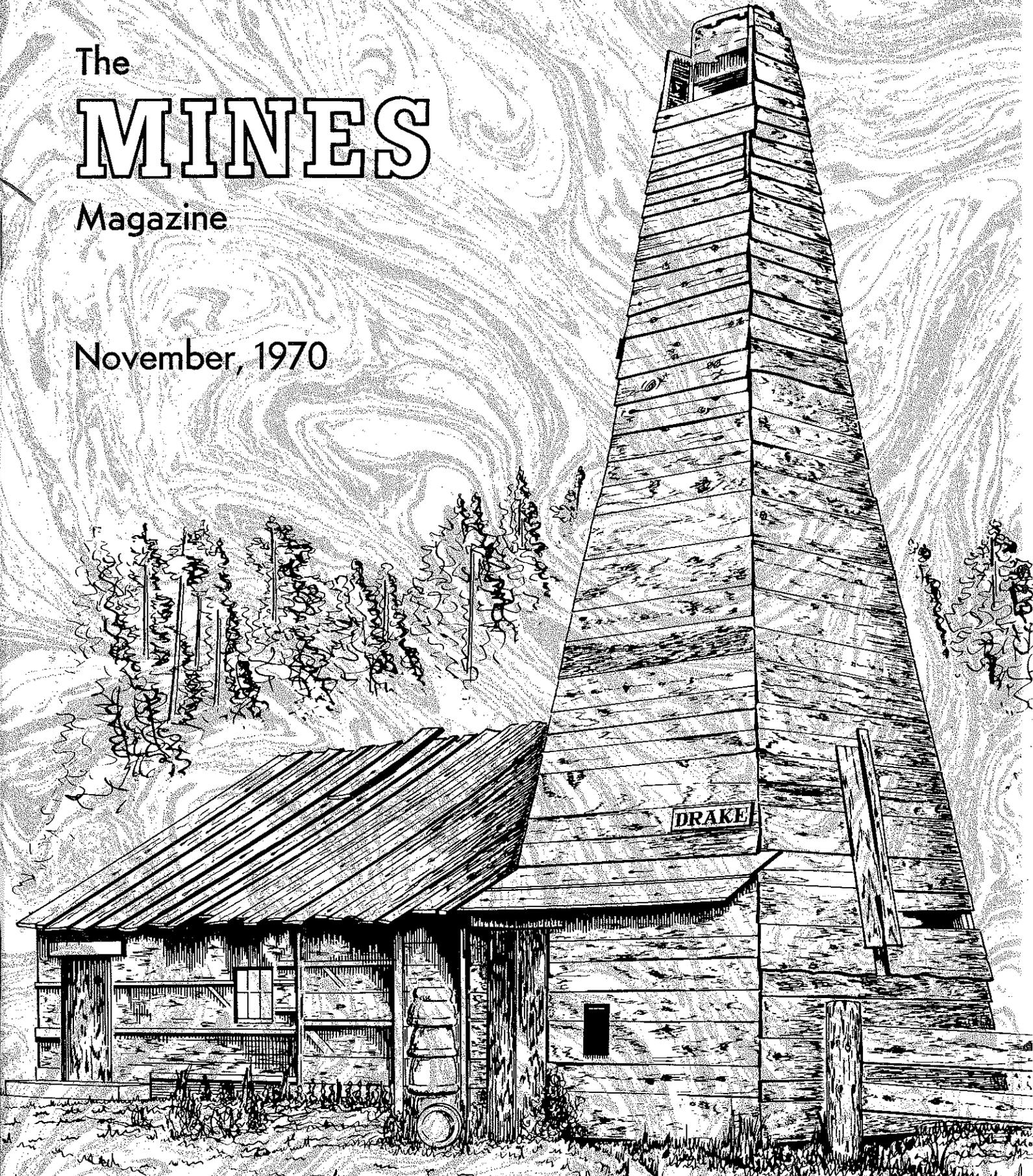


The

MINES

Magazine

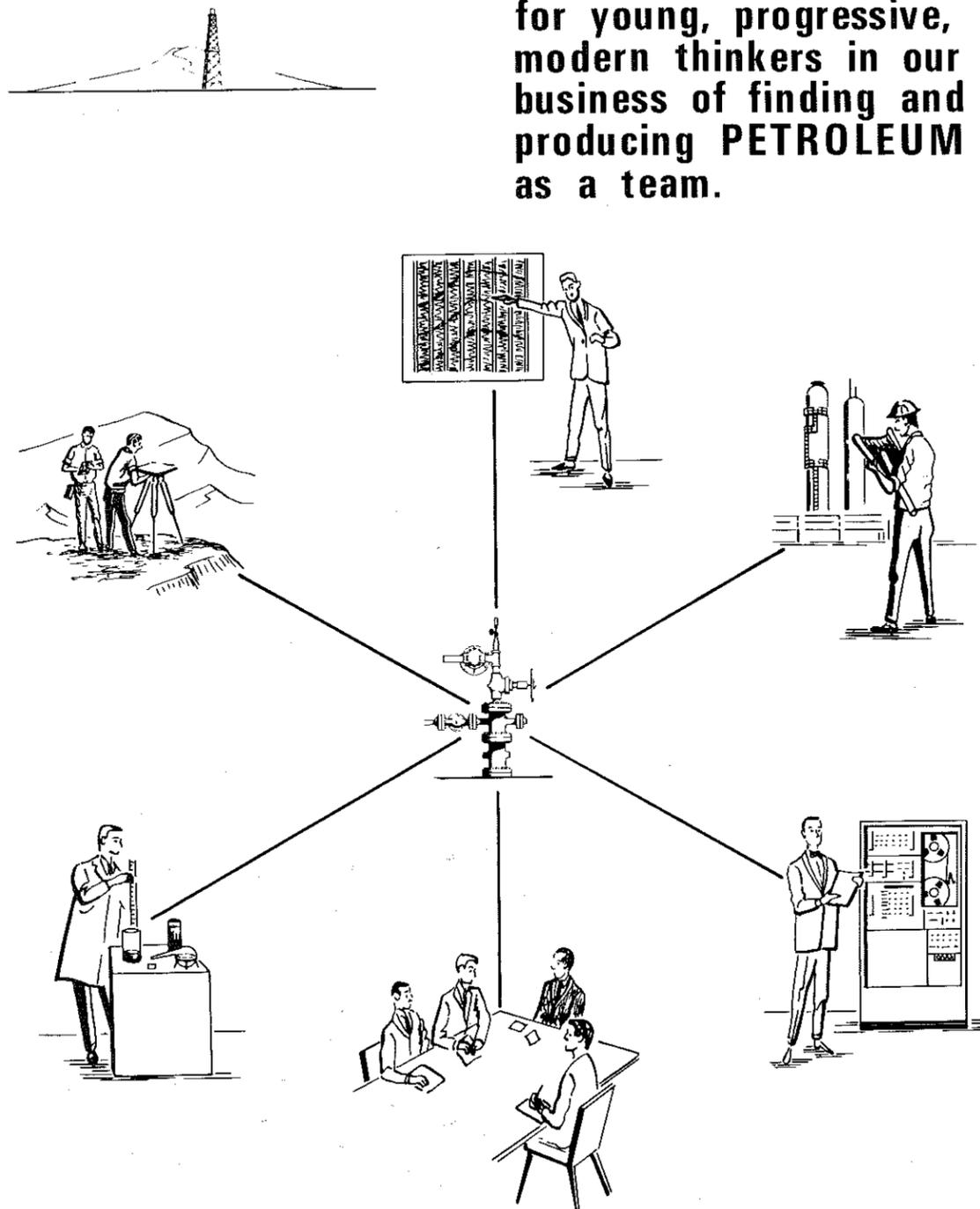
November, 1970



35th Annual Petroleum Issue

- Earl Rhodes -

A "TEAMWORK ORIENTED" COMPANY — might best describe Pan American. We are aware of the need for young, progressive, modern thinkers in our business of finding and producing PETROLEUM — as a team.



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THE MINES MAGAZINE

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 Circulation Mgr.

Calendar

Thanksgiving Day

*Thanksgiving Day is coming
 A day to celebrate
 The blessings we are given
 Before it is too late.*

*But every day brings blessings
 Mixed with problems we must meet,
 So Thanksgiving Day is THE day
 We should thankfully greet.
 —Pearl Anoe.*

Fall Symposium of West Texas Geological Society and University of Texas, "Geologic Framework of Chihuahua Tectonic Belt," in honor of Prof. Ronald K. DeFord, E.M. '21 M.Sc. '22 and Medalist '63, Scharbauer Hotel, Midland, Tex., Nov. 4-6.

Seminar on Pollution ("For Land's Sake"), sponsored by Environmental Sciences Inc., Pittsburgh, Pa., Nov. 9-11.

Computers in Metallurgical Processing, ASM sponsored, Statler Hilton Hotel, Cleveland, Ohio, Nov. 16-18.

Conference on the Fatigue Problem (ASM), Sheraton-Cadillac Hotel, Detroit, Nov. 30-Dec. 2.

Symposium—Materials/Process Selection (ASM), Statler Hilton Hotel, Cleveland, Ohio, Dec. 2-3.

76th Annual Convention of Northwest Mining Assn., Davenport Hotel, Spokane, Wash., Dec. 4-5.

Elements of Ferrous Metallurgy (ASM, Intensive Course), Four Seasons Motor Hotel, Toronto, Canada, Dec. 14-16.

AIME Pacific Southwest Mineral Industry Conference, Reno, Nev., May 5-7, 1971.

Underwater Mining Institute, Downtown campus of Univ. of Wis., Milwaukee, Wis., May 20-21, 1971.

The MINES Magazine

Volume 60

November, 1970

Number 11

Front Cover

The first successful oil well in the United States was drilled to a depth of 69.5 feet on Aug. 27, 1859 in Titusville, Pennsylvania. The Fertig Brothers were the drillers on Colonel Drake's well, according to a reference book entitled "Pennsylvania Oilmen—100 Years of Petroleum Production, 1969."

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Class Notes

1906
Mrs. Morton E. Frank, whose husband (Class of 1906) died Feb. 9, 1970, writes that her address is as follows: 1640 East 50th St., Apt. 19A, Chicago, Ill. 60615. We apologize for the error in story about Mr. Frank.

1939
Norman L. Foskett, P.E. 1936, was back on the campus for the first time in many years. He is an assistant engineering manager, Processing Industry; Stone and Webster Engineering Corp., 225 Franklin St., Boston, Mass. 80217. Norm is a transplanted Colorado who likes his present position and location. It was good to see him in Colorado.

1939
Lewis Anderson, E.M. 1939, stopped by our office to pick up a 1970 Directory reporting that he had not yet received his. The Directory was mailed almost a month ago and if others of you have not received your 1970 Directory, please let us know. Sorry we missed you Lewis. Lewis is with the National Park Service in Hawaii.

1940
William R. Lewis, Met. E. 1940, who has been with Union Carbide for many years, wrote: "I am still working for Union Carbide but in a different capacity. I had the option of moving to Colorado rather than staying in the New York area. It is wonderful to be back in Colorado after nearly 30 years." Bill's address is 18 Upland Rd., Colorado Springs, Colo.

1951
Dr. S. R. Titley, Geol. E. 1951, of the Department of Geosciences at the University of Arizona, was featured speaker at the regular dinner meeting of the Arizona Geological Society in Tucson Sept. 8th. His subject was, "Some Porphyry Copper Deposits of the Western Pacific — Contrasts and Comparisons." Dr. Titley's address is 6920 Laos Place, Tucson, Ariz. 85715.

1957
James E. Orofino, Geol. E. 1957, president and owner of Orofino & Co., has completed tests along the outer perimeter of the proposed 35-story First National Bank Building in downtown Tampa, Fla. Completion of the building, which will be the tallest in Florida, is scheduled for 1972.

1959
Lary G. Cahill, Met. E. 1959, was recently transferred by Asarco from its El Paso, Tex., smelter to the New York office where he will be an ore buyer. His address is 2 Countyroad Drive, Morris Plains, N. J. 07950.

1967
Dennis Peperkorn, Geol. E. 1967, was in our office in early October. He reported that he is a member of Delta Co., MCB 74, U. S. Navy, and is stationed at Gulfport, Miss.

CSM Faculty, Students, Alumni Welcome Dr. and Mrs. Guy J. McBride Jr.

COLORADO School of Mines President Guy T. McBride, Jr. and Mrs. McBride arrived on the campus Sept. 1. They have received an enthusiastic welcome from the faculty and administration, alumni, students, and the community. In turn, Dr. and Mrs. McBride have responded to this greeting.

On Sept. 22, the Faculty Women's Club sponsored a reception and dinner for Dr. and Mrs. McBride at the Mt. Vernon Country Club. It was the largest private dinner ever held at the Club, as 315 members of the faculty, staff, and their wives turned out to meet and greet the McBrides.

Ted P. Sockmar, president of the Board of Trustees, introduced Dr. and Mrs. McBride, saying the School was indeed fortunate to have them become members of the university community.

In his response, Dr. McBride said he and his wife were grateful for the encouraging welcome, and hoped that members of the faculty and administration would feel free to stop by and visit them when convenient.

Prior to the welcoming dinner, Dr. McBride participated in meetings with the faculty, students, and Golden businessmen.

On Sept. 14, he addressed the assembled faculty in Coolbaugh Hall in the annual Faculty Conference which begins the academic year.

In a "State of Mines" message, Dr. McBride said he planned "a clear look at problems to reveal the concealed opportunities." He said that his administration, in line with the policies of the Board of Trustees, would work hard for development of a national reputation and national leadership for the Colorado School of Mines.

The next day, at the Freshman Assembly to welcome the Class of 1974, he said the School was dedicated to excellence in under-graduate and graduate study and research, and also dedicated to creative service to the mineral industries. "You have no greater opportunity, as a



DR. GUY T. McBRIDE, JR., president of the Colorado School of Mines, discusses academic matters with a member of the faculty following his address at the annual Faculty Conference.

Mines student and graduate, to make man's life worth living by meeting the mineral needs of the nation," he addressed the 375 freshmen.

On Sept. 17, Dr. McBride was guests of the Golden Chamber of Commerce at its monthly luncheon meeting at the Holland House. There, he was introduced to the business leaders of the community and following lunch, met informally with many of them.

On Oct. 14, Dr. McBride met with Col. W.W. Fertig and members of the Board of Directors of the Colorado School of Mines Alumni Assoc. He pledged his support of alumni activities and encouraged the Alumni Association to assist the School in attracting out-of-state students to Mines.

A welcoming luncheon, sponsored by the Faculty Women's Club, for Mrs. McBride was held Oct. 1 at Hiwan Country Club. A total of 98 wives turned out for the annual event in honor of new faculty wives. Mrs. McBride was made honorary president of the Club by Mrs. J. R. Bergeson, president.

It has been a busy time for President and Mrs. McBride, and everyone is impressed with the vitality and leadership they bring to the campus and the community.

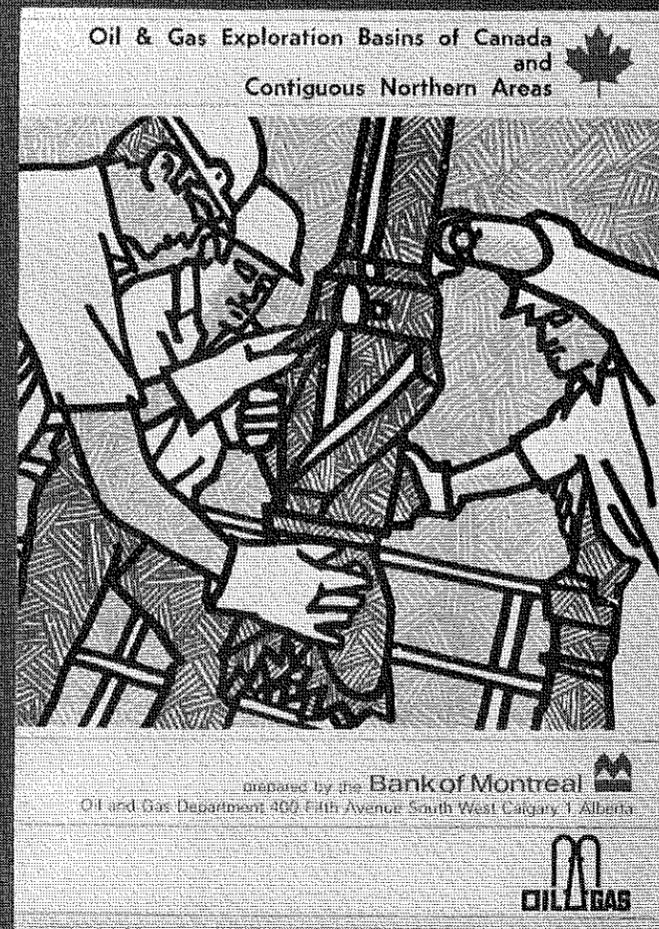


COLORADO SCHOOL OF MINES FACULTY WIVES welcomed Mrs. Guy T. McBride, left, at a luncheon at Hiwan Country Club. Mrs. J. R. Bergeson, president of the Faculty Women's Club, pinned a corsage on Mrs. McBride and named her honorary president of the group.

THE MINES MAGAZINE • NOVEMBER, 1970



THE CLASS OF 1974 was addressed by Dr. McBride Jr. at the Freshman Assembly in the Ben H. Parker Student Center. He said there is no greater opportunity than there is now and in the future for young men to have rewarding careers of service to the mineral industries and to the nation.



Take a tour of the oil and gas industry in Canada. Without leaving your office.

Just write for our two maps including our latest "Oil and Gas Exploration Basins of Canada and Contiguous Northern Areas", which particularly emphasizes Canada's North and Arctic Islands; also our informative forty-page guide. They're all free.

The maps pinpoint oil and gas fields, pipelines, refineries and natural gas processing plants across Canada's oil and gas country.

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Both maps and Guide are available, without obligation, to all businessmen interested in the petroleum industry. Simply mail in the coupon.

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CSM Chemical & Petroleum Refining Engineering Dept.

By the Staff

THE FACULTY of the Chemical and Petroleum-Refining Engineering Department has not changed since the last report to you in the November, 1968, issue of MINES Magazine, so this review will deal primarily with improvements in course offerings and additions to the department's sponsored research.

The undergraduate instructional program has been modified to permit students, who wish, to take a minor program in certain areas and to give them a broader perspective as to engineering fields open to them. The senior process control laboratory has been upgraded by the addition of several pieces of sophisticated equipment which permits the use of more industry-oriented problems in the course.

A Guest Lecture Series to bring outstanding Chemical Engineers from other universities and industry to the campus for the benefit of both undergraduate and graduate students has been very successful since its initiation, and a balanced program of sponsored research has made possible the expansion of our graduate program to its present level.

This year the CPRE Department has 45 seniors, 28 full-time graduate students, and a faculty of seven. The staff is very proud of the quality of our students and believe this can be attributed to a large extent by the support of industry in providing scholarships to reward outstanding students. In particular, we wish to express our appreciation to Atlantic Richfield, R. C. Baker Co., Continental Oil Co., Esso Education Foundation, Monsanto, Standard Oil Co. (Calif.), Union Oil, Mobil Foundation Inc., and UOP.

A series of short courses is now being given as an aid to engineers in industry. These courses serve to update engineers in their fields of endeavor and to give them adequate backgrounds in new areas. The response has been much greater than anticipated and the number of offerings will be increased in the future.

Minors in C. & P.R.E.

THE Chemical and Petroleum-Refining Engineering Department has instituted a new program whereby students in the option may elect to take nine-credit hours of approved course work in selected areas of study for a minor. Disciplines in which minors are presently granted include Mathematics, Metallurgy, Mineral Economics, and Petroleum Engineering. Six of the nine-credit hours required for the minor may be taken in place of the unrestricted electives. This program will permit a more effective use of the technical elective courses for Chemical and Petroleum-Refining Engineering majors and will give them a more in-depth knowledge in these minor disciplines.

Response to the program thus far has been very favorable. It is hoped that the program can be expanded in the near future to include other areas in the minor program.

The Guest Lecture Series

TWO years ago, the Department of Chemical and Petroleum-Refining Engineering instituted a Guest Lecture Series featuring noted authorities in chemical engineering. These two and three day on-campus lectures

have a dual purpose: first, to provide an opportunity for the CSM faculty to discuss problems of mutual interest with the speakers, and second, to serve as continuing education courses for CSM graduate and undergraduate students and area industrial personnel.

The keynote speaker for the first symposium was Dr. James J. Carberry, professor of chemical engineering at the University of Notre Dame. Professor Carberry is justly famous for his work in chemical kinetics, and his "Chemical Reaction and Reactor Behaviour Symposium," held March 31 to April 2, 1969, was a tremendous success.

The second symposium "Four Lectures on Macromolecular Hydrodynamics" was presented on Sept. 24 and 25, 1970. The department was extremely fortunate in obtaining Dr. R. B. Bird, professor of chemical engineering at the University of Wisconsin for these lectures. Professor Bird is the senior author of "Transport Phenomena," a text widely used in many branches of engineering, and a co-author of "molecular Theory of Gases and Liquids." Professor Bird has also been a Guggenheim Fellow and a Fulbright Lecturer at the University of Delft. The response to his symposium was very gratifying; the lecture hall was filled to capacity with faculty and students from the University of Colorado, University of Wyoming, University of Denver and CSM, in addition to a strong turnout from the engineers in the areas industrial and research firms.

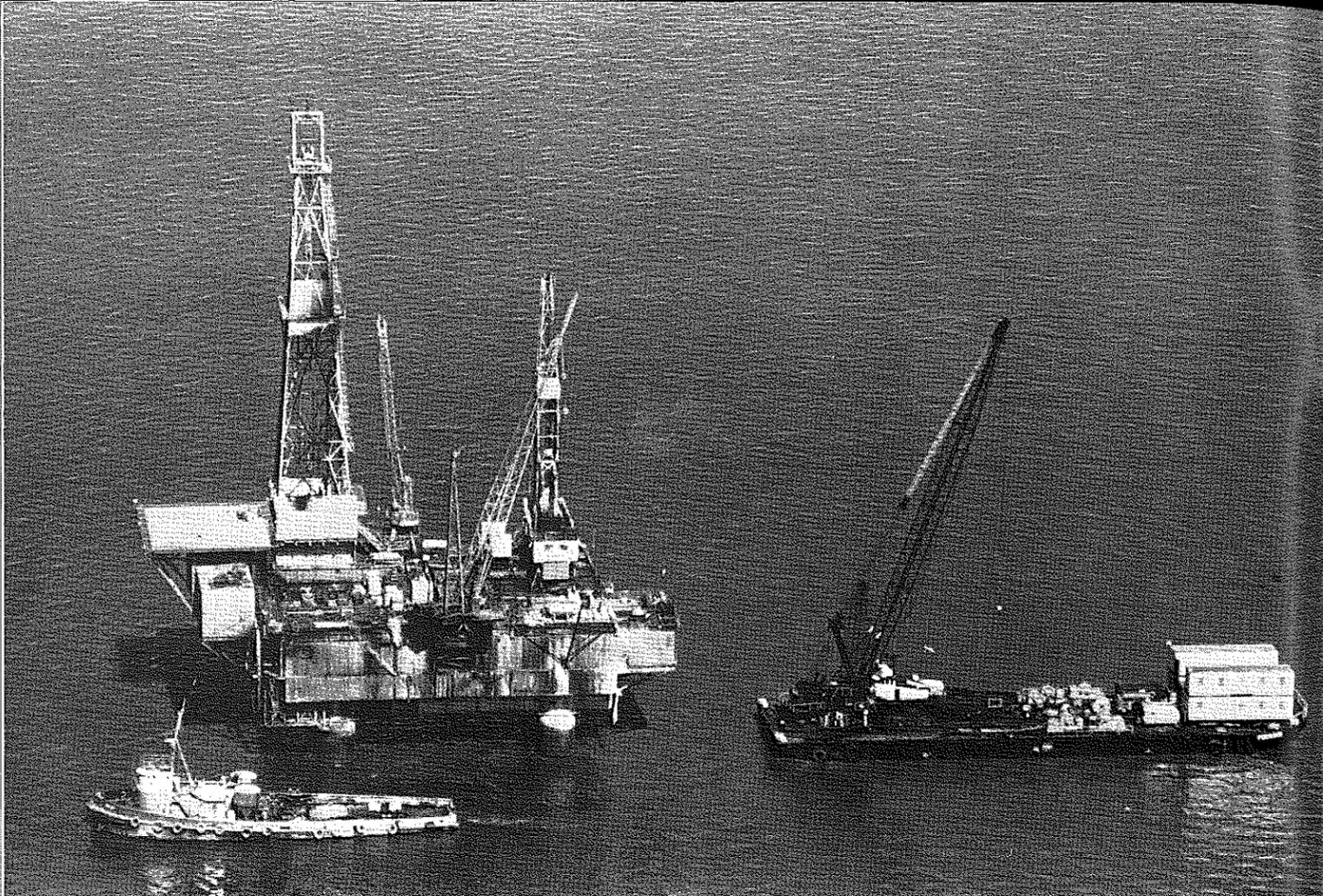
The third symposium in the series has tentatively been scheduled for April, 1971, and will be entitled "Engineering Applications to Medicine." Our guest lecturer for this series will be Dr. E. N. Lightfoot, professor of chemical engineering at the University of Wisconsin. Professor Lightfoot has been a pioneer in this new and exciting engineering area, and his lectures will be timely and stimulating.

The department hopes to continue the series in future years with symposia on topics such as engineering and the environment, heat transfer and chemical engineering applications of thermodynamics.

Process Control Laboratory

THE Process Dynamics course, CR 403, is one of three courses in the CPR option which has a laboratory section as an integral part of the course. Two recent developments have lead to improving the laboratory portion of the course. A National Science Foundation grant of \$12,100 was awarded to Elwyn Shimoda for the department through the Instructional Scientific Equipment Program. Several pieces of new instrumentation were purchased to allow the students to become more familiar with process control devices presently being used in industry.

The second development was the securing of a Libratrol — 1000 process control computer. The computer is a second-generation, solid state drum machine (32 bit, 8k) with the ability to scan analog and digital inputs (60 per second) and to produce computed outputs to be used for control signals. The projected use of this new equipment is in the area of process control (direct digital) courses and will also be used as a data logger for complex experiments. The computer is presently equipped to receive seven analog and twenty digital inputs (expandable), and to



Offshore— Petroleum and the Environment

The nation and its people have a vital stake in what has been called a developing new frontier — the oceans. Their beauty, marine life and resources are a natural heritage to be preserved on the one hand, yet also developed.

The offshore search for oil and natural gas began in earnest two decades ago and has intensified in recent years. As this search advanced, so has the petroleum industry's keen concern and constant efforts to protect the ocean environment — marine life, beaches, and the sea itself.

This article clarifies why it is so imperative to the nation's domestic security and economic growth that the seaward search for oil and natural gas continue, and what steps are taken by the petroleum industry to safeguard the life and beauty of the oceans. The article is, therefore, the petroleum industry's response to the numerous news stories about oil spillage in the Santa Barbara Channel.

PART I—AMERICA'S STAKE IN OFFSHORE PETROLEUM

ENERGY is the cornerstone of economic growth, industrial strength, and national security. The United States is the most highly industrialized and prosperous nation in the world, largely because Americans have had an ample domestic supply of energy resources—readily available at reasonable cost—to meet their needs.

Energy, in the broadest sense, is power—the ability to provide heat and light, to make things move, to do work in some form. America's principal source of power is petroleum—oil and natural gas. Together, these fuels provide three-quarters of the nation's total energy requirements.

(Continued on Page 12)

NOVEMBER, 1970 • THE MINES MAGAZINE

An engineer can cut crime as well as any cop. Maybe better.

Last year, murder was up 7%. Rape was up 17%. Robbery was up 14%.

It's getting to the point where a woman can't show her face on a dark street. And grown men are running scared. Sadly, crime has become a part of our everyday lives.

Where do we turn for help? To police, of course. But why not also to engineers?

Engineers at General Electric set out to develop a more efficient streetlight. And they came up with one of the most efficient crime fighters ever invented.

It's called the Lucalox® lamp. It puts twice as much light on a street as any other lamp without any extra operating cost. And wherever Lucalox has gone up, crime has gone down. By 50% or more in city after city.

But that's not all an engineer can do. He might design communications equipment that enables one patrolman to do the job of two. Or a complex of traffic monitors that puts twenty cops back on the beat. Or even a patrol car to do its special jobs in a better way.

It's sometimes hard for people to realize that engineers, with their technology, can solve social problems. But, in fact, some social problems can't be solved any other way.

So if you're an engineer who's bothered by social problems, you're in a unique position to help.

General Electric could use your help. We see more problems around us than we know how to solve. So what we need is more engineers.

GENERAL  ELECTRIC

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(Continued from Page 10)

The Role of Petroleum Energy. Petroleum is almost the sole source of power for America's vast transportation network—rail, ship, air, truck, and family car travel. Oil and natural gas fuel much of the nation's industry and its military might. They furnish most of the country's heat and lubricants, and they form the basis of thousands of plastics and petrochemical products which have become so important to the comfort and ease of living enjoyed in this country.

Petroleum's vital role is understandably taken for granted by most Americans, primarily because—apart from wartime rationing—Americans have never experienced a serious shortage of these fuels. But each day, 200 million Americans consume nearly 550 million gallons of petroleum liquids and over 50 billion cubic feet of natural gas.

Petroleum's Future Role. The population of the United States is expected to reach perhaps 250 million by 1980 and to climb to as much as 360 million by the turn of the century. To furnish the needs of future Americans all segments of the economy—from home construction to the largest industries—will have to rapidly expand. And with this expansion, the nation's petroleum energy needs will double.

Based on U. S. Department of the Interior estimates, daily oil demand will jump to over 770 million gallons by 1980, and to more than 1,100 million gallons every day by the year 2000. Natural gas demand is forecast to rise to nearly 70 billion cubic feet daily in 1980 and to 110 billion cubic feet each day by the turn of the century.

What these forecasts mean is that between now and the end of the twentieth century—roughly three decades—the nation will require two and one-third times more petroleum energy than it consumed during the entire 110 years that have elapsed since the birth of the oil industry in 1859.

Meeting future needs of this magnitude is a challenge to the industry—in fact, a mandate—to broaden its search for new oil and gas deposits to all corners of the continent. Every drop of oil and cubic foot of natural gas must be found if Americans are to be guaranteed a continuing uninterrupted flow of petroleum energy in the years ahead. And such a flow could not be guaranteed if the nation, instead, became heavily reliant on foreign oil to meet its needs—the cut-off of oil shipments to the West during the 1956 and 1967 Middle East Crises clearly demonstrated the insecurity of such an option.

Under this mandate the petroleum industry pushed its search seaward because it had to. The remaining oil and natural gas on land have become increasingly more difficult and costly to find. As a result, new discoveries of both fuels have been declining while demand for petroleum energy continues to spiral. Arctic Slope oil will begin to furnish a share of the nation's energy needs during the 1970's. And eventually, synthetic fuels will be an added source of supply for the nation—but because these fuels cannot yet be produced at a competitive cost, this eventuality is still years away. In the meantime, to assure the nation's consumers a continuing supply of low-cost energy, the petroleum industry must now find the oil and natural gas reserves that will be required for the 1970's and 80's—for it takes between five and 10 years after an initial discovery is made to fully develop and bring a field's potential to commercial production.

Offshore Potential. One of the areas which offers the nation and its people the best immediate promise of supplying a secure source of future petroleum energy demand lies offshore.

As yet, only about one per cent of the seabed surrounding this continent has been tested for its petroleum potential. But experts with the U. S. Geological Survey estimate that the total recoverable reserves underlying the U. S. continental shelf may be over 200 billion barrels of oil and more than 1,000 trillion cubic feet of natural gas—a potential great enough to supply U. S. needs for

many years to come. Deeper portions of the ocean floor off the U. S. mainland—the continental slope and the landward portion of the continental rise which have not yet been explored—may also add significant amounts of oil and natural gas to the domestic reserve supply.

Current Status of Offshore Development. The seabed off the U. S. mainland currently supplies approximately 13 per cent of the nation's oil and natural gas requirements. At the present time, production is centered in the Gulf of Mexico and in the waters of the Pacific off California. But the seabed off the Atlantic coast is also thought to have significant petroleum potential, although no exploration drilling has yet been undertaken in these waters.

Current production is primarily in water depths of less than 300 feet. However, operations are presently underway in waters approximately 1,300 feet deep. Within three to five years, the petroleum industry expects to have the technological know-how to not only drill, but also produce, in waters at least 1,500 feet deep, and within a decade to extend its operational capability to water depths of 4,000 to 6,000 feet.

With this advanced capability and the potential resources thought to exist beneath the ocean floor, experts estimate that offshore oil and natural gas may supply a major share of this nation's domestic petroleum requirements by 1980.

Offshore Costs. Offshore operations, however, are expensive and costs will rise considerably as greater depths are attained.

Thus far, the U. S. petroleum industry has invested an estimated \$13 billion in the search for and development of offshore deposits of oil and natural gas, and operating costs are adding to this total at a daily rate of \$2 million. Many companies operating offshore have not yet begun to break even—all told, offshore petroleum operations show an earnings deficit of an estimated \$7.5 billion.

Part of this capital outlay includes bonuses paid for offshore leasing rights. The federal government alone has collected an estimated \$3.5 billion since 1954 for leases granted in waters beyond state jurisdiction, while the states have realized an estimated \$1 million from their sales.

Drilling and producing platforms also represent a sizeable investment. Those currently operating in U. S. coastal waters cost as much as \$15 million each, while some now being designed will cost \$18 million.

Besides the capital outlay for the platform, actual drilling itself is a sizeable cost factor. In 1967, a total of 1,365 wells were drilled off U. S. coasts at a combined cost of over \$614 million—or an average of over \$450,000 per well. In other words, each offshore well is approximately six times more costly to drill than the average well on land.

Yet, despite these high costs, the offshore petroleum search must continue, for its potential resources are needed to meet this nation's future energy requirements.

PART II—PROTECTING THE OCEAN ENVIRONMENT

Offshore Operations Closely Regulated. Strict regulations and close supervision have long been part of the petroleum industry's offshore operations. The U. S. Department of the Interior—and its Geological Survey and Bureau of Commercial Fisheries—the U. S. Coast Guard, the Army Corps of Engineers, plus the various state agencies all supervise the industry's offshore activity—from preliminary survey operations, to the safeguards required during drilling and production. Periodic inspections by officials of these regulatory agencies are also made of the industry's offshore facilities. The industry itself carefully inspects each piece of offshore equipment, maintains round-the-clock supervision of its drilling operations, and closely monitors the rate of offshore production.

Seismic Surveys. In the search for oil and natural gas on land or at sea, one of the principal geophysical tools used is the seismograph. In seismic surveys a shock wave is generated which travels downward, striking successive

rock formations beneath the surface. These waves are then reflected back to the surface where they are picked up by geophones—detecting devices—and the various impulses recorded. By correlating the intensity of the waves and the time intervals required for them to travel down and back, the geophysicist learns the general characteristics of whatever formations may lie underground.

Ocean-floor seismic surveys are today nearly all conducted with non-dynamite energy sources to generate shock waves. Some of the more basic types being used are those employing hydraulic vibration, electric arcs, compressed air, and controlled detonation of gases. All of these non-dynamite seismic techniques have proved to be efficient, economical, and completely nonhazardous to marine life. As a matter of fact, tests conducted by the Interior Department's Bureau of Commercial Fisheries showed that these non-dynamite surveys had no damaging effect on marine life, even when the shock waves were set off in proximity to fish.

If preliminary ocean floor geophysical and geological data indicate the chance of finding oil or natural gas, plans are made to drill an exploratory well. For there is no sure way to know whether a possibility is, in fact, a reality until the drill bit actually finds oil or gas.

Safeguarding the environment is a prime consideration in determining how the exploratory well will be drilled. Based on their knowledge of the underground strata, companies take great care in selecting a drill site—not only to reach the depth at which they feel a deposit of petroleum may exist, but to reach it safely.

Types of Offshore Structures. Several types of rigs are used in offshore exploratory drilling.

One type is a mobile self-elevating rig which can be towed to location and is primarily used in waters of up to about 250 feet in depth. Once on-site, the legs are lowered to the seabed and the platform "jacked-up" to a safe level above the sea.

A second type is known as a submersible barge. These rigs sit on the bottom in shallow waters while drilling, and are pumped out and floated for movement to a new drill site.

Thirdly, there are the floating rigs. These are generally of two types: the semi-submersible, which is used in a partially submerged position to increase its stability; and the drillship, with a barge or shipshape hull. Floating rigs have been anchored to the bottom in water depths up to 1,300 feet. Dynamic positioning with propellers and thrusters may also be used, and is growing more popular for use in greater depths.

Finally, when exploratory drilling has been completed, and oil or gas found, platforms to develop the field are installed. These are enormous fixed structures which can be installed in hundreds of feet of water. They must be large enough to provide living quarters for the crew, a helicopter landing pad, warehousing for supplies, plus the drilling and production equipment. Using such structures, from 20 to 60 wells can be drilled directionally to cover hundreds of acres from beneath a single platform.

Design of the Drilling Structure. A vital part of the petroleum industry's efforts to protect the offshore environment has been its research in offshore structure design. Extensive study is made of the effect of wave and wind forces during storms at sea—for example, during hurricanes—water depths, tides, shifting currents, etc. to make certain that offshore drilling and production platforms can safely withstand these forces.

In effect, offshore structures are designed to protect the ocean environment. They are built to engineering standards which eliminate as much as possible the risk of damage to these installations by the forces of nature. In reducing this risk, the possibility of pollution from a severed pipe connection, for example, is correspondingly lowered.

Modern structures are now in use in the Gulf of Mexico which have been built to endure winds up to 140 miles per hour and waves as high as 60 feet. Alaska's Cook Inlet

has presented a special challenge. There, winter ice floes up to six feet in thickness are moved in and out of the Inlet by swift currents and 30-foot tides. Platforms operating in that area have been successfully designed and constructed to weather these adverse elements.

Pollution Control Aboard the Platform. On board, special precautions are taken to prevent pollutants from going over the side. When the rig decks are washed, the waste runs into a collection system built into the platform. There, whatever oily residue may have been collected is separated before the water is pumped back into the sea. Drip pans are positioned beneath all storage areas to collect and contain whatever leakage may occur. These drippings are then barged ashore. Great care is also taken to prevent chemicals or non-biodegradable wastes from going overboard, not even candy wrappers. The one exception is food left-overs which the fish apparently thrive upon.

As a sidelight—fish are also attracted to offshore platforms by barnacles and water plants which fix themselves to the underwater pilings. Small marine life feed on these and, in turn, attract larger fish. As a result, these structures have become favorite grounds for sport fishermen. Official U. S. government statistics reveal that the annual fish catch in waters off the Louisiana coast increased two and a half times during the years 1950-1965—a period of intensive petroleum activity in the area.

The Drilling Process. Drilling a well is an around-the-clock operation and one which is, at all times, closely supervised. Special devices log the progress of the drilling operation and a continuous watch is maintained on the underground pressures encountered.

Offshore wells are drilled by the rotary method. A drill bit is attached to the lower end of a string of pipe and the bit and pipe are passed through a rotary turntable on the derrick floor. As the pipe is turned, the bit bores a hole deeper and deeper into the ocean floor. As the hole deepens, new lengths of drill pipe are added to the so-called "drill string."

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DAMES & MOORE

The Function of "Mud." During the drilling process a special fluid called "mud"—a mixture of water, clay, and chemical additives—is forced down the drill pipe under carefully controlled pressure. When the "mud" reaches the bottom of the hole, it is forced out through perforations in the bit and returns outside the drill pipe to the surface, where it is collected and recirculated.

This constantly circulating fluid has several functions. It cools and lubricates the drill bit. It flushes the cuttings left by the bit from the well. It cakes and stabilizes the sides of the hole, thus preventing cave-ins. And, it also acts as a safety device, primarily by its weight, to control the pressure of any gas, oil, or water that may be encountered during drilling. If, during the drilling operations, a high pressure zone is encountered, the thickness, or weight, of the "mud" is increased and it is pumped down the hole under greater force to control the down-hole pressures. This contains the flow of oil and gas to the surface, thus preventing an uncontrolled flow from the well, commonly called a "blowout."

The Function of Casing. Casing is also an important safety device in all drilling operations. Casing consists of lengths of steel pipe which are set in the hole to protect fresh water strata, shut off high pressure zones, and prevent the possibility of uncontrolled pressures. Great precautions are taken to set casing to a depth sufficient to protect zones which have been penetrated by the drill bit from incursion by the drilling mud, and to preclude the escape of fluids or gas from these zones.

Stringent specifications are set for all casing — pipe thickness, grade of steel, etc.—to assure that they will be able to withstand down-hole pressures.

After the casing is set in the hole, it is sealed securely. This is done by pumping a cement slurry through the string of casing and forcing it out through the bottom, so that it rises to fill the space between the outside of the casing and the walls of the hole.

"Blowout Preventers." After the first string of casing is set, "blowout preventers" are installed—frequently a stack of up to four. When using floating rigs, this safety equipment is usually located on the ocean floor, while in the case of fixed or semi-submersible platforms the "blow-out preventers" are generally situated on the floor of the rig.

In a matter of seconds, "blowout preventers" close off the space between the drill pipe and the casing through which the pipe is run when high pressures are encountered. Other valves then close and shut off the entire opening at the well head if the string of drill pipe has already been withdrawn from the hole.

This safety equipment must also meet rigid standards for resistance to high pressures. It is carefully tested at frequent intervals to assure that it functions properly. The crew also is put through periodic test runs to make sure that they know what to do when high pressures call for quick action.

"Down-Hole Storm Choke." When the well is completed, tubing is run down the hole inside the casing. It is through this tubing that oil and natural gas flow to the surface.

Offshore flowing wells are equipped with a safety device inside the tubing, called a "down-hole storm choke," which, as its name implies, is installed below the seabed.

These devices automatically close down production whenever there is an abnormal flow from the tubing. For example, if a hurricane were to open the production assembly by severing the well head connection, the storm choke immediately stops the flow of oil or gas within the system, thereby preventing the possibility of pollution.

Here again, these storm chokes must meet rigid specifications and be periodically checked.

The "Christmas Tree." Another safety step in well completion is the replacement of the "blow-out preventer stack" with a "Christmas tree," so named because of its many branch-like fittings and valves. This equipment is designed to control the production of oil and natural gas and shut off the flow should abnormal pressures develop in the production system.

The Accident Record. The steps taken by the industry to prevent accidents in its offshore activities, and the control devices it has developed, have resulted in an impressive safety record. All told, some 8,000 wells have been drilled in federal offshore waters. Of these, only 24 blowouts have occurred—most of which were gas wells which did not pollute the water. Six, however, involved oil, but only one resulted in a significant release of oil on the waters.

PART III—SANTA BARBARA IN PERSPECTIVE

The Spill. The one major oil well blowout occurred on Jan. 28, 1969, in the Santa Barbara Channel off the California coast. It was an accident which spilled an estimated 12,000 barrels of oil into the Channel before the ocean floor leak could be largely controlled.

It was also an accident which received a great deal of publicity. The blowout did cause a considerable amount of contamination — oil polluted the area, beaches were fouled, and some birds were lost as a result of the spill. But as serious as the problem was, much of it was temporary. The Santa Barbara spill was not the tragedy which some of the news media reported in highly emotional terms—it was an extremely unfortunate accident which should be viewed on the basis of the facts and in the proper perspective.

History of Santa Barbara Drilling. Prior to the accident earlier this year, a cumulative total of 943 oil and gas wells had been drilled in state and federal portions of the Santa Barbara Channel, including 500 core tests and 443 wells drilled in the actual search for oil and gas. Of these 443 wells, 214 are producing either from platforms or installations on the ocean floor, 151 were drilled directionally from shore, and 78 have been abandoned and plugged.

All of these 943 wells were drilled without incident. Then the accident occurred.

Containing and Controlling the Leak. At the present time the leak has been largely controlled. The well itself has been sealed off, but a small amount of oil is leaking from fissures in the ocean floor in the area of the well. To contain this seepage, a number of collecting devices have been set under the well platform and several large hoods, made of plastic impregnated nylon and ranging in size from 25 to 110 square feet, have been installed on the ocean floor near the platform. The oil and water collected by these hoods flow through hoses connected to the platform, where the oil is separated from the water and subsequently transported to shore.

Presidential Panel Recommendations. Following the Santa Barbara spill, President Nixon asked his science advisor, Dr. Lee DuBridge, to appoint a special panel of independent scientific and engineering experts to investigate the accident and recommend procedures for controlling and eliminating the oil seepage. The panel submitted its report early in June of this year and concluded that it was "less hazardous to proceed with development of the lease (on which the accident occurred) than to attempt to seal the structure with its oil content intact. In fact, the panel is of the opinion that withdrawal of the oil from the Repetto zone (the oil-bearing formation) is a necessary part of any plan to stop the oil seep and to insure against recurrence of oil seeps on the crest of the structure."

Specifically, the panel made the following six recommendations:

- (1) Contain and control present oil seepage through the use of underwater receptacles or other suitable methods.
- (2) Seal off, or reduce as much as possible, the flow from existing seeps through a program of shallow drilling, pumping, and cementing.
- (3) Review the possible earthquake hazards and take necessary actions.
- (4) Attempt, through an oil withdrawal program, to determine the degree of interconnection between levels of the oil-bearing formation.

(Continued on Page 16)

"There's a little more freedom here to direct my own research than at most company labs."

Bob Pfahl, Western Electric

Thermal energy is his field. And since 1968, Bob Pfahl has been doing research and development in radiant heat transfer on the staff of Western Electric's Engineering Research Center.

Well-backgrounded, Bob holds three degrees from Cornell University—a bachelor's in mechanical engineering, and a master's and doctorate (received in 1965) in heat transfer.

"My job is self-motivating," said Bob. "I have to look ahead to see where I think research should be done."

And one such area was the design of heating equipment. Western Electric uses radiant heating in a variety of manufacturing processes because it's quick and inexpensive, and because it can be applied at a distance.

However, because of the limitations of existing reflectors, radiant heating has been limited to small areas. Bob has developed a reflector shape which uniformly distributes energy from a compact mercury arc lamp over larger circular areas.

"Many projects grow out of previous or existing work," Bob said. He explained that in order to calculate the reflector shape, he had to first design an instrument to measure reflectance of the reflector material.

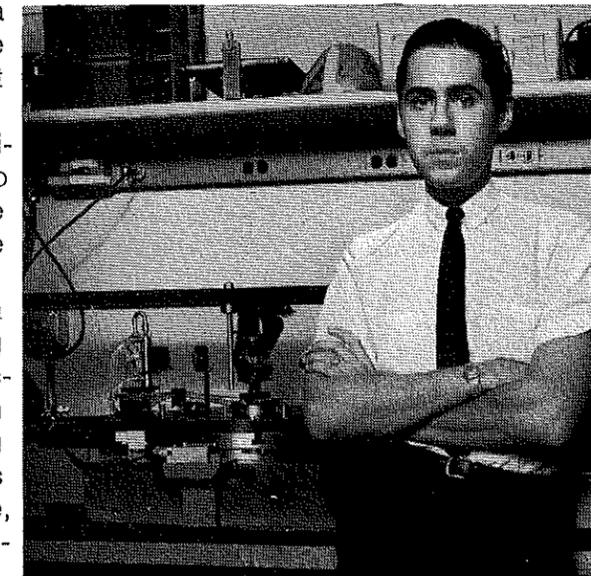
"But we're well supported here at Western Electric," said Bob. "We have very fine lab equipment—and can obtain the equipment we need."

So Bob designed and built his "spectral bi-directional reflectometer." It provides data for a computer program he created that calculates reflector shape by numerically integrating a set of differential equations.

Bob is currently working on the development of an even newer type reflector which will distribute energy from line type fila-

ment lamps over a large rectangular area. An array of these reflectors will allow the uniform heating of almost any size workpiece.

"We're free to look around for our own projects," said Bob. "I like that—that's why I'm here."



 **Western Electric**

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(Continued from Page 14)

- (5) Reduce pressures throughout the reservoir to safe levels and maintain pressures with water injection, if needed, to minimize subsidence.
- (6) Deplete all Repetto reservoirs as efficiently and rapidly as possible, consistent with safe practice.

Several of the panel's recommendations were already under way before it submitted its report—underwater containing devices had been installed and preliminary measures had been taken to implement recommendations four, five and six. All of these steps were taken after detailed consultation with government officials and technical experts.

The Cleanup. No effort was spared in the cleanup operations at Santa Barbara. Hundreds of oil company personnel were assigned to remove all remnants of the spill.

Miles of floating booms were used to contain the oil slick, and boats were put into service, equipped with skimming devices, to remove the oil from the water. Perhaps the most effective collecting device was, strangely enough, straw. Thousands of bales of straw were strewn on the water to sop up the oil so that it could literally be raked aboard boats. Although effective, it proved to be back-breaking work.

Trucks and bulldozers plied the beaches to remove any oily residue which washed ashore. And each rock in the Harbor breakwater was individually sandblasted or steam cleaned. As a result of these efforts, the beaches are as inviting as before to surfers, sunbathers and swimmers, and the breakwater is perhaps cleaner than it was when first constructed.

Homes, piers and boats which were affected by the slick have also been scrupulously cleaned and insurance claims by property or boat owners quickly handled.

Effect on Marine Life and Birds. The most emotional and, in fact, erroneous stories about the oil spill have dealt with its effect on marine life and wild birds.

The creatures which suffered the most from the spill were birds which dove into the slick searching for fish. Every possible effort was made to save the lives of the birds whose feathers had become coated with oil. Sanctuaries were set up, manned with scientists and specialists, to clean and care for the birds which were affected. But, although many of their rehabilitation efforts were successful, some 3,500 birds died as a result of the spill. Since the accident, however, new births are rapidly returning the bird population of the area to normal.

To determine the effect on other marine life, specialists under the direction of Dr. Wheeler J. North—of the California Institute of Technology who is considered one of the nation's outstanding marine biologists—inspected the tidal areas along the Santa Barbara coast and the Channel Islands. Their investigation was conducted about three weeks after the spill.

Reporting on the results of this investigation, Dr. North said that he felt the oil spill was a "cause for concern, but not a cause for hysteria." Specifically, Dr. North reported that the team had found no dead creatures except barnacles and other forms of sea life which had attached themselves to the legs of the drilling platform where the accident occurred. He went on to state that there had been no permanent damage to sea lettuce or other growth, such as plankton, in the area surveyed and concluded that "with luck the Channel will remain as luxurious as it ever was."

Effect on Whales. In March following the oil spill, six whales were reported to have washed ashore on California beaches, arousing concern that they had died as a result of the oil pollution in the Channel.

Subsequent autopsies and tissue tests on three of the whales revealed that they had died of natural causes and not as the result of oil pollution or reaction to the chemicals used to disperse the oil slick. These were the findings of the U. S. Fish and Wildlife Service and the Bureau of Commercial Fisheries.

Effect on Seals. San Miguel Island, which lies 35 miles off the coast of Santa Barbara, has been depicted in news

and magazine articles as a scene of untold death due to oil pollution. This island, which is under the jurisdiction of the U. S. Navy, is a habitat for some 25,000 seals and sea lions, and about 5,000 of their pups.

When the news media first reported that the Channel oil leak was killing seals on San Miguel, the Navy refuted the story in a special release to several West Coast newspapers. The release stated that representatives of the U. S. Park Service, Navy marine biologists, rangers, and veterinarians who surveyed the island found only two new seal carcasses. One was a bull elephant seal which had obviously been the victim of a fight, and the other is thought to have died from pneumonia, not oil.

According to the Navy and Park Service experts, the newspaper report was based on the false assumption that animals which are lying still must be dead. Actually, the experts stated, it is often necessary to nudge a sleeping elephant seal to get it to move.

A more recent magazine story, based on an admittedly unauthorized trip to San Miguel by staff reporters and photographers early in June, carried the false reports of death on the island a step further. Pictures accompanying the story showed baby seals supposedly blackened with oil and left to die because their mothers refused to feed them. Another picture showed a full grown seal emerging from the water, its face black with oil.

This story was completely refuted by the California Department of Fish and Game, the U. S. Navy, and the U. S. Department of the Interior. All three of these agencies, after detailed investigation and laboratory tests, attested to the fact that there was no evidence on the island of either illness or death from oil, and that the mortality rate among the sea mammals and their offspring was no higher than usual.

The Interior Department has been maintaining a daily monitoring of conditions on San Miguel. In its report dated June 29, 1969, Interior pointed out that oil appeared on San Miguel beaches on March 19, 1969—but that the area affected totaled only one-half of one per cent of the island's 34-mile coastline. Since March 19, according to Interior, no new oil has appeared on the island.

As for the magazine article's implication that baby seals were being abandoned by their mothers, the Interior Department had the following to say:

"It has been suggested that since close-range identification of pups by females is dependent on odor, the presence of oil on the pups would prevent the mothers from identifying the young or perhaps would cause the mothers to shun the young. We have no evidence that this is so."

Suggestions have been made that, regardless of how slight the effects from oil have been, San Miguel's sea mammals and beaches should be cleansed of any traces of oil. The Interior Department pointed out that since this is the breeding time, cleaning operations on the island would probably cause the seals to stampede, causing pups to be crushed. Others have suggested that the seal and sea lion offspring could be removed from the island and reared artificially. Interior's reply is that this is not only unnecessary, but potentially harmful since little or no success has been achieved in rearing various sea mammal species in captivity.

Effect on Fish. Fishing in the Santa Barbara Channel was sharply curtailed for some time following the spill primarily because few boats left the harbors while there was oil on the water.

Fish spotting from aircraft, however, revealed that there were large schools of fish in the Channel waters—including anchovies, mackerel, barracuda, smelt, whales, and porpoises. Now that the waters are relatively clear again, commercial and sport fishing has essentially returned to normal.

Conclusion. Although the Santa Barbara incident was serious, the over-all record for offshore petroleum operations has been one of compatibility with the ocean environ-

(Continued on Page 17)

A New Method of Geophysical Prospecting: Melos Exploration

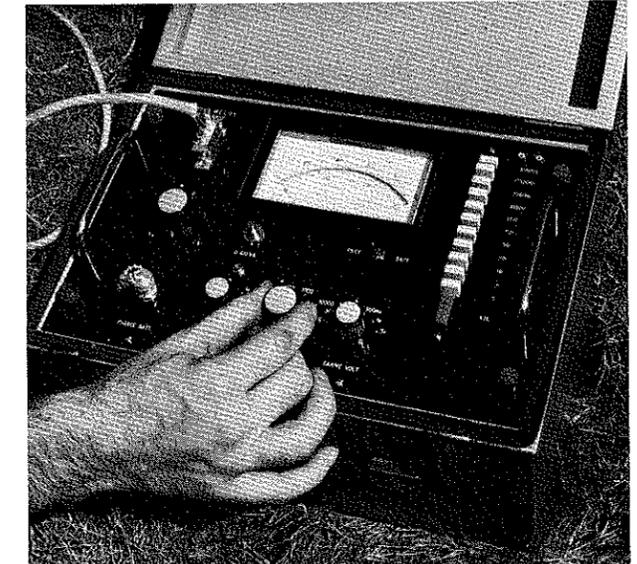
THE MELOS method* used by a French Company,† under BRGM license (Bureau de Recherches Géologique et Minière—Geological and Mining Research Bureau) delivers, from surface measurements, a depth measurement of the electrical resistivity of the sub-soil, applicable in various fields where investigation of the sub-soil is necessary such as mining exploration, geological and geotechnical, hydrological studies and petroleum exploration.

Working Principle—An electro-magnetic radiation transmitter consisting of a magnetic dipole with a vertical axis is installed on the surface of the ground. A receiver, located at some distance from there, also on the ground, measures all the components of the electro-magnetic field originating from the transmitter, transmitted to the air in the vicinity of the surface. The exploration method of the sub-soil then uses the more or less great penetration of the radiation in the sub-soil which is conductive as a function of the frequency, the lowest frequencies and most resistive ground corresponding to the greatest penetration.

Use of the amplitudes of the electrical and magnetic components of the field for a series of extremely low frequencies thus leads to a knowledge of the distribution of the resistivities in the ground of the sub-soil as a function of the depth.

Practical Application—From a single transmission station, a whole series of measuring points are connected to reception stations according to the desired layout (profiles, grid, etc.). The distance between transmitter and receiver is selected as a function of the geoelectrical parameters of the sub-soil (resistivities and depths) and, in practice, is located at several times the required investigation depth.

*MELOS: Magnetic—Electric by Surface Waves.
†TECH-NO (Compagnie d'Applications et de Diffusion de Techniques Nouvelles) 19, rue de l'Ancienne Comédie, Paris 6 (France) Tel.: 325.54.32.



Melos Exploration Instrument.

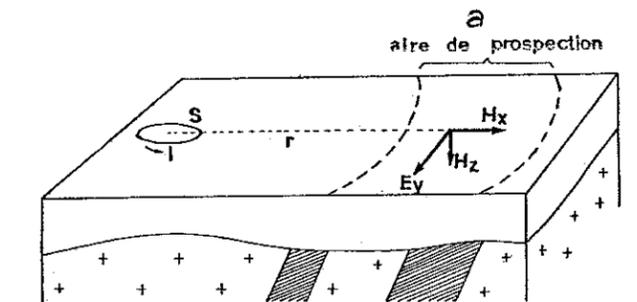


Fig. 1—Installation on ground. (a) Prospecting area.

Three persons suffice to conduct prospecting. The total duration of operations for one measurement in the actual state of the technique is of the order of several minutes including a brief examination of measurements which is possible on the spot. The units can be mounted on two light vehicles, one for transmission, the other for reception or again, be transported by hand.

The possibility should be mentioned of simplified and more rapid operation by profiling with a reduced number of frequencies.

Equipment—The MINI-MELOS miniaturized and completely portable, has been specially designed for mining prospecting and sub-soil studies down to a depth of 200 to 300 meters (656 ft. and 984 ft.). It consists of the following:

(Continued on Page 18)

Petroleum and Environment

(Continued from Page 16)

ment. The petroleum industry shares the public's deep concern that the oceans be preserved and protected. Oil companies, in cooperation with each other and with government agencies, are actively engaged in research to develop new and improved safety devices which, hopefully, will eliminate entirely any risk of potential damage to the ocean environment, marine life, beaches, and property. At the same time, programs are continuing to develop effective means for containing and cleaning up any accidental spills.

The American Petroleum Institute recently launched a new program of applied research aimed at developing new and improved methods of handling the cleanup of oil spills. Seven projects will be undertaken to develop improved systems, equipment, and oil spill treating agents that will more efficiently cope with all types of oil spills. The petroleum industry considers such efforts just as vital as the need to search for oil and natural gas offshore.

Soviet Petroleum Objectives Examined by Geologist*

AN internationally known geologist says Russia is adding emphasis to its petroleum objectives that involve political and economic pressures throughout the world.

"Russia hopes to dominate the world through petroleum," says Michel T. Halbouty, former president of the American Association of Petroleum Geologists.

The Houston independent oil operator says the Soviets are using every device necessary to get a foothold for their coming petroleum domination.

"Their interest in Vietnam is the oil in Indonesia, not in helping the North Vietnamese," he says.

Their interest in the Arab-Israeli conflict is their plan eventually to control Middle East and African oil—not in their love for Arabs or Africans."

Halbouty believes Canada is the only place outside the United States where the energy supply potential is high and where there is no current serious threat from communism.

*Reprinted courtesy of The Denver Post (June 21, 1970 issue).

He predicts the United States will gradually need to import more and more Canadian crude but expresses concern about Western Europe and other areas that depend on petroleum from the Middle East, Africa and South America.

Under present conditions, Halbouty says, there is no way this country could provide its allies and friends with oil over an extended time as was the case during the Arab-Israeli conflict of 1967.

Halbouty gives this appraisal of major producing areas:

Middle East—"Today most of the countries of the Middle East are either hostile to the United States and friendly to Russia or they are under overwhelming pressure from the Kremlin and their own leftist neighbors.

Africa—"Within the past year one regime after another in the important oil countries, regimes once friendly to the free world, have been replaced by those favorable to the Russians."

Libya—"One of the most prolific oil

areas of the world, a government friendly to the United States has been overthrown and replaced by a puppet of the Soviets, and I would imagine that our time there is relatively short."

Nigeria—"Rapidly becoming the location of tremendous offshore oil reserves, the existing government owes much of its existence to the Soviet Union."

Indonesia—"A considerable potential for tremendous new oil reserves is being found but only the action in Vietnam has so far prevented Communist control."

Venezuela—"Castro's agents are a threat to Venezuela and its great oil reserves. In fact, it is obvious this is communism's prime objective in this hemisphere."

Halbouty says he often wonders if the American public is aware of the fact more than 75 per cent of the known proven free world reserves of oil are in the Middle East and African countries either hostile or under unrelenting Communist pressure.

"The Middle East is now providing 67 per cent of our oil requirements for the war in Vietnam," he says.

He adds that Soviet petroleum marketing arrangements have reached almost every capital in Europe.

"Their basic plan is, as most people can see once it is shown them, to make all oil consuming nations, including us, dependent on petroleum they control in any part of the world," he says.

"With that goal accomplished, the Cold War will end and the Communists will be the winners."

Melos Exploration System

(Continued from Page 17)

Transmitter: signal generator, 120 W current amplifier, transmitter dipole up to 100,000 Amps x approx. 1 sq. yd.

Receiver: electrical and magnetic field sensors, amplifiers, filters, battery power supply, pre-tuned frequencies from 35 to 35,000 Hz.

A HEAVY MELOS is at present being tested for greater investigation tests, with a view to petroleum exploration.

Display of Results—Examination of ground measurements takes place with a computer. During a first stage, apparent resistivities as a function of the frequency are obtained. It is then possible, by approximation, to arrange for the use of systems of charts drawn up for the flat waves at normal incidence. The results are displayed in the form of sections or isoresistivity charts, and, after interpretation, in the form of sections or true resistivity charts as a function of depths.

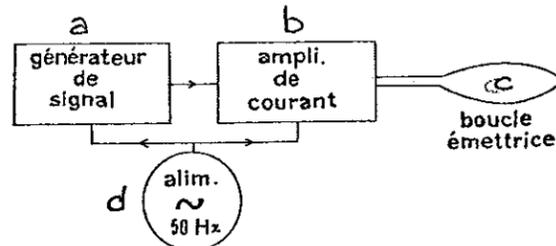


Fig. 2—Transmitter. (a) Signal generator; (b) Current amplifier; (c) Transmission loop; (d) 50 Hz a.c. supply.

MELOS exploration, according to the density of stations, can be used as a prospecting method or a detail method and can be adapted with great flexibility to the type of investigation required by the user.

The method, which is a great design novelty, also has a series of determining advantages over conventional electrical or electro-magnetic methods:

- The multi-frequency measurement of all the components of the electro-magnetic field delivers data generated in the form of a veritable sub-soil examination;
- The measurements at the receiver, independent of the soil, result in accurate localization of the exploration and good elimination of distant side effects;
- The use of the variable rate enable simple passage of resistive screens;
- The use of as low frequencies as required enables great investigation depths;
- The method and equipment offer very rare operational reliability, flexibility and simplicity of operation.

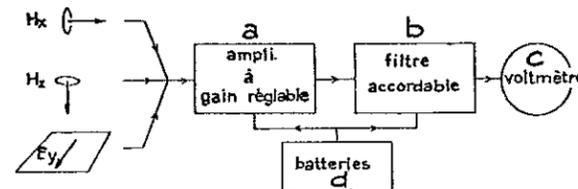


Fig. 3—Receiver. (a) Adjustable gain amplifier; (b) Turnable filter; (c) Voltmeter; (d) Batteries.



You're an engineer. You want to do things—big things. What kind of career could you choose at Bethlehem Steel?

Well, you could go into steel plant operations. Here you might supervise operations of one of our ultra-modern rolling mills, or basic oxygen furnace departments. You might design new mills, or direct their construction. You might be responsible for repair and maintenance of colossal, complex facilities.

What else? Plenty! You might

be deeply involved in metallurgy, electrical and electronic applications, power, coal chemicals, production engineering, or pollution abatement.

You could go into mining operations. Or shipbuilding and ship repair. Or ship design and engineering. Or fabricated steel construction. Or research and development. Or sales, as a technical representative or line salesman.

Diverse? You bet! We'd be hard-put to think of an industry

that can equal steel in the variety of opportunities for engineers and other technical graduates—or a steel company that can match the opportunities at Bethlehem Steel for moving up in management.

We could write a book about it. We have written a book about it. It's called, "Bethlehem Steel's Loop Course." You can pick up a copy in your placement office. Read it. If it interests you, plan on talking with our representative when he visits your campus.

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Giant Softrock Tunneling Machine

WHEN YOU BUILD AN OBJECT THAT IS THE FIRST ONE OF ITS KIND, weighs 400,000 pounds and stands 30 feet tall, people are bound to take notice. Especially when you construct it in your backyard.

That was the story of the SRT-40 Softrock Tunneler built in Seattle recently by the Lawrence Manufacturing Co., a subsidiary of Ingersoll-Rand Co. It drew stares everywhere and, for a hefty machine, it got around. The tunneler has already made it half-way around the world and is now attracting attention in Italy, where it arrived recently in Genoa by boat.

The tunneler, which looks something like a huge cannon on four wheels, was built especially for a highway-tunnel project near Pescara. At present the South Seattle firm is finishing a near twin of the first tunneler. It also will be broken down in parts and shipped by sea to Italy bound for the same job.

These machines have been designed to bore a 40 foot wide by 30 foot high arch section for the Twin Highway Tunnels under the Gran Sasso Mountains between Pescara and L'Aquila, Italy. This tunneler has a single rotating cutterhead 5½ feet in diameter mounted on the end of a 40 foot boom. The boom has a telescoping capacity of 12 feet. This boom is located on a Jumbo which is self-propelled by four 96" diameter wheels. The complete

unit is powered by 750 horsepower and weighs approximately 400,000 pounds. Two machines will be used on this project. The first one is scheduled to commence boring in Italy in October 1970. It is expected that this machine will mine the soft sedimentary rocks at a rate of 40 to 100 cubic yards per hour.

Although Lawrence is experienced at specialized automatic equipment and tunneling machines, it has primarily concentrated on the hardrock type. In fact, since 1958 the company has been the exclusive source for the Alkirk mining and hardrock tunneler machines. Today, they can be found all over the world on various underground projects.

The softrock tunneler, however, was a "first" and was built especially for the Italian highway job. During its construction a large sign was placed on the company fence to answer any questions of onlookers. The sign contained impressive figures on the miles of wiring and thousands of feet of tubing that went into the machine as well as other technical facts.

However, the fact that caught the fancy of observers was the size of the tires. They are 98 inches in diameter and 48 ply! But when you manufacture the world's first softrock tunneler of its type, things are done in a grand scale. That becomes apparent in the photo above.

To a man with emphysema, a flight of stairs is Mt. Everest.



If you have emphysema or other chronic lung problems, you know what it's like to climb a flight of stairs. And you probably don't know what it's like to play a round of golf or even take a walk.

Union Carbide's Linde Division has developed a portable liquid oxygen system which many doctors prescribe for their patients.

It weighs less than 9 pounds full. Set the oxygen at the flow your doctor tells you to. And you can do many of the things you did before.

Sure, we've oversimplified the whole thing. We're not going to go on and on about all the Union Carbide technology that makes the Oxygen Walker possible.

It's just one of the things we're doing with air.

We separate and purify nitrogen, argon, neon and krypton for industry. We make liquid nitrogen systems for everything from refrigeration to surgery. We make mixtures for underwater divers.

It makes sense that if we can help a diver dive to 1000 feet, we can give a man with emphysema the air to get to the top of the stairs.



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Oil Rush to Alaska*

Though interest runs high in Alaska's wildcats this winter, old hands caution this is no time to lose your cool—even in this sub-zero weather.

THE TIME was mid-January. The PLACE was Anchorage, Alaska . . . the third floor, First National Bank Building . . . the Pan Am office of N.E. (Shack) Shackelford, Anchorage area drilling supervisor.

Out of Shack's window it was the kind of winter day that Alaskans enjoy, only about 15 degrees below and no wind. The sun shimmered on the ice pans of the Cook Inlet as they moved with the tide. Anchorage, long ago recovered from its 1964 earthquake, shows few remnants of its former frontier flavor. With over 115,000 population today, Anchorage is the bustling oil capital of Alaska. The city — only about 15,000 after World War II — is a showcase of what happens when a city becomes a headquarters for a major regional oil play requiring hundreds of millions of dollars in new investment. Anchorage was humming this January day.

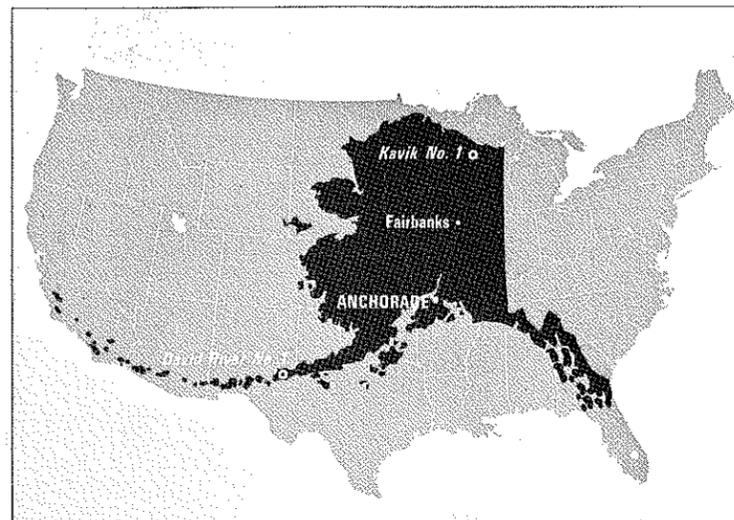
If you were not well versed in the logistics of a wilderness wildcat drilling program, you could be excused for thinking that things were moving with the same smooth tempo out in the field as they were in Anchorage. In and out baskets were well tended; typewriters clacked.

But this outward serenity in our Anchorage office masked the true picture of what was going on at our remote operations. Alaska always has a way of writing its own script. This is especially true when you are drilling two such unusual and widely separated exploratory tests as the David River No. 1, 640 miles down the Alaska Peninsula, and Kavik No. 1, 620 miles in the other direction.

The unmistakable clue that all was not what it appeared to be was the fact that the radio receiver on Shack's desk was quiet. No one was getting through. No reports; no questions; no requests for advice . . . just silence. Typically, Alaska's script this day was "something else."

This is what was really happening:

At David River it was a mild 20° above with only a 20-mile breeze — thus a chill factor of only about minus 10°. But there was also fog. Our geologist, trying to make his regular checkup on this tight hole, and the



RIDING herd on Pan Am's two wells from Anchorage is like being in Springfield, Mo. and directing drilling near Carlsbad, N. Mex. and Green Bay, Wis., except there are no roads, unsure radio communications, only uncertain bush flying.



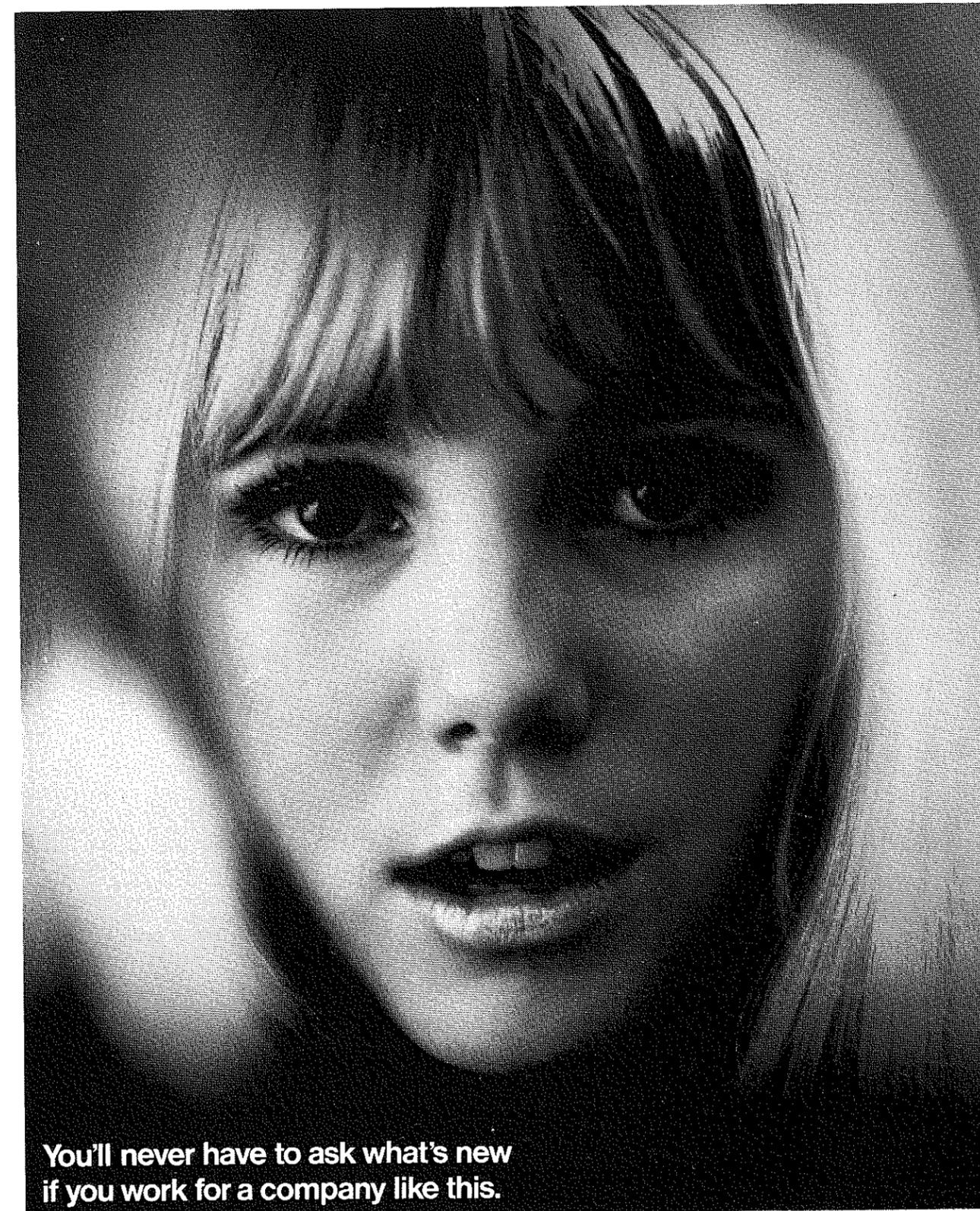
AT DAVID RIVER, pipe for well lines Pan Am's airstrip. Men are unloading semi-weekly food plane. With Pacific so near to Bering Sea at this point, fog and storms are frequent, and the airstrip is often weathered in.

food plane with fresh supplies were both weathered in at Cold Bay about 50 miles away. Nor were the prospects good for flying to the rig. One of Bristol Bay's innumerable storms was on its way. To make matters worse, the casing in the well had collapsed.

At Kavik, over 1,200 miles northeast, it was 40° below. The weather advisory from the Slope had it that everything was soaked in, visibility 200 feet. As it turned out, however, the weather report was from Prudhoe

(Continued on Page 24)

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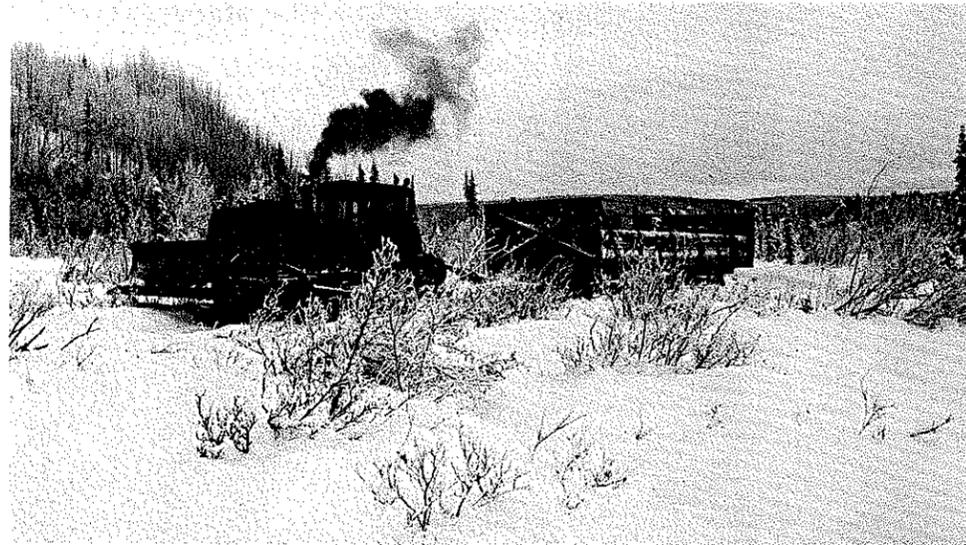
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WITHOUT roads to North Slope, Pan Am contracted to have 380 tons of casing sledged to Kavik via cat train. The big sleds and tractors break trail for over 400 miles over rivers and mountains. The train also hauls its fuel, "sleep and shop wanigans" and pipe from point 60 miles above Fairbanks. State of Alaska has put in winter road part of way to Slope, but sleds avoid bulldozed road.

(Continued from Page 22)

Bay, 60 miles to the northwest on the coast; and our own airship had visibility unlimited. But who could be sure; radio communications with Kavik were dead . . . probably the victim of playful northern lights. Our field foreman, Paul Ledbetter, already two days beyond his relief, continued to wait for his replacement, Jim Mc-Masters, who was due in from Anchorage.

At Fairbanks, halfway from Anchorage to Kavik and the marshalling point for our airlift of heavy drilling equipment to the North Slope, the thermometer remained in its deep freeze. It had averaged minus 44° since New Year's. So the ice fog that grips the city on frigid days like these continued to immobilize the huge Hercules planes that make the airlift possible, and tons of supplies for Kavik waited another day at the airport.

North of Livengood, about 60 miles above Fairbanks, the weather was at last report a lung-searing minus 52°. No one knew for sure; no one could get through. But at that temperature it was assumed—rightly, it was learned later — that the process of loading the 380 tons of casing onto our cat train headed for Kavik was still paralyzed. Shack's latest instructions had been, "Shut her down until it warms up to 45° below." Thus the train's big tractors and sleds that were to break trail over the 400 roadless miles to the Slope stayed in camp this side of the Yukon River. Like many other operations in the Far North, the cat train continued to defer to this, the toughest winter in recent Alaska history.

Altogether it was quite a script being written by Alaska on that mid-January day. Shack, a drilling expert with long experience, including our Cook Inlet operations, has had many days of frustration in recent years. He clamped a little more firmly on his unlit cigar and philosophized "A man

has to be pretty even minded in this country."

For a person from "outside," as Alaskans put it, it is hard to visualize the difficulties that occur as a matter of course in Alaska's scattered operations. At locations like David River and Kavik there are no roads; communications are unsure and frequently broken; the drill site airships are almost out of range from Anchorage, except for larger aircraft; the uninhabited desolation is almost total; there is seldom accurate weather information; and, finally, the weather is often brutal on men and equipment.

The effect of these environmental factors on oil exploration is profound. In Louisiana, the rule of thumb is that once you go offshore the costs of operation double or triple. In the Cook Inlet, however, they quadruple.

Out on the Slope they are as much as ten times the cost of land-based projects in the "Lower 48." As a result, a rank wildcat will cost anywhere from \$2 million to \$4 million. Before either David River or Kavik commenced drilling, each had already cost considerably more than \$1 million apiece — and the Cook Inlet no longer held the title as the toughest drilling area in the world.

Why then explore in such remote places, especially in winter? An answer to the last part first. In summer the tundra is a watery mush, pock-marked with hummocks of moss and earth that push up out of the ooze. You can conquer the summer tundra, but building roads and airstrips is an expensive undertaking and would be impractical before significant discoveries would make construction economically sound. So in the Far North, the first phase of exploration is always begun when the tundra is cold, frozen solid.

The answer to the first part of the question — why work there at all? — involves a number of factors. First, America needs more and more oil to

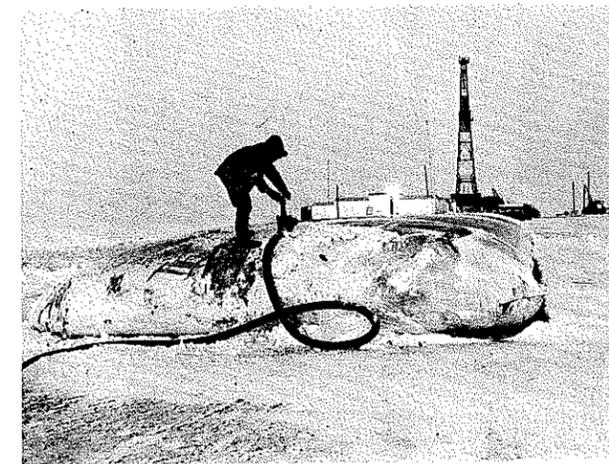
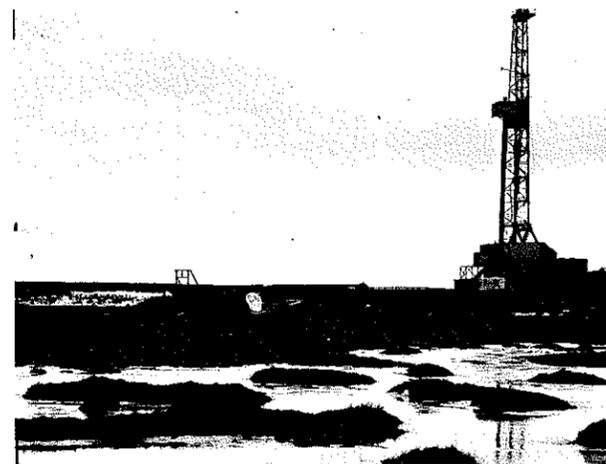
fuel its expanding economy. Experts forecast that if the United States is to find adequate oil for its own security in 1980, the industry must discover at least six billion barrels of new oil in place each year. However, our recent rate has consistently fallen slightly under five billion barrels. Consequently, the pressure to meet future demands continues to mount.

Second, to find the huge new reserves needed for the future, the oil explorer has in recent years intensified his search in the frontier, virgin exploration areas, both on and offshore in the United States and Canada.

Third, Alaska has recently been the scene of significant, major discoveries. The string began with Swanson River in 1957. Then came the Cook Inlet in 1962. Last year produced the most encouraging news of all — the Prudhoe Bay field on the North Slope. There in the silent expanse beyond the Brooks Range came a find that may ultimately rank as one of the all-time largest in North America.

What already was an important oil play in Alaska has now taken on the trappings of an "Oil Rush to the Far North." Among Alaskans, a fever reminiscent of the gold rush to Fairbanks at the turn of the century is building excitement all the way from the capital city of Juneau to the Eskimo village of Point Barrow on the Arctic.

However, seasoned oilmen caution that it is too early to justify "oil rush fever." Thus far in the recent activity, the industry has made only one discovery outside the Cook Inlet area itself. And it should also be remembered that while the developments of the last 10 years have pushed Alaska into the eighth-ranking position among oil producing states, its daily production is still no greater than that of Andrews Country in West Texas. Furthermore, even the productive Cook Inlet fields are still years from paying



LEFT: David River No. 1 is located in tundra near north shore of Alaska Peninsula. When not frozen as it is here, lakes pock-mark the mossy, treeless, squishy expanse. Hummocks push up through the water and ooze. Roads are difficult to build or maintain. Slope's tundra is flatter but similar. RIGHT: Rubber 50,000-gallon pillow tanks store Kavik fuel. Camp has 39 people, including dirt and drilling crews, pilot, cooks. As usual, horizon, left, is almost indistinguishable.



LEFT: Kavik has modern, two-to-a-room quarters. Flown up in Hercules in complete 38-foot sections, then laid out parallel with wide hall between, the camp is 204 feet long. RIGHT: Food is excellent and in great variety. Slope is too isolated for ordinary radio or TV, so only touch with outer world comes via occasional mail flown in with food.

out the hundreds of millions of dollars poured into them by the industry.

The sober fact is that, despite the excitement, Alaskan oil development is still in its infancy. As far as the Slope oil development is concerned, the industry must await further developments before Alaska can know for sure whether, in fact, the hope of additional widespread oil discoveries is a reality or only a prospector's dream. At \$2 million to \$4 million per wildcat well, it will not take many dry holes to convince some exploration companies to pull back to less costly ventures.

Considerations like these temper the enthusiasm of even the most adventuresome explorationist. On the one hand are the hard economics involved in financing drilling operations that may be 10 times as costly as those in the Lower 48, a rate of capital outlay that makes it necessary to find huge reserves in order to break even. On the other hand, there is the lure of highly favorable geological conditions,

spliced by the possibility of finding fields of the Prudhoe Bay variety.

Oilmen have weighed alternatives like these many times before. No one knows better than they that a faint heart seldom leads to the big discoveries like the early-day Spindletops or the present-day Peminas. Certainly discoveries will not be made in Alaska except by men with courage enough to take the risks.

Alaska's future will not come quickly, nor will it produce the unmixed bonanzas that many think it will. The long odds and the heavy expenses are too great for that. But oil discoveries there will be. Whenever enough incentives exist, when the geology is right and when the markets demand it, men will look for oil.

Pan American, already a well-known explorer and producer in Alaska, expects to register its share of the future finds there. If our present drilling program comes up dry, as well

it may, more projects are planned. Where? Perhaps in places far from any that have yet felt the drill bit.

Perhaps some years hence, drilling may even extend to the offshore reaches above the Slope. As a matter of fact, as operator of a new seismic project which will also include 32 other participating companies, Pan Am is even now in the process of planning a preliminary geophysical "shoot" next summer in the cold waters of the Beaufort Sea in the Arctic Ocean.

Where next? Only time and incentive will tell.

G. C. Weaver, '26
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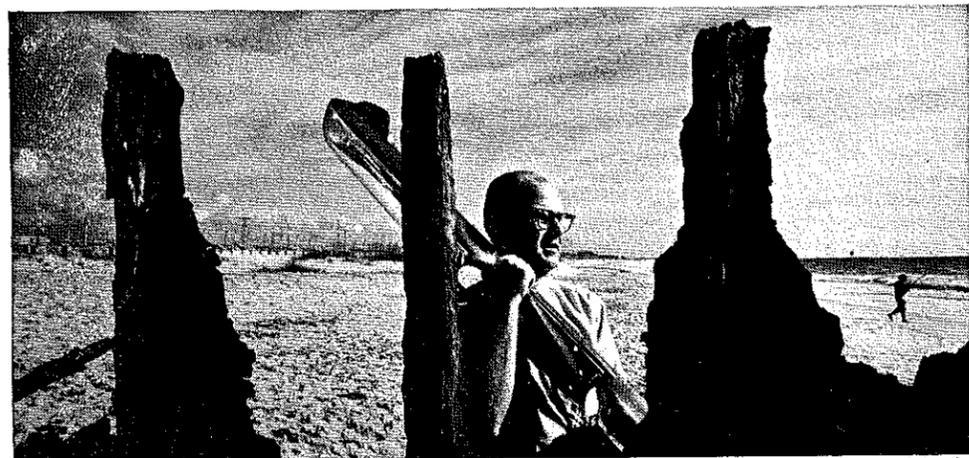
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Supply and Demand Of Free World's Oil

By Dr. Wilson M. Laird*

THE steadily worsening relations between the Arab nations and the State of Israel keeps our attention focussed on the supply and demand of the Free World's oil. This year we expect demand in the Free World abroad to exceed 24 million barrels a day, and as of June, the Arab nations were supplying almost two-thirds of it.

Bright as our hopes may be for discoveries in the North Sea and the North American Arctic, the fact remains that the bulk of the oil going to the Free World outside our own country is now being supplied by the Arab nations, and will be for as far into the future as we can reliably foresee. Like it or not, we must deal with reality, and the reality is that 15 million barrels of oil a day, including 80 per

*Dr. Laird, director, Office of Oil and Gas, Department of the Interior, delivered this address July 17, 1970, before the National Petroleum Council.

cent of Europe's supply—comes from the nations of the Arab world.

The closure of the Suez Canal has continued to exert pressure on tanker rates ever since the Arab-Israeli war even though supply patterns had adjusted to the closure by the end of 1967. In May of 1967—just before the hostilities began—the average spot tanker freight cost to move a barrel of oil from the Persian Gulf to our East Coast was 52 cents. By July, following the 6-day war, the spot rate was \$2.72, and the lowest it ever got back to after that was 86 cents in April of 1969. By April of this year, just before the TAPline shutdown, the rate had climbed back up to \$1.69 per barrel. The subsequent closure of TAPline, plus the cutback in production from Libya, brought the rate to \$3.30 as of last week—21 per cent above the crisis high of 1967.

The jump of \$1.60 a barrel over a period of two months reflects a real strain in tanker availability precipitated by the two events I just mentioned. And this, let it be remembered, was in early summer. While it is true that the spot market only accommodates about ten per cent of total tanker movements, I think the only conclusion we can draw from the evidence we have is that rates generally are going to rise as longer term charters are renewed in the context of a tight market.

These conditions are in turn translatable into other effects, such as higher delivered prices for crude oil and a corresponding decline in the value of import tickets, together with a profit pinch on small refiners. Imports from Eastern Hemisphere sources will decline and an added demand will be felt by domestic producers. The supply of residual fuel oil, which is already tight, will be further aggravated, with increases in the delivered price of that commodity.

Up until this week we were telling ourselves to cheer up, that things could be worse. So we cheered up, and sure enough, things did get worse. The TAPline closure threw a gratuitous burden onto the world tanker pool, and this was followed the next month by need to make up the 420,000-barrel-a-day cutback in Libya from more distant sources—most of it, in fact, from the Persian Gulf. In case you have forgotten the relative distances involved, let me just say that insofar as Europe is concerned one ship in the Libyan trade is worth six from the Persian Gulf by way of the Cape.

This left a very delicately balanced, but still feasible, relationship between shipping availability and requirements, as of last week. Came Monday of this week, however, and the news that Libyan production had been ordered reduced by an additional 150,000 barrels a day. The problem is still workable, for the time being, with the additional shipping requirement that the new cutback imposes. But the margin is just that much thinner, and we are two months closer to the winter heating season than we were when the closure of TAPline signalled the beginning of the current round of difficulties.

As regards our own oil supply from the Arab world, the situation is not markedly different from what it was in 1967. Then we were importing 3½ per cent of our total supply from Arab nations, and that figure remains about the same. Then, as now, East Coast refineries depended upon Arab crude sources for about 20 per cent of their inputs. The new element in the balance is that air purity standards of East Coast metropolitan centers meanwhile have created a substantial and growing market for residual fuel oils made from low-sulfur crudes originating in the Arab nations of North Africa.

In 1969, residual oil from these sources amounted to about 175,000 barrels a day, most of it going to power generation plants in the New York-Philadelphia area. Thus, while the knowledge that Arab oil accounts for only 3½ per cent of our total supply is comforting on the surface, it is deceptive in the implication that no difficulty would be encountered by the loss of so small a portion of the whole. The problems would be local and regional, but they would be serious to those who felt their full impact.

There is another difference between our ability to respond to an oil crisis today and the capability we had in 1967. Then the fields in Texas and Louisiana were able to increase production by a million barrels a day over a period of 7 weeks, which adequately supplied our own requirements and eventually made some 25 million barrels available to Canada and Western Europe. Today, however, production in Texas and Louisiana is already well above the peak rates achieved in August 1967.

We are caught in the bind between steadily rising production rates and declining productive capacity, and I will say that the two reports which will be presented later could not have been more timely in their appearance. We were fortunate in 1967 in that the additional demand was satisfied before the limits of deliverability were reached. As a result, we never ascertained what our true deliverability was.

The reports that your committees have prepared on three vital links in the U.S. petroleum supply system will be of great assistance to us in assessing just what the nation's oil delivery capabilities are. We shall know where and to what extent production will be limited by gathering capacity and we have been given vital information on terminal capacity. These data are complemented by a comprehensive survey of storage capacity by region and by product. We have been greatly in need of this vital information. It will materially enhance the quality of our planning for supply contingencies, and I am looking forward to receiving these two fine reports.

Thus, it is that quite apart from the general threat to world oil supply

posed by the Arab-Israeli confrontation, we continue to have troubles which may be only tangentially related to that conflict. We have not as yet fully assessed the implications of the takeover of certain company marketing and distribution affiliates by the Libyan government earlier this month. It doesn't take a detailed assessment, however, to know that this bodes no good for the future.

We have accordingly kept intact the emergency organization assembled under the Voluntary Agreement Related to Foreign Petroleum Supply Committee and its two subcommittees on Transportation and Supply and Distribution remain in standby status. They could be activated on a day's notice if a new emergency should demand it. By keeping this organization in being, as we have, we can save several days of precious time in the event another emergency should arise.

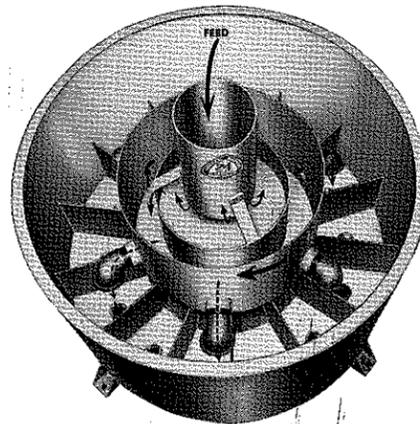
In the Office of Oil and Gas we are

in addition keeping a continuing watch on the world supply-demand situation in petroleum, updating our figures as new information becomes available, and keeping in close contact with people in key positions in the international companies. Late last month the Petroleum Security Subcommittee met with representatives of OOG and other Federal agencies to consider the potential requirements and supply of petroleum for national security programs. A classified report of the committee's findings has gone forward to the Department of Defense.

So we continue to watch and wait as the thunder continues to roll out of the Middle East. We can assuredly hope that the preparations we have made for the hange of contingencies that may develop will never have to be implemented. If they do, however, there is some satisfaction in knowing that we did the best we could during the waiting period.

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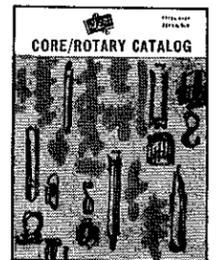
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It Was Ever Thus!

By Salvador Del Rio, E.M. 1928

THE leaky little boat plowed ahead into the packed lily pads in the teeth of the gale that dumped warm tropical rain in horizontal sheets. Four, six, eight inches forward under each stroke of the oars, only to retreat almost as much at the end of each stroke as the piled up lilies, aided by the wind, drove it back.

Ed, kneeling up forward, was frantically bailing out the water coming in from leaks, rain, and wind-blown spume while Del struggled with the oars. Indeed the circumstances were "dire." for the two mariners were barely more than holding their own. In fact they were making a little progress. But then Del felt, rather than heard above the rushing wind, a "thump" against the side of the boat before he saw a shimmering cylindrical object go past his port-side oar on its way to the bottom. By gad, it was the bailing can! He turned around and the look of consternation on Ed's face was beyond description. Ed had accidentally hit the gunwale with the can and had lost his grip on it. But this was the time for instant action, not consternation, and Ed rose to the occasion. Instead of kneeling there, half-drowned, lamenting his loss, he peeled off his soaked shirt and set to bailing with it.

How? By dipping it in the swirling pool around him and wringing it out over the side, that's how.

Open water clear of lilies was barely visible through the rain murk some hundred yards ahead. Also barely discernible in that open water were numerous little reptilian heads weaving their uncertain ways here and there looking for terra firma. Soaked and sodden it might be, but still terra firma was the desire. Snakes, turtles, lizards; amazing the number of creatures that live on any given area of land, no matter how small, invisible until they are flushed out by a flood.

The gale that was still blowing was the tail-end of the hurricane of 1933 that flattened the Tampico region on the Gulf of Mexico. It also flattened virtually all of the camps and operational facilities of the oil companies working in that area, including those of the Huasteca Petroleum Co. (Std. Oil of N.J.)

The force of the wind had backed up the Panuco River pouring its waters (and lily pads) into the normally seasonably-dry basin that Ed and Del were traversing. From now on it was to become and have the area's old name of La Pex, meaning crude oil, or tar, because of numerous oil seeps that abounded in it.

The Marland Oil Co. had some oil production at the far end of the basin away from the main Huasteca field-head-quarters camp at Ebano, and these Marland wells together with a gathering and pumping station, were being handled by the Huasteca under a contract with Marland. Ed Borrego (1927), the shirtless bailer, was then the Huasteca's general field superintendent, and "Del" Del Rio, the exhausted rower, was his assistant in charge of field operations. It should be made clear, that neither of these two stalwarts was out there in that boat for the sake of fresh air, nor for the exercise, nor yet on a fishing expedition. These two were in deep trouble!

The Marland gathering station had two 20,000 barrel tanks inside a common firewall, hooked together at their individually-valved outlets by a 24" pipe with a "T" midway between the two tanks, and 100-meters of 24" pipe leading from the "T" to the pumps.

They both knew that one of the two tanks was full of oil and that the other, having been pumped dry the day before the unlooked-for-hurricane struck, was empty. They also knew, from frenzied candlelight illuminated calculations derived from water-level measurements and topo-

graphic elevations, that the depth of the newly formed lake at the Marland station must be about 12 feet at just about the time that Ed dropped the bailing can, and that it was still rising fast.

It was also quite certain that the full tank would be sitting on bottom alright, and that it was extremely doubtful that the waters would ever rise high enough to float it. But the empty 20,000-barreler; well, that one had to float, and with tremendous lifting force. Had it torn loose from its connections to the other tank? If so, had it broken them in such way as to cause the full tank to give up its precious oil to the thieving waters? Or, was it still tied fast to its connections and floating there like a kite on a string?

Row man, row! Bail man, bail! Let's keep afloat long enough to find out!

The sky was ominously grey-black, with fleecy lighter-colored underclouds scudding away at unbelievable speeds. The rain, mixed with whiplashed lake water, cut down visibility to a few yards. But finally the boat slowly emerged from the hindering lily pads and Del gave a sigh of relief, that quickly turned into a gasp of frustration. The boat, formerly held more or less on course by the confining lilies that hugged its sides, was now at the full mercy of the gale. With a sudden lurch that almost unshipped the two landlubbers, it turned on a dime and headed back toward the floating green mess. So, more excruciating effort, more blisters on hands, more. . . .

Hours later, hours of swapping rowing-and-bailing chores, (Bailing? Hah! dip the shirt in the puddle, wring it out over the side!) the two exhausted and bedraggled Argonauts, having oared-and-bailed themselves six miles under S.O.S. conditions, discerned their destination. Immensely huge it loomed through the murk; 20,000 barrels of damp atmosphere wrapped in thin steel plates bobbing up and down in the tempestuous waters, being buffeted about by the gale, but still fast in its connections. Hallelujah! The tank was tilted at an incredible angle, with half its bottom describing a high arc above the waters.

The puzzle was, how did this balloon withstand the 140-mile fury of the hurricane? To what divinely benevolent dictum did we owe the fact that we weren't then wallowing in a sea of oil? How come this tank was there and not blown across the other side of the lake among the lilies? The answer had to be that the flood coming in from the Panuco some distance away did not reach the basin until the spitting fury of the hurricane had subsided down to a gale and, that when it did reach the basin, the latter filled up fast. As a matter of fact, the water level was still rising at something like one-foot per hour, not only with Panuco water but with the rain and run-off coming down over a considerable area draining to the basin and with its natural outlet blocked by debris pushed in by the rampaging Panuco.

To the right of the floating tank and about 100 yards away, the rising flood waters lapped the barely visible gentle slope of high ground on which stood the cozy-looking Marland camp and promising hot-coffee; ablaze with lights though it was yet early afternoon. The skiff was made to head that way, and as it approached dim figures could be seen watching us, huddled at water's edge all wrapped around in rainwear. There they stood, still phantoms in the gloom but giving out with frenetic signs of being alive whenever a half-drowned but determined serpent slithered out of the flood and wig-wagged its way

right through that ghostly bunch and on up the slope. That Marland camp must now have many, many snakes.

As Del and Ed rowed closer, the futile shouting back and forth began, and identification became possible if through no other clue than wind-whipped voice types. There was Juan, Pedro, Marciano, Jose, Luis, and Domingo, all Huasteca hands assigned to the Marland lease operation. But prominent among the group was little Billy Lyons, the Marland Oil Co. resident representative. But what caught Ed's and Del's eyes most astoundingly was this beautiful, big, open boat the size of a ship captain's barge moored to the shore. It was equipped with a beautiful powerful-looking outboard motor dangling from its stern!

After a few rain-washed and wind-lashed greetings laced with ejaculations of surprise at their having ventured out in such a storm, Ed and Del began to pose some questions:

"What's the situation at the tanks?"

"Don't know, haven't been out to see and the murk is too thick to see good from here!"

Del and Ed looked at the beautiful barge, and then at each other, and the mayhem they saw in each other's eyes subsided somewhat by mutual containment. Well . . . perhaps . . . let's find out! "Say, does that thing have a hole in the bottom?"

"No."

"Does that outboard motor work?"

"Yes"

"Are you out of gas?"

"No."

Then a silence more ominous than the wind, followed by a vitriolically uttered question shouted simultaneously by Del and Ed, "Then why haven't you put-putted your miserable way out yonder to that damned tank and done something about it?"

"Why didn't you at least chug your way out to Ebano for help and instructions?"

Chagrined looks and no answers, just the roar of the wind and an occasional jig to let half-drowned serpents pass.

Del said to Marciano the foreman: "Get a joint of 1/2" pipe, a 24" Stillson wrench, three men and yourself, and clamber aboard that yacht. Pronto! NOW!"

Ed stayed behind to give Billy Lyons a piece of his mind for not having had something done about that floating tank.

Del, now at the controls of the "ocean liner" (after that leaky row boat) circled the empty tank looking up at the airborne portion of its bottom and sides. "I must be living right," he said to himself, "and for two reasons: a) there appeared to be no breaks in the connections as there was no oil rising through the waters; b) the 6" flush-out valve located near the bottom of these tanks to bleed out formation water that may come in with the oil was nowhere in sight, so it had to be under water!"

From there on matters should have been relatively simple, just locate that precious 6" valve along the submerged periphery, open it to let La Pez lake into the tank, and chug back to the Marland camp for some hot coffee while Newton's Law finished the job! But let us see. . . .

Del slid the joint of 1/2" pipe along the submerged bottom edge of the tank until it hit an obstacle that had to be the looked-for valve. There he drove the pipe into lake-bottom mud to mark the spot. Then Del said to Marciano in his best ancient Castilian, "OK Bully Boy, peel off and get your tank-flooding tokus down there and open that valve with this wrench, PRONTO!"

Marciano replied, "Who, me?"

"You're right, it's you, Get!"

Marciano said desperately, "But I can't swim!"

Del imprecated and seriously considered throwing Marciano overboard, but then said, "Pedro, you!, get your clo. . . ."

"No senor, madre mia, no can seim!"

"Then you, Juan!"

"No, por Dios, not me!"

"Luis, you're . . ."

"Tampoco, senor, can't swim!"

So, swearing softly, but resignedly, Del chinned himself over the side, took the wrench handed down to him and hand-under-handed his way down the pipe, feeling the tank side all the way until he located the valve. Adjust the wrench jaws to the stem; take an opening half-turn on the stem; take off wrench; re-fasten wrench to stem and take another half-turn; keep it up until. . . . Joy, man, joy! The swish of water rushing through the aperture into the tank! Keep turning, keep turning, but then, "Air, I need air!" Man sure can't live by bread alone, so leaving the wrench on the stem Del broke surface and expelled a lung full of CO₂ like a spouting whale. And there he was, hanging on to the gunwale of the boat trying to revive while looking up at Marciano who had a particularly obnoxious ingratiating smirk changed suddenly to a look of horror. His popping eyes were fixed on something directly behind Del, his right arm shot forward to point in the same direction, and his mouth opened in a shout that overpowered the gale, "CUIDADO!"

Simultaneously with the sound of the "C" in Marciano's "Cuidado!", Del felt a gentle but cold nudge on his shoulder that instantly spread all around his neck. To this day he doesn't remember leaving the water, for there he was in the water, and there he was in the boat with no time at all elapsing during the transition. Yeh, but he hadn't come in alone, for there he was draped only in a thin veneer of water, and a six-foot snake doing a wriggling dance at his feet! Del instinctively grabbed an oar and then, for a minute or so, he must have personified that serpenticide cave woman of the "B.C." cartoon.

Wham-wham-wham-etc. . . . The result? Snake pulp. Finally convinced that the snake was a has-been, Del looked up from the mayhem.

"Hey, where'd they go?" For he was alone with the wind, the rain, and the boat pulling at its moorings to the tank ladder. The snake deserves no further comment, for she was the cause of it all. All it took was one second of her brief existence aboard to persuade all hands to jump ship! Upright and courageous hands who moments ago had vowed that they couldn't swim!

Mexico would have won the Olympic swims, had it had guys like Marciano, Pedro, Juan, and Luis on its team . . . and a snake to chase them!

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See **BOOK REVIEW** in **Mines Magazine**, August, 1969, or write us for particulars. Widely used all over the U.S. and southern Canada.

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Plant News

Aluminum Train Order

Aluminum Company of America will supply all of the 2,700,000 pounds of aluminum for a 300-car unit train being built by Greenville (Pa.) Steel Car. Co.

The aluminum cars will be leased by Cleveland Electric Illuminating Co. to haul coal from southern Ohio mines to its northern Ohio power plants.

The new unit train order is the second in the last year by a major utility. Some seven million pounds of aluminum are being used in 584 coal cars currently under construction for Detroit Edison Co.

Marketing Responsibility For Hard-Forcing Products

Marketing responsibility for the line of hard-facing products formerly handled by Linde Division of Union Carbide Corp. has been transferred to Stellite Division of Cabot Corporation as of June 1, 1970. The transfer includes the sale of cast rod, tube rod and alloy powders which are deposited by various welding and spraying techniques to the surfaces of metal parts in order to increase their service life. Hard-facing specialists formerly employed by Linde Division will now be part of the Stellite Division organization.

Kaiser Engineers to Construct Ore-Handling Facilities

Kaiser Engineers has been awarded a contract by Hamersley Iron Pty. Limited to provide engineering, procurement, and construction management services for what will be Australia's largest capacity ore-handling facility at East Intercourse Island.

Located near Hamersley's present port at Dampier in Western Australia, the iron ore loading and port installation will be capable of handling 30 million long tons per year.

Beryllium for Poseidon

Brush Beryllium Co. has been notified by Lockheed Missiles and Space Co. that it is the low bidder to supply approximately \$14,500,000 of beryllium parts for the Poseidon Program.

Brush was also the successful bidder on two previous procurements of these parts which was worth approximately \$13,000,000 and \$8,000,000 respectively.

Honeywell System Capability

A broad line of electronic instrumentation designed for industry, government and research was exhibited by Honeywell during the 25th annual convention of the Instrument Society of America (ISA) in Philadelphia's Civic Center, Oct. 26-29.

Three divisions of Honeywell — Industrial, Test Instruments and Computer Control — presented a united theme of "hardware, software, systems and services" to a record attendance at the four-day conference and exhibit.

Honeywell's Test Instruments Division, based at Denver, Colo., displayed its line of electronic test measuring and recording products including portable and laboratory oscillographs and magnetic tape systems, and X-Y potentiometers and digital voltmeters.

Gulf Design Co. Awarded Major Engineering Contract By Farmland Industries, Inc.

Gulf Design Co., a division of The Badger Company, Inc., has been awarded the engineering contract for a major phosphoric acid plant to be built near Bartow by Farmland Industries, Inc. of Kansas City, Mo.

The new plant, adjacent to Farmland's Green Bay phosphate complex, will produce high grades of phosphoric acid not only for the Green Bay operation, but for Midwest manufacturing facilities of Farmland, a regional cooperative with distribution through community cooperatives in 14 states. The facility is expected to be on stream by late 1971.

Earth Resources Office Bldg.

Earth Resources Co.'s Exploration Division has moved into a new, recently completed office building near Denver. The 12,000 square foot structure is located at the Colorado School of Mines Research Institute's Table Mountain Research Center outside Golden, Colo.

The building houses administrative and field personnel which directs the company's exploration work from Peru to Alaska and Canada. In addition to featuring the most modern design and equipment for drafting and map-making, the building has a large truck drive-in ore storage area and space for a future laboratory.

Gene K. Ealy is vice-president in charge of the exploration program. William B. Hall, senior vice-president of the Colorado headquarters, directs the minerals production program. Executive headquarters are in Dallas, Tex.

FRC Achieves Diversification

Federal Resources Corp. has achieved diversification, increased cash flow and profit and is in a position to accelerate its expansion in the field of natural resources.

The company has copper mining and milling properties in New Mexico and a silver-lead-zinc-copper mining and milling operation in Colorado. Both operations will provide substantial cash flow during the current fiscal year as will the company's uranium mining and milling holdings in Wyoming.

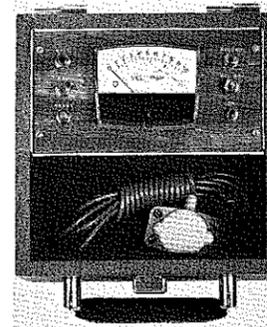
A major factor in increased earnings is the new ore body at the company's Camp Bird mine in Colorado, where mining and milling production has been underway since July of this year. The mill is now working on three shifts per day and is expected to be at capacity of 500 tons per day in a few weeks.

Long-Term Licensee Agreement

A long-term licensee agreement for the manufacture of Marion Power Shovel Co.'s heavy mining and construction shovels by Sumitomo Shipbuilding & Machinery Co., Ltd. of Tokyo was announced recently by Joseph N. Kemple, president of Marion Power Shovel Co.

Under the terms of the agreement, Marion's International Operations Group will market and support the machines with service and parts outside Japan and Okinawa. The new agreement marks the first time that Marion has entered such a licensee agreement with a manufacturing firm in the Far East. The company has maintained similar agreements for many years with licensee manufacturers in Great Britain, France and India. It also has manufacturing arrangements with firms in South Africa and Australia.

With the Manufacturers



Blast Monitor (318)

A new and unique indicating, blast monitoring instrument for measuring the vibrations in the earth or structures which may be associated with blasting, pile driving, heavy traffic, or other potentially damaging vibrations is manufactured by Dallas Instruments Inc., P.O. Box 38189, Dallas, Tex. 75238. The instrument, designated the Model B-2 Blast Monitor, indicates directly in peak particle velocity, as sensed by a vibration pickup and holds the indicated reading until it has been noted and reset by the operator. Circle 318 on Reader Service Card.

Water Quality Recorder (311)

A self-contained water quality recorder that can be set up by one man and operate unattended for up to a month has just been introduced by Beckman Instruments, Inc., 89 Commerce Rd., Cedar Grove, N. J. 07009. The Model RSQD Conductivity Recorder is designed for use in remote areas at minimum cost in terms of man/hours and maintenance. The all-solid-state unit is powered by internal batteries. Circle 311 on Reader Service Card.

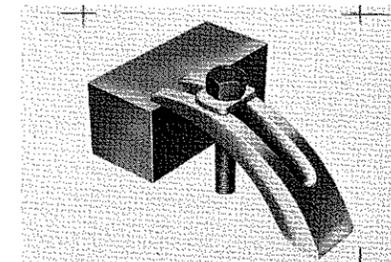
Blasting Agents (319)

Three aluminumized blasting agents to complement a line of nitro-carbonate (NCN) products have been introduced by the Du Pont Co. Explosives Department, Wilmington, Del. 19898. Known as "Aluvite" I, II and III, the non-cap-sensitive series completes the company's existing NCN line of ANFOs, "Nilite" and "Tovite". "Aluvite" I and II are designed for use in open work, particularly in hard rock where a high-performance, high-energy product is needed for increased fragmentation. They permit expanded drill patterns and reduced borehole diameters where drilling costs are high. "Aluvite" III is a high-density formulation suitable as a bottom load in large-diameter boreholes. Circle 319 on Reader Service Card.



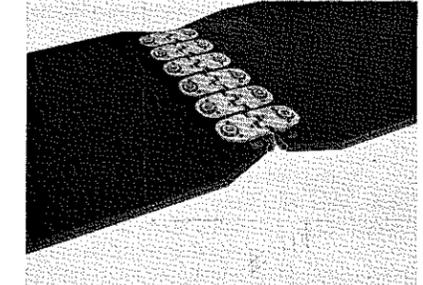
Resistivity Meter (322)

The Soiltest Strata Scout Resistivity Meter is used in subsurface exploration to locate gravel and mineral deposits, determine the depth of water table, find depth to bedrock, or in prospecting and civil engineering applications in which accurate subsurface information is needed. Information on the resistivity technique for subsurface studies is available from Soiltest Inc., 2205 Lee St., Evanston, Ill. 60202. Circle 322 on Reader Service Card.



Versaflex New Clamp (317)

A versatile new hold-down clamp can be used effectively and economically for a broad range of clamping requirements. The patented Insta-clamp® Hold Down Clamp is simple to use, effective, fast and safe. It saves time (and money) on all clamping jobs. (Instclamp Co., P.O. Box 26171, Denver, Colo. 80226.) Circle 317 on Reader Service Card.



Hinged Belt Fastener (314)

The Flexco Hinged Fasteners combine separability with the strength of a compression-type fastener. They are ideal for extensible belts used in underground mining operations such as coal, salt or potash. These special Flexco fasteners are designed for easy joint separation and flexing over pulleys too small for the solid plate Flexco. Flexible Steel Lacing Co., 4607 Lexington St., Chicago, Ill. 60644. Circle 314 on Reader Service Card.

Equipment Cleaner (316)

Washing a motor from the inside out isn't such a far-fetched idea. Ranco Industrial Products Corp., 13311 — NR Union Ave., Cleveland, O. 44120, has developed Motor Bath, a solvent that will flush all the dirt and grime from a sluggish motor. Motor Bath cleans a submerged electric motor while it operates. It may also be sprayed into electric motors or other electrical equipment for in-place cleaning. It is non-flammable, non-explosive, entirely di-electric, and non-injurious to metal, paint, or insulating material. Circle 316 on Reader Service Card.

Seismic Software (320)

In a new 12-page brochure, "Sand-Shale Ratio Determination From Seismic Interval Velocity."

A new GSI seismic software system designed to determine the relative proportions of sand and shale over potential oil-bearing structures is described.

The bulletin is based on a technical paper by Edward R. Tegland presented before the joint regional meeting of the Society of Exploration Geophysicists and American Association of Petroleum Geologists Mar. 8-19, 1970, in Dallas. Geophysical Service Inc., Box 5621, MS 938, Dallas, TX 75222. Circle 320 on Reader Service Card.

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Catalogs and Trade Publications

COAL RECOVERY DRILL (422)

A new bulletin (CA-702) from The Salem Tool Co., Salem, Ohio 44660, describes Salem's new multiple head coal recovery drill. The Salem MUL-T can be equipped to operate with one to three cutting heads. Head diameter range is: 30"-48" single head; 18"-30" dual head; 18"-22" tri-head. The machine offers the operator freedom to move from pit-to-pit and mine varying seam thicknesses with a single machine. Circle 422 on Reader Service Card.

COAL MINING EQUIPMENT (423)

A new 12-page brochure (M-218) "Joy Equipment for Modern Mining" is now available from the Joy Manufacturing Co., Oliver Bldg., Pittsburgh, Pa. 15222. The booklet illustrates and describes the company's complete line of mining equipment for coal and other flat bedded deposits. Equipment for conventional, continuous and longwall mining systems is covered, included are cutters, drills, loaders, continuous miners, shuttle cars, and belt haulage and longwall systems. Circle 423 on Reader Service Card.

GELATIN DYNAMITE (424)

A new line of medium-density, high-velocity gelatin dynamites has been announced by the Du Pont Company's Explosives Dept., Wilmington, Del. 19898. Known as "Hi-Drive," the new explosive is now available in diameters ranging from 1 1/4 inches to 3 inches. Particularly suited for priming ammonium nitrate/fuel oil (ANFO) products, "Hi-Drive" has a consistent velocity of 20,000 feet per second under borehole confinement. It is equal to "Hi-Velocity" 85 per cent on a weight basis and has a water resistance in excess of 72 hours at 15 psi. Circle 424 on Reader Service Card.

CRANE SCALES (425)

The Martin-Decker Corp., Santa Ana, Calif. 92705, announces one of the widest lines of crane scales available in the industry. Capacities are now available from 0-1000 to 0-300,000 pounds in both unitized and remote indicating models, with accuracies to better than .2% or full scale. Applications for these unique crane scales are unlimited. Any load can now be weighed on the spot; only an overhead crane or hoist is required. Circle 425 on Reader Service Card.

PRESSURE CONTROL (426)

The solution to a perplexing problem in controlling pressure letdown in a slurry system is described in a new application bulletin (6.0-3) by the Clarkson Co., 735 Loma Verde Ave., Palo Alto, Calif. 94303. An abrupt drop in pressure from 70 psi to 20 psi, coupled with the erosive effect of high-velocity slurry movement, was chewing up valves and other parts at an alarming rate. After much experimentation, the installation of a slurry valve in tandem with a ceramic-lined section proved to be the answer. The mill now reports trouble-free operation between regularly scheduled five-month maintenance shutdowns. The subject company is a major Western producer of uranium oxide. Circle 426 on Reader Service Card.

FOUR-ROPE BUCKETS (427)

A new illustrated brochure (2392-R) describing its line of four-rope clam-shell buckets is now available from Blaw-Knox Equipment, Inc., Blawnox, Pa. 15228. The new brochure describes the operation of the buckets in ore, coal, and other handling applications, and shows how they can be designed to fit user requirements in terms of type, weight of materials handled, and limitations on space. Detailed information on major components is furnished. To assist buyers, Blaw-Knox Equipment includes a check list of pertinent information to be supplied when requesting a specially designed bucket. The literature covers all the standard features of these buckets, and lists the options which are available. Circle 427 on Reader Service Card.

TRACTIVE COMPOUND (428)

Traction problems from soft, sticky fireclay and slick soapstone bottoms underground are easily overcome with a new compound, Special S, according to its developers, Talcor, Inc., Rte. 3, Jefferson City, Tenn. 37760. Talcor reports mines using Special S found the more it was worked into the fireclay, the more it hardened and firmed the haulway; that it also gave traction power on soapstone, similar to sand on a railway track. One shuttle car operator said it felt like he had studs in his tires. Special S also has been successful in treating slime left after water had been pumped out of old workings during reactivation. Circle 428 on Reader Service Card.

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To all MINES readers these publications are FREE, and may be ordered by giving index number.
On requesting publications from manufacturers, please mention the MINES Magazine.

'MN' INDICATOR & TEST PAPERS (429)

The Third Edition of the brochure on MN Indicator & Test Papers has been completely revised and up-dated by Gallard-Schlesinger Chemical Mfg. Co., 584 Mineola Ave., Carle Place, L.I., N.Y. 11514. The brochure covers a range of some 125 Test Papers in a variety of presentations. It includes papers for pH determination, cation and anion detection, for the non-destructive determination of some alloy compositions as well as a wide range of reagent Test Papers for the detection of numerous other substances. Circle 429 on Reader Service Card.

FLUORSPAR METALLURGY (430)

"Fluorspar Metallurgy and Flowsheets" is the title of an informative 12-page bulletin just published by Denver Equipment Division, Joy Manufacturing Co., P.O. Box 5268, Denver, Colo. 80217. Bulletin No. G3-B148 discusses mineralogy, market specifications, milling methods of various grades of fluorspar, and presents 15 of the more typical flowsheets to show the variations possible and to what extent the fluorspar producers have gone in their efforts to obtain maximum economic return from their ores. Plant layouts are also shown as an aid in mill design. Circle 430 on Reader Service Card.

DIESEL POWER UNITS (431)

Waukesha Motor Co., W. St. Paul Ave., Waukesha, Wis., 53186, has produced a new 24-page Catalog No. 5022 on its new VC series diesel power units. Available in eight-cylinder and twelve-cylinder Vee models, these compact diesels supply 250 to 800 brake horsepower in the 1800 to 2400 rpm range. Applications for the new diesels include oilfield drilling and mobile service rigs, aggregate and hot mix plants, river dredges and ocean barges, off-highway trucks and large construction equipment, and blower, fan and pump drives in industrial, commercial and municipal buildings. Circle 431 on Reader Service Card.

METALBAK (432)

Bulletin ME-5M-1169, available from Walbridge Co., 803 Patterson Bldg., Denver, Colo. 80202, presents specifications, procedure, uses and advantages of Metalbak, the multi-purpose Linatex-covered steel. Metalbak is available in 48" wide rolls of any length or in any size sheet. Circle 432 on Reader Service Card.

FACE MASK FILTER (433)

Peace of mind results from using the extraordinary new BREATHE EASY Face Mask Filter made of open-pored non-allergenic polyurethane foam. This is the first economically disposable (yet washable and autoclavable) mask to also provide maximum comfort, convenience and protection. Cut from a flat sheet with an ear hole at each end and a simple double protection feature in the nose area, this no-tie mask loops over the ears and clings almost unnoticeably to the contours of any face. It provides full closure with complete freedom of breathing, speech and sight. (Apart Five Inc., 162 Marble Drive, Rochester, New York 14615.) Circle 433 on Reader Service Card.

WIRE ROPE SLINGS (434)

Acco has revised its catalog sheet for UNALOC wire rope slings to include the latest ratings for each sling capacity. These ratings supersede all previously published ratings. The revised sheet (DH-223-A) is available free from the Wire Rope Division of Acco (American Chain & Cable Company, Inc.), 929 Connecticut Ave., Bridgeport, Conn. 06602. It has five specification tables. Each covers a different type of sling, listing the type of wire rope used, the rope diameter, the rated capacity in tons. Circle 434 on Reader Service Card.

FM TWO-WAY RADIO (435)

General Electric Mobile Radio Department has published a new version of its pocket-size booklet showing GE two-way FM radio models. ECR-1479B illustrates MASTR Progress Line "Professional," "Executive," and "Royal" mobile radios and base stations, as well as MASTR Progress Line Personal Series pocket two-way radios. It also describes GE's Porta-Mobile, one-way radio pagers, control centers, desk-top control consoles, monitor receivers, mobile telephone radios, terminals and base stations. For further information, write Section P, General Electric Mobile Radio Department, P.O. Box 4197, Lynchburg, Va. 24502 or Circle 435 on Reader Service Card.

FLUORSPAR MILL EXPANSION (436)

A 100% increase in milling capacity to 650 tons-per-day at the Ozark-Mahoning Co. fluorspar concentrator near Northgate, Colo., is the subject of Denver Equipment Division's Bulletin M4-B140. With the completion of the Northgate expansion, Ozark-Mahoning operates plants with a combined annual production of 150,000 tons of fluorspar. When the company's immediate goal of 170,000 tons is reached, it will be the largest producing company of acid-grade fluorspar in North America. In addition to the pictures and flowsheet of Ozark-Mahoning's Northgate concentrator, DENVER'S 8-page bulletin presents information about the history of the Northgate District, geology and mining, power, water supply, boiler plant, buildings, milling, grinding-classification, rougher flotation, regrind circuits, secondary cleaner flotation, flotation reagent consumption, concentrate drying, handling dried concentrates, brigetting, product storage, tailings disposal, sampling, laboratory, milling costs, and total connected mill horsepower. Circle 436 on Reader Service Card.

MINERAL FROTHER (437)

A highly efficient frother for both sulfide and non-sulfide minerals is detailed in a new 4-page brochure (F-42030) now available on request from Union Carbide Corp., 270 Park Ave., New York, N.Y. 10017. UCON Frother 200, a polypropylene glycol-type frothing agent, was developed to produce a compact, close-knit, highly selective froth with mineral-carrying properties. As a result, considerably less of it is needed for optimum recovery. UCON 200 is completely soluble in water and froths rapidly when added to the flotation cell. In addition, it does not tend to flatten the froth or cause effervescence when too much is added. Typical properties, storage, handling, shipping and suggested uses are all included. Circle 437 on Reader Service Card.

DIAMOND RESEARCH LABORATORY (438)

"Microscope on Performance" is the story of De Beers Diamond Research Laboratory, Johannesburg, South Africa, the only laboratory in the world devoting all of its attention to a single commodity—diamond. This 40-page booklet, with numerous four-color illustrations, describes the mining and recovery of natural diamond and manufacture of synthetic diamond. Applications of a variety of diamond grits, including the newest metal-clad types, are also covered. The booklet is available free of charge, from Ayer Public Relations, 1345 Avenue of the Americas, New York, N.Y. 10019. Circle 438 on Reader Service Card.

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Technical Societies

NCAR Quarterly Quoted On Affect of Pollution

AN ARTICLE entitled "Pollution Causes Climatic Changes," which appeared in the August 1970 issue of *Mines Magazine*, drew criticism from several readers. For this reason we wish to present the following excerpt from the May Quarterly of the National Center for Atmospheric Research, Boulder, Colo.:

"Apart from its immediate hazard to human health, air pollution is thought by many to be a potential cause of irreversible changes in the global climate. Some say the ice caps will grow, others say they will melt. And some say the effects of cooling and warming might balance, leaving the earth habitable through chance but not through foresight.

"In our excitable new era of environmental concern, atmospheric scientists are attempting to voice authentic warnings but also to counter exaggerated fears with well-balanced scientific facts. The prophecy of climatic change should not be dismissed lightly from conjecture. There is no doubt that climatic balance is delicate, perhaps depending on warming or cooling trends of one or two degrees. But to postulate a climatic wasteland, it does not suffice to project today's quantities of smoke, carbon dioxide, jet contrails, or rocket exhaust into future figures. So far it has not been shown with any assurance that climate is actually subject to man's influence."

SEG Lecturer

Dr. T. R. LaFehr has been designated by the Society of Exploration Geophysicists as the SEG Distinguished Lecturer for the Fall 1970. His topic will be "Gravity and Magnetic Digital Processing."

Professor LaFehr joined the Geophysics Department at CSM in the fall of 1969 after five years experience in industrial geophysical exploration. He has published several papers on his scientific work and delivered others which resulted in the SEG Best Presentation Award in 1961, Pacific SEG Best Paper Award in 1966, and the SEG Best Presentation Award in 1967.

Dr. LaFehr is a member of the SEG and several other scientific and professional organizations and is currently the Associate Editor for Gravity and Magnetic Exploration for the scientific journal *Geophysics*.

The Distinguished Lecture Tour, sponsored by the International SEG, includes addresses at most of the 22 local sections in North America.

Limitation of Offshore Boundaries Threat to National Interest

The United Nations proposal currently being considered by the U. S. Senate to limit offshore boundaries of nations would be a danger to the national interest of the United States, according to Robert H. McLemore, president of Otis Engineering Corp. of Dallas.

McLemore, who is also president of the 18,000-member Society of Petroleum Engineers of AIME, made his remarks on the proposed limitations

of offshore boundaries during a press conference Oct. 5 in Houston, where SPE held its 45th Annual Fall Meeting.

"The proposal now being pushed by the present administration that would establish 'artificial' rather than 'natural' boundaries to the Continental Shelf is dangerous to American interests in that it would have the U. S. renounce all present rights to seabed resources outside the 'artificial' boundaries of 200 meter depth of water," McLemore said.

The Dallas executive said he thought "everyone in the oil industry was surprised when the administration decided to support this proposal." McLemore stated he does not believe the U. S. should support the recommendation to limit offshore boundaries—which was made by the United Nations Commission on Marine Science, Engineering, and Resources—since the signing of the treaty would affect the nation's future oil and gas reserves.

"Limitation of the Continental Shelf would have a significant effect on our reserves," McLemore said, "and eventually we would have to start depending on foreign oil."

Northwest Mining Convention

The 76th Annual Convention of the Northwest Mining Association will be held on December 4 and 5, 1970, at the Davenport Hotel in Spokane, Wash.

Gold, silver, uranium, lead, zinc and copper will be featured as well as all aspects of public relations. Industry interest in conservation, natural beauty and air and water purity will receive increased attention. Technological advances in mining, metallurgy and geology will provide the scientific foundation for the convention as in the past.

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Mineral Industries

Kaiser Launches Search For Minerals in Southwest

Kaiser Exploration & Mining Co. is launching a major search for mineral resources in the southwest United States and northern Mexico. Edward L. Vickers, vice president and general manager, said the company, a wholly owned subsidiary of Kaiser Aluminum & Chemical Corp., has opened a regional exploration office at Tucson, Ariz.

"Principal emphasis, initially, will be on exploration for copper," Mr. Vickers said, "Silver and gold are also on our priority list, as well as a select group of non-metallic materials."

Mexican Patent Granted PMC Copper Process

PMC-Powdered Metals Corp. has received confirmation that a patent for the Company's PMC Process has been granted by Mexico.

The PMC Process, a no-smelter, electrolytic method of extracting pure copper powder, is currently patented in: Italy, Israel, Rhodesia, Great Britain, Canada, Peru, India, France, Congo, Belgium, Greece, Chile, Japan, Philippines, Australia, and in the United States.

The Mexican patent brings the number of foreign patents held by PMC to 16.

A recent working agreement between PMC and the Inco Mining Corp. of the Philippines marks the company's first outside the United States.

Standard Metals Acquires Leases on 27 Claims

Standard Metals Corp. has acquired leases on 27 mining claims, known as the Graham Properties in Cement Creek, Colo., near Silverton, it was announced by Boris Gresov, chairman and president. The claims include the Kansas City and the Berkeley properties high above timberline which have produced very high grade ore in limited quantities in the past.

According to Mr. Gresov Standard Metals is chiefly interested in the potential of the massive Trego vein which is around 100 feet wide and extends for the full width of the properties of over 3,000 feet.

"Current plans," Mr. Gresov said, "are to clean out the low-level, all-weather Elk Tunnel and then diamond drill ahead to test the lower extension of the Trego vein."

U. S. Steel at Klukwan

U. S. Steel Corp. has leased a 589 acre tract from the Klukwan Indian Council. This lease is on the alluvial pan of iron ore along the Chilkat River near Haines. The 10 year mineral rights lease (ten years or as long as minerals are produced in paying quantities) was obtained by a \$50,000 bid by U. S. Steel. Rental fees will be paid on a graduated basis over the ten year period. If production begins, a royalty payment of 35 cents per long ton of dry iron concentrates or products containing 60 percent iron will be paid in lieu of the rental fee.

St. Joe and Phelps Dodge Australian Exposition

St. Joe Minerals Corp. and Phelps Dodge Corp. have released further information with respect to the results of drilling on the exploration license near Tarago, New South Wales, Australia of Jododex Australia Pty. Ltd., the joint exploration venture equally owned by St. Joe and Phelps Dodge.

The two companies stated that 23 drill holes totaling 16,400 feet have been completed. Eleven of these holes have encountered significant intersections of commercial grade copper, lead, zinc and silver mineralization. The latter holes indicate a deposit of massive sulphides with assays varying substantially but averaging 2.9 per cent copper, 3.3 per cent lead, 9.4 per cent zinc and 1.9 ounces of silver per short ton.

Limits of the deposit have not yet been determined, but it appears to have a strike length of at least 700 feet, with a thickness varying from 25 to 135 feet, and to extend down-dip at about 45 degrees for a distance of at least 1,100 feet. These general dimensions outlined by drill hole results to date indicate a tonnage in excess of 7,000,000 short tons.

Kerr-McGee Property Near Patagonia, Ariz.

Significant copper mineralization has been discovered by Kerr-McGee Corp. in four of five recently completed deep diamond drill holes on its Red Mountain property near Patagonia, Ariz., D. A. McGee, chairman, announced recently.

McGee said the significant mineralization was intercepted at depths of from 3,410 to 5,194 feet. Three of the four holes contained one intercept of significant mineralization and one hole contained two intercepts. Average thickness of the ore zones is 455 feet and average grade is .71 per cent copper. Copper mineralization is primarily in the form of disseminated chalcopyrite, with small amounts of associated gold, silver, molybdenum, and other minor metals.

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THE COLORADO SCHOOL OF MINES ALUMNI PLACEMENT SERVICE functions as a clearing house for alumni and former students who wish to receive current information about employment opportunities for which they may qualify. It also serves the oil, gas, construction and related industries and many government agencies by maintaining current listings of openings they have for qualified engineers, technical and management personnel.

Companies needing qualified men with degrees in Geological Engineering, Geophysical Engineering, Metallurgical Engineering, Mining Engineering, Petroleum Engineering, Petroleum Refining Engineering, Engineering Physics, Engineering Mathematics, and Chemistry are invited to list their openings with the CSM Alumni Placement Service, Guggenheim Hall, Golden, Colorado.

Listed below are coded references to the graduates of the Colorado School of Mines who were available for employment at the time this issue of The MINES MAGAZINE went to press.

Client's Code Number	Degree	Age	Marital Status	No. of Children	Preferred Fields of Work	Locality Preferred	Languages Spoken
MN 34	Mining	39	M	1	Mining Geology	Western USA/Foreign	English/Spanish
MN 36	Mining	30	M	1	Open Pit or Underground	West, Northwest U.S.	English
MN 37	Mining	29	M	2	Production	Rocky Mountain or Western U.S.A.	English
MN 38	Mining	25	M	0	Mining— Open Pit or Strip	Domestic or Foreign	English
MN 39	Mining	32	X	2	Mining Supervision and Management	Open	English
MN 42	Mining	23	S	-	Exploration, Prospecting		
MN 44	Mining	28	M	2	Manufacturing & Marketing	Open	English
MN 46	Mining	36	M	6	Exploration Development	S.W.-U.S.A. or Alaska	English
MT 48	Metallurgy	35	M	2	Development, Project Management	Colorado	English/Spanish
MT 51	Metallurgy	26	S	0	Met. Engineering Systems analysis	Foreign	English
GE 34	Geol. Engr., Civil Eng.	39	M	3	Prefer Management	Open	English
GE 36	Geology	43	M	1	Production—Mining or Non-metallic Processes	Western U.S.	English
GE 38	Geology	35	M	2	Mineral Prop. Evaluation Mine Manag. & Planning	Western USA/Foreign	English
GE 40	Geol. Engr.	43	S	-	Exploration, Engineering or Research Geologist	Western U.S.A. or Foreign	English
GP 15	Geophysics	49	M	3	Petroleum Expl.	Rocky Mountains	English
GP 17	Geophysics	34	M	1	Geophysics	Colorado	English
GP 18	Geophysics	23	S	0	No Mgmt. Trainee	Rocky Mountain	English
GP 19	Professional Engineer	24	M	0	Mineral Exploration	Southwest U. S. or South America	English
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In Memoriam



Worden

John C. Worden

JOHN C. WORDEN, E.M. 1923, died very suddenly of a heart attack June 8 while on a fishing vacation in the Sierras. He had retired in July 1960 after 37 years with Shell Oil Co.

Mr. Worden was born in 1899 in the small town of Worden, Ill., which was founded by and named for his grandfather. He attended elementary schools in St. Louis and graduated from Colorado Springs High School. As a student at the Colorado School of Mines, he was a member of the Mines baseball team for four years, served on the Student Council, and belonged to such organizations as Kappa Sigma and Theta Tau fraternities, M Club, Trowel Club, and AIME.

After receiving his E.M. degree from Mines, he joined Shell Oil in July 1923 as a surveyor during the construction of the reservoirs at Wilmington. During subsequent years he held jobs of increasing responsibility both at Wilmington-Dominguez and Martinez refineries.

Over the years Mr. Worden became an ardent conservationist, a supporter of wildlife organizations and projects, and he was an accomplished outdoor photographer. He was a long-time member of the Izaak Walton Club. He never lost interest in the game of baseball, becoming an avid fan of the Los Angeles Dodgers.

Survivors include his wife, Edrienne D. Worden, 1235 Armando Dr., Long Beach, Calif. 90807; a sister, Miss Louella Worden of Los Angeles; stepdaughter, Mrs. Jeanne Koblack of San Carlos, and three grandchildren.

Paul S. Plumb

PAUL S. PLUMB, Geop.E. 1950, died Nov. 19, 1969 after being struck by an automobile in Bartlesville, Okla. Following his graduation from Mines in 1950 with a degree in Geophysical Engineering, he was employed by Dominion Oil Co. and later by Chevron Oil Co. in South America, California and Oklahoma.



Poy

Clarence W. J. Poy

CLARENCE WILLIAM J. POY, E.M. 1924, died very suddenly and unexpectedly while he and his wife were on a short vacation trip to Seattle, Wash. and vicinity to visit relatives and many Alaskan friends.

Born March 12, 1901 in Portland, Ore., Mr. Poy received his elementary and secondary education there. After graduating from Washington High School in 1919, he attended Oregon State for one year, the University of Washington for one year, and then transferred to the Colorado School of Mines for two years, graduating in 1924 with an E.M. degree.

For about a year he was assistant civil engineer for the city of Portland. He then obtained employment with Kennecott Copper Co. as assistant mining engineer at their mine on Latouche Island, Alaska, where he remained for more than five years. In the fall of 1929, he went to Port Wells, Alaska, where he designed and constructed a diesel power plant and several miles of pipe line to furnish power for the mine and mill.

At this time the U.S.S.R. began corresponding with Mr. Poy to go to Russia to design and develop modern mining methods in a particular large copper property in the Ural Mountains which they believed to be similar to the ore body on Latouche Island and for which he had developed a particular system of mining called the Latouche System of Mining. Mr. Poy accompanied by Mrs. Poy, left for the U.S.S.R. in 1930, remaining there three years — one year in the Ural Mts., and two years in old Central Asia or Russian Turkestan where he designed and developed modern methods of mining for ancient mines in an area of 600 miles diameter. He worked out of headquarters in the town of Tchikent in Uzebekistan, Central Asia. Some of these properties had not been worked since the time of Genghis Khan.

After Mr. Poy's return to the United States, he returned to Alaska to mine gold and silver and to be a consultant for other small properties, many of which were situated on glacier-covered mountains. While there he instituted the plan of freighting supplies by plane into these small properties, making it possible for year-round operation where formerly one season was required to "freight in" and work

the following season. The freighting was accomplished by landing a small plane on the extremely viscous mud flats at mean low tide on Valdez Bay. Wheels were replaced by skis, and then the plane took off with small loads which increased with experience to full loads. Sufficient supplies could be flown into these small properties in two weeks to enable continuous operations for two years. This same method was adopted by the military in the South Pacific after having seen it in operation in Valdez.

Mr. Poy and family remained in Alaska nine years at this time. In 1938 he was employed by the Alaska Road Commission as engineer on the highway system. While in this capacity, he surveyed and engineered the northeastern 90 miles of the then secret Glenn Highway through virgin territory to connect Anchorage, Alaska, with the Fairbanks Highway into Fairbanks and the interior. This was turned over to the U.S. Army upon completion.

From Alaska he went to Sonora, Mexico, where he mined and milled independently for gold, silver and copper for about six years. While there he suffered an industrial accident that necessitated the removal of his left hand and eventually caused him to be blind. After he left Mexico, he was employed by Paul Lime Plant in southeast Arizona out of Douglas to design and construct a 125-ft. long by 10-ft. lime kiln as well as several conveyor systems. At this time his eyesight forced his retirement from the engineering profession, and in a short time thereafter he became entirely blind.

Survivors include his wife, E. Poy; one daughter, Cora Elizabeth Davis, his son-in-law Kenneth K. Davis, Jr., and two grandsons, all of whom reside at 1606 Kamsack Drive, Sunnyvale, Calif.

Whitney Newton

WHITNEY NEWTON, 82, Pueblo financier and civic and social leader, died Oct. 5 at his home following a heart attack. A member of one of Pueblo's oldest families and a former owner of the old Newton Lumber Co., Mr. Newton was born Dec. 15, 1887 and attended the Colorado School of Mines from 1909 to 1911.

Newton was an uncle of Quigg Newton, former Denver mayor and ex-president of the University of Colorado.

He was a veteran of World Wars I and II, a benefactor of the Pueblo Metropolitan Association and a member of the Pueblo Country Club, Denver Country Club, Denver Club, Garden of the Gods Club in Colorado Springs, Elks Club in Durango, Colo., and the Denver Masonic Lodge.

Survivors include his widow, Barbara, whom he married Dec. 15, 1931.

K. W. Powers

KEN W. POWERS, Met. E. 1925, died May 30 at his home in Denver. He was formerly employed by Timkin Roller Bearing Co.

Verner E. Raukohl

VERNER E. RAUKOHL, P. E. 1932, died April 22 in an automobile accident in Denver. It is believed that he suffered a heart attack while driving. His car veered to the wrong side of Leyden St., hit a parked auto, jumped a curb, and hit a tree.

Mr. Raukohl was born July 13, 1908 in Denver. After graduating from East High School in 1926, he enrolled at the Colorado School of Mines where he received his Petroleum Engineering degree in 1932.

From 1936 until his retirement on July 7, 1967, Mr. Raukohl was employed by the Colorado State Highway Department. His position when he retired was supervising highway engineer. During World War II he served as a major in the Corps of Engineers.

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Adam N. Thomas

ADAM N. THOMAS, Geol.E. 1952, died unexpectedly of a heart attack Feb. 3, 1970 in Houston, Tex. At the time of his death he was a consulting photogeologist.

A memorial service was held in Houston on Feb. 7, 1970, where despite inclement weather, about 200 friends and acquaintances attended the services. Afterwards his body was flown to Colorado, where he was buried in his home town of Montrose.

As a student at Mines, he was unusually popular. He lettered in football for three years, was a member of the honorary engineering fraternity, Theta Tau, and active in "M" Club activities. Adam was sincere and dedicated in everything that he entered.

Although his career was relatively brief, it still was an exciting and colorful one. After graduation in 1952 he went to work as a geologist for the Colorado Exploration Co., a new firm established by a former Mines geologist, Dr. W. Alan Stewart. Adam left the company shortly after Dr. Stewart was killed in an airline accident in Oct. 1955.

From 1956 through 1960, he was a photogeologist for the photogeological consulting firm of Doeringsfeld, Amuedo and Ivey, Denver, Colo. In late 1960 he joined two of his classmates, Bob Turley and Clem Lehnertz, in forming Exploration Engineering.

Between 1962 and 1964 he taught photogeology on a part time basis at the University of Houston. In 1967 he took a one year contract on an AID project in Panama for locating and evaluating non-metallic resources of that country. Upon returning to the states in early 1968 he went into business for himself as photogeology consultant.

His professional affiliations were as a Registered Professional Engineer in Colorado and Texas; a member of American Association of Petroleum Geologists; South Texas Geological Society and the Houston Geological Society.

Surviving are his wife, Mrs. Eugenia D. Thomas (whom he married Mar. 13, 1954 in Golden, Colo.), and a daughter, Claudine, both of Houston; his parents, Mr. and Mrs. Bob Thomas of Montrose, Colo.; and a younger brother, Gary Thomas, who is a high school teacher at Nampa, Ida.

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Executive Secretary



W. W. Fertig

MEMBERSHIP CARDS. The 1971 Membership Cards have been mailed to all those members who were active in 1970. If you will mark the ballot and return it in the special envelope, together with the dues card and your check in payment of the 1971 dues everything will be in order for another year.

As mentioned the number of members increased enough in 1970 to compensate for the loss in revenues as advertising income dropped due to the condition of our economy. We hope that 1971 will again show an increase in the numbers of members for we still continue to operate on the barest of margins.

THE MINES BREAKFAST. The Mines Breakfast to be held at the Society of Mining Engineers Convention in St. Louis will be reported in the next issue of The MINES Magazine. It is difficult to estimate the number who will be present for this breakfast, but we anticipate there will be at least 60 Miners.

ALUMNI AND ADMINISTRATION Dr. McBride will propose within the next few weeks a program to enlist the support of the Alumni in developing a national recruiting effort to provide Mines with an increase number of applicants for enrollment in the freshman class. In the past we have concentrated largely on residents of the State of Colorado, but if Mines is to achieve its position as one of the outstanding engineering schools in the United States and the Outstanding School in the field of Mineral Resources, it is essential that the base for our recruitment be National in scope. At this particular time Dr. McBride is not prepared to present a full scale program, but we hope to report further in the next issue of The MINES Magazine. Actually this is an alert to the Alumni to be prepared to accept the responsible of implementing this program once it is formulated.

HOME COMING. Plans are complete and we anticipate an excellent attendance at the Homecoming which is to be held on Oct. 31. A full report will be published in the December magazine.

ENROLLMENT. As previously mentioned there will be an announcement

Meeting of the Board of Directors Colorado School of Mines Alumni Foundation November 14, 1970

FOUR members of the Alumni Board of Directors, three committee members and guests from the administration met at Colonel Fertig's home for cocktails before the dinner meeting held in the 50 Room of the Ben H. Parker Student Center on Wednesday, Oct. 14, 1970.

Those attending the regular business meeting were: Hall Addington, president; Harrison Hays, vice president; Bob Magnie, treasurer; Don Craig, director; Al McGlone, former chairman, High School College Relations Committee; Dick Seal, chairman, Membership Committee; Earl Ostling, chairman, High School College Relations; Dr. Guy T. McBride, president C.S.M.; Dr. Anton Pegis, vice president C.S.M.; H. D. Burdick, director of Admissions; Colonel Fertig, executive secretary; Dean Wm. V. Burger, alumni staff.

Minutes of the June 18, 1970, meeting were approved as distributed.

Financial statement for September reviewed and approved.

Old Business. — Colonel Fertig reported on the Mines breakfast at the American Mining Congress at the Denver Hilton Hotel, Tuesday, Sept. 29, 1970. Tables were set up for 68 which had to be expanded to 92 to accommodate those who attended. Dr. Guy T. McBride, the newly appointed president of the Colorado School of Mines, spoke briefly to the group, assuring Mines Alumni of his

within the next few weeks of direct interest to all Alumni and will call upon them to provide the manpower to meet the future needs of the Colorado School of Mines. This program will look to the increase enrollment from year to year with the final goal of some 3,000 students on the Golden Campus by 1985. This is a long range program and you will be hearing a great deal more about it. This is a call for personal service and not for more funds.

CENTENNIAL CLASS. There has been little information published, but the freshman class which enrolled this fall will in the order of things be the 100th Anniversary Class of the Colorado School of Mines. The Class of 1974 will be note-worthy for this particular fact. A year long celebration of the 100th Anniversary of the founding of this fine institution will continue during the entire year of 1974.

Information will be gradually developing, and you will be kept in touch with the plans. Of course it is early but it might be well to mark on your calendar that you expect to be back on the campus of the Colorado School of Mines sometime during the year of 1974. (Don't wait that long, we will welcome you anytime.)

Alumni Business

desire to have closer working relations between the administration and the Alumni to promote increased nationwide enrollment of quality young men and women at Mines.

Colonel Fertig reported on the upcoming Alumni meetings at the Society of Metals (Cleveland) and SME (St. Louis), and also on the Homecoming plans for Oct. 30-31. The classes to be honored are those of 1950, 1955, and 1960. Colonel Fertig read the report submitted by the Nominating committee, which was duly approved.

New Business. — Colonel Fertig reported that the 1971 dues mailing will be sent out in mid-October.

It was reported that the date originally scheduled for the 1971 Annual meeting was in conflict with the Colorado Mining Association Convention. It will be necessary to schedule another date. We moved, seconded, and passed that the proposed changes in the By-Laws should be deleted, leaving the date of the Annual meeting to be held annually in January of the new year following the election.

Colonel Fertig reported on his visits to the Local sections in Los Angeles; Anchorage, Alaska; Seattle, Washington and Houston, Texas. (These meetings have all been reported in the Local Section News.)

Dr. McBride spoke at some length on student recruitment on a national basis. He appealed for the support of all Alumni in seeking out qualified young persons in their local communities to arouse and cultivate an interest in attending Mines.

Dr. McBride pledged his support and cooperation with the Alumni as well as the support and cooperation of Dr. Pegis and Mr. Burdick in seeing that the "tools" are provided to do the job that has to be done. The example of the work done by the Tulsa Alumni section was cited to show what can be done to interest out-of-state students in coming to Mines.

Magazine. — Dean Burger reported that The MINES Magazine advertising revenue was down during the spring and summer months but is greatly improved this fall. Advertising revenue for the 1970 Directory was only slightly less than for the record year of 1969.

The next meeting will be held on Nov. 19, 1970. The meeting adjourned at 9:45 p.m.

Alumni Headliners

Seven CSM Alumni Listed in 1970 Outstanding Young Men of America

SEVEN young alumni of the Colorado School of Mines have been selected for inclusion in the 1970 edition (to be published December, 1970) of *Outstanding Young Men of America*. Nominated earlier this year, the following CSM alumni were chosen for the publication on the basis of their achievements:

James R. Heavener, Geop.E. '60, 2064 Pauline Blvd., Apt. 2B, Ann Arbor, Mich. 48103.

Dr. James J. Simpson, P.R.E. '61, (U. S. Public Health Service), 1047 South St., Lincoln, Nebr. 68502.

C. Hall Swaim, Geop.E., '61, 810 Scottsdale Dr., Richardson, Tex. 75080.

Joseph R. Wright, P.R.E. '61, Mgt. Consultant, Booz Allen & Hamilton, Inc., 300 E. 40th, Apt. 24-L, New York, N.Y. 10016.

Stanton T. Hadley, Met.E. '58, Patent Counsel, Scott Paper Co., 209 Beaumont Dr., Wallingford, Pa. 19086.

William S. Price, E.M. '61, Prod. Engr. & Adm. Asst., Ingersoll-Rand Co., 12 Logan Dr., Easton, Pa. 18042.

Jerry R. McLeod, P.E. '57, Planning Assoc. in Corporate Cities Service, 3926 E. 59th St., Tulsa, Okla. 74135.

Now in its seventh year, *Outstanding Young Men of America* is an annual awards volume sponsored by leading men's civic and service organizations. It is the purpose of *Outstanding Young Men of America* to recognize and honor the young men in our country who are working toward excellence in their careers and community service. It is these young men who will soon be the leaders of our country.

Doug Blankenship, past U. S. Jaycee president (1962-63) who is serving as chairman of the Board of Advisory Editors, said that the men selected "have distinguished themselves in one or more fields of endeavor to the point of being outstanding."

Each year over 5,000 young men between the ages of 21 and 35 are nominated for the awards publication by Jaycee chapters, civic organizations, college alumni associations and military commandants. Criteria for selection includes a man's service to others, professional excellence, business advancements, charitable activities and civic and professional recognition.

President Richard M. Nixon has said of the awards volume, *Outstanding Young Men of America* presents

Richard Reseigh and Joan Drury
Married Aug. 22 in Denver

RICHARD T. RESEIGH, E.M. 1966, called at the Alumni Office recently on the eve of his marriage to Miss Joan W. Drury, daughter of Mr. and Mrs. Floyd M. Drury of Rockville, Md. The wedding was held on Aug. 22, 1970 at the Memorial Chapel of Denver University.

The groom is employed as a project engineer by the Centennial Development Co., a subsidiary of Peter Kiewit & Sons, Inc. The newlyweds will make their home in Oakwood, Va. 24631. The post office address is P. O. Box 112.

Lt. Touslee Now on Duty With U.S.A.F. in Thailand

LT. RANDALL D. TOUSLEE, P.R.E. 1968, son of Mrs. V. E. Touslee of 1014 33rd Ave., Greeley, Colo. is on duty at Nakhon Phanom Royal Thai AFB, Thailand.

Lieutenant Touslee is a forward air controller with the 23rd Tactical Air Support Squadron, a unit of the Pacific Air Forces, headquarters for air operations in Southeast Asia, the Far East and the Pacific area.

The lieutenant, who previously served at Williams AFB, Ariz., is a 1963 graduate of Greeley Central High School and received his P.R.E. degree in 1968 from Colorado School of Mines.

He was commissioned upon completion of Officer Training School at Lackland AFB, Tex.



COLONEL WALTER C. GELINI, left, commanding officer, and Lieutenant Colonel Philip A. Woolaver, R&D coordinator, Military Technology Laboratory, pinned the silver bar on First Lieutenant Wilmer Jesse Foster, P.R.E. 1967.

Lt. Wilmer J. Foster Promoted;
Assigned to Ft. Belvoir, Va.

WILMER JESSE (JERRY) FOSTER, P.R.E. 1967, was promoted from second to first lieutenant, in a recent ceremony at the U.S. Army Mobility Equipment Research and Development Center, Fort Belvoir.

First Lt. Foster was assigned to the Center in June, 1969, and is presently serving as a coordinator in the Sanitary Sciences Division, which is responsible for the research and development of water purification equipment.

A native of Lubbock, Tex., 1st Lt. Foster attended Colorado School of Mines where he received a degree in chemical and petroleum refining engineering in 1967. He entered on active Army duty in April, 1969.

He is a member of the American Institute of Chemical Engineers, American Society of Mechanical Engineers, Society of American Military Engineers, and the Society of Automotive Engineers.

During his assignment at the Center, 1st Lt. Foster is residing with his wife, Janet, and children, Paula and Scott, at 5902 F. Queenston St., Springfield.

First Lt. Foster is the son of W. J. Foster, 3411 53rd St., Lubbock, Tex. The R&D Center, where he is serving, is responsible for research, development and engineering for round-the-clock mobility in some 15 fields of military engineering ranging from water purification equipment to detection devices.



Ilgenfritz



Shaffer



Kiersch



Schulte



Templeton

Major Jerry Ilgenfritz Assigned To C & I Div. of ARADCOM

MAJ. JERRY P. ILGENFRITZ, E.M. 1961, a long-time resident of Colorado, including Golden, has been assigned to the Construction and Installation Division, Directorate of Engineering, at Army Air Defense Command headquarters. He comes to ARADCOM from Vietnam, where he completed his second tour of duty.

Major Ilgenfritz was born in Iowa, but spent some of his adolescent years and most of his young adulthood in Denver, Lakewood, and Golden. His wife is the former Elaine K. Tait of Golden, and the couple's permanent home is in Golden.

Major Ilgenfritz' first tour of duty in Vietnam was from January 1967 to January 1968, during which he was assistant operations officer of the 45th Engineer Group (Construction) and, later, operations officer of the 35th Engineer Battalion (Combat). He received the Bronze Star Medal for meritorious service in both duties.

During his second tour in Southeast Asia, he was operations officer of the 299th Engineer Battalion (Combat) and then of the 937th Engineer Group. He was awarded an Oak Leaf Cluster to his Bronze Star Medal (representing a second medal) for his contribution, with the 937th, to the highway construction program, and for coordinating engineer support to the 4th Division during the Cambodian operation in May 1970. He also received a second Oak Leaf Cluster to the Bronze Star Medal for meritorious service with both the 299th and 937th.

Major Ilgenfritz holds an Engineer of Mines degree from the Colorado School of Mines, class of 1961, and a Master of Science in Engineering degree from Arizona State University, 1966.

Lt. Shaffer Wins Wings, Assigned to Marine Base

LIEUTENANT MARK E. SHAFFER, Geo. E. 1966 & M. Sc. 1969, son of Mrs. Joan A. Shaffer, 1076 Fraser St., Aurora, Colo., has been awarded his silver pilot wings upon graduation at Webb AFB, Tex.

Lieutenant Shaffer is being assigned to the U.S. Marine Corps Air Station at Yuma, Ariz., for flying duty on the F-4 Phantom fighter bomber.

A 1962 graduate of Aurora Central High School, he received Geop. E. and M.Sc. degrees from Colorado School of Mines, where he was a member of Beta Theta Pi fraternity.

Dr. Kiersch Elected Director Of Sierra Del Oro, Inc.

DR. GEORGE A. KIERSCH, Geol. E. 1942, was recently elected to the Board of Directors of Sierra Del Oro, Inc., a publicly owned mining holding company in Phoenix, Ariz. Dr. Kiersch of Ithaca, N. Y., is presently professor of Geology at Cornell University, a Fellow for the National Science Foundation, and an Arizona Registered Geological Engineer. Dr. Kiersch received his B.S. in Geological Engineering from the Colorado School of Mines in 1942, and earned his PhD in Geology at the University of Arizona in 1947. He has also completed special studies at the University of Vienna and elsewhere in Europe.

In his capacity as a consultant, Dr. Kiersch has worked as a geologist for the International Boundary and Water Commission, and the U. S. Corps of Engineers; since 1938 he has served as geological consultant for some 50 private companies, governmental agencies and legal firms. He is active in various technical and professional societies and has received numerous special awards.

Lt. Schulte Awarded Pilot Wings Upon Graduation at Craig AFB

LIEUTENANT FRED C. SCHULTE, E.M. 1968, son of Mr. and Mrs. Fred L. Schulte, 2101 22nd Ave., Greeley, Colo., has been awarded U. S. Air Force silver pilot wings upon graduation at Craig AFB, Selma, Ala.

Second Lt. Schulte was commissioned in 1969 upon graduation from Officer Training School, Lackland AFB, Texas.

A 1964 graduate of College High School, he received his degree in

Mining Engineering in 1968 from Colorado School of Mines. The Lieutenant is a member of Beta Theta Pi fraternity.

His wife, Mary, is the daughter of Dr. and Mrs. Martin S. Bechtel, 2455 22nd Ave., Greeley.

Templeton Elevated to President Of WCP & ORA on July 14

PHILIP C. TEMPLETON, P.E. 1937, assistant plant manager, Los Angeles Refinery, Texaco, Inc., was elevated to the office of president of Western Gas Processors & Oil Refiners Assn. by the Board of Directors at its annual electoral meeting on July 14.

Phil was elected as vice president in the regular election held in June, and comes to the office of president well qualified to discharge its responsibilities. He has been a member of the Board of Directors since 1965, and a member of the Executive Committee for the past three years. Previously, his committee experience included those of membership, program, fall meeting and finance budget.

The new president is a native of Fowler, Colo., and a graduate of the Colorado School of Mines with a degree in Petroleum Engineering. His graduate work was taken at Purdue University, where he received an MSE in 1940. After two years with Texaco with the old Indian Refining Co., the U. S. Army Corps of Engineering claimed his services in the European Theater of Operations until 1945. He was discharged as a major, after being a graduate of the Command and General Staff School, and the recipient of the Bronze Star.

Phil Templeton is a registered professional engineer, a member of Sigma Phi Epsilon fraternity, and a past president of the Toastmasters. He lives with his wife Betsy and their two sons, David and Larry, in Buena Park, Calif.

Capital punishment is when the government taxes you to get capital so that it can go into business in competition with you, and then taxes the profits on your business in order to pay its losses.

Letters

106 S. Parkway Road
Allentown, Pa. 18104
Oct. 4, 1970

Dear Wendell:

My only link with CSM—The Mines Magazine — has been severed since our last move. Help!

The new address is shown above and my old address was 1028 Linden Drive, Lafayette, Indiana 47905.

In August I received a Master's degree from the Krannert School of Industrial Administration at Purdue University. I am now with Air Products and Chemicals, Inc. I have a marketing position within the Material Sciences Division where the name of the game is a market oriented systems approach to the business of material joining.

Thanks!

Sincerely,
James R. Thompson, Met. E. '66

* * *

Oct. 16, 1970

Mr. C. K. Viland,
Taylor and Canon Streets,
Bodega Bay, Calif. 94923

Dear Mr. Viland:

Please accept my congratulations on your most excellent article, "Unleaded Gasoline and Smog-Free Autos — How and Why," which appeared in the August 1970 issue of The Mines Magazine.

Your analysis of this complex subject is comprehensive and well documented, and it makes the subject easily comprehensible and interesting to people who might otherwise find it difficult to understand because of its technical aspects. A number of people in Falconbridge have expressed this opinion.

With kind regards
Yours sincerely,
Falconbridge Nickel Mines Ltd.
I. M. Simmons,
Manager, Market Research

IMS:pc
cc: Mr. K. Kaanta, Editor
The Mines Magazine

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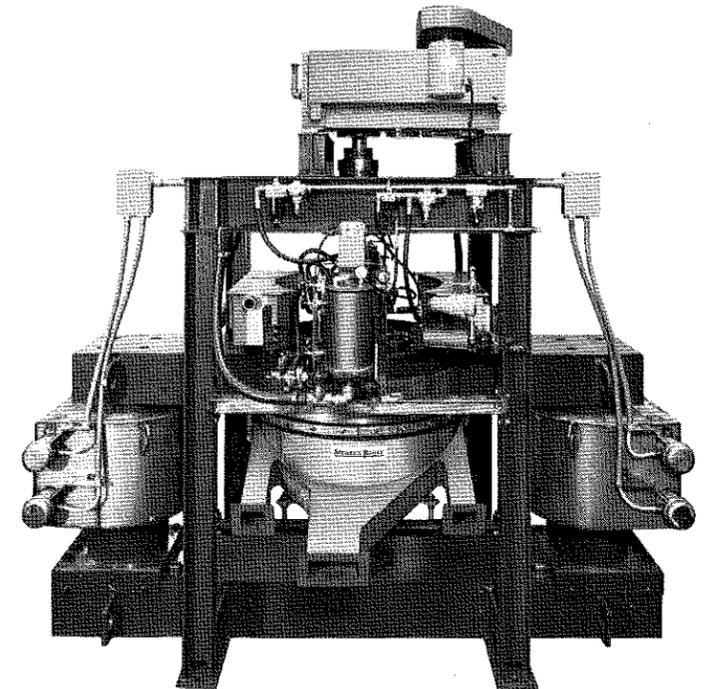


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Denver, Casper,
Oklahoma City,
Houston

F. T. "Tom" Ise, '55
J. H. "Pefe" Peterson, '57
John R. "Jack" McMinn, '42
Fred G. Van Matre, '56
Jaff J. Wood, '54,
Robt. J. Lickus, '58

THE MINES MAGAZINE • NOVEMBER, 1970

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Campus Headlines

Fellowships Are Awarded

GRADUATE fellowships for the 1970-71 academic year have been awarded to the following students: **David L. Francis** (Mathematics; Boettcher Foundation, \$2,649.96); **Catherine A. King** (Geophysics; Cities Service Oil Co., \$1,699.92); **Lawrence H. Kumanoto** (Geophysics, Mobil Oil Corp., \$3,000); **John T. Jones** (Geophysics, Texaco Oil Co., \$3,000); **James Craig Williamson**, (Metallurgical Engineering, ASARCO Foundation, \$1,237.50); **Jim Foy Lemons, Jr.** (Metallurgical Engineering, St. Joseph Lead Co., \$2,700); **Bruce A. Collins** (Geology, Gulf Oil Corp., \$2,499.93); **Stanley M. Howard** (Metallurgy, Inland Steel-Ryerson Foundation, \$1,000, 1970 fall semester); **William F. Martin, Jr.** (Metallurgy, Kennecott Copper Corp., \$1,000); **Arthur J. Pansze** (Geology, ASARCO Foundation, \$2,399.94).

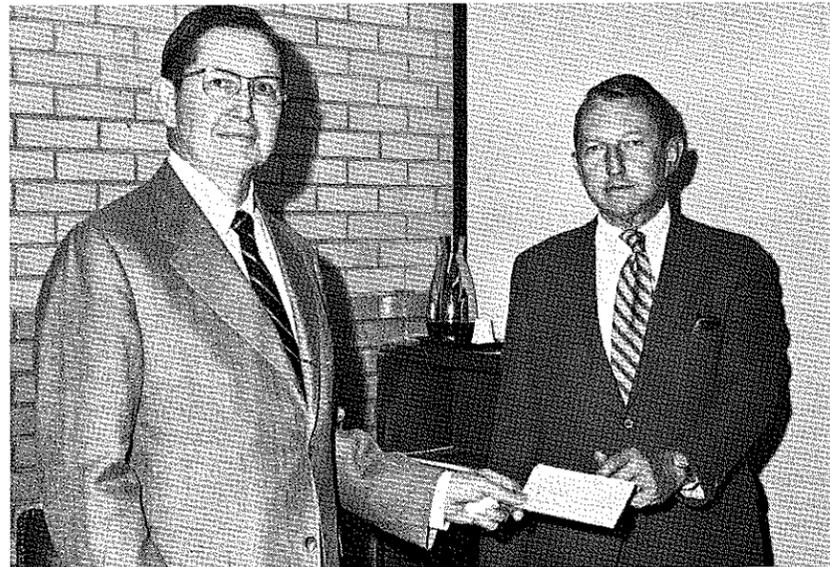
Colorado School of Mines was founded in 1874. The school through a continuing appraisal of the world's accelerating material progress, population growth, and social and cultural changes, has emerged as the nation's leading institute devoted to mineral-resource education.

Bachelor, Master and Doctorate degrees are offered through CSM's nine major departments involving chemical and petroleum refining engineering, chemistry, geology, geophysical engineering, mathematics, metallurgical engineering, mining engineering, petroleum engineering, and physics. In addition, a masters program has been developed within the newest department of mineral-economics.

Mobil Foundation Grant for Geology

Dr. Harry C. Kent, head of Colorado School of Mines Geology Department, has announced the grant of \$750 to the department from the Mobil Foundation Incorporated. The grant was awarded through the request of the Mobil Producing Scholarship and Fellowship Committee, and is unrestricted for use during the 1970-71 academic year.

The award is in accordance with Mobil's practice of making departmental grants rather than scholarships for students. Mobil feels that the faculty is in the best position to determine the most effective use of the funds. Therefore the grant will be allocated for charitable, educational or scientific purposes.



IBM GIVES CSM \$2,000 UNRESTRICTED GRANT. Dr. Guy T. McBride, Jr., (left), CSM president, accepts a \$2,000 check from Jim Dyer, sales representative of IBM Corp. The check was donated under IBM's program of continuing professional education, where supplementation of CSM's course costs are covered, in appreciation for the courses received from CSM by IBM employees.

International Day on Campus

INTERNATIONAL DAY festivities, based upon the theme "Toward Better Understanding" were held Saturday, Oct. 24, on the Colorado School of Mines campus. All activities open to the public were held within the Ben H. Parker Student Center and Berthoud Hall, each located at 16th and Maple Streets in Golden.

The exhibits opened at 10:00 a.m. and represented several parts of our world including, the Arab countries, Hong Kong, India, Japan, Latin America, Sweden, Israel and others.

Numerous other activities during the day supplemented the exhibits: beginning at 12:30 p.m. color movies of Colombia, Hong Kong, France, Germany, and other foreign countries were shown continuously in Room 154 of Berthoud Hall. The afternoon program began at 2 p.m. with opening remarks by David V. Dunklee, state chairman of the United Nations Week Committee of Colorado, and the reading of the United Nations Proclamation by CSM Prof. William J. Chaptis. The afternoon program continued with the crowning of the International Day Queen, Latin American and Japanese folk dances, and a Taekwondo (Karate) exhibit.

Starting at 3 p.m. a fashion show of international attire began followed by the Fantasia Mexicana dancers and prizes awarded to the best exhibits and fashions.

All of the program committee members and faculty sponsors were recognized along with honored guests at the Annual International Day Dinner Dance at the Applewood Inn. This

year's faculty sponsors were Dr. and Mrs. Austin Brown, Dr. and Mrs. Robert Carpenter, and Dr. and Mrs. Thomas Wildman. Special guests were Dr. and Mrs. Frank M. Lawson, a visiting professor from Australia, and Dr. Miloje Ilic, a visiting professor from Yugoslavia.

The dinner dance began at 6:30 p.m., at the Applewood Inn located at 14001 West 32nd Ave. Dr. Ved Nanda, professor of International Law at the University of Denver, was the dinner speaker. Starting at 9 p.m. the semi-formal dance began with music furnished by the Applewood trio.

During the intermission a presentation of gifts and thanks was expressed by Takashi Ohya, president of the International Council, to the participating members of this year's program committee. Members honored were Alfred P. Wu, general chairman from Hong Kong; Takashi Ohya, president from Japan; Nayan Lavingia, vice president from India; Sung, Szu-Ming, secretary from Hong Kong; Douglas Brown, treasurer from the United States; and Alfonso Ballon, social chairman from Peru.

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Phillips Grant Made to Mines

A \$1,500 grant from the Professional Development Fund of the Phillips Petroleum Co. was received recently by Dr. Truman H. Kuhn, vice president of Administrative Affairs, and will be allocated to the following CSM departments on campus; Chemical and Petroleum Refining Engineering, Petroleum Engineering, Geology, Geophysics, Mathematics, and Physics.

The Phillips fund supports and encourages professional growth and development of students and faculty in engineering, the physical sciences, business administration and related fields of study that are of critical importance to the petroleum and petrochemical industries.

Presentation of the grant, for the 1970-71 academic year, was made by James P. Jones, director of Phillips' Recruitment and Placement Employee Relations Dept.

Oredigger Football Team Loses Games Sets New Records

CSM lost its first game to Montana Tech 26-21 following a solid lead through the game until the fourth quarter and a Tech TD broke the 21-19 CSM Oredigger lead. The second non-conference game against the University of Northern Colorado at Greeley left the Miners 0-2 for the season, but not until the UNC Bears' broke a CSM 28-21 lead in the third quarter. Mines fell in the UNC game 68-34.

CSM has dropped games to Montana Tech (21-26), University of Northern Colorado (34-68), Westminster College (38-52), and Southern Utah State (10-45). Southern Utah has losses to University of Nevada, Las Vegas, and California State, Fullerton. Southern Utah's only win came against Western State in their first conference game of the season. Southern Utah overcame Western State 24-14 while the Orediggers fell to Westminster 52-38.

Although the Orediggers have not been able to win a game, they continue to set new school records.

Against Westminster, Mike Colodi broke the following team records: most receptions in one game (10), most points in one game (18), most touchdowns in one game (3), and most yards on receptions (310). Dennis Ulrich, senior quarterback, set a new record for the total offensive yards in one game (400). Mines broke one more record for the most passing yards in one game (383).

AR Foundation Donates \$6,000

A CHECK for \$6,000 from the Atlantic Richfield Foundation for the 1970-71 academic year was received recently by the Colorado School of Mines.

This grant will be divided among four of CSM's 11 departments as follows: Geophysics \$1,000; Petroleum Engineering \$2,000; Mining Engineering \$1,000; and Chemical and Petroleum Refining Engineering \$2,000.

1970 Registration Up by 3.4 Percent

COLORADO School of Mines registration for 1970 has increased over-all by 3.4 per cent from 1,670 students in 1969 to 1,727 students for the 1970 academic year.

This year CSM has a total of 365 seniors, 261 juniors, 305 sophomores, and 375 freshmen for a total of 1,306 compared with 1,317 for 1969.

The major increase in enrollment is within the graduate school. There is a 28.9 per cent increase in full-time graduate students from 197 in 1969 to 254 this year; and a 16.5 per cent increase in part-time graduate students from 127 in 1969 to 148 for the academic year.

The major decrease was 34.4 per cent which occurred with the registered part-time undergraduate students. A decrease of 10 students resulted from 29 in 1969 to 19 for this year.

Harry McNeill Scholarship

STEARNS-ROGER Corp. granted for the second year to Colorado School of Mines student Walter F. Malone, III, the "Harry L. McNeill Scholarship" for the 1970-71 academic year. The continuation of this \$1,000 scholarship was announced by Donald Provost, president of Stearns-Roger, and was presented to CSM President Guy T. McBride, Jr., by Larry Fisher, advertising director of the Denver based firm.

Malone, is the son of Mr. and Mrs. Walter F. Malone, 228 North 10th, Montebello, Calif. An active student of the CSM Metallurgy Department, Malone is now in his second year of study.

Harry L. McNeill is a 1924 graduate of the Colorado School of Mines, winner of a Distinguished Achievement Medal awarded by CSM in 1961, and is presently executive vice president of Stearns-Roger Corp.



LARRY FISHER, advertising director for Stearns-Roger Corp. (left) presents to Dr. Guy T. McBride, Jr., CSM president, a scholarship check for \$1,000 to be offered for the second year through CSM as the "Harry L. McNeill Scholarship."

Choquette Awarded \$750 Scholarship

STEFAN P. CHOQUETTE, a senior at the Colorado School of Mines majoring in Petroleum Engineering, has been awarded a \$750 scholarship from Petroleum Equipment Suppliers Assn. Choquette, whose home is in Denver, Colo., was one of three PESA National Scholarship winners announced for 1970-71.

The three winners were selected from outstanding petroleum engineering students throughout the nation. The other winners are students at Texas A & I and the Montana College of Mineral Science and Technology.

Choquette maintains a 3.58 grade average, is chairman of the college Homecoming Parade Committee and College Union Advisory Board. He serves as secretary of Scabbard and Blade and is president of the campus chapter of the Society of Petroleum Engineers.

Winners are selected on the basis of scholarship, participation in extracurricular activities and financial need. The selection committee is made up of PESA members, members of SPE and the dean of a school of petroleum engineering.

Albert C. Harding, '37

Partner, Black Hills Bentonite Co.

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From the Local Sections

Section news should be in the Alumni Office by the 20th of the Month preceding Publication.

SECTION	PRESIDENT	VICE-PRESIDENT	SECRETARY-TREASURER	TIME AND PLACE OF MEETING
Alabama Birmingham			Wm. Haynes, '54	On call of the president.
Alaska Anchorage			Ken Clodfelter, '51 2402 E. 49th Ave. Anchorage, Alaska 99502	
Arizona Arizona	Guerdon E. Jackson, '52	W. E. Saegart, '53	James D. Sell, '55 2762 W. Holladay St. Tucson, Ariz. 85706	Annual Meeting, Dec. 7, 1970, Western Motel, Tucson.
California Bay Cities	Carl Foget, '61	Dave Strandburg, '61	Tom Aude, '62 54 Woodford Drive Moraga, Calif. 94556	Meetings held on call of the Secretary.
Santa Clara Valley Sacramento	Gall Penfield, '56		Stanley Y. Ogawa, '53	
San Joaquin Valley Southern California	R. A. Ganong, '47 Bob Snyder, '67	Marsh Chapman, '38	F. B. Sweeney, '57 6619 Auburn Blvd., Citrus Heights	Nikolas Restaurant, 1449 W. Sunset, Los Angeles, 2nd Thursday of each month.
Colorado Denver	A. E. "Ted" Seep, Jr., '68	Hal Kellogg, '55	B. A. Ellison, '61	Luncheon meeting held third Tuesday of each month, Denver Press Club, 1330 Glenarm Pl.
Grand Junction	Robert F. Barney, '35	Roy C. Kirkman, '66	Robert P. Moston, '58 1359 Bunting Ave.	
District of Columbia Washington	A. A. Wyner, '25	Louis DeGoes, '41	Hal Cronin, '26 106 Buxton Dr. Falls Church, Va. 22040	Regular meeting at noon, second Tuesday of each month at the Shrine Temple, 1315 K St. N.W.
Illinois Great Lakes	C. R. Fitch, '49 7915 Exchange Ave. Chicago 17, Ill.		James Daniels, '51 307 Schweitzer Bldg., Wichita, Kans. AM 5-0614.	Meetings called by secretary. Contact secretary for date of next meeting.
Kansas Wichita	Francis Page, '39		Monte Richard, '60 Pan American Petr. Corp. P.O. Box 50879 New Orleans, La. 70150	Regular luncheon meetings — last Wednesday of the odd-numbered month except July.
Louisiana New Orleans	Charles Tyler, '53	Joseph L. DuBois, '50	Stephen D. Chesebro, '64 P. O. Box 51345 Lafayette, La. 70501.	Regular luncheon meetings at Lafayette Petroleum Club on fourth Thursday of each month.
Lafayette	John J. Wallace, '51	Edward J. Gibbon, '68		
Minnesota Iron Ore Range	Paul Shanklin, '49		E. W. Markwardt, '32 104 E. Monroe St. O'Fallon, Ill. 62269	
Missouri St. Louis			James H. Bright, '52 1450 E. 2nd St. Reno, Nev. 89502	Meetings held four times per year at call of the Secretary.
Montana Butte	John M. Suttle, '42 Continental Dr, Butte	H. R. Fitzpatrick, '36	N. E. Maxwell, Jr., '41 405 S. Church St. Aztec, N.M. 87410	Special meeting at the call of the president.
Nevada Northern Nevada	Paul V. Fillo, '40		E. T. Benson, '33 1175 Broadway, New York, N. Y.	Meetings on call every month or six weeks from September to May, usually at Uptown Mining Club, 49th and Park Ave.
New Mexico Carlsbad	John Magraw, '53	Al Loleit, '50	Raymond M. Schatz, '35 Battelle Memorial Institute Columbus	Meetings held on call of president.
Four Corners	Lou Amick, '50		Robert Feige, '66 9 WW—Frank Phillips Bldg.	Regular meetings held every Tuesday at noon, YWCA, 411 S. Johnston St. Regular meeting held at call of the president.
New York New York	Robt. B. Kennedy, '38	Board of Governors: Ralph Hennebach, '41 C. D. Michaelson, '32 C. Bellin, '34 R. B. Kennedy, '38	Jerry McLeod, '57 1708 East 60th Pl. Tulsa, Okla. 74105	Meetings held at call of the president.
Ohio Central Ohio	Harold M. Knudsen, '59	Theodore Solim, '53	Wendell Cloepfil, '62	On call of the president.
Cleveland	Bill Frederick, '56	Charles Strong, '58	David P. Rihl, '58 Dravo Corp., Pittsburgh and Terrace Rd., Carnegie, Pa. 15106	Meetings held first Wednesday of each month (noon), Cafe "B," Golden Triangle YMCA, 4th and Wood Sts., Pittsburgh.
Oklahoma Bartlesville	Ed Johnson, '49 844 First Nat'l Bldg.		Irwin M. Glasser, '43 Humble Oil & Regining Co. Corpus Christi, Tex. 78401	Luncheon Meeting — First Wednesday of each month at the Petroleum Club.
Oklahoma City	Todd C. Storer, '47		L. G. Truby, '48 4320 O'Keefe Dr. El Paso, Texas 79902	Meetings held on last Wednesday of January, March and May. Special meetings on call.
Tulsa	Michael DiLembo, '58	D. H. Griswold, '30		Luncheon meetings held at 12 noon on first Thursday of each month at White Horse Cellar, 1211 Fannin St.
Oregon Lower Columbia River Basin	Samuel Hochberger, '48	Arthur Most, Jr., '38 1345 Woodland Cr., Bethlehem		
Pennsylvania Eastern Pennsylvania	Vincent G. Gioia, '56	Charles R. Russell, '54		
Pennsylvania-Ohio	Ray Gouett, '52	William F. Dukes, '50		
Texas Coastal Bend	Peter A. DeSantis, '51	Edward B. Reynolds, '66		
El Paso	Ronald E. Diederich, '57			
Houston				

84 Attend CSM Alumni Breakfast During AMC Convention in Denver

THE Annual American Mining Congress Convention was held in Denver Sept. 29-30, 1970. On Tuesday, Sept. 29, the traditional Mines Breakfast was held at the Denver Hilton Hotel. More than 84 Alumni and guests attended, but it seems in reviewing the list of names that only 77 were recorded. If your name was missed, we are sorry and would be pleased to include it as a separate item.

For my own point of view, the difficulty with these breakfasts is the mechanical problem of getting everybody seated and having them properly served. As a result I fail to see many of those people that I would like to have seen. After reviewing the list this time, the number seems to be larger than usual.

It is only with the support of the Mines Alumni that we can continue the traditional Mines breakfast at the Society of Mining Engineers Convention as well as at the American Mining Congress.

Those who attended the breakfast were privileged to hear Dr. Guy T. McBride, Jr., president of the Colorado School of Mines, stress a few of his ideas that have developed in the short period since he has been on the campus.



MORE THAN 84 ALUMNI AND GUESTS attended the tradition Mines Breakfast held Sept. 29 during the American Mining Congress Convention at the Denver Hilton.

Those attending the breakfast were:

Warren Prosser	CLASS '07	Albert M. Keenan	CLASS '35
Kenneth H. Matheson	CLASS '11	Glen T. Horlbeck, Jack McK Pardee, George and Frances Wunder.	CLASS '36
Norma and Doleta Whitmore	CLASS '26	Albert C. Harding, W. D. Jeffries.	CLASS '37
C.E. Fertig	CLASS '34	William Anderson, Robert W. Brown, Bill Sparr.	CLASS '39
C.W. Gustafson, Bob Sayre, Dave Squibb		Charles S. Burris	CLASS '40

(Continued on Page 50)

SECTION	PRESIDENT	VICE-PRESIDENT	SECRETARY-TREASURER	TIME AND PLACE OF MEETING
Permian Basin	Hal Ballew, '51	Harry B. Hinkle, '59	Al Wynn, '65 4313 Princeton, Midland, Tex. 79701	Meetings held in Jan., Mar., May, Sept., and Dec.
Dallas-Ft. Worth	Harold E. Potter, '27	Dewey D. Bowling, '49	Peter A. MacQueen, '50 P.O. Box 2050 Ft. Worth, Texas 76101	Meeting held on call of president.
South Texas			William A. Conley, '19 1515 Haskins Rd. San Antonio	Meetings held at 7 p.m. on first Thursday of February, May August, November at Old Town Inn, 416 8th St., San Antonio.
Utah Four Corners Salt Lake City	See N.M. for officers John Weber, '66		Gregory H. Hoyl, '68 1356 Kennecott Bldg. Salt Lake City, Utah 84111	Four meetings annually on dates set by officers.
Washington Pacific Northwest	Richard O. Barnes, '55		Robert R. Cederstrom, '60 11011 N.E. 9th St. Bellevue, Wash. 98004	
Eastern Washington			Arden Bement, '54	Meetings on call of president.
Wyoming Central Wyoming			George S. Rogers, '59 3209 Aspen Drive Casper, Wyo. 82601	
Canada Calgary	Richard C. Siegfried, '50 Canadian Superior Oil Ltd. 703 6th Ave., Calgary Tel.: 267-4110 Local 429			Calgary Section meets for a noon luncheon on the 3rd Monday of Sept., Nov., Jan., Mar., May—at Calgary Petroleum Club. Visiting alumni invited to attend.
France	Resident or visiting alumni may contact Bernard Turpin, '60, 33 Rue de la Tourelle, 92-Boulogne, France.			
Libya	R. E. Palmer, '61, Corresponding Secretary, c/o American Overseas Petroleum, P. O. Box 693, Tripoli, Libya.			
Peru	Martín Obradovic, '53			Meetings first Friday of each month (April thru December), 12:30 p.m., Hotel Crillon. Other meetings on call
Philippines Baguio	Francisco Joaquin, '26			
Manila	J. R. Kuykendall, 41	Jesus Jalondoni, '40	M. E. Natividad, '40 c/o Northern Motors United Nations Ave., Manila	Meetings held at noon, second Tuesday of each month.
Puerto Rico	Resident or visiting alumni may contact L. L. Hagemann, '60, Apt. 17, El Monte Apartments, Avenida Munoz Rivera, Hato Rey, Puerto Rico.			
Turkey Ankara	Alumni visiting Turkey contact Ferhan Sanlav, '49, Turkiye Petrolleri A. O. Sakarya Caddesi 24, Ankara, Telephone 23144.			
Venezuela Caracas	Z. Saucovic, '57	Jean Pasquall, '60	Ian Achong, '58 Cla. Shell de Venezuela Aptdo. 809, Caracas	

(Continued from Page 49)

CLASS '41
Robert P. Comstock, Ralph Henneback, E. J. Mayhew, Walter L. Patty.
CLASS '42
Harold Harrah, George A. Kiersch, Lee Scott.
CLASS '43
Ralph K. Foster, Bob Greider, Eugene F. Klein, Robert E. Lintner.
CLASS '46
A.H. Patten
CLASS '47
Dick Nelson, Frank Seeton.
CLASS '48
Ken Nickerson, John Howbert, James Quinn, Dick Stewart, Lee Travis.
CLASS '49
Joe T. and Martha Robison, H. J. McGarr
CLASS '50
Bill Bessinger
CLASS '51
Ralph Scott
CLASS '52
David R. Cole, W.H. Johnson, Clem Lehnertz, Stu Merwin, Mr. and Mrs. Ira McKeever, Jim Ogg, Eugene D. Smith, Bob Turley, Tom Young.
CLASS '53
J. Paul Bingel, Kelsey Boltz, John L. Neff, James Shore.

CLASS '54
Bill Baumann, Neal Harr, Stewart Towle.
CLASS '57
Robert W. Dalton
CLASS '58
Don Rathburn
CLASS '59
Jim Link, Jim Swaisgood.
CLASS '61
William A. Price, Gordon H. Van Sickle.
CLASS '62
Tom Augustine
CLASS '63
Dan McFadden, Dyke Howell, John W. Peters, Joe Stano.
CLASS '64
Frank Buturia
GUESTS
Dr. James Boyd '32, Dr. A. W. Schlechten, James W. Wilcock, Dr. Guy T. McBride, Jr., Humbert Cozza, Dr. Truman H. Kuhn, F. J. Grlesemer, James E. Quinn '48, Jack Zwanien.

Houston Section Meeting

Prior to the short notice from this office, Ray Kerr was able to gather nine of the stalwart miners for a small dinner meeting in Houston on the evening of Sept. 23. The group was small enough to resemble a good old-style bull session rather than a formal meeting. I am sure that those who were there enjoyed the meeting, and it is hoped that we may have more of this kind. Attending the meet-

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EXPLORATION STRUCTURES

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Auto-Tronix Universal Co.
Fred Nagel, '40
Robert McPhee, '42
Consulting Engineers
Computer Systems/Programming
444 Sherman Street
Denver, Colo. 80203
Phone: 744-3381

Edward J. Johnson, '49
Petroleum Geology
Room 300
3535 N.W. 58th Street
943-8536, Office; 721-5353, Home
Oklahoma City, Okla.

Edward P. Jucevic, '60
Consulting Mining and Metallurgical Engineer
Mining Investment Evaluation
Mineral Exploration — Mill Design
P. O. Box 8077, University Station
Reno, Nevada 89507
702-322-7765

ing were Ray Kerr '36, Bob Everett '43, Wm. E. "Bill" Strain '38, Frank R. Moulton, Jr. '51, W. Bruce Barbour '37, Jim Ballard '25, Bill Burpeau '53, Ron Diederich '57, Ed Reynolds '66.

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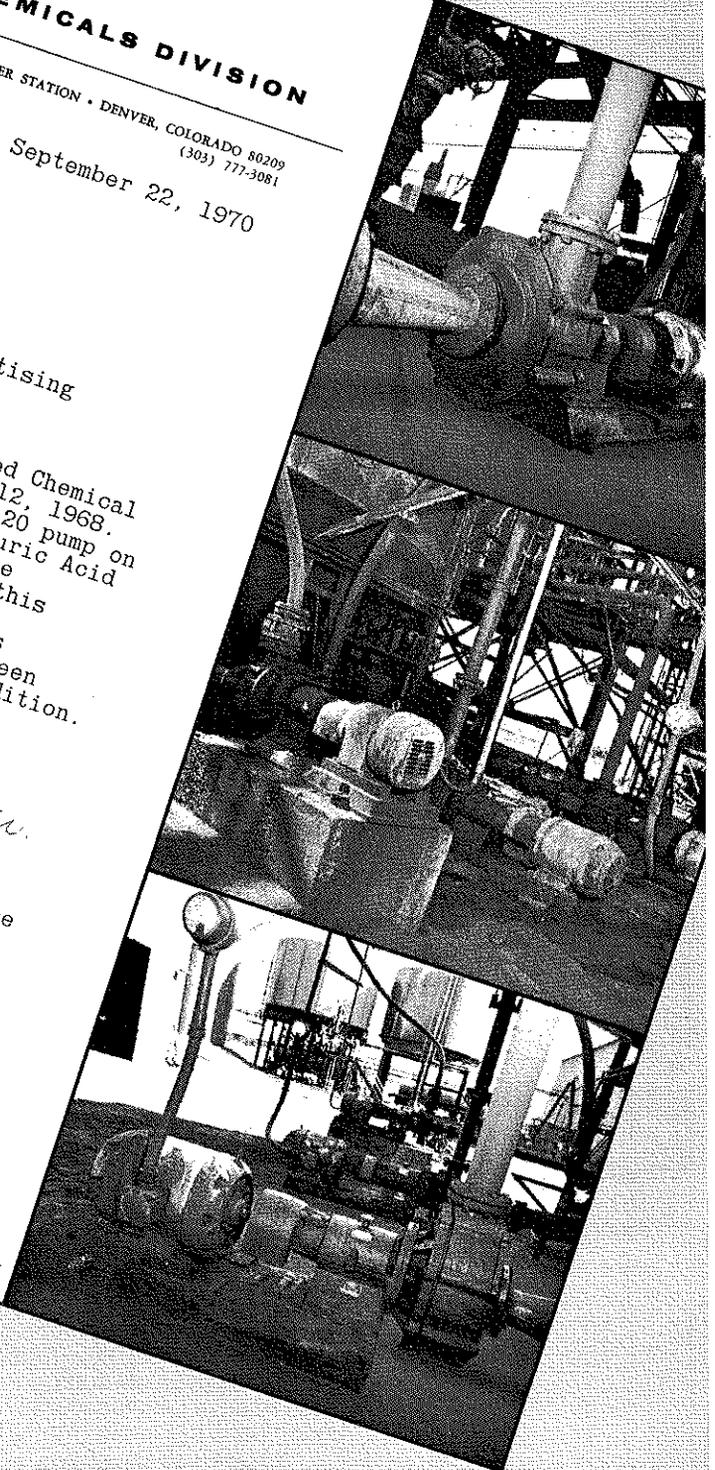
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