage to accommodate a student's special interest.

Coach Brennecke Announces Football Schedule for 1960

A nine-game Colorado School of Mines football schedule for 1960 has been announced by Fritz S. Brennecke, director of athletics.

The Orediggers will play five road games and four contests at home. Included is a full five-game Rocky Mountain Conference schedule. Last year the Miners played only four of the RMC schools.

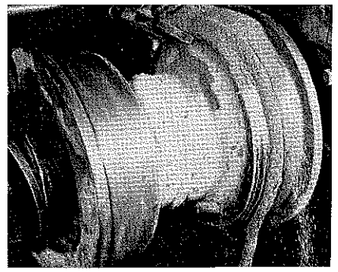
The 1960 Mines football schedule:

Sept. 17 — Mines at New Mexico Highlands (night)
Oct. 1 — Mines at Omaha (night)
Oct. 8 — Colorado College at Mines (night—RMC)
Oct. 15 — Mines at Westminster (Utah)
Oct. 22 — Mines at Colorado State College (RMC)
Oct. 29 — Idaho State at Mines (Homecoming—RMC)
Nov. 5 — Mines at Colo. Western State (RMC)
Nov. 12 — Panhandle A&M at Mines
Nov. 19 — Adams State at Mines (RMC)

All Mines home games will be played at Brooks Field, with evening games starting at 8 p.m., afternoon games at 1:30 p.m.

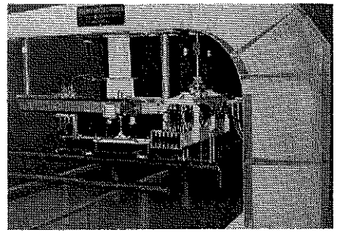
WITH THE MANUFACTURERS

Automatic Welding Flux



Hobart Autoflux H-950 is an inert automatic welding flux specially developed for use with automatic submerged arc hardsurfacing wires. It is truly inert and will not cause complicated alloying effects with the deposited weld metal. Hardness, ductility, and work hardening characteristics of the weld metal will be determined by the alloying content of the wires only when using this flux. Autoflux H-950 is available in 80 pound bags, or in a fiber, plastic lined drum at extra cost. For more complete information, write Hobart Bros. Co., Troy, Ohio.

Hydropress

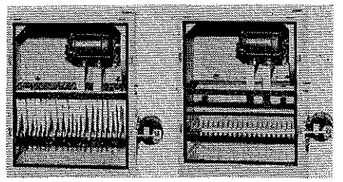


Baldwin-Lima-Hamilton's Industrial Equipment Division has supplied two fully automatic data-gathering and processing systems for heavy steel pipe to a leading Midwestern manufacturer.

The machine measures the length and weight of each pipe and stencils these variable data on the individual pipe, in addition to a preset non-varying message, all in accordance with the standards of the American Petroleum Institute. In addition it computes the weight per foot for each pipe, rejects pipes out of weight tolerance, indicates and prints the cumulative number of pipes, the individual and cumulative total lengths and weights, the time, the date, and preset non-varying records for each pipe.

The application of Loewy data-gathering and processing equipment is almost unlimited. It can be used as well for solid as for tubular products and in any process which involves linear measurement, weighing, any calculated quantities depending on these measured variables, automatic error-proof stenciling and printing of tally sheets, shipping information, inventories, production and incentive records and card or tape punching.

Filter Shaker



A newly developed, highly efficient automatic filter shaker is now available on all models of Torit cloth filter type dust collectors, the St. Paul, Minnesota, manufacturer has announced.

In addition to assuring peak operating efficiency by thoroughly shaking the filters each time the dust collector is used, the self-cleaning device eliminates the chance of a workman forgetting to manually shake the filters when the need arises.

The view at the right pictures the shaker bar with its metal fins, while the one at the left shows the filter bags in position. The bar is oscillated horizontally by the motor outside the cabinet, and the fins strike the filters to free them of dust.

Shaking action begins automatically whenever the collector motor is turned off. After shaking the filters for two minutes, the mechanism shuts itself off and will not operate again until the collector has been turned on and off again.

Information on this new filter cleaning device is available from Torit Manufacturing Co., 1133 Rankin St., St. Paul 16, Minn.

Electric Drive Vehicles

Electro Trucks Inc.—The Peters Co., manufacturers of earth moving and construction machinery, recently announced the availability of a completely new line of heavy duty vehicles utilizing four-wheel electric drive.

According to Electro officials, the new line of electric drive construction vehicles will include scrapers, bottom and rear dumps, and rubber-tired tractors for pushing and dozing.

The electric drive, including generators, controls and motors, will be engineered and manufactured by General Electric at its Erie, Pa., plant.

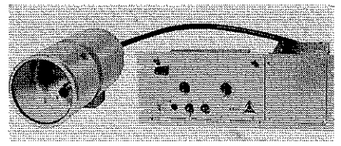
F & S Contracting Company of Butte, Mont., placed the initial order for the first of this new line of vehicles through Electro's local distributor, the Roberts Rocky Mountain Equipment Co., also of Butte.

This 60-ton rear-dump vehicle will have a maximum speed of 25 miles per hour and be able to turn completely around in less than its own length. The electric drive eliminates such standard truck mechanical parts as transmission, clutch, differential, and axles.

F & S will use the vehicles in contract strip mining for the Anaconda Co. near Butte.

Delivery of the first electric drive truck is scheduled for August.

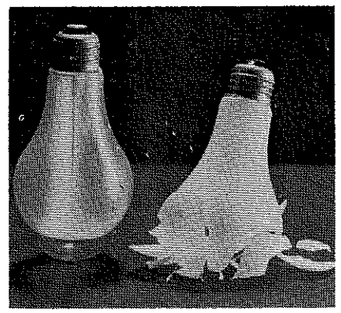
Magnets



A new line of Stearns "Pow-R-Light" lifting magnets designed specifically for scrap handling is described in Bulletin 3021, Stearns Magnetic Products, 635 S. 28th St., Milwaukee 46, Wis.

This new series of lightweight, heavy-duty magnets is available in 36", 39", 45", 55" and 66" diameters. They feature lighter aluminum field coils and all-welded, water-tight construction for longer maintenance-free life under the severe conditions of scrap handling service.

Flamescent



Flamescent, the Duro-Test Corp's new lamp that gives the appearance of gas flame in the electric bulb, is shatterproof as compared with an ordinary electric lamp after both were dropped onto a hard surface. This test was made from a height of over 5 feet.

Flamescent, the registered trade name for the new bulb, produces an entirely different lighting effect. A lamp of higher lumen output with more brilliance than any other processed bulb, it is regarded by lighting experts as the first new innovation in residential and commercial lighting since the introduction of fluorescent lighting 20 years ago.

Duro-Test engineered, designed and developed the lamp on a laboratory scale. The Corning Glass Works, Owens-Corning Fiberglas Corp. and the Dow Corning Corp. cooperated to put the lamp into production.

Owens-Corning Fiberglas contributed a Fiberglas yarn of exceptional fineness and unusually high luminous transmittance. Dow Corning developed a new silicone adhesive that was not only a prerequisite to the Fiberglas but created another remarkable feature for the Flamescent lamp by making it virtually impervious to Thermal shock. A hot "Flamescent" lamp can be dunked into ice water and remain lighted.

CATALOGS and TRADE PUBLICATIONS

Send your publications to The Mines Magazine, Guggenheim Hall, Golden, Colo., for review in these columns. Please mention The Mines Magazine when requesting publications from the manufacturer. Publications are free.

ALUMINUM JOINING MANUAL. A complete survey of aluminum welding, brazing and soldering is included in a comprehensive, practical, 40-page illustrated manual by All-State Welding Alloys Co., Inc. of White Plains, N. Y. Among subjects covered are welding aluminum and its alloys by inert gas shielded metal arc with a consumable electrode, inert gas shielded metal arc with a tungsten electrode and the latest arc and gas welding processes. A complete list of All-State's aluminum joining products and fluxes, said to be the largest aluminum line in its field, is included with government specifications covered by these alloys.

BIT. A new chain cutter bit for potash mining is announced by Vascoloy-Ramet Corp. of Waukegan, Ill. High clearance angle, narrow head and special carbides have been developed by V-R specifically to meet the requirements of the potash industry. For further information write to Vascoloy-Ramet Corp., 800 Market St., Waukegan, Ill.

CARBIDE BITS. Gardner-Denver Co. is now offering new Gardner-Denver Tungsten Carbide insert bits for maximum efficiency with the Mole Dril. The new combination drills larger diameter holes to achieve optimum results with inexpensive blasting agents. Drilling costs are trimmed regardless of the hardest and most abrasive formations encountered.

Using premium grade carbide inserts, the bits are engineered to exacting specifications for maximum service. The body is of top quality forged steel alloy. Precise and rigid manufacturing controls the brazing of the insert into the body. Drill disassembly is eliminated. Gardner-Denver reversed buttress threads assure trouble free attachment of the bit to the Mole-Dril. Contact the Gardner-Denver Co., Quincy, Ill. Ask for Bulletin 6-6HH.

COMPRESSED AIR LEAK COST CHART. New hanger card, F-255-A shows comparison cost of compressed air leaks. Chart shows area of leak by diameter in fractions of inch, air loss by cubic feet per month at 75 psi, and dollar loss by cost of waste per month at $0.12 per 1,000 cu. ft. Punch-Lok Co., 321 N. Justine St., Chicago 3, Ill.

COMPRESSOR CATALOG. Allis-Chalmers is now making available what is said to be the most complete catalog ever offered covering performance and engineering data on its scroll casing design single-stage centrifugal compressors for air applications. The loose-leaf catalog includes formulas for sizing the firm's B, C and D style units, dimensional data and prices, and 123 performance curves. Copies of the catalog can be obtained by request on company letterhead from Allis-Chalmers, Milwaukee 1, Wisc.

DRILLING PROCEDURES. An eight-page illustrated brochure entitled "Drilling Rock With Coupled Steels," detailing proper operational and maintenance procedures for coupled rock drill steels, now is available without charge from Thor Power Tool Co., 175 North State St., Aurora, Ill.

The Thor Bulletin No. 10815 discusses and illustrates correct rotation, drill, and feed control operations, starting a hole, proper feed, drilling, and lubrication practices, adding and removing steels, bit maintenance, and dust control.

DRY PROCESSING EQUIPMENT. Newest information on Sturtevant Mill Company's full line of dry processing equipment is contained in the Boston firm's 1960 dry processing equipment catalog, just made available. Illustrated with photographs, flowsheets, tables and graphs, the eight-page booklet contains information on Sturtevant's air separators, blenders, mixers, Micronizer fluid energy grinders, Pulver-Mill impact grinders, other crushing and milling machines, dens, elevators, granulators, screens, laboratory equipment and other machinery and accessories.

ENGINE OILS. Sun Oil Co. offers a technical bulletin on 2-cycle engine oil. The bulletin describes specifications, advantages, and test results for Sun 2-cycle engine oil. The oil is made for use in all outboard motors and in engines where lubricating oil is mixed with gasoline to power chain saws, lawn mowers, pumps, generators, railroad motor cars, scooters, and so forth. The bulletin says that the oil is designed to minimize sparkplug fouling, exhaust-port plugging, piston lacquering, ring sticking, and piston scuffing. Copies of the bulletin are available from Sun Oil Co., Industrial Products Dept., 1608 Walnut St., Philadelphia 3, Pa.

ENGINES. Everyone involved with the purchase of an engine will find this 28 page handbook very informative. Titled "Judging Engine Quality," it emphasizes the features of various designs which provide you with top performance for minimum cost—original and/or final. Copies of this valuable handbook, "Judging Engine Quality," Form 20185-DN935, are available at no cost from Caterpillar Engine Division, Peoria, Ill.

HOSE CLAMP FOLDER. New 6-page folder, F-310, describes Punch-Lok hose clamps, easy to use portable locking tools, the TA-1 Tension-Air production clamping machine and the K-45 Clamp-Master Maintenance Kit for fast, smooth clamping of hose, insulation, cable, split beams, etc. Punch-Lok Company, 321 N. Justine St., Chicago 7, Ill.

NICKEL ALLOYS. Publication of a new booklet entitled "Nickel Alloy Steels and Other Nickel Alloys in Engineering Construction Machinery" has been announced by The International Nickel Company, Inc. The fully-illustrated 37-page booklet is intended to serve as a guide to those involved in the design or fabrication of machinery for the construction industry. The booklet is available without charge through the Readers Service Section of The International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.

SEISMIC ANALYSIS. A new, two-color booklet, No. 33793, "Ripping With Seismic Analysis," has been released by Caterpillar Tractor Co., Peoria, Ill.

The eight-page brochure tells how earthmoving costs can be reduced by the use of crawler-drawn rippers, instead of blasting, in some materials.

The principles, method and operating technique of seismic analysis are discussed. A table showing the rippability of various materials such as limestone, sandstone, gneiss, caliche, conglomerate, etc., is included.

In seismic analysis, the velocity of shock waves traveling through the subsurface is used to determine the degree of consolidation, or rippability, and the depth of each layer of below-the-surface materials.

For copies of the booklet, contact your nearest Caterpillar Dealer, or write to Caterpillar Tractor Co., Peoria, Ill.

SILICONES AND THEIR USES. An up-to-the-minute summary of the forms, properties and applications of Dow Corning Silicones is contained in this free, 16-page brochure.

Silicone products reviewed range from adhesives to release agents, laminating resins to rubber compounds, and electrical insulation to water repellents. The table of contents is arranged according to applications enabling quick, easy reference to silicone materials that resist the effects of time, heat, moisture, weathering, oxidation, and chemical attack . . . properties of vital interest to design engineers and production-maintenance men. Available from Dow Corning Corp., Midland, Mich.

TRACTION MOTOR REBUILDING. Bulletin GEA-7114 covers Service Shop's new method of re-winding and re-insulating traction motors. Epoxy impregnation for mechanical strength, improved heat transfer, moisture resistance and contaminant protection is described, as well as bearing and mechanical repairs and dynamic balancing. Eight pages, illustrated—General Electric Co., Schenectady 5, N. Y.

VIBRATING MILL. A 30-inch vibrating mill suitable for continuous processing of a wide range of materials is a new unit in Allis-Chalmers line supplementing the 15-inch mill introduced in 1958. Powered by two 50-hp. motors, the compact mill can out-produce a tumbling mill 15 to 30 times per unit volume. Initial cost of the vibrating mill is at least one-third lower than that of any other machine of comparable capacity.

The Allis-Chalmers 30-inch vibrating mill is basically a spring-mounted cylinder with dual eccentric drive mechanisms running horizontally on each side. The entire unit with motors and integral base frame occupies only 66 square feet. It has an internal volume of 12 cubic ft. A description of the mill is given in a new leaflet, "Allis-Chalmers Vibrating Mill," 07B9582, available on request from Allis-Chalmers, Milwaukee 1, Wis.

PLANT NEWS

Blue Ribbon Award Presented To Denver Equipment Co.

For the fourth consecutive year, Denver Equipment Co. has been selected by a panel of internationally known mining engineers to receive the coveted "Blue Ribbon Award" presented by Mining World, an international circulation magazine published in San Francisco, Calif.

V. L. Mattson, '26, left, of Oklahoma City, Okla., manager of mining and milling for Kerr-McGee Oil Industries, Inc., presented the 1960 award to A. C. Daman, '15, president of Denver Equipment Co., on behalf of Mining World Magazine. The award, presented "for achievement in equipment development aiding the technological advancement of the mining industry," was received for the Denver Vertical Pumping Turbine Solvent Extraction Mixer Unit which is used in uranium processing.

Kerr-McGee Oil Industries, Inc., was one of the pioneers in development and commercial use of the solvent extraction process. The Denver Pumping Turbine Solvent Extraction Mixer makes possible continuous processing in a compact, space-saving unit which eliminates need of expensive acid pumps and plastic piping. The Denver unit was designed with the cooperation of Kerr-McGee Oil Industries, Inc. Installations of the Denver Pumping Turbine Solvent Extraction Mixer include Kerr-McGee Oil Industries Mill at Shiprock for uranium and vanadium recovery with other units of a modified design in use at the uranium mills of Susquehanna-Western, Inc., at Riverton, Wyo., and Mines Development at Edgemont, S. Dak. The Denver Vertical Pumping Turbine Solvent Extraction Mixer has also been selected for an additional complete plant installation.

Judges on Mining World's panel were: Edward Borchardt, consulting engineer; Lawrence Wright, chief of geological exploration, Southern Pacific Co.; William T. Griswold, manager, technical services, Marcona Mining Co.; Norman Weiss, milling engineer, American Smelting and Refining Co.; W. H. Wamsley, mine superintendent, U. S. Borax and Chemical Corp.; and William H. Love, general manager, Hecla Mining Co.

Kennecott's Hayden Plant Uses Atomic Device

A Kennecott Copper Corp. plant has increased production 50 per cent through a water reclamation project controlled by an atomic device.

The new system, part of a $55 million expansion of the Hayden, Ariz., refinery, increased capacity from 15,000 tons of ore a day to 22,500 tons, officials said.

The company is limited by law to use of 10,000 gallons of water per minute from the Gila River. To expand its production, the firm needed an extra 3,000 gallons per minute.

The company built a large pool into which water from the tailings (copper waste) is pumped. Solids in the water drop to the bottom, clear water rises to the top of the pool and is reclaimed for use.

The solids are flushed out the center through a pipe. At the entrance to this pipe is a box containing radioactive istotopes. On the other side of the pipe is a detection unit to measure the gamma rays given off by the isotopes.

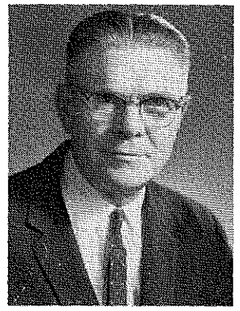
The intensity of these rays reaching the detector indicates the density of the solids in the pipe. When the density drops, the detection unit automatically slows the flow of water into the pool, allowing more time for the solid particles to settle.

Company officials said it is one of the first uses of an atomic device in the copper industry.

1960 Mining Issue

The May 1960 issue of The MINES Magazine covered the annual National Western Mining and Energy Conference held in Denver April 21-23. Copies are still available from The MINES Magazine, Golden, Colo., price $2.50 postpaid.

S. O. Bringhurst Heads Mine & Smelter Supply Co. In Salt Lake City, Utah



Appointment of S. O. Bringhurst as manager of the Salt Lake City Branch, Mine and Smelter Supply Co., has been announced by Herman F. Seep, vice president. Mr. Bringhurst has been with the company for 30 years and has been serving as assistant branch manager. He succeeds William J. Berryman who has retired from active service after 43 years with the company, but he is being retained in a consulting capacity.

The Salt Lake City branch serves that area's mining industry both as a distributor of equipment and supplies and as representative for the company's manufacturing division, located in Denver. The distribution division's main office is also in Denver with branches in El Paso and Albuquerque in addition to Salt Lake City.

Mine and Smelter manufactures Marcy Grinding Mills, Akins Classifiers and other ore milling equipment and has sales agents and licensed manufacturers throughout the world. Donald J. Drinkwater, Denver, is manager of the manufacturing division.

Kerr-McGee Announces Organizational Changes

Several organizational changes in the minerals division of Kerr-McGee Oil Industries, Inc., became effective June 1. V. L. Mattson, '26, formerly manager of mining and milling, has been named general manager, minerals.

R. T. Zitting, formerly manager of mineral exploration, is now manager, mineral exploration and land.

Phil Ellsworth, formerly district geologist at Golden, Colo., has been promoted to chief geologist (minerals). Ellsworth will remain in Golden.

Letters to the Editor

LESTER S. GRANT, '99, 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, as usual, too many things have interfered.

"The Certificate is beautifully done and needs a frame as do one or two other things that I should like to attend to if and when I ever get my accumulated mess of various and sundry papers and other things in order as I have hoped to do ever since buying this house. Unfortunately I was just about ready to start on this work, which includes the re-editing of some 8000 colored slides and other photographic relcis of my younger days as one of the main jobs that is yet to be done, when my wife became sick and during her three years in the nursing home and since I have been unable to find the time to do this sort of work.

"It was almost equally pleasing to find the signatures of the nominating committee, so many of whom were my students, and the greater number of whom I have at least met at Alumni Meetings. I thank you for your part in this and will appreciate your conveying to the Alumni my heartfelt thanks and sincere appreciation of the honor conferred on me.

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

(Editor's Note. This letter will be submitted to the next regular meeting of the executive committee. Come and see us any time now that we are in our new offices in Guggenheim.)

July 1960.

NATHAN J. HOFFMAN, '55, wrote us, "I'm still a research engineer, metallurgy, for Rocketdyne, but I am going on educational leave of absence for about 14 months to study metallurgy at the Graduate School of Technion, Haifa, Israel. I'm leaving for Israel about the middle of June.

"Your, or rather our, Magazine has always been a nostalgic favorite of mine since graduation, but now it is shaping up to a fine technical magazine combined with an attention-getting format. To misquote the old MINES football cheer, 'Boom, yea whole damn MINES Magazine staff'."

(Editor's Note. Thanks, Nate, for those kind words. We will try to continue to deserve them. Good luck on your new venture and let us hear from you.)

DOUGLAS E. BROWN, '51, chief mining engineer, Iron Mining Department, Inland Steel Co., Ishpeming, Mich., writes, "I would like to comment on the past couple of issues of your magazine. The spirit of it seems to have changed for the better, it is more readable, and generally more informative. Keep up the good work!"

(Editor's Note. What sweet words and how seldom do we hear them, even when they are deserved. Thanks, Doug.)

A. F. MAYHAM of Denver, Colo., has submitted pictures and additional facts about the ancient history of the Denver Mining Club which will be published in the August 1960 issue of The MINES Magazine.

CLASS NOTES

(Continued from page 57)

EDWARD G. RAPP's address is 17 Crossland Rd., Colorado Springs, Colo.

JOSEPH W. REESE may be addressed c/o Dave Coolbaugh, Ideal Cement Co., Tongass Trading Co., Ketchikan, Alaska.

DONALD R. REICHMUTH lives at 1101 Sixth Ave. South, Lewiston, Mont.

DAVID M. ROPCHAN's address is 337 Home Ave., Oak Park, Ill.

WILLIAM R. SANDIFER, II gives his address as Greystone Ranch, Evergreen, Colo.

DAVID B. SAPIK may be addressed c/o Bureau of Reclamation, Flaming Gorge Storage Unit, Dutch John, Utah.

FREDERICK P. SCHWARZ, JR., lives at 3 Laurelwood Dr., Mountain Lakes, N. J.

JOHN J. SELTERS' address is RFD, Monte Vista, Colo.

AUGUSTINE J. SLANOVICH's address is S.P.E. House, Golden, Colo.

NORMAN J. SMALLWOOD may be addressed c/o Proctor & Gamble Mfg. Co., 10th and Kansas Ave., Kansas City, Kans.

ADVERTISERS' LISTINGS

Aero Service Corp .....
Philadelphia, Penna.
236 E. Courtland Street

Air Rentals, Inc. ★.....
Denver, Colorado, 3301 Walnut

Allis-Chalmers Mfg. Co. .....
655 Broadway
Denver, Colorado
Milwaukee, Wisconsin

American Manganese Steel Division .. ..
Chicago Heights, Ill.

Armite Laboratories ★.....
Los Angeles 1, Calif., 8609 Broad St.

Atlas Powder Co. .....
Wilmington 99, Del.

Card Iron Works Company, C. S. ★.. .....
Denver, Colo., 2501 W. 16th Ave.

Climax Molybdenum Company 62

Colorado Central Power Co. .....
Englewood, Colo.

Colorado Fuel & Iron Corp. ★..... 6
Amarillo, 1008 Fisk Bldg.
Billings, 215 Pratt Bldg.
Butte, 401 Metals Bk. Bldg.
Chicago 1, 221 North LaSalle St.
Denver 2, Continental Oil Bldg.
Detroit 26, 1915 National Bk. Bldg.
El Paso, 803 Bassett Tower Bldg.
Fort Worth 2, 1506 Continental Life Bldg.
Houston 11, 340 South 66th St.
Lincoln 8, 1227 Sharp Bldg.
Los Angeles 1, 739 East 60th St.
New York 22, 575 Madison Ave.
Oklahoma City 2, 906 Colcord Bldg.
Phoenix, 305 East Buchanan
Portland 9, 1350 N.W. Raleigh
Pueblo, P. O. Box 316
Salt Lake City 1, 411 Walker Bk. Bldg.
San Francisco 3, 1245 Howard St.
Seattle 4, 3434 Second Ave., So.
Spokane, 910 Old National Bk. Bldg.
Wichita 5, 811 East 10 St.

Colorado National Bank ★.....
Denver, Colo., 17th and Champa St.

Coors Company ★.....
Golden, Colorado

Coors Porcelain Co. .....
Golden, Colo.

Deister Concentrator Co. ★.....
Fort Wayne, Ind., 911 Glasgow Ave.
New York, N. Y., 104 Pearl St.
Nesquehoning, N. Y., 231 E. Catawissa St.
Hibbing, Minnesota, P. O. Box 777
Birmingham, Alabama, 930 2nd Ave., North

Denver Equipment Company ★.....
Denver 17, Colo., 1400 17th Street
New York City 1, N. Y., 4114 Empire State Bldg.
Toronto, Ontario, 185 Bay St.
Vancouver, B. C., 305 Credit Foncelr Bldg.
Mexico, D. F., 14 Avenida Juarez
London E. C. 2, 15-17 Christopher St., Finsbury Square
Johannesburg, S. Africa, 3 Village Road

Denver Fire Clay Company ★.....
Denver, Colo.
Salt Lake City, Utah, P. O. Box 836
El Paso, Texas, 209 Mills Bldg.

Denver Hilton .....
Denver, Colo.

Dorr-Oliver Incorporated ★.....
Stamford, Connecticut
New York 6, N. Y., 99 Park Ave.
Atlanta, Ga., 900 Peachtree St., N. E.
Chicago 54, Ill., 942 Merchandise Mart
Cleveland 8, Ohio, 14700 Detroit Ave.
Virginia, Minn., 204½ Chestnut Ave.
Denver, Colo., 2916 South Fox St.
Dallas 30, Tex., 6115 Berkshire Lane
Los Angeles 17, Calif., 811 W. 7th St.
Oakland 1, Calif., 2900 Glascock St.
Seattle 1, Wash., 3104 Smith Tower

Dresser Industries, Inc. .....
Republic National Bank Bldg.
P. O. Box 718, Dallas, Tex.

du Pont de Nemours & Co., E. I. ★.....
Denver, Colo., 444 Seventeenth St.
Wilmington, Delaware
San Francisco, Calif., 111 Sutter St.

Equipment Engineers, Inc. .....
Palo Alto, Calif.

Federal-Gas Hills Partners 3

Flexible Steel Lacing Company .....
Chicago, Ill., 4628 Lexington St.

Franco Western Oil Co. ★.....
Bakersfield, Calif., 3120-18th St.

Frontier Refining Co., The 29
Denver, Colorado

Gardner-Denver Company ★.....
Quincy, Illinois
Denver, Colorado
Butte, Mont., 215 E. Park St.
El Paso, Texas, 301 San Francisco St.
Salt Lake City, Utah, 130 West 2nd South
Los Angeles, Calif., 845 E. 61st St.
San Francisco, Calif., 811 Folsom St.
Seattle, Wash., 514 First South

Geophysical Instrument & Supply Co. .....
Denver, Colo., 1616 Broadway

Golden Merchants .....

Hardinge Co., Inc. .....
York, Pa.

Heron Engineering Co. ★..... 62
Denver, Colo., 2000 So. Acoma

Hidden Splendor Mining Co., The .. 4
Salt Lake City, Utah

Humble Oil and Refining Co. .....
Houston, Tex.

Infilco, Inc. .....
P. O. Box 5033
Tucson, Ariz.

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Butte, Mont., 845 S. Montana St.
Chicago, Ill., 400 W. Madison St.
Denver, Colo., 1637 Blake St.
El Paso, Texas, 1015 Texas St.
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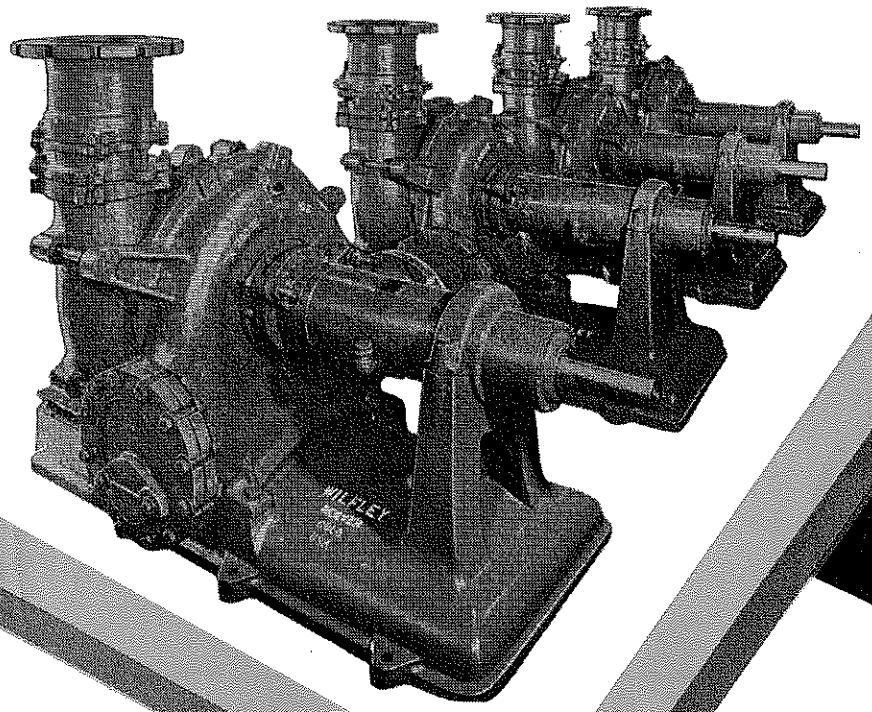

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