

# THE MINES MAGAZINE

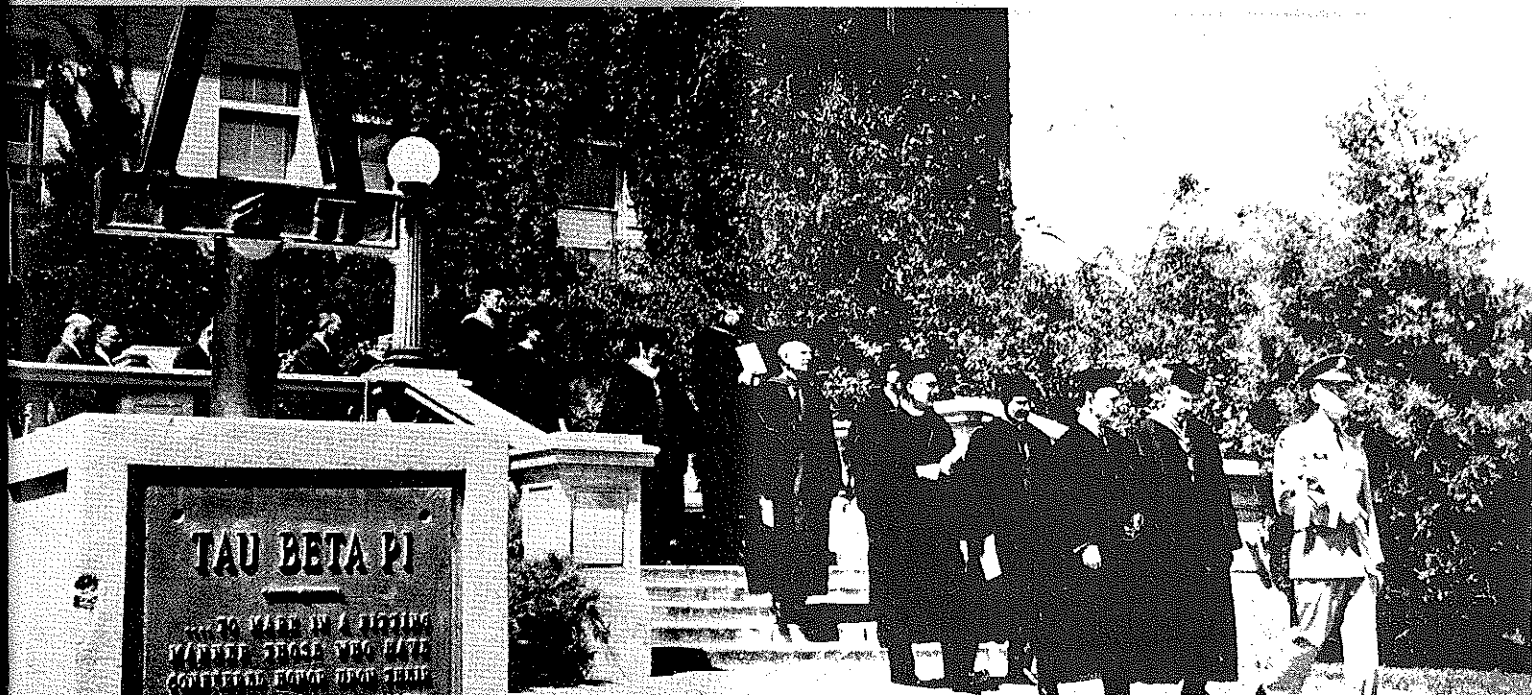
JUNE 1960



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- Secretary of Interior Seaton's Commencement Address
- Annual Alumni Banquet
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- Standard Uranium's Developments in San Juan County
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## CLASS NOTES

PAUL V. FILLO, '40, is living at 6933 E. Luana Dr., Tucson, Ariz.

1946-'50

BURTON E. COLES, '49, is senior research engineer for Atlantic Refining Co. His address is 3826 Merrell Rd., Dallas 29, Texas.

RUSSEL C. CUTTER, '49, lives at 2605 F 1/2 Road, Grand Junction, Colo.

DONALD L. JOHNSON, '50, who was doing graduate work at Purdue University is now metallurgist with Atomics International, Division of North American Aviation. He lives at 8568 Cozy-croft St., Canoga Park, Calif.

LT. COL. WILLIAM E. LECKIE, '49, is chief P and A Branch, ROTC Division, U.S. Army. His address is Office

1882-1930

IRA G. LOVERING, '01, lives at 303 W. 6th St., Pittsburg, Kans.

JOHN V. HUBBARD, '10, retired, may be addressed at Rt. 1, Box 524, Nevada City, Calif.

JOHN V. HARVEY, '11, may be addressed c/o Talley Harvey & Co., 237 Frances Bldg., Sioux City, Iowa.

EDMUND STEIN, '13, lives at 1201 Pleasanton Rd., San Antonio, Texas.

SAMUEL ELDRIDGE, '24, is living at 610 Second Ave., Crockett, Calif.

ELLIOTT V. BAUSERMAN, '25, has retired from the U.S. Bureau of Internal Revenue and is living at 2800 Ontario Rd., N.W., Washington 9, D.C.

GEORGE H. CRONIN, '26, has moved from Falls Church, Va., to 5948 N. Second St., Arlington 3, Va.

M. A. JORGENSEN, '28, is consultant for Newmont Exploration, Ltd., Danbury, Conn. He may be addressed at 2163 S. York St., Denver 10, Colo.

GLEN E. FASSLER, '29, who is doing quite a bit of examination work these days, may be addressed at Freeport, Texas, where his P.O. Box number is 1056.

CLARENCE Z. LEONARD, '29, may be addressed at P.O. Box 496, Seguin, Texas.

1931-'40

JEROME P. HAYES, '34, is project manager for The Lummus Co. Ltd., Imperial House, 80 Regent St., London W. 1, England. He lives at Abbeyfield, 15 the Rise, Sevenoaks, Kent, England.

H. DAVID SQUIBB, '34, lives at 2215 E. Sycamore, Anaheim, Calif.

HON. HERBERT C. HOOVER, '35, has moved from Palo Alto, Calif., to Waldorf-Astoria Towers, New York, N.Y.

JAMES H. HANNAN, x-'35, is consulting engineer and assistant general manager of Las Encinas, S.A., Monterrey, N.L., Mexico. His address is c/o Las Encinas, S.A., Pihuamo, Jalisco, Mexico.

FRANCIS F. SEEBURGER, IV, '35, now lives at Calle de Pedregal 17-A-2 Piso, Lomas de Chapultepec, Mexico 10, D.F., Mexico, according to his sister, Mrs. Carl S. Pellman.

THOMAS SNEDEKER, '36, is an engineer with the Oil Import Administration, Department of Interior, Washington, D.C. He lives at 404 Tulane Dr., Alexandria, Va.

THOMAS A. HERING, '38, mechanical engineer with AIO Office-Ladd Air Base in Fairbanks, Alaska, lives at 542 Baronof Ave., Fairbanks, Alaska.

CARL R. HOLMGREN, '38, senior research engineer for Pan American Petroleum Corp., lives at 5154 S. Marion Ave., Tulsa 35, Okla.

JACK W. PETERS, '38, has been transferred by Mobil Oil Co. from Billings, Mont., to Denver, Colo., where he may be addressed c/o Mobil Oil Co., 110 16th St. He lives at 2045 Newcomb, Lakewood, Colo.

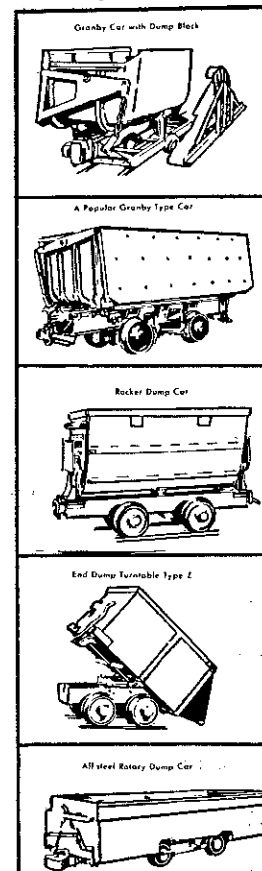
JOHN D. MOODY, '40, manager of exploration for Plymouth Oil Co., may be addressed at Box 1083, Sinton, Texas.

HERBERT D. THORNTON, '40, may be addressed c/o Union Carbide Olefins Co., 30 E. 42nd St., New York 17, N.Y.

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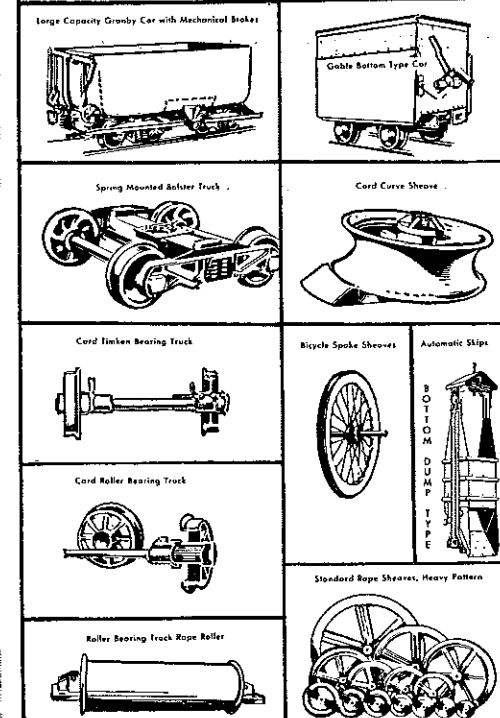
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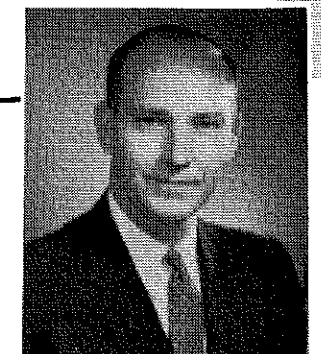
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## MEMO:

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Chief Army Reserve & ROTC Affairs, Rm. 2 D 542, Pentagon, Washington 25, D. C.

ROBERT C. McCAIN, '49, may be addressed c/o Petrobras-Setex-Av.-Frederico Poutes, Salvador, Bahia, Brazil, S.A.

LOUIS B. PARKS, '48, assistant director of the Process Center of Continental Oil Co., lives at 2221 E. Hartford, Ponca City, Okla.

DR. ARTHUR W. RUFF, '49, is general superintendent of operations, Orinoco Mining Co., with address Puerto Ordaz, Estado Bolivar, Venezuela, S.A.

CRAIG R. SMITH, '49, senior research engineer for Convair-Astronautics, lives at 2148 Fairfield Ave., San Diego 10, Calif.

ARTHUR H. YARBERRY, '50, has moved from Elkhorn City, Ky., to 7811 Cure Clermont, Ville D'Anjou, Montreal, Quebec, Canada.

ELLIS L. ANDERS, JR., '50, may be addressed at 404 First National-Ely Bldg., Abilene, Texas.

DONALD L. BERRY, '50, party chief for Phillips Petroleum Co., lives at 4724 Cornell, Bartlesville, Okla.

HARRY E. HAYNES, '50, has moved from Denver to Dallas, where his address is 1112 Republic National Bank Bldg.

DONALD H. BLAIRE, x-'50, is party chief for Continental Oil Co., with mailing address P.O. Box 457, Slaton, Texas.

BROOK D. TARBEL, '50, lives at 4143 E. 47th St., Tulsa, Okla.

#### 1951

MARTIN J. GARRITY, JR., lives at 3112 Roxanne Ave., Long Beach 8, Calif.

A. H. KAPADIA, formerly in Brazil, has moved to Barymin Explorations, Ltd., Suite 413, 25 Adelaide St. West, Toronto 1, Ontario, Canada.

WILLIAM E. PATMAN, who was with Richmond Exploration Co. in Maracaibo, Venezuela, is now living at 2301 Elizabeth St., Metairie, La., where he is employed as geologist by the California Co.

GEORGE W. WHARTON is process engineer for Socony Mobil Oil Co., with address 585 Midford Dr., Beaumont, Tex.

WILLIAM A. WILSON, geologist for Gulf Oil Corp., lives at 3100 Sinclair Pl., Casper, Wyo.

#### 1952

HARRY D. ADAMS, formerly with Sinclair Venezuelan Oil Co. in Caracas, Venezuela, is now employed by Pan

American Argentina Oil Co., Casilla de Correo 379, Comodoro Rivadavia, Provincia de Chubut, Argentina, S.A.

ERLING K. ARNSTON, commercial sales representative for Standard Oil of Indiana, may be addressed at Easley Rd., Box 504, Golden, Colo.

ARTHUR J. GRAVES, chief geologist for American Chrome Co., gives his address as Box 453, Mouat Mine, Nye, Mont.

D. L. LEE, exploitation engineer for Shell Oil Co., lives at 3145 S. Raleigh, Denver 19, Colo.

EUGENE L. McDANIEL'S mailing address is 7221 Avrum Dr., Denver 21, Colo.

U SOON SEIN, head of the Mining Engineering Department at the University of Rangoon, lives at 17 Inya Rd., Rangoon University P.O., Rangoon, Burma.

JAMES B. SHEEHAN has been in Saudi Arabia as subsurface geologist for Arabian American Oil Co. for the past six years. He left there May 31 for a leave of absence in the U.S. His address will be 4192 W. Eastman Ave., Denver 19, Colo.

CHESTER H. WESTFALL, JR., lives at 6786 S. Evanston, Tulsa, Okla.

ROBERT G. WILSON, instrument engineer for Union Carbide Corp., lives at 2801 Del Papa Dr., Apt. 7, Victoria, Tex.

FRED H. WURDEN is consulting geologist with address 2122 Clark, Billings, Mont.

#### 1953

ROBERT S. AKINS is engineer, Smelting Department, Inland Steel Co. His address is 8013 Monroe, Munster, Ind.

KENNETH A. DUNN is assistant unit superintendent for Celanese Corp. of America with mailing address 1506 Coffee St., Pampa, Texas.

LAURENCE H. GARDNER has moved from Salt Lake City to 812 Cabell Ave., Charlottesville, Va.

LAWRENCE M. LEE has moved from Cascadia, Ore., to 2214 Market St., San Diego, Calif.

#### 1954

RANDALL A. GARDNER, employed by N.R. & P. Consolidated Coal Co., lives at 325 Stewart St., Welch, W. Va.

PHILIP H. HALSTEAD writes from Ankara, Turkey, that in the future he will receive mail c/o Texaco Inc.-California Oil Co. of Spain, c/o Maritima Medymar, Plaza del Comandante Franco 5, Las

Palmas, Gran Canaria, Canary Islands, Spain.

BURT E. HARTMANN picks up his mail at P.O. Box 1565, Grand Junction, Colo.

JACK L. TINDALL lives at 5117 Page St., Marrero, La.

#### 1955

DAVID P. DAVIS, associate research engineer for California Research Corp., lives at 622 A Golden Gate Ave., Richmond, Calif.

EDUARD J. DOUZE'S mailing address is 558 B Forest Ave., Palo Alto, Calif.

DONALD L. HACKING, development engineer for Western Phosphates, Inc., may be addressed at P.O. Box 893, Salt Lake City 10, Utah.

HAROLD J. HEDLUND, civil engineer with U.S. Geological Survey, lives at 1714 Ford St., Golden, Colo.

CLYDE R. INGLES, senior engineer with Convair Co., lives at 1610 Jess St., Pomona, Calif.

EUGENE R. WELSH is project engineer for Coors Porcelain Co. His address is 5316 Jellison St., Arvada, Colo.

#### 1956

JOHN D. STOCKTON lives at 2709 S. Garfield St., Denver 10, Colo.

JAMSHID N. NAGHIZADEH'S address is 5647 Dorchester Ave., Chicago, Ill.

JOHN R. RITER, JR., lives at 2564 56th S.W., Seattle 16, Wash.

ARTHUR J. KIDNAY is chemical engineer with Cryogenic Engineering Laboratory, National Bureau of Standards in Boulder, Colo. He lives at 3421 W. 30th Ave., Denver 11, Colo.

#### 1957

HARRY H. CUNNINGHAM, systems engineer for The Martin Co., lives at 5744 S. Huren, Littleton, Colo. He was formerly living in Newcastle, Wyo.

HARRY M. LOSEE, JR., has moved from Brewton, Ala., to Beeville, Texas, where his post office box number is 93.

ROBERT A. OURADA, engineer for Mutual Insurance Co., lives at 123 Norbert Ave., Hinsdale, Ill.

JAMES F. OROFINO, formerly of Pompano, Fla., may now be addressed c/o Win Kyaing, Dawezui Qr., Mergui, Burma.

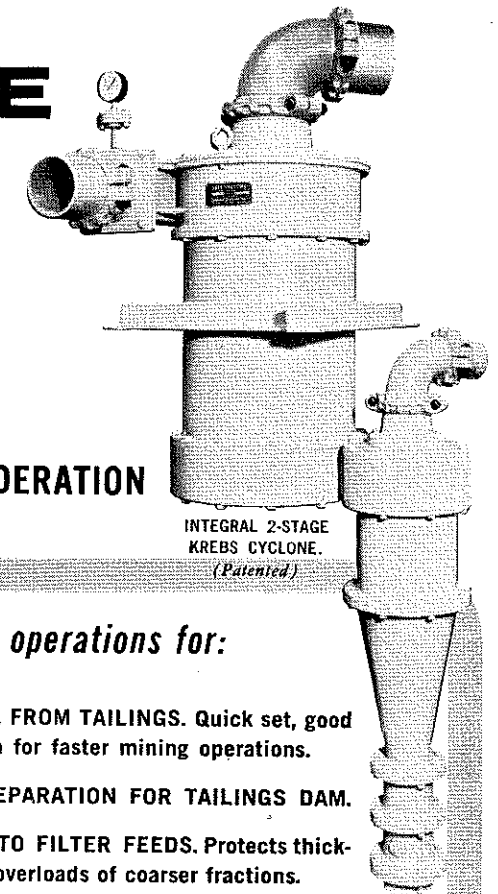
ROBERT E. OSBORNE, geologist for The California Co., lives at 4714 Mark Twain Dr., New Orleans 26, La.

(Continued on page 17)

# KREBS CYCLONE

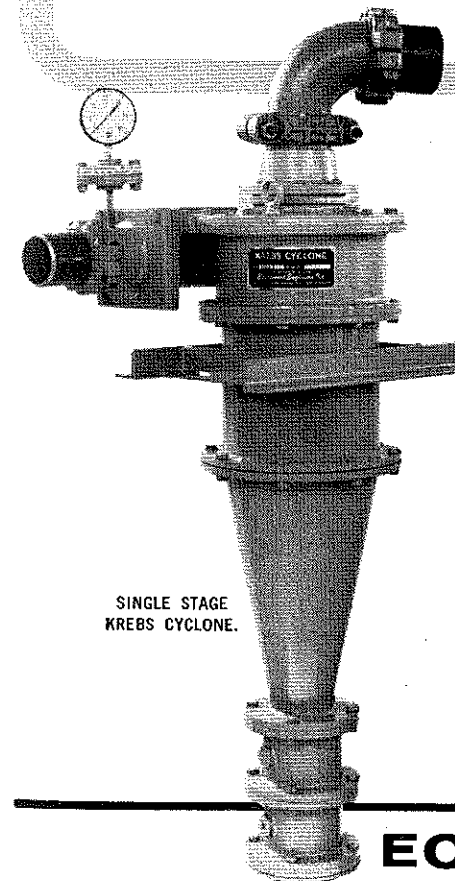
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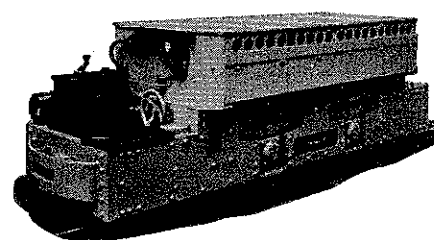


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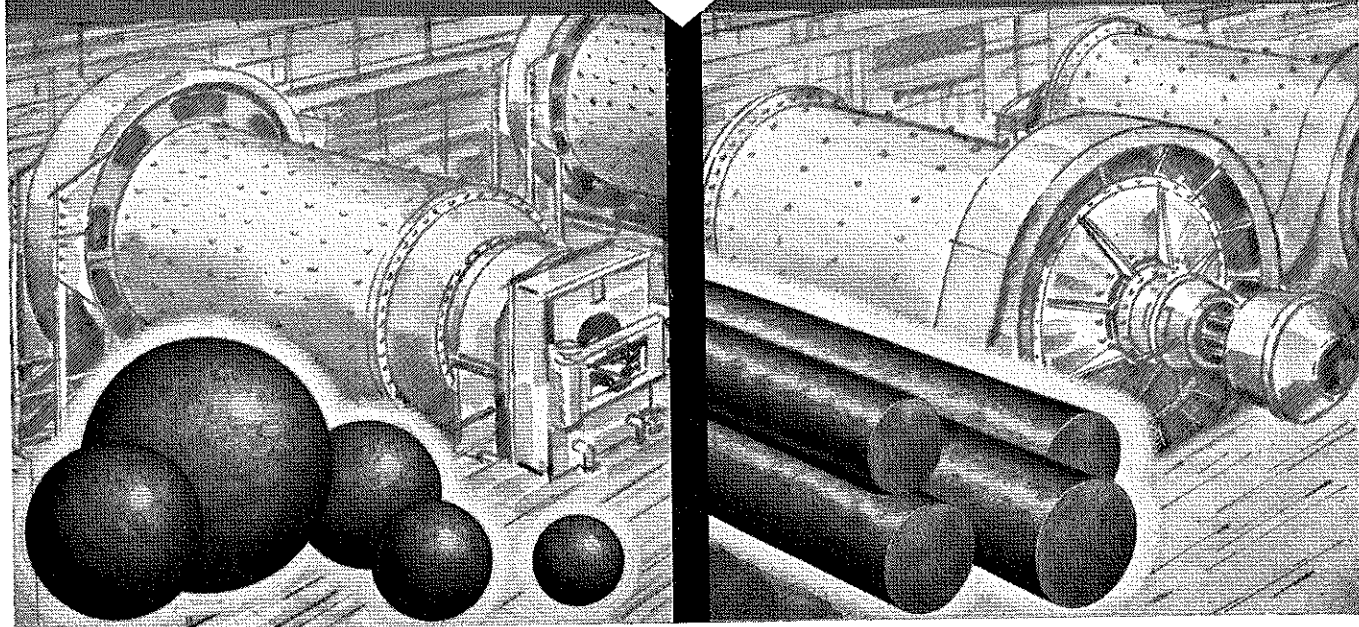
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**THE MINES MAGAZINE**

Volume L

June, 1960

Number 6

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**FRONT COVER—**

Led by Lt. Col. Bruce D. Jones and followed by Secretary of Interior Fred A. Seaton, Dr. John W. Vanderwilt, faculty, Distinguished Achievement medalists, and students, the 1960 Commencement Procession descends the steps of Guggenheim Hall on its way to Steinhauer Fieldhouse.

**STAFF**

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# NEWS OF THE MINERAL INDUSTRIES

## OME Field Operations Reorganized April 18

Changes in the field organization of the Office of Minerals Exploration effective April 18, are as follows:

Field Officers of the OME will replace the Executive Officers who, prior to this change, had been selected from the staffs of the Bureau of Mines and the Geological Survey to direct OME work in their respective regions.

The individuals selected to act as Field Officers, the regions which they serve, and their post office addresses are as follows:

D. R. MacLaren, Acting Field Officer, Office of Minerals Exploration, Region I, So. 157 Howard St., Spokane 4, Wash.

Replaces Executive Officer A. E. Weissenborn.

Glenn G. Gentry, Acting Field Officer, Office of Minerals Exploration, Region II, Room 420 Custom House, 555 Battery St., San Francisco 11, Calif.

Replaces Executive Officer W. F. Deitrich.

H. M. Connors, Acting Field Officer, Office of Minerals Exploration, Region III, Building 20, Federal Center, Denver 25, Colo.

Replaces Executive Officer J. W. Townsend.

Lawrence G. Houk, Acting Field Officer, Office of Minerals Exploration, Region IV, Room 11, Post Office Bldg., Knoxville 2, Tenn.

Replaces Executive Officer Robert A. Laurence.

The designation of Region V has been changed to IV, but the area served by this office is unchanged. Mr. Houk will be located temporarily at

the Office of Minerals Exploration, Department of the Interior, Washington 25, D. C.

These changes will adjust the OME organization and operations to the present workload and are expected to reduce the cost of administrative and technical services.

Financial assistance for exploration will continue to be available through the OME under the same terms and conditions as heretofore, with the federal government paying up to one-half of the cost of approved exploration projects.

## Uranium Monocarbide Possible Nuclear Fuel

Uranium monocarbide—until recently a "sleeper" in the research race for better nuclear reactor fuel materials—could conceivably move out front of uranium alloys and uranium dioxide. R. F. Dickerson and Frank A. Rough, Battelle Memorial Institute metallurgists, report that uranium monocarbide, on the basis of limited data, has many points in its favor as a fuel material for the future.

Comparing uranium monocarbide with metal and uranium dioxide as fuel materials, the Battelle scientists made the following observations:

1. Uranium monocarbide possesses heat conductivity that is almost identical with that of unalloyed uranium at low temperatures and about two-thirds that of uranium at temperatures in the 700 degree Centigrade range. With a melting point of about 2315 Centigrade, it has the advantage of being able to withstand roughly twice the amount of heat that uranium can take. Uranium monocarbide's melting point is only 400 degrees Centigrade below that of uranium dioxide.

2. For equivalent amounts of material, there is substantially more uranium fuel in uranium monocarbide than there is in uranium dioxide. This is an important consideration in the design of compact nuclear reactors.

3. While there are still serious gaps in information needed to evaluate uranium monocarbide's ability to withstand radiation damage, there is reason to believe that it will be as serviceable under operating conditions as is uranium dioxide. Research now in progress at Battelle should do much to clear up this point.

4. Uranium monocarbide can be processed into fuel elements by several methods. The fact that casting is a low-cost fabrication technique and uranium monocarbide can be cast speaks well for this material, which behaves in some ways like a metal and in other ways like a nonmetallic.

While Dickerson and Rough consider uranium monocarbide a "leading candidate" for the reactor fuel of the future, they are quick to point out that this material has some obvious limitations. It has no resistance to corrosion by water, so it will not be suitable as a fuel for water-cooled reactors, unless some means is found to improve its corrosion resistance. Moreover, powders of uranium monocarbide are highly flammable and must be handled in a special atmosphere during fabrication. Finally, there is the possibility that other handling problems might develop in the chemical reprocessing of spent fuel.

Despite the many questions which remain unanswered at this time, and despite some known limitations, uranium monocarbide must still be considered as a "major candidate" to fill future needs for an economical reactor fuel material, say metallurgists Dickerson and Rough.

## AEC Employee Receives Performance Award

John A. Patterson, chief of the Ore Reserves Section at the Grand Junction Operations Office of the Atomic Energy Commission, has received a superior performance award and a check for \$300 in recognition of the outstanding manner in which he has performed his duties during the past three years. The award was made April 27 under the AEC incentive awards program which provides cash or honorary certificates, or both, for outstanding service in government.

## Idaho Properties Acquired By Rare Metals Firm

The \$11,000,000 holdings of Salmon Uranium and Idaho Thorium Companies and other properties in the Lemhi Pass area of Montana and Idaho were recently acquired by Nuclear Fuels and Rare Metals Corp. of Pocatello and Los Angeles. With over 2,000,000 tons of ore ready to mine and estimated reserves of over 100,000,000 tons, D. B. Lewis, president of Nuclear Fuels, states this is the largest ore body of thorium-bearing and rare earths known on the North American continent.

A new \$250,000, 100-tons-per-day mill and plant facility completed in 1959 by the Salmon River Uranium and Development Co. has been acquired by Nuclear Fuels, and more machinery and equipment is being added to concentrate and up-grade thorium and rare earths under the Nuclear Fuels' process.

## Army Engineers Testing Airborne Tellurometer

The tellurometer, an electronic distance measuring instrument which eliminated the time-consuming taping method used in surveying, has now gone airborne.

Currently being tested by the U. S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va., the airborne tellurometer is expected to provide a position determination or a distance measurement up to 150 miles with a high degree of accuracy. The range of the ground tellurometer is 40 miles. In addition, the airborne equipment will not be hampered by line-of-sight restrictions, such as curvature of the earth and mountains, which limit the operation of the ground instrument.

The Airborne Tellurometer is simply the application of ground Tell-

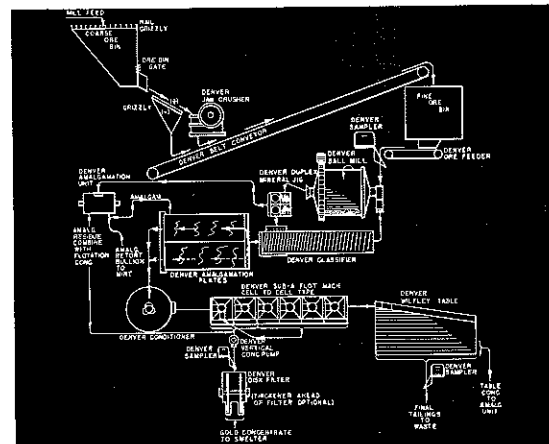
urometer microwave phase comparison ranging techniques to aircraft use. Equipment necessary for field operations includes the airborne master equipment and ground remote station equipment.

## Dawn Mining Company Uranium Contract Extended

A uranium concentrate purchase contract between the Atomic Energy Commission and Dawn Mining Co., operators of a 400-ton-a-day uranium processing mill at Ford, Wash., has been extended to Dec. 31, 1966. The new contract with Dawn is in accordance with the Commission's announcement of November 24, 1958, which provides for the purchase of appropriate quantities of U<sub>3</sub>O<sub>8</sub> in the 1962-1966 period from ore reserves developed prior to Nov. 24, 1958.

The first AEC contract with Dawn was signed on Aug. 9, 1956, and the mill delivered the first uranium concentrate to the Commission in September of 1957. The plant site is near Ford, in Stevens County, Wash., approximately 40 miles northwest of Spokane. Commercial deposits of uranium ore were first discovered in this area in the fall of 1954.

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**Availability of Uranium Studied by Dr. Starr**

A study of the availability of uranium recently completed by Dr. Chauncey Starr, president of Atomics International, will be published by Uranium Institute of America.

Dr. Starr found that we have enough uranium resources today to fuel atomic reactors (based on conservative rates of growth in nuclear power) until the year 2005. This assumes the price would average \$8 per pound of U<sub>3</sub>O<sub>8</sub>, and that with adequate markets, today's reserves would be doubled through exploration.

Dr. Starr also found that we could increase our uranium resources materially with an increase of price; that if the price were increased from \$10 to \$26 per pound, U. S. uranium resources would increase by a factor of 6.8.

A UIO press release states that such price increases would only slightly effect the price of power produced by nuclear reactors. It points out that at a cost of \$23 per pound for uranium power costs would increase only 0.5 mill—an increase that could be offset by improvements in nuclear power technology.

**Glacier Water Supply System Developed by Army Engineers**

An ingenious system to provide large quantities of water to satisfy man's requirements when living on a glacier has been developed by the U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va.

Basically, the system involves melting a 3 to 4 foot diameter hole into the dense ice layers of the glacier. With continued melting in the dense glacial ice a "bell shaped" cavity is formed and the water produced is pooled in a subsurface pond. The water is then pumped to the surface when needed by a submersible type well pump. Steam generated at the surface is piped to a special drilling tool to make the initial hole and later to a melting-pump tool for subsequent production of water in the ice cavity.

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# TECHNICAL SOCIETIES and ASSOCIATIONS

## Wyoming Mining Association

The July issue of THE MINES MAGAZINE will present coverage of the Wyoming Mining Association convention held June 10-11 at Jackson Lake Lodge in Grand Teton National Park.

## Denver Mining Club

Officers and members of the Denver Mining Club extend a cordial invitation to all mining and metallurgical engineers, and those interested in the fields, to attend any of the luncheon meetings held each Wednesday noon in the Denver Dry Goods Tea Room.

## Semiconductors Convene Aug. 29-31 in Boston

Thirty-four technical papers will be presented by top engineers and scientists of major corporations, professional and educational institutions, and U.S. services at the Conference on Metallurgy of Elemental and Compound Semiconductors to be held Aug. 29-31 at Boston, Mass. The conference is sponsored by the Semiconductors Committee, Institute of Metals Division of the Metallurgical Society, and the Boston Section of AIME.

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## Physical Metallurgists Meet July 11-12 in Estes Park

Eminent U.S. and British authorities will present technical papers at the Conference on the Response of Metals to High-Velocity Deformation to be held July 11-12 at Estes Park, Colo., by the Metallurgical Society of AIME. Papers should provide answers to some of the questions raised concerning the characteristics of various metals under fast deformation rates.

In announcing the conference, the Metallurgical Society said recently:

"It has long been known that materials are apt to behave differently at fast deformation rates than they do at slow ones. On the applied level, it has been found recently that some metals such as molybdenum that are otherwise brittle, and all but unworkable, can be extruded successfully if done under essentially explosion loading rates.

"Also, recently, it has been observed that scabbing fracture of armor plate may be induced by explosives under conditions indicating unexpectedly high fracture stresses. When properly subjected to shock waves, metals may essentially, without plastic deformation, be hardened as much as if they had been plastically deformed 95 per cent. These findings have led to the adoption of high-velocity deformation techniques to form large forgings, to form large sheet-metal components, to harden selected parts of components, and to extrude parts of metals heretofore regarded as essentially unfabricable.

"Many of these developments have occurred with incomplete participation of the metallurgical profession. As a result, the metallurgy of these processes occurring at high rates is poorly understood and incompletely described. To effect an exchange of such information as has been developed but not published, to afford discussion of controversial areas by bringing together the leading experimentalists in the field, to compile in one publication a summary of the most important current research programs in the field, and to stimulate more work in this field, members of the Physical Metallurgy Committee of AIME explored the possibility of such a conference and found enthusiasm for a meeting of this kind.

"The only previous conference related to the subject was held under the aus-

pices of the Institution of Mechanical Engineers in London in April 1957 and dealt not so much with the metallurgical aspects as with the phenomenology of higher strain rates."

The National Science Foundation is supporting the conference with a grant that will make possible the participation of experts in the field from abroad. Proceedings will be published and will constitute another volume in the series known as "Metallurgical Society Conferences."

## Drilling-Blasting Symposium On CSM Campus Oct. 17-19

Announcement has been made of the holding of a Symposium on Drilling and Blasting on the campus of the Colorado School of Mines in Golden, Colo., on Oct. 17-19. The agenda includes papers which will be of interest both to the practical man in the field and to the academic individual.

The drilling symposia were originally started by the University of Minnesota back in 1950, and this is the third in the series of 10 devoted specifically to Production Drilling and Blasting. A committee which includes representatives from the mining departments of the University of Minnesota, Pennsylvania State University and the Colorado School of Mines—as well as a number from industry—is working out details of what is expected to be an unusually interesting and pertinent group of papers in the two fields.

## Heavy Geological Program Under Way in China

Red China is so intent on speeding its industrialization that the Ministry of Geology has involved, in some areas, 70 per cent of the population in prospecting for new mineral deposits. In one province alone, Fukien, in 1958, some 200,000 people were mobilized for this purpose. These "prospectors" discovered 2,000 mineral occurrences, including 500 of iron. Though the geological administration found it possible to check only 5 per cent of the claims made by non-professional seekers, the quest persists.

These and other evidences of the vast scale of Red China's activities in this program are related in MINING ENGINEERING, official magazine of the Society of Mining Engineers of the American Institute of AIME by Eugene A. Alexandrov, an editor of ENGINEERING INDEX. His review is a report based on five recent articles from the Soviet Union.

The article says that there are 12,000 geologists in the Chinese Ministry of Geology, in addition to 11,000 technicians. A total of 270,000 employees are on the geological service roster. There are 14,000 geology students in ten educational institutions with 18,000 others in technicians. Because of the enlightened geological exploration program, four more institutes are to be opened, pointing to a total enrolment of 30,000 students. Ultimately, each province and autonomous region will have a geology technician with a total of 40,000 students.

The article states that Communist China's inferred reserves of coal are estimated at 1,500 billion tons. Almost 30 per cent of Chinese territory is reported to

(Continued on page 15)

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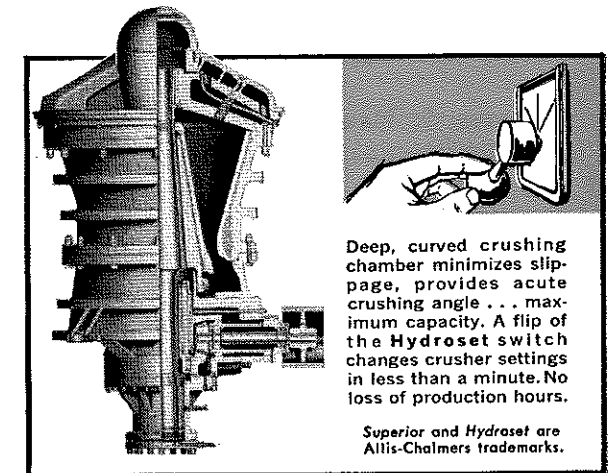
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## TECHNICAL SOCIETIES

(Continued from page 12)

have potential oil and gas bearing structures. Inferred reserves of iron ore are estimated at 100 billion tons. The indicated reserves of iron ore are figured at 6 billion tons. More than 200 tin deposits are known. Several new copper deposits have been reported. The numerous bauxite deposits have not yet been adequately explored.

The Soviet Union's Minister of Geology, P. Y. Antropov, recently visited Communist China and reported substantial reserves of tungsten, molybdenum, antimony and phosphates, and, also, occurrences of economic value, of chromite, nickel, gold, beryllium tantalum, columbium, rare earths, and asbestos.

## Heat Transfer Conference Scheduled for Aug 14-17

Some of the less esoteric aspects of heat transfer will be the subject of several panel discussions during the Fourth National Heat Transfer Conference and Exhibit of the American Institute of Chemical Engineers and the American Society of Mechanical Engineers at the Statler Hilton Hotel in Buffalo, N.Y., Aug. 14-17.

In addition to an outstanding technical program, some 30 exhibits will display the latest developments in this increasingly important field of engineering.

Panel discussions will be on discrepancies between design procedure and plant operation, moderated by D. Q. Kern, of Kern Associates, Cleveland. Panelists will be D. J. Bergman; C. H. Brooks, Sun Oil Co., Philadelphia; C. H. Gilmore, Carbide, Carbon Chemical Co., South Charleston, W. Va. and A. C. Mueller, Dupont, Wilmington, Del.

Other panels will be on heat exchanger standardization, moderated by R. M. Armstrong, Chester, Pa.; heat transfer in advanced reactor concepts, moderated by P. A. Lottes, and oxide fuel heat transfer, moderated by Richard Powers, Pittsburgh, Pa.

## ASEE Officers Elected

Dr. Eric A. Walker, president of the Pennsylvania State University, is the new president of the American Society for Engineering Education. He will serve for the year beginning in July, 1960.

Dean Melvin R. Lohmann of Oklahoma State University and Prof. Newman A. Hall of Yale University have been chosen as vice presidents, and Wendel W. Burton of the Minnesota Mining and Manufacturing Co. has been re-named treasurer.

The selections are the result of a national mail balloting by the 9,300 members of the ASEE, the national professional organization of college and university teachers of engineers.

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## Educational Program International in Scope

Statistics indicate United States colleges, universities and other institutions of higher learning have more than 57,000 foreign citizens enrolled.

This international educational program is not a one-way street as more than 12,000 U.S. citizens will complete their schooling abroad this year which permits them through close personal associations to project the American way of life among foreign nationals. These international educational programs promise long-range benefits politically and economically.

More foreign citizens study in the United States than in any other country which promises a better understanding of America's philosophy aimed toward improving the lot of small nations. Inevitably they return better equipped to aid in the development of the economy and standard of living of their native lands.

Not surprising is the fact that the vast majority of foreign citizens studying in the United States come from the underdeveloped countries where schools of advanced learning covering broad fields are either non-existent or all too scarce to satisfy the educational needs.

The largest number comes from the Far East followed in sequence by Latin America, Europe, Near and Middle East, Canada and African countries.

## AIME Committees to Present Nominations for Awards

Committee members have been named by the Society of Mining Engineers of AIME to present nominations for such major awards as the Hal William Hardinge Award (for outstanding achievement in the field of industrial minerals), the Robert H. Richards Award (for achievement in any form which unmistakably furthers the art of minerals beneficiation in any of its branches), the Daniel C. Jackling Award and Lecture (for significant contributions to technical progress in the fields of mining, geology or geophysics), and the Percy Nicholls Award (for notable scientific or industrial achievement in the field of solid fuels).

Three of the awards, Hardinge, Richards, and Jackling, will be conferred at the AIME Annual Meeting in St. Louis next March. The Nicholls Award will be presented next October in Charleston, W. Va., at the Joint Solid Fuels Conference of the Society's Coal Division and the Fuels Division of the American Society of Mechanical Engineers.

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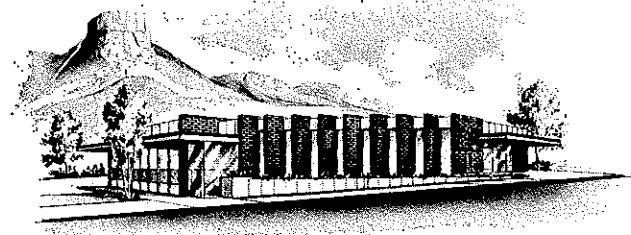
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### CLASS NOTES

*(Continued from page 4)*

HENRY W. SNYDER advises that he and his family have moved from Pauls Valley, Okla., to Rural Route 2, Lawrenceville, Ill.

ROBERT L. STANSBURY'S address is 1443 Frances Lane, Plainfield, N.J.

1958

DONALD G. MILLER has moved from Wheatridge, Colo., to 8793 W. 46th Ave., Arvada, Colo.

ROBERT T. ROBERTS' address is 2180 Braun Rd., Golden, Colo.

PATRICK C. RYAN has moved from Torrance, Calif., to 100 Citrus Ave., Daly City, Calif.

GERALD E. UHLAND, 4917 Sycamore Pl., Lynchburg, Va., is metallurgical engineer for Babcock & Wilcox Co.

DONALD E. ERIKSEN, 60 Birch St., Park Forest, Ill., is engineer for Northern Illinois Gas Co., of Bellwood, Ill.

JON HAMLIN'S new address is c/o Garrett Oil Tools, P.O. Box 1226, Oil Center Station, Lafayette, La.

1959

WOLFGANG F. KYLLMAN, head of the engineering office of International Mining Co., lives at Casilla 1267, La Paz, Bolivia.

ROGER L. KAESLER is assistant instructor at the University of Kansas. He lives at 2466 N. Fountain, Wichita 20, Kans.

WILLIAM H. BAUER, engineering geologist for Sonoma County, Flood Control & Water Conservation District, lives at 1838 Will Scarlett Lane, Santa Rosa, Calif.

MARSHALL G. BEHRENS is civil engineering assistant of Los Angeles County. He lives at 837 W. Beverly Blvd., Whittier, Calif.

LESLEY O. BOND'S address is 902 Wyoming, Rock Springs, Wyo.

DONALD E. DALTON, district engineer, Far East, APO 18, San Francisco, Calif., gives his mailing address as 2723 Graysby Ave., San Pedro, Calif.

LT. WILLIAM R. MILLS, JR., second lieutenant USMCR, gives his address as BOQ NAS, Pensacola, Fla.

FRED H. PATTERSON lives at 412 Valparaiso Rd., Oak Ridge, Tenn.

AYTEKIN TIMUR may be addressed c/o University of California, Department of Geology, Berkeley 3, Calif.

1960

WARREN ARNOLD, employed by Exeter Drilling Co., lives at 1260 Logan St., Apt. 304, Denver, Colo.

B. FRANK PORTER has moved from Golden, Colo., to 705 E. Glenooks Blvd., Glendale, Calif.

ROBERT A. SULTZBACH, assistant geophysicist for Bear Creek Mining Co., lives at 2533 E. Water St., Tucson, Ariz.

*Best Wishes . . .  
Class of '60*

**Robert W. Evans, '36**

Sales Engineer  
The Stearns-Roger Mfg. Co.  
Denver Colorado

**Donald I. Gahagan, '27**

Tennessee Gas & Oil Co.  
Houston Texas

Congratulations

to

**Class of 1960**

from

The

**Class of 1927**

### MINERS

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SCHOOL OF MINES

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Chicken in a Basket  
and Steaks

**dud's**

**GOLDEN LIQUORS**

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Congratulations and Best Wishes

13th & Ford Golden

**JUANITA'S  
ACE HI TAVERN**

Congratulations To A  
Swell Bunch Of Fellows

1216 Washington Golden

# PLANT NEWS

## Stone Appointed by Le Roi As Regional Sales Manager



Appointment of Thomas E. Stone as Mountain Region sales manager, with headquarters at 610 Farmer's Union Bldg., Denver, Colo., has been announced by Le Roi Division, Westinghouse Air Brake Co., Milwaukee, Wis. He will guide Le Roi sales and service programs in Colorado, Utah, eastern Idaho, Wyoming, Montana and the western parts of North Dakota, South Dakota and Nebraska.

Ed White, '36, who is president of Denver-Air Machinery Co., 1421 Blake St., Denver 2, Colo., is the local distributor. Le Roi is a manufacturer of air tools and both portable and stationary type air compressors for the mining, construction and general industries markets.

## Floyd B. Odlum Retires As Chairman of Atlas Corp.

Floyd B. Odlum, a native of Colorado, has announced his retirement as chairman of the board of Atlas Corp., investment company he founded more than 30 years ago.

In a personal letter accompanying the company's annual report to stockholders, Mr. Odlum, 68, said his retirement as chief executive and director would take effect immediately. Succeeding him as chief executive is David A. Stretch, who has been president of the company since 1958. The post of chairman of the board has been abolished.

In recent years, Odlum pioneered the development of uranium mining, assembling the largest independent uranium mining company in the United States.

## Kerr-McGee Technical Aid Given Company in Brazil

Kerr-McGee Oil Industries, Inc. has signed a contract with Uniao Brasil Bolivia de Petroleo S.A. The agreement calls for Kerr-McGee to provide administrative and technical services on a 661,420-acre concession owned by Uniao and designated Brazilian Area "B," near Camiri, Bolivia. Company representatives are already at work in the area.

(Continued on page 19)

## Best Wishes... Class of '60

<b>J. K. Houssels, '22</b>	
Hotel Tropicana	
Las Vegas	Nevada
<b>R. E. Knight, '07</b>	
Alliance National Bank	
Alliance	Nebraska
<b>Albert L. Ladner, '27</b>	
3362 Del Monte Dr.	
Houston 19	Texas
<b>Ronald F. Lestina, '50</b>	
Geological Consultant	
202 Majestic Bldg.	Denver, Colo.
<b>John F. Mann, Jr., '43 and Associates</b>	
Consulting Groundwater Geologists	
945 Reposado Drive La Habra, Calif.	
<b>R. A. McClevey, '32</b>	
Box 537	
Ottawa	Illinois
<b>Vincent Miller, '35</b>	
Exploration Service Company	
Box 1289	
Bartlesville	Oklahoma
<b>Harold L. Muench, '40</b>	
3818 Quitman St.	
Denver	Colorado
<b>Wendell C. Munson, '27</b>	
1101 8th St., Apt. 1	
Alexandria	Virginia
<b>M. Jordan Nathason, '36</b>	
1625 Brae Burn Rd.	
Altadena	California
<b>Ken Nickerson, '48</b>	
2001 Washington Ave.	
Golden	Colorado

## Best Wishes... Class of '60

<b>STANDARD METALS CORPORATION</b>	
Russell L. Wood, '49	Assistant General Manager
Robert R. Ward, '51	Chief Engineer
Robert M. Hurst, '52	Superintendent, Shenandoah Unit
Jack H. Dressel, '50	Superintendent, Micawber Unit
Frank E. Siegfried, '49	Superintendent, Sunnyside Unit
Edgar T. Hunter, '53	Sunnyside Unit
Gordon Bruchner, '58	Shenandoah Unit
Robert Elder, '58	Shenandoah Unit
<b>Dale Nix, '26</b>	
Arabian American Oil Co.	
505 Park Ave.	New York 22, N. Y.
<b>L. J. Parkinson, '23</b>	
Mining Department	
Colorado School of Mines	
Golden	Colorado
<b>C. E. Osborn, '33</b>	
Limited Partner and General Manager	
Homestake-New Mexico Partners	
1033 Chestnut St.	Grants, N. M.
<b>C. W. Payne, '38</b>	
Exploration Consultant	
Geology - Geophysics	
812 Continental Bldg.	
Fort Worth	Texas
<b>Oran L. Pack, '26</b>	
Consulting Petroleum Geologist	
212 Majestic Bldg.	Denver 2, Colo.
<b>Don H. Peaker, '32</b>	
Box 1595	
Pueblo	Colorado

# PLANT NEWS

(Continued from page 18)

## New Gypsum Plant In Port Tampa, Fla.

National Gypsum Co. has started construction of a large new gypsum plant at Port Tampa, Fla. The plant will cost several million dollars and site and foundation work has begun on the 30-acre plant site on Tampa Bay. It will manufacture gypsum wallboard, lath, sheathing and plasters for the growing Florida building market. It will be supplied with gypsum ore by ship from the company's vast Nova Scotia gypsum deposits.

## Flick-Reedy Wins Awards

Flick-Reedy Corp. opened its new plant in Bensenville, Ill. last July and on May 22 it received two awards:

- (1) The Plant of the Year Award (for being one of the Ten Top Plants of the Year) given by Factory Magazine, and
- (2) The Silver Anvil Award (for meritorious public relations program) presented by the American Public Relations Association.

(Continued on page 52)

**KISTLER'S**

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construction industry  
for more than  
a quarter  
century

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Also Promal top plates.

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"25-PAK" contains enough fasteners to join common belt widths.

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## COLORADO SCHOOL OF MINES

# 1960 Commencement

"The future of mankind depends upon how diligently we apply ourselves to the search for new knowledge in our respective fields" Secretary of Interior Fred A. Seaton told graduating seniors at the 86th Annual Commencement of the Colorado School of Mines, May 27, in Steinhauer Fieldhouse.

Asserting that in the modern world knowledge has come to equate itself with power—power which can be quickly translated into action, Seaton said that for this, if for no other reason, the frontiers awaiting exploration by well-trained scientists and engineers are more intriguing, more fraught with promise, more critical many times over than those faced by the intrepid explorers of a century ago. We must seize every opportunity, he said, to push back the endless frontiers of ignorance.

Seaton explained that society has moral obligations it can ignore only at the peril of its own destruction and that as free men in a free system, we have certain responsibilities and obligations. One of these obligations, Seaton declared, is to foster an environment of freedom for scientific inquiry and technological advance. He continued:

"There must be no forcing of a modern Galileo to recant; no discrimination against an Einstein of the next generation which forces him to flee the wrath of whoever holds governmental power; no worshipping at the altar of conformity so as to stifle the enthusiasm and creativity of imaginative and questioning men."

He warned that we must always be on guard against the centralization of education, in whatever guise. Otherwise, those in control could have the opportunity to turn out a nation of carbon copies of themselves. At the best, he said, that could lead only to stagnation; at the worst, it could easily become the path to regimentation and lead to our ultimate destruction.

Pointing out that one of the principal reasons for this nation's strength has been its massive diffusion of power, of knowledge, of skills, and of initiative going down to the very roots of our economic and social system, Seaton told Mines' graduates that to him, this principle also applies to the minerals industry and to our economic system as a whole. "Progress comes best through orderly change," Seaton affirmed, "and change is impeded when individual and group freedom is unnecessarily limited."

Seaton told seniors that a second obligation of society is to do its utmost to assure that the revolution in science and technology leads to the elevation of man and the betterment of his lot rather than his destruction. He reminded his audience that today, the price of war would defy comparison with that of all the wars of history—with the very existence of humanity itself at stake.

"Our responsibility to society cannot be delegated exclusively to scientists working in a laboratory, or to generals or kings or prime ministers or presidents," Seaton concluded. "It is part of the responsibility of every human being. You, as members of the 1960 graduating class



▼ Commencement Procession about to enter Steinhauer Fieldhouse.

of the Colorado School of Mines have been prepared to contribute much to your professions and to the good of society here at home and abroad. I have every confidence that you will do so by giving of yourselves in full measure. Toward that end, you have my congratulations on winning your diplomas and my very best wishes for the future."

### Honorary Doctor of Engineering

Secretary Seaton was awarded the honorary degree of Doctor of Engineering by Dr. John W Vanderwilt, president of Mines. His citation read:

"Cabinet member, top-level adviser for the Republican Party, and newspaper publisher, Fred A. Seaton has gained recognition for his outstanding service to our nation. Known for his administrative skill, his broad understanding of politics, and his concern with the country's welfare, he has performed a number of key assignments as assistant to President Eisenhower, Assistant Secretary of Defense, and currently as Secretary of the Interior. His long-standing interest in politics extends back to his college days, and includes presidential campaign work, terms in the state legislature and service as a U. S. Senator from Nebraska. President of several publishing companies, his achievements as a newspaper executive have been recognized by his election to the presidencies of the Associated Press Newspapers of Nebraska and the Inland Press As-

sociation. He is a Trustee of the University of Nebraska Foundation and of Hastings College.

"Through his able performance of high-level government assignments, his impressive career, his genuine concern for our nation and its mineral resources, and his active interest in higher education, he has set an example which will inspire young men entering professional life.

"For these qualities and many others, the Board of Trustees of the Colorado School of Mines is proud to confer upon Fred A. Seaton the honorary degree of Doctor of Engineering."

### 125 Undergraduate Degrees

Sterling silver diplomas were awarded to 125 undergraduate and 12 graduate students, in addition to the honorary Doctor of Engineering degree presented to Secretary Seaton. On July 9 an additional 10 undergraduate students will receive degrees, and on Sept. 3 silver diplomas will be given to 13 undergraduates.

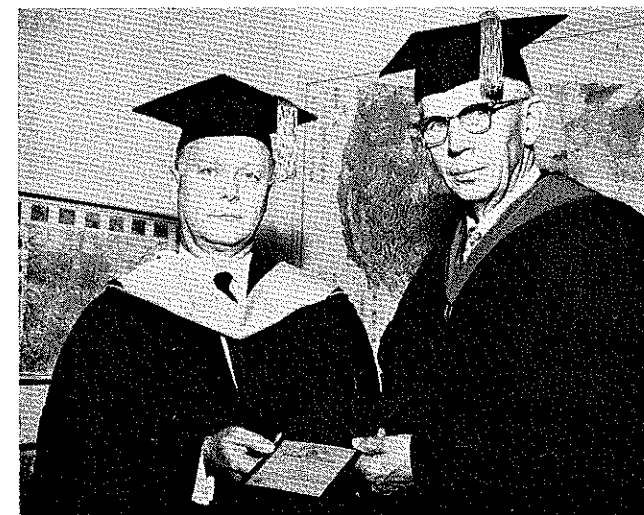
Of the 125 graduating seniors, 28 were mining engineers, 22 metallurgical engineers, 20 geological engineers, 24 petroleum engineers, 17 petroleum refining engineers, and 14 geophysical engineers. The 12 candidates for advanced degrees included one Doctor of Science degree in mining engineering, and Master of Science degrees went to four mining engineers, one metallurgical engineer, one geological engineer, one petroleum engineer, and four geophysical engineers.

Kenneth L. Larner, a geophysical engineering senior from Miami Shores, Fla., graduated with highest honors in the class of 1960. He compiled a 3.9 academic average over the four years. Graduating with high honors were nine other students: John J. Selters, E.M., Monte Vista, Colo.; William C. McClain, E.M., Wichita, Kans.; George D. Shier, Met.E., Golden, Colo.; George C. Kane, Met.E., Poncha Springs, Colo.; Robert H. Karlsson, Met.E., Tucson, Ariz.; Millard M. Judy, Met.E., Redlands, Calif.; Frederick P. Schwarz, Jr., Geol.E., Mountain Lakes, N. J.; John F. Evers, P.E., Green River, Wyo., and James R. Heavener, Geop.E., East Charleston, W. Va.

### Distinguished Achievement Awards

Distinguished Achievement Medals were awarded to five Mines' alumni. The silver medal is the highest honor which the School may bestow on an alumnus and is equivalent to the honorary doctorate.

Alumni receiving the 1960 Distinguished Achievement Medals were:



▼ Secretary of Interior Fred A. Seaton, left, was awarded an honorary Doctor of Engineering degree by Dr. Vanderwilt.

THE MINES MAGAZINE • JUNE, 1960



▼ Stanley J. Marcus, '45, left, received the van Diest Gold Medal during Commencement ceremonies May 27.

Theodore F. Adams, 1929 geological engineer, project manager of Blue River Construction Co., Denver;

Max W. Bowen, 1924 engineer of mines, executive vice-president and general manager of Golden Cycle Corp., Colorado Springs, Colo.;

Robert C. Earllougher, 1936 petroleum engineer, president and owner, Earllougher Engineering, Inc., Tulsa, Okla.;

Vernon L. Mattson, 1926 engineer of mines, manager of Mines and milling, Kerr-McGee Oil Industries, Inc., Oklahoma City, Okla.;

Ben F. Zwick, 1929 petroleum engineer, manager of oil and gas department, the Chemical Bank-New York Trust Co., New York City.

The Medal presentations began in 1942 and since that time 109 Mines graduates have been so honored. Included among past recipients are Dr. Arthur S. Adams, president of the American Council on Education; James Boyd, president of Copper Range Corp.; A. Hartwell Bradford, president of West Coast Refining Co.; George R. Brown, vice-president of Brown and Root Construction Co.; Frank Coolbaugh, president of American Metal Climax Co.; Harold W. Haight, director of the Humble Oil and Refining Co.; Edward S. McGlone, executive vice-president of Anaconda Copper Co.; Louis W. Prentiss, executive vice-president of the American Road Builders Association; and Harold C. Price, owner of the H. C. Price Co.

### Marcus Receives van Diest Gold Medal

Stanley J. Marcus, a 1945 Mines' graduate and one of the nation's leading missile and satellite engineers, was awarded the van Diest Gold Medal.

Currently a resident of San Jose, Calif., Marcus has received numerous citations from the federal government for his important contributions to the nation's rocket and missile development program.

Marcus, 38, was the chief engineer and senior civilian on the US Naval Ordnance Polaris missile project for three years, and from 1950 to 1956 was head of the special nuclear weapons division of the Naval Ordnance Test Station, China Lake, Calif. He also assumed prime responsibility for the Argus missile testing contract with Lockheed Aircraft.

Marcus presently is the technical manager of a \$60 million-a-year Lockheed Missile and Space Division project. It is a classified contract having to do with satellite systems. He has also written many publications, all of which are classified by the government.

Born in Buffalo, N. Y., Marcus entered Mines in 1941 and finished studies for his engineer of mines degree in late 1944. He performed tungsten prospecting and con-

21

sulting for several Utah and Nevada mining companies for one year before going to the China Lake test site. From 1945 to 1950 he served as a project engineer on the atomic bomb project.

The van Diest Gold Medal was established by Dr. Edmond C. van Diest in 1950 to recognize Mines alumni who perform outstanding achievements within five to 15 years following graduation from the mineral engineering college.

The last time the medal was awarded, in 1955, it went to Walter E. Heinrichs, Jr., a 1940 geological engineering graduate. Heinrichs is now president of the Heinrichs Geo-exploration Co., Tucson, Ariz.

#### Golden Anniversary Class of 1910

Thirteen of the 23 surviving members of the Golden Anniversary Class of 1910 toured the Colorado School of Mines campus Thursday, were honor guests at the annual alumni banquet Thursday evening, and preceded the class of 1960 in the march across the stage in commencement exercises Friday morning, May 27. There were 40 in the original class. Each of the 13 men who attended 1960 Commencement Exercises were honored by Dr. Vanderwilt with Golden Anniversary Reunion diplomas commemorating the recipients' long interest in their alma mater. They were:

J. C. Ballagh, president of Jet-Lube, Inc., Burbank, Calif.;

Emil J. Bruderlin, retired, former manager, Amarillo Plant, A. S. & R. Co., Amarillo, Texas;

John B. Carman, manager, Urad Mine, Molybdenum Corp., Idaho Springs, Colo.;

Charles E. Dyer, cattleman-rancher, Durango, Colo.;

John H. East, Jr., consulting engineer, former director Region III, U. S. Bureau of Mines, Denver, Colo.;

Ronald P. Fitzgerald, mining engineer, Roswell, N. M.;

Howard J. Hilton, retired, Kirkland, Wash.;

John V. Hubbard, horticulturist, Nevada City, Calif.;

Vincent K. Jones, retired, former construction company vice president, Denver, Colo.;

Robert M. Keeney, retired, former CSM faculty member and metallurgist, Farmington, Conn.;

Jean McCallum, consulting engineer, former vice president St. Louis Smelting & Refining Co. (division of National Lead Co.), Kirkwood, Mo.;

Glover C. McKay, retired, former general manager El Potosi Mining Co., El Paso, Texas;

Alfred E. Perkins, retired, former district manager, Crucible Steel Co. of America, Alegen, Mich.

#### Awards for Scholastic Achievement

Medals and awards for outstanding achievements were given to 10 Mines' graduating seniors.

John J. Selters, mining senior from Monte Vista, Colo., received two awards. He was given the William D. Waltman Award, \$400, for "conduct and scholarship most nearly approaching the recognized characteristics of an American gentleman" and the Clark B. Carpenter Award, \$50.

The Cecil H. Green gold medal went to James R. Heavener, Charleston, W. Va. It annually is awarded to the senior geophysical engineering student who attains highest rating in scholastics, personality and integrity.

The Wolf Medal went to Kenneth L. Larner, geophysics senior from Miami Shores, Fla., for his highest

scholastic record. He was graduated with a 3.9 academic average. At Mines 4.0 is straight A.

The Harold O. Bosworth Award, \$50, went to Albert E. Miller, Lakewood, Colo., for meritorious work in metallurgical engineering.

Richard Egen, of Hastings, Nebr., received the Thomas Harrison Award, \$25, for meritorious work in petroleum engineering.

For his outstanding work in petroleum refining, Edwin Wing, Englewood, Colo., was granted the Harrison L. Hays Award, \$25.

For the student who contributed most to athletics, the John C. Burt Award, \$25, went to A. Lawrance Holmes, Jr., a geological engineering student from Long Island, N. Y.

Three Brunton transits were also awarded. The first, provided by the late Hon. D. W. Brunton, went to F. Gail Loper, Riverton, Wyo., for meritorious mining engineering work. Robert L. Ferriter, Pueblo, Colo., received the Charles N. Bell transit award for outstanding progress in mining engineering. Melville C. Erskine, Jr., Happy Camp, Calif., was awarded a transit by the Rocky Mountain Association of Geologists for outstanding scholastic work.

#### Graduate Degrees

Graduates of nine colleges received advanced degrees. Advanced degrees awarded were:

Doctor of science in mining engineering to Parke Orlando Yingst, of Golden, Colo. Undergraduate degrees from Mines, 1951.

Master of science in geophysical engineering to Harry L. Baldwin, Jr., of Bartlesville, Okla. B.S. from University of New Mexico, 1952.

Master of science in geophysical engineering to Robert M. Becker, of Lakewood, Colo. Geol.E. from the University of Minnesota, 1950.

Master of science in petroleum engineering to Hassan Beykpoor, of Tehran, Iran. B.S. from the University of Oklahoma, 1957.

Master of science in mining engineering to Maung Win Kyaing, of Mergui, Burma. Undergraduate degree from Mines, 1957.

Master of Science in mining engineering to Donald D. Kraft, of Aurora, Ill. Undergraduate degree from Mines, 1958.

Master of science in geophysical engineering to Tun U Maung, of Rangoon, Burma. Undergraduate degree from Mines, 1957.

Master of science in mining engineering to William C. Maurer, of Madison, Wis. B.S. from Wisconsin Institute of Technology, 1958.

Master of science in mining engineering to Dhannalal N. Patni, Indore City, India. B.S. from Benares Hindu University, 1950.

Master of science in metallurgical engineering to Emilio Allende Posse, of Buenos Aires, Argentina. Undergraduate degree from the University of Buenos Aires, 1957.

Master of science in geological engineering to James K. Trimble, of Berryville, Ark. B.S. from the U. S. Military Academy, 1946.

Master of science in geophysical engineering to Bernard J. C. Turpin, of Paris, France. B.S. from the Ecole Superieure des Travaux Publics, 1954.

#### 1960 Mines' Graduates Listed

Mines' graduates receiving silver diplomas were:

##### ENGINEER OF MINES

George J. Beattie, Richard E. Blodgett, Jr., Bernard L. Bobo, Warren E. Brown, Edwin H. Crabtree, III, Robert L. Ferriter, Robert E. Green, Lennox L. Hagemann, Gordon R. Hersey, Carlos A. L. Cordero, Lawrence E. Long, Jr., Farrest

G. Loper, William C. McClain, Larry L. McCune, Curtis LaVon Miller, Richard J. Pitney, B. Frank Porter\*, Kent D. Pothast, William S. Ransom, Joseph W. Reese, Donald R. Reichmuth, David M. Ropchan, John J. Selters, Norman J. Smallwood, David L. Watson\*, James M. Winston, Euclid P. Worden, Jimmy U. Yu Chiao-Hui.

##### METALLURGICAL ENGINEER

Gerald J. Bagan, Bradley K. Boyd, Robert R. Cederstrom, Richard A. Daniele, James F. Green, Jr., Samuel B. Heister, Robert B. Hoffman, Millard M. Judy, George C. Kane, Robert H. Karlsson, George A. Lindroth, Lester H. Meltzer, Delmar V. Miley, Albert E. Miller, David W. Morse, Ted L. Myers, Merl L. Redhair, Richard R. Severns, George D. Shier, Arnold S. Turner, Glenn A. Walton, and M. L. West, Jr.

##### GEOLOGICAL ENGINEER

Mohammed H. Alief, Gerald L. Askevold, William E. Cristiano, Melville C. Erskine, Jr., Joseph C. Goldhammer, Artemas L. Holmes, Jr., William N. Houston, Donald H. Howell\*, Walter I. Knudsen, Jr., Roderick J. Morrell, Jean P. Zanin, Lee D. Patton, Dean H. Pospisal, Edward G. Rapp, David B. Sapik, Frederick P. Schwarz, Jr., Archer D. Swank, Stanley F. Versaw, C. Wallace Wade, and James W. Walton.

##### PETROLEUM ENGINEER

Keith E. Anderson\*, William A. Anderson, Warren K. Arnold\*, Ronald D. Baker\*, Thomas A. Carroll, III, Alva M. Caster, Andrew J. Dickson, Richard B. Egen, John F. Evers, Eduardo G. Arana\*, Robert F. Jenkins, Jr., Arvi Kivi, Burke B. Krueger, William R. Morgan\* Roger H. Osborne, William M. Ramsburg, Gordon LeVon Royce, John B. Smith, Jr., John R. Smith, R. Glenn Vawter, Gary E. Warner\*, Robert A. Weldon, Albert H. Wieder, and Donald R. Zelinkoff.

##### PETROLEUM REFINING ENGINEER

Knollys A. Ahloy, Lauren B. Ames, Joseph L. Anjier, Donald L. Bennett, Ronald L. Bredehoft, Ronald W. Evans, Neil R. Everett, William H. Gerdes, Glenn C. Graham, Albert S. Griffin, Jr., Ronald A. Krizman, Harry E. McCarthy, Quentin T. McGlothlin, Jerry P. McKnight, James K. Molden, Kenneth L. Spalding, and Edwin E. Wing.

##### GEOPHYSICAL ENGINEER

John A. Bowler, III\*, Charles L. Carpenter, Paul J. Harrison, James R. Heavener, James A. Hileman, Robert F. Hinshaw, Jon R. Kirkpatrick, Kenneth L. Larner, Kenneth M. O'Connell, Forrest D. Peters, Jack H. Pizante, Robert A. Sultzbach\*, Robert R. Talley, and Richard E. Van Doeren.

Graduation on July 9, 1960:

##### ENGINEER OF MINES

Jack C. Haptonstall and John D. Longenecker.

##### METALLURGICAL ENGINEER

Albert L. Dugger, Irwin W. Engel, George W. Hoagland, Dennis B. O'Neil, Thein Oo Po Saw, Louis W. Pribila, and Michael R. Sargent.

##### PETROLEUM REFINING ENGINEER

Carl W. Samuel.

Upon satisfactory completion of the courses now in progress and a field course, the following seniors were recommended for graduation on Sept. 3, 1960:

##### ENGINEER OF MINES

James C. Dorian, Jr., Clyde W. Frost, David R. Gilbert, Richard V. Good, James E. Montgomery, Ralph N. Rockwell, William R. Sandifer, II, and George M. Venable, Jr.

##### METALLURGICAL ENGINEER

F. Sparks Langher, Jr.

##### GEOLOGICAL ENGINEER

Shirley Mae Valencia.

##### PETROLEUM ENGINEER

Eugene H. Skinner and Augustine J. Slanovich.

##### GEOPHYSICAL ENGINEER

Lawrence E. Jones and Charles M. Richard.

Graduate students receiving degrees on May 27 were:

##### DOCTOR OF SCIENCE

Department of Mining Engineering

Parke O. Yingst.

##### MASTER OF SCIENCE

Department of Mining Engineering

Donald D. Kraft, Maung W. Kyaing, William C. Maurer, and Dhannalal N. Patni.

Department of Metallurgical Engineering

Emilio A. Posse.

Department of Geological Engineering

James K. Trimble.

Department of Petroleum Engineering

Hassan Beykpoor.

Department of Geophysical Engineering

Harry L. Baldwin, Jr., Robert M. Becker, Tun U Maung, and Bernard J. C. Turpin.

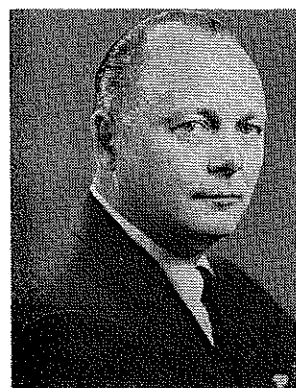
\* Completed work Jan. 27, 1960.



▼ Distinguished Achievement Medals were presented by Dr. Vanderwilt to T. F. Adams, '29; B. F. Zwick, '29; V. L. Mattson, '26; M. W. Bowen, '24, and R. C. Earllougher, '36.

# 1960 CSM Commencement Address

By FRED A. SEATON, Secretary of the Interior



FRED A. SEATON

All through recorded history, public attention has tended to focus on wars and kings and political leaders and changes of national boundaries. Always dramatic and while often times quite significant, the net influence and effect of many of those events and the personalities concerned has been comparatively transient in the light of the sum total of history.

It is easy to overlook the fact that most of the basic changes which have marked civilization's gradual rise toward the heights intended by our Creator have stemmed, not from bloodshed and political intrigue, but from discoveries in the realms of religion, of science and of technology—some great, many small, some even obscure at the time. By those giant and pigmy steps, mankind has advanced toward a very large degree of mastery over his natural environment.

## Events Versus Ideas

In terms of long-lasting effect, compare, for illustration, the impact of the empire building of the ancient conquerors with the discovery that iron could be smelted and wrought into plowshares.

You can make a case, of course, that war's demand for weapons superior to those of bronze was the catalyst in men's minds for the fashioning of weapons and armor from iron. But the point is, the plowshare remains of tremendous utility long after striking weapons of iron became obsolete.

How would you compare the aftermath of the Elizabethan Wars with the scientific discoveries of Copernicus, Kepler, Galileo, Harvey, and Newton—to mention only a few of the 16th and 17th Century immortals who laid the groundwork for modern science, engineering, and medicine?

And what of the end results of the struggles of the 18th and 19th Centuries which culminated in the Napoleonic Wars as compared with the invention of the steam engine by Watt or the cotton gin by Eli Whitney; or the rise of the new chemistry under such leaders as Priestly, Scheele, Cavendish, and Lavoisier, who charted the way for much of the power technology of 100 years later? Or compare those wars to the discovery, in 1831, by Faraday, of the behavior of electric currents in magnetic fields—an event that in less than 50 years, made possible the development of the dynamo and the harnessing of electric power.

In the present century, it seems unlikely that there have been any more revolutionary developments than those growing out of the work of such men as Bohr, Einstein, Rutherford, Fermi, and others whose contributions have enabled us to usher in the atomic and space age with all of its tremendous promise and grisly problems.

At the time they were first made, not all, by any means, of the potentiality of these discoveries was recognized even by the scientific community as particularly important. Indeed, some of them lay fallow for decades, for each was on the vast and endless outer frontier of human knowledge.

## Chain Reactions Triggered

Yet these milestones of human progress eventually

triggered chain reactions which were to profoundly influence the future of mankind.

Through them, we have learned something of how to cooperate with nature, to understand some of the workings of natural phenomena, and to use some of the materials and the forces of nature to do our work. Through them, too, we have learned to recognize and guard against elements in nature that are hostile to our health and comfort.

So it is today, in countries which have felt the full impact of the revolution in science and technology, that man has been freed from the chains which once bound him to a bare and hazardous existence. And in due course, this impact will be felt by all the peoples of the world.

The final conquest of man's physical environment, and of his doubt and fear and ignorance is closer today than ever before. For its total fulfillment one great hurdle remains: Man's inability to control himself.

To an extent never before possible, millions can now be engaged as scientists and engineers, in study and research and building and teaching and management. While some seek more efficient ways to satisfy needs for food, shelter, and clothing; others, because of an inner compulsion that will not be subdued, apply themselves to the pursuit of basic knowledge and to expanding man's activities and presence from the bottom of the sea to whatever ends of space may exist.

As an example of the forward march of science and technology—a march in which each member of this graduating class has a role to play if he chooses—one need not look beyond the development of the mineral industry in the Rocky Mountain region.

## Bishop Randall Dedicates CSM

When Bishop George M. Randall dedicated the Colorado School of Mines 91 years ago, he said that mining must depend upon the application of scientific knowledge, common sense, and the elements of courage and patience. The Creator had hidden boundless mineral riches which theretofore had been a secret from all the world, said Randall, and it was time for doing all which could be done to secure the wealth that the Almighty first laid up

Those were prophetic words indeed, for very little then was known of the mineral riches that were subsequently to be developed in this region. The known "mineral riches" in that year of 1869 consisted essentially of placer gold, for only gold could find a ready market.

Nevertheless, men of vision and courage, such as those here at the School of Mines, persisted in testing new ground and new ideas on mining, and searched for new minerals and improved recovery methods. The success that attended those efforts is, of course, well known to you.

Step by step, troublesome mining and metallurgical problems of the day were resolved and a better understanding of the character and mode of occurrence of mineral deposits was ascertained, to the end that new and many times more important deposits were discovered.

Gold mining, you will recall, was succeeded by an era of gold-silver mining, augmented by the production of lead. Copper soon entered the lists. Then zinc, long considered a "poison," by Colorado gold miners, became a source of profit. Later on oil, coal, molybdenum, tungsten, vanadium, radium, and many, many others came into their own.

As recently as the 1940's, the recovery of vanadium and radium was plagued by the presence of uranium and

selenium in the ore—just as in earlier days the recovery of gold and silver was plagued by the presence of various sulphides. Yet with the coming of the atomic and electronic age, uranium and selenium became so important that the vanadium in these deposits was reduced almost to the status of a mere byproduct.

Each successive step evolved because dedicated and inspired individuals, in the mineral producing industries, in educational institutions or government, succeeded in developing better understanding of the natural world in which we live. That enabled them and others to devise the skills and harness the power needed to extract and adapt more and more of the earth's materials to human use.

## Technological Advance Vital

The mining industry of this region—of the world, for that matter—bears eloquent testimony to the fact that both scientific and technological advance is absolutely dependent upon our learning more about the behavior of matter and a growing ability to interpret natural phenomena.

This is a never-ending process. There was a great deal which remained to be discovered in Bishop Randall's day. There is much which remains to be discovered today, surely far more than we can even now imagine. This much we do know: You of this graduating class have a task before you which is a demanding one. It is also an exhilarating one and an exciting one.

In the minerals and mining field, as in all others, it is a justifiable generalization to say that what man could only imagine yesterday has been discovered and applied today. From that we can conclude that what we can only imagine today will be discovered and applied tomorrow.

In responding to this challenge, each one of you can have a part: whether as a miner, metallurgist, geologist; as manager or builder or planner; as professor, salesman, engineer, or scientist. The opportunity beckons. The degree of your success depends largely upon you—your ability, knowledge and how much effort you want to put forth.

It is obvious that rapid change will be a hallmark of the world in which you will live, to a degree never before experienced. Furthermore, the world, being what it is, will be more dependent on science and technology than in any previous period.

## Search for New Knowledge

More than ever before, the future of mankind depends upon how diligently we apply ourselves to the search for new knowledge in our respective fields. In the modern world, knowledge has come to equate itself with power—power which can be quickly translated into action. For this, if for no other reason, the frontiers awaiting exploration by well-trained scientists and engineers are more intriguing, more fraught with promise, more critical many times over than those faced by the intrepid explorers of a century ago. We must seize every opportunity to push back the endless frontiers of ignorance.

Society has moral obligations it can ignore only at the peril of its own destruction. You and I as a part of society, must share responsibility for what it does; all the more so because we are free men in a free system.

One of those obligations is to foster an environment of freedom for scientific inquiry and technological advance.

If we are to live up to our potential it is absolutely necessary that we encourage and make room for the so-called unconventional thinker. This is so, if only because he tends to be a catalyst of progress.

## Original Thinkers Must Be Encouraged

There must be no forcing of a modern Galileo to recant; no discrimination against an Einstein of the next generation which forces him to flee the wrath of whoever holds governmental power; no worshipping at the altar of

conformity so as to stifle the enthusiasm and creativity of imaginative and questioning men.

And we must always be on guard against the centralization of education, in whatever guise. Otherwise, those in control could have the opportunity to turn out a nation of carbon copies of themselves. At the best, that could lead only to stagnation. At the worst, it could easily become the path to regimentation and lead to our ultimate destruction.

We should always be mindful that one of the principal reasons for this Nation's strength has been its massive diffusion of power, of knowledge, of skills, and of initiative going down to the very roots of our economic and social system. Once we restrain that diffusion, to say nothing of cutting it off, we have lost the master key to sure progress and improvement in the future.

## Equal Opportunity For All

Most of us think of our form of society as one which provides an equal opportunity to every citizen, according to his ability and effort. That being so, we cannot guarantee an enforced equality which exalts the dignity of none but rather reduces the level of all. True enough, everyone should have an equal opportunity at the starting line but we can never guarantee a dead heat finish without destroying the very freedom and opportunity which makes the equal start possible.

To me, this principle also applies to the minerals industry and to our economic system as a whole. This Nation's economy is a vastly complicated and dynamic thing. To bind it into a strait-jacket, where most of the strings would be pulled from Washington or any one place by any one group could only serve to stifle initiative. It would also inevitably destroy the climate of flexibility which is so essential if individual initiative is to operate.

## Progress Through Orderly Change

Real progress comes best through orderly change. Change, in turn, is impeded when individual and group freedom is unnecessarily limited.

A second obligation of society is to do its utmost to assure that the revolution in science and technology leads to the elevation of man and the betterment of his lot rather than his destruction.

No matter what the period in history—whether at the time of the Roman conquests, the Elizabethan, the Napoleonic, or World Wars I or II—wars have cost mankind a horrible price in blood and treasure. Today, the price would defy comparison with that of all the wars of history. The very existence of humanity itself may well be at stake.

It is absolutely essential, therefore, that we and our fellowmen, with the help of God, rise above the often sorry record of the past, both in relationships between nations and in the man-to-man relationships of daily living.

It is on this human front that we must place our first priorities. There we must have the best scientific, technological and professional abilities we can muster. We must also have the continuous interest and participation of a thinking and informed electorate.

Our responsibility cannot be ignored. Neither can it be delegated exclusively to scientists working in a laboratory, or to generals or kings or prime ministers or presidents. It is part of your personal responsibility as it is mine. It is part of the responsibility of every human being.

You, as members of the 1960 graduating class of the Colorado School of Mines have been prepared to contribute much to your professions and to the good of society here at home and abroad. I have every confidence that you will do so by giving of yourselves in full measure. Toward that end, you have my congratulations on winning your diplomas and my very best wishes for the future.

CAUGHT AT THE  
1960 ANNUAL BANQUET—  
C.S.M. ALUMNI ASS'N.

SKETCHED BY  
Harold A. Wolfenbarger, Jr.—  
CF+I ARTIST



HAROLD PRICE '13  
MR. "PIPELINER"

TED STOCKMAR '43  
TOASTMASTER

ED CRABTREE '27  
PRESIDENT  
ALUMNI  
ASS'N.

"CHUCK"  
EARLOUGHER '36  
MR. "SECONDARY  
RECOVERY"

COLONEL  
FERTIG '51  
EXECUTIVE  
MANAGER

ALBERT PERKINS '10  
PINCH HITTING FOR  
V.K. JONES  
SPEAKER  
CLASS '10

TED ADAMS '29  
MR. "BLUE RIVER  
TUNNEL"

MAX BOWEN '24  
MR. "GOLDEN  
CYCLE"

TENNEY DE SOLLAR '04  
"HONORARY MEMBERSHIP"

BEN ZWICK '29  
MR. "BANKER'S  
PETROLEUM  
ENGINEER"

AL KEENAN '35  
SILVER ANNIVERSARY  
CLASS  
SPEAKER '35 CLASS

LARRY  
HOLMES  
PRESIDENT  
CLASS '60



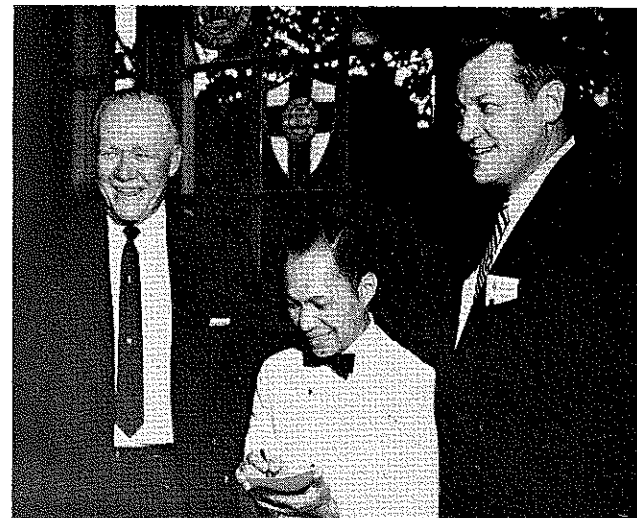
Seated at the head table were, left to right: David C. Johnston, CSM trustee; Dean of Faculty Truman H. Kuhn, Tenney C. De Sollar, '04; Dr. Ben H. Parker, '24, CSM board of trustees president; Edwin H. Crabtree, '27, CSM Alumni Association president; Ted P. Stockmar, '43, toastmaster; Dr. John W. Vanderwilt, CSM president; R. Lee Scott, '42, Alumni Development Fund chairman; Troy Crowder, assistant to CSM president.

## 1960 MINES Alumni Banquet

The CSM Alumni Banquet—for almost 65 years a cherished event bringing together Mines graduates on the evening before Commencement—was held this year at 6 p.m. Thursday, May 26, at the University Club in Denver. Two hundred and six Miners and their guests attended the banquet. Men from 41 classes spanning a period of 59 years gathered for cocktails before the dinner. "Old Timers" present included Frank Bowman, '01; Lynn Storm, '02; Tenney De Sollar and Oscar Reynolds, '04; Warren Prosser, '07; "Pop" Buell, '08; Mills Bunger, '09, and 12 members of the Golden Anniversary Class of 1910: J. C. Ballagh,

Emil Bruderlin, John Carman, Charles Dyer, Jack East, Ronold Fitzgerald, Howard Hilton, John Hubbard, Robert Keeney, Jean McCallum, Grover McKay and Alfred Perkins. After thirsts had been quenched and appetites satisfied, President Edwin H. Crabtree welcomed Miners and guests and presented Honorary Memberships to Tenney C. De Sollar, '04, (who was present to express his appreciation and thanks), Thomas C. Doolittle, '27, of Sacramento, Calif., and Lester S. Grant, '99, of Colorado Springs, Colo. President Crabtree read the following letters from the two men not

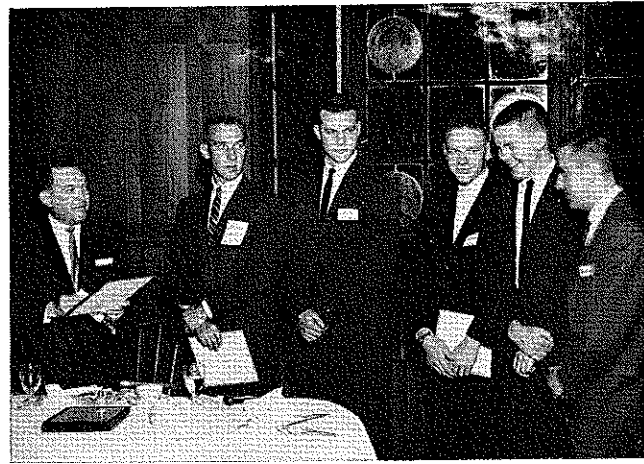
present:  
Doolittle: "The recognition makes me very proud and very happy to know, that, even after an absence of 15 years from Golden, I am not entirely forgotten. It has been my rare good fortune and my great privilege to personally know each and every alumnus of the Colorado School of Mines up to the time that I left Golden. Their names and faces are just as clear in my mind now as when they graduated. I deeply regret that I shall not be able to be present at the annual banquet to receive the certificate in person . . ."  
Grant: "It was a surprise and of



Wendell W. Fertig, '51, and Ted P. Stockmar give their order to a University Club waiter.



Enjoying a cocktail before the banquet are H. C. Price, '13, Frank E. Briber, '16, and Edwin H. Crabtree, Jr., '27.



▼ R. Lee Scott, '42, appoints 1960 Class Agents G. L. Askevold, Geol.; J. R. Heavener, Geop.; R. L. Bredehoff, PRE; S. B. Heister, Met.; A. J. Dickson, PE; J. J. Selters, Mining (not in picture).



▼ H. E. McCarthy, '60; Q. T. McGlothlin, '60; G. C. Graham, '60; R. A. Krizman, '60; R. W. Evans, '60; Harvey L. Miller (father), Curtis Miller, '60; Lawren B. Ames, '60.

course a great pleasure to know that the executive committee of the Alumni Association has conferred upon me the Honorary Membership together with all the appurtenances thereto. I did not know that the Alumni ever conferred that honor on anyone except some of the visiting great . . . I am sorry that I will not be there this year, it being the first year I have missed since my retirement excepting when my wife and I were traveling in the first years. The celebration at Commencement has been the chief social event in my life in recent years and I should enjoy it just as much this year, but I have been under considerable pressure in many ways and have found in the last several years that staying out late requires a couple of days at least for recovery, so I have decided to forego the pleasure this year and hope that things will be so that I may be in attendance in 1961. Please convey to the Committee my heartfelt thanks and appreciation for their consideration of me for such an honor . . ."

After introducing those seated at the head table, Toastmaster Ted P. Stockmar said he hoped Dr. Ben Parker's remarks would be brief.

Dr. Parker threatened to extend his remarks but goodnaturedly didn't. He welcomed Mines men in behalf of the Board of Trustees and assured them he enjoyed these annual get-togethers with classmates and old and new graduates of Mines.

When asked by Toastmaster Stockmar to make a few remarks, Dr. John W. Vanderwilt addressed the group in these words:

"I'd like to extend felicitations to the Class of 1960 which might even be able to tell the Golden Anniver-

sary Class of 1910 a few things worth listening to.

"At a reception this afternoon many parents expressed their thanks to me, as president of Mines, for 'helping' their boys through school. It was a very gratifying experience, and my congratulations to you parents who are here this evening.



▼ J. W. Reese, '60, and his father, W. J. Reese.

"I'd also like to express appreciation to the Alumni Association for its loyal support of the Horizon Plan. Even more fundamental is the fact that you Alumni are assisting students who will be coming to Mines in the years to come . . ."

"In regard to jobs for graduating seniors, the situation is better this year than last and it wasn't bad last year."

Dr. Vanderwilt then made the following introductions of each of the five men to receive Distinguished Achievement Awards at the Commencement ceremonies May 27:

**Theodore F. Adams**, Geological Engineer, '29, Denver, Colo. Project manager for the Blue River Construction Co., his firm has been responsible for the execution of the Big Thompson Project, and

now also for the Roberts Tunnel Contract. He has done classified work for the U. S. government on the Olympus-Pole Hill Tunnel Contract, and has supervised other tunnel work for Brown and Root, Inc. A native of Golden, and a resident of Denver, he has supervised mining operations in Texas for the Esparado Mining Co.; in Mindanao, Philippine Islands, for the Surigao Consolidated Mining Co.; and in Bolivia, for the Patino Mines and Enterprises. During World War II he served as a Captain with the Corps of Engineers. Early in his career he undertook graduate study with a Fellowship at the Colorado School of Mines.

**Max W. Bowen**, Engineer of Mines, '24, Colorado Springs, Colo. Executive vice president and general manager of the Golden Cycle Corp. and numerous other Carlton mining and milling interests since 1950, he has been in various managerial and supervisory capacities with Golden Cycle since 1929. Following his graduation he worked with the CSM Experimental Plant, the American Cyanamid Co., and the Portland Gold Mining Co. of Victor, Colo. He has been a consultant to the Denver Equipment Co., and has made numerous mine examinations throughout the Western Hemisphere. He served 12 years on the Board of Trustees of the Colorado School of Mines, and was president of the Colorado Mining Assn. in 1959. He is the author of articles in many technical publications.

**R. C. Earlougher**, Engineer of Mines, '36, Tulsa, Okla. President and owner of Earlougher Engineering, Inc. of Tulsa, he has made laboratory analyses of cores from more than 10,000 wells in the Mid-Continent area and from most oil producing areas in the U. S. An expert on oil recovery by water injection, he has supervised the engineering, design and construction of more than 100 such projects. Before establishing his own firm in 1946, he was managing partner of Geologic Standards Co. of Tulsa, the first Mid-Continent commercial core analysis laboratory established in 1935 for evaluation of water recovery. He has been chairman of the Mid-Continent Section of AIME, and has been a member of its executive committee. He is the author or co-author of numerous papers in technical journals.

**Vernon L. Mattson**, Engineer of Mines, '26, Oklahoma City, Okla. Now manager of mines and milling operations of Kerr-McGee Oil Industries, Inc., he was for six years director of the CSM Research Foundation. He has been chief engineer for Consolidated Feldspar Corp.; mining consultant for Norrie and Tower of New York; manager and vice president of Celso Mines and of Mountain States Fuel Co.; a mining engineer for the Plumley Engineering Co. of Charleston; and a mill foreman for Mazapil Copper Co. in Mexico. He has done major consulting and extensive examination work for Corning Glass and for Texas Gulf Sulphur. He is the author of various papers for AIME, Mining World, Ceramic Age, Ceramic Industry, Glass Industry, Mining Engineering and numerous other technical and trade journals.

**Benjamin F. Zwick**, Petroleum Engineer, '29, Scarsdale, N. Y. He is manager of the Oil and Gas Department of the Chemical Bank New York Trust Co. He has been a practicing consulting engineer; has been vice president in charge of Canadian operations for both the Husky Oil Co. of Wyoming and the Husky Oil of Calgary, Canada. He has coordinated operations in the Middle East for the Standard Oil Co. of N. J., and has been assistant general manager of the International Petroleum Co. in Peru; and vice president and general manager for International Ecuadorian in Ecuador. From the time of his graduation through 1943, he worked with the Tropical Oil Co. of Colombia, where he advanced from petroleum engineer to assistant production superintendent and finally to production superintendent. He holds a Medal of Merit from the Ecuadorian government, awarded in 1947.

Reunions were celebrated by the Golden Anniversary Class of 1910, Thirty-Fifth Anniversary Class of 1925, Silver Anniversary Class of 1935, Tenth Anniversary Class of 1950, and Graduating Class of 1960.

Speaking for the Class of 1910, Alfred E. Perkins explained that he'd been asked to substitute for Vincent K. Jones, who had suffered a heart attack at the buffet supper given by



▼ A. H. Wieder, II, '60, and his father A. H. Wieder, '34.

him for members of the Class of 1910.

"A few statistics are appropriate," Perkins declared. "Our Class graduated 40 and there are 23 living today, which is a pretty good average these days. Thirteen of the living are back for the Reunion. We are indeed glad to be here, and I suspect my classmates would join me in saying the hemlock of old age has quenched the fires of the past. But at least we're here as more or less ambulant cases . . . Now I'm going to let these fine old patriarchs introduce themselves. Give your name ONLY, no mention of your great achievements, and ABSOLUTELY no mention of your wonderful grandchildren."

Perkins proclaimed the class slogan as being "if you're there before it's over, you're on top!"

Frank J. Laverty, spokesman for the Class of 1925, expressed greetings from members of the 35th Anniversary Class.

Albert M. Keenan, as spokesman for the Silver Anniversary Class of 1935, declared:

"It's a great privilege to be here tonight . . . Our only claim to fame is that we graduated from the Colorado School of Mines 25 years ago. There were 85 in our class of which 75 are still living, and there are 23 of us here tonight. . ."

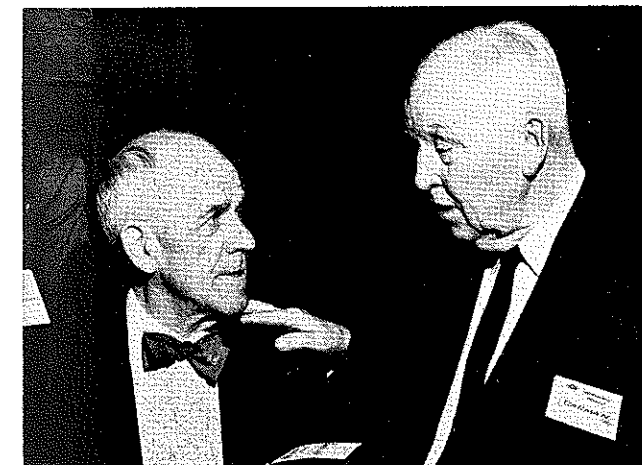
"One of our illustrious members, George O. Argall, Jr., editor of *Mining World*, telegraphs us from Hong Kong: 'Best wishes. Wish I could be with you. Looking forward to reading about it in MINES Magazine'."

Keenan modestly asserted that when the 50th Anniversary rolled along, his class would have to get themselves a new boy because he might not be able to speak. With a torrent of words he explained that "we of the vintage of '35 were headed by President Coolbaugh, and of course there was Dean Morgan . . ."

"Now I'll tell you about Dean Morgan," Keenan confided. "When I was a student at the School of Mines, I had a lot of trouble with a lot of men . . . But Dean Jesse Morgan was one of the FEW men I've ever been able to SEE EYE TO EYE WITH. I think I'm even a little taller than he is!"

Addressing his remarks to members of the Class of 1960, Keenan said: "When you go out and get a job, remember that you have two responsibilities to your employer—loyalty and a disregard for working long hours. If you're loyal and work hard, you'll be up here some day as Distinguished Achievement medalists."

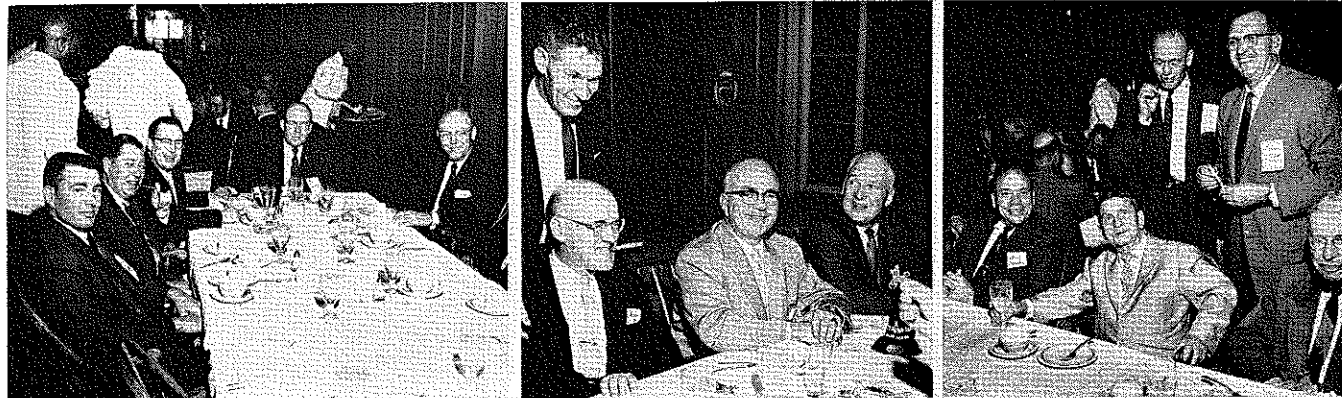
Keenan said his class wanted to make a contribution to the CSM Horizon Plan. He pointed out that when he and his classmates graduated, times were tough so they are very conscious of the value of a dollar . . . especially



▼ Harvey Mathews, '13, and John B. Carman, '10.



▼ Gene Meyer, '37; B. R. Asel, '34; R. L. Bolmer, '44, and Oscar Reynolds, '04.



▼ Picture 1, left to right: Glen D. Cheney, '58; Frank Geib, '40; Robert W. Evans, '36; R. E. Johnson, '33; C. C. Tappero, '35. Picture 2: J. R. Zadra, '35; Frank Bosco, '35; Al Keenan, '35; Max E. Coats, '35. Picture 3: N. J. Christie, '35; W. A. Kyleberg, '35; Dean Jessie Morgan; Arthur W. Buell, '08; Otto L. Schmitt, '35; George D. Vold, '35.

SILVER dollars. Emptying a bag of 85 silver dollars into a dishpan, he made so much noise that the citizens of Golden, 15 miles away, must have been aroused.

Keenan concluded: "Here, Mr. Steinbauer, is a potfull of money and here is a check for \$415 to go with it!"

James M. Taylor, substituting for Edward L. Karn as spokesman for the Class of 1950, asked members of his class to stand, then offered this bit of advice (which he said had been uttered by the late Bill Skelly):

"Wherever you are, whatever you may do, don't let anybody get your powder damp."

Speaking for the Graduating Class of 1960, Larry Holmes said softly: "We're listening."

R. Lee Scott, '42, chairman of the Alumni Development Fund, presented 1960 Class Agents Gerald L. Askevold, Geol.; Ronald L. Bredehoff, P.R.E.; Andrew J. Dickson, P.E.; S. Bruce Heister, Met.; James R. Heavener, Geop., and John J. Selters, Mng. Scott pointed out that this year honor men will serve as class agents for their own options. He said the plan is an improvement over the old

plan in that six men now do the work that one man did formerly.

Lucky Miner prize winners were: Ronald P. Fitzgerald, Lucky 1910 Miner; Frank C. Bowman, Oldest Class; Herbert B. Hegglund, Longest Distance (Venezuela); Myron C. Kiess, Lucky 1925 Miner; Walter A. Kyelberg, Lucky 1935 Miner; Richard G. Martin, Lucky 1950 Miner; Jack C. Haptonstall, Lucky 1960 Miner; Larry Holmes, '60, and Thomas E. Phipps, '49, Lucky Miner Present; Albert Perkins, Lucky Miner from Allegan County, Mich.

#### Banquet Sidelights

Historians may classify this event as the fathers-and-sons banquet. Some 20 fathers and sons were present and two fathers-in-law and a brother. One of the proudest fathers at the banquet was Albert H. Wieder, '34, who had one son graduate last year (C. A. Wieder, '59), another son graduate this year (Albert H. Wieder, II, '60), and still a third son studying at Mines.

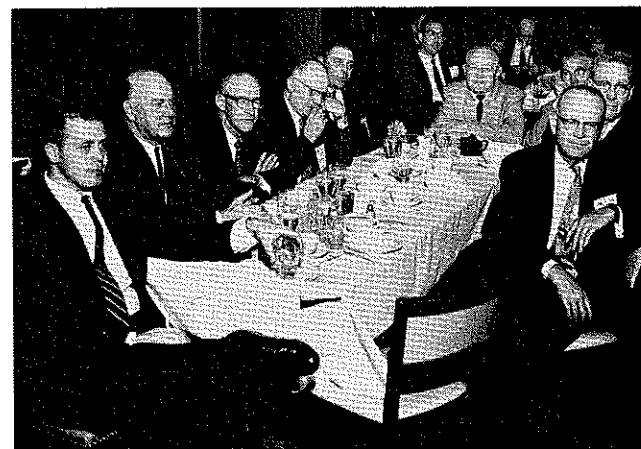
Colorado Fuel and Iron Corp. again sponsored photography and art work of the banquet. Robert Barnes of the CF&I advertising department

directed picture taking, while Bill Steen handled the camera. Harold A. Wolfenbarger, Jr., CF&I artist, drew the personality sketches.

Program committee members were Warren C. Prosser, Chairman, Hugh A. Wallis, and Robert E. Johnson.

The following classes were represented at the banquet:

- '01 Frank C. Bowman
- '02 Lynn W. Storm
- '04 Tenney De Sollar, Oscar Reynolds
- '07 Warren C. Prosser
- '08 Arthur W. Buell
- '09 Mills E. Bungler
- '10 J. C. Ballagh, Emil J. Bruderlin, John B. Carman, Charles E. Dyer, J. H. East, Jr., Ronald P. Fitzgerald, Howard J. Hilton, John V. Hubbard, Robert M. Keeney, Jean McCallum, Grover C. McKay, Alfred E. Perkins.
- '11 Kenneth H. Matheson, A. N. Sweet
- '12 L. C. Thomas
- '13 Harvey Mathews, H. C. Price, S. Power Warren
- '16 Frank E. Briber

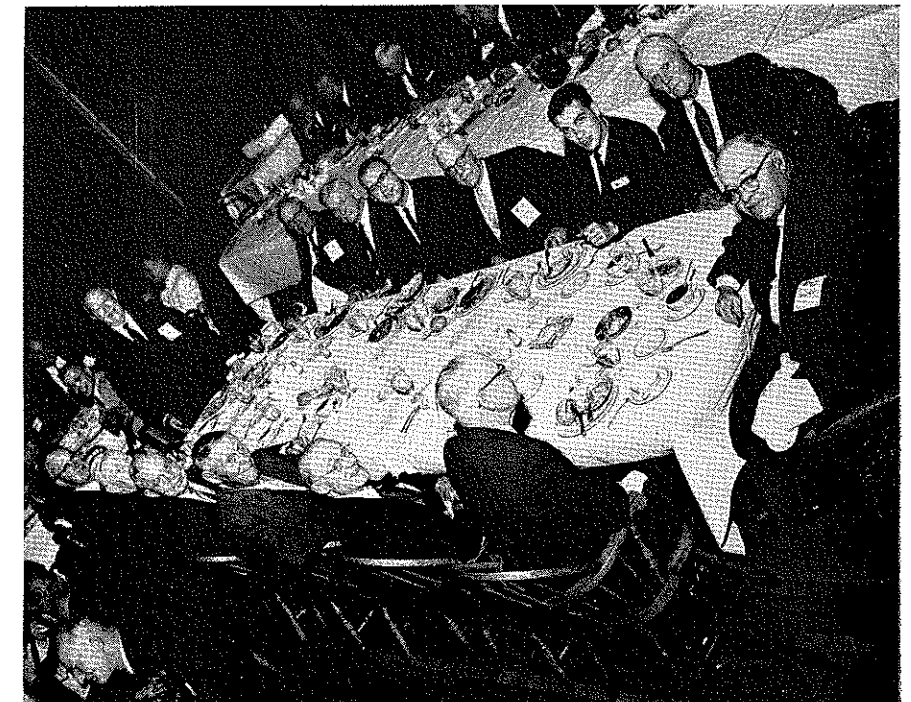


▼ Frank Laverty, spokesman for the Class of '25, is seated at the end of the table.



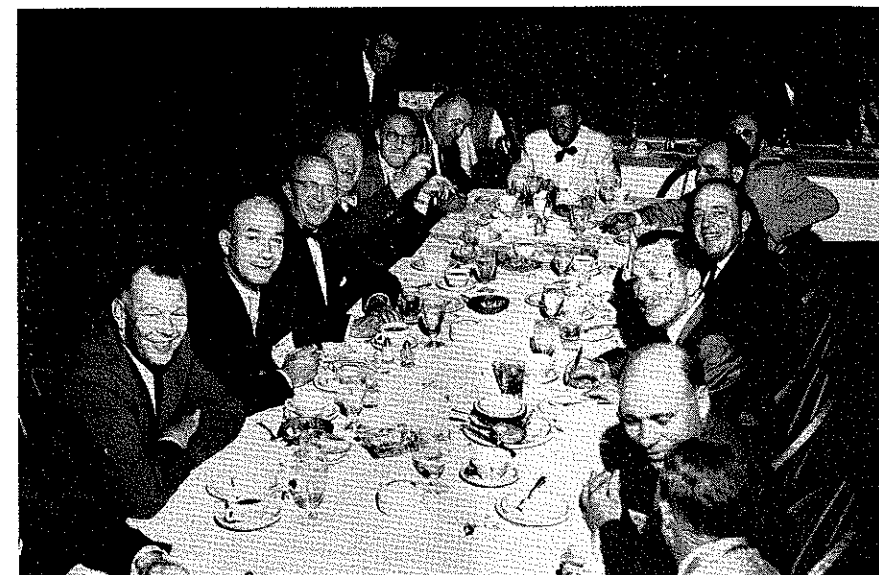
▼ John H. Shank, '35; James Colasanti, '35, and Clifton W. Livingston, '33.

- '22 A. L. Pierce
- '23 Edward J. Brook, J. Harlan Johnson, Charles O. Parker, Lute J. Parkinson, John H. Wilson.
- '24 Max W. Bowen, Wendell W. Fertig, Harry McNeill, Dr. Ben H. Parker
- '25 D. L. Kessler, Myron C. Kiess, Frank J. Laverty
- '26 Vernon L. Mattson, Oran L. Pack, M. H. Salsbury, Archibald A. Sproul, Russell H. Volk
- '27 M. Edward Chapman
- '28 S. M. Del Rio, Hugh A. Wallis
- '29 Theodore F. Adams, Robert R. Williams, Jr., Charles H. Jenkins, Benjamin F. Zwick
- '30 B. M. Bench, Parke O. Yingst
- '31 C. L. Barker, Harrison L. Hays, Earl C. Phillips, Robert L. Stark
- '32 H. F. McFarland
- '33 R. E. Johnson, C. W. Livingston
- '34 Philip R. Asel, Edward F. Kingman, W. G. Warren, A. H. Wieder
- '35 John H. Baker, Robert F. Barney, Frank N. Bosco, C. H. Carlton, Norman J. Christie, Max E. Coats, Herbert B. Hegglund, Walter A. Kyelberg, William A. McGilvray, Donald M. Morrison, James F. Neill, James A. Ord, T. A. Pelton, Otto L. Schmitt, John S. Shank, Paul W. Smith, C. C. Tappero, Thomas P. Turchan, W. A. Van Hook, G. D. Volk, John R. Zadra
- '36 Albert H. Brookes, A. W. Cullen, Earl L. Durbin, R. C. Earlougher, Robert W. Evans, Herbert W. Heckt, Caspar Hofmann, III
- '37 Gene Meyer
- '40 Frank Geib, J. J. Kelley, A. B. Manning, Douglas Watrous



▼ At the table of the Golden Anniversary Class of 1910 were Alfred E. Perkins (standing), '10; J. C. Ballagh, '10; R. M. Keeney, '10; Norman J. Smallwood, '60; Jean McCallum, '10; Bill McClain, '60; Charles E. Dyer, '10; Howard J. Hilton, '10; Warren Prosser, '07; J. B. Hubbard, '10; R. P. Fitzgerald, '10; John H. East, '10; J. B. Carman, '10; G. S. McKay, '10.

- '42 Robert D. McPhee, R. L. Scott
- '43 David F. Coolbaugh, Ted P. Stockmar
- '44 Robert L. Bolmer
- '45 Clyde V. Johnson
- '47 John M. Bernstein
- '48 Bruce D. Jones, Kenneth W. Nickerson, Jr.
- '49 Denman S. Galbraith, John H. Mason, Thomas E. Phipps, J. R. Torpey
- '50 Leo E. Borasio, Ralph H. Jones, Richard G. Martin, James M. Taylor
- '52 Robert E. Johnson
- '53 Jorge E. Costillo, George A. Minick
- '58 Glen D. Cheney
- '59 George Welch
- '60 M. Hassan Alief, Lauren B. Ames, Joseph Anjier, Gerald L. Askevold and father; Donald Bennett, Ronald L. Bredehoff, Alva Caster and father; William E. Cristiano, Andrew J. Dickson and father; Albert Dugger, Melville Erskine, Ronald Evans, Robert L. Ferriter, Glenn Graham, Robert Green, father, and father-in-law; Jack C. Haptonstall, father and brother; James R. Heavener and father; Robert Hoffman and father; Larry Holmes, Robert Jenkins and father; Robert Karlsson and father; Ronald Karlsson and father; Ronald A. Krizman, Frank Langher, Carlos Lares; Donald Longnecker, father, and father-in-law; Harry McCarthy, William McClain, Quentin T. McGlothlin, Curtis Miller and father; James Montgomery and father; Roderick Morrell and father; Roger Osborne, L. Douglas Patton and father; Forrest Peters, Richard J. Pitney and father; Frank Porter, Kent D. Pot-hast, Donald R. Reichmuth and father; Joseph W. Reese and father; Carl W. Samuel, Norman J. Smallwood, C. Wallace Wade, Albert H. Wieder, II, and father; Jimmy U. Yu, John J. Selters and father; S. Bruce Heister and father.



▼ There were so many of the Silver Anniversary Class of 1935 that not all of them could be shown in this picture.

Additional faculty members, staff and guests were:

Dr. John W. Vanderwilt, Dean William V. Burger, Dean Truman H. Kuhn, Ex-Dean Jesse Morgan, Gurnett Steinbauer, Troy Crowder, Fritz Brennecke, Chris Tolas, Dave Johnson, Carter Kaanta, Ted Roberts, Robert Barnes, W. P. Steen, and Rialto Philleo.



▼ Picture 1: Cadet Col. Jerry P. Ilgenfritz is congratulated by Capt. James L. Lammie, as they admire the fifth trophy received by the Mines student post of SAME. Picture 2: Cadet Edward G. Rapp is congratulated by Lt. Col. Bruce D. Jones on his receipt of the Distinguished Military Graduate award.

## 42nd Year of ROTC on Mines Campus

The Colorado School of Mines ROTC detachment completed its 42nd year on the Mines campus as the 1400th graduate was commissioned in the Corps of Engineers at this year's commencement. At no time in its long history has the ROTC unit seen so many changes and new developments as during this past year. A new 10-point rifle range in the Mines gymnasium and new Army-green uniforms for the entire cadet corps have been the most conspicuous. Not so obvious, but undoubtedly of greater impact, are the changes in the ROTC curricula.

Fall of this past year saw a reduction in the number of hours of attendance from four to three hours per week for freshman and sophomore basic course cadets. This has greatly reduced the number of hours spent by the basic course student on the drill field. A reorganization of the drill companies, with the cadet organization performing all planning and instruction, has markedly increased interest and spirit at drill. The spirit of competition and sense of responsibility shown by this year's seniors developed one of the sharpest drill units in Mines ROTC history.

More recently, a revised program has been set up for the junior and senior cadets, to reduce their class hours from five to four hours per week. While reducing the attendance load on the student, the fundamental course content of the program has not been altered. The principal material cut from the course has been in the area of technique and mechanical training courses such as individual and crew-served weapons. To compensate for the reduced hours, the advanced program next year will give the cadet some credit for subjects which he elects to take in the school's normal academic program. In this way, the cadet pay will not be effected and the Army will obtain the well-rounded graduate engineer it desires. A detailed breakdown of the subjects to be taught beginning in the fall of 1960 is shown in *Table I*.

### A Re-Evaluation

After considering the changes being made in the ROTC program, it might be well to re-evaluate the role

TABLE I		SCHOOL HOURS
<b>FRESHMEN</b>		
Organization of the Army and ROTC	.....	4
American Military History	.....	30
Leadership and Drill	.....	30
Chemical and Radiological Warfare	.....	4
Individual Weapons and Marksmanship	.....	15
U. S. and National Security	.....	10
<b>SOPHOMORE</b>		
Orientation	.....	2
Tactics and Communications	.....	26
Leadership and Drill	.....	30
Maps and Aerial Photography	.....	17
Mine Warfare	.....	8
Explosives	.....	10
<b>JUNIORS</b>		
Leadership Principles	.....	10
Military Teaching Methods	.....	18
Field Fortifications and Camouflage	.....	10
Leadership and Drill	.....	30
Maintenance of Equipment	.....	3
Construction Materials	.....	18
Fixed Bridges	.....	10
Floating Bridges	.....	9
Construction and Computations	.....	11
Movement of Personnel	.....	3
<b>SENIORS</b>		
Engineer Operations	.....	23
Roads and Airfields	.....	18
Buildings and Utilities	.....	10
Leadership and Drill	.....	30
Supply of Engineers	.....	8
Administration and Military Justice	.....	23
Orientation	.....	3
Role of U. S. in World Affairs	.....	10

of this program on the Mines campus. As with any academic program, a periodic examination should be made to see if the curricula satisfies the established need. This problem can best be considered in two categories: the needs of our country, and the needs of the individual student.

Today, as in the past 42 years, the ROTC program continues to be the nation's primary source of military leaders. Two-thirds of the career officers who enter the Armed Forces each year are ROTC products. The vast

bulk of the nation's reserve officers, a pool of trained manpower ready for rapid mobilization in any national emergency, are also ROTC graduates. Skilled engineering and scientific personnel from Mines and other engineering institutions are of particular importance in the complex technology of modern warfare. It is only through the ROTC that the Army can obtain voluntary access to this trained manpower.

The individual student also derives considerable personal benefit from the unique aspects of the ROTC program. The most obvious benefits are the pay for the Advanced Cadet of more than \$500 over his last two years of school, the privilege of placing his military service into his life with minimum interference to a civilian career, and the serving of his military obligation at a level consistent with his college education. Of particular benefit to Mines graduates are some less obvious advantages which are not normally available to engineers pursuing such a heavy and highly technical program.

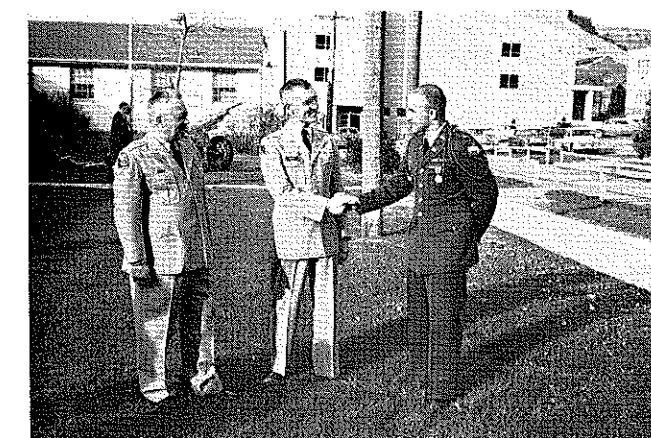
ROTC, through classroom study and practical work at summer camp and on the drill field, emphasizes additional skills needed by the engineering student: the capability of relating himself to other people; the ability to communicate and speak in front of a group; an appreciation of social responsibilities, and the manner of dealing with superiors and subordinates. The benefit of this training to an individual is best summed up by Lieutenant General Herbert B. Powell, an ROTC graduate, who said:

"It is precisely because military training is designed to develop *men* for the ultimate trial of combat that it is so effective in preparing them for other trials of life. When a man is motivated to withstand the storm and stress of battle, certainly no lesser struggle should daunt him!"

### Annual Inspection

The Colorado School of Mines ROTC detachment had its 35th Annual Inspection May 9-10. A parade and formal inspection of the cadet battalion was held on the Mines baseball field at 3 p.m. May 9. The federal inspection team, led by Col. Paul H. Jacobs of Omaha, Nebr., inspected all records and procedures of the Mines Military Department during the two-day period. This inspection compared the Mines unit against Army-wide standards and against other ROTC units throughout the country. Mines again received the highest possible rating in the inspection, thus continuing a perfect record since 1919.

Military awards were presented to the outstanding ROTC cadets of each class at the inspection of the cadet battalion. Selection of the cadets to receive awards was based on military and academic grades, school activities



▼ Cadet John P. Selters, selected as the outstanding cadet in the four-state area (Wyo., Colo., Kans. and Nebr.) is congratulated by Lt. Col. Jones, as Col. Paul Jacobs looks on.



▼ Top picture: Cadet Dennis G. Pollock is presented the Superior Cadet Ribbon as the outstanding freshman by Col. W. W. Fertig, Alumni Assn. executive manager. Bottom picture: Junior Cadet Frank Coffman is presented the SAME Medal for leadership and academic achievement in his junior year. The medal was presented by Col. Edward S. Hanley, '34, president of Denver SAME post.

and other requirements as set forth by the donor of each award.

The Sons of the American Revolution Medal was presented to Cadet Lieutenant Jerry P. Ilgenfritz, as the outstanding senior ROTC cadet displaying exceptional leadership, soldierly bearing and over-all excellence. Mines graduate Col. Tenney C. DeSollar, presented the award. The Department of the Army Superior Cadet Ribbon was presented to cadet Maj. John J. Selters by Col. Wendell W. Fertig, for outstanding achievement in his senior year in both military and academic scholarship and leadership. Selters also received the Society of American Military Engineers Gold Medal with Key Replica, as the senior ROTC cadet in the top 25 per cent of his class in academics who has demonstrated the highest standards of military leadership. Col. Edward S. Hanley, Mines graduate and head of the Denver SAME, made the presentation. Selters has also been selected by Headquarters, Fifth United States Army, to receive the Army-Navy Legion of Valor Bronze Medal as the outstanding ROTC cadet in the four-state area of Kansas, Nebraska, Wyoming and Colorado.

The Department of the Army Superior Cadet Ribbon for outstanding achievement in both military and academic scholarship and leadership was given by Colonel Fertig to junior Miles L. Kara, sophomore Gary L. Smith, and freshman Dennis Pollock. Kara was also awarded the Association of the United States Army Medal by Col. Paul R. Guthrie for his contributions to the standing of the ROTC unit at the Colorado School of Mines. The Society of American Military Engineers Gold Medal with Key Replica was presented to Cadet Franklin D. Coffman Jr., as the junior ROTC cadet in the top 25 per cent of his class in academics who has demonstrated the highest standards of military leadership.

Cadet First Sergeant Marvin Kay Jr., received the Veterans of Foreign Wars Medal and Plaque as an outstanding junior ROTC cadet, from Ernest V. Lacer, past VFW commander. The American Legion Medal and Plaque was presented to Cadet First Sergeant Joseph R.

Wright by Joseph Bokan of the Fifth Colorado District, for excellence in military leadership and citizenship.

The Chicago Tribune Gold Medal for military achievement, scholastic attainment, and personal character, was presented by Dr. Vanderwilt to junior Donald K. Henderson, sophomore Samuel Smith and freshman Thomas J. Perkins.

#### Military Societies

*Pershing Rifles, Company C*, 9th Regiment, was established at Mines in 1951. The purpose of the Pershing Rifles, originally founded by Gen. John J. Pershing, is to foster the highest ideals of the military profession and American citizenship. This organization is designed primarily for basic course students and gives these students a chance to receive recognition for superior military skills. The commander of this unit, currently Cadet Capt. C. Monte Richard, is annually elected by the basic course members and handles all the operations of the company. Faculty sponsor for Pershing Rifles this year was Maj. John Mason. The Regimental Assembly for units in the Colorado-Wyoming area, was held at Mines this past April.

*The National Society of Scabbard and Blade*, military honor society, established Company "G," 7th Regiment, at the Colorado School of Mines in May 1932. Membership is limited to advanced cadets chosen by active members on secret ballot. Pledges are accepted and tapped, then required to go through activity period, including an overnight bivouac on campus. The morning initiation ceremony is followed by a breakfast honoring new members. Activities include regular meetings, annual steak fry, a spring party, and the Military Ball, the outstanding social event of the campus. Cadet Maj. John J. Selters served as Scabbard and Blade captain this year. Capt. Frederick J. Hamlin acted as faculty sponsor.

*The Colorado School of Mines Post of the Society of American Military Engineers* was formed November 27, 1942. The primary objective of the Society is to increase the engineer potential of the United States for national security. The 1959-1960 school year program continued to be as active as in past years. Featured speakers during the year were Dr. R. L. deLuise (M.D.) on Nuclear Radiation; Col. Wendell W. Fertig on Guerilla Warfare; R. J. Tipton of Tipton, Kalmbach and Associates, on Engineering Ethics; Brig. Gen. J. H. Rothschild on Chemical and Biological Warfare; and Col. Alden E. Clifford on NORAD. Trips were made to the Rocky Mountain Arsenal, the Lowry Air Force Base Titan facilities, the Waterways Experiment Station at Vicksburg, Miss., and the S.A.M.E. Regional Meeting in Dallas, Texas.

The Colorado School of Mines student post, headed by Cadet Lt. Col. Jerry P. Ilgenfritz, was selected as Distinguished Student Post for the year 1959. This post has been selected as an Outstanding Post on five occasions: 1951, 1956, 1957, 1958 and now in 1959. This record is unequalled by any other school in the nation. Capt. James L. Lammie was faculty sponsor for the past year.

#### 34 To Be Commissioned

Thirty-four Miners will receive their commissions as second lieutenants in the United States Army after graduation this year. All but three of these will be commissioned in the Corps of Engineers. Thirteen men completed Summer Camp last year and were commissioned at commencement. The other 21 men will be commissioned at Fort Leonard Wood, Mo., on July 29 after their six-week camp.

### THE MINES MAGAZINE

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Those who will be commissioned at commencement are: Edwin H. Crabtree, III; Richard A. Daniele, Samuel B. Heister, Andrew J. Dickson, Artemas L. Holmes, Jr.; Richard J. Pitney, Edward G. Rapp, Charles M. Richard, John J. Selters, Arnold S. Turner, Roy G. Vawter, Albert E. Wieder, and Donald R. Zelinkoff.

Those who will be commissioned on July 29 are: Joseph L. Anjier, Ronald L. Bredehoft, Charles L. Carpenter, Richard A. Egen, James A. Hileman, Robert F. Hinshaw, Jon R. Kirkpatrick, Ronald A. Krizman, Kenneth L. Larner, George A. Lindroth, John A. Bowler, III; George N. Brown, Jr.; Daniel E. Karig, Delmar V. Miley, Gordon L. Royce, Michael R. Sargent, Frederick P. Schwarz, Jr.; Norman J. Smallwood, Kenneth L. Spalding, Stanley F. Versaw, and Edwin E. Wing. ROTC Staff

The present year has also seen a large turnover in the ROTC staff. Lt. Col. Bruce D. Jones, M.E., Mines 1948, has completed his second year as PMST. Maj. John Mason, 1949 Mines graduate, now holds the position of executive officer. Maj. Mason assisted in coaching the football and wrestling squads during the past year.

Capt. James L. Sutton, B.S., Texas University and M. S., Purdue University, arrived this year to teach the engineering and technical parts of the ROTC course. Capt. Frederick J. Hamlin, in his second year at Mines, taught Military History and acted as Commandant of Cadets. Capt. Hamlin coached the Mines Soccer Team this year.

Leaving Mines this year are Sgt. Maj. M/Sgt. Walter E. Gilmore, after five years duty on the staff; rifle coach and administrative assistant M/Sgt. William E. King, with four years at Mines, and Capt. James L. Lammie with three years on the staff.

Other instructors at Mines are M/Sgt. Chauncey Case; M/Sgt. Johnny F. Byrd, on his second tour at Mines; SFC Constantine S. Pournarus, recently assigned from attache duty in Saudi Arabia, SFC Richard G. King, and Sgt. Arthur A. Hoffman.

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## An Application of Quality Control In the Mining Industry \*

By JOHAN SIKKAR, '58

#### Introduction

Statistics can be a very helpful tool in the mining industry. It can, for example, be employed to help to keep good control over the grade of the mill feed. As it is often advantageous to keep the mill feed at a constant grade, and as usually the ore mined is of several different grades, then the different grades of ore must be mixed in certain specified proportions in order to get the final mixture of the required grade. To make sure that the mill feed will be within the required grade tolerance, all the different portions of ore making up the final mixture, and the final mixture must be examined for grade. As a general rule, it may be said that statistical methods of inspection will lead to the most economical inspection technique for the degree of certainty required. This statistical inspection technique is called "statistical quality control" or just "quality control."

#### Discussion

The variation which arises in the grade of the mill feed may be considered as being due to two main kinds of causes: chance causes and assignable causes.

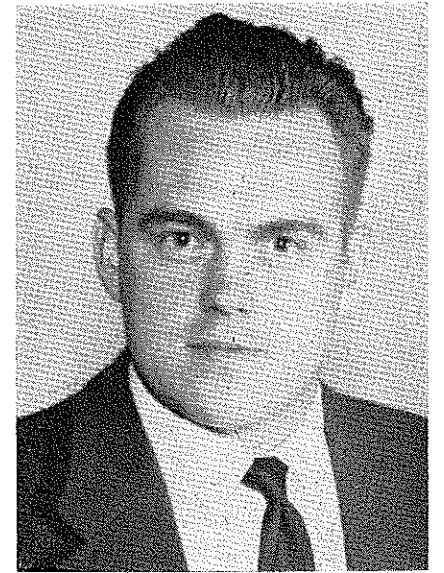
Chance causes are the innumerable causes, each of which exercises a small effect on the total variation. They are variations which cannot be identified, either because of lack of knowledge or because such identification would be uneconomic. They cannot be eliminated without modification in the system of mixing the different grades of ore.

Assignable causes are causes which can be identified and which are usually economical to discover and eliminate. They arise from sudden or abnormal variations in the grade of the different portions of ore which are used as "raw material" in mixing the mill feed, or they may be due to man or machine.

To keep the process of mixing the different grades of ore under full control, two control charts must be kept simultaneously. One chart is for the average value of the sample, the other is for showing the variability about the average.

The calculation of the average value of a number of items is very simple, but to calculate the standard

\* Mr. Sikkar was awarded the prize for the best paper presented in the 1959 Student Prize Paper Contest, Mining Society, Graduate Division. The paper appears here with the permission of the author and of ADME.



JOHAN SIKKAR

#### THE AUTHOR

I, Johan Sikkar, was born Sept. 18, 1933, in Tartu, Estonia. In 1944, when Russians again started to invade Estonia, our family fled to Sweden. After living about 10 years in Stockholm, Sweden, I received a Rotary Educational Foundation Scholarship to Emory at Oxford in Georgia.

Next year, 1955, I was able to transfer the scholarship to Colorado School of Mines, where I graduated with the degree of Engineer of Mines in May, 1958. During the summer after graduation I worked for The New Jersey Zinc Co. at Gilman, Colo., and in the fall of 1958 I started to work for my Master of Science in Mining Engineering at Montana School of Mines. After receiving my degree in June 1959, I returned to Gilman as mine engineer for The New Jersey Zinc Co.

deviation, which expresses the variability about the average, every time a sample was taken, even of so small a number as five items, would be very laborious. For this reason, it is, according to Moroney<sup>1</sup>, usual practice to base the chart controlling variability on the sample range, which is obtained by taking the difference between the greatest and least values recorded in the sample.

The control charts, according to Parran<sup>2</sup>, build a frequency distribution on a time trend basis, with the ordinate as the variable being measured, and the abscissa as time. Usually five observations are taken per sample, and the average range of the sample is plotted. After a minimum of 25 samples have been taken, control limits can be drawn for averages and ranges within which the points must fall if the process is in statistical control. A point outside these limits indicates that an assignable cause of variation exists.

The limits for warning and action on the control charts have, according to Moroney<sup>3</sup>, absolutely no in-

<sup>1</sup> M. J. Moroney. *Facts from Figures*. Baltimore: Penguin Book Inc., p. 152, 1958.

<sup>2</sup> M. Parran. "Mathematics Necessary for Quality Control in Mass Production," *G.M. Eng. Journal*, Vol. 1, No. 3, p. 22-27, 1953.

<sup>3</sup> Moroney, *op. cit.*, p. 152.

herent connection with the limits the designer sets for the accuracy required. The limits are statistical limits, which depend on the inherent variability of the mixing process and on the size of the sample which is taken. Irrespective of limits set by the designer, statistical control limits will widen if the job is made by a poor method or by a poor workman (in as far as the workman has control over the accuracy of the mixing). Again, if all the other conditions are the same, the statistical control limits on the average chart will close in and the limits on the range chart will widen if the number of items in the sample is increased.

According to Moroney<sup>4</sup>, the following factors and formulas can be used to calculate the limits of the average and range charts:

CONVERSION OF MEAN SAMPLE RANGE TO STANDARD DEVIATION AND CONTROL LIMIT FACTORS AND FORMULAS FOR AVERAGE CHART

Sample size n	Warning factor A	Action factor A	Conversion factor d	Formulas
2	1.229	1.937	1.128	$g = \frac{w}{d}$ U.L. = $\bar{x} + Aw$ L.L. = $\bar{x} - Aw$
3	0.668	1.054	1.693	
4	0.476	1.054	1.693	
5	0.377	0.594	2.326	
6	0.316	0.498	2.534	
7	0.274	0.432	2.704	
8	0.244	0.384	2.847	
9	0.220	0.347	2.970	
10	0.202	0.317	3.078	

where: g = population standard deviation; w = mean sample range;  $\bar{x}$  = grand average (average of the sample averages); U.L. = upper limits; L.L. = lower limits.

CONTROL LIMIT FACTORS FOR THE RANGE CHART

Sample size n	Upper action factor D	Upper warning factor D	Lower warning factor D	Lower action factor D
2	4.12	2.81	0.04	0.00
3	2.98	2.17	0.18	0.04
4	2.57	1.93	0.29	0.10
5	2.34	1.81	0.37	0.16
6	2.21	1.72	0.42	0.21
7	2.11	1.66	0.46	0.26
8	2.04	1.62	0.50	0.29
9	1.99	1.58	0.52	0.32
10	1.93	1.56	0.54	0.35

The upper and lower warning and upper and lower action limits are calculated by multiplying the mean sample range (w) by the limit factor (D) shown in the above table for the number of items (n) in the sample. Thus:

$$\text{Limit} = Dw$$

These limits are based on the fact that for a normal distribution 99.7 per cent of the whole population lies within three standard deviations of the average, 96 per cent of the whole population lies within two standard deviations of the average, and 68 per cent of the whole population lies within one standard deviation of the average.

In some cases it might be advantageous to determine the standard deviation more accurately than the use of conversion factor allows. In that case either of the two following formulas may be used:

$$g = \sqrt{\frac{(\sum X - X^1)^2}{N}} \quad (\text{used for ungrouped data})$$

$$g = \sqrt{\frac{fd^2}{N} - \frac{fd}{N}} \quad (\text{used for grouped data})$$

<sup>4</sup> Moroney, *op. cit.*, p. 155-172.

where: X = individual reading; X<sup>1</sup> = arithmetic mean or average; N = number of observations; d = the class interval (width of conveniently sized groups into which data are divided); f = frequency of occurrence.

Example

The following readings are the results obtained when 50 units are taken off from the actual grade of ore.

INDIVIDUAL READINGS								
No.						Sum.	Ave.	Ra.
1	-2	-1	+2	+1	-2	-2	-0.4	4
2	-1	0	+2	-1	-3	-3	-0.6	5
3	+1	-2	-2	-1	-2	-6	-1.2	3
4	-2	-2	0	-2	0	-6	-1.2	2
5	-1	-1	-2	-2	0	-6	-1.2	2
6	-1	+1	0	-1	-1	-2	-0.4	2
7	+2	-1	+1	-2	-1	-1	-0.2	4
8	-2	+3	-2	0	-2	-3	-0.6	5
9	-1	-2	-1	-2	0	-6	-1.2	2
10	+2	+2	0	-2	-2	0	0.0	4
11	-2	0	-1	-1	-2	-6	-1.2	2
12	+1	0	+3	-1	-1	+2	+0.4	4
13	-1	+2	+1	-2	-1	-1	-0.2	4
14	-1	-2	-2	+1	-1	-5	-1.0	3
15	0	-2	-1	-1	+2	-2	-0.4	4
16	-1	-1	-1	-1	+2	-2	-0.4	3
17	-1	-1	-2	0	-2	-6	-1.2	2
18	-1	-1	-2	-1	-2	-7	-1.4	1
19	-1	+1	+2	0	-1	+1	+0.2	3
20	-1	-1	-2	-2	-2	-8	-1.6	1
21	-2	-1	-2	-1	-1	-7	-1.4	1
22	+1	-1	-1	0	-1	-2	-0.4	2
23	-1	0	-2	+1	-2	-4	-0.8	3
24	-1	+1	-1	-1	-2	-4	-0.8	3
25	-1	0	-2	+1	-2	-4	-0.8	3

Grand Average -0.72 2.88

CALCULATION OF LIMITS ON AVERAGE CHART

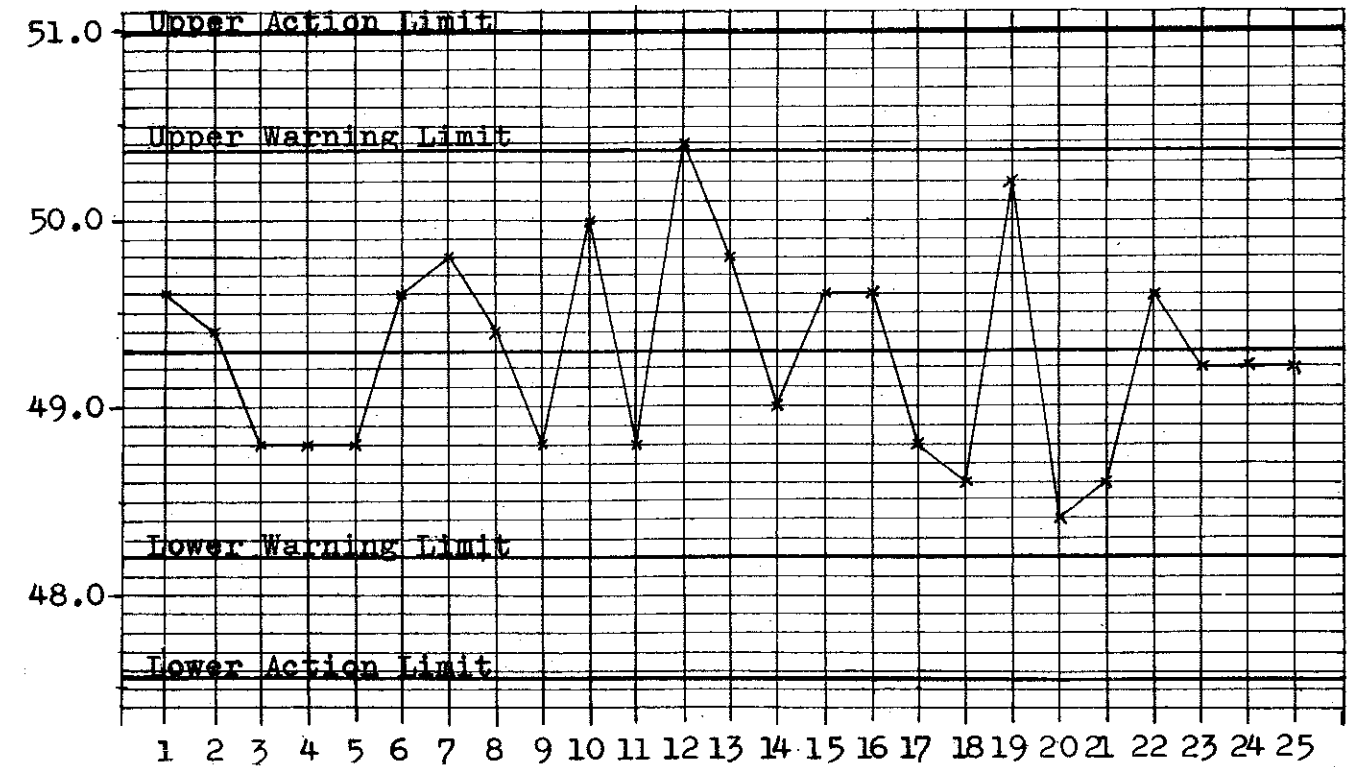
Upper Warning Limit =  $\bar{x} + Aw = 49.28 + 0.377 \times 2.88 = 50.36$   
 Upper Action Limit =  $\bar{x} + Aw = 49.28 + 0.594 \times 2.88 = 50.99$   
 Lower Warning Limit =  $\bar{x} - Aw = 49.28 - 0.377 \times 2.88 = 48.20$   
 Lower Action Limit =  $\bar{x} - Aw = 49.28 - 0.594 \times 2.88 = 47.57$

CALCULATION OF LIMITS ON RANGE CHART

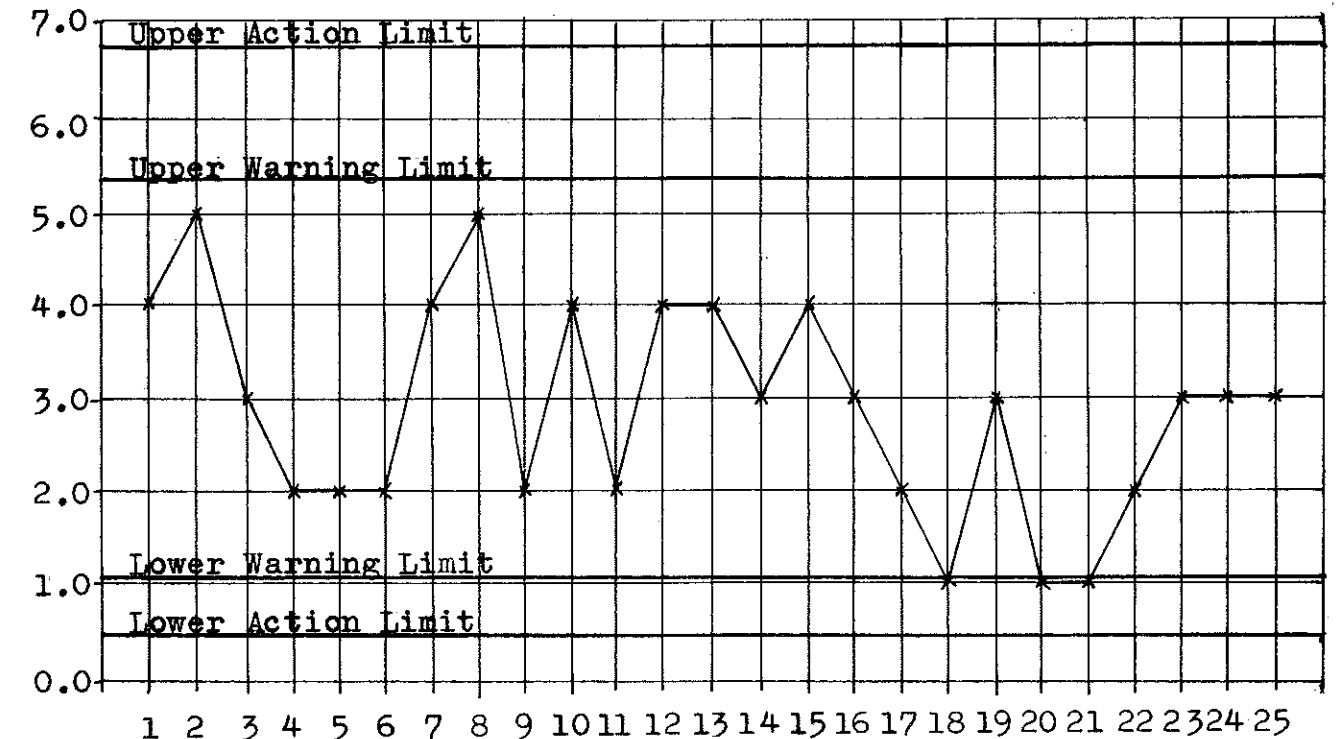
Upper Warning Limit =  $Dw = 1.81 \times 2.88 = 5.35$   
 Upper Action Limit =  $Dw = 2.34 \times 2.88 = 6.74$   
 Lower Warning Limit =  $Dw = 0.37 \times 2.88 = 1.06$   
 Lower Action Limit =  $Dw = 0.16 \times 2.88 = 0.46$

As the points in this example fell fairly well in between the limits, it can be concluded that this set of data is under statistical control. Point 12 on average chart fell outside the upper warning limit, and it might be wise to investigate the reason why it fell outside. Points 18, 20, and 21 on the range chart also fell outside the warning limit, and it might be wise to investigate the reason for that.

AVERAGE CHART



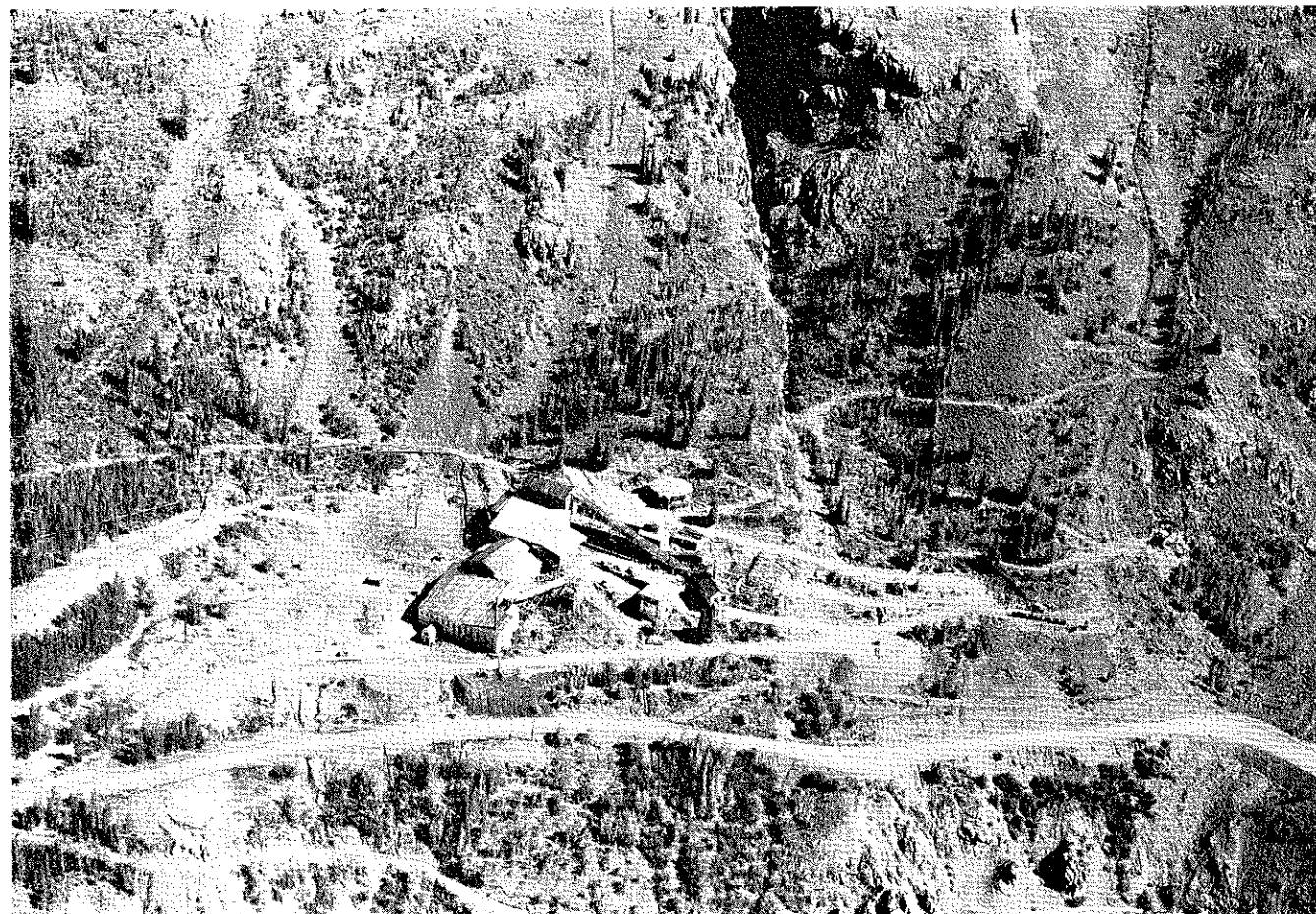
RANGE CHART



If the requirements for the mill feed state that the grade of the feed can vary from 47 per cent to 51 per cent, then we can conclude that the present process of mixing the different grades of ore is acceptable. If the requirements for the feed are such that the action limits on the average chart would fall further apart than the grade tolerance, then it can be concluded that the mixing process must be changed, if it would be economical to do so, or the grade tolerance must be widened.

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▼ Standard Uranium Corp's Shenandoah Mill as seen from an airplane.

## Standard Uranium's Developments In San Juan County, Colo.\*

By RUSSELL L. WOOD, '49

The recent renewal of large scale mining activity in San Juan County, Colo., has created considerable interest among Western mining people. The purpose of this paper is to attempt to describe Standard Uranium Corp's part in this revival of an old mining district.

Although San Juan County and Silverton, the county seat, are enjoying an economic boom as compared with conditions during the past several years, it cannot be said that there is a mining boom in the area. Standard Uranium Corp., the district's largest operator, is engaged in one major project, and two lesser projects. In addition to Standard's operations, several other smaller companies have resumed work in the county, perhaps partly because of the possibility of having a custom mill operating in the district.

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

### Base Metal Mining Activities

Perhaps the first thing which arouses the interest of a mining man is the fact that a uranium company is directing its activities into the base metal field. This is a direct reversal of the trend in the middle 1950's when several old and established base and precious metal mining companies, such as Hecla, Homestake, Climax, and others, successfully entered the uranium mining business. Although Standard did not then exist as a mining company, most of the individuals now with the company had migrated to the uranium business as refugees from a depressed base metals business.

Today, Standard does not consider itself strictly as a uranium company even though its income is still derived almost entirely from uranium ore sales. Because of its large scale development program in the San Juan district and elsewhere in Colorado, over

### THE AUTHOR

Russell L. Wood, graduated from the Colorado School of Mines with the degree of Engineer of Mines in 1949. Working as a miner for the Gouverneur Talc Co., Gouverneur, N. Y., from July 1949 until May 1950, he learned practical mining the hard way. The next year he joined the Colorado Research Foundation as a junior engineer.

From June 1951 until June 1953, Mr. Wood worked as engineer and superintendent for Mining Research Corp., Golden, Colo., in determining the penetration of heavy bombs in diverse media such as sandstones and granites. Again returning to mining, he worked as a miner for Telluride Mines, Inc., until

April 1954. Then he accepted the position of mine manager with McCormick Mines, Big Indian District, Utah, and continued there for the next two years.

In April 1956, he joined Standard Uranium Corp., Moab, Utah, as mine foreman, subsequently being promoted to assistant general manager. Mr. Wood was instrumental in achieving the exceptionally high percentage of ore recovery from the pillars left by the room and pillar system used in mining the original high grade uranium ore. In the past year or more, Mr. Wood has devoted much of his time to the San Juan project described in his paper. The progress of this project should breath new life into the famous old mining district of Silverton and San Juan County, Colo.

half of the company's activities are today in the base metal field. As a further evidence of its diversification, the corporate name will shortly be changed to Standard Metals Corp., to better reflect the company's present interests.

### Company Financially Able to Diversify

Another point calculated to arouse the interest of many is why a company with such obvious success in uranium mining would choose to get into an industry as depressed as base metals. The first answer, of course, is that the company is financially able to diversify. With nearly \$2,000,000 net income, after taxes, from sales of only \$3,500,000 in 1959, the company obviously has money available for new ventures.

Standard's management believes that its venture in the Silverton area will be quite profitable, even at today's depressed economic conditions in the base metals industry. Management further believes that this country must eventually make a separation between its foreign policy and its domestic mining policy, and that there will be a return to a more sensible and favorable economic base for metal mining.

### Four-Part Program Planned

Standard has one basic objective in the base metals field—to make money. The program to reach this objective in the San Juan County area is divided into four parts:

1. To reopen and rehabilitate the old Shenandoah-Dives Mine;
2. To reopen the Sunnyside mine;
3. To renovate and reopen the Shenandoah-Dives Mill, and
4. Completion of a program to produce a manganese by-product from the ores of the Sunnyside mine.

### History of Silverton District

The history of Silverton and San Juan County mining begins around 1870 when the first prospectors in the area found placer gold in the vicinity of Arastra Gulch. Arastra Gulch drains the area surrounding the present Shenandoah-Dives mine. Difficulties with Indian tribes prevented any serious mining being done until 1873 when the first real production started. Throughout the next 55 years mines were discovered, opened, and abandoned.

Various consolidations took place, until by 1929 a single company, the Shenandoah-Dives Mining Co., emerged as the dominant producer of the immediate

area about Arastra Gulch. This company operated the Mayflower mine and later the Silver Lake Unit, leased from American Smelting and Refining Co., until 1953 when the mine and mill were shut down because of economic conditions.

In 1958 the Shenandoah-Dives Mining Co. was merged into the Marcy-Shenandoah Corp. Early in 1959 Marcy-Shenandoah entered into a limited partnership with Standard Uranium Corp., which became the general partner and operator of the former Shenandoah-Dives property. Later Standard purchased Marcy-Shenandoah's interest in the limited partnership and is now the sole owner and operator of the various properties.

### Shenandoah-Dives Mine Reopened

Subsequent to becoming the operator of the Shenandoah-Dives Mine, Standard has engaged in a program designed to rehabilitate the old mine and develop additional ore. Underground rehabilitation in the mine has consisted of reconditioning the Zero, or master raise, which permits access to most of the old upper levels, and completion of the DMEA program started in 1952 and 1953. This DMEA program was directed towards opening up the Letter "G" vein on the Shenandoah-Dives main level. This program was recently concluded with the completion of a 450 foot raise from main level to the Unity level, the lowest previous workings on this vein.

The raise from the main level to the Unity level is located in the foot-wall of the Letter "G" vein and was driven with an Alimak Raise Climber. This marked the first use of an Alimak Raise Climber in this part of the country, and the results are being observed with considerable interest, both by Standard and by other companies faced with similar raise problems.

### Alimak Raise Climber Satisfactory

Standard's experience with the Alimak Raise Climber has been most satisfactory. The chief advantages of this method of raising lie in the increased speed of raising and increased safety for the miners. Accurate cost figures on Alimak raising are not available at this time because of uncertainties as to the correct amortization rate to be charged against the equipment. However, it appears that a considerable cost savings over that of conventional raising was achieved in this raise. The raise was driven on an 80 degree slope and was driven in extremely hard rock

for its entire distance. It was driven by a two man crew in the form of a slot 7 feet wide by 11 feet deep. The average rate of advance, even at the top of this 450 foot high raise, was approximately 2.25 feet per man shift of labor.

With the completion of this ventilation and access raise, the emphasis has shifted to stope preparation work at the Shenandoah-Dives mine. This work is underway, both on the main level, on the Letter "G" vein and on some of the upper levels of the other veins of the Silver Lake Unit. It is anticipated that the mine will be in a position to furnish mill feed by late spring or early summer.

#### History of Sunnyside Mine

The Sunnyside Mine is located above Eureka, Colo., some 10 miles north of Silverton. The mine, in common with most of the others in the district, has a long and varied history extending back into the 1880s. It has been the largest and richest mine in San Juan County, and the sizeable proven reserves remaining at this time indicate that it will again assume that position.

The Sunnyside Mine was developed and operated on a large scale basis for over 40 years and faced some of the most severe physical conditions to be found in any mine in the United States. The shutdown of the Sunnyside mine in 1938 can be attributed to several of these physical conditions. Chief among these was the extremely severe climate caused by the high altitude and heavy precipitation.

The main portal of the Sunnyside was located at an elevation of 12,200 feet above sea level, well above timber line and in a very poorly protected location. Access to the mine was achieved by various drifts and internal shafts which extended in stages as far as 1,000 feet below the main level. In later years, all ore and waste had to be hoisted in operations involving two or more transfers. Ore was crushed at the portal of the mine and then transferred by aerial tram to the mill located some two miles distant, at the town of Eureka, Colo.

During later years as the mine penetrated deeper into the mountain, the handling of heavy flows of water became a very serious problem. The remoteness of the mine from marketing facilities, and the generally poor metal prices finally combined with the natural factors in 1938 causing a permanent shutdown. Consideration was given to reopening the mine during the war years, but the scarcity of labor and materials ruled out this possibility.

#### Gold King and American Tunnel

At about the same time that the Sunnyside mine was being developed above Eureka, the Gold King Mine was being worked on Bonita Peak above Gladstone, a small community located on Cement Creek some seven miles from Silverton. The Gold King Mine is adjacent to and on the same general vein system as the Sunnyside Mine, but they are on opposite sides of Bonita Peak.

In 1900 the company operating the Gold King Mine started work on the American Tunnel at the base of the mountain near Gladstone. The American Tunnel was to be a low-level haulage way and drainage tunnel for the Gold King Mine. The project was never completed and the tunnel was abandoned around 1908, after being driven some 6000 feet into the mountain. Through its acquisition of the holdings of Marcy-Shenandoah and the limited partnership, Standard acquired a permanent easement on this tun-



▼ Wet section in old American Tunnel.

nel. In April 1959 the company started operations designed to extend the tunnel to a point beneath the Sunnyside Mine thus providing a low-level haulage and drainage tunnel for the entire Sunnyside Mine.

#### Project to Connect Sunnyside

The project of connecting the American Tunnel with the Sunnyside Mine is divided into three phases. The first phase, now completed, consisted of slabbing to enlarge the old tunnel for a total distance of 5500 feet. The second phase, now well underway, consists of driving a new tunnel for a total distance of approximately 4900 feet. The third phase will consist of driving a 300 foot raise to connect with the bottom of the deepest shaft in the old Sunnyside workings. It is anticipated that this connection will be made early in 1961.

No serious problems were encountered in the slabbing operation, although it was a large project and required nearly a year to complete, including time for plant set-up and organization. The original tunnel varied from seven by eight feet, to eight by nine feet in cross section, with a ditch laid between the rails. A flow of about 900 gallons per minute of acidic water originates at a point approximately 4000 feet from the portal. The presence of this water hinders slabbing operations to a very considerable degree.

#### Old Tunnel Enlarged

The old tunnel was enlarged to give a final section approximately 11 feet wide by 12 feet high. The new tunnel being driven beyond the end of the slabbing is of the same dimensions. Although rock in the tunnel generally stands well, it was necessary to stand a total of 430 feet of horseshoe shaped steel tunnel sets in the portal and through sections of bad ground. Thirty-six inch gage track is laid in the tunnel with a ditch along one side three feet wide by two feet deep. A six inch air line and a two inch water line are carried along the rib opposite the ditch, and a 24 inch diameter vent line is carried in the center above the tracks.

The original tunnel grade figured out to an average of slightly over three-quarters of one per cent. However there were some sections of much steeper grade, and it was necessary to establish a grade of 1.6 per cent in one section of several hundred feet in length. The new tunnel will be driven on a grade of three-quarters of one per cent for a few hundred feet until the Bonita Fault is intersected, beyond which

point a one-half of one per cent grade will be maintained.

#### Equipment Designed for Project

Much of the equipment used in the slabbing and driving of the American tunnel was especially designed and built for this project. Most of the equipment was so designed that it can be used in regular mining operations when the tunnel is completed. Drilling in the tunnel is handled by a three boom jumbo mounted on the chassis of an old crawler tractor. The jumbo is self-propelled by an air motor which replaced the diesel engine on the original machine. The jumbo is transported through finished sections of the tunnel on a low bed flat car, which is also used to transport the Eimco 630 crawler-mounted mucking machines used in the mucking cycle.

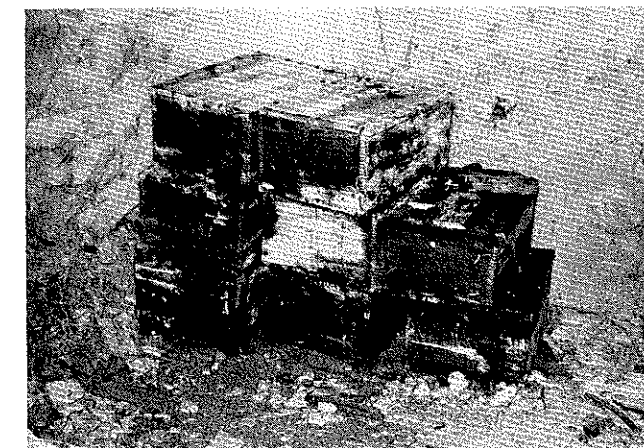
The muck train is made up of 200 cubic foot capacity Granby-type Card cars. The train is made up to operate as a slusher train with muck being loaded by the 630 loaders into the end car and slushed into the other cars. The heading is drilled so that an entire round can be handled by one train at the rate of approximately one car of muck per foot of advance. This arrangement has proved to be exceedingly satisfactory and permits a minimum of time on the mucking cycle.

#### Machines Mounted on Crawlers

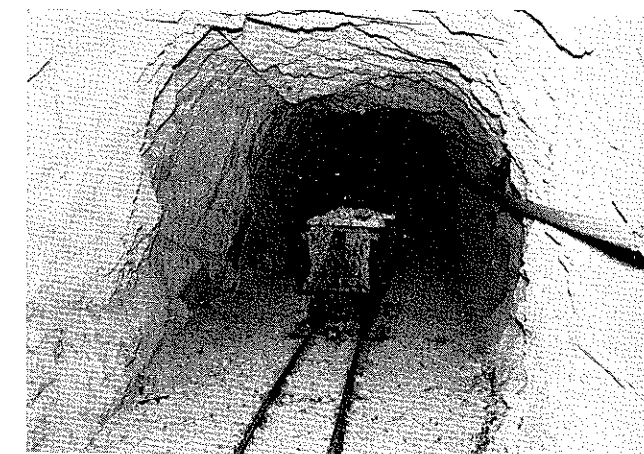
By having both the mucking machines and jumbos mounted on crawlers it is not necessary to have rail extended clear to the heading for each round. The work of extending rail and hanging air, water and vent pipe is carried out during the drilling cycle by a special service crew. The vent line is handled by a specially designed flat car mounting a converted hydraulic drill jib capable of picking up and raising a 20 foot joint of vent pipe.

The ditch is drilled and shot during the regular drilling and blasting cycles and is mucked during either the drilling or mucking cycles by a two man ditch crew. The ditch mucking machine consists of a regular production model of the Davis Backhoe mounted on a heavy flat car chassis. An electric motor drives the hydraulic pump which operates the backhoe. The backhoe discharges into low sided Granby-type cars capable of holding approximately five tons of muck. This equipment is extremely mobile and requires no setup time. It is possible for a two man crew to dig over 100 feet of ditch in a shift.

Although the daily footage of the American Tunnel is not too impressive by high-speed tunnel driving



▼ Old powder dated April 3, 1908, found in American Tunnel.



▼ Loaded cars left in old tunnel. Ditch was carried under the rails.

standards, the company is making excellent progress when measured in cubic yards of excavation per man shift of work. Likewise the cost per cubic yard excavated has been very low, due principally to the degree of mechanization achieved on this job.

#### Old Mill Being Renovated

The third phase of Standard Uranium Corp's program in San Juan County, Colo., is to provide facilities for the milling of ores from the Shenandoah-Dives, Sunnyside, and such independent mines as lack a market for their ore. This problem is being handled by a revamping and renovation of the old Shenandoah-Dives Mill located approximately two miles north of Silverton.

The bulk of the ore previously processed at this mill originated at the Shenandoah-Dives mine. Crushing facilities were located at the mine and the ore was delivered to the two mile long aerial tram which connected with the mill. Small and generally inadequate facilities were available at the mill for handling limited amounts of custom ore. As it will soon become necessary to handle large amounts of ore from the Sunnyside Mine, it was decided to enlarge the crushing and sampling facilities at the Shenandoah-Dives mill, and at the same time provide better facilities for Shenandoah-Dives ores and for custom shippers.

#### New Crushing and Sampling Plant

Work is now well advanced on a new crushing and sampling plant located at the mill. Ore from the Shenandoah-Dives mine will be crushed at the mine as was done formerly, and then transported to the mill for sampling and milling. Ore from the Sunnyside and from custom shippers will be delivered to existing bins at the mill and then reduced by two stage crushing to one inch size. All ores from the Shenandoah, Sunnyside, and custom shippers will then be sampled by standard sampling methods.

A copper circuit is being added to the mill to better handle the copper-bearing ores from the Silver Lake Unit, and from certain smaller mines in the area. The mill will thus produce three concentrates, copper, lead and zinc, and in some cases a fourth concentrate of rhodonite will be produced from an experimental circuit being added to handle some ores from the Sunnyside mine.

(Continued on page 46)

## METROGRAPHY—

# The Science Of Measurement

By FRED C. BOND, '22

Measurements began in that vast dim era of the evolution of human thought when man first began to count. Certain savage tribes had words only for one, two, and many. The perceptions require ages of sharpening before the significance of large numbers can be appreciated, and words are evolved only after it becomes apparent that the necessity of conveying information requires their usage.

### Counting Began With Fingers

There can be little doubt but that counting began with the fingers. Men carry with them constantly a ten-point abacus on the ends of their two hands, and our decimal system arose from our physiological structure. Men learned early to count days, people, and objects on their fingers.

After our ancestors had named each of the fundamental digits, the expansion of the counting system into twenties, hundreds, and thousands followed inevitably with the use of symbols. These symbols were notches cut in a stick, knots in a thread, or marks upon wood, stone, or leather, and they almost certainly preceded all other forms of writing.

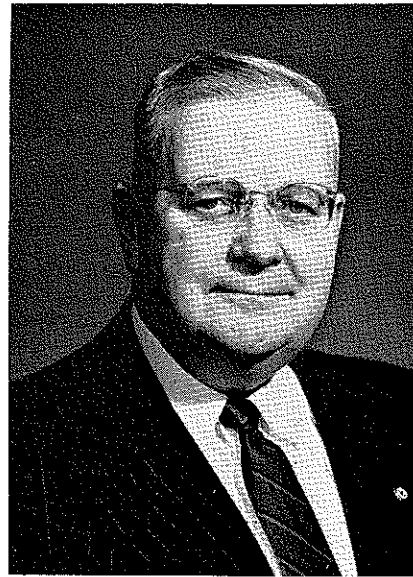
### Symbols Used by Romans

The development of the decimal system of units, tens, hundreds, etc. was not so spontaneous. The multitudinous transactions of the great Roman Empire did not have its benefit, and up until the sacking of Rome this world-ruling empire used the symbols of outstretched fingers for one, two, three, and four, with five representing the hand, or the V-form between the thumb and first finger, and ten was represented by the two hands, or the two crossed index fingers.

The word index is derived from the name for the first finger. The symbol for 50 was the thumb and forefinger held at a 90-degree angle, and in the symbol for 100 the forefinger was curved so that with the thumb it formed the letter C. The Romans tended to divide quantities into twelfths instead of tenths, and in consequence of this, and the fact that their numerals from one to ten did not consist of single characters, they never adopted a decimal system.

### Arabic Numerals Introduced

Our Arabic numerals and decimal system evolved either in Persia or India, and seem to be associated



FRED C. BOND

### THE AUTHOR

*Fred C. Bond, who received an E.M. degree in 1922 and a M.Sc. degree in 1926 from the Colorado School of Mines, is consulting engineer, Process Machinery Department, Allis-Chalmers Manufacturing Co.*

*An authority on the subject of grinding, crushing and mineral dressing, Mr. Bond originated the Third Theory of Comminution, has written about 50 technical papers, and was the recipient in 1952 of the Colorado School of Mines' Distinguished Achievement Award. He is a member of AIME (having served from 1948 to 1951 as chairman of the Committee on Comminution Research and as chairman from 1950 to 1951 of the Committee on Crushing and Grinding); American Chemical Society, CIMM, AAAS, Milwaukee Engineering Society, Astronomy Society of the Pacific, Milwaukee Astronomy Society, registered professional engineer in Wisconsin.*

*WHO'S WHO IN ENGINEERING presents the following additional information about his professional career:*

*Assayer and millman, New York and Honduras Rosario Mining Co., 1923-24; designer, Tennessee Copper Corp., 1929-30; director, Basic Industries Research Laboratory, Allis-Chalmers Manufacturing Co., 1930-47; in charge of construction of radium uranium concentration plant of Eldorado Gold Mines, Ltd., N.W. Territory, 1933-34; constructed gold flotation plant of Compania Minera, Nacional at Huachon, Peru, 1935-36.*

*Born June 10, 1899, in Golden, Colo., Mr. Bond was married to Miss Margaret Jean Lowe on Aug. 29, 1925, in Denver. The couple has two sons, Robert Franklin and Bruce Frederick. The family's home address is 1645 South 80th Street, West Allis, Wis.*

with the Sanskrit language. They were introduced into the western world by way of the Arabian peninsula, and the Crusades finally converted all of western Europe to their use. The Egyptians and the Chinese were among the first to use a decimal system.

However, in the western hemisphere this evolution took a different turn. The Inca Empire centered in Peru made its computations on a vigesimal system of 20 units, or scores, probably derived from the total

of 20 fingers and toes used for counting. It is interesting to speculate that a vigesimal system could arise only where the climate was sufficiently warm so that the toes were customarily exposed.

### Duo-decimal System Developed

The Aztec Empire in Mexico evolved a duo-decimal system with twelve units instead of the ten of Europe and Asia, such as the Romans might have developed if their numerals had consisted of single characters. From the mathematical standpoint the duo-decimal system has some advantages, since 12 is divisible by 6, 4, 3, and 2, while 10 is divisible only by 5 and 2. It is because of this relationship that a sort of pseudo duo-decimal system has evolved in historical times along with the decimal system, mostly from Roman beginnings. Products such as apples, oranges, and eggs are sold by the dozen because a half, quarter, third, or sixth of a dozen can be obtained in whole units. For the same fundamental reason our English system of measurements employs many variations of the duo-decimal idea. There are twelve inches in a foot, 24 hours in a day, four quarts in a gallon, and 360 degrees in a circle.

The Babylonians tended to think in terms of sixties, and our subdivisions of the circle, hour, and minute, go back to ancient Babylon.

### Science Is Measurement

It has been stated that "science is measurement," and "the business of science is to measure." If this is true, then the subject of metrography constitutes all of science, so that it would be well to examine more closely into the theory of measurements.

Measurements consist merely in the comparison of standards, and no measurements are absolutely exact. In addition, there are few commonly accepted invariable standards, so that science itself seems to rest upon the foundation of perceptual comparisons.

### Instruments Extend Perception

Scientific instruments are instruments for extending the range and accuracy of our sensual perceptions, and preserving accurate records of these manifested phenomena. The telescope, microscope, camera, thermometer, etc., are cases in point. The advances of science are based upon (1) extensions in the range of what we can perceive sensually, and (2) the integration of observations into a unified system of knowledge.

Science is essentially deductive in method, and tends to ignore all phenomena which fall outside the range of perceptual physical measurement. The field of science is continually expanding as more and more phenomena respond to measurement, but it must remain limited in scope. Any philosophy which is based entirely upon science must ignore the great unanswered questions of human existence, and must therefore remain unsatisfying and incomplete.

The so-called conflict between science and religion results from the encroachment of scientific measurements upon domains which the religionists formerly claimed as their own. As an instance, many men years ago worshipped the sun as a source of life and health. Increasing knowledge of the physical nature of the sun made this worship appear as a gross superstition, but recent scientific measurements of the health giving qualities of ultra-violet radiation have made the sun a scientific source of health rather than a religious one.

### Fundamental Quantities of Measurement

There are three fundamental quantities of measurement: mass, length, and time, commonly designated as m, l, and t. Possibly the oldest standard of measurement aside from the solar day, is that of length. A natural standard of length is the pace or yard, followed closely by the length of a man's foot.

However, the most common unit met with in ancient literature is the cubit. The usual value of the cubit is either 18 or 20.62 inches, variations of an inch or more existed between different countries in ancient times. The great pyramid of Egypt was constructed in cubits of 20.6 inches, and the Hebrew cubit was practically the same. The Assyrians, Sumerians, Babylonians, Chaldeans, and Persians all measured length in cubits which were approximately equal. The basis for the existence of this fundamental unit is the distance from the point of the elbow to the extended middle finger.

### Ancient Units of Measurement

Other common units of ancient measurement were: the digit or thickness of a finger, which equaled approximately  $\frac{3}{4}$  inch; the hand of four inches, the hand span of nine inches between the extended thumb and little finger, and the fathom of six feet by which rope was measured between the extended hands. The inch is the width of a thumb; the Spanish word for thumb is "pulgar" and the inch is a "pulgada."

Our common unit is the English foot, or the length of the foot of King John I. Many foot measurements of other sizes, both smaller and greater than our own, existed in ancient times, and to this day the shorter Spanish foot is in common use in Latin America in places where it has not been supplanted by the meter. Thus, a yard, or "vara" south of the border, of three Spanish feet is equal to 33 English inches, and purchasers of cloth in Latin America must constantly keep in mind the difference between the Spanish and English yard.

The yard was two cubits of 18 inches, or an ell, which was a turn of cloth or rope between the thumb and elbow. It was also the length of the Anglo-Saxon girdle, showing that these people may not have been as plump as they are depicted on Christmas cards.

The mile derives from the Latin word for thousand. The Roman passus, or pace, was the distance between successive contacts of the same foot, and the marching legions of the Caesars paced off miles of one thousand double paces and set up milestones all over western Europe. The Roman mile was 5000 of our English feet.

The rod was  $5\frac{1}{2}$  yards, and was measured by 16 men touching toe to heel. The acre was the area a plowman with one ox could plow between sunrise and sunset, which was defined as a strip 40 rods (or one furlong) long by 4 rods wide. Queen Elizabeth defined the English mile as equal to 8 furlongs, or 5280 English feet.

### Ancient Units of Weight

The ancient units of weight seem to have a more common basis, since comparisons in many countries were made by measuring the weight of articles on primitive beam balances against the commonly available but inexact measure of a grain of wheat. Our English system of weights is based upon the ancient Egyptian grain of wheat; the present avoirdupois English pound was defined early in the 14th century

as equaling 7000 grains. The Roman libra was considerably smaller, consisting of slightly more than 5000 grains.

The City of Troyes in France devoted since the time of the Phoenician traders to working in jewelry and precious metals, adopted an ancient system of measurements. This survives in our Troy measurements which are legal in English speaking countries for jewels and precious metals. In the Troy system 24 Egyptian grains equal one pennyweight, which is half the weight of our modern pennies. Twenty pennyweights equal one Troy ounce, and 12 Troy ounces constitute one Troy pound, as compared with 16 avoirdupois ounces in one avoirdupois pound. Thus a pound Troy equals 5760 grains and is smaller than an avoirdupois pound, while the Troy ounce is larger than an avoirdupois ounce. The apothecary's pound and ounce are the same as the Troy, but 20 grains equal one scruple, 3 scruples equal one dram, and an ounce contains eight drams.

The avoirdupois ton is 20 hundred weight, or 2000 pounds. In order to curry favor with the buying populace, Queen Elizabeth decreed that the hundred weight should be increased by 12 pounds, and our long ton of 2240 pounds survives as a result. Our modern Kip is 1000 pounds (or Kilo-pound).

#### Coinage Based on Grain Standard

Ancient coins constituted secondary units of weight or mass. The shekel in various countries was about 120 grains, and the coinage of all ancient countries was based upon the grain standard. The English pound sterling is 7000 grains of silver, 925 fine, and the French and Belgian francs and the Italian lira were originally of the same value, until debased by the inflation following the Napoleonic wars, and further decreased in value by successive wars. The monetary cost of making war is largely paid for by this debasement in the value of money.

The ancient Greeks, probably on the Island of Cyprus, were the first to coin money; and they invented the practice of milling, or grooving, the edges, so that any clipping or paring would be apparent.

Our U. S. dollar was made equivalent to the old Spanish dollar, derived from the Dutch thaler; and the first dollars minted in 1794 showed two columns encircled by a ribbon. Our dollar sign derives from this old coin.

Gold powder was measured in quills, or the amount contained in a goose quill, and later quills were weighed against carats, or the small Arabian Karob bean. This was formerly equal to 4 grains, but is now 3.086 grains.

#### Units of Capacity

The units of capacity are based upon similar arbitrary standards. The various gold and silver measuring cups of the ancients, the great hogheads of wine or tuns, from which our modern ton is derived, and the present arbitrary pints, quarts, and gallons of the English system, are alike derived from merely arbitrary standards.

In America we still use the old English wine gallon or Queen Ann gallon of 231 cubic inches, and containing  $8\frac{1}{3}$  pounds of water, while in the England of 1824 this was superseded by the more logical imperial gallon which contains precisely ten pounds of water. These two conflicting gallon measurements have resulted in a multitude of confusions, and the Canadians now speak of our unit of capacity some-

what derisively as the 3-quart gallon, although it is actually  $\frac{5}{6}$  of the Imperial gallon.

#### Temperature Measurements

Temperature measurements are also arbitrary. In 1714 Professor Fahrenheit laid an arbitrary scale alongside a narrow column of mercury in a vacuum, and marked thereon the coldest day of winter at zero degrees, with 32 as the freezing point and 212 as the boiling point of water.

This scale was improved in 1742 when Celsius substituted the centigrade, or Celsius, system with zero as the freezing point and 100 as the boiling point of water, and was still further improved by marking minus 273.16 on the centigrade scale as zero degrees absolute on the Kelvin scale. However, these temperature measurements still expressed nothing more than the relative expansion of mercury, or of a perfect gas, and are only indirectly related to the energy content, or energy level, of matter.

#### Measurement of Time

The measurement of time alone among the three fundamental quantities rests upon a natural basic standard, the mean solar day. The day was early divided into 12 hours of daylight and 12 hours of dark, and ancient sundials were universally constructed on this basis. In later times the hour was divided into 60 minutes and the minutes into 60 seconds. In modern science we commonly deal with the unit of the micro-second or millionth of a second, in expressions dealing with the velocity of light.

The year controlled the important recurrence of the seasons, and most ancient people knew that there were 365, or slightly more, days in a year. The apocryphal Bible book of "Enoch" deals with this in detail, and is a very interesting study.

The cyclic waxing and waning of the moon constituted the ancient month, and was of such importance to the nomadic night roaming hunters that many of their records were accounted in new moons rather than in years. Indeed, something of the habits of a people can be determined from their method of computing time, since pastoral peoples dealt with days, seasons, and years, while hunters preferred the moon system. The seven day week represented each of the four phases of the moon.

The synodical month, or moon, is 29.53 days, and there are twelve moon months in a tropical year, with an excess of slightly more than eleven days. This eleven day disconformity caused endless trouble to the ancient astronomers, and was eventually adjusted by extending our months to 30 and 31 days.

#### Four Yearly Markers of Seasons

The four yearly markers of the seasons are the vernal and autumnal equinox, and the winter and summer solstices. The natural beginning of the year should be measured from one of these four markers, and the equinoxes are still used in some systems such as the Jewish New Year.

In the ancient world the year began with the spring equinox on March 21, and our present system of numbering the twelve months of the year dates from this beginning; thus September means seventh month, October eighth, November ninth, and December tenth. Babylonian astrologers and soothsayers divided the yearly cycle into quadrants and months on this basis, as shown in the first chapter of "Ezekial."

Julius Caesar codified the year by making it equal to exactly  $365\frac{1}{4}$  days by adding an extra day

to each recurring fourth February. However, this was still not sufficiently correct, since the sidereal year contains 365.2422 mean solar days. And in 1582 Pope Gregory made a further correction which is still in use. He restored the ancient seasons of the holidays by adding ten days to the calendar date, and causing the equinoxes to fall on the 21st day of March and September. When this change took place the cry arose among the more ignorant people of Europe that the Pope was stealing ten days from everyone's life, but the reform went through nevertheless, and was even adopted in Soviet Russia in 1927, at which time thirteen days were added. The principal change was that one leap year was to be omitted every century, thus bringing the sidereal year more in line with its actual value. At this time celestial mathematics in the new world was far ahead of its European counterpart, and the Mayan chronology could be extended for many thousands of years with far less cumulative error than the European.

Our present New Year has absolutely no astronomical significance, as it would have if the year began on the ancient date of March 21st.

#### Calendar Reforms Proposed

Several calendar reforms have been proposed; one, the world calendar, has been endorsed by 14 governments and proposed to the United Nations. Any such change should cause as little dislocation in our daily lives as possible, and it seems the following principles should be adhered to:

- (1) Retain the present 12 month year.
- (2) The date of New Year might be changed to the winter solstice on December 21st without any serious difficulty, to coincide with the astronomical year.
- (3) Make each quarter except the last of the same length. Each quarter would contain one month of 31 days and two of 30 days.
- (4) An additional day would be added to the last month of the year, and a second day on leap year, these days being holidays.
- (5) Divide the other holidays evenly between the four quarters.
- (6) Start each quarter with Sunday and end it with Saturday, so that the relationship between the days of the week and days of the month would be regular.

At present exact second impulses, based on equinoctial time, or the tropical year, are sent out over short wave at exactly 2.5, 5, 10, 15, and 20 megacycles from the Naval Observatory Station WWV in Washington, D. C. These are corrected every 24 hours by the measured transit of a star across the meridian. Our measurement of time is thus very exact and clearly exceeds that of the other fundamental standards.

#### Velocity of Light Measured

The exact measurement of the velocity of light on the earth's surface is determined as  $2.998 \times 10^{10}$  cm. per second, 186,280 miles per second, or 984 feet per micro-second. This measurement furnishes the basis for our radio and television circuits. The measured velocity of light on the earth's surface is one of our most fundamental and invariable units. The reason for this limiting maximum velocity is still a great mystery, which will only be solved with a great advance in our knowledge of the structure of the universe.

In celestial mechanics it is assumed that this same velocity is constant throughout all space, and that light impulses travel in geometrically straight lines throughout space. These assumptions may be questioned, in spite of the Kepler Third Law relationship, but when they are granted, the whole Copernican system of infinite space, with stars as much as one billion light years from the earth, comes into being, with its attendant sense of the infinitesimal physical importance of man.

#### Metric System Devised

The French people have a gift for logic and mathematics. In 1790, soon after the French Revolution, a commission was appointed to establish logical units of weights and measurements, to be based either upon the length of the second's pendulum at sea level, or the length of the earth's quadrant passing through Paris. The quadrant system was chosen, and the metric system was adopted in France at the close of the 18th century. The fundamental unit, the meter, was to be one ten-millionth of the distance from the earth's equator to its pole, equal to 39.37 English inches. Prototypes of this length were made and preserved in the archives of Paris, and distributed to other countries. Because of inaccuracies in the early terrestrial measurements, the prototype has now become the metric standard. The old unit of time, the second, was preserved in the metric system, but a new unit of mass, the gram, was chosen as the mass of one cubic centimeter of water. In this case also prototypes of mass were made, and because of early inaccuracies of measurement the prototype gram is now the standard of mass which differs slightly from the mass of one cubic centimeter of water at its greatest density. Attempts to extend the metric system by establishing a ten day week were unsuccessful.

The metric system is entirely decimal, and hence much more logical to a civilization using a decimal system of notation, than the odd numbers with the continual recurrence of 12 and its multiples which persist in the English system. The metric system is now the legal system in the Soviet Union and is in common use in Europe and Latin America. It enjoys an equal legal status with the English system in the United States. When I was in college 40 years ago it was freely predicted that the metric system would replace the English within a few years. However, as far as I can see now the relative status of the two systems is just about the same as it was 40 years ago. Mankind has an immense inertia in the adoption of new standards, and we persist with our more difficult measurements and notations simply because when once learned they are more familiar than the newer method. The transition period of changing from the old to the new would be a time of great difficulty for industrial countries.

#### Units of New Quantities

We have dwelt at considerable length upon the development of the present standards of weights and measures, and have shown that they are essentially arbitrary and unrelated. However, the universe is a unit, a complex of many turned into one, as the word implies, and the advances of science result from the synthesis and unification of quantities that were formerly thought to be entirely separate and distinct. As the need arose, units of new quantities appeared in multitudinous succession. The horsepower of 550 foot-pounds per second was arrived at from tests with

heavy draft animals in France, and a man-power was set at 90 foot-pounds per second. The whole electrical system of volts, amperes, coulombs, and watts, with units bearing the names of their inventors, developed as soon as these quantities were made apparent. Such concepts as velocity, acceleration, momentum, force, power, work, or energy, and capping the long list, action, were given names, values, and symbols.

One of the greatest of these relationships between different quantities was revealed by Einstein in 1905 with the simple equation  $E=mc^2$ . Energy and mass are thus seen to be but different forms of the same fundamental of existence, united by that basic but very puzzling quantity ( $c$ ), the velocity of light.

#### Manifestations of Existence

In actuality, time, space, matter, and energy cannot be conceived of as existing separately. We measure space by the time required to traverse it, the fundamental measure being the velocity of light. We measure time by the motions in space of the celestial bodies, or of a swinging pendulum. Matter or mass, and energy are but different manifestations or conditions of the fundamental unit of existence.

It now appears that the most basic phenomenon of existence is vibration, and that in all our measurements we are dealing only with differences in relative frequencies. Planck's quantum hypothesis advanced in 1903 has opened up possibilities of a new world of integrated understanding whose extent is only barely realized as yet. The fundamental frequency may be a single quantum of action, one vibration cycle of one electron, and we may have here the key to the eventual unification of our entire heterogeneous system.

#### Single Set of Standards Advocated

Because of the almost universal adoption of the convenient Arabic decimal system of notation, the language of Arabic numbers is much more widespread than any language of the spoken or written word. There can be no doubt that the adoption of a single set of standards in all civilized countries would result in increased efficiency. The metric system is the leading candidate for universal adoption, and we should realize that in furthering its adoption we are doing something concrete in promoting mutual understanding and tolerance between different countries. The cumbersome fractions of an inch in which all of our design work is done constitute a considerable obstacle to world trade and mutual understanding.

We are only now becoming aware of the interrelationship existing between the fundamental quantities of length, mass, and time. If this interrelationship could be embodied in our system of measurements in such a manner that it is immediately apparent to everyone using these units, a great barrier would be removed from a general understanding of the basic relationships of science.

#### STANDARD URANIUM'S DEVELOPMENTS

(Continued from page 41)

##### Service Facilities Transferred

Service facilities for all of Standard's San Juan County operations have been transferred from various points to a new central location at the old Western Colorado Power Co. sub-station. This facility, located between the town of Silverton and the Shenandoah-Dives mill is of ample size to accommodate a variety of services. These include the company's general offices for the Silverton operations, a central

warehouse, and carpenter and electrical shops. In addition the company assay laboratory has been re-established at this location and will handle assaying from the mill and the company's mines in the district.

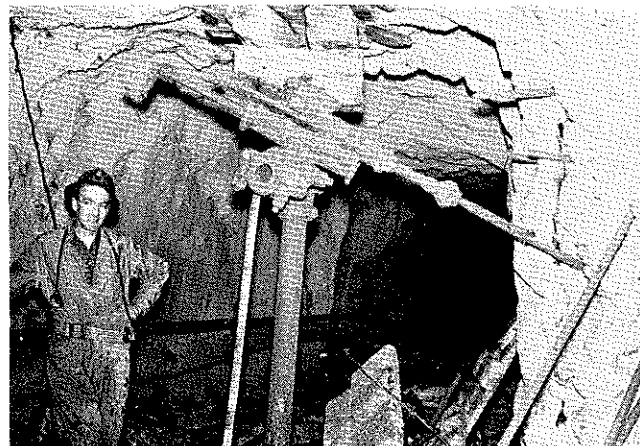
##### Salable Manganese By-Product

The final phase of Standard's program for San Juan County, Colo., is the development of methods and facilities to convert the rhodonite gangue of the Sunnyside mine to a salable manganese by-product.

The most common gangue mineral found with the Sunnyside ores consists of manganese silicate in the form of rhodonite, a very refractory manganese mineral. The amount of manganese present in the ore varies inversely with the amount of sulphides. For example, in the comparatively high grade sulphide ores found around the fringes of an ore body, there may be only 5 per cent manganese, whereas in the center of the ore body, as the percentage of sulphides decreases the percentage of manganese may increase to as high as 30 per cent. The total amount of manganese present in the district in the form of manganese silicate is tremendous, and has been estimated to be as high as 150 million tons of 20 per cent manganese ore.

##### Converting Rhodonite to Manganese

The program of converting this rhodonite to a salable manganese product can be divided into two general steps; first, the concentration by flotation or magnetic separation, or both, to a suitable rhodonite concentrate of 30-35 per cent manganese; and secondly, the conversion of this rhodonite concentrate to



▼ Old drifter (Burleigh drill) found set up in tunnel. Frank Siegfried, '49, Sunnyside superintendent, on left.

silico manganese, ferro manganese, or other manganese products. The latter step is generally accomplished by electric furnacing.

Considerable research has been in progress for the past 10 to 15 years on the problems of converting a rhodonite ore to a manganese product. This research, augmented with the work done by Standard Uranium Corp. in the past year, indicates that production of silico manganese or ferro manganese is economically possible under present conditions. Standard is presently engaged in additional research projects intended to provide further information prior to construction of plant facilities for production of manganese. It is estimated that it will be approximately two to three years before appreciable amounts of higher grade rhodonite will be produced from the Sunnyside mine, and the present plans call for having facilities available to handle the rhodonite produced from these ores at such time as it becomes available in large quantities.

# Mining Engineering Education \*

By JOHN MOSS JONES

Since Russia raised eyebrows with its Sputnik in 1957, the complacency of the United States has been shaken and attention has been focused on the supreme need for excellent education in this country. To lose the education race is to lose all, Admiral Rickover has emphasized. Thus everyone from senators to janitors has hacked around at the general topics of what is wrong with our education system, and what is wrong with our teachers.

#### Something Must Be Done

Most agree that something must be done—but what? Sometimes it seems our advisors advocate “change,” per se; to paraphrase Lewis Carol: “Off with his head,” shouted the Queen; “but what has he done,” cried Alice. “We’ll find that out later,” said the Queen. Mining education has also been caught in this head chopping, and is particularly vulnerable because mining forms but a small part of the engineering profession. Let’s outline in an objective fashion some of the points being widely aired in mining education today.

Any engineering curriculum can be broken into the following areas:

1. Basic sciences
2. Communications
3. Humanities and social studies
4. Engineering

Most of the criticisms of mining schedules can be summed up: too much engineering, insufficient basics, communications, humanities and social sciences. In passing we should note that the ratio of scientists and experts in communications, humanities and the social sciences, to engineers, is hundreds to one.

#### Clarification of Terms

“Scientists make it known, but engineers make it work” is the statement that we all should as engineers have before us daily. There is much misconception as to the difference between engineers and scientists and clarification of this issue is necessary before we proceed further. Part of the confusion is due to the spectrum which exists forming a continuous gradation from the theoretical sciences on the one hand, through applied sciences, nuclear engineering, aerodynamic and mechanical design, to highway and con-

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



JOHN MOSS JONES

#### THE AUTHOR

John Moss Jones, an instructor in the Department of Mining at the Colorado School of Mines, graduated in 1955 with a First Class Honors Degree in Mining from the University of Wales. In 1957 he received a Master's Degree in Mineral Economics from Pennsylvania State University. He is currently working toward a Ph.D. in Mining.

Mr. Jones was employed for five years by the National Coal Board in the United Kingdom, during which time he received a Mine Manager's Certificate. For the past two years he has been ventilation consultant at the Climax mine of American Metal Climax, Inc.

Courses taught by Mr. Jones at Mines include Introduction to Mining, Mine Industrial Engineering, Statistical Analysis, Penetration and Fragmentation, Mine Administration, Mine Ventilation and Air Conditioning, and Advanced Air Conditioning.

struction engineering at the other extreme.

There is no clear-cut point in this spectrum which delineates the respective fields of the engineer and the scientist in fact, engineers act as scientists and vice versa in some applications. Both these professions are beset with problems of mathematics, physics and chemistry: wave forms, strengths and principles of failure of materials, motions of units; but the main interest, reason for attacking the problem, and perhaps modus operandi, of the scientist is different from that of the engineer. The pure scientist seeks the reason for the phenomena he sees, he is driven by an unextinguishable “why.” The engineer also looks for answers, but he is not as concerned with investigating phenomena, as with utilizing these natural properties.

#### Emphasis on Fundamental Research

E. S. Hiscock's writing in the March 13, 1959, edition of *Science Magazine* on the organization of science in the United Kingdom states, “A great—perhaps too great—proportion of our scientific effort is devoted to fundamental research. This is due to many causes, one of which is the educational system which tends in science to produce rather narrow specialists. Our social structure is such that attainment in pure science appears to attract greater social status than attainment in technology. We revere our eggheads.”

A second area, similarly befogged is in defining "basic science." Since this area is currently in vogue it is good strategy to declare your particular topic to be absolutely basic. We must not be talked into believing that 100 per cent of any subject is all basic. For instance, all of physics is basic to a physicist but what a stretch of the imagination is required to make theories concerning transformation of mass and energy "basic" to the mining engineer. Careful consideration must therefore be given to the subject matter of the so-called basic sciences to ensure they do in fact lay groundwork for the engineering subjects to follow.

#### Area of Communications

The area of communications includes languages, mathematics, and graphics. After speaking, writing, hearing and reading his native language for eighteen or more years, it might be concluded that the entering freshman should be well able to communicate in English. Unfortunately, this is far from the fact; the Colorado School of Mines devotes over 7 per cent of its schedule to improving the style and grammar of its students' language. Is this a subject which should be handled more adequately by our high schools?

Our critics frequently snipe at engineering graphics and descriptive geometry and it is possible that these will be reduced in future engineering curricula, yet it is difficult to imagine a mining engineer without an appreciation for three dimensional problems, and an ability to understand plans and blueprints.

Mathematics is being expanded in engineering education and, to handle the increasingly complex problems, is justified. Unfortunately, like all languages, mathematics is easy to forget if not used daily, and most mining problems involve ill-defined parameters that do not require advanced mathematical treatment, and so mining engineers soon lose their mathematical skills. How far should a study of mathematics in college be taken beyond the level of probable use by the graduate?

#### Humanities—Social Studies

The engineer is surrounded by forces other than those defined in physics: conservation laws, labor bills, human relations, may influence the price of the job, or the product, and the profit margin. Promotion traditionally carries the engineer into management ranks. The ability to organize, plan, control, handle people, becomes an essential attribute. What happens today is influenced by happenings of yesterday, last year, and a hundred years ago and an appreciation of history, particularly the impacts of new thought on the development of our civilization is important.

Ours is a private enterprise economy in which money and profit play vital roles, and yet few people have a good understanding of the workings of money, of the developing markets abroad, of foreign competition. Thus such subjects as history and economics, to name but two of the humanities-social studies group, become vital parts of an engineering education.

#### Engineering Curriculum Analyzed

Considering that engineering has been the forte of the United States for generations, and that engineering productivity, in terms of tons per manshift of minerals, agricultural produce, highways laid down, machinery constructed, in the U.S., is by far the highest in the world, in spite of education deficiencies, we must exercise great care in our analysis of the amount and nature of engineering required in

an engineering curriculum. In passing, we might note that certain weaknesses in diplomacy, economics and scientific research, have in fact been more prominent than engineering failings.

Like everything else, mining has changed in the last decades and will change in the future, but it is probably changing more slowly than other fields. Over the world in total the vastly expanding population plus the rising standards of living will require tremendous increases in mineral extraction. The deposits will deteriorate in worth per ton, will be mined at increasing depths, and will create problems of ground control, air-conditioning, and materials handling that we are only touching on today.

In the United States the metals from underground mines may diminish tonnage-wise and the emphasis will be on coal and the industrial minerals such as limestone, potash, gypsum. A very high percentage of the mineral production will be mined using room and pillar, block caving, and surface operations; the classic stoping methods contributing a minutely small percentage of the products. We must be careful that mining engineering in universities is viewed in the light of both these economic changes, and the most current technological knowledge.

#### Mechanics of Materials

The most obvious field of special study for the mining engineer is the mechanics of materials, and specifically rock and soil mechanics. We must understand how materials fail under various stress conditions—slowly applied loads as in pillar failure, and impulsive stresses as in drilling and blasting. Two of the specific problems concerning rock mechanics to which the mining engineer might direct attention are the design of protective underground installations, and the understanding of ground movement in very deep mining.

If all the competing factions were allowed to broaden or deepen the mining curriculum, it would require ten years to obtain an initial degree. We can be reasonably sure of what to add, but what can be deleted? The exponents of whatever subject is discussed for deletion indignantly protest the utter necessity of their specific field. Descriptive portions of all subjects must be viewed for possible erasure; in particular some aspects of geology, chemistry and mining itself must go.

#### CSM Mining Engineering Department

The mining engineering department of the Colorado School of Mines is adopting the following breakdown:

Basic Sciences	27 per cent
Communications	23 per cent
Humanities & Social Sciences	14 per cent
Engineering	36 per cent

The mining department is introducing courses in rock mechanics, statistical analysis, and industrial engineering, and combining other courses to eliminate some descriptive aspects of stoping and mine development.

We must be constantly wary of the trap of changing curricula to include what we think OUGHT to be necessary for the mining engineer, instead of including what IS necessary. It is vital that our students learn how to analyze, learn the principal engineering concepts, and above all learn to communicate well. A school must not fall to the temptation of relying on its past history—no matter how creditable, but must continually be aware of this changing world of engineering, and using sense and good judgment, must change with it.

## The Energy Gap And Atomic Power

By DR. LAUGHLIN M. CURRIE

Following the First Geneva Conference on the Peaceful Uses of the Atom, an OEEC study group, under the direction of Sir Harold Hartley, issued in May of 1956 a report, "Study of Europe's Growing Needs of Energy—How Can They Be Met?" Similar studies in the United States and elsewhere over the world indicated that world demands for energy would soon outrace the rate of production and transportation of fossil fuels and that additional sources of energy would be required.

Following issuance of this report, a major program for production of atomic energy was initiated in Great Britain, and other major study programs started in Europe, Japan, and the United States. This was the situation in the fall of 1956 when the Suez crisis arose. This crisis gave emphasis to "the energy gap." THE LONDON ECONOMIST (2/6/60) stated, "No economic concept can have played a more important role in the politics of Western Europe than 'the energy gap' did in 1955-1957." It toppled Sir Anthony Eden from the Prime Minister's seat. In his recent autobiography Sir Anthony wrote, "I told the Russians that the uninterrupted supply of oil was literally vital to our (the British) economy . . . we would fight for it." The irony of the situation is that Britain did fight for it—and cut off her oil. Wars or near wars broke out all around Israel and the Suez Canal.

The energy gap was at the core of French policy in its vast efforts to regain great power status by obtaining Sahara oil.

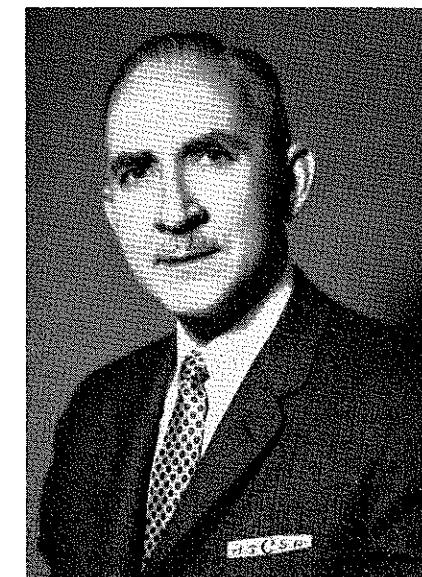
West Germany got off cheaply—if not without pain—for its appreciation of the energy gap resulted in long-term contracts for American coal which arrived neatly in time to undercut marginal mines in Germany and Belgium.

#### Results of Energy Gap

The energy gap, therefore, may be reckoned as having started two shooting wars, prolonged another, and caused economic crises over much of the world.

Personally, I believe that the current glut of fossil fuels represents a temporary situation, both here and abroad. Because of Britain's current prosperity and

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DR. LAUGHLIN M. CURRIE

wealth in foreign exchange, much of her current surplus of coal is due to her own decision to replace coal with oil.

Similarly, current prosperity in Germany, France, and Italy, coupled with two mild winters and some minor recessions, have resulted in fuel surpluses that, to me, seem but temporary.

In Scandinavia, Switzerland, Spain, Holland, and Japan fossil fuels are in short supply and much of the available and economic hydroelectric power is already developed. This is true even in certain areas of the United States. In the state of Oregon steam-electric power is being developed.

I will admit that there is *now* no real energy gap in most of the world if you will admit that there has been one and may be another. The question is—when? Answers to this query depend upon the country or countries involved. In countries depending upon foreign exchange for most of their fuels, the energy gap can develop almost overnight whenever the balance of trade remains adverse for a short time. In other countries the energy gap develops whenever indigenous supplies of energy plus foreign exchange are insufficient to meet total requirements for energy.

In our own country this condition is not likely to arise in the near future, so our questions divide into:

1. Can we drill or mine for sufficient fuel?
2. Can we transport that much fuel?
3. Is it sufficiently cheap?

#### Fuel Reserves

The United States has enormous reserves of fossil fuel. We are consuming enormous and increasing quantities each year. In the last three 10-year periods starting with 1930, the total kilowatt hours in the United States have increased 55-133-114 per cent over the preceding decade. Consumption in 1960 is estimated as almost eight times that of 1930, roughly doubling in each decade.

The over-all picture for total energy consumption is similar. U.S. coal mined in 30 years has decreased 5 per cent; oil, up 200 per cent; and natural gas 500 per cent. Over the same 30 years, U.S. population has increased but 45 per cent. Hydroelectric power cannot keep pace. My purpose in giving these figures is to point out that not only is the U.S. in-

## THE AUTHOR

Dr. Laughlin M. Currie was elected a vice president of Babcock & Wilcox Co., and placed in charge of its Atomic Energy Division in 1958. He was elected a member of Babcock & Wilcox's board of directors in 1959.

Dr. Currie began his association with the American atomic energy program in 1943 when he was selected associate director of War Research for the Manhattan District atom bomb project. Following World War II, he was a technical observer at "Operations Crossroads," during the Bikini atomic tests.

Distinguished abroad as well as in the United States for his activities in the nuclear energy field, Dr. Currie attended the first "Atoms for Peace" conference in Geneva, Switzerland, in 1955 as a member of both the U. S. delegation and the U. N. Secretariat. A year later, he attended the Calder Hall Symposium in London, England, as consultant, and in 1958 was an observer at the second Geneva conference on the peaceful uses of the atom.

Dr. Currie retired as vice president of the Union Carbide Nuclear Co., a division of Union Carbide Corp., to accept his B&W post. He joined Union Carbide Corp. in 1925 as a research chemist for National Carbon Co. in Cleveland, later becoming superintendent of the Edgewater Works there. He has served as director of the Vinylite Division in Cleveland, su-

creasing in population, but increasing in per capita utilization of energy. One of these increase curves is exponential. The other may be so great that enormous total demands for energy in the United States are predicted for the near future.

Now populations of few countries are increasing (percentage-wise) as fast as the U.S.A., but most countries currently have such low per capita utilization of energy that percentage increases could be fantastic. For example, the principal source of energy in India is still animal—and many men there are still just animals—and their per capita use of electricity is only 30 kilowatt hours per year; in the U.S.A. it is 4050; and in Japan, 870. If India's per capita consumption were even up to Japan, India would require more new electrical generating capacity than is now operating in all of the U.S.S.R., plus France, plus East Germany, plus West Germany.

An energy gap has existed. I believe it can occur again. When, I don't know.

### Fuel Transportation

The second point was to question if the increased demands for fossil fuels can be transported. This will be hard to answer until our markets can better be located. It is, I believe, significant that increasing quantities of fossil fuels are being piped or water borne, and wherever possible users of fossil fuels are locating near their sources.

Power lines at very high voltages (500,000 volts or higher) are becoming increasingly popular in an effort to cut down transmission losses and increase the areas served by centralized power stations.

### Total Cost of Fuels

Finally, we must face questions of total cost of fossil fuels delivered to the point of consumption. Increased efficiency of steam-electric plants is approaching an asymptote—getting nearer to the theoretical—so further improvements cannot be predicted at the present rate. Costs of fossil fuels per kilowatt hour are almost certain to increase. The question is how fast?

perintendent of the plant of Bakelite Co. at Bound Brook, acting director of research for National Carbon laboratories, and in 1945, as vice president in charge of research. He became a vice president of Union Carbide Nuclear Co. in 1955.

He is a member of the Nuclear Energy Committee of the U. S. Chamber of Commerce, chairman of the Nuclear Energy Committee of the National Association of Manufacturers, and past chairman of the New York State Atomic Energy Advisory Committee. Dr. Currie is also a member of the American Chemical Society, American Institute of Chemical Engineers, Society of Chemical Industry, Atomic Industrial Forum, American Nuclear Society, The Chemist's Club, Tuxedo Club, Larchmont Yacht Club, Phi Gamma Delta Club, University Club of Mamaroneck and Sigma Xi.

Born in Chapel Hill, N. C., in 1898, he was graduated from Davidson College with a B.A. degree in 1918. Dr. Currie later attended Cornell University, where he received a graduate scholarship in 1923, a Sage Fellowship in 1924, and a Ph.D. in 1925. He was awarded honorary degrees of Doctor of Science from Clarkson College of Technology in 1950 and from Davidson College in 1951.

Dr. Currie lives in Mamaroneck, N. Y. He is married to the former Ethel Snyder Jopp of Niagara Falls, N. Y. They have two daughters, Helen Catherine and Christian MacLurin Currie.

These three factors for fossil fuels—availability, transportation, and total cost—determine when other answers may be needed to the question of the energy gap. Atomic energy—initially fission energy—may be one answer.

This brings us to consideration of where nuclear energy can stand in the picture of world-wide demands for energy. Let us early clear up some general questions about fission energy.

### Uranium Reserves Enormous

First of all, there are enormous quantities of uranium already available or in conservatively estimated reserves. The world's recoverable reserves of fossil fuels (coal, oil, shale, gas) are estimated as equivalent to 2,000,000,000,000 ( $2 \times 10^{12}$ ) tons of coal. For comparison, total recoverable uranium plus thorium is estimated as equivalent to 30 times this total. So we are not going to run out of energy fuels for some time. The questions are—*who* is going to have them? And at *what cost*?

In my talk here in Denver in 1956, I quoted a NEWSWEEK statement that the AEC was "mounting a new attack on one of the big road blocks to the age of the commercial atom: the cost barrier." At that time I stated very emphatically that "there is as yet no 7 mill power from atomic plants." This statement still holds true in 1960.

### Nuclear Power Coming

But competitive nuclear power is coming. You all remember the famous slogan that bedeviled the Hoover administration, "Prosperity is just around the corner." It took a long time to find the corner. I have no license in the practice of predicting, so I shall be careful in so doing. There are certainly more prophets than there are profits in the nuclear business today.

You ask why U. S. and foreign industries want to, and try to, participate in the atomic energy business. First of all, it is hope for ultimate profits. Let's be

frank, it is not *sinful* to make an honest profit. In the atomic energy business it is *just difficult*.

U. S. and foreign industries recognize the increasing demands for fossil fuels, the probably limited known reserves, and the almost certain increase in their costs. No industrial leader wants to be caught short if nuclear energy is a sure thing as a commercial source. There are by-product advantages other than military that must not be overlooked. There are special advantages and interests to forward-looking companies like Babcock and Wilcox, GE, Westinghouse, etc., who are already in the business of producing steam or electrical power units.

Actually, U. S. industry has had an industrial opportunity in atomic energy only since the Atomic Energy Act of 1954. It is true that commercial developments in atomic energy have fallen far short of hopes and expectations. The U. S. atomic power program has just barely gotten started. The U. S.-Euratom program of 1958, 1959, 1960 has been an almost complete failure, and the outlook for 1960 and 1961, and possibly 1962, is a bit bleak. But some real progress has been made, and by the end of 1961 three large U. S. nuclear power plants will be capable of producing more than 500,000 kilowatts. These three plants will be the "bell weathers."

### Why Industry Is Interested

With progress so disappointingly slow, why does U. S. industry stay in the business?

Again let us be frank. The atomic energy industry in the United States has made large investments in this business. They still retain a certain degree of optimism varying in degree and timing, and basically the majority of the industry believes that since they are already in the nuclear business, they have more to lose by leaving than by staying in it.

Although the atom program has not resulted in building as many reactors as the AEC, European firms, and the U. S. industrial corporations had anticipated, it is true that certain designs protected by patents and certain proprietary information (particularly in the engineering design of reactors) have been sold to European organizations. This means that these organizations have chosen to buy U. S. know-how and do their construction in their own countries. A specific instance of this is found in a recent announcement in a New York newspaper that the Babcock and Wilcox Co. has signed an agreement with a large Italian shipbuilding organization for cooperation in furnishing information and know-how to the Italian organization. The agreement permits building merchant ships, with nuclear propulsion plants based on B&W designs, to sell both within and outside Italy.

### Status of Atomic Energy Today

Today the status of atomic energy is somewhat as follows: Four reactor concepts have been developed to a point where they can be constructed and operated with the assurance that industry must have before it will engage in a venture that requires an outlay of from 25 to 75 million dollars per reactor. The oldest of these four concepts is the gas-cooled graphite moderated reactor, widely used for research and development purposes throughout the world and the basis of the extensive nuclear power program already under way in Great Britain.

The other concepts are the pressurized water reactor—the basis of American submarine service, the

Yankee Power Reactor, and the Consolidated Edison Power Reactor—the boiling water reactor typified by the Dresden Power Plant, and the sodium-cooled reactor—the small power unit at Santa Suzanna and the larger power plant now under construction at Hallam, Nebr. There are three or four other concepts which have been developed to the point of experimental prototypes.

Much more research, engineering, and development is needed for the full exploitation of each and any one of these reactors. The pressurized water and boiling water reactors probably require smaller outlays of time and money.

People in Colorado are, of course, interested in what may be the outlook for uranium in the next few years. Again I hesitate to make predictions. The most definite statement I can make is that it takes the equivalent of 150 tons of natural uranium metal to start up a nuclear power plant of 100 electrical megawatts. For a very rough, and I emphasize that it is rough, figure, one can estimate that approximately 75,000 tons of average Colorado ore will be required for the initial charge of the core of 100 electrical kilowatt plant and that this plant will consume approximately 25,000 tons of ore for each year of operation.

In a recent address before the First Canadian Conference on Uranium and Atomic Energy, the Honorable Chet Holifield of California, speaking as the new chairman of the Joint Congressional Committee on Atomic Energy, attempted to give some encouragement to the Canadian producers. He was understandably conservative. I do not think I can do better than to quote two statements from his speech of Jan. 12, 1960:

"When the civilian uranium market develops there is no doubt that the producers in Canada and the United States will be in a position to supply it. This could not have been said a few years ago, nor could those interested in power from the atom have proceeded to expend large sums on reactor projects with any degree of confidence that sufficient uranium would be available to support the new industry.

"In the short range the uranium industry is capable of supplying substantially more uranium than will be needed to meet both military and civilian demands. Uranium producers must adjust to this situation and prepare for the competitive market which will apply to uranium sales above and beyond those being made under existing contracts. Although the whole world has a stake in the rapid development of nuclear power, the uranium producing countries have an added reason for pressing for soundly conceived, vigorous programs aimed at reducing the lag between developmental efforts and commercial power production."

As compared with these statements, Mr. Philip Sporn, president of American Electric Power Co., made the following statements in the company's annual report for 1959:

"There has never been a time . . . when we were more deeply convinced of the great future that atomic power has in the country as a whole . . . and, looking farther ahead, for our entire service system."

When one realizes that the American Electric Power Co. is located almost on top of the great soft coal fields of West Virginia, Ohio, and Kentucky, one can understand that this is real optimism.

Mr. Elmer Lindseth, president of Cleveland Electric Illuminating Co. and Edison Electric Institute, has repeatedly stated that "nuclear power will be cheap and competitive when American industry (public utilities and manufacturers) is utilized fully."

### Situation Summarized

The situation then seems to narrow down to these points:

1. There is no immediate likelihood of an energy gap in the United States.
2. There has been, and may again be, in Europe.
3. There are many areas in the world where an increased availability of energy (other than animal) would greatly improve standards of living.
4. The energy gap in most places is due to military, nationalistic, or purely economic reasons. There can be wide fluctuations here.
5. Nuclear fuels at attractive costs are available at many points over the world, particularly in Africa, Canada, and the United States.
6. Transportation of concentrated nuclear fuels anywhere in the world will not be difficult in peace times.
7. In the near future the production and costs of nuclear fuels are more likely to decrease than to increase.
8. Uses other than military—for example, nuclear power—must develop before a sound industry can exist in nuclear fuels. This is of importance here in Denver. The only alternative is the stockpiling of yellow cake, and Government experiences with stock-piling have not encouraged this procedure. I cannot paint a rosy picture for the immediate market conditions for uranium.
9. Nuclear fuel cycles, compared with fossil fuels, are already competitive with fossil fuels. In fact, nuclear fuels on a Btu basis can be appreciably

- cheaper than fossil fuels. It is in the utilization of nuclear fuels that costs begin to mount.
10. Capital costs and engineering for atomic power plants are appreciably higher than costs for conventional plants. This is particularly true for small (less than 100 MWe) plants.
  11. Electric power at 7 to 9 mills from large nuclear power plants now seems possible and not too far away around the famous corner. These costs will be competitive with conventional fuels in certain areas. Five years will tell the story for future advances. Five years from now we may be making 7 mill power and competing with fossil fuels.

### Story Illustrates U. S. Problem

Four years ago I attempted to tell to the group here in Denver a story of a young mother listening to her little daughter talking to her doll. Little Mary was telling of a little pig who was being chased down a forest path by a big, black bear. Just in the nick of time the little pig escaped by climbing a tree. The mother said to Mary, "Little pigs can't climb trees." Mary was crestfallen for but a moment and then replied, "This one could, he had to."

Now the Russian military experts may have their doubts, but Mr. Khrushchev says they will bury us in economic warfare. He may be right but I doubt it. I think, though, that regardless of what approach the "big, black bear" may make, we in the free world had better make some upward progress. Advancement in development of nuclear power would be one way.

### PLANT NEWS

(Continued from page 19)

#### B & W Co. Signs Agreement With Denver Fire Clay Co.

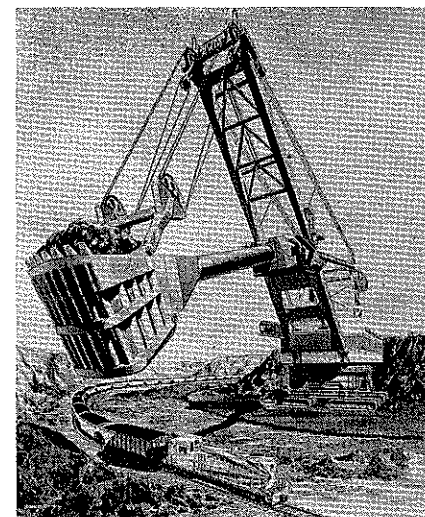
The Babcock & Wilcox Co. has signed a dealer sales agreement with The Denver Fire Clay Co., it was reported by R. A. Barr, vice president in charge of B & W's Refractories division, and R. C. Shepard, president of Denver Fire Clay.

Under terms of the agreement, the Denver firm will market B & W's refractories products in a six-state area comprising Colorado, Wyoming, New Mexico, Utah, Eastern Nevada, Idaho and Western Montana.

Denver Fire Clay, one of the oldest firms of its type in the Rocky Mountain area, maintains sales offices in Denver, Colo., and Salt Lake City, Utah, in addition to two plants and clay mines in the Denver area.

The Babcock & Wilcox Refractories division has its headquarters in the Company's general offices in New York City, and a plant in Augusta, Ga. In addition to its refractories production, Babcock & Wilcox is a major supplier of steam generating equipment, tubular products, soot-blowing systems, meters and controls, electronic equipment and nuclear systems and components.

#### Super-Size Stripping Shovel Built for Peabody Coal Co.



Railroad cars are dwarfed in this artist's conception of a new super-size stripping shovel now being built for Peabody Coal Co., St. Louis, Mo., by Bucyrus-Erie Co., South Milwaukee, Wisconsin. Expected to be in operation in 1962, it will be over twice the size of any power excavator ever built. The excavator will weigh 14 million pounds and provide 12,200 horsepower. Present plans call for a 115-cu.-yd. dipper. The earth (overburden) removed by the shovel in one month could fill all the cars in a train stretching from Pittsburgh to Chicago.

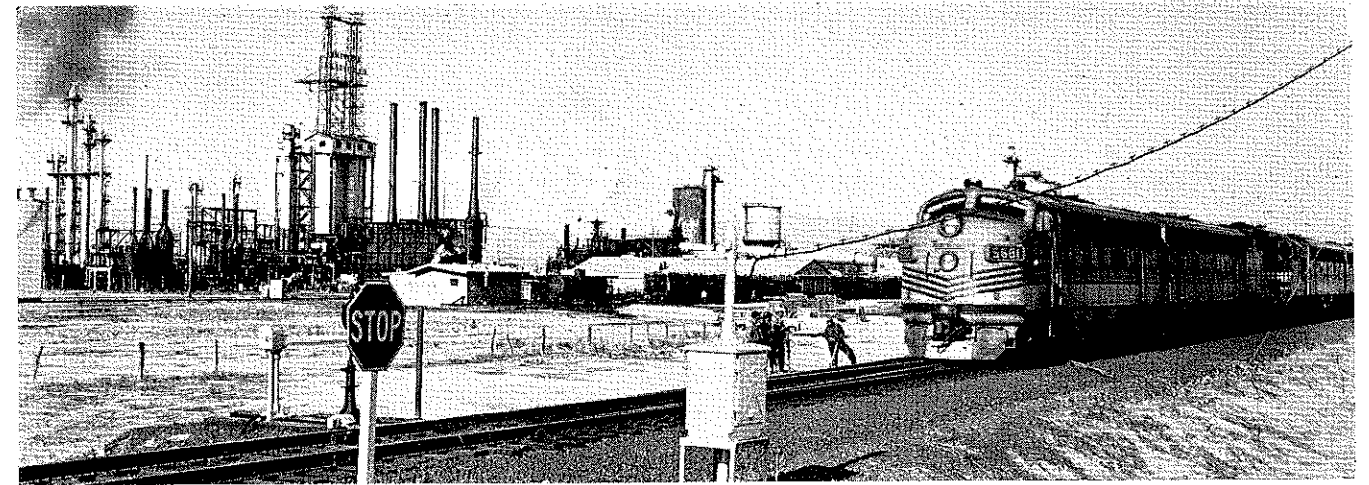
#### Heavy Media Process Now Fully Automated

Complete automation of heavy media processes, long an objective in coal and iron ore preparation, is reported achieved for the first time.

The closed loop control system, in operation since January, is reported by the Underkoffler Coal Service Co. of Lykens to have substantially lowered costs by making possible (1) the preparation of coal consistently uniform in ash content, and (2) the recovery of low-ash coal previously discarded.

The instrumentation innovation, expected to be widely applied, is a collaborative development of Wilmot Engineering Co., a leading manufacturer of heavy media equipment, Brown Instruments Division of Minneapolis-Honeywell Regular Co., and Industrial Nucleonics Corp.

At the Underkoffler plant, which processes 600 tons of anthracite per day, control is interlocked to a series of valves and mechanical devices to rigidly maintain specific gravity of the water-magnetite medium in the separatory system at optimum value and to add magnetite automatically as needed. Control of gravity is held within  $\pm 0.003$  at the widest spread. Control units, an ElectroniK circular chart recorder with Electr-O-Line proportioning unit and a Modutrol motor, revolve around an AccuRay density measuring unit.



▼ Main line trains of the D&RG Western Railroad pass the huge refinery of the American Gilsonite Co. near Grand Junction, Colo., which is now turning out fuels for diesel locomotives.

## Unique Gilsonite Operations Expanded

American Gilsonite Co., a joint affiliate of the Standard Oil Co. of California and Barber Oil Corp. of New York, announces that its unusual refinery near Grand Junction, Colo., has been required to undergo a second expansion program since its erection in August, 1957. This is due to continuing increase in the market for Gilsonite fuels, particularly as economy-grade fuel now being supplied to the Denver & Rio Grande Western Railroad, according to Ernest F. Goodner, president of American Gilsonite.

One of the most revolutionary developments in the petroleum and mining industry, the conversion of Gilsonite ore—a solid hydrocarbon asphaltite—into high-octane gasoline and other fuels as well as calcined coke for the metallurgical industry, was fathered by American Gilsonite Co. after years of research into methods that would permit a fuller utilization of the vast Gilsonite reserves owned by the company in eastern Utah.

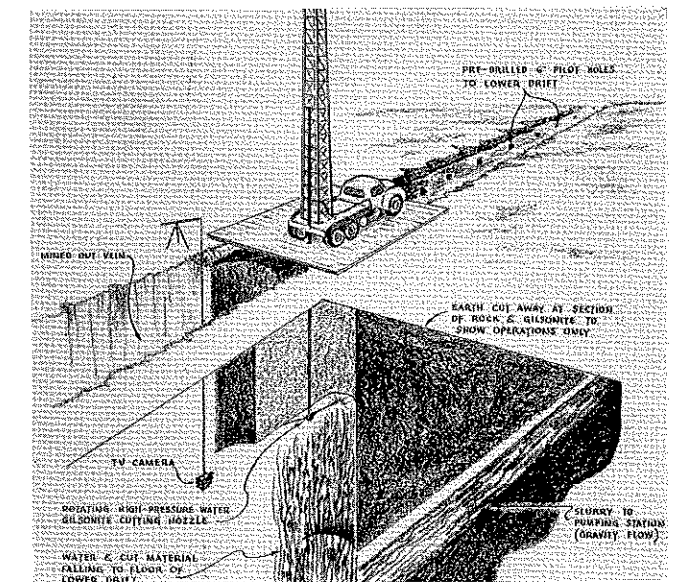
The Gilsonite ore, mined in the vicinity of Bonanza, Utah, near the Colorado state line, is transported as a slurry by a 72-mile pipeline to the refinery near Grand Junction, where it is de-watered and converted to liquids and coke. Operating initially at the rate of 650 tons of Gilsonite per day, the pipeline is expected shortly to deliver approximately 1,100 tons daily to the refinery. By the time the expansion program is completed, the daily output of the refinery is expected to be 1,600 barrels of gasoline, 1,300 barrels of railroad fuel, and 350 tons of coke.

The almost universal exposure of the narrow Gilsonite ore veins near or on the surface of the ground has provided the basis for a completely radical method of mining using regulation oil well drilling equipment operating from the top of the ore fissures. Formerly, Gilsonite ore was removed by high-pressure hydraulic jets advancing along drifts underground, which cut away and partially pulverized the mineral in one operation.

The new method uses drilling equipment mounted on large trucks supported on a platform immediately above the Gilsonite veins. This innovation calls for driving vertical holes with the oil well drills down through the center of the ore vein to an intersecting bottom drift. Hydraulic high-pressure nozzles are then substituted in place of the drill bits and lowered

to the bottom drift. Water at 2,500 pounds per square inch is delivered through the nozzles as they are slowly rotated and gradually pulled back to the surface. The terrific pressure of the water is delivered against the walls of the hole and tears the Gilsonite ore free, which falls into the drift below. At that point, a stream of low pressure water carries the ore as a slurry by gravity flow to other handling facilities in the mine which eventually raise the ore to the surface. This system completely eliminates the necessity for men working along the underground faces.

An interesting aspect of the new method also is the proposed monitoring of the hydraulic phase of the operation by closed-circuit television cameras at the level of the high-pressure cutting nozzle. The camera would be suspended by a cable from the surface into the open area behind the face of the vein being cut. The operator on the ground will then be able to guide the hydraulic nozzle in accordance with the view provided by the camera.



▼ Artist's rendering of the new high-pressure hydraulic mining method for removing Gilsonite ore from the narrow veins which are normally exposed to the surface of the earth.

# ALUMNI BUSINESS

## Executive Committee Meeting Of Mines' Alumni Assn., Mar. 17

The regular Executive Committee meeting for the month of March was held on Thursday, March 17, at 7:30 p.m., in the Stearns-Roger Manufacturing Co. building, 660 Bannock St., Denver.

Members present were: Edwin H. Crabtree, president; S. M. Del Rio, executive committee; Robert Evans, executive committee; Robert Waterman, treasurer; Wendell W. Fertig, executive manager. Members absent were: John M. Petty, vice president; James A. Mullinax, secretary; Harvey Mathews, executive committee.

The minutes of the previous meeting held on the evening of Feb. 25, 1960 were approved.

The financial report for the month of February 1960 was presented and approved.

The motion for approval for the minutes of the February meeting as well as the financial report was made by Mr. Evans and was seconded by Mr. Waterman.

A brief report was made on the status of recommending names for the Class Agents. Since the class of 1950 is holding their 10th Reunion this year a recommendation has been made to Mr. Crowder offering the names of four men each of whom will act as Class Agent for the graduates in his option. Mr. Crowder will write to the men concerned and if they agree, their names will be added to the list of Class Agents. If this is successful the practice will be extended to all the classes from 1947 to 1960.

It was regularly moved by Mr. Del Rio and seconded by Mr. Evans that the committee named to consider the Alumni Endowment Fund and its title should be dissolved. Mr. Trueheart, who had been named chairman of the committee, concurred in this recommendation, agreeing that it was a matter that should be handled by a standing committee rather than a special committee.

It was reported that Mr. Otto Highfield has signed an agreement to solicit advertising for the Magazine. This agreement was read and accepted. However no action was actually necessary for the terms of this agreement had already been presented to the Executive Committee in 1959 and is being implemented at this time. It was reported that the delay in preparing the brochure was due to our inability to get the desired testimonials from long time advertisers. This will be taken care of within the next few days and the brochure should be printed shortly thereafter.

It was reported by Mr. Bob Davison that he will complete the legal work on the instructions to be given the First National Bank on handling the funds held in the Alumni Endowment Fund. At the present time these instructions are not clear and Mr. Davison has been engaged on this project for some time. A report will be rendered later.

Mr. Robert Bolmer, chairman of the Publication Committee, reported that the following men have been appointed to his committee and they have accepted: Kirk Forcade, geological engineer; Jim Taylor, petroleum engineer; Fran Smiley, petroleum engineer; Maynard Ayler, mining engineer; Elmer J. Garbella, metallurgical engineer.

Ken Nickerson, chairman of the Membership Committee, reported that the following men have been appointed to his committee and they have accepted: Dr. L. W. LeRoy, Fran Smiley, Niles Grosvenor, George Welch.

The loan application of Mr. Bill McClain was considered and denied. Mr. McClain requested a loan of \$1,000 to finance graduate study in Great Britain. The decision of the Executive Committee was that the loan fund could not be used for such purpose since it had been set up to assist worthy students completing their work here at the Colorado School of Mines.

It was announced that the annual dinner of the Denver Section will be held at the Denver Press Club, 1330 Glenarm, at 6:30 p.m., April 21. This annual dinner is held for the Miners who attend the National Western Mining and Energy Conference.

The matter of confusion between the AADF and the Alumni Endowment Fund was discussed and it was proposed that funds accumulating from month to month should be deposited in a savings account until their true ownership could be determined. Mr. Waterman moved that the savings account be established for this purpose. The motion was seconded by Mr. Robert Evans and approved. As a result the donations will be accumulated in the savings account in the Golden Savings & Loan. As soon as the final ownership of these funds is determined, they will be withdrawn from the Building & Loan Association and deposited in the Endowment Fund of the First National Bank of Denver.

The desirability of using membership cards in 1961 was raised but no definite action was taken at this time. The executive manager recommends strongly that the use of membership cards be reinstated beginning with the year 1961.

A report on the plans for the membership campaign directed at the class of 1960 was given. These consisted of (1) a series of articles in the Oredigger (2) briefing sessions to be arranged for the seniors and (3) applications were to be made available at Dean Burger's office and for members of the membership committee as well as in the Alumni office.

A proposed application for use by the Loan Fund was submitted at the meeting but no action was taken at this time. Mr. Lestina's committee is continuing to work on this matter and should have a report in the near future.

The question of changing the name of the Alumni Endowment Fund was submitted to the Research and Investigation Committee as a result of a motion made by Mr. Bob Evans and seconded by Mr.

Del Rio. The motion also included the proposal that this same committee should be charged with the overall problem of updating the Constitution of the Association so that it may be submitted to the membership for approval at the same time the ballots are sent out in fall of 1960.

A brief report on the relationship of the Alumni office with that of the CSM Foundation was made. Mr. Lee Scott and Mr. Crowder called at the Alumni office and said that it was their intention to provide the material for a page in the magazine. The cut to be used at the head of the page is to be paid for by the Foundation.

A report on the comparison of advertising revenues for the first three months of 1960 was made but additional material will be gathered and a more complete report will be made at a later meeting.

Two proposed covers were presented to the meeting and as a result of their decision the new cover as used on the April Magazine was approved.

It was reported that the April issue will consist of 48 pages since there is not adequate advertising available to support more than that number. However it is proposed to increase the number of pages in the May issue to at least 80 pages.

The Executive Committee agreed that the Alumni Association should cooperate with the Colorado School of Mines in staffing the booth at the National Western Mining Conference. Arrangements will be made for a member of the Alumni staff to be on duty at all times.

The Executive Committee agreed that the Magazine shall be published 12 times annually and that the subscription price to overseas non-members shall be increased from \$6 to \$7.50.

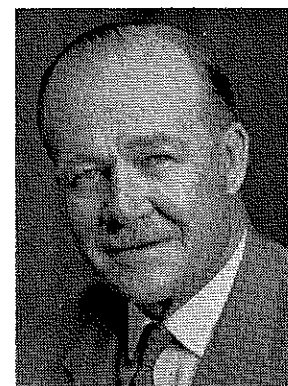
The arrangement made with McGraw-Hill's Subsidiary-Overseas Subscription Agency—was approved and hereafter the Alumni Association will refund \$1.50 to McGraw-Hill on each overseas subscription which they obtain for non-member subscribers. This agreement does not affect members for to date practically all members subscribe direct and consequently do not use an agency.

It was reported that job listing in the Placement Service previously carried in the Magazine was supported in part by a grant of the Colorado School of Mines of \$100 per month for this service. This grant has now been withdrawn and there is little evidence that it can again be reestablished. The executive manager believes that this service is needed and if the School will not support it, then it may be necessary for the Alumni Association to undertake this additional expense.

The executive manager reported that 178 members have been added to the active list since Feb. 1, 1960. These are graduates who were not active in 1959.

Motion to adjourn was made by Mr. Bob Waterman accepted and seconded by Mr. Del Rio. The meeting was adjourned by President Crabtree at 9:35 P.M.

## FROM THE EXECUTIVE MANAGER'S DESK



COL. WENDELL W. FERTIG

The Special Mining issue has been in your hands for a week. How do you like it? The gold cover was a better color than April and we may stay with it, for the printer says that Gold is a miserable ink with which to work. Poor Gold, no one likes it apparently, but it is still the only monetary medium which is accepted readily by pagan, Christian, Buddhist or Mohammedan. As for me, I like it and wish that there was more of it in my life.

Back to my question, the editorial staff has been pleased by the number of compliments that we have received on the Special Mining Issue. It is still too soon for mail to arrive offering a verdict, but we have done our best and hope you will agree that it is a magazine of which you are proud. If you do, show it around your company's office, particularly to the advertising manager. Impress on him, the high quality of readership and the ability of the magazine to reach and interest the top executives of outstanding companies in all fields of the minerals industry.

### Office News

Now that I have sold my soap for this issue, I must apologize. We did not move into our new quarters in time for commencement, but we will do so early in June. The offices are spacious and beautiful. To the north, Bear's Tooth still stands above the Library, while out my window to the west, the Big "M" keeps me company. You will be proud of the new location. Our previous invitation is again extended, "Come and See Us."

### The Banquet

From our point of view, the Annual Banquet is the high point of the annual Commencement Week. MINERS come from far and near, and this year there were an unusual number of them from afar. The magazine story lists them in full, and every name in turn suggests someone else whom we wish had been there too. Two hundred and six attended, including the fathers, and in some cases fathers-in-law as well, of members of the Class of 1960. Nearly 50 members of that fine class were also there. Of course, the Silver Anniversary Class of 1935 were present

in force, 25 of them in fact, and very happy. The Golden Anniversary Class of 1910 were represented by 25 per cent of their original number. It was a good party and next year we will have to find a larger place for we have outgrown the present facilities of the University Club.

### Membership

Our effort to obtain members of the Class of 1960 was reasonably successful, for we have 77 out of a total possible of 156. By starting earlier next year, we should improve our record when the class of 1961 becomes seniors.

### The Directory

It is with regret that we have to close the lists of the Year Book and Directory of MINES MEN for 1960. Too many are still listed as "Address Unknown," and yet we have no choice. All changes or corrections received after June 1, 1960, will be given in Class Notes each month as they are received. Strange as it seems, we have found four or five "Address Unknowns" right here in Denver recently. Yet a telephone call would have given us the information when the MINER arrived. Please let us know where you are.

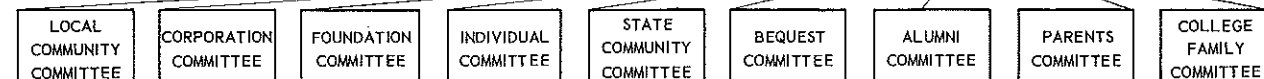
### Future Programs

One of the important decisions that must be made within the next few months is whether the Alumni Association will solicit the regular gifts to the Annual Alumni Development Fund of the MINES Foundation. We are prepared to do it, and for one I believe we can do an effective job by soliciting the gifts to the AADF and the ALUMNI Endowment Fund on the same dues card. It will save money in mailing requests and also relieve your mail of some requests for dues and donations. This is my personal opinion and has neither the approval or disapproval of the Executive Committee.

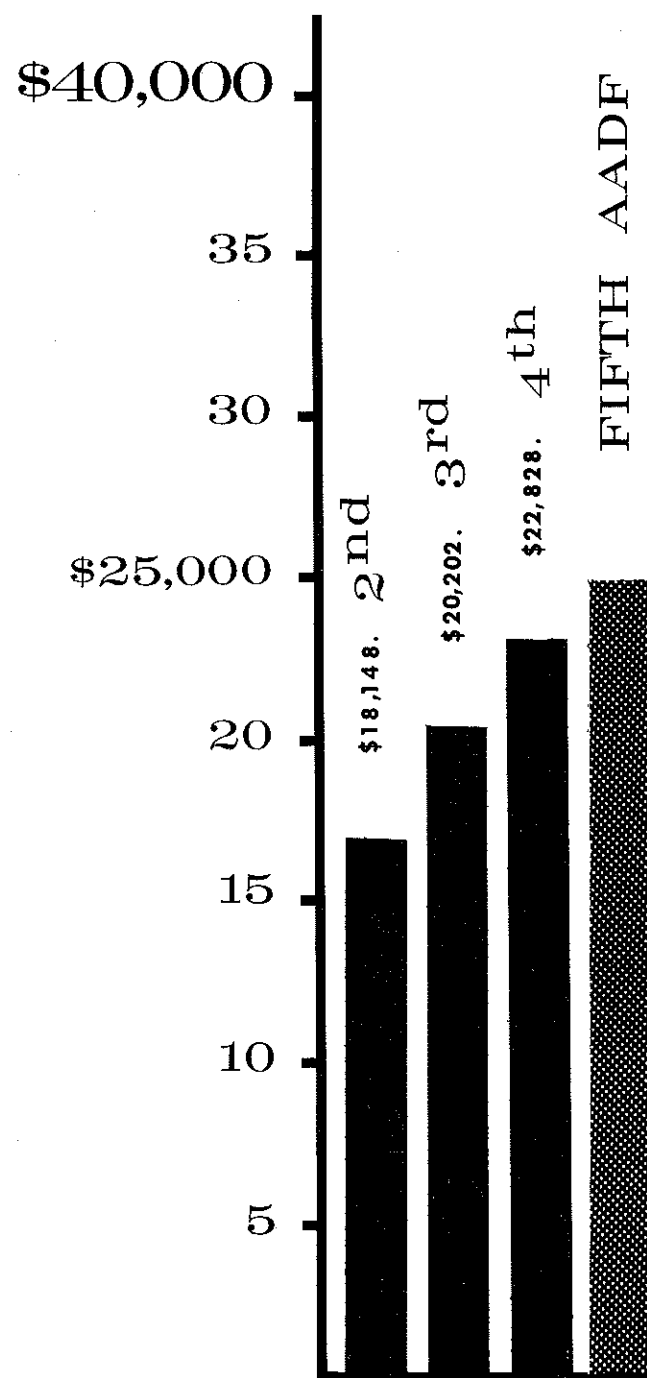
The Placement Service needs additional help. It is not operating effectively because of inadequate staff. Yet between Dean Burger and our office, we have filled more than 20 jobs during the past six weeks. With proper handling this service could be improved, for neither he nor I have time nor personnel to handle it properly. When Industry wants competent Mineral Engineers, they call on the Alumni Association to find them.

*(Editor's note—The series "Mineral Engineering Education for the Future" will be omitted from this issue. With Commencement, there is adequate coverage of the field of education.)*

# CSM FOUNDATION, INC.



## AADF Support Shows Steady Growth



▼ Chart shows steady growth of Annual Alumni Development Fund.

Yearly increases in alumni support of the Annual Alumni Development Fund have continued to push that fund nearer its goal of \$40,000—established several years ago on the basis of \$10 contribution from each Mines alumnus.

Through its fourth year, the AADF has shown a steady growth in the number of contributors and in the total amount contributed. Last year 1187 of the known living Miners contributed \$22,828.10 to this important fund. Not only has the fund become a major source of support for the faculty improvement program in itself, but it has provided the base for further financial support from the industry, foundations, parents, alumni and other friends of the School. Last year that total support exceeded one-quarter million dollars.

### Still Short of Goal

As of May 15, the Fifth AADF has a way to go if it is to uphold the growth trend. By that date 802 alumni had contributed \$17,637—still some \$5000 short of last year's final figure—and \$8000 short of \$25,000, a logical goal in terms of past growth.

The past success of the AADF can be attributed to the alumni who have recognized the need for such a program and have contributed their support. Alumni support has not only been in terms of gifts, but in time and energy working as class agents, on development committees, or independently on the Mines development program and in selling it to others. It is this same alumni leadership which will bring the Fifth AADF to its goal for the year.

The alumni development committee is headed up by Chairman R. Lee Scott, '42. Current members of his committee are James Mullinax, '47; Edwin H. Crabtree, '27, president of the Alumni Association; and Col. Wendell W. Fertig, '51, executive manager of the Colorado School of Mines Alumni Association.

### New Class Agents

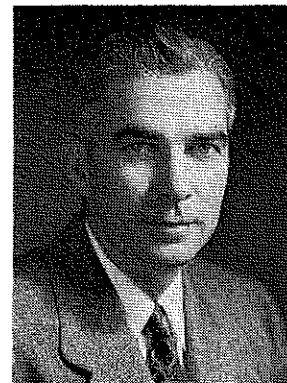
In connection with the AADF a new procedure has been adopted for the appointment of class agents. Beginning with the Class of 1960, a class agent will be named from each of the six options, rather than asking one alumnus to work with more than 150 classmates. Seniors who have accepted the class agent positions for 1960 are: John J. Selters, mining; Ronald L. Bredehoft, petroleum refining; Gerald L. Askevold, geology; Andrew J. Dickson, Petroleum engineering; Samuel Bruce Heister, metallurgy; and James R. Heavener, geophysics.

### Alumni Section Gives \$1000

The Southern California Alumni Section set a challenge for other sections recently when its members contributed \$1000 to the Colorado School of Mines Foundation, Inc. The story is covered in "From the Local Sections" in this issue of the Magazine.

## ALUMNI NEWS

### Frank Coolbaugh, '33, President Of American Metal Climax, Inc.



Frank Coolbaugh, who received his E.M. degree in 1933 from the Colorado School of Mines, has been elected president and chief operating officer of American Metal Climax, Inc., 1270 Ave. of the Americas, New York 20, N. Y. A year ago last June he left Golden, Colo. to assume the presidency of Climax Molybdenum Co., one of the five divisions of American Metal Climax, Inc.

Mr. Coolbaugh joined Climax Molybdenum Co. at Climax, Colo., in 1933 after his graduation from Mines. He moved up through various positions to general manager of all mining operations. In 1954 he was elected vice president of Climax's Western Operations, and following the merger of Climax into American Metal Co. in 1957 he was named president of the Climax division of the merged company in 1959.

He is a director of the Colorado School of Mines Research Foundation, Golden, and of the Colorado National Bank, Denver.

### Rolf Rohwer, '50, Has Tunnel Connected to New House

Rolf Rohwer, '50, is the envy of all Miners, for he can boast of having his own private mine tunnel connected directly to his house.

Rolf, wife Louise and son Douglas, recently moved into their newly built home at 1960 Mt. Zion Dr., Golden. The Rohwers built their home at the entrance of the old school mine which was used by Colorado School of Mines mining students before the Experimental Mine was established at Idaho Springs.

The tunnel is entered through a door off the kitchen. A natural spring in the tunnel furnishes all their water. It also houses a walk-in for cooling Golden's favorite beverage.

### R. A. Morgan, '29, Appointed Assistant Dean of the UW College of Engineering



Raymond A. Morgan, head of the University of Wyoming's departments of general engineering, and engineering drawing, has been named assistant dean of the UW college of engineering.

Professor Morgan received a mining engineering degree in 1929 and a master of science degree in 1933 from the Colorado School of Mines in Golden. He has been a registered professional engineer since 1933.

He joined the Univ. of Wyoming faculty in 1941 as an instructor and became head of the engineering drawing and general engineering departments in 1946.

Prior to 1941 he served as an engineer with the Stanoline Oil and Gas Co. of Tulsa, the H. W. Gardner Co. of Golden, Colo., and the U. S. Bureau of Mines in Pittsburgh.

He did research in petroleum at the University's Natural Resources Research Institute during the summers of 1953-54, and was a consultant to the University of Kabul in Afghanistan during the summer of 1958.

From 1944-46, Professor Morgan did research in petroleum engineering with the oil and gas division of the U. S. Bureau of Mines in Laramie.

Professor Morgan was named to *Who's Who in Engineering* in 1953, to *Who's Who in the West* in 1957 and to *American Men of Science* in 1959.

Among the many organizations in which Morgan holds membership are the engineering honoraries, Sigma Tau, Sigma Gamma Epsilon, and Blue Key; the American Institute of Mining, Metallurgy and Petroleum

Engineers; National Society of Professional Engineers; and the Wyoming Society of Engineers. He is a Lion and a charter member of the UW chapter of Acacia fraternity.

He and his wife, Marjorie, reside at 1706 Garfield St. in Laramie.

### J. P. Bonardi, '21, Initiated In NHU Chapter, Tau Beta Pi

Jack P. Bonardi, who received his E.M. degree in 1921 from the Colorado School of Mines, was initiated April 21 into membership in the New Hampshire University Alpha Chapter of Tau Beta Pi, national engineering honorary society.

In a letter announcing his election, he was informed that he was elected because of his "high scholarship, integrity, breadth of interest, adaptability, activity and accomplishments" since his graduation in 1915 in chemical engineering from the University of New Hampshire. Mr. Bonardi also holds membership in Alpha Chi Sigma, honorary national chemical society.

Mr. Bonardi has received the distinction of being listed in *American Men of Science* (1921), *Who's Who in Engineering*, *Chemical Who's Who*, and *Who's Who in the East*.

He was the first person called upon to recover radium accidentally mixed in several hundred pounds of furnace ashes at a New York Hospital, and he is credited with producing the first 100 per cent radium salt, now reposing in the U. S. Bureau of Standards in Washington, D. C.

About 37 years ago Mr. Bonardi went into the business of representing in the East various concerns manufacturing equipment for mines. His association with Wilfley and Sons, Inc. and Mine & Smelter Supply Co., both Denver concerns, has extended over 35 years.

### Kaljjan, x-'61, Undergoing Pre-flight Training

Undergoing pre-flight training at the Naval Air Station, Pensacola, Fla., is Marine Aviation Cadet Dan Kaljjan, a former student at the Colorado School of Mines (x-'61).

Kaljjan, whose address is 2227 Yorba St., San Francisco, Calif., is studying aviation science, navigation, and other military and technical courses to prepare him for duty as a flight officer. Upon completion of pre-flight, he will undergo primary flight training at Saufley Field Naval Auxiliary Air Station in Pensacola.

**W. N. Lyster, '53, Promoted To Senior Chemical Engineer At Humble's Baytown Refinery**

W. N. Lyster, a 1953 petroleum refining engineering graduate of the Colorado School of Mines, has been promoted to senior chemical engineer in the solvents section of Technical Division at Humble Oil & Refining Co.'s Baytown, Texas refinery. This section is responsible for technical assistance in optimizing plant operations, including the naphtha re-run unit, a hydrodesulfurization unit, two hydroformers and the Benzene and Paraxylene Plants. It also designs new processes for producing solvents and petrochemicals.

Mr. Lyster's recent work has included a study of improvements in production of aromatic solvents and means of increasing the capacity of aromatics production facilities. He has also worked in the applied math and computing section of Technical Division. While in that group he developed a new computer program for distillation calculations that is gaining wide acceptance.

During his senior year at Mines he was editor of The Oredigger. He is a member of the American Institute of Chemical Engineers. Mr. and Mrs. Lyster and their two children live at 204 Woodside Dr. in Baytown, Texas.

**Dunn, '41, Production Engineer for U. S. Gypsum**

Donald W. Dunn, who received his E.M. degree in 1941 from the Colorado School of Mines, has been appointed production engineer, Gypsum Tile and Perlite, U. S. Gypsum Co. at Chicago.

Mr. Dunn joined United States Gypsum in 1948 as quarry foreman at Alabaster, Mich., became quarry superintendent in 1949, and was appointed general foreman of the Oakfield, N. Y., mine in 1950. In 1954 he went to the Caribbean as division mining engineer, and was made general superintendent of Mexican Operations in 1958.

Mr. and Mrs. Dunn and their two children are living at 300 W. Adams, Chicago 6, Ill.

**C. G. Massieon, '52, Promoted To Supervising Metallurgist By Caterpillar Tractor Co.**

Charles G. Massieon, who received his metallurgical engineering degree from the Colorado School of Mines in 1952, has been promoted to supervising metallurgist in Caterpillar Tractor Co.'s Research Department. He joined Caterpillar soon after graduating from Mines.

**D. B. Sikka Awarded Medal for Best Essay**

Desh B. Sikka, a graduate student in geology at the Colorado School of Mines from September 1948 to July 1950, has been awarded the President's Medal for the best essay submitted to the Canadian Institute of Mining and Metallurgy in the 1960 Students Essays Competition. His essay was entitled "Radiometric Survey, Redwater Oilfield, Alberta."

Mr. Sikka obtained his B.Sc. degree in 1945 from the University of Lahore, Pakistan, his M.Sc. degree in Geology from New York University, and his Ph.D. degree in Geology in May 1960 from McGill University.

He has had experience both in research work and professionally. From 1955 to 1959 he was engaged on the Geochemical and Geophysical research problem described in his prize winning essay under the sponsorship of Imperial Oil Ltd. He is currently acting as a research assistant in the Department of Geological Sciences, McGill University. Professionally, Mr. Sikka has been employed by the Iron Ore Co. of Canada, Algoma Ore Properties, Conwest Explorations, and Lundberg Explorations, during his summer vacations and at various periods during his university career.

**Philip A. Ray, '29, Retires From Hercules Powder Co.**

Philip A. Ray, a 1929 metallurgical engineering graduate of the Colorado School of Mines, retired May 1 as manager of the Denver office of Hercules Powder Co.'s Naval Stores Department.

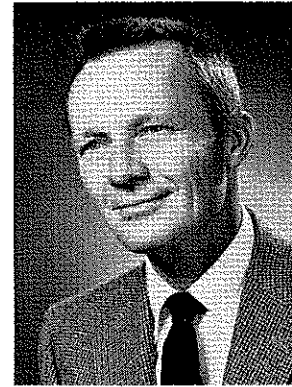
Mr. Ray joined Hercules in 1928 when he became associated with the company first as a metallurgist in the CSM Laboratory. Two years later, he transferred to Hercules Home Office in Wilmington, Del., working in this area for the next 16 years. In 1944 when the company's Naval Stores Department opened a district office in Denver for the first time, Mr. Ray went there as district manager.

Mr. Ray was one of the pioneers in the early development of Hercules pine oil and later toxaphene. He is a member of the American Institute of Mining and Metallurgical Engineers.

**Mines People Going to Europe**

Mines people and their families leaving Golden for Europe this summer include the John W Vanderwilts, Lloyd Wrights, Ben Parkers, Harlan Johnsons, Mrs. Gertrude E. Miller and granddaughter, Miss Jane Weigand, Ralf Holmer, William Levings, and Lute Parkinson.

**Harry E. Haynes, '50, Named Division Geologist for Carey**



Harry E. Haynes, who received his geological engineering degree in 1950 from the Colorado School of Mines, has been appointed division geologist in the Dallas headquarters of William J. Carey, independent oil producer. He formerly was manager of Carey's Rocky Mountain operation. Before joining the Carey organization in 1954 he was employed by the Pure Oil Co.

Mr. Haynes' business address is 1112 Republic National Bank Bldg., Dallas 1, Texas.

**H. C. Price Company Opens Branch Office in Lakewood**

H. C. Price Co. of Bartlesville, Okla., one of the world's outstanding pipeline constructors and a pioneer in electric arc welding methods, has opened a western branch office in the Lakewood Professional Building, 9635 W. Colfax Ave., Lakewood, Colo.

Harold C. Price, a 1913 graduate of the Colorado School of Mines, is chairman of the board, and his son, Harold C. Price, Jr., is president of the company. Mr. Price's annual scholarship grant to the school of Mines helps several deserving boys each year with their education at Mines. Presently there are three Mines men sponsored in this manner.

**David Coolbaugh, '43, Heads Exploration Group to Alaska**

David L. Coolbaugh, '43, will be in charge of an exploration party which leaves Seattle on June 1st for Southeastern Alaska to do exploration work for the Ideal Cement Co. John Wolf, '47, heads the Exploration Department for Ideal Cement.

Among the crew will be Ben Parker, Jr., '49; Don Howell, Melvill Erskine, Joe Reese, and Robert Ferriter—all 1960 graduates, and the following undergraduates: Joe Fisher, Jimmy Johns, Robert Roberts, Bill Whitney, George Rouse, John Nelson and Lloyd Jones.

**Visitors to the Alumni Office**

GERALD V. ATKINSON, '48, c/o Mobil Oil Co., Apartado del Este, 5373, Caracas, Venezuela, is visiting in Golden during his home leave. Verne will be returning to Venezuela within the next few weeks.

M. EDWARD CHAPMAN, '27, was here for the Commencement week. He and Mrs. Chapman expect to spend the summer in Golden. Eddie lists himself as a consultant, and will maintain his office address at 310 Thompson Building, Tulsa, Okla.

CHARLES H. COTTERELL, '59, has just completed his active duty with the U.S. Army as an engineer officer at Fort Carson, Colo. His temporary address is 4260 So. Fox, Englewood, Colo.

GEORGE W. HEIM, '32, mining engineer, Food Machinery and Chemical Corp., Box 250, Pocatello, Idaho, was through Golden on business. We were happy to have him call, for he gave us some information on developments in the western potash industry.

K. WILLIAM JEFFERS, '56, came to discuss the job situation. He was with the government and can be reached at 2504 N. Kenilworth St., Arlington 7, Va., as a temporary address. Let us know as soon as you get settled.

EDMOND A. KROHN, '43, resigned as design engineer, U. S. Steel Corp., Dragerton, Utah, and plans on relocating in the Denver area. His mail is being forwarded from 142 Grassy Trail, Dragerton, Utah, until he is relocated.

EDWARD M. MATSEN, '34, general superintendent, St. Anthony Uranium Co., Subsidiary American Metals Climax, Laguna, N. Mex., stopped in to tell us that he and Mrs. Matsen are opening their home at Lyons, Colo. Ed and I always refight the battle of Bataan when we get together.

DONALD E. MICHELS, '59, who has just completed his active duty with the U.S. Army as a second lieutenant, Corps of Engineers, may be reached at 3229 So. Lincoln, Englewood, Colo. Please let us know as soon as you get settled.

ORAN L. PACK, '26, consulting geologist, 212 Majestic Bldg., Denver, has moved to Golden and is living in his new house at 307 Lookout View Ct. Oran is chairman, Research and Development Committee, Alumni Association. This committee has been given the job of revising and up-dating

ing the Constitution and By-Laws of the Association.

LUTE J. PARKINSON, '23, head, Mining Department, has been most cooperative in assisting the MINES Magazine in presenting the material for the story of the CSM Mining Department (written by Maynard Ayler, '45, instructor). Further material on conference with officials of mining companies on curriculum discussions will be given later in the MINES Magazine.

ALBERT L. PIERCE, '22, Metallurgical Department, 9 Mines Park, Golden, dropped in to express his interest in the proposed metallurgical issue of the MINES Magazine scheduled for February 1961.

FRANK PORTER, '60, is trying his hand at mining a copper prospect in the California desert. Frank finished his required work in January, 1960, but returned for Commencement Week. Good luck.

CLARK M. PRICE, originally of the Class of '44, finished at Columbia University in 1948, after the war interrupted his studies at Mines. Clark submitted his application for Associate Membership in the Alumni Assn., and it was approved at the last meeting of the Executive Committee. Happy to have you with us.

JOHN ROBERTSON, JR., '49, engineer for the Colorado Fuel and Iron Corp., Box 1211, Cedar City, Utah, called at our office while in Denver for the National Western Mining Conference.

DAVID A. ROWLAND, '49, instructor, Petroleum Engineering Department, reported on his visit to the Petroleum Meeting held in Calgary. This was a joint meeting of the Petroleum Engineers, AIME and its Canadian counterpart.

HAROLD W. STOUFFER, '51, mining engineer, ALCOA, Republic of Panama, is back in the States on home leave with his family. While here he can be reached at 1309 9th Avenue, Beaver Falls, Pa.

CHARLES C. STEWART, JR., '51, is now manager, Petroleum Department, National Bank of Detroit. He was in Denver for the petroleum meeting in late April and found time to come to Golden. We appreciate that.

HUGH A. WALLIS, '28, petroleum consultant, a member of the Public Relations Committee of the Alumni Association, came out to confer on final arrangements for the Annual Banquet. Hugh is also the vice-president of the Denver Section.

**LETTERS TO THE EDITOR**

JOHN R. WITT, 1st Lt., USA, Corps of Engineers, writes from Fort Belvoir, Va.

"This is just a short note to give you my new address and bring my friends up-to-date on my travels. I'll graduate from the Engineer Officer Advanced Course on May 20, and immediately depart for my next assignment at Texas A&M College where I'll take graduate study in Civil Engineering. My address there will be 610 Mary Lake Dr., College Station, Texas, for the next year at least.

"After years of resistance, I was married to Jeanne Andrew of Pueblo on April 23, 1960, at Arlington, Va. I'm anxious to show her off to any of my old school friends who happen to live in the College Station-Bryan area.

"I'm still a first lieutenant after six years of active duty as promotions are getting slower, but hope to make my 'tracks' (Captain's bars) in July after Fiscal Year '61 begins.

"Keep up the good work you're doing in bringing MINES Magazine up-to-date. I really enjoyed the April '60 issue." (Editor's Note: First our congratulations to you and Mrs. Witt; then our sincere thanks for your kind words. We are trying! WWF)

ARTHUR YARBERRY, '50, 7811 Cure Clermont, Ville D'Anjou, Montreal, Quebec, Canada writes in response to my inquiry concerning the fact that he now has the same address that his brother Lee Yarberry had before he moved to Trinidad, BWI.

"Yes, I am renting brother Lee's house while it is on the market. It is quite likely we will be in it at least until fall when another (one in the spring too) wave of housing changes sweeps the area.

"Incidentally, I am faced with a very large problem of production blasting (up to 34,000 tons per day very shortly) in the middle of an increasingly critical metropolitan population. The experiences of the New York Trap Rock Corporation are very informative. However, I am hopeful something new, such as sonic breaking, will develop very soon.

"I hope the editorial staff of The MINES Magazine recognizes the size and the scope of the problem facing the rock producers—and will be quick to offer all possible developments in this line to MINES Men.

"Lee tried Caterpillar Tandem Ripping here (the top layer was too hard) and I introduced it on my last location in Kentucky, so we were interested in the article on the Caterpillar Seismic Testing of 'rip-ability'.

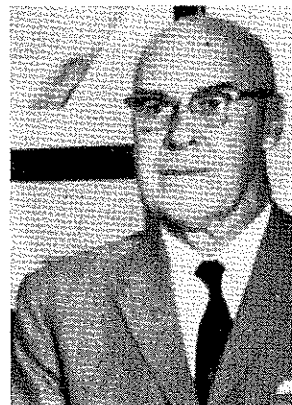
"Incidentally, Lee is using ripping to break his limestone in Kingston, Jamaica.

"Keep 'us' rock men in mind on this phase of development. It may even be a MINES Man or Men, that comes up with a solution that will control politicians and the populace designs on our operations."

(Editor's Note: This is a problem that becomes more and more important. One large quarry near Golden was closed because the heavy blasting was said to have damaged buildings and homes near the School. WWF)

# IN MEMORIAM

## Blair Livingston Sackett



Blair Livingston Sackett, a 1909 mining engineering graduate of the Colorado School of Mines, died April 27 in a Salt Lake City hospital. On March 7, Mr. and Mrs. Sackett observed their 50th wedding anniversary, and at last year's Alumni Banquet Mr. Sackett acted as spokesman for the Class of 1909.

From 1947 until his retirement in 1956, Mr. Sackett was metallurgical manager for International Smelting & Refining Co. at Salt Lake City. He served as the company's superintendent at the Tooele, Utah plant from 1922 to 1947.

Born Sept. 16, 1886, in Jersey City, N. J., Mr. Sackett enrolled at Mines in 1906 and was an active member of Crucible Club and of Beta Theta Pi. He began his professional career in 1909 with Grandby Consolidated Mining & Smelting Co. at Grand Forks, B. C., where on March 7, 1910 he married Miss Daisy Hodges. He was employed by Cerro de Pasco Copper Corp. in Peru, South America, from 1910 to 1912, when he became associated with International Smelting & Refining Co.

Mr. Sackett was an active member of American Institute of Mining, Metallurgical and Petroleum Engineers, Society of the Cincinnati, Red Cross, Travelers' Aid Society, Knife and Fork Club, and Presbyterian Church.

Survivors include his widow, Mrs. Daisy Sackett, 1762 Harrison Ave., Salt Lake City; a daughter, Mrs. Virginia Alsop of Salt Lake City; two sons, Earl L. H. Sackett (a 1933 graduate of Mines) of Potosi, Mo., and Paul Sackett of Hilo, Hawaii; and six grandchildren.

## E. Floyd Shields

E. Floyd Shields, who attended the Colorado School of Mines from September 1909 to June 1911, died April 16 at his home in Indio, Calif. Mr. Shields also studied mining engineering at Iowa State College and graduated from Montana School of Mines in 1911.

Born 74 years ago in Oskaloosa, Iowa, Mr. Shields worked as a newsboy after being orphaned at 14. Until 1922 he was employed as a mining engineer and later as a mine owner.

In 1922 he purchased an apartment in Long Beach, Calif., and on Christmas Day 1924 he traded it for a 40-acre homesite west of Indio. Throughout the years he developed his holding into a prosperous date garden and packing business. Featured at his retail sales room is a continuous film on "Romance and Sex Life of the Date."

Mr. Shields is survived by his widow, Bess Shields.

## Ernest Floyd Jones



Ernest Floyd Jones, a 1910 mining engineering graduate of the Colorado School of Mines, died April 8 in Corpus Christi, Texas. He was born in Huntington, W. Va., in 1888.

After his graduation from Mines, Mr. Jones worked in Pennsylvania and New Mexico, leaving his position in the latter state to serve his country in World War I. When the war was over, he returned to work in Colorado, and then Mexico, where for many years he was employed by Compania Real del Monte y Pachuca at Pachuca, Hidalgo, Mexico. When he retired because of ill health, he was district superintendent of mines.

Mr. Jones is survived by his wife, Consuelo Rawson Jones.

## Robert H. Sayre



Robert H. Sayre, who was a member of the board of trustees of the Colorado School of Mines from 1924 to 1936 and who was president of the board for two years, died April 8 at Presbyterian Hospital in Denver.

Mr. Sayre was born in Denver Dec. 18, 1885, and was educated at St. George's School, at St. Paul's School, and at Harvard College where he graduated in 1908. He engaged in mining in Colorado, New Mexico, Arizona and California, and in the early 1920s was associated in a Guatemala business venture with Ex-President Herbert Hoover. He served for years as a mining consultant for the U. S. Department of Justice. Organizations to which he belonged included the American Metallurgical Society, Harvard Club, Colorado Scientific Society, and University Club.

Surviving in addition to his wife, Mrs. Gertrude Berger Sayre of Denver, are two sons, Robert Jr. of Grand Junction, and William of Denver; three daughters, Mrs. Demaris Hoyle of Denver, Mrs. Phyllis Baldwin of Golden, and Mrs. Constance Collier of Logan, Utah; a sister, Mrs. William Berger of Denver, and 16 grandchildren.

The Sayre family have been strong in their support of Mines. Robert Sayre, Jr., graduated with the class of 1934; while Hal, who was killed in action in World War II, was a member of the class of 1937. Alfred G. Hoyle, who married Demaris, graduated in 1940.

As Robert H. Sayre, Jr., said of his father: "We may truthfully say that with the passing of Robert H. Sayre, we see the end of the era of really great mining engineers: Charles A. Chase of Silverton, Charles Bell of Ouray, Orville Whitaker, and Quimby Schlereth of Denver, to mention a few. The mineral industry owes an incalculable debt to these independent hard-driving men of rock-like honesty and ethics."

# 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)

Next meeting will be Sunday afternoon social for Miners and their wives to be held at the home of Henry Parfet, '49, 332 Neola, Park Forest, Ill., from 3 to 5 p.m., June 12. For further details call Charles Fitch, '49, c/o Charles Ringer Co., 7915 Exchange Ave., Chicago 17, 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  
V. Pres.: Hal Ballew, '51  
Sec.-Treas.: Tom McLaren, '52  
4301 Mercedes, Midland  
Luncheon meetings held first Friday of each month at the Midland Club.

### 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

Contact Robert B. Ingalls, '48  
National Equipment Co.,  
1020 South 6th West St.,  
Salt Lake City, Utah.

## WASHINGTON

### Pacific Northwest Section

Pres.: Wm. Douglass, '11  
Sec.: C. Ted Robinson, '53  
16204 S.E. 8th, Bellevue

## WYOMING

### Central Wyoming Section

Contact Walt Forbes, '50  
Walt Forbes Co.,  
First National Bank Bldg.,  
Casper, Wyo.

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, Yenisehir Ankara; Tel. No. 21328.  
Ferhan Sanlav, '49, Turkiye Petrolleri A. O. Sakarya Caddesi 24, Ankara; Tel. No. 23144.

VENEZUELA

Caracas Section

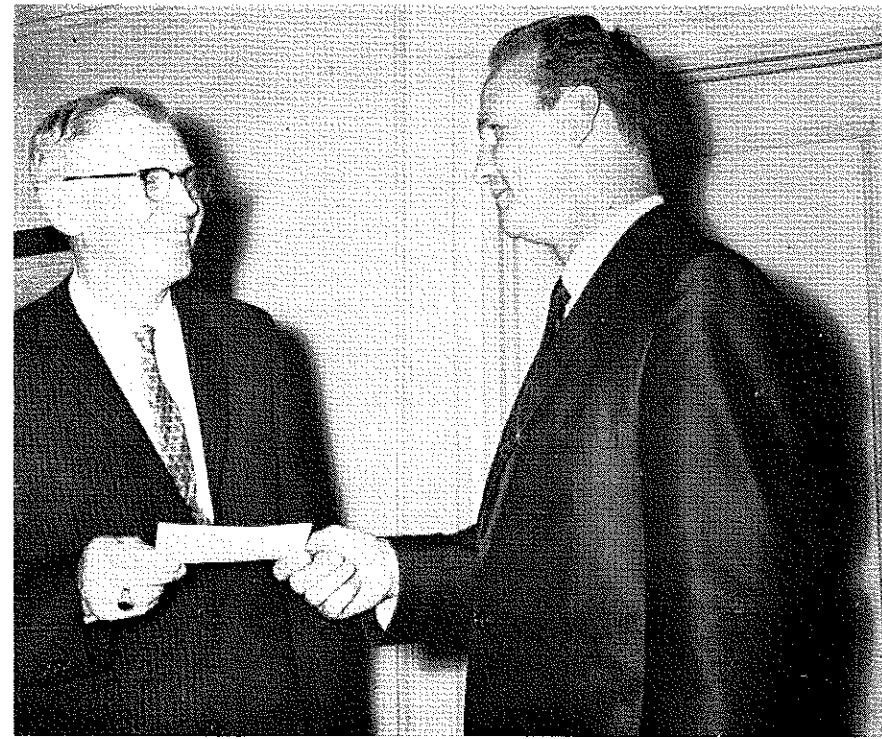
Pres.: William A. Austin, Jr., '27  
V. Pres.: G. V. Atkinson, '48  
Sec.-Treas.: T. E. Johnson, '52  
c/o Phillips Petr. Co.  
Aptdo 1031  
Asst. Sec.-Treas.: R. L. Menk, '51  
c/o Creole Petr. Corp.  
Aptdo 889

Southern California Section

Present officers of the Southern California Section are as follows:

R. E. McGraw, '53, president  
J. R. Leonard, '42, treasurer  
H. David Squibb, '34, secretary

The section had its spring meeting April 21, attended by President John W. Vanderwilt, Troy Crowder and H. Dean Burdick as guests. Dr. Vanderwilt presented a very informative and enjoyable description of the present status of the School and told of the effect of the Horizon Plan and work that had been accomplished to this end.



Members of the Southern California Section of the Alumni Assn. voted to present the Colorado School of Mines Foundation, Inc. with \$1000. Shown, left to right, President John W. Vanderwilt accepts check from Raymond E. McGraw, '53, section president, at a meeting held April 21 in Los Angeles. The donation was an unrestricted gift to the Foundation.

Members voted to present the Colorado School of Mines Foundation, Inc. with \$1000. (See picture.)

Jordan Nathason, '36, organized a committee of 20 alumni who met with Dr. Vanderwilt and Mr. Crowder at noon April 21 for the purpose of planning solicitation of funds for the Development Fund.

Houston Section

The following Miners attended the March 2 luncheon meeting at the Houston Club:

Albert G. Wolf, '07; S. A. Mewhirter and L. R. Van Burgh, '17; C. W. Beeth, '24; M. L. Euwer, J. L. Ballard and D. M. Davis, '25; Don I. Gahagan, '27; R. K. Tracy, '28; J. B. Ferguson, '30; I. G. Burrell, '31; Donald L. Herbert and Merle Gilbreath, '33; R. A. Kerr, '36; W. Bruce Barbour, '37; W. J. Wickstrom, '38; Nick Shiflar, '40; K. C. Heald, Jr., '47; Bob Turley, R. W. Gallagher, and Jim Ogg, '52; John Capshaw and Jim Endicott, '54.

The Section held its monthly luncheon meeting on May 4 at the Houston Club, with the following Miners present:

Albert Wolf, '07; J. L. Ballard and Donald M. Davis, '25; Ralph Schilthuis, '30; Merle Gilbreath, '33; R. A. Kerr, '36; R. W. Snyder and W. B. Barbour, '37; Nick Shiflar, '40; Clem Lehnertz, Bob Turley and Bob Gallagher, '52; Howard Kaylor and Jack Earl, '53; John Capshaw, '54.

Jack Earl led an interesting discussion about the Horizon Fund, described his visit to Golden, and spoke highly of plans and efforts to improve the Alumni Association. He was much impressed with the new facilities in

the CSM athletic department.

Considerable time was spent discussing ways and means of generating more interest and participation in the Horizon Fund. Howard Kaylor and Bob Turley will head up a group to make a special effort in that direction. Everyone present at the luncheon made a small contribution to be forwarded to the Horizon Fund.

Grand Junction Section

Joe Hopkins reports in *The Wet Stope* that the final party for this season was a Finger Lickin' Chicken Bar-B-Que at Shipman's claims on Saturday, May 28, at 6:30 p.m. He continues:

"This year's officers bowed out and new blood staggered in. Theme of the Shipman brawl, prior to their departure for Alaska, was 'Struck It Rich.' Prospectors who have 'hit it' came as they were or in dress appropriate for the celebration and were prepared to cope with the elements. There were jackasses a plenty (some 4-legged too) and fun galore on patented and unpatented diggin's.

"Each spouse brought her choice of salad or dessert while the old boy coughed up \$2.50 per head (\$5 per couple) for the best bargain of his 'Struck It Rich' career. Hootch was served by the trusty tenders of the Rusty Plank Bar sponsored by such picturesque characters as Rock Hound Motica, Hanging Wall Fulton, or Anticline Kohler. Cooking was done by those charming Shipmen Maidens,

on open grills, in rain, snow or blow. Mary Kay and her girl supporters were given a rest from hors-d'oeuvres, as thanks for all they have done this year. Reservations were sent in by May 25th to lovable Ma Shipman or Baby Doll Emerson. Chicken for 60 gluttons were ordered. Those who traveled far were invited to bring their own camping gear as weather was moderate for roughin' it in city parks or Court House lawn."

Pacific Northwest Section

Minutes of the meeting of Pacific Northwest Section held March 15 are as follows:

W. C. "Bill" Douglass, '11, president

C. T. "Ted" Robinson, '53, secretary

Following cocktails and an excellent dinner at Andy's Diner, Seattle, Wash., the meeting was called to order by President Douglass. The following 10 members were present:

Walter H. Jackson, '01; Eric M. Smith, '05; William C. Douglass, '11; Dewey A. Dutton, '21; Arthur R. Kesling, '40; Colin L. Fox, '41; C. W. Bowlby, '50; C. Ted Robinson, '53; Richard O. Barnes, '55; Carter R. Kelly, '56.

The minutes of the last meeting were read and approved.

President Douglass announced the deaths of Axel Anderson, '04, on Jan.

10 and Leo Scherrer, '24, on Feb. 29. Flowers were sent to Andy by the secretary. President Douglass read a thank-you letter from Mrs. Anderson. He said he had called Mrs. Scherrer offering any help we might be able to give. No request for help was received.

The Annual Progress Report and Mines Memo of December 1959 were read.

The Memo stated that enrollment has held steady and the Progress Report shows a total of 1003 for the second semester. State distribution shows Colorado first with 416, about 40 per cent; California second with 98, about 10 per cent; New York third with 57, about 5½ per cent, and Texas fourth with 37, about 3½ per cent. Graduating class of 182: 51 metallurgists, 47 geologists, 27 petroleum engineers, and 25 miners.

Two new buildings—the Metallurgy Building and the New Gymnasium—are a credit to the school. The Progress Report is very informative and indicates that Dr. Vanderwilt is holding the Colorado School of Mines up to its high standards and that the Alumni are giving fine support.

Comments by Fritz Brennecke were read on the 1959 athletics.

Dewey Dutton gave a brief report of his trip to Mines, remarking about the graduate facilities and ore dressing area.

Carter Kelly added that they had planned for future expansion.

The next meeting was voted to be held the first half of October 1960 with a football film.

A short talk, "Lead Glass for Radiation Shielding," was given by C. Ted Robinson of the Penberthy Instrument Co. The glass made by Penberthy contains 80 per cent lead oxide. Mr. Robinson is the chief metallurgist for the company. Samples of 6.2 density glass were passed out.

The meeting adjourned at 10:30 p.m.

Tulsa Section

Tulsa Section held a dinner meeting April 20. Chester Westfall brought us up-to-date on some of the senior high students in Tulsa who are interested in entering Mines next year.

New officers for our section were elected and are as follows:

Chester Westfall, '52, president  
Brook Tarbel, '50, vice president  
Jerry Diver, '52, secretary-treasurer  
Present at the meeting were:

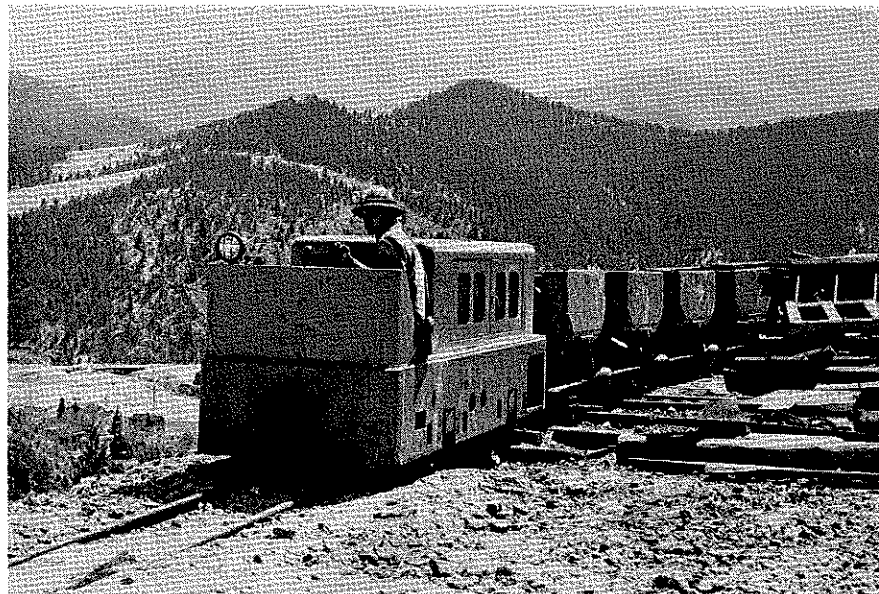
Parke Huntington, '26; Jack Haley, '48; Brook Tarbell and Pete Bike, '50; Jim Newell and Chet Westfall, '52; Dick Thixton, '53.

The **MIDWEST STEEL & IRON WORKS CO.**  
ESTABLISHED 1894  
FABRICATOR • WAREHOUSE  
STRUCTURAL SHAPES AND PLATES  
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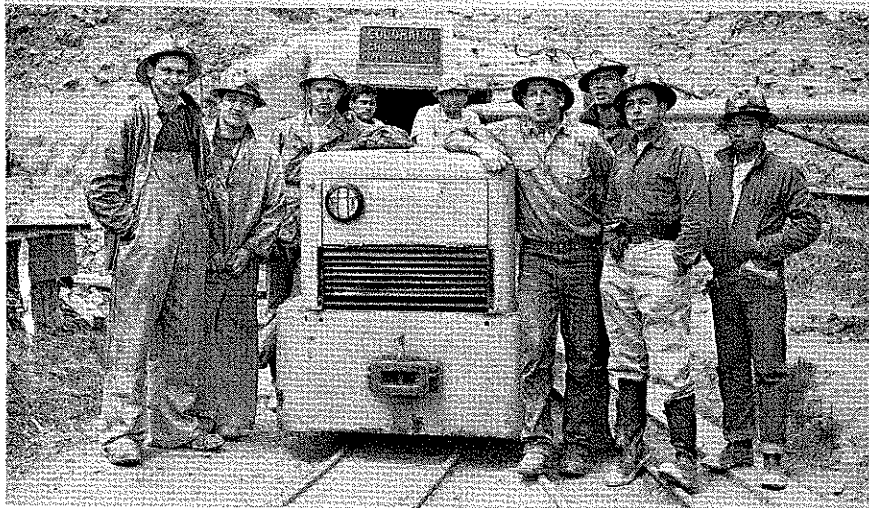
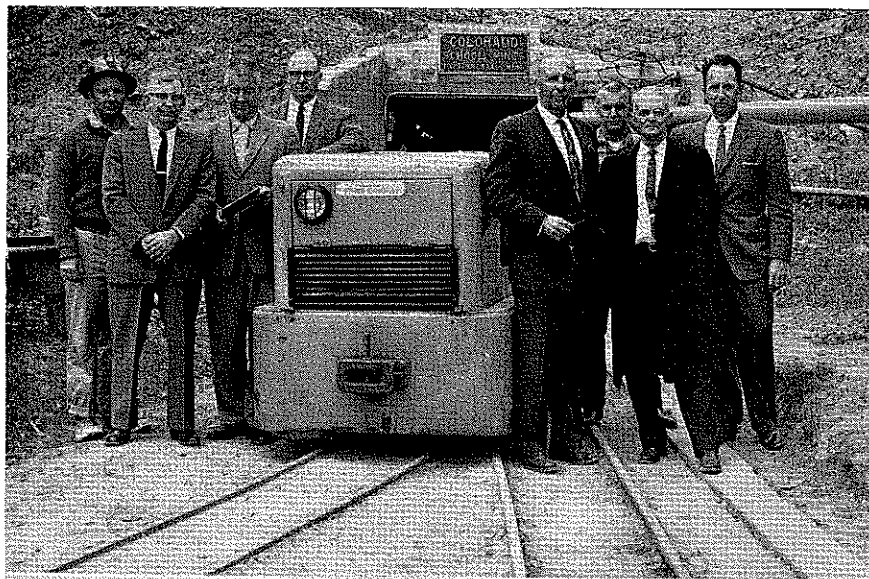
**FRANCO WESTERN OIL COMPANY**  
3132 18th STREET  
BAKERSFIELD, CALIF.  
HARRY D. CAMPBELL, '42  
FRANK E. WEAGANT, '51

**McELROY RANCH COMPANY**  
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CATTLE RAISERS  
405 Fort Worth National Bank Bldg.  
Fort Worth 2, Texas  
703 Wilco Bldg. P. O. Box 392  
Midland, Texas Breckenridge, Texas  
312 Tower Building  
Denver U. S. National Center  
Denver, Colorado  
Edward J. Brook, '23  
Lloyd W. Madden, '41

# CAMPUS HEADLINES



▼ Entrance of CSM Experimental Mine, Idaho Springs, Colo.



▼ Top picture: M. F. Aylor, Mining Dept. instructor; M. J. Fitch; Dean Kuhn, Howard Toncray, local Plymouth Locomotive dealer; L. J. Parkinson; Don Longenecker, AIME student president; E. H. Jenks, Old Timers' Club representative; T. F. Root. Lower picture: Students Ed Tutkaluk, John Fatum, Claudio Margueron, David Lyman, Lazlo Bid, Ulrich Lorber, Roberto Karmen, Santiago Lehr and Mya Soe.

## Locomotive Presented To Experimental Mine

Formal presentation ceremonies of a locomotive to the CSM Experimental Mine were held Sunday, April 24, at the mine site near Idaho Springs, Colo. Thomas F. Root, vice president in charge of advertising for Plymouth Locomotive Works, and Madison J. Fitch, engineer in charge of the company's Mine Locomotive Division, presented CSM officials with bronze plaques commemorating donation of the locomotive by Plymouth Locomotive Works and of the diesel engine by Hercules Motor Corp. of Canton, Ohio. Accepting in behalf of the Colorado School of Mines were Truman H. Kuhn, dean of faculty, and Prof. Lute J. Parkinson, head of the mining department.

The locomotive — a Plymouth Mine-O-Motive Model FMD-24, 5 Ton, 18" gauge, powered with a Hercules diesel, Model DOOD engine, and a Fuller Model 12-U Torque Converter—was placed in service in July of 1958, but title was not delivered officially to the school until this ceremony.

An AIME Student Chapter picnic was attended by some 70 members, their wives, and students taking the special class in mining laboratory practice scheduled for Sunday, April 24.

As this year's best student in coal mining, Bernard L. Bobo was given the Old Timers' Watch by E. H. Jenks, member of the Old Timers' Club and consultant for Hanna Coal Co.

Mining laboratory practice classes are usually held on Saturdays, but in exceptional cases extra sessions are scheduled for Sundays. Each session consists of a full 8-hour shift, and during the course of their 15 required shifts, students have a chance to practice various fundamental techniques of underground mining. Classes are offered during both semesters because of the large number of students involved.

EDITOR'S NOTE: The text of Mr. Jenk's remarks in presenting the Old Timers' Watch will be carried in full in the July issue.

## 90 Attend "Open House" At Mining Department

CSM Mining Department has established a policy of having a spring "open house" for students in the department, their dates, wives and friends.

This year the affair was held the evening of May 2. A movie illustrating the work of the mining engineer was shown. This was followed by a tour through the facilities of the mining department. Then to prove that life in the mining option is not "all work and no play," slides of last year's senior trip were shown. Cookies, ice cream and coffee topped off the evening. More than 90 persons attended the open house this year.

## N. J. Smallwood Chosen Oredigger "Man of Week"

Norman J. Smallwood, who received his E.M. degree this May, was chosen *Oredigger* "Man of the Week" in its May 17 issue (final issue of the spring semester).

In his years at Mines, Norm has been very active around campus. He is a member of Sigma Phi Epsilon (comptroller 1958-59), Press Club, AIME and ASME. He served on an E-Day Committee and was editor of the *Oredigger* for the past year.

Norm and his wife Mary Cay, to whom he was married June 22, 1959, will live in Kansas City, Kans., where he will be employed by Proctor and Gamble Manufacturing Co.

(Editor's Note: Good luck, Norm, and thanks for the support you gave the Alumni Association in the *Oredigger*.)

## Dr. James L. Hall Receives NSF Grant of \$19,800 For Research Project

Dr. James L. Hall, assistant professor of chemistry at the Colorado School of Mines, has been granted \$19,800 by the National Science Foundation. The grant was announced by Dr. Truman H. Kuhn, Mines dean of faculty, and Dr. Alan T. Waterman, NSF director.

The grant will cover a three-year basic research project on the use of acetone as a solvent for inorganic reactions. The grant became effective in April. The grant covers Dr. Hall's study plus the aid of a graduate research assistant.

Dr. Hall has been on the Mines faculty since last fall. He is a gradu-

ate of Colorado Western State College and holds a doctorate from the University of Texas.

This is the second NSF grant awarded to Dr. Hall this spring. He will also direct a \$17,820 NSF six weeks summer institute in chemistry and geology for advanced high school students. The institute will be held at Mines July 11th through Aug. 20th. About 50 outstanding high school students from throughout the nation will participate in the institute.

## Mines Trackmen Turn In Surprisingly Good Season

The majority of Colorado School of Mines track lettermen will return next year, following a surprisingly good season in 1960. The *Orediggers* won two and lost one dual meet, won one triangular meet and took seconds in two other triangulars, and took third place in both the Rocky Mountain Conference Relays and the Rocky Mountain Conference Championships.

Top pointmaker for the year was all-purpose freshman George Brinkworth, a Burbank, Calif., track and field man. Brinkworth won 60½ points in six meets, and won points in six different specialties.

Distance runner Stan Versaw finished second in the point making department with 55, and vaulter-hurdler Bill Ryan had 54 points for third place.

Head Track Coach Joe Davies expects a better year in 1961, with an expanded indoor schedule. Mines will also host the RMFAC Relays again in 1961, in addition to several outdoor dual and triangular meets.

Season's Record:

Feb. 26 (Indoor), Denver 59 5/6, Mines 54 1/6.

March 19 (Indoor) Colo. State U. 55½, Mines 47½, Denver 33.

April 2, Mines 70½, Colo. State College 51½.

April 9, Denver 61, Mines 46, Colo. State College 41.

April 23 RMC Relays, Idaho State 28, Colo. State 7, Mines 6, Colorado College 6, Adams State 4, Western State 3.

April 27, Mines 87, Colorado College 35.

May 7, Mines 72, Western State 38, Adams State 33.

May 14, RMC Championships, ISC 95, CSC 60, Mines 38, CC 14, WSC 6, ASC 0.

## Prof. H. E. Fletcher Studies Army Course

Hilbert E. Fletcher, assistant professor of electrical engineering at Mines, has completed the Fifth Army Area Methods of Instructions course. Professor Fletcher, who holds the rank of major in the reserve Signal Corps, recently spent a week at Fort Riley, Kans., completing his instructions methods work.

## Pan American Grants Petroleum Engineering Fellowship to Mines

A new graduate fellowship in petroleum engineering has been granted to the Colorado School of Mines by Pan American Petroleum Foundation, Inc. C. L. Larson, Jr., Foundation vice president and vice president and manager of Pan American Petroleum Corporation's Rocky Mountain Division, said the first fellowship grant would be offered with the 1960-61 academic year.

Pan American Petroleum Foundation, created and supported by Pan American Petroleum Corp., offers 16 fellowships at 15 different U. S. colleges and universities. The 1960-61 academic year represents the 24th in which fellowships have been offered by Pan American or Pan American Petroleum Foundation.

The fellowships, in five fields of graduate study, provide stipends of \$1,500 each and cover all costs of tuition and fees. In all cases, fellows are selected by the institutions where the fellowships are offered.

Each Pan American fellow is free to select any area of study or research he desires within the defined field at his school. No fellow is in any way obligated to the foundation or its founder either during his tenure as a fellow or at any time thereafter.

## Mines Senior Wins Award For Work in Investments

Robert L. Ferriter, mining engineering senior, has been awarded the Student Achievement Award by the Wall Street Journal for his outstanding work in investments, an optional senior economics course. This is the first time a Mines' student has received this honor.

The award consists of a silver plaque and a year's subscription to the Wall Street Journal.

# OREDIGGER SPORTS



▼ Shown are two football "greats"—Jack F. Earl, '53, one of Mines' greatest quarterbacks, and (right) Vince Tesone, '60, Little All-American tailback. Fritz Brennecke (center), head coach at Mines, dreams of more to come.

## Wrestling Tournament Will Be Held at Mines; Hancock, NAIA Chairman



Two national wrestling honors recently came to the Colorado School of Mines. The National Association of Intercollegiate Athletics (NAIA) announced the 1961 national tournament will be held at Mines on the third weekend of March. The national wrestling meet is expected to draw about 30 teams and some 50 additional individual entries. The 1960 meet was held at Lock Haven, Pa. Mines will stage the national meet in its new gymnasium.

Appointed as national NAIA wrestling chairman was Jack Hancock, Mines head wrestling coach since 1954.

Hancock also announced his 1960-1961 schedule for wrestling. The top home attractions will be dual meets with the university of Oklahoma, the 1960 NCAA champion, and the University of Illinois.

The Orediggers will also meet the region's two top squads, facing Wyoming at Laramie and Colorado State College at Golden. Mines will wrestle 10 dual meets in addition to participating in the Rocky Mountain Faculty Athletic Conference championships, the regional AAU and the NAIA carnival.

Hancock's team the past season won eight, lost four and drew one

in dual meet competition. They placed second in the RMFAC meet.

Mines victories are reflected in the following 1959-1960 intercollegiate meet scores: Mines 22, Adams State College (RMFA) ?; Mines 27, University of Nebraska 2; Mines 22, Iowa State Teachers College 5; Mines 27, University of Denver 5; Mines 14, Western State College (RMFAC) 12; Mines 24, University of Colorado 5; Mines 26, U.S. Air Force Academy 5; Mines 24, Colorado State University 6.

The entire 1959-1960 squad (18 men in total) return for next season, giving Hancock his most experienced squad since coming to Mines. Included among the returnees are Glen Hasse, 137 pound RMFAC champion and top Mines winner with a 37 and 12 record, and 123 pounder Tom Tisonc, NCAA national quarterfinalist with a 14 and three record last season. Also returning are Ron Lease, 130, 5-4-1; Ken Hecht, 147, 2-5-1; Dick Meyers, 157, 3-8-0; Don Meyers, 167, 10-5-0; Lyle Paulsen, 177, 7-2-0; and Marv Kay, unlimited, 5-4-1.

The NAIA meet will be the first national tournament ever staged at Mines.

## Baseball Squad Wins Eight of 23 Games

Single-hitting Ken Ibsen took the 1960 batting honors for the Colorado School of Mines baseball squad. The junior infielder collected 30 hits—only one double and one triple included—in 67 trips to the plate for a .448 average.

The Miners completed their season by taking a pair of games from Colorado College. The Orediggers won eight of 23 games and had a five and 12 RMC record.

### 1960 BASEBALL STATISTICS

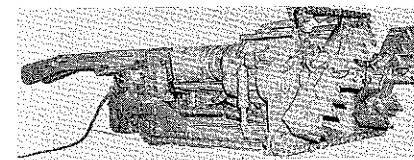
NAME	AB	H	R	BB	SO	RBI	SB	2B	3B	HR	Avg	Errors
Ken Ibsen, 2b	67	30	21	20	9	16	6	1	1	0	.448	16
Ed Crabtree, 1b	80	27	23	14	9	9	5	3	2	1	.337	11
Kay White, rf	70	21	23	13	14	20	15	4	3	3	.300	8
Mike Sargent, cf	71	21	20	14	6	14	2	1	0	0	.296	13
Larry Holmes, ss	72	20	17	12	13	12	3	2	0	1	.278	31
Ken Miyoshi, 3b	71	17	20	22	17	3	0	1	2	0	.239	10
Gary Smith, ss	38	9	6	5	16	2	2	0	0	0	.236	10
Jan Aldrich, c	62	14	9	5	13	4	11	1	0	0	.226	6
Don Stegman, if	42	8	6	5	12	6	0	1	0	0	.191	1
all others	72	11	8	11	18	5	3	0	0	0	.153	4

PITCHERS	Won	Lost	Innings	ER	ERA	Pct
Paul Rairden	5	2	57	33	5.24	.715
Vince Tesone	3	3	54	54	8.43	.500
Norm Burmeister	0	1	10	12	7.50	.000
Mike Sargent	0	2	10	14	6.43	.000
Kim de Rubertis	0	4	31	28.3	9.88	.000
Dick Egen	0	3	22	16.7	11.90	.000
Gary Smith	0	0	3	1	27.00	.000

# WITH THE MANUFACTURERS

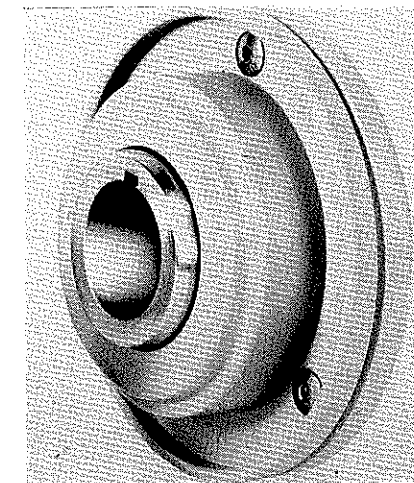
## Continuous Miners



A new series of Marietta Continuous Miners—with Dual-Range height adjustment through 18"—has been developed by National Mine Service Co. The machines are crawler-mounted, boring-type units with capacities of approximately 8 tons per minute. The Marietta Series II Miners permit height adjustment to meet varying operating conditions in the mine—without sacrifice of rigidity. Shifting from one range to another is a mechanical adjustment which can be accomplished on the job within a few hours.

Other design features of the Marietta Series II Miners include: separate motors for each of the two cutting heads and the hydraulic system, extremely broad throat, unique accessibility for maintenance, and an advanced support design which provides stability and concentrates mass against the working face without the aid of jacks. Marietta Series II Continuous Miners are detailed in a new bulletin available from National Mine Service Co., 2530 Koppers Bldg., Pittsburgh 19, Pa.

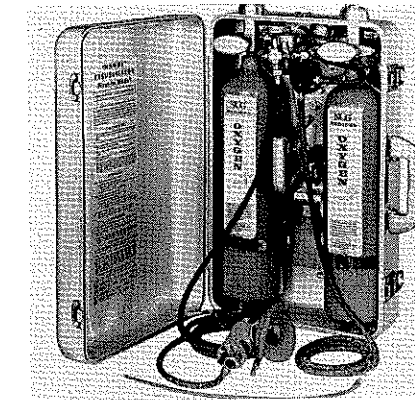
## MC Motor Couplings



Three features have been added to Link-Belt's line of MC geared flexible motor couplings: New corrosive duty covers of polypropylene for operating conditions under which chemical attacks can occur. Larger size coupling, extending the range of the line to 2½-in. bore. New spacer adapter which functions as a demountable, rigid extension of the motor shaft.

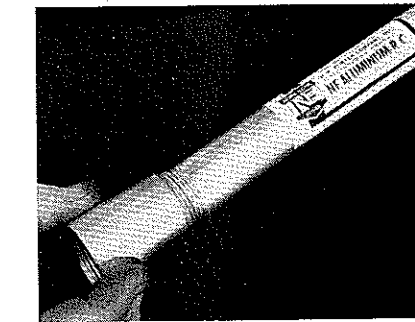
These features are described in detail in a new leaflet 2875A, now being distributed with Folder 2875, "MC Motor Couplings." A copy of both publications can be had free by writing to Link-Belt Co., Dept. PR, Prudential Plaza, Chicago 1, Ill.

## NCG Resuscitator



"FIRST IN" resuscitator, designed to be the first equipment rushed to a fire or accident victim, is no larger than an overnight bag. Unit introduced by National Cylinder Gas Division of Chemetron Corp. weighs only 18 pounds and Oxygen cylinders weigh about 12 pounds each. It operates as resuscitator, inhalator and aspirator. It is highly resistant to heat and shock and can be used in any position.

## Aluminum Electrical Conduit



A line of aluminum electrical conduit, especially suited to installations requiring light-weight, corrosion-resistance and easy bending, is in production by the National Electric Division of the H. K. Porter Co., Inc. Added to National Electric's line of steel rigid conduit, it enables the division to offer conduit for every application from a single source.

NE-Aluminum Conduit is available in all sizes, ranging from ½" through 6" in diameter. Each length measures 10 feet when a coupling is attached. Color-coded thread protectors are used for ease of stocking and size selection. Aluminum elbows are furnished in all sizes including special radii.

TUNGSTEN CARBIDE ROCK BITS. A new four-page bulletin by Joy Manufacturing Company discusses tungsten carbide rock bits. Bottom drive, shoulder drive, and taper socket bits are illustrated and explained. A simple chart provides selection data for all types of bits made by the company, and includes information on cross and "X" type bits, diameters, and thread types.

Write to Joy Manufacturing Co., Henry W. Oliver Bldg., Pittsburgh 22, Pa., for bulletin NR-87-C.

## Circular Slide Rule



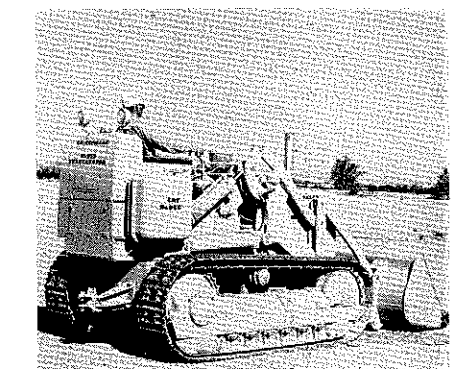
General Industrial Co. has started production on a handy Circular Slide Rule for engineers and for other plant and office executives. Any executive who must perform simple calculations will find this convenient, pocket-size calculator extremely useful in his work. For your free Circular Slide Rule write on your business letterhead to General Industrial Co., 1788J Montrose Ave., Chicago 13, Ill. and be sure to mention the name of this magazine.

SYNCHRONOUS MOTORS. Construction features of Allis-Chalmers synchronous motors which help maintain efficiency at fractional or full loads, correct power factor, increase system output, and improve plant voltage regulation are described in a new bulletin released by the company. Available in ratings above 1 hp per rpm at speeds of 450 or less, the motors described are high-efficiency, constant speed, grinding mill synchronous machines for cement, mining, rock products and chemical industries.

Construction features include stator windings of all-silicone-rubber Silco-Flex insulation and integrated field coils which provide dimensional stability at high temperatures and rotational speeds, and are completely sealed against contaminants.

Copies of the bulletin, "Synchronous Motors," 05B9522, are available on request from Allis-Chalmers, Milwaukee 1, Wisc.

## 955 Series H Traxcavator



The new, power-shifted 955 Series H Traxcavator announced by Caterpillar Tractor Co., is powered by a 100 net horsepower compact design diesel engine. Bucket capacity for the 955H is 1¼ cu. yd., increased from 1½ cu. yd. on previous models. A 23 per cent increase in lifting capacity is credited to an all new hydraulic system for the loader mechanism.

# CATALOGS and TRADE PUBLICATIONS

Send your publications to The Mines Magazine, 1612 Illinois St., Golden, Colo., for review in these columns. Please mention The Mines Magazine when requesting publications from the manufacturer. Publications are free.

**CONVEYOR-SCALE SYSTEMS.** A new, four-page bulletin on the use of conveyor-scale systems for flow-rate control and total thru-put measurement of bulk materials has been published by Weighing & Control Components, Inc.

The new bulletin deals with the use of W-C conveyor-scale systems in conjunction with flat-bed or trough-type conveyor-line systems, fixed or variable speed, to provide in-motion weight measurement. System operation is explained and illustrated with pictorial diagrams. Application and performance data is given on all of the unitized system components.

A section of the bulletin describes the application of W-C conveyor-scale systems to a variety of control functions in processing and formulating operations, including ingredient proportioning. This section also covers the use of the system's continuous thru-put data, expressed in weight per unit of time, for inventory control and cost accounting purposes.

Bulletin 60, Unitized Conveyor-Scale Systems, is available from Weighing & Control Components, Inc., 821 E. County Line Road, Hatboro 10, Pa.

**FILTER.** Union Carbide Development Co., Division of Union Carbide Corp., offers a four-page, illustrated bulletin on its new ULOK Cube Type Replacement Air Filter.

The two-color bulletin tells how the cube filters can reduce filter bank face area by more than half. The physical process of reverse loading, primarily responsible for high efficiency and long life of the ULOK filter unit, is described in detail.

Exploded-view illustrations show how the four components are assembled prior to installation in a filter bank. A diagram illustrates typical arrangements, and a data table lists the capacity and resistance of each of the dozen filter sizes. Low cost and easy installation are among eleven over-all features highlighted. For copies of ULOK Filter Bulletin B, write Union Carbide Development Co., 30 E. 42nd St., New York 17, N. Y.

**FLOTATION OF MOLYBDENITE FROM COPPER.** Denver Equipment Co. has issued a Flowsheet Study on the flotation of molybdenite from copper. The Flowsheet illustrates the molybdenite section of a copper mill starting with the copper rougher flotation concentrate, conditioning and floating the molybdenum to make a molybdenum and copper separation, and then multiple cleaning and re-cleaning to produce a high-grade MOS<sub>2</sub> concentrate in excess of 90% MOS<sub>2</sub>.

This Flowsheet Study, designated as Bulletin No. M7-F66, will be sent by Denver Equipment Co., 1400 17th St., Denver 17, Colo., to any interested person. **FOIL FLASHOVERS.** A new, 4-page brochure explains how Dow Corning 5 Compound applied to pole line insulators and electrical equipment bushings pro-

ducts against excessive leakage, flash-overs, and service interruptions in areas where atmospheres are contaminated by salt spray, industrial dust, or other airborne particles. Pole line insulators and equipment bushings treated with this material can be cleaned easily. The brochure explains how, even in highly contaminated areas, contaminants can be removed by wiping the insulators with dry rags. The brochure gives details on the function, application, cleaning, and durability of Dow Corning 5 Compound. It is available by writing for Brochure 4-218, Dow Corning Corp., Midland, Mich.

**HEAT RESISTANT CASTINGS.** A new booklet, "Heat Resistant Castings . . . Corrosion Resistant Castings . . . Their Engineering Properties & Applications," has been issued by The International Nickel Co., Inc. The fully-illustrated 64-page booklet is designed as an aid to those interested in stainless steel and high-alloy casting selection, design and production. It offers a comprehensive picture of all types of stainless steel and high-alloy heat and corrosion-resistant castings and their applications. 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.

**NEW DIMENSIONS IN LIGHT-WEIGHT GAS TURBINE POWER.** Bulletin GEA-7083, 8 pages, introduces General Electric's family of 75 horsepower to 20,000 horsepower ultra-light-weight, compact gas turbines designed for a wide variety of applications including fluid and gas pumping, electric power generation, and marine and vehicular propulsion.

Described are design features, performance and operating characteristics, plus current and potential applications for the 900-horsepower Model 720/722 and 20,000 horsepower Model 240 gas turbine. General Electric Co., Schenectady 5, N. Y.

**PRODUCTS FOR THE PLANT.** Ingersoll-Rand Co. has just published a new booklet entitled, "Products for the Plant." This informative piece of literature is now available to anyone with an interest in the selection and supervision of plant equipment.

Standard reciprocating, axial-flow and centrifugal air compressors, centrifugal pumps, steam condensers, steam-jet ejectors, vacuum pumps, air hoists, and air and electric tools are all covered in this eight-page booklet. Representative machines in each product line are illustrated and outstanding design features noted. This booklet also gives the size and capacity ranges of the many units, as well as recommended applications.

For your copy of this booklet, Form 223, contact your local Ingersoll-Rand branch office or write direct to Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.

**SOLIDS-CONTACT REACTORS.** Cochrane Corp. has issued a revised 20-page bulletin (Pub. 5001-C) on solids-contact reactors for water clarifying and softening. The publication has many new photographs and drawings illustrating various types of reactors and their basic design considerations.

The principle of radial horizontal rather than upflow as an aid to complete settling of fine precipitates and clarifying is explained in the bulletin. Illustrations show how the reactor is constructed as a package unit divided by baffles into reaction and clarifying zones. High turbulence in the reaction zone promotes mixing of water and chemicals and prevents settling of sludge, which has a catalytic effect in forming large settleable precipitates. In the clarifying zone above, water and slurry flow horizontally from the center of the reactor at decreasing velocity. Slurry settles by efficient downflow to a concentrator area. Slurry carry-over into the effluent is thereby avoided.

The bulletin also contains information on chemical feeds and auxiliary equipment and lists many applications for solids-contact reactors. Copies may be obtained from Cochrane Corp., 17th St., below Allegheny Ave., Philadelphia 32, Pa.

**THE TIE-IN.** We have just received a copy of the First Quarter 1960 issue of The Tie-In of H. C. Price Co. Altho The Tie-In is published primarily in the interests of the personnel of its various projects, it was interesting to us because of its beautiful pictures and fine format. It was with regret that we note that Harold C. Price, '13, has stepped up to chairman of the Board and that his son, Harold C. Price, Jr., has taken over the president's job on Jan. 1, 1960. Harold, Sr., left him a real job to fill, but apparently with complete confidence in his son's ability to do so.

**TRACTORS.** Production and mechanical advantages of the new Caterpillar D7, D6 and D4 Tractors are discussed in "The Profit Side of Your Ledger," a new eight-page booklet by Caterpillar Tractor Co.

Owner testimonials are cited in the two-color booklet to illustrate the cost-saving, profit-making potential of the D7 Series D, the D6 Series B and the D4 Series C. Also mentioned are the easy operation, high production and dependability of these machines. Mechanical features listed include new diesel engines, dry-type air cleaners, lifetime lubricated undercarriages, and Caterpillar's exclusive oil clutch.

Copies of "The Profit Side of Your Ledger" may be obtained from Caterpillar dealers or by writing for form D004, Caterpillar Tractor Co., Peoria, Ill.

**BREWED  
WITH PURE  
ROCKY MOUNTAIN  
SPRING WATER**

**Coors**

AMERICA'S FINE LIGHT BEER

ADOLPH COORS COMPANY, GOLDEN, COLORADO

# BOOK REVIEWS

## Erbium and Holmium Metals

Data sheets on erbium and holmium metals have been published by Nuclear Corporation of America's Research Chemicals Division, Burbank, Calif.

Information contained in the data sheets refers to many properties of these rare earth metals including melting and boiling points, crystal structure, atomic radius and magnetic movement.

Erbium metal has the highest melting point of the more abundant members of the heavy rare earth group. Its availability, as a result of recent production advances, suggests its consideration for alloying or electronic applications.

Holmium is one of the more available mono-atomic elements. It has a high magnetic moment and is relatively corrosion resistant.

Data sheets may be obtained from Research Chemicals Div., Nuclear Corp. of America, 170 W. Providencia St., Burbank, Calif.

## Industrial Minerals and Rocks

AIME's third edition of "Industrial Minerals and Rocks," regarded as the most authoritative publication of its kind in the field of non-metallics other than fuels, has been reconstituted to keep pace with the rapid changes of recent times in the technology, application and usefulness of industrial minerals. The 934-page book, clothbound and illustrated with photos, charts, maps and tables, was made possible by the Seely W. Mudd Memorial Fund. Dr. Joseph L. Gillson, now president of AIME, was editor-in-chief of the third edition.

Each of the 56 chapters of the third edition is by an eminent authority in the particular field of which he writes, with the volume, as a whole, accomplishing a full-range coverage of the profession's activities and interests in the many phases served by the volume. Though prepared as an authoritative work for engineers and as a college textbook, it is available to the public at \$12 a copy from the American Institute of Mining, Metallurgical and Petroleum Engineers, 29 W. 39th St., New York 18, N.Y.

## Massive Blasting Operation

A massive blasting operation in Wisconsin trap rock quarry is described in a Bureau of Mines publication released by the Department of the Interior.

Known as the coyote-hole technique by the mining industry, the method involved the detonation of 20 tons of explosives in two simultaneous, but physically separate blasts. A quarter of a million tons of rock was broken—enough to keep the quarry busy more than a year, the Bureau's report says.

In coyote-hole blasting, major charges of explosives are placed in "coyote-holes" or in tunnels parallel to the operating face. Such blasts usually are followed by secondary blasting, after which the rock is crushed and screened to small sizes.

The Bureau publication, another in a series of reports in mining methods and costs throughout the United States, was written by Lawrence G. Marshall, mine examination and exploration engineer, Minneapolis, Minn. It includes a brief

account of the history and general operations of the Dresser Trap Rock Co., in particular, and of trap-rock quarries elsewhere in the Central States. Most trap rock from this operation now goes into concrete and roadstone, railroad ballast, and filter stone for sewage-disposal plants.

The publication is Bureau of Mines Information Circular 7913, "Coyote-Hole Primary Blasting, Dresser Trap Rock Co., Dresser, Wis." Copies can be obtained ONLY from the Superintendent of Documents, United States Government Printing Office, at 20 cents each.

## Pearl Harbor Dry Dock

"Saga of the Pearl Harbor Dry Dock" by George B. Tuggle and Walter W. Tuttle. Some say that had the shark god been propitiated most of the difficulties in construction of this dry dock would have been obviated. This was not done; hence, the job, begun in 1909, was not completed until 1919, and then after disaster and at more than double the originally estimated cost.

## Strength Tests of Concrete

The American Concrete Institute has published its Bibliography No. 2, "Evaluation of Strength Tests of Concrete." This new bibliography lists and annotates selected articles appearing in available technical publications issued from 1924 to 1958 and dealing specifically with compression tests of concrete, variations in test results, and evaluation of tests.

The new ACI bibliography is in 8½ x 11 in. format, saddle-stitched, and punched for easy insertion in a three-ring binder. Price per copy is \$2.

ACI Bibliography No. 1, the first in this ACI series, lists publications and articles on prestressed concrete.

## Taxation of Mining Industry

Equitable taxation of Colorado's mining industry is the subject of the latest Colorado School of Mines QUARTERLY. The 110 page mineral economics journal is written by Dr. Oscar Lentz, assistant professor of economics at Mines.

The majority of the QUARTERLY is devoted to a critical study of the percentage depletion allowances for the extractive industries. It includes an analysis of the legislative rationale for depletion allowances, the concepts and principles underlying that rationale, and a presentation of the broad policy issues facing the federal government.

Dr. Lentz closes his QUARTERLY by taking exception to the taxation methods advanced recently by other Colorado economists. He criticizes most of them for their oversimplification in mine taxation cases—especially those economists who promote the equalization of property taxes between mining and agriculture.

Dr. Lentz calls "unwise" the suggestion that all Colorado metal mining be assessed a severance tax. He states the majority of this Colorado industry is essentially a marginal one and that a severance tax would be both unwise and punitive.

The QUARTERLY, Vol. 55—No. 2, is available through the Department of Publications, Colorado School of Mines, Golden. It is priced at \$1.

## Best Wishes . . .

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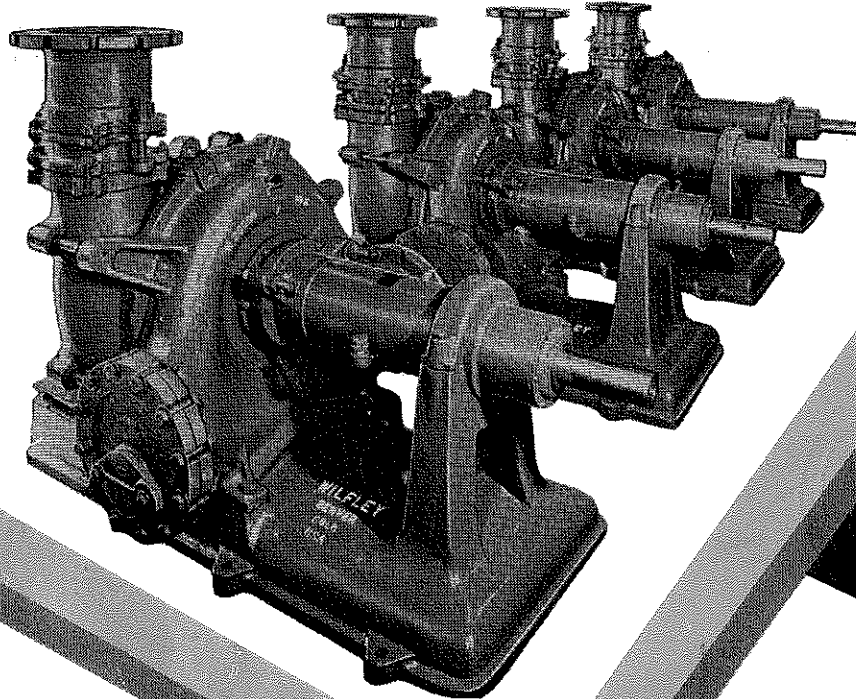
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