Another Complete Mill-to-Smelter Plant ENGINEERED by STEARNS-ROGER

This smoothly operating project including copper mill, smelter and power plant was designed to process 30,000 tons per day. The engineering performed by Stearns-Roger included designs for concentrator, smelter, heavy density plant, power plant, crushing plant, and engineering of supporting facilities also furnished. Confident of Stearns-Roger's reputation, two complete townsite, public buildings, machine and maintenance shops at mine, specifications for thousands of items of mill and smelter equipment was designed to process 30,000 tons per day. The Stearns-Roger offers reliability in design, engineering, fabrication, mill and smelter, transmission lines and lime plant.

(Continued on page 6)
Total grinding costs are lower with CF&I grinding balls and rods

Grinding Balls and Rods have a direct bearing on major grinding costs — mill throughput and power consumption. The use of CF&I Grinding Balls and Rods will actually increase your mill throughput, lowering power per ton of material ground. This is a result of the microstructure of the high quality steel made and used by CF&I.

CF&I Grinding Balls have the balance of hardness and toughness that provides proper wear and impact resistance. In addition, their excellent abrasion resistance permits them to wear evenly and retain their original shape. CF&I Grinding Rods — through controlled mill chemistry techniques — have excellent wearing properties, resisting bending and premature breakage.

All these factors contribute to more efficient grinding, higher throughput... lower grinding costs. For the complete story on the advantages of CF&I Grinding Balls and Rods, contact your local CF&I sales office.

Other CF&I Steel Products for the Mining Industry

CF&I Industrial Screens • CF&I-Wickwire Rope • CF&I Grader Blades
CF&I Mine Rail and Accessories • CF&I Rock Bolts and Reelock Metallic Fabric

THE MINES MAGAZINE
May, 1960

CONTENTS
63rd ANNUAL NATIONAL WESTERN MINING AND ENERGY CONFERENCE
FORWARD WITH THE MINING INDUSTRY
RESOLUTIONS (COMMITTEE REPORT)
The Economic Future of Atomic Energy
By Dr. Paul F. Harteck
Radioisotopes in the Mineral Industry
By Fred L. Smith
A Landmark — The Denver Mining Club
By J. C. Milanes and T. B. Young
Underground Blasting Experiments Using Ammonium Nitrate in Small Diameter Holes
By J. G. Milanes and T. B. Young
A Dilatometric Investigation of a Portion of the Titanium-Oxygen-Hydrogen System
By Malcolm T. Hayworth

CSP EXPERIMENTAL MINE USED FOR INVESTIGATION OF EXPLOSIVES
By Robert Dynast

INCO Opens Highly Automated Mill in Sudbury Area of Canada

MINERAL ENGINEERING EDUCATION FOR THE FUTURE
By Col. Wendell W. Fertig, '51

CSP DEPARTMENT OF MINING, 1960
By Maxwell P. Aplin, '48

26th ANNUAL ENGINEERS' DAY

DEPARTMENTS
CLASS NOTES
NEWS OF THE MINERAL INDUSTRIES
TECHNICAL SOCIETIES AND ASSOCIATIONS
FROM THE EXECUTIVE MANAGER'S DESK
OFFICE OF THE MINERAL ASSOCIATION
ALUMNI BUSINESS
ALUMNI NEWS
LETTERS TO THE EDITOR
IN MEMORIAM
FROM THE LOCAL SECTIONS
CAMPUS HEADLINES
OREDIGGER SPORTS
PLANT NEWS
WITH THE MANUFACTURERS
CATALOGUES AND TRADE PUBLICATIONS
BOOK REVIEWS

ADVERTISERS LISTING PAGE 82

THE MINES MAGAZINE
May, 1960

Volume L
Number 5
CLASS NOTES
(Continued from page 3)

JOHN P. DENNY, '42, who recently changed his address to Argo Oil Corp., Houston, Texas, gives his new address as c/o Shell Development Co., P.O. Box 481, Houston, Texas.

EDWARD C. BRYAN, '42, is assistant manager of Ewa Plantation Co., Ewa, Hawaii.

DR. I. MILTON LeBARON, '41, is manager of Ewa Plantation Co., Ewa, Hawaii.

CHARLES R. JOHNSON, JR., 45, formerly with Richfield Exploration Co. in Venezuela, has a new mailing address: P.O. Box 961, Wahiawa, Oahu, Hawaii.

JOHN D. McIVER, '46, writes that he has spent the last two years in designing and constructing a 16,500-ton per month copper refinery south of Baltimore, in Anne Arundel County, Md. Anything to do with the article in the March issue of E&MJ, John will continue as production superintendent of the new Kennecott Refinery.

His address is 47 Cedar Rd., Severna Park, Md.

JOHN H. MASON, '49, who is associate professor of Military Science and Sanction, has been promoted from captain to major.

B. J. FERRIS, '47, formerly of Midland, Texas, has moved to 412 Marshall Dr., Shillington, Pa. The Dennys were formerly living in Schenectady, N. Y.

1946-50

JOHN P. COGAN, '47, area petroleum engineer for Shell Oil Co., Denver, Colorado, has changed his address to Argo Oil Co., 410 Boston Blvd., Dallas, Tex.

L. M. YARBERRY, '46, has left Canada for Kingston, Jamaica, B.W.I., where he is sales engineer for Johnston Engineers, Inc. His mailing address is 1359 S. Walnut St., Copper, Wy.

JOHN H. MASON, '49, who is associate professor of Military Science and Tactics at the Colorado School of Mines, has been promoted from captain to major.

J. W. R. CRAWFORD, III, '48, has moved from Denver to Amarillo, Texas, where he is superintendent of the new Kennecott Refinery.

KENNETH W. PAUL, '49, has moved from Dallas to Aransas, Texas, where his address is 305 Fort Worth National Bank Bldg., Bakersfield, Calif.

DeMAYO's mailing address is 22 1/2 17th St., Denver, Colo.

ROBERT A. MARTIN, development engineer—mining for Pacific Power & Light Co., lives at 3325 SW Cherokee Co., Oregon, Ore.

1951

LUCIUS H. AURICHRUS has moved from San Augustin, Chile, to Bogotá, Colombia.

His address is 47 Cedar Rd., Severna Park, Md.

J. W. R. CRAWFORD, III, '48, has moved from Sacramento to 2400 Maine Ave., Bakersfield, Calif.

GUY ROUCHINS, formerly of Jackson, Miss., now lives at 9309 Nichols Rd., Northwest, Okla.

Lloyd W. Madden, '41

DENVER HILLIAN
Denver, Colo.

THE MINES MAGAZINE • MAY, 1960

In step with modern mining needs
—GARDNER- DENVER

Why is Gardner-Denver so often first choice in mining? Resources have led to the development of equipment for use in every type of rock and ore—safer, more producutive equipment that meets the need of modern mining in open pit and underground.

That's why—time and again—penetration rates go up and costs per foot of hole come down when Gardner-Denver drills and drill steel are used. Why Gardner-Denver mining men have worked side by side. Their combined on-the-job experience and resources have led to the development of equipment for use in every type of rock and ore—safer, more producutive equipment that meets the need of modern mining in open pit and underground.

Edward J. Brook, '23
Lloyd W. Madden, '41

McELROY RANCH COMPANY
Oil Operators Cattle Raisers
405 Fort Worth National Bank Bldg.
Fort Worth, Texas
703 Wilco Bldg.
Midland, Texas
312 Tower Building
Denver U. S. National Center
Denver, Colorado

It is our sincere hope that your visit with us during the April 21, 22, 23, 1960 National Western Mining Conference of The Colorado Mining Association was pleasurable in every respect.

Whenever you're in Denver, may we have the delight of being your hosts?

Respectfully,

Denver Hillian
Denver, Colo.

The Mines Magazine • May, 1960

GARDNER- DENVER
Gardner-Denver Company, Denver, Colo.; Quincy, Illinois
NEWS OF THE MINERAL INDUSTRIES

Paul Weir Investigates Coalbrook Mine Disaster

Paul Weir, chairman of the Board of the Paul Weir Co., Inc., Chicago, returned March 25 from a unique technical mission to Coalbrook, Orange Free State, South Africa, scene of the disaster which occurred on January 21, 1960 and which claimed the lives of 436 miners.

Mr. Weir was engaged by the owners, the Clydesdale Collieries Limited, to join Sir Andrew Bryan, British coal mining authority, to investigate probable causes and to make recommendations.

The two experts agreed that the disaster at the North Colliery was caused by an unprecedented fracture of the overlying strata, resulting in the collapse of an area of mine workings approximately 1,000 acres in extent. This colliery was developed 50 years ago and has operated continuously. No disaster of a similar nature has ever occurred in this coal field.

Mr. Weir is the only living American honorary member of the United Kingdom's Institution of Mining Engineers. Sir Andrew is also an honorary member. Mr. Weir is past chairman of the Coal Division of the American Institute of Mining and Metallurgical Engineers, and an Erksine Ramsay gold medallist.

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World Market for Tungsten To Increase Throughout 1960

Minerals Engineering Co. president R. G. Sullivan believes the "world market for tungsten will increase steadily throughout 1960 as tungsten is becoming increasingly important in high temperature alloys for missiles, rockets, and jets."

Sullivan said recently the development of high temperature alloys has also been responsible for increased interest in metallic compounds that are resistant to high temperatures. He cited such products as electric-furnace abrasives which include tungsten carbide and new cemented carbides which are now used extensively in jet engines, rocket motors, and atomic energy plants.

As a part of the company's expansion program, Sullivan also reported that the program for vanadium production has "sustained earlier predictions." He said the company expects to build additional facilities adjacent to its Salt Lake City vanadium plant within two months and expects to be in full production of vanadium during the fourth quarter. The new Salt Lake City facilities, Sullivan said, will be constructed to produce "vanadium pentoxide" from the by-product vanadium.

(Continued on page 10)
Anti-Smog Devices Stimulate Vanadium Pentoxide Output

R. G. Sullivan, president of Minerals Engineering Co. of Grand Junction, Colo., said a five year contract signed by his firm for the full by-product vanadium production of the Mineral Products Division of Food Machinery and Chemical Corp., of New York City follows the recent vote of the California legislature requiring anti-smog devices on cars and trucks.

In citing the California action, Sullivan said the catalyst "vanadium pentoxide" for California's 7,000,000 vehicles alone would amount to approximately 80,000,000 pounds, which is more than six times the nation's current output. Minerals Engineering will produce vanadium pentoxide from the by-product vanadium.

"A rapidly increasing demand for vanadium is assured as vanadium pentoxide is the least expensive as a main constituent, as a catalyst, for vehicle smog control units," Sullivan said.

Vanadium pentoxide is now being used at the annual rate of 12,000,000 pounds in the United States, according to the U. S. Bureau of Mines. Sullivan said that up to now major uses were for alloy steel, as a catalyst, and atomic energy uses as a pure metal.

New facilities will be set up by Minerals Engineering to handle the by-product vanadium that will be shipped from the Pocatello, Idaho plant of F.M.C.'s Mineral Products Division, Sullivan said.

The Minerals Engineering Co. president said that his company will construct a new refinery in Salt Lake City, adjacent to the company's existing tungsten refinery, to produce commercial grades of vanadium pentoxide. Under the terms of the new contract, Sullivan said, initial shipments will be made by Food Machinery and Chemical Corp. in early July. He estimated that his company will begin production at the new Salt Lake City facilities within 60 days of receipt of the first shipment.

Minerals Engineering Co. is a leading producer of tungsten and a pioneer in mining and treatment of vanadium-uranium ores. The company's operations are carried out in three states—Montana, Utah, and Colorado. The firm also operates in Mexico. Executive offices are located at Grand Junction, Colo.

Third Semi-Annual Report Released by OME

The Office of Minerals Exploration released 12 applications for minerals exploration assistance, entered into five new contracts with mine operators for exploration assistance, and certified discoveries on 12 projects during the last half of 1959, according to its third semi-annual report.

The report was prepared for transmittal to Congress pursuant to Public Law 701, 85th Congress. The report says that public interest in the exploration assistance program is somewhat less than that shown in previous periods.

The Office of Minerals Exploration succeeded the Defense Minerals Exploration Administration as a permanent agency of the Department of the Interior and participates with private industry in exploration for critical and strategic minerals.

During eight years of operation, the financial assistance granted by the Defense Minerals Exploration Administration resulted in the discovery of mineral reserves having a net recoverable value of $800,000,000.

Vanadium Pentoxide Being Sold by AEC

Invitation to bid on approximately 1,500,000 pounds of fused vanadium pentoxide (V2O5) have been distributed by the United States Operations Office of the Atomic Energy Commission at Grand Junction, Colo. Sealed bids will be received until 10 a.m. Mountain Standard Time, on May 23, 1960, and bids will be publicly opened at that time.

Twenty-two lots totalling approximately 1,500,000 pounds of vanadium are being offered for sale. The lots range from a low of about 42,000 pounds to a high of 102,000 pounds, with the average size about 64,000 pounds. The material is in 30 and 55 gallon steel drums.

The vanadium being offered for public sale is stored at Grand Junction and is a part of the material purchased over the years from the uranium processing mills.

Widest Plates in World To Roll from New Mill

A new rolling mill to produce steel plates wider than any now available in the world will be built at Gary, Ind. Steel Works. Construction of the facility, which is scheduled for completion early in 1962, will not interrupt production on a 160-inch plate mill built during World War II that the new mill will supplant.

The new facility is designed as a combination 160-inch and 210-inch wide plate mill. This provision for rolling and flattening at either width is a steel industry "first," adopted by United States Steel in order to obtain exceptional plate surface quality and flatness on the full range of products from the mill.

(Continued on page 12)
To Provide Cleaner Air
Atomic Product May Help
ment scientists during a meeting of several topics discussed by govern­
combat urban air pollution was one of the topics by the Bureau of Mines, which hopes to develop a device to reduce particulate matter in automobile exhaust. The device, a filter, would be installed in the exhaust system of an automobile to trap the particulate matter before it is released into the atmosphere. The Bureau is working with automakers and other interested parties to develop a practical and effective solution to the problem of automobile pollution.

This material is called "depicted uranium" because most of the fissionable material in uranium hexafluoride is depleted uranium, which is available in the form of depleted uranium. This material is used in nuclear reactors as a fuel and is also used in nuclear weapons.

Submarine Manganese Deposits Will Be Photographed
The U.S. Navy Electronics Laboratory, San Diego, Calif., will have a new deep-sea camera for photographing the ocean bottom in an area where Russian oceanographic ship, "Vityaz," was photographed. Nodules were also high in manganese, an important industrial mineral.

New Mexico university students are conducting research on the potential uses of semi-taconite, a type of iron ore. The research is being funded by Consolidated Western Steel and the goal is to determine the commercial possibilities of semi-taconite. The research is being conducted at the university's pilot plant.

Thor Power Tool Co., Aurora, Ill., has developed a new feed drill that outperforms every other drill in its class. The new drill has a retractable feed leg and is designed for use in push feed drills. It provides more control and stability than other drills, allowing for more precise drilling and a cleaner cut. The Thor "Red Tool" distributor and Thor service branch are distributors of the new drill.

R. W. Oehman Named Chief Of Bureau’s Region III Office
Robert W. Oehman has been ap­pointed regional director of the Bu­reau of Mines office in Denver, suc­ceeding J. H. East, Jr., who retired last year. Mr. Oehman has been with the bureau since 1942.

Region III office directs bureau ac­tivities in Arizona, Colorado, Ne­braska, Nevada, New Mexico, North Dakota, South Dakota, Utah and Wyoming.

MINERAL INDUSTRIES
(Continued from page 10)

MINERALS FOUNDRY & MANUFACTURING CO.
PLANT ESTABLISHED 1852
MINING, MILLING AND INDUSTRIAL MACHINERY
TUNNEL AND DYE CASE—MINERALS GROUP, CONVERTERS, ETC.
NEVADA CITY, CALIFORNIA
P. O. BOX 67

Thor Power Tools
Everything you want in Push Feed Drills... and more!

Thor’s new model 330 push feed rock drill outperforms every other drill in its class... a fast, rugged, perfectly balanced drill with convenient controls. New feed legs have been engineered for use with the Thor model 330.

Model 335 is a power retracted feed leg, single stage, which extends 48" in opera­tion. Feed rod extends from bottom of cylinder.

Model 355 is a telescopic, manually re­tracted leg which extends 78" in opera­tion. Feed rod extends from the top of the cylinder.

Either leg is easily attached to the drill by a single nut. The valve controls the air and water supply to drill and feed leg. Ask your Thor “Red Tool” distributor or Thor service branch for complete information.

Thor Power Tool Co., Aurora, Ill. Branches in all principal cities.

THE MINES MAGAZINE • MAY, 1960
THE MINES MAGAZINE • MAY, 1960
Crabtree and Grenier Plan
Mining Congress Program
Edwin H. Crabtree, director of the Colorado School of Mines Research Foundation, Inc., and Lee C. Grenier, general manager of Magnatvue Barium Corp. in Greybull, Wyo., will help plan the 1960 program of the American Mining Congress convention to be held in Las Vegas, Nev., Oct. 10-13.

Mr. Crabtree obtained his E.M. degree from the Colorado School of Mines in 1937 and is serving this year as president of the CSM Alumni Association.

Wyo. Mining Convention
Scheduled for June 10-11 At Jackson Lake Lodge
The 1960 Convention of the Wyoming Mining Association will be held Friday and Saturday, June 10-11, at Jackson Lake Lodge in Grand Teton National Park. Annual meeting of the association has been set by the board of directors for 8 p.m. Thursday, June 9, at Jackson Lake Lodge, R. F. Love is general chairman, Roy Coulson, program committee chairman, A. V. Quine, arrangements and resolutions committee chairman, Mrs. Terry Love, ladies’ committee chairman.

The convention program is as follows:

Friday, June 10
Welcome
Harry Barker, Jr., State Legislator, Trona County
Greetings
Jack W. Gage, Secretary of State, State of Wyoming
“A Look to the Future”
Myron L. Sisson, President, Wyoming Mining Association
“Percentage Deposition”
Steve O’Brien, Tax Specialist, American Mining Congress, Washington, D.C.
“Mining on Our Public Lands”
Val Payne, Area Director, T. B. Brannon of Land Management, Denver, Colo.

Luncheon Meeting
Speaker to be announced
“Application of New Labor Legislation”
Kenneth C. Kellay, Attorney, Lead, S. Dak.

“Honest is Industry”
Paul Ocheltree, Assistant Manager, Technical Division, Wiggins Coal & Coke Corporation, Texas
“Underground Mining is Poofy”
Consolidated Pennsylvania Coal Co.
Panel Discussion
Moderator—C. H. Farnsworth, General Superintendent, Continental Materials Company, Nevada
Ken A. Nobs, Superintendent, Hidden Splendor Mining Co., Riverton, Wyo.

Saturday, June 11
Luncheon Meeting
Jack H. Bailey, Project Manager, Utah Mining Co., Casper, Wyo.
“Greetings”
“Ladies Appreciation”

Panel Discussion
“Application of New Labor Legislation”
Fred Chisliolm, Assistant Manager, Hidden Splendor Mining Co., Riverton, Wyo.
“Laboratory and Pilot Plant Techniques,”
Myron L. Sisson, President, Wyoming Mining Association, Casper, Wyo.
“Construction and Operating Costs for Latin American Projects,”

“Ladies Appreciation”

Thumbnails of Service Centers for Steel and Aluminum Complete Handling, Cutting, and Machining Facilities in Salt Lake City brings to THREE the number of Silver Service Centers in steel and aluminum. Complete handling and transport facilities permit fast delivery through the four-state area; you need not carry large inventories. Permit us to show you how Silver Service saves you money.

The new, bigger A-C grinding mills actually float on oil. Process industries are grinding out bigger profits because of Lubritrol constant lubrication system. No bearing-wearing starts. No dry sliding after shutdown. Less wasted horsepower. All functions of the Lubritrol system are automatic... controlled by foolproof pressure gauges and switches. The system is filtered to remove contaminants.

When you modernize your operation, check the benefits of an Allis-Chalmers grinding mill — the only mill that gives you the positive production, the operating and maintenance economy of Lubritrol constant lubrication. See your A-C representative, or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin. In Canada, write Canadian Allis-Chalmers Ltd., Box 37, Montreal, Quebec.
The tough ones come to Card

Card Automatic Bottom Dump Skips Serve U. S. Producers in Most Major Mining Areas

This is a progress report on a relatively new idea. Beginning in 1956, increasing demand for the new Card automatic bottom dump skips has gradually brought them into service in a majority of the nation's principal mining areas—from Arizona to the Canadian line. In a typical operation two of these Card skips of approximately 150 cu. ft. capacity each are used to haul ore up a thousand-foot three-compartment shaft at a rate in excess of 900 tons per day.

In the initial year of operation, in one such installation, these automatic skips carried over 270,000 tons of rock before needing attention other than routine maintenance. The same successful design will prove out in your next project. It can be adapted to any capacity and specifications with ease.

Tell us your requirements.

C.S. Card Iron Works Co.
2501 WEST 16TH AVE.
DENVER, COLORADO
63rd ANNUAL
National Western Mining and Energy Conference

Denver's fabulous new Hilton Hotel was the scene of the 63rd Annual National Western Mining and Energy Conference, April 21-23. Spacious lobbies, conference and banquet rooms overflowed with an estimated 2500 mining men from throughout the nation. Speaking or presiding at general and special sessions, luncheons and banquets were some 175 mining industry leaders, mining operators, scientists, educators, national and state government officials, and business executives. Ore and rare mineral specimens were exhibited, and many companies manned booths displaying equipment or services pertaining to the mining industry.

CISM Speakers

Colorado School of Mines faculty members and CSM Research Foundation personnel speaking at the conference and the titles of their addresses were: Dr. Oscar H. Lentz, assistant professor of economics, "Mineral Economics and the Problem of Equitable Distribution"; H. E. Grooower, mining department, "The Photostress Meter and Its Underground Application"; John Moss Jones, mining department, "Mining Engineering Education"; Fred L. Smith, manager of mining division, CSM Research Foundation, "Use of Radioisotopes in the Mineral Industry" (published in this issue of the magazine); James O. Millmore and T. R. Young, CSM Research Foundation, "Preliminary Blasting Experiments with Ammonium Nitrate Fuel Oil Mixtures" (published in this issue of the Magazine).

Energy Resource Luncheon

The luncheon held the first day of the National Western Mining and Energy Conference (Thursday, April 21), was devoted to the general topic of Energy Resources. Arthur C. Gregory, attorney at law, Denver, presided.

Dr. Brymer Williams, University of Michigan, Ann Arbor, discussed his "Observations in the Chemical and Metallurgical Field." He did not use a prepared text, yet several points were so pertinent that they should be repeated here, at least in outline form. "The mining industry," he said, "is the last to pay attention to population increase." By 1975, Battelle estimates that there will be 245 million people in the U.S., although the Bureau of the Census estimates only 226 million. In the former figure, there will be 65 million individuals of age 15 years or younger. Eighty million people, or one third of the total population, will be below voting age.

Transportation has been faced least squarely by the Eastern Railroads who do not care for passengers. Yet the railroads do not abdicate their responsibility to move people. At present, they are interested in bulk shipments, but the coal pipes line of Hanke Co. is moving coal cheaper and faster than it has ever moved before. The days of rail shipment of bulk commodities may be passing. The canals are coming back, and the Ohio River is becoming a much more important highway than the railroads that traverse its banks. Power is being shipped by power line at new ultra-high voltages of 300,000 to 450,000 volts.

The one priceless possession which the railroads control is their right of way. Unobstructed, it leads into the heart of every major city and offers access that cannot be gained by any other means. The Ohio Turnpike is just five years old. Yet traffic has so far exceeded estimates that there is a water shortage at each of the service plazas, although the supply was considered adequate for 15 years when it was completed. Super highway construction will not keep up with requirements and auto traffic faces eventual strangulation.

Continuing, Mr. Anderson touched on other problems, such as energy. He said that Admiral Byrd's observation was convinced that the nation would have to depend on nuclear power but shut from plants we now know them. At the new reactor at Shippingport, Pa., power costs are 65 mills which is certainly not economic. The cost must be brought down in 7 mills to compete. This will be possible in new thermo-electric bi-metallic units which will operate with a stream of scintillating gas, eliminating the boiler and its steam cycle.

The present surplus of food will not last, and yet we are doing little to develop other sources. Of the 5,000 edible plants known, only 20 are being used for food here. The best farmland is being consumed by the ruthless urban expansion. Recreation facilities will require great expansion, for they are in sad shape now. If improvements are not made, the tourists will go to Europe. Mexico and else where instead of visiting the National Parks and mountains of the West. Mr. Anderson believes that this demand will be overwhelming and that the West is not making as effort to meet this need if it expects to keep tourists coming out here.

Industrial competition will increase as the European economy continues its remarkable advances, Mr. Anderson said. "In my several trips to Europe I never found the average European. I found Italians in Italy, Frenchmen in France, and Germans in Germany. It is only here in the United States that you can find an average European. It is only here that you can have Chinese food in an Italian restaurant in an Irish neighborhood."

The European small cars were developed because the European could not afford a big car. High gasoline taxes, tax laws, and heavy taxation forced the development of the small car. Imported here, they were welcomed for the same reasons—they were cheap and they required little gasoline. He said, "It is possible to drive one of these small cars and park the car in the city. Costs of getting there are not exorbitant, and the little fellow travels from traffic light to traffic light with the same lighting speed as the big American car. In fact, it has to travel longer and lower cars are unsuitable, by 1975 the big American car would have to be 10 feet long, with 7-inch wheels, and with the eyes of the driver level with the pavement."

The auto industry turned to the compacts, and now although Chrysler prepared text, yet several points were so pertinent that they should be repeated here, at least in outline form. "The mining industry," he said, "is the last to pay attention to population increase." By 1975, Battelle estimates that there will be 245 million people in the U.S., although the Bureau of the Census estimates only 226 million. In the former figure, there will be 65 million individuals of age 15 years or younger. Eighty million people, or one third of the total population, will be below voting age.

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The auto industry turned to the compacts, and now although Chrysler
is producing more cars than ever before, they are using less steel. A compact car takes 1000 pounds less steel than the usual small car. More cars and less steel seems to be the picture.

From this, Mr. Anderson said, we should draw a parallel and learn a lesson. In the horse and buggy days, there were only two makers of buggy whips. They had no labor problem, no competition, plenty of raw materials and a fine product. Yet, they were dead when the buggy went out of business.

Cut your business plans to fit changing conditions and do not simply extrapolate figures to prove that if "X" pounds of "Y" product are used per capita, that a mere increase in numbers will certainly increase the consumption of product "Y". Remember the buggy whip business.

Mr. Anderson concluded, "It went from capacity to oblivion with changing times, while population continued its spiraling climb."

The third speaker on the program was Dr. L. M. Curtice, vice president, Bulloch and Wilcox Co., New York.

His subject was 'Nuclear Fuels and the Energy Gap." This address was too long and too pertinent to be bridged here. It will be printed in full in a later issue. In closing he said, "Now is the time to be over-cautious. Most of us may have their doubts, but Mr. Khruzhev says they will bury us in economic warfare. He may be right—but I doubt it. I think, that regardless of what approach the big black bear may make, we in the Free World must continue our upward program. Although the development of nuclear power would be our way.

It was a profitable lunch for those who attended. The talks were timely, and the food was excellent.

Joint Luncheon Friday

Herman Frucht, vice president, American National Bank, co-chaired for the April 2 luncheon program, introduced Dr. Paul F. Genachte, director, Atomic Energy Division, Chase Manhattan Bank, who spoke on the subject, "The Economic Future of Atomic Energy." Dr. Genachte has not been stumped by the clamor that atomic power has failed to live up to expectations but has preserved his belief in the potential of atomic power to help the U. S. and the world bridge any energy gap that may occur in the near or distant future. He recognized the problems that remain to be solved, but is confident that there will be a solution found. His article is given in full in this issue of THE MINES MAGAZINE.

Robert Henderson, manager Western Operations, Climax Molybdenum Co., Golden, Colo., as co-chairman of this joint luncheon, introduced Oscar L. Altman, advisor, Research and Statistics Department, International Monetary Fund, Washington, D.C. Dr. Altman presented his views on "The Role of Gold in International Liquidity." He stated that the views presented were his own and did not necessarily reflect the official position of the International Monetary Fund. After discussing the development of gold standard in the latter part of the 19th century, he passed on to consider the structure and behavior of gold reserves and the amount of the world's supply of monetary gold. Nearly all monetary gold has now been gathered into official holdings. Economic developments since World War II have changed greatly the structure, ownership and distribution of these gold reserves. Whether they are adequate or not is a question that elicits many answers. Too completely inadequate to more than adequate. "However, no amount of reserves will be adequate," Mr. Altman said. "If the most important countries cannot learn to live within their means."

Frequent proposals to increase the price of gold, thus increasing substantially the amount of gold reserves, would devalue the dollar, penalize countries and individuals who have kept their assets in dollars, and eventually give an upward push to prices. The effect on the Russian gold reserves would be substantial. "It is a matter of considerable scrutiny," he was told. "to think that people who would instantly reject the idea of lending the U.S.S.R. $1 to $8 billion would seriously consider doubling the price of gold, which would virtually present the Soviets with the same amount as a gift."

In closing, Mr. Altman said, "Our international financial machinery has developed a great deal since the war, and it will continue to develop. A realistic appraisal of present conditions, and of the foreseeable future, shows us problems but not crisis; it suggests that we should be concerned but not fearful; and it counsels us to perfect the international financial structure we already have, rather than rush on far-reaching measures for which we are not ready."

THE MINES MAGAZINE • MAY, 1960

THE MINES MAGAZINE • MAY, 1960

Dr. Robert M. Grigson, Development Dept., Climax Molybdenum Co. of Ambrosia Lake, N. M., was addressed by Dr. Paul F. Genachte and by Genachte, director. Atomic Energy Commission. Dr. Genachte has not been stumped by the clamor that atomic power has failed to live up to expectations but has preserved his belief in the potential of atomic power to help the U. S. and the world bridge any energy gap that may occur in the near or distant future. He recognized the problems that remain to be solved, but is confident that there will be a solution found. His article is given in full in this issue of THE MINES MAGAZINE.
the mining industry should not expect too much in the form of new markets if the nation mobilizes for an emergency.

"The national stockpile of 75 strategic and critical materials can now meet emergency mobilization requirements," Price said. "I don’t foresee any immediate findings which would justify major changes in the stockpile."

Stockpile objectives, Price stressed, are governed only by national security.

"My office has an obligation," he said, "to restrat all efforts to use the stockpile as a drain to reinforce our defenses, as a source of materials not otherwise available, in normal operations of the nation’s economy, but this does not mean an indifference to the problems of any industry or to the general health and vigor of the country."

Price pointed out that OCBM maintains a constant lookout for trends toward the defense use of new metals and cited current research in development of molybdenum, tellurium and tantalum. "Neither the famous Sowbelly Dinner, former Sen. George W. Malone of Nevada called to Congress to "retain its constitutional responsibility to regulate foreign trade and the national economy," he said. "It is up to the mining associations of the West to fight and fight hard for proper recognition for the domestic mining industry... It is not for Congress to establish a national policy through legislation so that the United States will not become self-sufficient."and comparable to the world price of $63.

(3) Extending the manganese car- ing location and opposing passage of any legislation, such as the Wilder- ness Bill, that would deprive the miner of his right to locate claims on public lands.

(4) Extending uranium purchas- ing contracts beyond 1962 in the event that the Atomic Energy Commission abrogates the 1962 contracts.

(5) Consolidating federal and state inspections departments dealing with radiation to avoid duplication or conflict in establishing radiation standards.

(6) Maintaining lead and zinc quotas set by the president until an adjustable duty of 4 cents a pound on each metal can be imposed.

(7) Extending the manganese barrel purchasing program another year to permit inventories to realize a return on their investments.

(8) Exemption of legislation for small miners to permit tungsten production of up to 1,000 units a year per mine and establishing a unit price of $63.

(9) Retaining the system of mine location and opposing passage of any legislation, such as the Wilderness Bill, that would deprive the miner of his right to locate claims on public lands.

Newly Elected Officers
Colorado Mining Association of- ficers, elected at a business session held during the National Western Mining Conference, are: Robert Henderson, manager of western operations for Climax Molybdenum Co., president; John A. Westman of Climax, Inc., president; J. F. Brenton of Grand Junction, Cardwell, Northrup, treasurer; H. W. C. Prommel, secretary, and W. H. H. Gunther, vice president (His address is given in full in the issue of THE MINES MAGAZINE.)

Resolutions Summarized
Resolutions adopted at the con- vention called for:

1. Encouragement of the mining industry through legislation so that the United States will not become self-sufficient.

2. Discontinuation of the secretary of the treasury to sell silver from the treasury to consumers at a price below the world price, allowing the world price to seek its own level.

(3) Recognition by the United States that gold should seek its own price level. If international commit- ments would embarrass U. S. foreign policy, then domestic- international agreements, then domestic-
Forward with the Mining Industry

By ROBERT S. PALMER

Executive Vice President, Colorado Mining Association

Colorado is a reservoir of raw materials of ever-increasing variety. The expanding use of raw materials and the economic progress of mankind go hand in hand. In our striving to improve the lot of mankind, we have drawn more and more on mineral resources, for the advancement of our social standard of living.

At times, supplies of raw materials—particularly the metals—have been inadequate to meet current needs. With increasing world population, it is recognized that mineral deposits are irreplaceable and cannot be increased. It has been evidenced that they may not be sufficient to meet the needs of the future. These auxiliaries are supplemented by the increasing dependence on military security on adequate mineral resources, essential in emergencies which arise from time to time where they are indispensable in modern warfare.

Premium Price Plan Recalled

Many remember the days of the Premium Price Plan, when the Federal Government was doing everything possible to encourage the production of lead and zinc in the United States. Bonuses were paid on low grade production. Some remember erroneously that the United States Government was forced to pay for foreign production during periods of shortages in the United States.

The exhaustible nature of mineral deposits creates problems of depletion, which are not present in products from animal and vegetable sources. Substitutes have been resorted to by some industries in times of shortages, but in the main the basic materials are as essential to man's welfare today and will be tomorrow.

Use of Metal Reflects Living Standard

The remarkable thing about those figures is that they reflect the true standards of living enjoyed by the different peoples in different countries. The greater use of metals—the higher the standard of living. The average American uses only one-fourth as much energy or metal as his American counterpart. It might be explained, of course, that Russian consumers are being neglected to a certain extent because they cannot be seen to meet heavy concentration on military production, but whatever the facts, it is clear that metals are highly essential to a highly productive community.

No satisfactions can be realized by us when we know of the many metal products that are not found in many parts of the world. But the point is, that as those countries advance, they will demand the use of more metal. More metal will be used as the standards of living advance. It is equally true that as military requirements of great power governments increase, the governments themselves will place heavier demands upon mineral products.

Exploitable Resources Inadequate

If world averages should move up to those presently enjoyed by the United States, or even those of Free Europe, exploitable reserves as we know them would shrink alarmingly. This assertion does not take into consideration the additional factor of increased world population. The inescapable conclusion, however, is that as we march forward, world exploitable resources will become grossly inadequate.

Some recent studies on this subject have been compiled by the U.S. Bureau of Mines and various international organizations. It is illustrated that in 1956 the cost factor of production is apt to be higher in the near future than it was in 1956. Similar impressive figures could be given for the other metals. These figures are undoubtedly impressive to today's producers, striving to survive in a period of depressed prices and overproduction. It is hoped that they would encourage those who seek to hold onto their mining claims for the long pull.

Mineral Scarcity Inevitable

The United States cannot long survive without an adequate metal supply for its industry. The outlook for the long term future is undoubtedly mineral scarcity, particularly with the common nonferrous metals. The cost of production is apt to be higher in the near future than it was in 1956. Similar impressive figures could be given for the other metals. These figures are undoubtedly impressive to today's producers, striving to survive in a period of depressed prices and overproduction. It is hoped that they would encourage those who seek to hold onto their mining claims for the long pull.

In a country which has a vital need for metals, the cost of production is never secondary. No one can deny that throughout the world nationalism is growing. With the growth of nationalism, many political factors are introduced which influence the discovery of new deposits. Revolutionary new methods of scientific ore finding have been developed. Research in this field is going forward rapidly.

Energy resources may be regarded as inexhaustible. Coal reserves exceed a thousand years' supply at current rates of use. Oil and gas are less abundant. Estimates here have been that the total recoverable natural oil and gas in the earth is approximately equivalent to a supply of about 90 years at current rates of use, but of course consumption is advancing rapidly.

World Nationalism Growing

The Rocky Mountain Oil and Gas Association has pointed out that reserves of crude oil in the United States are equal to a nearly 15 year supply at current production rates and those of natural gas at 22 years. Our oil shales will undoubtedly come into play and we will hear much about the potential of oil shale at this Convention. A great many are very much on the horizon and if it develops that this is not sufficient to meet man's needs, then of course there are other ideas advanced, including the utilization of solar and outer space energy sources.

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The efforts of the Western Senators, Congressmen, and Governors, in their support of the mining and milling activities of their constituents is warmly com­ mended. Our thanks also go to our many supporters in Congress of the South and West who, against entrenched opposition, have resigned and yielded the vital meal that is bold, assertive and constructive min­ isterial program. Additionally, we gratefully acknowledge the cooperation of other mining organizations allied with us in our efforts for the betterment, and indeed the very life, of the mining industry. In presenting this declaration to the nation, we are confident of the continued support of all of these friends and allies and others everywhere, who understand that this great country can only prosper from a healthy and active mining industry.

The mining companies suffer from a continued lack of scientific achievement in metals and minerals, which is in effect abandoned. In the light of these general decla­ rations that we submit our resolutions.

Administrative Proceedings Reform

Elementary justice requires a single agency to administer the laws of the Public Lands.

Interference by and between bureaus or departments of government in the administration of the public lands is an absolute evil. A few is all that is necessary to prevent the effective enforcement of the laws.

A district office cannot confer power or retain authority because the very department that is conferring such power is in charge of the very office that is charged.

Officials of the Interior Department is charged.

The Mining Laws are not administrative.

Mining Procedure

New laws are needed to expedite the mining process. The current laws are outdated and do not provide for the mining industry.

Mining Locations are Private Property

The Department of Agriculture, the Forest Service and Bureau of Land Man­ agement should exercise moderation in their handling of mining claims. Under current practice, it is being al­ leged that the government is failing to issue mining claims.

We advocate a greater recognition of the value of mining claims. Any tax system which dis­ criminates against mining in any way cannot be allowed to circulate the national supply of minerals.

We stress the need for property in mining claims. Any attempt to control the mining industry by taxation cannot be taken away by any policy. Rights under a valid loca­ tion are property. They can only be di­ verted by due process of law. Due proc­ ess means actual service of notice on the individual owner and not a mere con­ servative notice which in all probability he will never see.

Single Purpose Withdrawals

Recognizing that a withdrawal of the public domain for a single purpose is indis­ pensable with multiple uses, we desire to advocate free enterprise use of public land. This has been the American's right and privilege since 1781. It has been described as "the American Nation," as a general government on the socialist model of other nations.

We expose the single-purpose with­ drawal of public domain advanced in the proposed National Wilderness Act, and we commend both Senators O'Mahoney and Allott for their constructive efforts in our behalf.

Public Lands and the 1872 Act

The time-tested system, established by the General Mining Law, for locating and patenting mining claims, has proved to be a costly and shortsighted step. The success of the national defense can be threatened and its standard of living undermined.

We declare that mining will provide the necessary goods to our people and enhance the environment.

Taxation of Non-Producing Mines

The various districts, which have the task of enforcing the laws, must be allowed to concentrate on their mission without the distraction of other duties.

We oppose the single-purpose with­ drawal of public domain advanced in the proposed National Wilderness Act, and we commend both Senators O'Mahoney and Allott for their constructive efforts in our behalf.

Resolutions

Committee Report

Colorado Mining Association

As for gold, 11.7 billions of dollars in reserve are necessary to keep constant­ ly productive mining. It is evident that the thirteen banks of the Federal Reserve System are unable to produce the billions of dollars in reserves necessary to keep constant­ ly productive mining. It is evident that the F.R.S. cannot produce the billions of dollars in reserves necessary to keep constant­ ly productive mining. It is evident that the F.R.S. cannot produce the billions of dollars in reserves necessary to keep constant­ ly productive mining. It is evident that the F.R.S. cannot produce the billions of dollars in reserves necessary to keep constant­ ly productive mining. It is evident that the F.R.S. cannot produce the billions of dollars in reserves necessary to keep constant­ ly productive mining. It is evident that the F.R.S. cannot produce the billions of dollars in reserves necessary to keep constant­ ly productive mining. 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The Economic Future of Atomic Energy

By Dr. PAUL F. GENACHTE

The present Atomic Energy Commission budget for the fiscal year 1960 calls for expenditures of approximately $2.7 billion. This is about the same amount that was expended in the fiscal year 1959. This amount includes—and this is important to you—close to $740 million for raw materials, i.e., primarily heavy water, thorium dioxide and U.S. mill products; and those in Canada and other nations.

The known uranium ore reserves in the United States as of Dec. 31, 1959 amounted to approximately 86 million tons containing 28% U,0_2, or a total of 240,000 tons of uranium oxide. The proven reserves in Canada amount to 377 million tons of ore with 389,000 tons of uranium oxide. The South African uranium recovery in the year 1960 is estimated at some 1,113,000 tons of ore containing 370,000 tons of uranium oxide.

Uranium Oxide Production

Uranium oxide production in the U.S. last year amounted to slightly more than 15,000 tons. Purchases from Canada, with 13,700 tons coming from Canada and the remainder from South Africa, Australia, the Belgian Congo and Portugal. The U.S. is also the producer of UPA.

Our milling capacity in the U.S. could be increased by a few more mills in southwest Texas, New Mexico and South and South Dakota, but this would not result in any substantial increase over the present milling capacity of 22,000 tons of ore per day equivalent to some 20,000 tons of uranium oxide per year. In fact, it is likely that the output from our domestic mills through the end of 1966 will not exceed 18 to 20,000 tons of uranium oxide per year.

AEC Agreement with Canada

As you know, the bulk of the Canadian output is delivered to the U.S. and the present level of milling is approximately 15,000 tons per year. The AEC could have exercised options before the end of 1959 as the present contracts through 1966 at the same price of $8 per lb. of uranium oxide, be paid to our domestic mills. On Nov. 6, I mentioned that it was unlikely that we would exercise its options, but it did agree to a stretch-out arrangement with Canada to purchase uranium concentrates in the post 1962 period through Dec. 31, 1966.

The new plan provides for a single contract between the Consolidated Mining and Refining Corporation and the AEC instead of the several contracts which had existed heretofore, each covering an individual operator. The entire quantity of ore to be delivered and the prices to be paid under existing contracts remain unchanged. In order to help the Canadian companies meet their financial obligations on the basis of advances and loans or advances, the Canadian government will become a tenant in the same time as delivery would have been made had there been no deferral.

The AEC agreement with Canada is a rational solution to this problem that has been discussed in the past. The agreement with Canada will certainly be the best solution provided that the Canadian companies are willing to accept the revised contract in the form that has been arrived at.
millions for the reactor program. This total includes
AEC for the fiscal year 1960 allots more than $400
million. It is likely that quite a few reactor concepts will become
private effort augurs well for the achievement of
fissionable reactor program, as we have the greatest number
wards the development of the organic-moderated re-
fissionable materials are in the form of solid fuel
placed on the heterogeneoius reactors in which the
form of a slurry^, have shown that the technical prob-
doms in terms of useful energy produced, while also
portional lengthening of the lifetime of the fuel ele-
ments in terms of useful energy produced, while also
reducing the capital costs of the kilowatts of installed capac-
ity. General Dynamics promises efficiencies of at least 32
per cent. It is not expected that this new fissionable
concept now being developed. Undoubtedly, competitive atomic energy will not be achieved with-
cut rates of efficiency we have at present.

Organic-Moderated Reactor

In 1959, the technological emphasis shifted to
the development of the long-burn, pool, and partial
focus on the heterogeneous reactors in which the
fissionable material is in the form of solid fuel
elements. It is likely that research work on an ex-
tensive scale on homogeneous reactors will only be possible when those solid fuel elements have begun to deliver economic power.

Superheated Steam Lowers Cost

One way to lower the cost of electricity made from the
long-burn reactor, and partial
emphasize is now being placed on this process. Re-
tectors have been operated at rather conservative tem-
rapatures because of the danger of a hot spot in a
reactor which might cause a meltdown of one of the fuel elements and thus release radioactive fission
products in the cooling water. One of the advantages
of a thermodynamic efficiency of only about 25 per cent. Of course, this does not compare with the efficiency of
about 40 per cent (8,000 BTUs per kilowatt-hour) ob-
tained in some of the most modern conventional plants.

All the principal companies are present in the area of nuclear steam. Any increase in the
overall thermodynamic efficiency, and this is ex-
tremely important, will automatically result in a pro-
portionational lengthening of the lifetime of the fuel ele-
ments in terms of useful energy produced, while also
reducing the capital costs of the kilowatts of installed capac-
ity. General Dynamics promises efficiencies of at least 32
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concept now being developed. Undoubtedly, competitive atomic energy will not be achieved with-
cut rates of efficiency we have at present.

Program Awarded

In the international field, the six nations of the European Community (France, West Germany, Italy, Belgium, the Nether-
lands and Luxembourg)—had appointed in May 1967 a
Committee of experts, including nuclear engineers, to
achieve planning on a much more intensive

A large amount—15 million kilograms—of nuclear
capacity by 1983 or 1984. Thereafter, the commissar
was decided upon calling for one million kilograms of nu-
clear capacity by 1983-84, employing reactor types de-
veloping in the American market.

A deadline had been set for Oct. 20, 1959 for the
submission of firm bids to construct atomic plants. It
had been hoped that these projects would be
presented, and it was a great disappointment to all that
they were no longer valid. The commissar for nuclear
energy other than for electricity.

In ore preparatory work for this area is the "pipeline" requirements leading to and from the
reactors, will absorb the full output of the mills at the
same time, and the uranium levels in this country.

The International Atomic Energy Agency, a spe-
ialized agency of the United Nations, was created in
1957 to serve the interests of the world. It is now fully
operational and is doing excellent work in coun-
seling and advising nations in preparing for
the day when atomic energy will become practical for them. Its primary role is to assist, guide and co-
operate with the other nations of the

Bilateral Agreements Signed

From this vast deployment of engineering effort and money, it is estimated that the European market
is being reviewed and providing flexibility is injected
through the Agency with the other nations of the

The principal thing to bear in mind is that the
American mining and milling industry is assured of
a market for the next seven years. While no one can guarantee exactly when
atomic energy will become competitive, it appears that
bilateral agreements it may
begin to be in some areas by 1960 and in many places
by 1965. This means that a large amount—15 million kilograms in one
nuclear power stations. It could as well be 15 or 25 million.

The exact figure is not important. The important thing is the direction toward the day when
atomic plants will become competitive, at first in the
nuclear industry and in the technically advanced na-
tions of the world. Should this occur—as seems quite
likely—by 1965, it will still take a few more years before
the uranium miners will find it advanta-
egeous to resume exploration on a much more intensive
scale before 1960.

General Conclusions

In general conclusion, I may draw from all that
The domestic uranium industry is in sound condi-
tions, as is the American mining and milling industry. Still, the abun-
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by 1965. This means that a large amount—15 million kilograms in one
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The exact figure is not important. The important thing is the direction toward the day when
atomic plants will become competitive, at first in the
nuclear industry and in the technically advanced na-
tions of the world. Should this occur—as seems quite
likely—by 1965, it will still take a few more years before
the uranium miners will find it advanta-
egeous to resume exploration on a much more intensive
scale before 1960.

General Conclusions

In general conclusion, I may draw from all that
The domestic uranium industry is in sound condi-
tions, as is the American mining and milling industry. Still, the abun-
dance of atomic energy will become competitive, it appears
that
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egeous to resume exploration on a much more intensive
scale before 1960.
Radioisotopes have a good potential in the mineral industry as tools to be used in cutting costs, improving product quality, and permitting the mining engineer and metallurgist to do things in their work that would be difficult or impossible to do by other means. Radioisotopes also have definite characteristics, problems, and hazards of their own and are by no means a cure-all for every problem.

This paper will point out some of the uses to which radioisotopes have been put, some of the uses which they will have in the future. It will also discuss some of the things that must be done before the radioisotopes can be put to such widespread use as their ultimate potential justifies.

As a more or less formal definition, isotopes are certain forms of one element that differ as to the number of neutrons in the nucleus and thus in the atomic weight but have all the other chemical characteristics of the element. One way to visualize a radioisotope is to consider it as an atom of an element that behaves chemically just like ordinary atoms of the element except that it is radioactive and decays or emits a particular kind of radiation that is in effect a specific label for that atom; shows where it is and what it is doing.

**Radioisotopes in Industry**

**Fixed Source**
- Measuring charge in radiation intensity
- Neutron sensitive detectors
- Gamma sensitive detectors
- Particle sensitive detectors

**Variable Source**
- Liquid flow through pipe
- Volumetric flow
- Radiation isotope
- Viscous fluid
- Radioactive isotope
- Nuclear counting equipment

**Tracer**
- Physical transformation
- Chemical transformation
- Thermodynamic transformation
- Nuclear transformation

**Tracer Detection**
- Liquid level gage
- Radioactive isotope
- Liquid level detector

**Figure 1. Uses of radioisotopes in industry.**

The author,

Fred L. Smith joined the Colorado School of Mines Research Foundation in 1950 and has served as manager of its Mining Division since 1955.

Mr. Smith obtained a B.S. degree in physics from the California Institute of Technology in 1930. Since his graduation he has had experience in geophysical surveys, underground and open pit mine operations, tunnel driving and controlling, cost evaluations and feasibility studies with such companies as Beaumont Mining Corp., Union Carbide Corp., G. S. Shilling, |Kohe, and Mining Co., Newman Mining Co., Brown Root Construction Co., and Parker and Vanderwalt, Consulting Geologists.

He is a member of the American Institute of Mining, Metallurgical, and Chemical Engineers, American Association for the Advancement of Science, National Society of Professional Engineers, American Mining Congress, and United Mining Scientists Society.

Radioisotopes for use in industry may be made available from a fixed source, a movable source, or as tracers placed in the material to be measured. The various uses to which the different sources are most readily applicable are shown in Fig. 1.

All uses of radioisotopes stem from one of the three ways in which the isotopes and their associated radiation behave.

1. **First—Radiation affects materials.**
   - Example: radioisotopic tracer effect on the rate of reaction.

2. **Second—Materials affect radiation.**
   - Example: radioactive isotope used to determine the density of a material.

3. **Third—Radiation traces and labels materials.**
   - Example: radioactive isotope used to determine the efficiency of mixing.

The application of radioactivity to industry is illustrated in the following series of slides:

**Figure 2. A liquid level gage employing radioactive cobalt.**

**ADVANTAGES:**
- Continuous recording
- Measurement made on closed system
- Simple automatic control

**Figure 3. Isotopes may be used to determine the efficiency of separation by calculation from the activity of the tracer.**

**ADVANTAGES:**
- Radioactive isotope for determining thoroughness of mixing
- Less hazardous than radioactive pipe
- Less expensive than radioactive pipe
- Used in all kinds of metalworking. By a slight change in the technique, these isotopes could be used to determine how much water or air is flowing through a permeable formation.
Back in the nineteen fifties when gold mining was the principal industry in Colorado, a group of pioneer giants in industry, comprising the Colorado Mining Stock Exchange, purchased the ground then described as “Lots 1, 2, 3, 4 & East Denver” for $160,000. On this property, to the north of Arapahoe Streets, was erected in 1880 and 1885, the Mining Exchange Building, on top of which stands the statue of the old prospector, pick in one hand and gold brick in the other, master of all he surveys. He has stood guard over the surrounding area for all these 70 years, a forgotten man, representing an almost forgotten industry—gold mining—in the state of Colorado. This splendid old building is now the home of the Mining Record, one of the oldest mining weeklies in this country.

Subscribers to the fund for the cost of the buildings and the operation of the system, first governor of which is always at an optimum condition for the material in a particular stage of the process. Two things should be done to make continual neutron activation possible. The first is developing a good, cheap, reliable neutron source that gives sufficient number of neutrons per second to bombard the materials. The second thing that must be done is to develop large volume counters that can determine the kind and amount of radioisotopes present as a result of the neutron activation. This enablecounters to be made with very low radiation levels and with very short half-life materials so that by the time the source is shielded to the consumer, no radioactivity will be left in it. Both of these requirements are under intensive research and development and should be available in a few years.

When completed, the Central Savings Bank, now Central Bank and Trust Co., occupied the corner ground floor, while the Denver Mining Exchange traded on its second floor and the stock exchange handled sales for clients and speculators, both local and throughout the United States. Many important mining companies and organizations had offices in the building, including such active mine owners and operators as J. O. A. Carper, George Collins, Charlie Chase, John T. Barnett, Charles Barnes, Benjamin and D. R. C. Brown. The 20th Century Silver Mining and Furnace Co., property at Logan, N. M., is now district mine engineer for Eagle County, Tex. His address is 924 S. Salina St., Twin Falls, Idaho.

LOUIS BURG, JR., former foreman of American Steel Co., has moved to Logan, Utah, to 607 Foregate Ave, Logan City, Utah.

ROBERT W. KETTLE, junior engineer for the San Miguel Properties, has moved to Logan, Utah, to 112 S. 3rd St., Logan, Utah.

DONALD L. ELLSWORTH, petroleum engineer for the Atlantic Richfield Co., has moved to 4000 Fifth Ave, El Paso, Texas.

WILLIAM H. HAYNES, JR., a project engineer for U. S. Pipe & Foundry Co., has moved to 4000 Fifth Ave, El Paso, Texas.

SANDERSON, Copper Mining Co., property at Logan, N. M., is now district mine engineer for Eagle County, Tex. His address is 924 S. Salina St., Twin Falls, Idaho.

These men gathered for lunch to discuss the mining and mineral news from different areas of the state—reports by prospectors and mining men on new discoveries and activities in mining. At present these lunch-meetings are enlivened by good talk on mining and mining and the other subjects of general interest. A recent speaker at these lunch-meetings—Dr. John W. Vanderwilt, president of the Colorado School of Mines—drew a record number of members.

Strictly a luncheon club, the Denver Mining Club welcomes anyone remotely connected or indirectly associated with the mining industry. There has never been any membership fee or dues. Members merely pay their own lunch checks and those of their guests.

Before leaving the story of the proposed “Back to the Rockies” celebration which was scheduled for 1959, the members agreed to rent the old stock exchange room in the Mining Exchange Building and put in a display of ores, concentrates, mining machinery, antiques, maps, pictures and books. Accordingly “The Hall of Mining Progress” was opened to the public in January 1959. A fine display of more than 500 items was accumulated through the efforts and cooperation of mining and machinery companies and their representatives. An “Old Timer,” A. Roy Wicker, supervised the display, and the building was occupied on a part-time basis, kept the display open throughout the Centennial celebration. More than 20,000 visitors passed through this fine display in eight months. This was made possible by voluntary contributions from members of the Mining Club, for no support was given by the state, county or city.

The Denver Mining Club maintains an office in Room 207, Midland Savings Building. Current officers of the club are: President, Guy L. V. Jenson, president, Thomas A. Atwood, president; Treasurer, James A. McPhee, treasurer; Oil President, Kenneth Herrman, Union Supply Co., Denver; Secretary, Arthur F. Mayne, newspaperman and mining writer. These men, former associate professor of metallurgy, Colorado School of Mines, and now a consulting metallurgist in Denver.
Introduction

During the past year the Colorado School of Mines Research Foundation has been investigating the use of N-IV ammonium nitrate as an underground blasting agent. The purpose of this investigation was to determine the feasibility of ammonium nitrate fuel oil mixtures for underground blasting. At the start of these tests, little information was available on the use of ammonium nitrate in underground blasting. The principal aim was to determine whether ammonium nitrate fuel oil mixtures, properly boostered, could be used in place of explosives now being used for hard rock mining.

The data, given in this paper, were obtained in an 8 by 8 foot drift at the Colorado School of Mines experimental mine in Idaho Springs, Colo. The drift was driven at a right angle to the main tunnel, about 800 feet from the portal. The rock was a hard, granitic gneiss from the Idaho Springs formation; little variation in the rock was noted during the tests, and the conditions were ideal for the use of ammonium nitrate.

Test Procedure

Ammonium nitrate was mixed with 6 percent by weight, of No. 2 fuel oil in a small cement mixer, and then hand loaded into either plain paper tamping bags 1½-inch diameter, or 1½-inch diameter 1.5-mil-thick polyethylene bags. For other than test scale work, a cheaper and quicker method of loading the bags would have to be found. There was no noticeable difference between the paper and polyethylene bags in handling, tamping or firing the holes. The age of the mixture when used varied from five to forty days, with no noticeable effect due to this factor. A pneumatic shotcrete device is available for loading the drill holes, but was not used during this work.

A five-hole burn was drilled for rounds less than five feet depth (see Figure 1) and an extra un-loaded center hole was drilled for deeper rounds. The number of holes per round varied from 24 to 28, depending on the depth of the round and the hole diameter. The first rounds were drilled with 3½ inch bits. Hole diameter was later successfully reduced to 1½ inch. Both steel and tungsten carbide bits were used for drilling.

Since ammonium nitrate fuel oil mixtures are not cap sensitive, the mixture must be detonated with a cap sensitive explosive, referred to as the booster. In all the rounds shot except one, the booster was either a half or a full stick of DuPont Gelex 80. Forty percent by weight, of the mixture was added to the booster, the remaining 60 percent of the mixture, combined with the weight of the mixture and Gelex was slightly over 200 pounds. This round was loaded in the bottom of the drill holes with no boosters. Fragmentation was excellent; only a few pieces of rock in the muck pile were over 12 inches in the largest dimension. Powder consumption was 1.94 pounds per cubic foot of rock broken. This powder factor is slightly higher than the average for the rounds fired in the test program.

Test Round No. 2

Another five-hole burn, five feet deep with 3½ inch holes, was boostered with 175 grain plastic-covered Koppers Hoistrock Primacord. The primacord was stretched the length of the hole with a knot at the bottom. The paper bags of mixture were firmly tamped into each hole, approximately 70 pounds of the mixture were used for the round. Regular delay caps were attached to the primacord at the collar of the holes, since it is not safe to tamp the ammonium nitrate on top of an unprotected cap.

When this round was shot, ten holes missed. The primacord was severed between the cap and the mixture because of a rock slip 12 to 18 inches thick in front of the hole. Because of this difficulty, primacords were used for underground blasting in any other rounds. Perhaps this failure could be eliminated if the cap could be placed at the bottom of the hole.

Test Round No. 3

The next round was collar boostered with a full stick of Gelex 2 and a regular delay cap. This round was a five-hole burn, five feet deep with 2 inch diameter

**Underground Blasting Experiments Using Ammonium Nitrate in Small Diameter Holes**

By J. O. MILMOE and T. R. YOUNG, '52

JAMES O. MILMOE received a B.S. in Chemistry from Colorado College in 1949. He has taken additional courses at the University of Pittsburgh, Denver University, University of Colorado and Colorado School of Mines. He was employed by a Colorado School of Mines Research Foundation, Inc. in 1954, working first in the chemical

JAMES O. MILMOE received a B.S. in Chemistry from Colorado College in 1949. He has taken additional courses at the University of Pittsburgh, Denver University, University of Colorado and Colorado School of Mines. He was employed by Koppers Co. in research and development work in their Technical Department Laboratory. Mr. Milmo received his degree at the University of Colorado School of Mines Research Foundation, Inc., since January, 1954, working first in the chemical

T. R. YOUNG received an M.S. degree from the Colorado School of Mines in 1952. He was employed from 1953 to 1955 by the Ammonoid Copper Co., Butte, Mont., as a supervisory trainee. During 1953 Mr. Young was a mining engineer with the Bell and Zoller Co. He served from 1953 to 1955 in the U. S. Army, both as officer for the Moffat Coal Co., from 1955 to 1957. In 1957 he went to work for the Colorado School of Mines Research Foundation, Inc. as a project engineer. His work at the Foundation includes mine evaluation and planning, also the hydraulic transportation of solids. He is the co-author of the following papers: "Exploitation of Large Orebodies by Conventional Versus Nuclear Means" and "Transportation of Slurry to Pipelines." He is a member of the following organizations: The American Institute of Mining, Metallurgical, and Petroleum Engineers; American Mining Congress; the Colorado Mining Association; and OSM Alumni Association.

**The Authors**
holes. The paper bags of mixture were finally tamped into the holes. The powder factor for the mixture used was 17.4 pounds per foot of advance. This round pulled within six inches of its drilled depth with very good fragmentation.

Test Round No. 4
Another round was collar-boosted with a full stick of Gelex 2 fired with millisecond delay caps. The round was shot using a five-hole burn of one-foot deep, one-half-tapered, and one and one-half inch deep, drilled with 1 1/2 inch tungsten carbide bits. Several cut and trim holes misfired because the booster was blown out by the blast from the adjacent hole. Good fragmentation was obtained, even with the misfired holes.

Test Round No. 5
A five-foot deep round was drilled with throwaway bits, 1 3/4 to 1 1/2 inches diameter, using a five hole burn cut with a total of 27 holes in the round. The booster, placed at the bottom of the hole, was a half stick of Gelex 2 and a regular delay cap. The round was loaded with 26 pounds of mixture in paper tamping bags. This round pulled within six inches of its drilled depth with very good fragmentation. The total powder consumption was 0.275 pounds per cubic foot of rock broken.

Conclusions
The results obtained with collar boosting, it appears that this method is not satisfactory for the drift of this size. For larger openings, where the distance between holes is great enough to prevent the primer from being shot out by adjacent holes, satisfactory results may be obtained. Variations in density of the explosive column in these holes loaded and fired may also have contributed to the problem. International Minerals’ Carbised potash operation has been using collar boosted 1 1/2 inch diameter holes successfully, however, the holes are farther apart, the ore is less hard, and pneumatic placement of the mixture provides an unobstructed column of uniform density.

In the 8 by 8 foot drift, bottom hole boostering yielded more encouragement. Results of the first round mentioned, several other rounds were shot, using the booster in the bottom of the hole.

Figure 4A. Before, Collar primed 6-hole burn cut with the two center holes unloaded.

Figure 4B. After, Black primed collar primed round shot with millisecond delay caps. Note boostings.

Figure 4C. After, Black primed collar primed round shot with millisecond delay caps.

Figure 4D. Before, Cut with the two center holes unloaded.

Figure 5A. Before, Bottom primed 6-hole burn cut.

Figure 5B. After, Muck pile of bottom primed 6-hole burn cut with the two center holes unloaded.

Figure 5C. After, Muck pile of collar boostered 1 1/2 inch tungsten carbide bits.

Figure 5D. After, Muck pile of collar primed and loaded round with 1 1/2 inch diameter holes.

Figure 5E. After, Muck pile of collar primed and loaded round with 1 1/2 inch diameter holes.

Figure 5F. After, Muck pile of collar primed and loaded round with 1 1/2 inch diameter holes.

Figure 5G. After, Muck pile of collar primed and loaded round with 1 1/2 inch diameter holes.

Figure 5H. After, Muck pile of collar primed and loaded round with 1 1/2 inch diameter holes.

Figure 5I. After, Muck pile of collar primed and loaded round with 1 1/2 inch diameter holes.

Figure 5J. After, Muck pile of collar primed and loaded round with 1 1/2 inch diameter holes.

Figure 5K. After, Muck pile of collar primed and loaded round with 1 1/2 inch diameter holes.

Figure 5L. After, Muck pile of collar primed and loaded round with 1 1/2 inch diameter holes.

Figure 5M. After, Muck pile of collar primed and loaded round with 1 1/2 inch diameter holes.

Figure 5N. After, Muck pile of collar primed and loaded round with 1 1/2 inch diameter holes.

Figure 5O. After, Muck pile of collar primed and loaded round with 1 1/2 inch diameter holes.

Figure 5P. After, Muck pile of collar primed and loaded round with 1 1/2 inch diameter holes.

Figure 5Q. After, Muck pile of collar primed and loaded round with 1 1/2 inch diameter holes.

Figure 5R. After, Muck pile of collar primed and loaded round with 1 1/2 inch diameter holes.

Figure 5S. After, Muck pile of collar primed and loaded round with 1 1/2 inch diameter holes.

Figure 5T. After, Muck pile of collar primed and loaded round with 1 1/2 inch diameter holes.

Figure 5U. After, Muck pile of collar primed and loaded round with 1 1/2 inch diameter holes.

Figure 5V. After, Muck pile of collar primed and loaded round with 1 1/2 inch diameter holes.

Figure 5W. After, Muck pile of collar primed and loaded round with 1 1/2 inch diameter holes.

Figure 5X. After, Muck pile of collar primed and loaded round with 1 1/2 inch diameter holes.

Figure 5Y. After, Muck pile of collar primed and loaded round with 1 1/2 inch diameter holes.

Figure 5Z. After, Muck pile of collar primed and loaded round with 1 1/2 inch diameter holes.

Figure 6A. Before, Bottom primed 6-hole burn cut with the two center holes unloaded.

Figure 6B. After, Muck pile of collar primed 6-hole burn cut with the two center holes unloaded.

Figure 6C. After, Muck pile of collar primed 6-hole burn cut with the two center holes unloaded.

Figure 6D. After, Muck pile of collar primed 6-hole burn cut with the two center holes unloaded.

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Figure 6Y. After, Muck pile of collar primed 6-hole burn cut with the two center holes unloaded.

Figure 6Z. After, Muck pile of collar primed 6-hole burn cut with the two center holes unloaded.

Table 1. Comparison of Loading Factors for Similar Size Drifts

<table>
<thead>
<tr>
<th>Size of Drift in feet</th>
<th>Type of Rock</th>
<th>Type of Explosive</th>
<th>Per cent Nitrogen in Mixture</th>
<th>Post of Advance in Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 by 7.5’’</td>
<td>hard schist  and quartz</td>
<td>gelex dynamite</td>
<td>49</td>
<td>6.5</td>
</tr>
<tr>
<td>4 by 7.5’’</td>
<td>hard and massive slate</td>
<td>straight gelex</td>
<td>49</td>
<td>6.5</td>
</tr>
<tr>
<td>2 by 8’’</td>
<td>hard diabase</td>
<td>gelatin dynamite</td>
<td>49</td>
<td>7.5</td>
</tr>
<tr>
<td>2 by 6’’</td>
<td>meta limestone</td>
<td>semi gelatin</td>
<td>49</td>
<td>5.5</td>
</tr>
<tr>
<td>2 by 6’’</td>
<td>medium hard schist</td>
<td>gelatin dynamite</td>
<td>49</td>
<td>4.5</td>
</tr>
<tr>
<td>2 by 5’’</td>
<td>hard diabase</td>
<td>gelatin dynamite</td>
<td>49</td>
<td>6.5</td>
</tr>
<tr>
<td>2 by 5’’</td>
<td>hard granite</td>
<td>nitroglycerin</td>
<td>49</td>
<td>5.5</td>
</tr>
<tr>
<td>2 by 4’’</td>
<td>meta schist</td>
<td>nitroglycerin</td>
<td>49</td>
<td>15</td>
</tr>
</tbody>
</table>

(1) Yeele. Mining Engineer’s Handbook, 3rd Ed. (1950) 14-56
(2) Gelatin dynamite is manufactured by the Spencer Chemical Co. of Kansas City, Mo.
(3) Nitroglycerin is manufactured by the Spencer Chemical Co. of Kansas City, Mo.

The third problem involves the difficulty of loading a vertical up-hole for the loose primed ammonium nitrate fuel oil mixture which will fall out before it can be stemmed in place in a homogeneous column. Even before these problems are solved, there are applications in underground hard-rock operations where the mixture may be used readily. Due to its relatively low cost, a saving may be realized wherever this ammonium nitrate fuel oil explosive mixture is properly employed.

However, since little is known about the fumes of ammonium nitrate, an investigation of the fume characteristics of this explosive is now underway. At the present time there is no information available for publication. Until the information on the fume production is published, extreme caution should be exercised when using this explosive.

There has been no noticeable difference between the full stick and the half-stick boosters. The full stick was used because of the length of the delay caps. The short half-stick for bottom hole boostering constituted a safety hazard.

The performance of the ammonium nitrate explosive mixture in this investigation definitely indicates the use of this explosive as a replacement for use in underground hard rock blasting operations. With proper mixing, packaging, loading, and boostering, the mixture can be shot in 1 1/2 inch diameter holes with excellent fragmentation. The properly packaged mixture can be handled with greater safety than with conventional explosives due to its relative inactivity.

There are three problems which must be solved before ammonium nitrate will be freely accepted as a general underground explosive. The first is fume production which has been discussed. The second problem occurs if excessive fume production is present with its consequent reduction of the explosive’s effectiveness. Since most underground operations are humid, the ammonium nitrate cannot be stored underground for any length of time.

There are three problems which must be solved before ammonium nitrate will be freely accepted as a general underground explosive. The first is fume production which has been discussed. The second problem occurs if excessive fume production is present with its consequent reduction of the explosive’s effectiveness. Since most underground operations are humid, the ammonium nitrate cannot be stored underground for any length of time.
A Dilatometric Investigation

Of a Portion of the Titanium—Oxygen—Hydrogen System

By MALCOLM T. HEPWORTH

THE AUTHOR

Malcolm T. Hepworth graduated from Massachusetts Institute of Technology in 1954 with a B.S. degree in Metallurgical Engineering. He did his graduate work at Purdue University where he majored in metallurgy and chemistry. His doctoral thesis was concerned with thermodynamic properties of multi-component systems in particular gaseous systems of titanium with oxygen and hydrogen. His research problem was based on the application of Gibb's-Dukhan isotherms to ternary systems and succeeded in determining oxygen activities in the titanium—oxygen system by an indirect approach, i.e. hydrogen solubility measurements.

Titanium and titanium alloys have been the object of much study in recent years. Particularly in aircraft applications, the strength—weight ratio of titanium alloys and their high resistance to chemical attack are desirable properties which encouraged the titanium industry. Subsequent research indicated that most titanium alloys did not measure up to early expectations with regard to high temperature corrosion. In particular titanium alloys have a strong tendency to absorb interstitial impurities at high temperatures. Nitrogen, oxygen and hydrogen are among these interstitials which greatly change the mechanical properties of titanium. Hydrogen embrittlement is a problem which has received much attention.

A brief review of the metallurgy of titanium is required in order to understand the nature of the current investigation on the titanium—oxygen—hydrogen system. Pure titanium exists in two allotrope crystal forms—a hexagonal close packed (HCP) structure, α—titanium; and a body-centered cubic (BCC) β—titanium. The α form is stable up to 882°C and the β form up to the melting point. Upon heating, a specimen of pure titanium undergoes expansion which is a continuous function of temperature—but at 882°C a sudden expansion occurs in going from α to β forms since the body-centered cubic structure is not as dense as the hexagonal close packed. The increase in volume is approximately 5.5 per cent. This increase in volume affects the effective stress of all other phase changes in this system. However, other properties will also undergo a discontinuity, e.g., resistivity, lattice parameter. Another means of effecting a change from one crystal structure to another is by the introduction of alloying agents. The constitution diagram of the titanium—hydrogen system is given in Figure 1. If a specimen of pure titanium is heated to 800°C in an evacuated vessel, the stable crystalline form is the α—HCP form. If small quantities of hydrogen are introduced, it is found that the hydrogen molecules will dissociate and move monomolecularly in the interstices of the HCP structure.

There are two different kinds of interstices possible for solution of small atoms within the α—titanium lattice. One set is termed tetrahedral in that each interstitial site is surrounded by four nearest neighboring hydrogen atoms. Hydrogen prefers the tetrahedral site. As more hydrogen is added the structure may expand slightly to accommodate the additional atoms (or if the interatomic forces are highly attractive the lattice may contract). Long before saturation or complete filling of the available tetrahedral interstices, the energy of the crystal modification suddenly rises above that of the β modification and some β—titanium starts to appear with increasing hydrogen addition. From the constitution diagram this point corresponds to a hydrogen content of about 3 atomic per cent at 800°C.

The body-centered lattice of β—titanium has one type of interstice—the tetrahedral. Interstitial atoms of hydrogen diffuse to these locations. Increasing the hydrogen content only increases the relative proportion of β to α in the two phase mixture. The total amount of the alloy undergoes a sudden increase with the appearance of the β phase, corresponding to discontinuity in slope of a density—composition plot.

Finally when the overall composition reaches 7 atomic per cent hydrogen, the α phase has transformed completely to the β phase by redistribution of atoms by a diffusion mechanism. The BCC lattice may now expand or shrink with further hydrogen additions.

Hydrogen is the most important element for the application of titanium in aircraft industry so the absorption of oxygen is not reversible since the equilibrium pressure of oxygen in titanium is very low. The diffusivity of oxygen is very low. The diffusivity of oxygen is several orders of magnitude lower than the diffusivity of hydrogen. A recent investigation of the titanium—oxygen—hydrogen system at 800°C has led to a tentative isothermal section which appears schematically in Figure 4. The procedure for determination of this phase diagram was to plot square root of hydrogen pressure against mole fraction hydrogen for various titanium—oxygen alloys at constant temperature. The absorption of oxygen is not reversible since the equilibrium pressure of oxygen in titanium is very low. The diffusivity of oxygen is several orders of magnitude lower than the diffusivity of hydrogen.
A typical experiment is described as follows:

A weighted specimen of high purity titanium is arc melted with a measured quantity of titanium dioxide powder to form a homogenous alloy of a given oxygen-to-titanium molar ratio. The specimen is introduced into the dilatometer compartment which is then evacuated to a pressure of about 10^-4 mm. of mercury. The specimen is heated under vacuum to a given temperature and annealed. Let \( T_1 \) be below the \( \alpha \) to \( \beta \) transformation for this alloy so that the crystal form is \( \alpha \).

With temperature maintained at \( T_2 \) and molar ratio of oxygen to titanium maintained constant, a small measured quantity of hydrogen is added to the specimen, and the increase or decrease in length of the specimen is observed as a function of time. Eventually when no change is observed with time, the value of increase in length and equilibrium pressure is recorded. This period is of the order of a few minutes at a single phase alloy where the rate of controlling step is the diffusion of hydrogen. A second quantity of hydrogen is admitted and a new value of length and pressure is recorded. (The reversibility of the hydrogen absorption can be checked by removing hydrogen to reestablish the first point). A series of hydrogen additions is made until a discontinuity appears in slope of a plot of differential length vs. atom percent hydrogen and concurrently a discontinuity in slope in the plot of equilibrium pressure hydrogen vs. atom percent hydrogen.

These plots are analogous to Figure 2 for the \( \alpha \)-\( \beta \) binary. The introduction of oxygen into the specimen causes some increasing complications.

As the experiment continues, it is found that as hydrogen is added to the two phase mixture of \( \alpha \) \+ \( \beta \) time lapse before equilibration becomes progressively longer. The reason for this is the necessity for oxygen to redistribute itself between the two phases over a diffusion path which is a function of the grain size. The rate of diffusion of oxygen is much slower than that of hydrogen. As hydrogen additions continue the \( \alpha \) phase disappears finally and the alloy is again single phase now in the \( \beta \) form. The compositions corresponding to the two discontinuities in slope mark the limits of the two phase region for the particular temperature and the particular oxygen to titanium molar ratio. The results of a given run are then reported on a ternary isothermal section.

The unique feature of these sets of experiments will be theIsothermal study of expansion as a function of continuously varying composition, which is possible by virtue of the ease in which hydrogen content can be varied. Eventually it is anticipated that concurrent high temperature x-ray lattice parameter measurements may be made. The major difficulty which will be encountered is the tendency of the slope of the expansion vs. composition curves to round off because of the sluggish redistributions of oxygen. No comment can be made on this phenomenon until further data are collected.

**CLASS NOTES**

(Continued on page 34)

PHILIP PREEBLES advises that his new address is 224 Sexton Rd, Mansfield, Ohio.

1955

DAVID L. HOOVER is a graduate student at Colorado School of Mines with address 916 14th St, Golden, Colo. His current new address is 2728 East 14th St., Tulsa, Okla.

1956

JOHN G. HILL, metallurgical engineer for Advanced Technology Laboratory—Mechanics, lives at 3140 Fairmount Ave., Los Altos, Calif.

CESTER L. LOVE has moved from San Diego, Calif., to Coalinga, Calif., where he may be addressed c/o Standard Oil Co. of Calif., Route 1, Torrance, Calif.

FRANK S. MOON, formerly in Louisiana, is now with the Gas Process Division of Allied Chemical & Dye Corp., 30 Rockefeller Plaza, New York 2, N.Y.

MAJOR W. SERBY has changed his mailing address from Stanford, Calif. to 47th Street, New York, N.Y.

JOHN A. SPRINGER, Jr. has moved from Clifton, N. J., to 413 E. 71st St., New York, N. Y., and is now with H. K. Porter Co., 350 Madison Ave., New York, N. Y.

1957

LEROY W. BOWMAN, exploring geologist, gives his new address as 2705 Main St., Farnington, N. M.

L. RAYMOND E. GRANT, who was at 910 W. 7 Avenue, Golden, Colo., May 1, now resides at 910 W. 7 Avenue, Golden, Colo.

TONY L. KING'S address is 200 W. 2nd, Farmington, N. M.

DONALD W. NORMAN'S new address is 1472 S. Locust, Denver 22, Colo.

THOMAS R. RANDALL, Jr., may be addressed at 910 W. 2nd, Farmington, N. M.

JOHN E. VAN DELL, project engineer for the University of Utah, lives at 3045 S. 600 East, Salt Lake City, Utah.

WILLIAM J. BLACKWELL, former of John's, Pa., advises that his mailing address is 3100 NE, Silver Lake, Boulder, Colo.

1958

ROBERT N. DICKINSON, who has been living in Lockwood, Pa., has changed his mailing address to 205 S. 11th St., Suite 10, Pittsburgh, Pa.

L. DONALD A. MYERS has been transferred from Salt Lake City, Utah, to Stanford University, Stanford, Calif.

J. KENT PRESTON new address is Route 3, Box 130, Apache, S. Colons, Colo.

WILLIAM A. THOMPSON, III, has moved from 805 S. 600 East, Salt Lake City, Utah, to 910 W. 2nd, Farmington, N. M.

JERRY J. WARNER has moved from Clifton, N. J., to 327 E. Hickory St., Golden, Colo.

(Continued on page 58)
THE AUTHOR

Robert G. Dyment, a graduate of Rochester Institute of Technology, was a former associate editor for three weekly newspapers published in New York state.

For the past six years he has been a full-time professional, specializing in the field of mining engineering, and he has written for many of the country's leading business, technical, and industrial magazines, specializing in construction and engineering articles.

Colorado's history is bright with mineral wealth and tales of prospectors who climbed and clawed their way among the rocky crags and valleys to find the elusive mineral riches or spend themselves in a lifetime of failure. Today, in Colorado, great mines are producing, utilizing the finest mining methods known.

Their output has made "Colorado" another name for "mineral" among mining engineers the world over. Except for the foresight of the Colorado School of Mines, the Edgar Mine at Idaho Springs might be a ghost mine, stripped of a half million dollars in ore. But as a training laboratory for future engineers, the Edgar Mine is still a producer, still contributing to the general mechanical engineering of mines. Another important purpose of the mine is to provide a place for mine research and experiments, covering all types of mining studies for further development and increased efficiency.

THE EDGAR MINE

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Dr. James Underhill, who came to the school in 1919, is primarily responsible for the acquisition of the Edgar Mine. At that time, mine surveying was being conducted at the Stanley Mine at Idaho Springs. Its shut down precipitated the need for another property, and the Edgar was ideal for all intended purposes. The Colorado State Legislature appropriated $20,000 for buildings and the repair of workings, and a long-term lease was obtained from the North American Mining Company of Denver. All of the upper workings were leased by the Colorado School of Mines, and provision also was made for the lower portions of the mine and of the Big Five tunnel that extends under and beyond the mine for a distance of 8,000 ft.

The Colorado School of Mines follows manufacturers' recommended procedures for use of explosives and training of students in explosives safety. Both experimental and regular blasting patterns are used.

The vein-type material in the experimental mine contains gold, silver, lead, copper, and zinc. The wallrock is granite. Blasting is performed on both cross and parallel. Cables used are Gardner-Denvers, Cleveland, Joy, and Ingersol-Rand. The types of drills are drifter, jack-leg, stoper, and jackhammer. Jumbo carriages also are used. Drill steel varies in size from % to 1% in. in lengths of 2, 4, 6 ft., and 8 ft. 4 in. is used for long holes.

There are two air compressors used in the experimental mine. Both are Gardner-Denvers, one 500 c.f.m. and the other 900 c.f.m. Diameter, depth, and spacings of drill holes vary in some cases, but, predominantly, are 1%-in. holes, 6 to 8 ft. in depth, with spacing of approximately 28 in.
Mine Laboratory Course Required

Every student enrolled in mining engineering (there are now 153 undergraduate students and 15 graduate students) is required to take the mining engineering laboratory course. This course teaches the fundamental operations of underground mining, including drilling, blasting, mechanical loading, haulage, and support practices as applied to drifting, raising, and winzing. Managerial aspects and the integration of unit operations also are studied. The course is taught on 15 Saturdays and holidays during one semester, eight hours a day. For this amount of work, the student receives two semester hours of academic credit.

The classes average 35 men each semester, and either a mining instructor or a trained shift boss supervises each group of six students. Maynard Ayler, instructor in mining engineering, is in charge of the mine.

The experimental mine also is used for other purposes. Gardner-Denver and other mining machinery manufacturers use the mine to experiment with new machinery developments. The Colorado School of Mines Research Foundation uses the experimental mine as a laboratory for mining engineering research projects. During the summer months a certain portion of the mine is open to tourists. During the summer of 1959, nearly 11,000 tourists made guided tours of the mine. These free tours are guided by several mining students who staff the mine during the summer months.

Thus, the Colorado School of Mines and its experimental mine are playing an important part in supplying trained engineers and executives for the mining industry.

**Petroleum: A typical summer session scene in the petroleum-refining materials laboratory.**

**INCO Opens Highly Automated Mill In Sudbury Area of Canada**

A new, highly automated ore milling plant has been opened by The International Nickel Co. of Canada, Ltd., in the Sudbury area of Ontario in the latest step in a continuing program to counter rising costs with increased production efficiency through technological advances.

The modern mill, located at Inco's Levack Mine near Copper Cliff, Ont., and built at a cost of $12,000,000, makes extensive use of instrumentation to permit centralized, and in some cases automatic, control of the crushing, grinding, flotation, and dewatering processes involved in the production of concentrates from ore. All operations are controlled from centrally located instrument panels. Many recently developed techniques, such as the use of radioactive isotopes for making density measurements, have been incorporated into the new plant.

**Additional and Improvements Carried Out**

The mill is among additions and improvements the Company is carrying out at its properties in the Sudbury area which, with the new nickel mining project being developed at Thompson, Manitoba, will raise Inco's nickel production capacity to 385,000,000 pounds per year by 1961. The Levack installation brings to three the number of ore milling plants operated by Inco at its nickel mines in the Sudbury area, the free world's greatest source of nickel.

The Levack mill has a capacity of 6,000 tons of ore per day. Crushed ore from the Levack mine No. 2 Shaft is conveyed directly into a concrete silo-type bin with a live capacity of 3,000,000 pounds. Two parallel conveyors feed the ore to two 7,000-ton crushers which reduce it to three-quarters of an inch in size. The crushed ore is then conveyed to three...
Selective Flotation Process

The selective flotation process used produces a nickel concentrate, a copper concentrate and a rock tailing. Flotation process variables such as pulp density, temperature and alkalinity are automatically controlled by instruments located on a central panel. The flotation concentrates are dewatered in thickeners followed by vacuum filters. The operation of the thickeners and filters is automatically controlled through instruments on a central panel on the filter floor. The thickener underflow pumps and filtrate pumps are started from this panel. More than 50 railway cars of nickel and copper concentrates are shipped daily to London by rail. The mine tailings are pumped 1,500 feet to the thickener overflow and dewatered in vacuum filters. The flotation tailings are pumped 1,500 feet to the filters where the nickel concentrate is dewatered after flotation. A rotating rake slowly moves the thickened material to a discharge in the center of the tray, at which point it is 16 feet deep. The copper concentrate is also thickened.

Control from Central Instrument Panel

The crushers, crusher oil pumps, screens, variable-speed ore feeders and conveyors are all operated and controlled from a central instrument panel where lights indicate what equipment is in service. The occurrence of trouble in operation equipment sounds an alarm on the control panel and gives a visual indication of the trouble. An indicating and recording weightometer on the panel shows the tonnes of ore being crushed.

The two grinding units each consist of a 16-foot rod mill, a 14-foot ball mill, and two cone classifiers. A central instrument panel controls the entire grinding operation. Weightometers automatically control and record the rate at which ore is fed into the grinding units. Water addition to the rod mills is adjusted from the panel. In the cone classifiers the density of the overflow to flotation is measured and automatically controlled by radioactive isotope instruments which regulate the water addition to the classifiers.

An Analysis of the Problem

Mineral Engineering Education for the Future

By COL. WENDELL W. FERTIG, ’51

Last month, we discussed a new approach to this problem offered by Charles Brinckerhoff, president of The Anaconda Co. Now, as a different facet of the same problem, we will consider the welcoming address delivered by Dr. John W. Vanderwert, president, Colorado School of Mines, at the annual meeting of the American Institute of Mining, Metallurgical and Petroleum Engineers, held in New York City Feb. 12, 1960. There he spoke on the subject: "The Real Problem—Mineral Engineering Manpower."

In considering this, the end product of Mineral Engineering Education, he said: "As reported in a number of newspapers and magazine articles in recent months, there is no future for the mineral industry, or for mining, metallurgy and petroleum engineering as a profession for young men entering college. These articles call attention to decreasing enrollments in these fields and to joblessness as a basis for their dim view of the future.

"I cannot agree with the picture that these stories present and fortunately not all prospective students can accept them either.

Dr. Vanderwert then went on to say that it is well to consider first those conditions that tend to obscure the bright and emphasize the dark side of the picture. From early 1957 and extending through most of 1959 our economy passed through a period of adjustment. As a result of many factors, some experienced engineers were unemployed and jobs were relatively scarce. The new engineering graduates in 1956 and 1959 did not all have the choice of three to eight job offers as in previous years; in fact, a few had no job offers at all. Most employers regarded this as a return to normal conditions and were able to exercise a selective choice in hiring. Even in this more normal situation, a third of the graduates who did not enter the military service or continue in graduate work were placed. Interviews and inquiries from prospective employers indicate that the outlook for the graduate of 1960 will be as good, if not better, than ever before.

The cause for concern is not that a few graduates had difficulty in finding jobs, but that the total undergraduate enrollment in mineral engineering in the United States has dropped for the second consecutive year. The cause for this decrease is not definitely known, but many believe that it is due to the depressed state of the mineral industries. All engineering fields have experienced similar decreases, but to a lesser degree. This has been in the face of steady increases in the number of students enrolled in all non-technical fields of higher education. From this it is concluded that the decreases in mineral enrollment are related (1) to the general economic readjustments that have been taking place, and (2) to competition coming from new demands for engineering talent in the rapidly developing fields of nuclear energy, oceanography, electronics and instrumentation, space propulsion, and others.

Now that is the darker side of the picture, said Dr. Vanderwert, and here is the brighter side. In its December 1959 report on "Demand for Engineers," the Engineering Manpower Commission of the Engineers Joint Council reports projected increases in the demand for new engineering graduates as follows: 1959 1960 1963 1966

Mining Engineers 8.9% 10.4% 14.9% 28.7%

The study did not include projected demands for graduates in the fields of metallurgy, geology or geophysics. Although statistics of this kind represent a sampling whose reliability may be questioned, yet 19 industrial areas were represented and all agreed that the demand would continue to increase. Other evidence that supports the increases in demand are the growing population and expanding economy that will require greater quantities of mineral raw material of all kinds. Although one segment of the economy may be operating in a slow period, the others are operating in a more favorable climate. The net result, based on past experiences, is that there will be increases in the consumption of metals and minerals, and a demand for an even greater variety of materials than ever before.

To meet these growing requirements there must be more and more exploration and development of the mineral resources of the world. More research will be required to improve recovery methods, and to improve refining operations. Men with an engineering background and a training in mineralization will be needed to solve increasingly complicated management problems. Thus in three major spheres: namely oper-
Engineering education is sensitive to changes in industrial needs and technological development. Marked changes in curricula have occurred. A general trend has been for greater emphasis on fundamental principles and mathematics. Training in routine skills has become relatively scarce. More non-technical courses, especially in the humanities, have been added. Advance study is recommended for an increasing number who wish to specialize in a particular subject or field.

Certainly a shortage in the supply of new miners has been evident in the last two years, particularly in 1962 and 1963. After 1963 the shortage will continue as long as engineering freshman enrollments are maintained or increased. It is important to realize that what can be done to encourage more young men to enter mining engineering is primarily the responsibility of industry, for in other fields, notably petroleum, electrical, chemical and aviation, corporations have continuously announced the need for additional manpower resources to present the cause of the mineral industries to young men. The responsibility of industry, for in other fields, notably petroleum, electrical, chemical and aviation, corporations have continuously announced the need for additional manpower resources to present the cause of the mineral industries to young men.

Mineral industries have not initiated a program of public relations in which they make known what their respective fields have to offer in salaries, job advancement opportunities and satisfying life careers.

We have it—the fault of neither the educator nor the mineral industries, but perhaps it may have been their mutual failure to recognize the problem before it became acute. Industrial needs and technological development.

Concurrent with this complacency, mining entered a period of tight labor markets. The result was a common subject of discussion for many years. Despite those differences, there is unanimous agreement on the need to keep engineering education standards high and to strive for continuous improvement.

In comparing the differing positions taken by Mr. Brinckerhoff and Dr. Vanderwilt, it appears that the final solution of the problem of mineral engineering education lies somewhere between these two positions.

Mr. Brinckerhoff closed his address with the statement, "Student enrollment in our engineering course has been a common subject of discussion for many years. Despite these differences, there is unanimous agreement on the need to keep engineering education standards high and to strive for continuous improvement."

On the other hand, Dr. Vanderwilt said, "The ultimate distribution of engineering manpower will favor those industries which are most successful in making known what their respective fields have to offer in salaries, job advancement opportunities and satisfying life careers."

Therefore, the need to make known the mineral industries' offer programs is the responsibility of the educational institutions, professional societies, national associations and governments. They must tell it more often and more emphatically in the future if they are to meet the needs that lie ahead.

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Graduate Student Inquires About Alumni Assn.

Mahammad Assadi, who received a civil engineering training from the University of Iran and who is now doing graduate work in petroleum engineering at MIT, paid a visit to Shemiran Road, Teheran, home of the Alumni Office.

Assadi's interest was in learning about the Alumni Association, which he consid­ers a wonderful opportunity to meet old "Buddies," Swap Lies, and have a good time.

Although Mr. Assadi already has a position in Iran when he completes his M.Sc. in 1961 after which he will hopes to complete his studies and get membership on election ballots to be mailed out. The Public Relations Committee, vpill.

Hugh A. Wallis, '28; 16 S. Ogden St., Denver, is chairman of the Publications Committee.

This provided an opportunity to point out the good points of our Magazine and to solicit subscriptions. The booth and display proved so successful that plans are underway to enlarge it for the 1961 National Western Mining and Energy Conference.

The booth was manned by a member of the Alumni office staff and student volunteers from the CSM Student Chapter, AIME. Many visiting alumni, as well as friends of Mines stopped by to chat and look at the display of pictures and copies of THE MINES MAGAZINE.

This provided an opportunity to point out the good points of our Magazine and to solicit subscriptions. The booth and display proved so successful that plans are underway to enlarge it for the 1961 National Western Mining and Energy Conference.

Alumni Development Fund of the CSM Foundation, Inc. This committee was established in 1923 by the Alumni Association. Over the years many alumni and members of the class of '35, and their wives following the Commerce Department in Washington, D.C.

From the monetary point of view, this effort would have cost us several hundred dollars. Only one week after Mr. Roll's initiation knowledge of the Alumni Association's functions and its organization would have identified these documents readily available for use and will be preserved for historical purposes.

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45

manded the Engineer Squadron of service in the Pacific and com­tenant colonel. He had three years he was discharged in 1947 as a lieu­neers in 1942 as a second lieutenant,
tendent of the Leonard in 1939, the hut returned to the Anaconda Co. in 1928 as a sampler at the Tramway. Strock came to Butte and started as boxing coach at Mines.

A native of Mt. Morris, III, Mr. Strock, '22, Succeeded him!"

Entering the Army Corps of Engineers from 1942

James Boyd, a vice president of the KenneCott Copper Corp., New York, will become assistant manager of the eastern sales region of Union Carbide Metals Co., Division of Union Carbide Corp. Headquarters of the eastern region are in Philadelphia, N. J.

In the June 1959 meeting of the Geological Society of America, Mr. Seery was elected an honorary member. In 1945 he initiated the Geology Symposium at the annual meeting of the American Geological Society, and he is a member of the American Institute of Mining and Metallurgical Engineers, and the American Society for Metals.

Mr. and Mrs. Jackson, their daughter Beverly and son Robert, live at Box 230, Boulder, Colo.

James Boyd, '32, to be Elected President of Copper Range Co.

After serving from 1910 to 1917 as a miner at the Pennsylvania mine, he was a founder in 1943 of the hypers of America's new 42-man Ways and Means Committee to study the present situa­tion of the petroleum development division of the independent petroleum industry.

Mr. Quine has been appointed manager of the Los Angeles office of the eastern region, effective April 14, following the annual meeting of Copper Range shareholders, it was announced jointly by John P. Lally, chairman of the Copper Range board, and Nelson J. Darling, Jr., chairman of the executive committee.

Mr. Boyd will assume his duties in May 1959 when Mr. Lally was elected chairman of the board.

Mr. Quine was made vacant in May 1959 when Mr. Lally was elected chairman of the board.

J. P. McDonough, '59, Naval Aviation Officer Candidate

Four From Class of 1957 Spotted in Air Force

Alan R. Cunningham, a 1941 pe­troleum engineering graduate of the Colorado School of Mines, has been appointed an engineering associate in the petroleum division of Esso Research and Engineering Co. The position of associate is a new one for the company with outstanding technical ability.

Mr. Cunningham, who is con­cerned with making evaluations of petroleum processes, began his career with Esso in 1946 as a petroleum engineer. He joined the company in the technical service division of the Standard Oil's Berway Refinery. In 1958 he was transferred to Esso Research and Engineer­ing Co., where he has been making economic studies of potential oil refining processes.

During World War II he served with the Air Force as a petroleum procurement officer.

Married and the father of a 13-year-old daughter and a 10-year-old son, Mr. Cunningham served six years as a member of the board of education in Springfield, N. J. He is also active in the American Red Cross. His mailing address is 58 Spring Brook Rd., Springfield, N. J.

Charles J. Hares, '56, Receives AAGP Honorary Membership

Charles J. Hares, who in 1956 re­ceived the honorary degree of Doctor of Engineering from the Colorado School of Mines, has been appointed an engineering associate in the petroleum division of Esso Research and Engineering Co.

He was a founder in 1943 of the Wyoming Geological Association, was its first president, and is an honorary member. After graduating with a B.S. degree in 1948. His publications include articles on glaciology, stratigraphy, geology, and geophysics, and he has served as chairman of the Rocky Mountains section of the Rocky Mountains section of the Geological Society of America.

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He was a founder in 1943 of the Wyoming Geological Association, was its first president, and is an honorary member. After graduating with a B.S. degree in 1948. His publications include articles on glaciology, stratigraphy, geology, and geophysics, and he has served as chairman of the Rocky Mountains section of the Geological Society of America.
John D. Moody, who received a geological engineering degree in 1940 and an M.S., Geo.E., and Ph.D. degrees in 1947—all from the Colorado School of Mines, has been employed by Gulf Oil Co. as manager of exploration. Operating headquarters are in Texas. In his new position, Mr. Moody will be in charge of the geological, geophysical and land departments.

Employed by Gulf Oil Co. for 23 years, Mr. Moody served in various capacities in several areas of the United States and Kuwait.

Organizations to which he belongs include American Association of Petroleum Geologists, American Petroleum Institute, American Institute of Mining, Metallurgical and Petroleum Engineers, Midland Geological Society, American Association for the Advancement of Science, American Geophysical Union, Geological Society of America (Fellow), Geological Association of Canada (Fellow), and Geological Society of London (Fellow). He also is a life member and colonel in the U. S. Marine Corps Reserve.

Naghizadeh, '56, Awarded Bell Graduate Fellowship

John D. Moody, who received his E.M. degree from the Colorado School of Mines in 1956, has been named vice president of Straight Line Filters, Inc., an associated company of the St. Regis Paper Co.

The Straight Line filters have been used as oil filters in the petroleum industry for more than 30 years, and are said to be highly effective in removing contaminants from oil. The filters are used in a variety of applications, including in the production of crude oil, natural gas, and coal gas. The filters are also used in the refinement of petroleum products, and in the production of synthetic rubber and plastic materials.

Naghizadeh, '56, who graduated from the Colorado School of Mines in 1956 with a degree in production refining engineering (P.R.E.), is the winner of a 15-year scholarship established by the Bell Telephone Laboratories Graduate Fellowship grant to outstanding students working toward the Doctor of Philosophy degree in science or engineering disciplines.

Mr. Naghizadeh is now a student at the University of Chicago, where he plans to continue his graduate studies toward the Ph.D. degree in chemical physics. He is a research assistant at the University of Chicago and a member of Sigma Xi. His address is 5647 S. Dorchester Ave., Chicago, Ill., with permanent address in Tehran, Iran.

Fellowships carry a minimum grant of $2,000 to the winners and an additional $2,000 to cover tuition, fees and other costs at the university they have selected for their doctoral work.

Awards are based on the candidates' demonstrated abilities and potential for advancement of their graduate program to the broad field of communications technology, and the likelihood of their professional growth. There were 101 applicants for the 15 awards made this year.

Selbert, '52, Vice President Of Straight Line Filters

Herbert D. Thornton, a 1940 petroleum engineering graduate of the Colorado School of Mines, has been appointed senior vice president of Union Carbide Olefins Co., an affiliate of Union Carbide Corp. In his new position, he will be responsible for the exploration and development of natural gas.

Before joining Union Carbide, Mr. Thornton was with McEiroy Ranch Co., where he was Rocky Mountain division manager. He received a Master of Business Arts degree in 1954 from the University of Denver.

The position of senior vice president of Union Carbide Olefins Co. is one of 15 winners of the American Institute of Mining, Metallurgical & Petroleum Engineers' Silver Annuity Awards.

K. S. Selbert, who received his E.M. degree from the Colorado School of Mines in 1952, has been named vice president in charge of operations by Straight Line Filters, Inc., an associated company of the St. Regis Paper Co.

The Straight Line filters have been used as oil filters in the petroleum industry for more than 30 years, and are said to be highly effective in removing contaminants from oil. The filters are used in a variety of applications, including in the production of crude oil, natural gas, and coal gas. The filters are also used in the refinement of petroleum products, and in the production of synthetic rubber and plastic materials.

Selbert, '52, who heads the Colorado School of Mines, recently completed the officer basic course at The Washington Training Center, Belvoir, Va. Lieutenant Wahl received training in logistics, administration, building and airfield construction, and combat tactics and techniques. His mailing address is 5530 Holland Dr., Arvada, Colo.

Herbert D. Thornton, '40, Named Production Manager Union Carbide Olefins Co.

According to Mexican authorities, Lieutenant Wahl received training at the University of Denver.

CSM graduates in the lecturing group in addition to Professor Parkinson include George O’rdonez, ‘29; J. F. Moraes, ‘28; and C. D. Michaelson, ’32, and Dr. Arthur W. Ruff, ’49.

Hollister, '33, Candidate For SEG Vice President

Prof. John C. Hollister, ’33, head of the department of geological engineering at the Colorado School of Mines, has been nominated for the office of first vice president of the Society of Exploration Geophysicists. Mr. W. B. Lee, supervisor of geophysical engineering at the Gulf Production Division of Gulf Oil Corp., will be his opponent.

New officers of the Society will be elected in the customary mail ballot which will be voted on by the corresponding members in May and will become effective at the next annual meeting in Galveston, Texas.

(Editors' note: We are happy to see one of our alumni nominated for this office. We cordially wish him the greatest success in this endeavor.)

R. H. Fulton, '50, Supervises Drilling Program in Japan

Richard H. Fulton, ’50, and his wife left for a three-month assignment in Japan. There he will supervise a drilling program for the Tokyo Gas Co. in the city of Tochigi, Japan, where the company is engaged in drilling for natural gas. The project was originally sponsored by the Telkeboro Oil Co., with disappointing results as only a little production of water soluble gas was found. Preliminary exploration indicated that the structure might be ideal for gas storage.

Mr. Fulton has been in charge of the Washington office of Bell Atlantic & Petroleum Contractors, but the firm has closed that position until the present time.

He is a member of the American Association of Petroleum Geologists, American Petroleum Institute, and the American Institute of Mining, Metallurgical & Petroleum Engineers.

Professor Parkinson, '23, Lectures in Mexico

Prof. J. F. Parkinson, ’23, head of the CSM Mining Engineering Department, spent two weeks during March lecturing at the University of Guanajuato (Mexico) on mining subjects.

The work is done under the auspices of the Colorado School of Mines which organized a group of six lecturers from mining industry to talk each year on various mining subjects.

The project, in its third year, is most successful and worthwhile, conducted for selected senior officers of the military services as well as officials of the civilian governmental agencies.

Mr. Weishaupl, who holds the rank of major with the U.S. Air Force, is chief geologist and supervisor of Land and Exploration, American Potash & Chemical Corp., 3000 W. 6th St., Los Angeles, Calif. He is a member of AIME, GSA, SAME, MG1 and the Knights of Columbus.

Visitors to the Alumni Office

Luis H. Aguirre, ’51, together with his wife paid us a call during his state-side vacation. Luis is mining engineer, Neptune Gold Mining Co., Bamana, Nicaragua. We were happy to see Luis for our records still showed him at his former address in Autolagasta, Chile.

Benjamin Arkin, ’27, stopped here long enough to pick up a letter of addresses of Mines Men that he may be able to see on his extended trip through Mexico and later up the West Coast as far as San Francisco. The Arkins should be back in Denver in about two months.

John A. Bowsher, ’34, 900 W. Quart St., Butte, Mont., is still in Butte doing consulting work, mostly in the Montana area. John was in Denver for the National Western Mining Convention.

James H. Bright, ’52, who is still with Carbide Nuclear and is living at 1340 Oxford Ave., Sparks, Nev., was in Denver due to sickness in the family. Mr. and Mrs. Bright were able to stay long enough for us to show them out a couple of asbestos deposits before they had to leave.

Harry A. Ellis, ’54, called to talk over alumni problems so that he could report back to the Tulsa Section. Harry is studying law at the University of Oklahoma. He finds that his engineering education comes in handy for he is teaching some courses in the Engineering School of the University while attending law school. I expect Harry to head back to Denver as soon as he graduates from law school.

Phil D. Grommon, ’57, was in Golden for the afternoon and we had a pleasant correspondence the last few weeks, so he called to talk about some of our old-timers. Philo is living in Berkeley, Calif.

John D. Moody, ’40, Manager Exploration for Plymouth Oil

Arthur J. Jersin, ’49, district inspector of the Colorado Oil and Gas Conservation Committee, came to see us in order to give us some technical material on one of our old-timers. No use mentioning any names for I don’t know whether Mike has the information for, and I might be giving away secrets.

Sidney N. Johnston, ’55, is visiting his parents, Mr. and Mrs. Johnstone here in Golden.

Albert M. Keenan, ’33, came out to the office so that we could furnish him addressed envelopes for the members of the class of 1933, Al Keenan is chairman of the committee in charge of the Silver Anniversary celebration of that class. Hope they have a fine representation, for it is too bad that they missed their next formal reunion in 1985.

George J. Kinn, ’57, is a geologist with Pan American, and whose mailing address is Box 1437, Bismarck, N. Dak. George was just in town for a couple of days but came out to the Alumni office and to see Dean Burger.

Michael J. Leob, ’48, came back to Golden for the first time in more than 11 years. It was good to talk about Brazil and their prospects with one who knows the picture intimately, and who is much interested in plans of the Alumni Assn. He carries our best wishes back to the Minors family and others of our alumni in Sao Paulo.

Richard K. O’Neil, ’57, production engineer, Continental Oil Co., Riverton, Wy., told us that the problems of living in the wilds of Wyoming could sympathize with the onset of two winter’s in Gas Hills. It’s a rough country—climatically at least.

Thomas E. Philps, ’49, has closed the job of organizing the First National Bank of Golden for his company, Western Machinery Co., for Engineer’s Day by coming to see us. It was a good exhibit and proved interesting to the students.

Annual Alumni Banquet May 26 — 6:30 P.M.

Buy your ticket now!
DR. WILL Y. NORRIS, ’21, writes: “At the present moment I am in fair health and am engaged in work a few years ago. However, I have decided to return from active teaching and in charge of an association can our alma mater progress.

It is the custom of the alumni of mines such as our MINES MAGAZINE that every class have their magazine is extremely important to us, and we must stand back and let them do their work. It is true to say that if you are not interested in the magazine, they will be interested more and more in the various instructions that it brings in. All the more reason for me to think that if you are not interested in the magazine, we will be interested in the people of our school. This will make people more familiar with our school and will also be an incentive to keep the magazine as an advertising medium.

Here is where in mine all the success in the world. Call the if I can do of advertising medium for you.”

(Editors’ Note: Gpte is product man­

ufacturers. He liked the work so well and should be to help it progress, and we can progress. This magazine is ex­

clusive, and should he in our new offices on the

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THE MINE MAGAZINE • MAY, 1960

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

ALABAMA
Blounting Section
Pres.: Joseph Heli, Jr., '21
Sec.: Richard White, '42
329 Flint Dr., Fairfield

ARIZONA
Barflesville Section
Pres.: John H. Bassarear, '50
Sec-Treas.: W. K. Shack, '51
P.O. Box 203, Barflesville, Colo.

CALIFORNIA
Bay Cities Section
Pres.: John D. Roll, '51
V. Pres.: Ralph D. Pick, '48
Treas.: J. R. Leonard, '42
2120 Ayoa Ave., Richmond

COLORADO
Denver Section
Pres.: Ronald F. Linnin, '50
V. Pres.: Hugh Wallis, '52
Sec-Treas.: Patrik C. Brennon, '53
1935 S. Lincoln, Denver 22

DISTRICT OF COLUMBIA
Washington, D. C., Section
Pres.: Charles T. Baruch, '25
V. Pres.: Vincent G. Gloss, '64
Treas.: Thomas E. Howard, '54
15 E. 15th St., Washington, D.C.

FLORIDA
Sanibel Island Section
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Pres.: Charles M. Walls, '49
1805 Old Sanibel Rd., Sanibel, Fla.

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Columbus Section
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Treas.: Robert Shilanski, '46
12 E. Liberty, Champaign

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Central Iowa Section
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V. Pres.: John Boiles, '49
Treas.: W. E. Markwardt, '32
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Sec-Treas.: J. T. H. Hensley, '49
413 S. Kansas, Kansas City, Mo.

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V. Pres.: Joseph V. Costello, '50
Sec-Treas.: Thomas G. Folds, '47
6195 Eaux Croises, New Orleans 14

MINNESOTA
Iowa Range Section
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V. Pres.: Leroy Kolls, '59
Sec-Treas.: James Brown, '53
2342 S. University, Minneapolis

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V. Pres.: William Caputo, '57
Sec-Treas.: W. S. Crook, '60
220 W. Silver St., Cape Girardeau

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V. Pres.: John Bulles, '56
Sec-Treas.: W. R. Marwood, '56
210 Union Ave., Butte

Tulsa Section
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Four Corners Section
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V. Pres.: Tony King, '56
Sec-Treas.: Tom Allen, '47
210 E. 12th St., Farmington

NEW YORK
New York Section
Pres.: Ben F. Wilt, '52
V. Pres.: H. R. Thomas, '40
Sec-Treas.: Union Catholic College, '50
50 E. 42nd St., New York City

OKLAHOMA
Barlsville Section
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12472 Amberly Dr., Bethel/Beaumont

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Treas.: Bernt Nord, '42
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V. Pres.: Frank C. Brandt, '43
Treas.: Robert Shilanski, '46
12 E. Liberty, Champaign

THE MINES MAGAZINE • MAY, 1960

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Calgary Section
Pres.: R. P. Finner, '49
V. Pres.: J. B. Irwin, Jr., '44
Sec-Treas.: G. E. Ormer, '55
2304 K St. W., Calgary

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Baguio Section
Pres.: Francisco Jurado, '55
V. Pres.: Claudio Ferriol, '55
Sec-Treas.: Arturo Tapia, '56
P.O. Box 203, Baguio City

Peru
Lima Section
Pres.: Richard Bercer, '44
V. Pres.: Martin Obrahim, '57
Sec-Treas.: Edgaro Villavicencio, '58

The Mines Magazine • May, 1960
At Mines, in addition to administrative duties, he required of all students who do not return after their graduation. For them school stands still—it is about the same as they knew it. The faculty, courses, and facilities are thought of an unprecedentedly higher standard than they knew as the recent graduates. Throughout the years many things have changed at Mines, and the Mines Department is no exception. The faculty has changed, continued alterations have changed the interior of the building, and the student body has grown. But first you should meet the faculty, starting with those who are senior in length of service.

CHARLES O. FRUSLI joined the staff as associate professor in 1956. He was graduated as a Mining Engineer from Iowa State College in 1941. After graduation, he joined the engineering staff of the Chile Exploration Co. at Chuquicamata, Chile. In 1944, he joined the U.S. Smelting, Refining, and Mining Exploration Co. at Luritza, Nev. A year later he returned to Iowa to assist in the organization, development, and operation of a new coal mine.

In 1945 he joined the Mining Department staff at Iowa State University, did graduate work, and was on the staff of the Iowa Engineering Experiment Station doing research on the utilization of coal mine wastes.

Coached during his first year, Franklin professor Prof. G. E. McGee included Mine Surveying, Mining Law, Surface Mining, Mine Plant, Tunneling, Mineral Economics, Coal Preparation, and Mine Safety.

In September 1957, JOHN MOSS joined the department staff as an instructor. He was graduated in 1953 with a First Class Honors Degree in Mining from the University of Wales. He spent five years with the U.S. Air Force. As an instructor he was head of the Department of Planning and Study for Daggett Mines Limited, the Consolidated Diamond Mines of South West Africa, and the parent DeBeers Co.

The following eight years were spent in mine examination work in Brazil and as a mining consultant in Chile.

LUTE J. PARKINSON, Mines '23, has been professor and head of the department since 1937. Upon graduation, Professor Parkinson joined the department staff in 1922; he was the head of the Department of Mining and Metallurgy at Iowa State College during the period of 1937-1957. In 1958 he was appointed as head of the Department of Mining and Metallurgy at Iowa State College.

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In the past ten years, Mine Rescue and First Aid, Fire Assaying, and Accounting have been dropped from the required list. Mining Methods, Mine Examination and Valuation, Mine Ventilation and Mine Surveying have all been reduced in scope. It is now suggested that Mining Methods be included with Mine Development to make room for a course in Quality Control.

Courses in Mine Industrial Engineering, Rock Mechanics, Statistical Analysis, and Soil Mechanics (an elective at present) have been added. In all cases, more stress is placed on the analytical approach, with due attention to historical background. "Why" is now more important than "how." More stress is placed on current articles in technical publications and less on texts that grow obsolete in the light of present rapid progress.

The facilities within the department are continually being improved and are quite modern. This leads to better teaching and enables the student to enter industry "abreast of the times" rather than being burdened with knowledge that is already passé. Thus he has the knowledge necessary to be of immediate use to his employer.

The Mining Department wishes to extend an invitation to each of you to come and visit the department. If you cannot give first hand information by a visit, write and ask for any information that you may need.

Courses taught by Mr. Jones in- clude Introduction to Mining, Industrial Engineering, Statistical Analysis, Provision and Fragmentation, Mine Administration, Mine Ventilation and Air Conditioning, and Advanced Air Conditioning.

In February of 1958, MAY- NARD F. AYLER, a 1945 graduate of the Mining Department of Mines, joined the department staff as an instructor. During the intervening 12 years he worked for 18 months as an engineering geologist for the U.S. Bureau of Reclamation; served one year as a member of the U.S. Army; worked as a petroleum geologist in several parts of the U.S. during a five-year stay with the California Co.; and spent the remaining years as a mining consultant specializing in mine examination, valuation, and exploration. He is currently teaching toward an M.S. Degree in Mining.

Courses taught include An Intro- duction to Mining, Mine Explora- tion, Mine Development, a Mining Problem (where each student pre- pare a complete report on a mining property), and Mining Laboratory.
A certificate by Sigma Xi, national earth sciences fraternity, Dr. Dodge applies 14 general concepts to the treatment of oil shale on a laboratory scale. Petroluem refining exhibits illustrated the treatment of oil shale on a laboratory scale and recovery of final end products of gasoline, diesel oil, and heavy turp.

15 ROTC Students Tour Waterways Experiment Station
Fifteen Advanced Course ROTC students flew to Vicksburg, Miss., for a tour of the Army Corps of Engineers Waterways Experiment Station during spring vacation. The students, members of the Mines post of the Society of American Military Engineers, left Lowry Air Force Base April 13 and flew to Jackson, Miss., then went by bus to Vicksburg. They returned to Mines on the afternoon of April 16.

At the Waterways station the cadets saw elaborate operating models of the New York Harbor, Niagara Falls and parts of the Mississippi-Missouri-Ohio River system. This latter model covers over 200 acres and reproduces 41 per cent of the land area of the United States. These models are used to study the effects of channel improvements and control structures in actual situations.

In addition to hydraulic models, the cadets also saw testing laboratories for concrete, flexible pavements, soils, and other materials affecting Corps of Engineers structures or Army mobility. The cadets were urged to discover that the Corps of Engineers is the world’s largest single user of concrete.

One afternoon of the two-day visit was spent on the Civil War battlefield of Vicksburg National Military Park. Here the cadets reviewed their military history while going over the trenches and rifle pits of one of the key battles of the war between the States.

The trip and accommodations, with the exception of meals, were paid for by the Omaha District, Corps of Engineers.

Dr. DodgeAddresses Earth Sciences Fraternity
Dilution of saline and brackish water was the topic discussed by Dr. Barnett F. Dodge at a recent meeting of the Mines chapter of Sigma Xi, national earth sciences fraternity. Dr. Dodge is chairman of the chemistry department at Yale University and is national Sigma Xi lecturer.

"Oceans are an inexhaustible source of water," Dr. Dodge stated, "but the salt must be removed for use. Even then the purified water will be unavailable to locations more than a few hundred miles from the sea coast."

He maintained that the total rainfall on earth is adequate for all fresh-water needs, but that distribution is very unequal and serious water shortages exist in many areas.

Dr. Dodge applies 16 general chemical processes to the purification of water with the exception of sea water. Some of the processes now used by the U.S. Department of Interior Office of Saline Water involve evaporation, freezing, solvent extraction, osmosis and electrodialysis.

"Most of this work is typical of engineering research as distinguished from scientific research, in that it is concerned with the improvement and cheapening of existing processes rather than discovery of new ones," he added.

THE MINES MAGAZINE • MAY, 1960
At Mines.

Ted Lee Myers, Albert Eugene Milling, fraternity, announced that...Kempkirs L. Lany.

Mines. Another 20 undergraduates...ommercial assistant to the President. Secretary Seaton, now 50, was...the Mines campus since 1956.

United States Secretary of the Interior Fred A. Seaton, will deliver the 1960 Commencement address at the Colorado School of Mines. He will receive an honorary degree at the graduation ceremony which takes place at 10 a.m., Friday, May 27, in the School's fieldhouse.

Some 130 undergraduates and 22 graduate students will be awarded their "Silver Diplomas" during the 86th annual Commencement at Mines. An additional 150 Mines graduates who will finish during the summer sessions will also take part in the exercises. The sterling silver diploma has been awarded to every Mines graduate since 1875.

Now president of several newspaper publishing firms and broadcasting and telecasting stations, Secretary Seaton served in the United States Senate from Nebraska. In 1953 he moved into the Department of the Interior as administrative assistant to the President. Secretary Seaton, now 50, was appointed Secretary of Interior by President Eisenhower to hold that office.

As a former member, Secretary Seaton has emphasized the need for a sound national and mineral resource policy. He has called for a coordinated research and exploration for mineral resources on U.S. soil.

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Vibrating A-C Ball Mill Effective in Grinding Barite

Industrial Minerals, Inc., York, S. C., is effectively grinding barite with Allis-Chalmers vibrating ball mills instead of the conventional roller mill. The vibrating ball mill resulted in a saving in air filters, through improved and more efficient operating conditions.

The company, which uses Allis-Chalmers vibrating ball mills at five different locations, will be equipped with a third mill this fall, recently installed a 30-ton unit for increased production. It is a spring-compensated cylinder with dual eccentric mechanism powered by two 30-hp electric motors, installed under the counter on a tile floor. Barite is the only material used.

A veteran of 31 years with the company, Robert C. Campbell, retired March 31 as director of advertising and sales promotion for Joy Manufacturing Co., Pittsburgh-based manufacturer of mining, construction and industrial machinery, for the past 12 years. He had been with Joy for 35 years. A graduate of the University of North Dakota, Mr. Campbell worked for mining companies in the western United States and Canada and North and Central America.

Michael Stumm, director of Information Services, has announced that Alan G. Caternon has been appointed technical editor of Crucible Steel's newly created department. He was formerly director of Mar- det Development in the Pittsburgh division of the company's Midland Steel Co.'s newly created department.

THE MINES MAGAZINE  MAY, 1960
Atomic Reactor Designed by Stearns-Roger Engineers

A $4 million atomic "runaway" reactor designed by Stearns-Roger Manufacturing Co. has gone into operation at the national reactor testing station near Idaho Falls, Id.,a. The reactor is built to work safely while delivering violent "spurts" or surges of atomic power.

Stearn-S-Roger officials said their responsibility covered detailed design of the process cycle, including the reactor building, site development, reactor vessel and process piping, pressurizing systems, water purification, radiation disposal system, electrical and other utilities, and process instrumentation. They also inspected workmanship, materials and equipment during construction.

Oasis Oil Co. Conducts Production Tests in Libya

On official production tests Amerada Petroleum Corp., Continental Oil Co., and Ohio Oil Co.'s Abu-26 well flowed at the rate of 75,000 tons of acid per year.

San Francisco Chemical Plants: Phosphate Operation

San Francisco Chemical Co. has completed plans for the construction of a major phosphate rock crushing and beneficiation plant at Vernal, Utah. Designed by Western Kansas Engineering Co., construction work began in April and is scheduled for completion by November.

Operations will be based on San Francisco Chemical's phosphate rock deposits at Vernal. Initial output of the new crushing and beneficiation plant will be 200,000 tons of phosphate concentrate annually. This concentrate will be trucked 200 miles to Western Phosphates Inc. at Garfield, Utah, as raw material for the production of wet process phosphoric acid, triple superphosphate and ammonium phosphates.

Western Phosphates Inc. is owned by Stauffer Chemical Co., (50%), American Smelting and Refining Co. (25%), and Knessco Copper Corp. (25%).

Flat Coke Acquires Campbell Sons Corp.

Flat Coke has acquired Harry T. Campbell Sons' Corp., a major producer of ready-mix concrete and "Sadcrete," dry concrete, masonry, concrete and masonry mix marketed in a 15-state area and part of Canada by the "poly-quick euro" market. According to the pooling of interests agreement, the Campbell company and its subsidiaries will continue to be operated in the present corporate forms and with no changes in the management or personnel.

Suquehanna doubles Wyoming's sulfuric acid production

A new sulfuric acid manufacturing plant at Riverton, Wyo., which doubles the sulfuric acid production capacity of Suquehanna-Western, Inc., a wholly-owned subsidiary of the Suquehanna Corporation, has been placed into operation.

The new unit of the sulfuric acid plant to be operated by the company, expands production capacity to 75,000 tons of acid per year. Suquehanna-Western, Inc. launched its sulfuric acid production operations on November 15, 1958, with the completion of Wyoming's first commercially produced sulfuric acid, also at Riverton.

Suquehanna's total investment in acid producing plants now exceeds $1,350,000. The company is Wyoming's only sulfuric acid producer. Allen D. Gray, Suquehanna-Western president, said the additional facilities were needed to meet a substantial increase in demand for sulfuric acid resulting in part from new ore processing mills constructed recently in the area. Sulfuric acid is also used in substantial quantities by oil refineries, the sugar industry, and in fertilizer manufacturing.

Continental Oil Co., through its Suquehanna Engineering Company, a division of Suquehanna-Western, Inc., in a record four months has brought the plant to the most technically advanced processes, and it is fully operational. Acid is produced by burning the through pure sulfur and conversion of the resulting gases. Sulfur for the plant is obtained from local Wyoming suppliers who recover it from the by-product gas.

Petroleum Bays interest in Creole Oil Properties

Petroleum Bay is gaining interest in producing Acadia parish (Louisiana) oil properties owned by Campell Sons Corp., New Orleans, by Petroil Oil Corp., New York City, has been announced by Robert W. Blum, president of Creole.

The transfer involved an undisclosed sum of cash in and stock of Petroil for a 30% per cent working interest in a drilling field and is expected to bring the total to 4,700 acres in the new producing field southeast of Eunice, Louisiana, and is 20 miles southwest of Bayou Mallet.

Petroil is in the process of expanding its world-wide operations and this initial Louisiana purchase from Campell Sons Corp. is for the "Poly-quick euro" market. According to the pooling of interests agreement, it was learned from Simon Amin, president of Petroil, who arranged the transaction between Campell Sons Corp., and Co., Inc., investment banking firm of both firms, that the regular order in top position by means of the makeable positioning control selector switch. Upon removal of the regular cover and damaged, the quick-opening manhole cover is then attached to the line on the mill shell with a pin; the release latch is then attached, and the mill is brought up to operating speed.

The mill is then stopped with the manhole in the bottom position. A chain or cable is then laid at least to the bottom, and a lever is then attached to the release latch, the latch locked bolt removed, and the latch pin placed on the grinding medium.

After maintenance servicing, the quick-opening manhole cover is removed and the regular cover replaced and secured with manhole crabs.

With the Manufacturers

Continuous Vacuum Filter

The Straight Line Filter is a new horizontal, continuous vacuum filter which can be used in a high production, continuous, on-line system, with no moving valves and a corrosion resistant, unlined dual-elbow washbox which permits close separation of filtrates.

It features extremely high capacity, low operating and maintenance costs, uses less heat treatment and floor space than filters of equal capacity. The entire filtration cycle from feed to filter cake discharge is visible at all times as compared to systems maximum operating efficiency.

Among the suggested uses for the new filter are in: chemical processing, sewage treatment, concentration of oil, crude oil, asphalt, fuel processing, and in the pulp and paper industry. Many operations are reduced because all parts are visible and measurable and no complex valves and special assemblies are needed. Down time is reduced because the filter media can be removed and replaced in 30 minutes. No filter or filter aid maintenance is required.

The filter cake is formed by a combination of vacuum and gravity drainage and is discharged by gravity. Clean current washing or backwashing can be used.

The company maintains testing facilities to test the efficiency of its filters on customer's samples, including those of Idaho State University, Inc., Roe 291, Whittier, 99, for complete details about the new filter.

Manhole Cover for Mills

A quick-opening manhole cover has been designed for the mining and construction industries with the purpose of enhancing safety and to reduce the number of roof bolts formerly required and provide support between roof bolts.

A key strength and cost reduction feature results from overlapping the manhole cover with that provided in the hole to be mined. The new type was designed to mine safely and economically to the extreme left and in the foreground.

In conjunction with roof bolts, the manhole is intended specifically for prevention of rock spalling conditions, and to assist in handling and loading. The manhole was designed to mine safely and economically to the extreme left and in the foreground.

Application of the new roof bolt mat varies. It has been found in the mining, construction industries has been announced by Commercial Shearing and Stamping Co., Youngstown, Ohio.

Manufactured of acid blasting pellets, ammonium nitrate in a new pellet form said to increase the economy and effectiveness of blasting is announced by the explosives Division, Atlas Powder Co., Washington 99, Dall.,.

A $1 million project recently completed near Joppville, Miss., Atlas pellets are described as the optimum size and shape for better control over rock blasting. High energy and absorption. Atlas pellets are available in 1/8, 1/4, and 3/8-inch pellets. The pellets flow freely and may be field-formed by any method. 1/4 in. pellets will also be available in premixed form.

Dial-A-Slope Blade Control

Development and satisfactory test of a mine roof bolt mat for use in mining and construction industries has been announced by Commercial Shearing and Stamping Co., Youngstown, Ohio. Application of the new roof bolt mat has greatly increased flexibility and form support. Examples of overburden, rock fall, and movement seen at extreme left and in the foreground.

Used in conjunction with roof bolts, the new bolt is employed specifically for prevention of rock spalling conditions and to assist in handling and loading. The new bolt was designed to mine safely and economically to the extreme left and in the foreground.

The mill is then stopped with the manhole in the bottom position. A chain or cable is then laid at least to the bottom, and a lever is then attached to the release latch, the latch locked bolt removed, and the latch pin placed on the grinding medium.

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JOY Compressor Unit

A complete 600 CFM rotary positive-displacement compressor unit for mounting on the rear of a 25-ton carrier, has been introduced by JOY Manufacturing Co. Called the JOY Air-Analyzer, the unit mounts easily on the carrier and is driven through a rear power take-off. It is designed to provide a flexible, high-speed means of converting a used tractor into a compressed air source, ready to mount, The manufacturer claims it includes everything necessary to make a working compressor including vane RT-600 Rotary Compressor, the housing, heavier frame, larger segment gear, and all portable, swiveling unit and two portable, combination of air conditioning and air handling equipment, air compression and extension, etc. Also included in a sample application is a 22 X 28 inch high speed, high efficiency centrifugal compressor.

Research Plant Planned for Metallurgical Coke

A research plant for the experimental production of metallurgical coke from substoichiometric coal will be operated jointly by Food Machinery & Chemical Corp. and U.S. Steel Corp. The plant, to be located near Kalama, Wash., will utilize Wyoming coal and produce high density, high quality coke which have proven so successful in service, in compliance with existing specifications and tests.

Creative Explorations, Inc., completed the discovery well and consequently the new field in late March, 1960. The first well is a high product well, being purchased by Cities Services. The discovery well, the Henry Gas No. 1, was brought in with an initial production of 151 barrels of oil at 61.4 gravity on a 1/2 inch choke with a flowing pressure of 200 pounds. Production was brought in at the 5500 foot level, approximately 900 feet and 950 feet.

National Gypsum Co. Begins $125-Million Expansion Plan

Chairman Melvin B. Baker of National Gypsum Co. has announced the most ambitious expansion program in his 14-year association with the company's management. The expansion program, a $125-million plan for new plants, equipment, modernization and improved production at existing facilities.

Quick-Work Track Shovels

Joey Compressor Unit

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Catalysts and Trade Publications

Seed your publications to The Mines Magazine. 1617 Illinois St., Golden, Cola. for more freedom in their enterprises. Please mention The Mines Magazine when requesting publications from the manufacturer. Publications are free.

Copy of Bulletin G-751 that be obtained by writing to the General Electric Co., Schenectady 5, N. Y.

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BOOK REVIEWS

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DIGEST OF SWEDEN

"Digest of Sweden," by Allan Kastrup, has been published by the Minnesota Historical Society. It is devoted to informing the public about the nature of the Swedish mining industry and the chemical industry. The book is an extensive list of references for the mineral industry and the chemical industry. It is aimed at those who already are familiar with the subject.

MINERAL INDUSTRIES

(Closed from page 12)

Koch said the first maps issued in 1959 were at the request of the mining enterprises. They were made by Miss Anita Taylor and Mr. I. A. Koch.

The Atomic Energy Commission purchased some two and a half billion dollars worth of uranium concentrates from private sources in the years 1954 to 1959, and purchases of uranium concentrates for that period amounted to $1,175,000,000. The Atomic Energy Commission has amended its statistics on domestic uranium production for the last six months of 1959. The new figures are based on purchases of uranium concentrates, ore, ore processing, ore transportation, ore reserves, and initial production bonus payments.

MILLING PLANTS IN CANADA (Continued)

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URANIUM PROCESSING PLANTS

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THE MINES MAGAZINE • MAY, 1960

Note: The above listed mills are privately owned and operated, and all are licensed to buy uranium ores from producers. The USAEC buys the concentrates under the terms of contracts with each mill operator.
Zinc-Columbium Coating

A civilian metallurgical engineer at the U. S. Naval Research Laboratory has been studying zinc-columbium coatings, and in the September 1960 issue of the Journal of Metals that highly encou-

raged. The zinc-columbium coatings are formed by the deposition of a zinc-columbium alloy onto the surface of the component.

As with most intermetallic com-

compounds, the process involves the immediate plating of a zinc layer onto a base metal, followed by the diffusion of zinc into the base metal, which results in the formation of a strong bond between the coating and the base metal. The zinc-columbium coating is known to be durable and resistant to corrosion, and it has been used in a variety of applications, including automotive and aerospace components.

The coating is formed by first depositing a thin layer of zinc onto the component, followed by the diffusion of zinc into the base metal. This process results in the formation of a strong bond between the coating and the base metal, which makes the coating resistant to corrosion and other environmental factors.

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TERRIT MANUFACTURING NAMING NEW REGIONAL SALES MANAGER

Richard Bennett has been named regional sales manager for the Chicago area for Territ Manufacturing Co.

Bennett will supervise sales activities for Territ's industrial dust collectors and associated equipment in Chicago and its neighboring industrial area. The E. A. Davenport organization, 1539 W. 86th St., Chicago, will continue as manufacturers' representatives for Territ. Chas. said.

The new position is in recognition of growing use of dust collection systems in industry and to provide additional specialized field engineering services in the Chicago area, Chas. pointed out.

The financial aid given by colleges and universities makes possible the production of high grade iron ore concentrates from semifinished, a low grade non-magnetic ore.

In Brazil, engineering and cost studies show the possibility of commercial production of ore for export to the U.S. and Europe from the large and exceptionally high grade iron ore deposits held by St. John de Rey Mining Co., Ltd., in which Hanna Mining and associated holds controlling interest.

Moab Uranium Mill Contract Amended

An amended uranium concentrate purchase agreement has been consummated by the U.S. Atomic Energy Commission and the Uranium Resources Corp., operators of the 1,500-tpd uranium processing mill at Moab, Utah, it was announced by the Grand Junction Operations Office of the Commission.

The amended agreement extends the contract to Dec. 31, 1966, and provides for conversion of one of the mill's acid circuits to a carbonate-circuit capable of treating the high-grade ores of the district. It also provides for a firm market for significant independent ore producers whose properties hereafter are "dedicated" to the Moab mill.

By converting one circuit to a carbonate circuit, the Moab mill henceforth will provide a market for high-grade ores found in the Big Indian district.

The inclusion of the amended contract in the contract to Dec. 31, 1966, and the purchase agreement has been signed by the U.S. Atomic Energy Commission and the Moab Uranium Mill, Moab, Utah, to sell the concentrate to the U.S. Atomic Energy Commission and for the U.S. Atomic Energy Commission to purchase the concentrate.

The dock handled 1.1 million tons of ore, facilitating by the opening of the new kiln for treating the ore. The kiln is a $2 million pilot plant in the Cooley District of Minnesota to test the possibilities of producing high-grade pyritic concentrates at Moab.

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