

THE MINES

MAGAZINE

AROUND THE WORLD
THE MINES



Featuring—

“MINES” HOMECOMING, 1950

HIGHLIGHTS OF MINING IN COLORADO

**GEOCHEMICAL RECONNAISSANCE—SAMPLING
FOR COPPER, LEAD AND ZINC**

SUCCESS PRINCIPLE

FLOTATION AND CYANIDATION TESTS

NOVEMBER • 1950

VOLUME XL

NO. 11

Professional . . .

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5031 Laurelcrest Lane
Seattle 5 Washington

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Aptitude Testing—Sales Training
Executives Selection & Training Institute
956 Maccabee Bldg. Detroit 2, Mich.

Byron B. Boatright, '22
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Capital National Bank Building
Austin, Texas

Warren T. Bostwick, Ex-'31
Lease Broker
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1264 Elizabeth St. Phone: EAst 1636
Denver 6, Colorado

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President
San Joaquin Drilling Company, Inc.
417 S. Hill St. Los Angeles, Calif

Will H. Coghill, '03
No Consultations
145 W. Lincoln Ave. Delaware, Ohio

Ralph D. Curtis, '26
Production Manager
C. H. Murphy & Co.
1st Nat'l Bank Bldg. El Dorado, Ark.

E. E. Dawson, '38
Manager, Foreign Operations
Brown Drilling Company
Long Beach California

Earlougher Engineering
Petroleum Consultants—Core Analysis
319 E. Fourth St. Tulsa 3, Okla
R. C. Earlougher, '36, Registered Engineer

Albert C. Harding, '37
General Manager
Black Hills Bentonite, Inc.
Moorcroft Wyoming

Thomas S. Harrison, '08
Consulting Oil Geologist
1104 First National Bank Bldg.
Denver, Colorado

Letters . . .

TRANSFERRED TO NEVADA

From W. L. BURNHAM, '41, Box 664, Elko, Nevada.
Would you please change the address on my copies of *Mines Magazine* to that given above.
I've been transferred by Standard Oil of California to their Great Basin District.

There has been quite a bit of geological activity in this area and there are a number of *Miners* around. Darn near enough for an alumni group!

CHANGING FROM ENGINEERING TO RETAIL BUSINESS

From ROBERT J. MCGOVERN, '49, 141 Argyle, Pueblo, Colorado.
I would like to change my mailing address to that given above until a more permanent one is established.
I am giving up my engineering profession to enter the "drug retail" business with a well established firm in Pueblo.
Please keep my copies of the magazine coming through because I enjoy getting news from the "old Alumnus."

TWO INTERESTING NEWS ITEMS

From CHARLES L. WILSON, '44, 1306 Lyndale Ave., Austin, Minn.
I have been so busy the last two months looking for Minnesota's three days of summer that I have neglected to tell you that our second son, Scott William Wilson, was born August 3rd. If hell, high water or the Communists don't kill him off, he should be at *Mines* in 18 years.

I might also mention that my brother, Jim Wilson, Ex-'45, was married September 1st to Miss Sally Jones of Austin.

You are doing a fine job on the magazine—I really like to see it pop up in the mailbox every month.

GREETINGS TO THE MINERS

From GEORGE H. MACGREGOR, '97, Terrebonne, Oregon.
It is a long time since we met and it is about time that I drop you a line.
Some of the older boys may ask about me so tell them I am about washed up. Have gone on crutches or the like for about six years. Main cause was the electric shock I received at the time my father was killed, the summer of '96. It shattered my left hip and I've been getting worse the older I get.

Also my wife has been in a wheel chair for over a year, the result of a car accident.

Best regards to all the boys.

HAS BEEN KEPT BUSY

From ROBERT F. HERNDON, '27, 3337 Douglas Road, Apt. 4, Toledo 13, Ohio.
Please accept my humble apology for not sending in my dues long before now. Gulf moved me from Harlan, Kentucky, to their Toledo Division office as staff engineer this spring—learning my new job, house hunting, and other misfortunes have kept me plenty busy.

Would appreciate your sending this on to the mailing department of *Mines Magazine* so they will have my correct address.

My check is enclosed and I hope you will feel it is better late than never.

CHANGES POSITION

From KENNETH R. BOWIE, '30, Union Sulphur & Oil Company, 663 Gulf Building, Houston, Texas.

As you will probably gather from above change of address I have resigned from Shell Oil Company and am now employed by Union Sulphur & Oil Company as assistant production superintendent.

My offices and headquarters will be here in Houston, but I shall have supervision of all production in the state of Texas.

I made the change effective Oct. 1, 1950, and am very enthused about it. I shall still maintain my newly acquired home here in Houston.

ENJOYS HIS NEW WORK

From EDWARD W. LUTHY, '50, Box 181, Gilman, Colorado.
A few lines to thank you once again for the job you so well recommended me. We have been at Gilman for a month now and I have found the work, as well as the people I work with, very pleasing.

We are on a six-day week which makes it impossible to drive into Denver but if ever the opportunity offers itself we'll be dropping in on you.

With the winter coming on I'll be glad to get my copies of *Mines Magazine* since I expect to be snowed in most of the time and will find the magazine the best way to keep in touch with the happenings at *Mines*.

ANNOUNCES SON'S ARRIVAL

From ALBERT J. QUINLIYAN, JR., '49, 2901 East 14th Ave., Denver, Colo.
I hope you can excuse my negligence in not notifying you immediately of my latest change of address; this is given above.

The one main item which has caused me to be so careless in attending to things is the recent arrival of my first son, David Charles. My wife and I naturally, feel we can justly be proud and I want all interested alumni to know of his arrival on June 14, even at this late date.

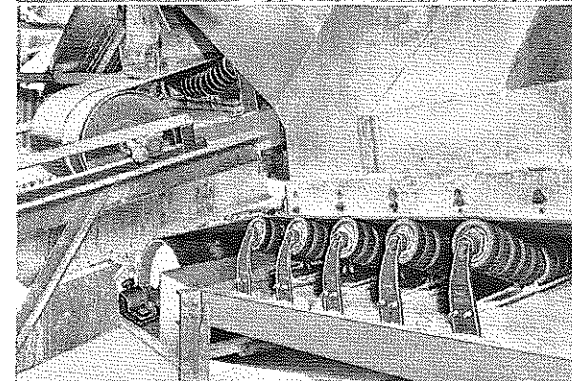
Enclosed is the card giving corrections for *Mines Alumni Directory* and Year Book.

(Continued on page 45)

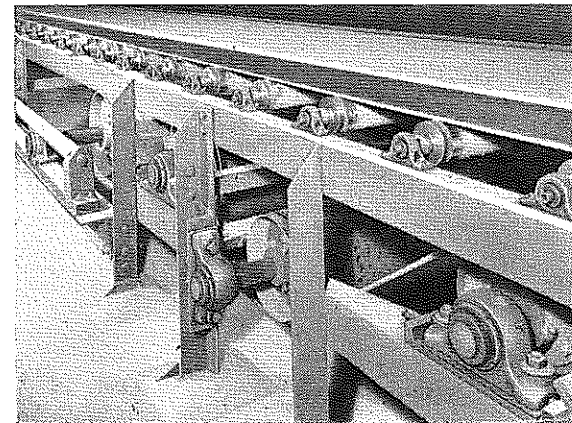


LINK-BELT
Belt Conveyors
Fit the Job

A section of a 30" wide Link-Belt roller-bearing belt conveyor handling 500 tons of gypsum rock an hour, showing standard Link-Belt troughed idlers. In the foreground is one of the Link-Belt belt training idlers that prevent damage to the belt from misalignment due to off-center loading, stretch, or improper splicing.



Junction of two Link-Belt roller-bearing belt conveyors showing Link-Belt welded-steel foot pulleys and the rubber-tread impact idlers that absorb the shock of falling material, protecting the idlers and preserving the belt.



Link-Belt standard ball- and roller-bearing pillow blocks and takeups used throughout the flat belt conveyor system which carries wall board.

For materials conveying, whether the problem is tonnage, distance, or a combination of both for any of an almost endless variety of materials, heavy or light, ranging in size from large lumps to fines, for continuous or intermittent operation, it is a Link-Belt job.

Link-Belt designs the belt conveyor system to meet your requirements, builds the various elements, assemblies, supporting structures and enclosures, and installs the job complete. With Link-Belt, experience puts the right equipment in the right place for the specific application and service. Every detail is given the proper attention for trouble-free performance, efficiency, and endurance.

It will pay you to put your materials handling problems up to Link-Belt. Ask our nearest office.

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Johannesburg. Offices in Principal Cities.

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BELT CONVEYOR EQUIPMENT
IDLERS • TRIPPERS • BELTS • PULLEYS
BEARINGS • DRIVES

TECHNICAL MEN WANTED

Those interested in any of the positions listed may make application through "Mines" Capability Exchange, 734 Cooper Building, Denver 2, Colorado.

(841) INSURANCE SALESMEN. An old established life insurance company offers excellent opportunities for inexperienced and experienced salesmen. The type of men wanted should be capable of earning several thousand dollars per year.

(1171) MILL FOREMAN. A South American mining company has a position open for a graduate metallurgist as Mill Foreman. Applicant must have had experience in the operation of flotation and concentration equipment. Must have a good working knowledge of Spanish and be able to successfully handle South American employees. Must report single status for six months. Salary open with liberal vacation allowance and free living quarters. Bonus to the right man.

(1176) METALLURGIST. An aircraft manufacturer has position open for metallurgical graduate with education and experience covering metallurgical testing of ferrous and non-ferrous metals as well as physical processing, heat treatment, welding practices and ability to coordinate these practices with the application of metals for manufacturing. Salary open.

(1188) DRAFTSMAN & DESIGNING ENGINEER. Well known consulting engineering organization located in the middle-west has a position open for designing engineer who has had extensive experience with the cement industry. Should have had from 5 to 10 years experience of which 3 to 4 years have been drafting and designing. Probable salary, \$400 to \$500 per month.

(1199) PETROLEUM ENGINEER. A company operating in a southern state has position open for Petroleum Engineer 30 to 40 years of age with experience in natural gas transmission and distribution. Will be necessary to travel approximately 50% of the time. Salary open.

(1200) MINING ENGINEER. Company operating in South America has position open for assistant to Mining Superintendent. Man must have had a few years mining experience, be able to stand high altitudes and report single status. Three year contract. Probable salary, \$400 to \$500 per month.

(1215) MINE FOREMAN. A South American mining company has position open for Mine Foreman who has had several years experience in metal mining and is a college graduate. Must have working knowledge of Spanish and be either single or willing to go single status for at least six months. Three year contract. Starting salary, \$4200 per year plus a bonus of one month salary for each year. Four weeks vacation. Free living quarters.

(1216) MILL SUPERINTENDENT. A well known mining company in South America has position open for Mill Superintendent with several years experience in milling operation. Latin American background is essential. Three year contract with housing provided. Approximate starting salary, \$5000 per year.

(1225) ENGINEER AND PHYSICIST. A shipyard has position open for an Engineer and Physicist with experience in the control of sound and vibration. Must be able to develop new techniques for reducing and controlling these elements. Probable starting salary, \$5400 per annum.

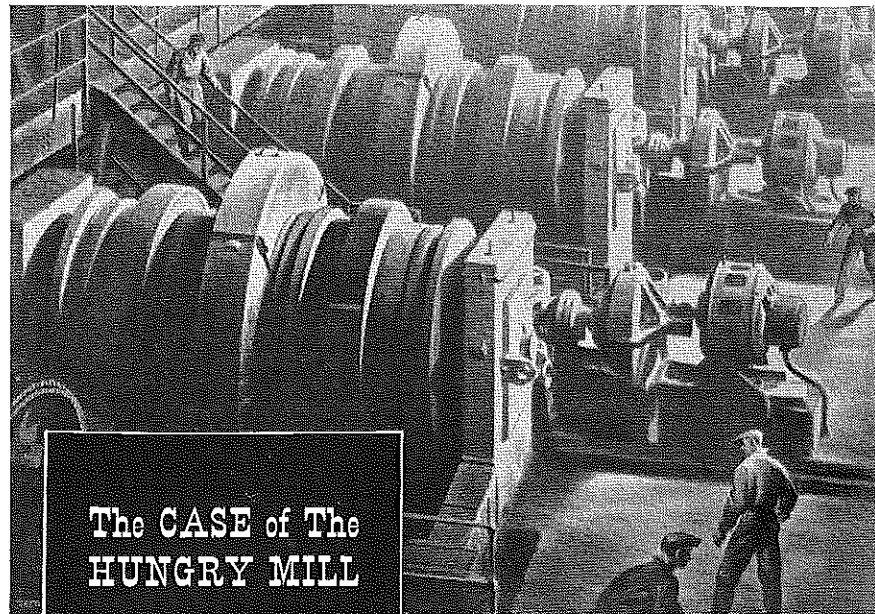
(1228) METALLURGIST. Foreign company has position open for a young Metallurgist with some actual experience in ore beneficiation. Natural aptitude for research important. Salary open.

(1239) SEISMOGRAPH PARTY CHIEF. A well known geophysical company has position open for Party Chief in connection with geophysical work in Canada. Applicant should have at least two years experience as Party Chief in seismic field work. Single man preferred. Starting salary \$600 to \$750 per month, depending upon experience and ability. Good chances for advancement within six months.

(1243) CONCENTRATOR MILL FOREMAN. A copper mining company with 1500 ton milling plant has position open for mill foreman with experience in the flotation of copper ores. Living and climatic conditions are good. Salary open depending upon experience and ability of applicant.

(1244) SMELTER FOREMAN. A foreign operated copper smelter has position open for a smelter foreman, with experience in smelting flotation concentrates in reverberatory furnace with pulverized coal as fuel. Must have had experience with horizontal copper converters and copper casting machine. Good living and housing conditions. Salary open depending upon experience and ability of applicant.

(1257) JUNIOR MINING ENGINEER. One of the large coal mining companies has position open for a young mining engineer as trainee for engineering and operation in one of their coal mines. Salary open.



The CASE of The HUNGRY MILL

Two grinding mills running side by side... one accepting only moderate amounts of ore but always overfull, never turning out the tonnage expected of it. The second mill, grinding ravenously, always delivering well over its capacity rating. The size was the same, construction made the difference.

Conventional trunnion overflow mills run nearly half full at normal speeds, with a balanced load condition which uses only part of the power made available by the driving motor. MARCY Low Pulp Line mills have a higher rate of discharge, use a

much thicker pulp. Grinding medium, coated with thick pulp, delivers a full impact drop with faster reduction. The load in a MARCY is never balanced, always uses the full torque of the driving motor.

In the case quoted here, the second mill, a MARCY, paid off in 29.6% faster grinding and proportionately lower costs per square foot of floor space. This is a true story taken from records of operating milling plants. Ask us to give you complete facts on MARCY grinding under your conditions. Our engineers can show you how MARCY mills will save you money in many ways. Write for our free engineering services.

OTHER PRODUCTS

Masoco Fahrwald Flotation Machines; Masoco-McCarthy Hot Millers; Rock Bit Grinders, Density Controllers; Belt Feeders; Pinch Valves; Assay and Laboratory Supplies and Equipment; Complete Milling Plants.



Main Office: DENVER, COLORADO, U.S.A.; El Paso; Salt Lake City; 1775 Broadway, New York, N. Y.; Canadian Vickers, Ltd., Montreal; W. R. Judson, Santiago and Lima; The Edward J. Nell Co., Manila, P. I.; The Ore & Chemical Corp., 80 Broad St., New York 4, N. Y., Representatives for Continental Europe.

THE Mine & Smelter SUPPLY COMPANY

(1259) MINING ENGINEER. An eastern manufacturing company has position open in the ore buying department of their organization, which is engaged in the furnishing of raw materials for the company. Applicant should have knowledge of metals and ores of columbium, tantalum, cobalt, tungsten, nickel and others. Salary open.

(1261) JUNIOR MINING ENGINEER. A western mining company has a position open for Junior Mining Engineer who is qualified to handle surveying, mapping and drafting. Salary open.

(1262) ASSAYER AND CHEMIST. An old established assay office has position open for an assayer and chemist who has had considerable experience in complete analysis of ores and metals. Good opportunity for the right man. Salary will depend upon the experience and ability of the applicant.

(1269) GEOPHYSICISTS. A well known geophysical corporation has positions open for party chiefs, computers, observers, surveyors and others. Good opportunities for men with experience and also recent graduates. Top notch men will be required for every job. Salaries will be in proportion to a man's experience and ability.

(1274) GEOPHYSICAL ENGINEER. A geophysical company with headquarters in Dallas has position open for Computer and Draftsman as trainee on seismograph crew. Man with small amount of previous experience preferred. Salary open.

(1277) PROCESS ENGINEER. A large chemical manufacturing company extending their plant facilities has position open for Process Engineer with at least five years experience in designing, construction, estimating and plant operation. Starting salary \$350 to \$450 per month, depend-

ing upon experience and ability of applicant. Excellent opportunity for advancement. Location in Rocky Mountain Region.

(1279) MILL SUPERINTENDENT. A well known mining company with operations in South America has position, open for metallurgical graduate who has given special attention to ore-dressing and had several years experience in flotation plant operation and testing work. Must have held previous positions of responsibility. Age under 45 years. Should have speaking knowledge of Spanish. Must understand maintenance of mill equipment. Capacity of mill, 1000 tons. Zinc, lead sulphide ores. Married man preferred. Travel expenses paid for man and family. Liberal vacation allowance. Living quarters furnished. Starting salary, \$600 per month, U. S. Currency.

(1290) ELECTRICAL ENGINEER. A large manufacturing company in the East has position open for electrical engineer capable of designing and developing radar systems. Three years experience required in electronics and closely related fields. Salary open.

(1294) GENERAL MINE FOREMAN. A South American mining company has position open for general mine foreman between the ages of 30 and 40 years with underground experience using room and pillar methods. Operations are largely mechanized. Production of 1000 tons daily. Two-year contract. Furnished house available. Probable starting salary, \$450 per month, U. S. Currency.

(1295) MINING GEOPHYSICIST. A mining company with international operations has a position open in their exploration department for

(Continued on page 7)

TECHNICAL MEN WANTED

(Continued from page 6)

a young graduate engineer with University training in Physics and Electronics, who is interested in geophysical field work in connection with mining exploration. Applicant should be between the ages of 25 and 30 years and willing to travel in any part of the world. Salary open.

(1299) ASSAYER & CHEMIST. One of the South American mining companies has position open for assayer and chemist. Applicant must have had experience in fire assaying and wet determinations. Probable starting salary, \$4000 per year plus bonus.

(1304) JR. MINING ENGINEER. One of the large coal mining companies with operations in the western country has positions open for two Jr. Mining Engineers as trainees in the Engineering Department. Salaries open.

(1305) ASSISTANT GEOPHYSICS PROFESSOR. One of the eastern colleges has position open for Assistant Professor in Geophysical Department who has a knowledge of fundamental principles and their relationship to techniques in exploration geophysics. Probable salary, \$400 per month for ten months.

(1306) GEOPHYSICS INSTRUCTOR. A position is open with the Geophysical Department of an eastern college for a man who desires to do graduate work at the same time assisting in laboratory and teaching. Salary, \$120 per month for ten months plus free tuition for graduate work.

(1307) JR. METALLURGIST. A large manufacturing company in Ohio has position open for Jr. Metallurgist in research work. Must be well trained in fundamental principles of Metallurgy, alert and industrious. Probable salary, \$275 per month based on 40-hour week.

(1308) DRAFTSMAN AND DESIGNER. One of the large cement companies has position open in their plant for Draftsman and Designer, and Assistant Plant Engineer. Probable starting salary, \$300 per month.

(1309) JR. GEOLOGICAL ENGINEER. One of the major oil companies has position open for Jr. Geological Engineer for training in geophysical work. Must have good knowledge of mathematics, single and willing to accept foreign employment. Salary open.

(1310) MINING ENGINEER. An eastern coal mining company has position open for Mining Engineer with experience in surface and underground surveying and also in plant design and construction. Salary open.

(1318) JR. CHEMICAL OR METALLURGICAL ENGINEER. A well known industrial company

WHERE AN ACCURATE ASSAY BEGINS

The equipment and supplies used in an assay lab add tremendously to the smoothness of the Assay Operation. Demand the best for your Assay Lab—Demand:



ASSAY FURNACES—GAS, OIL OR ELECTRIC



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CHEMICALS



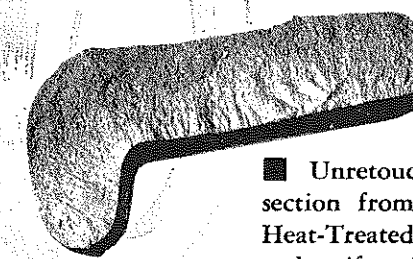
SAMPLERS AND SIEVES



LAB APPARATUS, SUPPLIES AND FURNITURE



Why do Card Wheels resist wear so much longer?



Unretouched photo of rim section from a card Semi-Steel Heat-Treated wheel. Note depth and uniformity of chill in tread and flange.

The job of improving and controlling the metallurgy of Card Wheels never stops. They are close-grained, strong, tough, and excel in wear resistance. Years of cost-cutting service in hundreds of mines prove it!

C.S. Card Iron Works Co.
Denver 1, Colorado

has positions open for Jr. Chemical Engineers or Metallurgists, for trainees in some of their plants. Salaries will depend upon the qualifications of applicants.

(1319) JR. MINING ENGINEER. A company with mining operations in the middle-west has position open for Jr. Mining Engineer as trainee for supervision in production capacity.

(1321) METALLURGIST. A well established smelting and refining company has position open for a Metallurgist capable of handling job as Assistant to General Foreman. Applicant should have had at least 5 years smelter experience or refining experience. Salary open.

(1322) INDUSTRIAL ENGINEER. A well established eastern company has position open for Industrial Engineer 35 to 45 years of age. Must be graduate of recognized engineering college with manufacturing experience in metal working industry as Plant Engineer or Assistant Plant Manager. Salary open, depending upon qualifications of applicant.

(1324) PETROLEUM ENGINEER. One of the large research and development companies has position open for petroleum engineer who has had experience in research and reservoir engineering. Man with good background in reservoir engineering studies and few years field experience required. Salary depends upon experience and ability.

(1325) JR. MINING ENGINEER. One of the government bureaus has position open for an understudy who is interested in securing statistics pertaining to the mineral industries. Probable location in Rocky Mountain Region. Starting salary about \$300 per month.

(1326) JR. CHEMIST. A mining company well established in the western country has position open for Jr. chemist for employment in their assay laboratory. Applicant should have good knowledge of assaying and chemical laboratory methods. Salary open.

(1327) SEISMOLOGIST. One of the major oil companies has position open for seismic interpreter with at least four years previous experience preferably in California or Louisiana. Foreign employment. Single status for 90 days. Salary depends upon the experience and ability of applicant.

(1328) PETROLEUM GEOLOGIST. A well known petroleum company operating in the United States and foreign countries has position open for Assistant Petroleum Geologist in connection with one of their foreign operations. Applicant should be able to report single status and work will consist of directing progress of core drills and interpretation of data to form structural maps. Man with at least two years

(Continued on page 44)

Professional...
CARDS

K. L. Koelker, '14
Consulting Mining Engineer
318 Joplin St. Joplin, Mo.

Jean McCallum, '10
Mining & Metallurgical Engineer
Consulting
722 Chestnut St. St. Louis 1, Mo.

Vincent Miller, '35
Exploration Service Company
Bartlesville Oklahoma

Cleveland O. Moss, '02
Consulting Petroleum Engineer
Estimates of Oil and Gas Reserves
Valuation—Production Problems—Proration
208 Midco Bldg. Tulsa 3, Okla.

J. Ross Reed, '37
Division Manager
National Electric Coil Company
1751 New York Dr. Altadena, Calif.

Joseph J. Sanna, '41
Christensen Diamond Products Co.
Mining—Petroleum—Construction
Diamond Bits & Supplies
1975 South 2nd West, Salt Lake City 13, Utah

Wm. D. Waltman, '99
325 So. Plymouth Boulevard
Los Angeles 5 California

Elmer R. Wilfley, '14
Wilfley Centrifugal Pumps
Denver, Colo.

John H. Wilson, '23
Independent Exploration Company
1411 Electric Building
Ft. Worth, Texas

John H. Winchell, '17
Attorney at Law
315 Majestic Bldg. Denver, Colo.
ALPine 5251

Harry J. Wolf, '03
Mining and Consulting Engineer
420 Madison Ave. New York 17, N. Y.

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FOR 1950

These contributors to "Mines" Placement Service assure its success and continuous expansion. It makes it possible for "Mines" Men to improve their employment by automatically presenting their qualifications to the employer best suited to make

use of their services. Your contribution now may insure your future advancement or that of some other "Mines" Man who has the ability but not the contacts with the better job. Every "Mines" Man takes a pride in watching this list grow.

- | | | |
|--------------------------|-----------------------------|-----------------------------|
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| John Biegel, '39 | R. M. Frost, '48 | A. D. Swift, '23 |
| L. F. Elkins, '40 | R. D. Eakin, '48 | H. D. Campbell, '42 |
| R. G. Finlay, '39 | K. B. Hutchinson, '39 | R. R. Bryan, '08 |
| L. E. Smith, '31 | W. S. Chin, '49 | R. W. Knapp, '40 |
| F. C. Bowman, '01 | K. W. Nickerson, Jr., '48 | S. H. Hochberger, '48 |
| F. F. Frick, '08 | T. V. Canning, '32 | G. V. Atkinson, '48 |
| Franklin Crane, '43 | L. O. Green, '32 | Robert Bernstein, '42 |
| B. F. Zwick, '29 | James Colasanti, '35 | C. G. Hayes, '41 |
| J. A. McCarty, '35 | W. E. Bush, '41 | I. R. Taylor, '48 |
| Hildreth Frost, Jr., '39 | R. C. Pruess, '42 | E. G. Snedaker, '14 |
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| J. R. Medaris, '49 | Finley Major, '47 | H. C. Bishop, Jr., '43 |
| P. B. Shanklin, '48 | W. J. McQuinn, '46 | G. G. Griswold, Jr., '14 |
| M. W. Miller, '49 | R. E. Cheek, '43 | V. N. Burnhart, '32 |
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| J. R. Newby, '49 | W. H. Nikola, '41 | H. F. Holliday, '42 |
| J. P. Bonardi, '21 | S. E. Zelenkov, '36 | R. D. Locke, '44 |
| C. A. Weintz, '27 | G. H. Fentress, '49 | B. E. Duke, '39 |
| F. D. Kay, '21 | J. L. Bruce, '01 | W. D. Lord, Jr., '44 |
| J. C. Andersen, Jr., '45 | W. L. Falconer, '41 | Christian Kuehn, '41 |
| T. L. Goudvis, '40 | G. P. Mahood, '24 | Douglas Ball, '43 |
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| Daniel H. Dellinger, '31 | W. C. Kendall, Ex-'47 | E. L. Durbin, '36 |
| A. C. Harding, '37 | J. C. Smith, Ex-'35 | W. D. Caton, '35 |
| R. L. Scott, '42 | E. L. Durbin, '36 | W. A. Conley, '19 |
| P. W. Crawford, '22 | W. D. Caton, '35 | H. H. Christy, '22 |
| M. L. Gilbreath, '33 | W. A. Conley, '19 | F. E. Lewis, '01 |
| R. F. Dewey, '43 | H. H. Christy, '22 | E. C. Royer, '40 |
| J. A. Kavenaugh, '38 | F. E. Lewis, '01 | E. A. Berg, '41 |
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| F. E. Woodard, '42 | G. A. Smith, '34 | S. C. Sandusky, '48 |
| Wm. H. Bashor, Jr., '49 | H. L. Jacques, '08 | J. W. R. Crawford, III, '48 |
| T. H. Allan, '18 | S. C. Sandusky, '48 | O. P. Dolph, '25 |
| T. F. Adams, '29 | J. W. R. Crawford, III, '48 | A. M. Keenan, '35 |
| C. V. Woodard, '44 | O. P. Dolph, '25 | W. H. Breeding, '39 |
| Otto Herres, '11 | A. M. Keenan, '35 | N. S. Whitmore, '29 |
| E. J. Brook, '23 | W. H. Breeding, '39 | R. G. Hill, '39 |
| J. W. Gabelman, '43 | N. S. Whitmore, '29 | L. E. Wilson, '27 |
| J. B. Ferguson, '30 | R. G. Hill, '39 | L. P. Corbin, Jr., '40 |
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| A. G. Hoel, Jr., '40 | L. P. Corbin, Jr., '40 | F. C. Aldrich, '48 |
| R. L. McLaren, '32 | W. J. Rupnik, '29 | R. H. Sayre, Jr., '34 |
| J. A. Davis, '39 | F. C. Aldrich, '48 | R. W. Evans, '36 |
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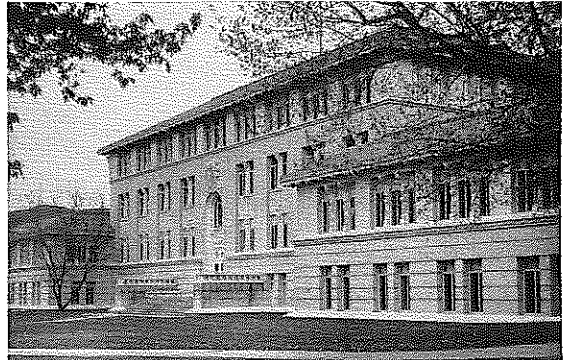
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The Mines Magazine

VOLUME XL NOVEMBER, 1950 NO. 11



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FREEDOM BELL — Drive made on Colorado School of Mines campus, Golden, Colorado.

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Dr. Melville
F. Coolbaugh
President
Emeritus
of
Colorado
School
of Mines
Dies

Dr. Melville F. Coolbaugh, president emeritus of **Mines**, passed away suddenly the morning of September 9, following a heart attack.

He was a noted educator, which career he began upon completion of his college work at Colorado College in 1902. After taking graduate work at Columbia University and special research work at Massachusetts Institute of Technology, he served on the faculties of Colorado College, Columbia University, South Dakota School of Mines, and Case School of Applied Science in Cleveland. In 1925 he was named president of the Colorado School of Mines which position he held until 1946 when he retired and became president emeritus.

Honorary law degrees were conferred upon him by Colorado College in 1925 and by Colorado University in 1927, and honorary doctor of engineering degree was given him last year by Colorado School of Mines.

Dr. Coolbaugh was born February 8, 1877 in Coolbaugh, Penna., a town named for his family. He was reared in Iowa where his parents moved when he was a child.

During World War I he served in the chemical warfare division, following which he was director of research for Metals Exploration Company in Denver until 1925.

Throughout his career Dr. Coolbaugh held several



DR. M. F. COOLBAUGH

state and federal appointments. He served as secretary of the Colorado Geological survey, as a member of the Colorado state planning commission, and as a member of the state mineral resources board. In 1947 he served on President Truman's "nineteen man" foreign aid committee. During World War II he was regional representative for the government's Engineering Science and Management War Training program for Colorado, Wyoming, Utah, Idaho and Montana. He held membership in many technical societies including the American Institute of Mining and Metallurgical Engineers, the Mining and Metallurgical Institute of America, and Sigma Xi.

His articles have appeared in various technical journals and his extensive research in ore treatment netted him foreign as well as United States patents. After his retirement, he was engaged in metallurgical research until the time of his death.

He is survived by his wife, the former Osie Smith of Colorado Springs, to whom he was married in 1902; a daughter, Mrs. Lois Mae Hinkley of Aurora, Colo.

(Continued on page 43)



▼ Homecoming — Open House at Cafeteria for Alumni and their wives.



▼ Homecoming Queen and Attendants: Mae Chase, Denver; Queen Marilyn "Mike" Bolender, Golden; Pat Carney, Golden.

"MINES" HOMECOMING OCTOBER 7, 1950

Homecoming festivities this year on Oct. 7, at the Colorado School of Mines drew more Alumni than ever before in the history of the school. This was matched by activities, larger in number and scope, in addition to the Mines' Colorado College football game which CC won 21-12.

Alumni and their wives, on campus for the celebration totaled an estimated five hundred persons, and nearly all attended a coffee and donut period after the game. Among the crowd the following were seen:

Herb Waterman, '50; Norm Johnson, '50; Arch Boyd, '26; Robert McMillan, '41; C. M. McDaniels, '50; S. Meltzer, '50; Clyde I. True, '35; T. O. May, '49; Gordon M. Miner, '48; Warren S. Dronen, '50; Mr. & Mrs. A. S. Dickinson, '50; Howard R. Keil, '39; John M. Coke, '28; George L. Robb, '38; Edward L. Pike, '49; W. A. Freeman, '23; Neil E. Johanson, '22.

Earl C. Phillips, '31; Mr. & Mrs. B. W. Knowles, '08; Mr. & Mrs. M. R. Mott, '44; Mr. & Mrs. Russell H. Volk, '26; Wilbur E. Volk, '25; J. Russell Chambers, '40; A. W. Pfeil, '27; Frank E. O'Neill, '12; L. C. Thomas, '12; D. E. Newton, '48; F. X. Corbett, '26; Mr. & Mrs. F. J. Laverty, '25; Mr. & Mrs. S. J. Burris, Jr., '15; H. W. Addington, '43; W. H. Williams, '17; Jack B. Ben-

nett, '49; William H. King, '28; Edward Matsen, '34; Caspar Hofmann III, '36; Cecil R. Walbridge, '29; Mr. & Mrs. Herbert W. Heckt, '36.

Mr. & Mrs. Claude L. Barker, '31; Mr. & Mrs. Carl I. Dismant, '31; Mr. & Mrs. Robert L. Stark, '31; Mr. & Mrs. Frank E. Briber, '16; Mr. & Mrs. Harvey Mathews, '13; Mr. & Mrs. Bruce B. La-Follette, '22; Mr. & Mrs. Hugh M. Connors, '22; Mr. & Mrs. Charles O. Parker, '23; Mr. & Mrs. Clare Evans; Mr. & Mrs. Graham R. Miller, '24; Mr. & Mrs. Arthur W. Buell, '08, '23; Mr. & Mrs. William B. Milliken, '93; Mr. & Mrs. A. George Setter, '32; Mr. & Mrs. James Colasanti, '35; Mr. & Mrs. Edward J. Brook, '23; Mr. & Mrs. Frank C. Bowman, '01.

Col. & Mrs. Wendell W. Fertig, Ex-'24; Mr. & Mrs. Ben H. Parker, '24, '32, '34; William H. Courtier, '28; Vincent Miller, '35; Albert H. Bradford, '09; Mr. & Mrs. Gurnett Steinhauer; Mr. & Mrs. Stanley C. Haney, '37; Mr. & Mrs. Edmund C. Bitzer, '29, '32; J. Marvin Kleff, '06, and sister; Mr. & Mrs. Keppel Brierly, '34; Mr. & Mrs. Albert L. Pierce, '22; Mr. & Mrs. Will M. Traver, Jr., '16; Robert E. Bond, '28; Mr. & Mrs. Benjamin C. Essig, '15; Harry J. McMichael, '39; Mr. & Mrs. Harry L. McNeill, '24; Mr. & Mrs. Carver B. Ellis, '33, '39.

The weekend opened officially with a soap box derby Friday afternoon,



▼ Homecoming Game — Pres. Vanderwil's Box and Crowd.

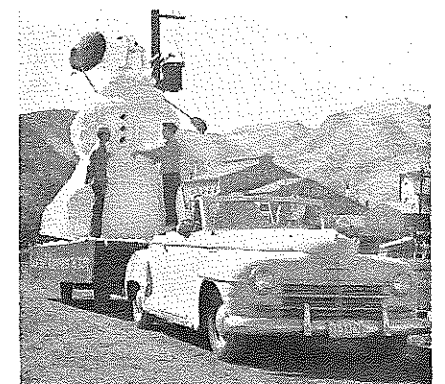
where Miners crowned brown-haired, brown-eyed Mrs. Marilyn "Mike" Bolender, Golden, their queen. Her two attendants were Mrs. Pat Carney, Golden and Miss Mae Chase, Denver. Coach Fritz Brennecke made the presentations and followed through with an old Mines' tradition of kissing the queen. The queen and her attendants led the torchlight parade Friday night through the streets of Golden to City park where a bonfire program was held.

Judging of house decorations was held Saturday morning, despite a whipping wind which damaged displays of three of the houses. First place was won by Kappa Sigma. Alumni then attended open house at the Integral club.

The float parade from City park to Brooks field preceding the game gave Miners another chance to compete for prizes, and Sigma Alpha Epsilon walked off with top honors in this event.

By 2:00 p.m. kickoff time, the wind died, and more than five thousand fans saw the game played in beauti-

(Continued on page 22)



▼ Homecoming S.P.E. Float.

where first place was won by Sigma Alpha Epsilon. Nine cars entered the three-block downhill dash, and were judged by officials, Professors Warren J. Mason, Robert B. Osborn, and W. Alan Stewart.

Five hundred people attended the Friday night rally held in Steinhauer fieldhouse

HIGHLIGHTS ON MINING IN COLORADO

By H. W. C. PROMMEL, Ex-'20
Consulting Geologist and
Mining Engineer
Denver, Colorado

May I precede my reviews on MINING with a few general remarks. Let us face the facts for a minute. Europe as well as our own country is now confronted with possible invasion by Communist Russia. Are we and our Allies prepared for it? NO!

History Repeats Itself

History repeats itself. There have been several invasions of Europe by northern Mongolian hordes, and European Russia and its satellites are suffering under their yoke today. Attila and his legions overran Europe in the 5th century. Although not actually defeated at Chalons-Sur-Marne in northern France, his army was so slaughtered that he was never again able to terrify Europe.

Early in the 13th century Genghis Khan overran Asia Minor and continued his conquests into Persia, Russia, Poland, China, and Tibet. His kingdom stretched from the Volga to the Pacific and from Siberia to the Persian Gulf. 18½ million lives were ruthlessly destroyed during his rule. It took Europe 400 years to check his influence.

I was in Russia and Siberia from 1930 to 1932. At that time there were some 2000 American and 2000 German engineers over there. The character of Bolshevism is definitely Mongolian. Today these hordes are again dominating half of Europe and endeavoring by foul means to force their yoke on the rest of the world.

TIME magazine under its heading "Background for War" asks: "War Now?"—"Or When?"—"Or Never?" To me the answer is simple. So-called Communism, or these Northern Mongolian hordes can ONLY be held in check by superior force or power, — they will respect

*Address before State Chamber of Commerce meeting, Cosmopolitan Hotel, Denver, Colorado, September 18, 1950.

NOTHING else. We can only win without a war if we are prepared for the worst kind of a war; by half-hearted, lukewarm, and dilly-dallying preventive measures we are selling our country and the rest of the world down the river. And time is growing very short!!

World War II Adjustments

It is well to review adjustments made in World War II, but new factors considered today should be based on preparedness in the shortest possible time for an all out war. With the foregoing in mind let me review briefly adjustments made in mining in Colorado during World War II.

In our State we are mostly concerned with a large number of small mines; in fact, from reading Jack Foster's delightful little articles on the Editorial page of the Rocky Mountain News, describing his frequent trips to ghost mines and mining towns, you might be lead to believe that mining in Colorado is a thing of the past and now stone dead. Actually, due to present economic conditions and metal prices which the small miner finally receives for his labor after a myriad of deductions, our mining industry, while still existing, is being slowly throttled to death,—indeed an unpleasant situation in the present emergency.

Adjustments made in mining during World War II consisted in closing down gold mining completely in October 1942 by Order L-208. During 1941 placer gold produced in Colorado reached its highest dollar value over a period of 73 years; a little over a million dollars; by 1943 it was down to \$12,000. Lode gold mining which had also been on the upswing, fared similarly. The Administration hoped that by closing gold mines, gold miners would be made available for mining copper, lead, and zinc. This turned out so disastrously wrong, that miners who had volunteered or had been drafted into the army had to be released from the army to produce much needed metals. Small miners had a hard time with priorities for much needed equipment and supplies. Had it not been for a premium price for lead, copper and zinc which assured the miner of at least some profits, we would have been short on much needed metals. The whole emphasis was on production, and exploration and development work had to be neglected. Some imported metals reached us, but much went to the bottom of the seas together with needed ships due to submarine warfare.

Taxpayers Money Goes to Foreign Countries

After the emergency was over, not

only were premium prices discontinued, but metal prices spiraled downward while freight charges, labor and equipment and supplies went the opposite way. To make things still worse, E.C.A. and point four programs giving financial aid, that is, American Taxpayer's money, — to underdeveloped countries, was being pushed in Washington. Such aid consisted in building of roads, delivery of mining machinery and other heavy equipment and providing technical advice and supervision, for which we expect to import critical raw materials and metals from these countries, with no assurance that they are able to defend themselves in case of war and prevent the material from falling into the hands of the enemy.

The American miner therefor finds himself in the peculiar position of paying taxes until it hurts, with proceeds used to hamper home industry and his own means of livelihood. As a result nearly 80% of all western mines have closed down.

I firmly believe in the righteousness of peace time imports of critical materials and metals of which there is a shortage in our own country in order to meet civilian and government production and take care of stockpiling; World War II has shown us the necessity of doing so. But when we do so at the expense of our own mining industry, in time of unpreparedness; when we allow our mines to fill with water and timbers to rot, such action borders on treason. Would it not be wise to assist our OWN mining industry, keep the mines working, develop ore reserves, or at the very least, keep our mines in a stand-by condition, ready for any emergency! That should be a part of our program for preparedness. If war does come, many of our imports will be cut off and we will not be able to meet the heavy demand for metals from our own mines, filled with water, and timbers rotted away, and shafts, tunnels and entries caved. It takes time to unwater and rehabilitate a mine and such efforts, however valiantly made after a war starts, may be "TOO LITTLE" and "TOO LATE."

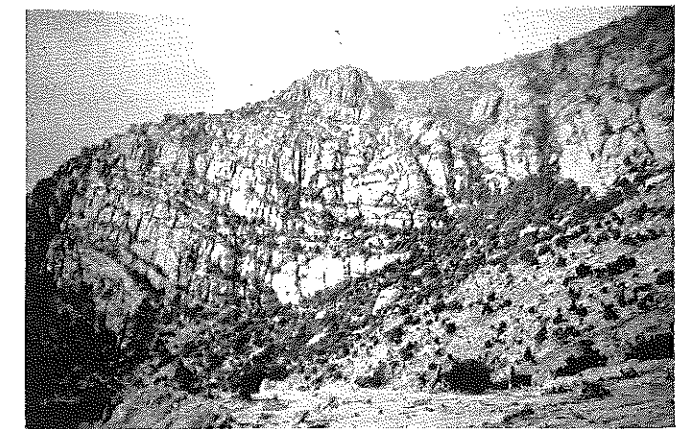
Colorado Still Has Mineral

The mineral resources of our State are FAR from being exhausted. Our mineral belt extends from Boulder county through the state in a south-westerly direction to Blackhawk, Central City, Idaho Springs, Lawton, Dumont, Empire, Georgetown, Silver Plume, Montezuma, Breckenridge, Alma and Fairplay, Leadville, Gilman, Aspen, Gunnison, Lake City, Summitville, Creede, Ouray, Silver-

(Continued on page 22)



▼ Examining Soils within a magnetic anomaly, Cobar, New South Wales



▼ Mt. Lyell, Tasmania.

SAMPLING AND TESTING OF SOIL AND ROCK FOR COPPER, LEAD AND ZINC IN GEOCHEMICAL RECONNAISSANCE

By V. P. SOKOLOFF*

Introduction

Applied geochemistry or geochemical prospecting is a study of normal and anomalous distribution of economic chemical elements in rocks, soils, plants, waters and other suitable natural bodies and materials, in aid to geological and geophysical exploration for economic mineral deposits. This study is based on a body of data, to the effect that geochemical anomalies in parts of the regolith may be associated with presence of economic prospecting targets, under certain conditions. Such associations were demonstrated in a variety of environments, in different parts of the world. No economic successes had been claimed, however, so far, in the professional literature, due chiefly or entirely to the geochemical prospecting, with one exception previously cited. There may be several reasons for such reticence, aside from the relative newness of the subject, some of which may be now considered in brief.

The technical components of geochemical prospecting are not particularly difficult to maintain at a reasonable level of serviceability and existence, kind, dimensions, and intensity of geochemical anomalies are easily established, as a rule. Interpretation of geochemical anomalies is not a simple problem, however. Intensity of geochemical anomalies is not neces-

*The Isaiah Bowman School of Geography, The Johns Hopkins University.

sarily an indication of the intensity or economic value of the target they may represent. In fact, some geochemical anomalies may be vestigial, representing targets destroyed or dissipated by erosion and by other catastrophic agencies. Furthermore, the spatial relationship between the anomaly and the target may be and generally is not



V. P. SOKOLOFF

a simple one. There is generally no precise direct linear least distance relationship, in space, between the anomaly and the target. The size of targets is generally small, in deposits of economic metals, especially in vein deposits. Regardless of the size of the anomaly, the small target is not easily

hit by the deep exploration conducted entirely on the geochemical evidence. Occasional direct first hits are most likely to be due to luck rather than science.

It is reasonable therefore, pending further developments in prospecting for blind ore bodies, to make use of the applied geochemistry for attainment chiefly of one kind of objective, namely:

In relatively large areas of suspected but not proved mineralization, where thick eluvial (residual) soil cover conceals geological structures, the geochemical prospecting is probably the quickest and the cheapest method of sorting the more economically promising part of the area from the less promising ones. The reduction of size of the area of potential economic interest so accomplished, under certain conditions, permits application of more reliable and more costly exploration methods, such as costeaning, quantitative chemical analysis, a detailed study of geologic structures, geophysical studies and ultimately, deep drilling which is the only way of ascertaining presence of concealed ores.

A summary of sampling and testing procedures here presented is an outcome of the geochemical exploration in Australia in 1948-49. A detailed account of the exploration is now in preparation¹ and some individ-

¹Sokoloff, V. P.; Dallwitz, W.; Debnam, A.; and Trezise, J. "Geochemical Exploration in Australia in 1948-49." The Commonwealth Bureau of Mineral Resources. (In preparation).

ual projects had already been discussed.^{2,3}

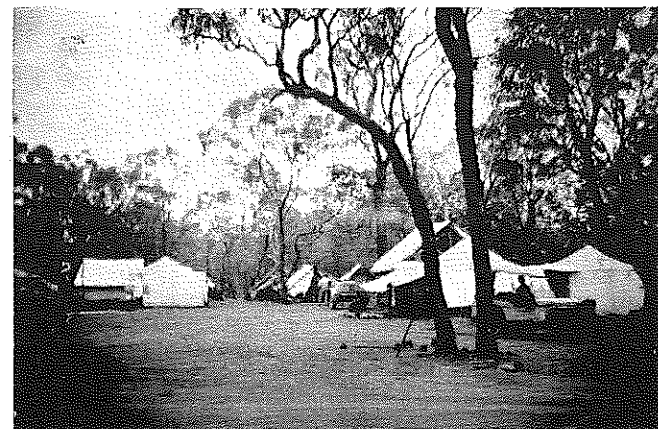
The extensive literature on the dithizone procedures was summarized and discussed by Sandell⁴ and, less comprehensively, by Proding⁵. Adaptations of individual reactions are common in the literature.^{6,7,8}

The emphasis of the present report is on the practical field application of the tests, in environments and terrains where the explorer is limited in his equipment and facilities and is compelled to rely on the resources of his judgment and observation rather than on additional technical facilities and supplies practically non-procurable, in remote areas. Much prominence is given accordingly, in the report, to interferences and off-shade colors, in the colorimetric tests, and their probable or certain significance, to recognition of troubles due to the contamination or deterioration of reagents, and to many other practical hints, both in testing and in sampling of the terrains.

Sampling

Selection of sampling sites and materials, the sampling procedure, and prevention of contamination of samples in taking, in transport, and in storage may be here touched upon in brief. Ordinary care and common sense are sufficient generally to minimize the errors inherent in such operations.

²Sokoloff, V. P. "Geochemical Reconnaissance in Wallaroo Mining District, South Australia." *Mining Review* 88: 32-64, 1949.
³Sokoloff, V. P. "Geochemical Prospecting Methods Bring Results in Australia." *Mining World* 12 (4): 26-28, 1950.
⁴Sandell, E. B. "Colorimetric Determination of Traces of Metals." *Interscience*, New York, 1944, 487 pp.
⁵Proding, W. "Organic Reagents Used in Quantitative Inorganic Analysis." Elsevier Publishing Co., New York, 1940, 203 pp.
⁶Lakin, H. W.; Stevens, R. E.; and Almond, H. "Field Method for the Determination of Zinc in Soils." *Economic Geology* 44 (4), 1949.
⁷Huff, L. C. "A Sensitive Field Test for the Heavy Metals in Waters." *Economic Geology* 43 (8), 1948.
⁸Chisholm, O. E. "Geochemical Survey in Ontario." *The Mining Magazine*, April: 245-247, 1950.



▼ Exploration Camp, Cape York, Queensland.

Objectives or purposes of sampling were discussed earlier in this report. The sampling programme depends entirely on the kind and purpose of the prospecting problem. The geochemical background is established by a preliminary examination of soil profiles to ascertain both vertical and lateral distribution trends of the metals in question in non-mineralized parts of the area. A similarly detailed study is required to establish the geochemical expression of known targets in the area. Both the background and the expression may be given by traverses over and across the strike or the projection of an ore body, provided the traverses are sufficiently long to reach into the country, all other things being comparable. Spacings of reconnaissance grids or traverses depend on the size of the probable target. Depth of the reconnaissance sampling depends on the zonal and the anomalous trends in the distribution of the metal sought, as established by the background and the expression respectively. Similar considerations determine sampling of rock outcrops or of rock in shafts and in drill cores.

The sampling technique is necessarily flexible. Augers, cork-screw or post-hole, crowbars, spades, or any reasonable or available equipment had been employed. Projects like the Wallaroo required a compressor to penetrate the caliche layer and to reach the palaeosol wherein the geochemical expression of the bedrock was sought and established. Rock outcrops or shafts are sampled directly, by breaking-off suitable specimens with a hammer. It must be remembered that sampling is but the means to an end (not an end in itself), that our search is for indications and not for values, and that productivity of the reconnaissance depends on productivity of sampling. There is no particular merit in compositing, unless it actually facilitates the work. Individual tests may mean more in their variation that perfectly reproducible tests on a number of perfectly mixed composites.

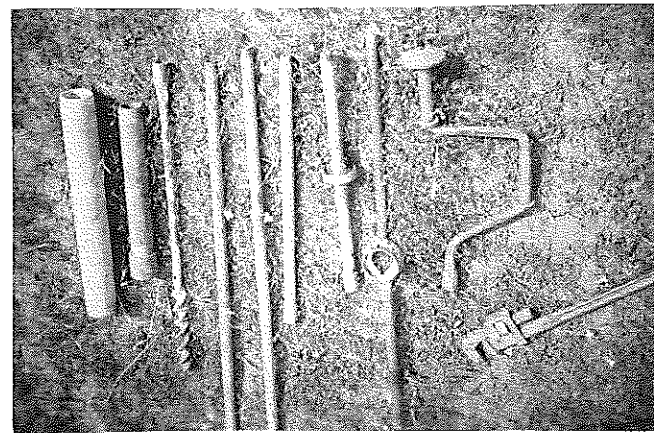
In sampling drill cores, attention should be paid to possible contamination of the core surface with metallic tools and with oils. The contaminated surface may be chipped off with carefully directed hammer blows or may be eliminated by washing with gasoline, soap and strong acids, followed by water. Samples of outcrops, particularly of bedded, layered or fractured rock may be contaminated by wind-blown or other materials. This contamination may or may not be important. It is best, however, always to clean such samples, in any reasonable way, before preparing them for the analysis.

In sampling soils at a pre-determined depth, e.g. with a post-hole auger, the hole need not be cased as a rule, unless the upper horizons are particularly loose or unless the surface is known to be contaminated. It is best, in any event, to take the central part of the soil core and to discard materials on the periphery. The use of water, to facilitate boring, is counter-indicated.

A common cause of contamination in transport is the use of weak paper bags and improper packing of the samples. A contamination during storage may be traceable to laboratory dusts. These can be easily avoided.

PREPARATION OF SAMPLE

Rock. Drill core and rock samples are pulverized to about 150-200 mesh. If mechanical grinders are not available, the pulverization is accomplished by hand. The sample is crushed with a hammer and rolled to fineness on a heavy steel plate, with a heavy steel roller. If sieves are available of sufficient purity to prevent contamination of the sample on screening, the powdered sample is screened. Screening is omitted, in the absence of pure iron or plastic sieves and the uniformity of grinding is judged by touch and feel. Effects of the lack of uniformity are minimized by taking large aliquots



▼ Tools, left to right: large casing; small casing; small auger; extensions; ballrace; pressure handle; brace; stillson.



▼ Inserting small casing after using intermediate auger.

of pulverized material, e.g. 5 - 10 - 20 grams, for the test.

Soil. Screening to remove gravel-sized particles (coarser than 2 mm.) is essential. If suitable screens are not available, the coarse particles can be removed by hand. Separation of coarser from finer materials is facilitated, in loose-textured materials, by shaking the dry sample in a dish or a beaker, in the horizontal plane. The coarser materials accumulating on top can be easily scooped then and discarded. A preliminary test to ascertain distribution of metals between the coarse and the fine fractions of the sample is always desirable. The preparation procedure may require modifications, depending on the results of this test.

Gravel-free materials may be mixed manually or, if heavy-textured, rolled to fineness and then mixed. Possible lack of uniformity is minimized as formerly by taking large aliquots for the test.

Plant Materials. In the absence of metal-free ball mill, air-dry samples sufficient to yield 0.1-0.5 g. ash (4-6g. dry weight is generally adequate) are crushed by hand and ignited to whiteness over an open flame. Hand crushing may be preferable to grinding in a mill as it assures a better aeration of the sample during the combustion and a minimum of losses of Cu and Zn as volatile carbonyls. A preliminary charring of the test material with a few drops of concentrated H₂SO₄ reduces the time of the ignition to about ¾ hr. on the average, minimizes fusion of the alkali silicates and stabilizes generally the trace metals in the ash. The carbonate-oxide content of the ash is minimized by this pre-treatment and the extraction of the ash is facilitated,

except in cases where Ca is unusually high.

The ignition is carried out in a silica dish over an open flame but a clean well aerated muffle furnace is also usable. Stirring of the ash with a rod of pure iron or a sturdy glass rod facilitates the combustion, although such stirring is rarely needed, with the H₂SO₄ pre-treatment.

The white ash constitutes the test material and is treated accordingly, depending on need and judgment.

The well known Mg (NO₃)₂ fusion may be useful also, but only with very finely pulverized materials.

Water. No special treatment is required, except filtration, if water samples are tested directly after they are collected. If the samples are to be stored for some time before testing, clear filtered samples should be acidified first with HCl (unless Ag is sought; if so—H₂SO₄ is preferable), to pH2 or thereabouts, and then stored, in glass-stoppered bottles. No rubber or cork should be used; rubber contains enough Pb, as a rule, somehow to contaminate the sample; cork generally contains Zn.

PREPARATION OF TEST SOLUTIONS

It is not always necessary to aim at a complete extraction of the test metals from the test material, in the geochemical reconnaissance. Different forms of metals may each have an independent prospecting significance, for reasons already stated in this report. The best reasonable procedure to suit the prospecting problem in question should be devised in every particular case and applied intelligently rather than cook-book fashion. The main economic purpose of geochemical prospecting should not be allowed to become obscured by unnecessary refine-



▼ Jackhammer used instead of the intermediate auger where underlying rock is too hard.

ments. Refinements are parts of definitive quantitative procedures sufficiently well known and indispensable in the more advanced stages of the exploration, but not in the reconnaissance.



▼ Clay removed from small auger.

Copper. In examining rock and drill cores from the sulphide zone, roasting alone, roasting followed by KHSO₄ fusion, and digestion with aqua regia are generally sufficient to render most if not all of the Cu soluble in mineral acids. KHSO₄ fusion is definitely unsatisfactory. Aqua regia extraction is apparently the most suitable procedure. A few grams of the pulverized sample are treated with a few mls. of 1 : 3 aqua regia, in large-bottomed pyrex beakers. The mass is evaporated to dryness on a steam bath or on a hot plate with an asbestos top. A single evaporation is generally adequate. The nitrates are decomposed with 2-3 successive evaporations to dryness with a few mls. concentrated HCl; Cl₂ is driven off, as a rule, if the procedure is carried out with care. The residue is taken up in HCl (or H₂SO₄) of desired strength. The suspension is filtered, generally with the addition of enough NH₄F to precipitate the iron. The filtrate constitutes the test solution.

Indications of Cu in oxidized rock could be obtained consistently by extraction of powdered samples with mineral acids, without any pre-treatment. A proportion of copper in reduced rock (some Wallaroo cores) is also extractable with mineral acids, without any pre-treatment. The usefulness of indications so obtained depends entirely on the problem in question.

In the examination of soils, in certain types of terrains only, a simple acid extraction may be sufficient to obtain indications and even semi-quantitative values for the "free" (i.e. mineral salts), the occluded, and the exchangeable forms of Cu. The crystal-structure forms and the organic forms are not represented in such extracts, to any appreciable extent.

Organic forms of Cu are contained chiefly in the upper horizons of soils, the horizons that are very rarely useful in the reconnaissance, excepting perhaps, studies in the dispersion train phenomena. Their prospecting significance is minor or none, in all areas so far examined. Should there be any need, however, to examine such materials in the future, the organic substance must be decomposed either with the conventional nitric-perchloric acid digestion, or with aqua regia, Mg (NO₃)₂ fusion, strong H₂O₂ with HCl, as in the mechanical soil analysis, by ignition preceded by charring with concentrated H₂SO₄, or in any other suitable way.

If the prospecting indications are to be sought in the crystal-structure Cu only, that is, in Cu that is locked in the clay minerals, the adventitious free and occluded forms of Cu may be removed by elutriation with a dilute mineral acid and the elutriated sample oxidized by heating and fused with KHSO₄, to decompose the clay mineral.

Test solutions for Cu in general should be in HCl or H₂SO₄ at pH 1-2. Separations of interfering substances are described under "Tests." It may be noted that the Ag interference tends to be depressed in HCl and the Au interference—in the H₂SO₄ solutions.

Zinc. Procedures outlined for Cu apply also to Zn.

Lead. Pb appears to have a tendency to be more easily extracted by acetates than by mineral acids from rocks and soils alike. This tendency is not easily explainable and may be due to our limited range of observations.

In the examination of powdered unoxidized rock, roasting alone, followed by an acetate extraction at pH 5-6 appeared adequate in obtaining substantial indications of Pb, in excess of those obtained with the KHSO₄ fusion. Cold acetate extracts were suf-

ficient, on occasions, to obtain consistent indications of Pb in outcrops of oxidized rock. It may be noted that galena is somewhat soluble in acid to neutral acetates.

The acetate extraction was sufficient also in obtaining indications of Pb in soils. Most if not all of Pb in a variety of soils in different climates appears to be in the free form, as more or less sparingly soluble salts, or else in the organic forms. The latter are prominent in waterlogged areas. Occluded forms of lead are apparently rare or non-existent, nor is there any evidence of Pb in the crystal structure of clays. There is no reason, however, why Pb could not substitute for K in some clays, in view of the similarity of their size and despite the difference in their charge.

It appears best therefore, pending further developments, to rely on the acetate in the preparation of test solutions for Pb. Unoxidized rock should be roasted prior to the extraction. Soils low in organic matter should be extracted directly. Humus-rich soils, muck, peat, etc. should be oxidized or burned, as described under Copper.

TESTS

Copper

Approximately 6 gammas of divalent Cu react with about 50 gammas of dithizone forming a reddish purple keto-dithizonate extractable by CCl₄ from acid solutions. Fractions of a gamma of Cu are detectable.

The test is relatively simple and reliable. Copper blanks in most reagents and waters, including the tap water supplies, are insignificant. Some distilled waters, however, contain copper, especially if the stills are new or clean.

Presumptive Test.

(1) Aliquot of test solution in H₂SO₄ or HCl at pH 2 to 1 is shaken with e.g. 5 mls. of 0.001% dithizone in CCl₄. (Certain lots of dithizone contain a factor that seems to retard the extraction of Cu with-

out affecting the test. Prolonged shaking is recommended.)

(2) The resulting reddish purple colours may be interpreted as Cu, in the absence of interferences and off-shades.

Interferences.

(1) Trivalent Fe is the most common interference (divalent Fe has no effect). In practice, straw-coloured to yellow HCl extracts of soil or rock contain enough Fe to require its elimination. This can be accomplished by adding solid NH₄F (or NaF) to the test solution, until the iron colours disappear and by filtering the solution to remove the precipitate. The filtrate should be clear and colourless. pH of the solution, following the precipitation of iron ammonium fluoride, should be checked and adjusted, if required.

Unless Fe is removed, it interferes with the estimation of Cu in two ways: (a) By hindering the extraction of Cu from the aqueous layer. (b) By oxidizing dithizone. Thus low recoveries of Cu and the yellow off-shades in the CCl₄ are the undesirable effects of Fe. If Fe is absent or not excessive, however, and if the extraction is done in the cold, these two interferences are not very important, in the presumptive field test. (This was the case in the Wallaroo project, where very little or no Fe was extractable with 0.01N mineral acids from the ancient clays.)

(2) Oxidizing agents such as Cl₂, if present in the test solution, will oxidize the dithizone into a canary-yellow substance. This oxidized product does not react with the metals and can be recognized accordingly. It can be also recognized by its shade (distinct from Au or Ag dithizonates) and by the rapidity of its development. 0.1g. of solid NH₂OH. HCl added to the filtrate will eliminate this interference.

(3) Au, Ag, Hg, Pd form coloured dithizonates within the same

pH range as Cu. Au, Hg and Ag particularly have an affinity for dithizone; a few gammas of either will keep hundreds of gammas of Cu from reacting. The golden yellow faintly reddish-tinged dithizonates of Au and Ag can be decomposed easily with KI, permitting Cu to react with the dithizone. The iodide may be added to the test solution before, during, or after the extraction. Successive extractions with fresh portions of the dithizone may also be employed, to remove Au and Ag, prior to the extraction of Cu.

(4) Zn, Pb, Cd, Ni, Co, and some others do not react with the dithizone on the acid side of pH3± and therefore do not interfere with the Cu test.

(5) Large amounts of Bi (orange yellow dithizonate) may interfere with the detection of Cu. Trivalent TL oxidizes dithizone slowly, in the manner of Fe, into a yellowish substance. Pd dithizonate (green) may produce an illusion of a negative test, with a slight off-shade of the reagent green which may be easily ascribed to other causes. Hg dithizonate (orange) was insufficiently studeid, nor was the Pt dithizonate.

Thus Bi, Tl⁺⁺⁺, Pd, Pt, and possibly Hg remain as potential interferences. Practical effects of such interference are not important, in the interpretation of the reconnaissance for which the presumptive test is intended to serve.

Reagents

- (1) Dithizone, 0.001% in CCl₄.
- (2) NH₄F, solid.
- (3) NH₂OH.HCl, solid.
- (4) KI, solid.
- (5) Cu-free water, tap or distilled.

Zinc

Approximately 6 gammas Zn react with about 50 gammas of dithizone forming a cherry-red keto-dithizonate extracted by CCl₄ from weakly acid to weakly alkaline solutions. Fractions of a gamma of zinc are detectable, under certain conditions.

The test is not an easy one to make, chiefly because the high zinc blanks in all reagents, waters and glass, as well as because of certain chemical interferences.

Presumptive Test.

(1) Aliquot of test solution containing a few gammas of zinc is brought to pH5 to 6 with an acetate buffer.

(2) The buffered solution is extracted with e.g. 5 mls. of 0.001% dithizone in CCl₄ in the presence of about ½ g. Na₂S₂O₃. (The thiosulphate may be added later, if desired, and the extraction repeated).

(3) The remaining colours may be interpreted as Zn.

Cd is apparently eliminated, in the presumptive test, but Sn, Ni, Co, and Tl may interfere, if present in large amounts. Al may interfere with the extraction, as if by holding some Zn in the aqueous phase.

Interferences.

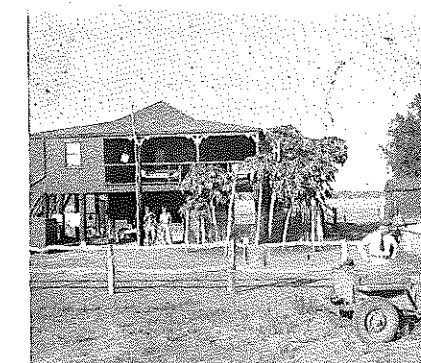
(1) Pb, Cu, Ag, Au, Hg, Pt are eliminated by the * addition of Na₂S₂O₃. Cd is not eliminated.

(2) Cd may be removed from the CCl₄ layer containing the mixed dithizonates by washing it with Na₂S solution.

(3) High amounts of Sn, if present, may be removed by volatilization with Br₂-HBr, following evaporation of the CCl₄ extract. The residue taken is aqua regia, etc. and re-tested for Zn as above.

(4) High amounts of Ni and Co may produce brown off-shades in the CCl₄. Their elimination is tedious. The test solution is made neutral with NH₄OH; the precipitate is dissolved in 5% KCN; KCl is added to pH 3-4; the solution is buffered with the acetate at pH 5 to 6 and extracted as above.

(5) The oxidizing interferences described under "Copper" appear to be rare. They can be probably eliminated with NH₂OH.



▼ Station (ranch) at end of mail route, Northern Territory

(6) High Zn blanks in all waters and reagents is a major difficulty with the test. The blanks may also develop on storage of reagents almost in any kind of glass. Dusts of diverse kinds are likely to contain zinc. (Even before the test solution is prepared, the probability of contaminating the sample with Zn from tools, sieves, airborne materials etc. is greater than that of contamination with most other metals. These considerations, together with a generally high zinc background in soils, rocks, etc. detract from the interest and the value of the test).

Reagents.

- (1) Dithizone, 0.001% or 0.002%, in Zn-free CCl₄.
- (2) NH₄ or Na acetate buffer, 1 to 2N, aqueous, Zn-free, 2N.

- (3) Na₂S₂O₃, Zn-free, solid.
- (4) Na₂S, Zn-free solid.
- (5) Redistilled water, Zn-free.

Lead

Approximately 18 gammas Pb react with about 50 gammas of dithizone forming a cherry-red keto-dithizonate extractable by CCl₄ from almost neutral to alkaline solutions. Small fractions of a gamma of Pb are detectable, under optimum conditions.

The test is subject to serious errors and to interferences that are not easily recognized or easily eliminated. Lead blanks are generally low in the reagents, unless the materials are in contact with rubber.

Presumptive Test.

(1) Aliquots of test solution containing several gammas of lead are buffered at pH7⁺ with an acetate buffer.

(2) The buffered solution is extracted with e.g. 5 mls. of 0.001% dithizone. The extraction may be in the presence of KCN. An easier practice was to add KCN after the extraction.

(3) The remaining colours, following the agitation with KCN, may be interpreted as due chiefly to Pb.

Monovalent Tl is co-extracted with Pb and Bi may be co-extracted.

Interferences.

(1) Zn, Cd, Cu, Au, Ag, Hg and probably a number of others, including trivalent Tl, are eliminated in the presence of KCN.

(2) Monovalent Tl may be eliminated by making the aqueous phase 5% KCN solution. Some lead is also lost, however, in the excess of KCN, at least where certain lots of KCN are used.

(3) Bi may be removed, together with some others, by a preliminary extraction of the test solution at pH3-4 with the dithizone, whereupon the aqueous layer is buffered at pH7⁺ and examined for Pb.

(4) There seem to be some other interferences, the nature of which is not yet understood. These would be eliminated probably by following the customary quantitative procedure in which Pb is extracted in the presence of NH₄ citrate and NH₂OH, followed by NH₄OH, KCN, etc., at pH 8.5 to 9.0.

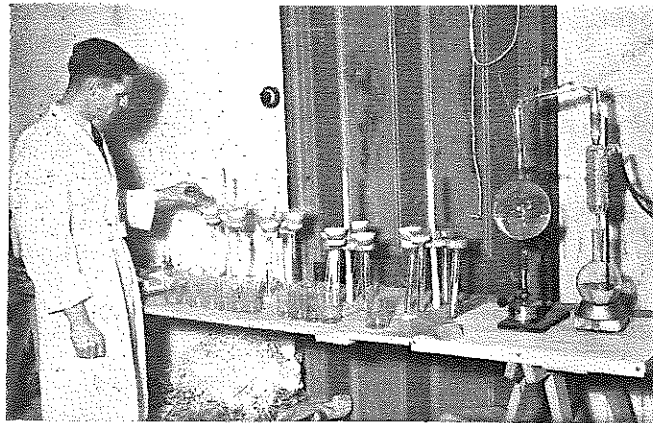
(5) Pb dithizonate appears to be somewhat soluble in alkaline solutions, in the presence of NH₄OH or excess KCN. This solubility may prevent detection of very small amounts of Pb, in the presumptive test. The excess dithizone is soluble completely in alkaline solutions. Thus, in the presence of excess KCN, traces of Pb may be unmasked, in the CCl₄ layer, compensating thereby for the negative



▼ Rolling dried clay on cast steel plate.



▼ Crushed clay ready for weighing.



▼ Filtration.

error due to the solubility of the Pb dithizonate.

Reagents.

- (1) Dithizone, 0.001% or 0.002% in redistilled CCl_4 .
- (2) NH_4 or Na acetate buffer, pH 7⁺, Pb-free, aqueous, 2N (freshly made buffers are best)
- (3) KCN, 10%, aqueous Pb-free (may develop a Pb blank on prolonged standing in certain kinds of glass)
- (4) Redistilled water, Pb-free.

Other Metals

Dithizone procedures for a member of other metals are entirely feasible. A presumptive semi-quantitative test for gold was developed recently by the Western Mining Corporation. A test for silver (not yet available) may be developed by separating Ag from the interfering metals in alkaline solutions as Ag enol-dithizonate, Ag SC ($\text{NNC}_6\text{H}_6\text{Ag}$), (NNC_6H_5), insoluble in CCl_4 , converting the enol into keto dithizonate, SC ($\text{NHNC}_6\text{H}_7\text{Ag}$), (NNC_6H_5), in the presence of excess dithizone, in acid solutions, extracting the keto from with CCl_4 , and estimating Ag accordingly, by the intensity of the yellow colour. The stability of green Pd dithizonate in strong acids and alkalis alike may be utilized in developing a test for palladium. There are also certain other possible applications.

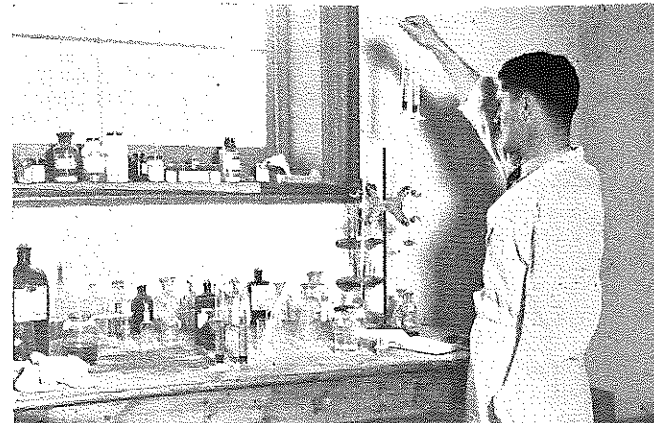
It is evident from the considerations here offered as well as from the literature cited earlier in the report that indications of the following metals may be obtained, with the aid of dithizone, in the presumptive field tests of soils and rocks:

- Cu, Zn, Pb, Ag, Au,
 Ti^+ , Cd, Bi, Pd, Hg,
 (Pt, In, Ti^{+++} and possibly Ni, Co, Mn, although the latter 3 already have adequate procedures.)

INTERPRETATION OF DITHIZONE COLORS

Qualitative

Qualitative interpretations of the dithizone colors, as indicated by the



▼ Matching colors (dithizone)

foregoing procedures, can be made by reference to solutions of known composition or to standards similarly prepared. The colors should be committed to memory. (Preparation of permanent standards for both true shades and diverse interferences would be warranted in a large-scale reconnaissance.)

The single-color method involving removal of the excess dithizone with alkalis or ammonia, so as to unmask the metal dithizonates, in the final stage of the test, is not recommended, in the presumptive tests, for reasons of economy of time that would be consumed in maintaining blank-free alkaline solutions and in performing the operation. These are justified, however, in instances where an increase in the sensitivity of the test is desired. Generalizations here to be offered are based on observations made with the mixed-color variant of the dithizone test* and on the assumption that a certain excess of the reagent is present in the CCl_4 layer, in the final stage of the estimation. Some of the generalizations may be incorrect in part, due to the limitations of background and experience.

(1) HCl or H_2SO_4 solutions on the acid side of pH3. NH_4F not added

(a) *Reagent green*. Less than $\frac{1}{4}$ - $\frac{1}{2}$ gammas of Cu to none; Au, Ag, Hg absent; Fe^{+++} or Ti^{+++} interference inoperative.

(b) *Iron-gray*. Cu present but probably less than 2 gammas. Au, Ag, Hg absent.

(c) *Reddish violet (purple)*. Cu present, possibly in excess of 6 gammas. Au, Ag, Hg absent or, at most, amount to much less than 1/200 of Cu.

(d) *Intermediate shades*, "b" to "c", correspond to intermediate amounts of Cu, all other things being the same.

*When an aliquot of the test solution is extracted with 5 mls. of 0.001% dithizone in CCl_4 .

(e) *Yellowish off-shades*, "b" through "d", may be due chiefly to the iron and possibly to the thallium interference. A certain small amount of yellow plus Cu purple may appear orange, very much like the Hg orange. Yellowish tinges in "c" may be due to very small amounts of Ag or Au that are easily cleared with KI. Appearance of the purple in the CCl_4 layer, following the addition of KI, may be due also to I_2 , if the aqueous layer contains oxidizing agents. The yellowish off-shades should be viewed with suspicion and the test should be modified accordingly.

(f) *Yellowish green*, developing relatively slowly, in the cold, may be due to the iron interference. It may be due also to appreciable amounts (e.g. 1-3 gammas) of Au or Ag. In the latter case, the extraction of Cu is inhibited to a remarkable extent. The test must be modified to eliminate these shades, in the manners previously described.

(g) *Brown yellow or golden yellow* is due generally to Au and Ag, in appreciable concentrations (e.g. 10 gammas or so) and does not mean absence of Cu. The first globules of CCl_4 containing Au or Ag dithizonates seem to be slightly tinged with red as they settle from the suspension produced by the shaking, whereupon the reddish tinge disappears. These shades are different from the yellow produced by ferric iron in hot solutions and from the yellow under "h".

(h) *Canary-Yellow*, appearing rapidly, is caused by oxidizing agents, chiefly Cl_2 , and invalidates the test.

(i) *Orange* may be due to Hg or to combinations described under "e". It may be due also to Bi, in vicinity of pH3.

(j) *Cherry-red* means an error in the pH control (not uncommon in handling highly calcareous materials), and the appearance of Zn dithizonates, etc. in the CCl_4 . These colors

APPARATUS MATERIALS AND REAGENTS

(For 1000 tests or 4 man-weeks.)

Preparation of Sample

	Quantity
Braun Pulverizer*	1
Heavy steel plate, e.g. 2' x 2'	1
Heavy steel roller	1
Mortar, diamond, Plattner type*	1
Sieves, pure iron or plastic, 2 mm. openings	2*
Sieves, pure iron or plastic 150 or 200 mesh	2*
Spatulas, horn spoons, brushes, paper bags, heavy brown paper, glass jars, pencils, writing paper, gummed labels.	

Preparation of Test Solution

Balance, semi-quantitative, $\pm 0.01\text{g.}$ accuracy	1
Weights, 0.1 to 50g.	1
Scoop, aluminum, tared, with a counterpoise, 25 cm. ³ cap.	1
Beakers, Pyrex, 450cc. cap.	40
Watch glasses, to fit the beakers	40
Stirring rods, Pyrex	6
Test tubes, Vykro, 50 cm. ³ cap.	6
Volumetric flasks, Pyrex, glass-stoppered 100cc. cap.	20
Funnels, Pyrex, $2\frac{1}{2}$ - $3\frac{1}{2}$ inches diam.	20
Funnel racks, to fit 10 funnels	2
Filter paper, Whatman No. 1, pkgs. of 100	20 pkgs.
Filter paper, Whatman No. 42, pkgs. of 100	2
"Hydrion" pH indicator paper	6 rolls
Graduated cylinder, 1L cap., Pyrex	1
Graduated cylinder, 500cc. cap., Pyrex	1
Graduated cylinder, 250cc. cap., Pyrex	1
Graduated cylinder, 100cc. cap., Pyrex	2
Glass-stoppered bottles, "Winchester," $2\frac{1}{2}$ L cap.	4
Hot plate, electric; top area e.g. 2' x 1'	1
Hot plate, electric, small (for all-glass still)	1
Steam bath* to accommodate 20 beakers	1
Burners, Bunsen type, gravity fed, with accessories	2
Burners, Primus	2
Asbestos sheets and screens, e.g. 1' x 1'	8
Kerosene or other suitable fuel for burners	2 gallons
Methyl alcohol	1 qt.
Still, all-glass, Pyrex, complete, 2 - 4 L cap., incl. receiving flask	1

*Desirable but not critical.

generally disappear on addition of sufficient acid.

The off-shades and interferences here enumerated, as well as their combinations, can be eliminated by the appropriate use of NH_4F , NH_2OH , HCl, and KI, as described under "Testing."

(2) Acetate Solutions at pH5 - 6 - 7.

(a) *Cherry-red* may be due to Zn, Pb, Cd, Bi, Cu, Ti^+ , In and their combinations; various off-shades may be produced by Ag, Au, Hg, and possibly others; brownish off-shades may indicate sufficient Ni or Co to cause the interference.

If the extraction of test material is made at pH5⁺, with acetate solutions, neither iron nor Cl_2 interferences, described under "le" and "lh" are likely to be operative.

The uncontrolled cherry-red means simply presence of metals enumerated, singly or in combinations, and as such is not entirely devoid of value in the non-selective testing.

A preliminary extraction at pH3—will practically eliminate Cu, Ag, Au, Bi, Hg, and possibly some others, and limit the probable significance of the cherry-red to Zn, Cd, Pb, and Tl and of possible brownish off-shades to Ni and Co.

(b) *Cherry-red in the presence of added $\text{Na}_2\text{S}_2\text{O}_3$* indicates chiefly Zn and Cd. Cherry red persisting after a Na_2S wash is practically definitive for Zn.

(c) *Cherry-red in the presence of added KCN* means Pb and Ti^+ . Cherry-red persisting after further additions of KCN is practically definitive for Pb, although some Pb may be lost to the alkaline aqueous layer.

(d) *Reagent-green* means a practical absence of Zn, Pb, Cd, Bi, Cu, Tl, In, Ag, Au, Hg, and of large amounts of Ni and Co. This negative test is highly significant in the reconnaissance.

(3) Alkaline Solutions at pH8⁺.

Testing within this pH range is not rewarding because of the disturbing tautomeric shifts in the dithizonates, involved color and solubility effects, and extractability of the unused dithizone by the alkalis. The alkaline range is employed chiefly in unmasking traces of the colored dithizonates in CCl_4 , in the single-color variant of the test. It may be useful also in the separation of Ag enol-dithizonate (violet in the aqueous layer; insoluble in CCl_4), and in the detection of Pd. The latter application had not been developed.

	Quantity
Bottles, Pyrex, glass-stoppered, 2 L. cap.	6
Silica dishes, 25cc. cap.	4
Matches, soap, towels, rags	
Testing, Reagents, Analytical Grade	
Dithizone (diphenyl thio-carbazone)	10g.
Carbon tetrachloride	15L.
Hydrochloric acid	8 lbs.
Sulphuric acid	8 lbs.
Nitric acid	2 lbs.
Acetic acid	5 lbs.
Ammonium hydroxide (NH_3 gas in cylinder preferable)	10 lbs.
Ammonium fluoride	4 lbs.
Hydroxyl amine hydrochloride	2 lbs.
Potassium iodide	1 lb.
Sodium thiosulphate	2 lbs.
Potassium cyanide	2 lbs.
Sodium sulphide	$\frac{1}{2}$ lb.
"Hydrion" pH paper	6 rolls
Copper sulphate	25g.
Zinc sulphate	25g.
Lead nitrate	25g.
(For orientation: salts of metals, such as Fe, Bi, Tl, Cd, Au, Ag, Hg, Pd, Pt, Ni, Co, etc. a few grams each.)	
Testing, Additional Glassware and Apparatus	
Separatory funnels, 250cc. cap.	3
Separatory funnels, 500cc. cap.	1
Bottles, Pyrex, glass-stoppered, 1L. cap.	4
Bottles, Pyrex, glass-stoppered, 500cc. cap.	4
Bottles, Pyrex, glass-stoppered, 250cc. cap.	4
Burettes, Pyrex, glass-stoppered, 50 mls. cap.	2
Burette stands, with clamps	2
Test tubes, Pyrex, 25-35cc. cap.	48
Test tube racks, each for 12 test tubes	3
Cylinders, graduated in 1cc., Pyrex, glass-stoppered, 100cc. cap.	4
Cylinders, graduated in 1cc., Pyrex, glass-stoppered, 50cc. cap.	4
Beakers, Pyrex, 50cc. cap.	4
Beakers, Pyrex, 100cc. cap.	4
Beakers, Pyrex, 250cc. cap.	4
Beakers, Pyrex, 1000cc. cap.	2
(Gummed labels, paper, brushes for glassware, drying board, accessories, etc.)	

Semi-quantitative

Testing procedures outlined earlier in this section are sufficiently flexible to afford a semi-quantitative appraisal of the amounts of Cu, Zn, Pb (and possibly some others) present in the test solution. The appraisal done visually or by comparison with sets of standards, without any change in the proportions of the reagent and the test solution, permits a fairly reliable expression of the order of magnitudes encountered. Such order of accuracy of the indications is generally sufficient for the reconnaissance purposes.

A closer appraisal is possible in volumetric variants of the test.

A measured volume of the reagent in CCl_4 can be titrated with the test solution to an end-point previously established (e.g. 3 gammas of Cu or Zn, using 5 mls. of 0.001% dithizone). Or, if the metal-content of the test solution is within the suitable range, intensity of colors in the CCl_4 layer can be controlled by varying the volume of the reagent. The former method may yield reliably one significant figure; the latter is a mere expedient in a clearer delineation of the orders of magnitude.

Neither one of these can be taken as substitutes for the quantitative photometric determinations.

PREPARATION AND MAINTENANCE OF REAGENTS

Dithizone. Dilute solutions are made from a concentrated stock, e.g. 0.01%, in CCl_4 , in 250-500cc. lots, and are generally used-up before they deteriorate. The stock deteriorates slowly, if exposed to sunlight; elevated temperatures favour the deterioration. The solution should be stored in Pyrex glass-stoppered bottles, grease-free, protected from light, warmth, and contamination by dust.

Deterioration is recognized by appearance of a yellow oxidation product, soluble in CCl_4 but not in aqueous ammonia, or by appearance of yellow shades, instead of the normal green, in extremely dilute solutions of dithizone in CCl_4 .

The oxidized product may be tolerated as long as it does not interfere with the sensitivity of the test.

Mineral Acids. Any kind of water may be used in making up dilute acids intended for the copper tests, as long as the water is copper-free. Most city water supplies and some spring and stream waters, as well as rain water stored in concrete tanks fall into this category. Their relatively high zinc content (e.g. 200 gammas per liter) does not interfere with the test.

Most C.P. grade acids are copper-negative, when tested in twice the

amounts employed in the detection of Cu.

Contaminated lots should not be used, unless their purification by redistillation is feasible.

Both concentrated and dilute acids can be stored in almost any kind of glass without developing any noticeable copper blank.

Acids intended for the Pb-Zn work, however, should be made with redistilled Zn-free water. Zn blanks are common in many reagents and some Zn and Pb are contained in some kinds of soft glass. Dilute mineral acids, originally Zn-negative, can be stored in Pyrex glass successfully, without developing any Zn-Pb blanks, as long as they remained protected from dusts.

Acetate Buffers. Weakly acid to weakly alkaline acetate solutions present a serious difficulty, especially in reference to Zn. Both acetic acid and ammonium hydroxide generally were found to contain some Zn and the Zn blank tended to increase on storage of the acetate buffers, at pH 5.5 to 6, even in hard glass. The difficulty is minimized by storing aqueous acetate buffers over a layer of a strong solution of dithizone in CCl_4 , and also by making them sufficiently concentrated, e.g. 4N, to minimize the Zn blank by dilution.

Only redistilled Zn-free Pb-free water should be used.

Cyanide Solutions, made with redistilled water, develop a zinc blank on storage in many kinds of glass, including Pyrex. This does not interfere, however, with the purpose for which they are employed, as zinc does not react with dithizone in the presence of cyanide.

Solid Reagents. NH_4F , NH_2OH , KI , $\text{Na}_2\text{S}_2\text{O}_3$ (also KCN) are used as solid reagents, in the reconnaissance work. Since the exact amounts used are unimportant, within a very wide range of variation, this preference is justified by the simplicity of such use, as long as the reagents remain protected from contamination.

ACKNOWLEDGMENT

I am indebted to my colleagues in the Australian exploration, Messrs. W. Fenner, J. Treszise, W. Dallwitz, A. Debnam, and W. Symonds for their many helpful suggestions, in the preparation of this summary; to Mr. M. Mawby, Director of Exploration and Research, the Zinc Corporation, Ltd. and to Mr. C. J. Sullivan, Superintending Geologist, the Commonwealth Bureau of Mineral Resources, for their interest and support of the exploration; and to Professor A. Corwin and his colleagues in the Department of Chemistry, the Johns Hopkins University, for their review and criticism of the manuscript.

THE SUCCESS PRINCIPLE

By
L. W. STORM, '02
Geological Research Dept.
Sun Oil Co.
Denver, Colorado

Through all the intricacies and uncertainties of life and in the labyrinth of philosophies that have been devised to obtain some notion of reality, there is a practical short cut that we have to use while we are building safe and logical highways.

Events will not wait. We have to act without full knowledge and in our thinking, quick if there is little time, or more deliberate if time permits, we seek a practical plan—one that will succeed. It is based upon experience, upon what information we have, much or little. The test is: Will it work, will it save the situation, will it succeed? That is the practical short cut. It is the way of action.

In safe surroundings or in intervals of safety, there are those among us who try to reason these things out. Their thoughts take in a wider scope. They reason about the nature of truth, for example, or of beauty, or of what is good, about the subjective and the objective; and perhaps some of them find answers that the rest of us can use. But among these philosophers there are some who become impatient with this searching for the ultimate, that seems so often to arrive nowhere; and they look for practical answers. These are the realistic or pragmatic philosophers, so-called, of whom William James and John Dewey are perhaps the leading modern representatives. Their test again is: "Will it work? Will it succeed? They are concerned with what can be used in action, what is expedient. Some go so far as to assert that what is expedient; that which works out well, is true or right. It may be bandying with words. But, however that may be, these people say that the important thing is for a belief or a philosophy to work out in practice, to be successful; and practical people incline to agree with them.

Other thinkers, once classified among the philosophers, dealt with what was called "natural philosophy."

the farmer has more votes than the miner.

Colorado Mines Need Help

The mining industry of our State needs consideration and help in this emergency so that it can produce much needed metals and receive a fair price therefor. It needs consideration so that it will have sufficient labor, equipment and supplies. It needs help so that it can build mills to concentrate its metals at their source and thus reduce costs to the miner and release otherwise much needed trucks and freight cars.

If proper encouragement is given to our mining industry which has been the basic factor of Colorado's wealth, it can be of real assistance in the present emergency, besides being a real contributor to our State's future.

PERSONAL NOTES

(Continued from page 3)

being addressed Box 447, Abbeville, Louisiana.

Major Louis DeGoes, '48, was in Denver and Golden for Homecoming at Mines. He is on duty as student at Stanford University, residing at 2927 South Court, Palo Alto, California.

Steven S. Dettman, '31, Valuation Engineer, California State Board of Equalization, has a change of residence address

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readily available the list, but said many states were represented. Among those traveling the greatest distance was Albert H. Bradford, '09, president of the West Coast Refining company at Los Angeles.

HIGHLIGHTS ON MINING

(Continued from page 14)

ton, Telluride to Rico and beyond. I dare say that in the vicinity of any of these mining centers there are lead, zinc, silver and gold mines, ready to be developed and worked and to furnish metals which will be so badly needed for civilian and government production in our present emergency and our endeavors to prevent an *all-out war*, for that is what we must *NOW* prepare for.

To anyone who believes in free enterprise and individual initiative, any government subsidy is bad. Unfortunately subsidies have been accepted as a part of our economic system. But would subsidies not be more useful if applied to commodities that are becoming scarce, like some of the metals, rather than to those that are in tremendous oversupply, like potatoes, butter and eggs? The only argument in favor of the latter is that

This is now the domain of the chemist, the physicist, and the astronomer, and of others following them, such as the biologists, the anthropologists, psychologists and sociologists; all known as scientists. These all practice the pragmatic method to a greater or lesser degree. It is, in fact, almost an ideal with them. In this method, by inductive thinking, one arrives at a guess that seems to bring order and to explain the relation among his data. This guess is tested by deductive thinking. Its implications and corollaries are traced to their conclusions. Inconsistencies are found and changes are needed. New guesses are made and analyzed. Thus by observing, and speculating, by dreaming and imagination, by guesses, flashes of intuition and by hard, careful thinking and, very often, by including the thoughts of others, one may arrive at a conclusion so apparently sound that it seems worth special testing. Experiments are carried out; observations are made under critical conditions, and thus we may arrive at something that seems better than a guess. It is worth calling a theory or hypothesis. But still it may not be safe against further test. It is accepted unmodified only so long as it succeeds. We may cite an example from physical astronomy.

"Will light waves from a star be deflected in passing close to the sun as observed in a total or near total eclipse of the sun? If they are not so deflected then energy is not affected by gravity and has not the properties of mass that Prof. Einstein and others had assigned to it."

It was observed that the light was deflected about as much as had been predicted by the new theories. This helped to show that the fundamental theories grouped around the name of Isaac Newton and long accepted as close to ultimate truth, are only a part of the story.

Such a proof may be conclusive or may leave possibilities that it is incomplete or for only a limited set of circumstances or does not exclude conditions other than those assumed. Further verification may be needed.

But at any rate, this is the scientific method of feeling a way out into the unknown, of learning the ways of nature, or of society, or of finance, or of psychology. The knowledge may be empirical, not final, but it is useful to those seeking practical results.

The method may be applied in such a field as ethics. In a recent book "Out of My Later Years" by Albert Einstein, he says "Ethical directives can be made rational and coherent by logical thinking and empirical knowledge. If we agree on some funda-

mental ethical propositions, other ethical propositions can be derived from them, provided that the original premises are stated with sufficient precision. Such ethical premises play a similar role in ethics, to that played by axioms in mathematics." Later on he says "Ethical axioms are found and tested not very differently from the axioms of science. Truth is what stands the test of experience." That is to say, if a principle of ethics actually works out beneficially, and does not lead to injustice or other harm, it is true for all practical purposes. And ethics is certainly a practical thing.

But the Success Principle is not limited in its application to philosophy and science. It applies in all the affairs of life. In fact that is where its application began. We may quote Prof. Einstein again from the book cited above. "The whole of science" he says "is nothing more than a refinement of every day thinking."

The ordinary man, seeking to keep alive, the practical man in dealing with nature; about which, fundamentally, he knows nothing, uses the pragmatic method. Surrounded by mysteries on all sides he does the thing which, by experience, he believes will succeed. In a new situation he proceeds with caution, looking first and listening, tasting a little of the unknown fruit or nut, venturing a little out of hiding to see if the monster will attack, testing and drawing back.

It is the way of animals too, trial and error, possibly a thousand errors—if not fatal—till the successful trial is made; with the element of thought or the help of memory less and less as we go lower in the scale of intelligence. The successful trial results in escape from the difficulty. It is effective for that one occasion at least. With a modicum of memory and after many or few repetitions of the successful trial, a habit may develop or a knowledge of what to do in the circumstance if it is encountered again. Thus we and our friends of the fields and woods feel a way through the unknown dangers of our environment.

We learn to adjust to the ways of nature or of our fellowmen. We learn; and the more intelligent of our fellow creatures learn. On a lower level there is less of learning, but instincts are developed that determine conduct. The instinct that succeeds preserves its owner. It is retained, inherited and strengthened, while violation of the instinct or a lack of it may lead to death.

This brings us to the fundamental domain or field of the success principle

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MINES HOMECOMING

(Continued from page 13)

ful October weather. The half-time schedule featured the introduction of the queen and her attendants, presentation of decoration trophies, and the much feted Sig Gam-Theta Tau burro race in which Theta Tau was the victor.

Eddie J. Brook, '23, Fort Worth, president of the McElroy Ranch company, was honored by the Athletic Association with a certificate in appreciation of services rendered to Mines' athletics. Dr. Vanderwilt made the presentation.

All social fraternities held open house and buffet suppers after the game.

Closing out the two-day festival was the traditional Mines' Homecoming dance, held in Guggenheim ballroom, sponsored by the "M" club. More than three hundred couples danced to the melodies of Rolly Robert's orchestra. Blue Key pledges were presented during the dance and the winning ticket for a LeRoy lettering set was drawn by Robert Fitch, geophysics senior, in the Tau Beta Pi-sponsored raffle.

Blue Key members who conducted registration of Alumni do not have

FLOTATION AND CYANIDATION TESTS ON A GOLD-COPPER SULFIDE ORE FROM COOKE, MONTANA

Continued from September, 1950

NEW METHODS

Preliminary Cyanidation Tests

Several preliminary cyanidation tests were made during the present investigation to determine if the consumption of cyanide could be reduced to a reasonable amount and to discover the cause of the previous excessive consumption. Results of these tests were unsatisfactory, but it was found that 90 percent of the gold could be extracted by cyaniding the ore for only 16 hours after grinding to minus 100-mesh. Cyanide consumption was 12.7 pounds per ton of ore. Longer periods of cyanidation did not give lower-grade residues and consumed more cyanide. The cyanide consumption was caused by continued oxidation of the sulfides in the ore. Replacement of pregnant solution with fresh solution at intervals during treatment did not help to decrease cyanide consumption. Although superior to results of a test mentioned in the report of Project 270, excessive consumption of cyanide still occurred. As analyses of test products showed considerable solution of copper during cyanidation, it seemed evident that any improvement in cyanidation treatment would involve removal of the copper minerals to as great an extent as possible by flotation before cyanidation.

Flotation of Copper

Tests to study the flotation of copper from the ore were made. Standard flotation procedure with lime to depress the pyrite, potassium ethyl xanthate as collector reagent, and cresylic acid for frother gave good results. No cyanide was used in flotation, although such use had been reported under Project 270 and was presumably an additional depressant for pyrite. However, the use of 0.25 pound of sodium silicate per ton of ore as a conditioning reagent in the rougher flotation circuit appeared to give cleaner froths. Very little xanthate was required, and by adding this reagent in increments of 0.01 to 0.03 pound per ton of ore, good selection of copper mineral was obtained. A limit of about 0.15 percent copper in the flotation tailings was noted re-

gardless of rougher concentrate grade, this amount of copper being lost when rougher concentrates contained 4.6 to as much as 16.2 percent copper.

Apparently the use of more than 0.04 pound of xanthate per ton of ore resulted only in flotation of more pyrite. Copper recovery in rougher concentrates was approximately 90 percent. Simple cleaning in one stage without additional reagents produced concentrates carrying 19.8 to 25.3 percent copper, representing from 82.7 to 81.6 percent recovery. When rougher concentrates from several batch tests were combined for cleaning in one stage, better results were obtained; for example, concentrates contained 21.51 percent copper, with 86.4 percent recovery. Two-stage cleaning of the copper rougher concentrates without additional reagents produced final concentrates containing 27.93 percent copper, representing 80.6 percent recovery. By close regulation of the addition of xanthate in plant operation, together with normal countercurrent cleaning in the copper flotation circuit it should not be difficult to produce high-grade copper concentrates with at least 85 percent recovery from this ore. The copper concentrates would amount to about 4 percent of the original weight of ore.

Flotation of Gold with Copper

The copper concentrates mentioned in the preceding paragraph that contained 21.51 percent copper and represented 86.4 percent recovery were typical of those obtained in several similar tests in which the copper rougher concentrates were cleaned once. These concentrates carried 3.29 ounces of gold per ton and 9.40 ounces of silver, representing 62.7 percent recovery of gold and 61.2 percent recovery of silver.

It was reported under Project 270 that when 86.3 percent of the copper was recovered in concentrates carrying 17.00 percent copper, 81.1 percent of the gold and 58.2 percent of the silver also were recovered, the concentrates assaying 3.02 ounces gold and 6.00 ounces silver per ton. It was concluded at that time "that the highest net return per ton of ore treated probably can be realized by treatment

of this ore by selective flotation for production of a copper-gold concentrate for marketing at a smelter.

Although in the tests made on the present ore sample a similar recovery of copper was made, it was evident that a considerable portion of the gold did not occur with the copper minerals. It was observed in the present work that whenever a low-grade copper rougher concentrate was produced, gold recovery increased; but the material, mostly pyrite, that was dropped in cleaning the rougher concentrate carried considerable gold and little copper. This was believed to indicate that although more than half of the gold probably was contained in the copper mineral, the remainder was contained in the portion of the pyrite that floated quite readily. Consequently, tests were made to produce two concentrates, the first carrying as much copper as possible while maintaining a good grade of copper, and the second to recover as much of the remaining gold as possible without floating all the pyrite.

"Scavenger" Flotation of Gold

In normal plant operation of the copper flotation circuit, the material produced as cleaner tailings in laboratory tests would be retained in the circuit during countercurrent cleaning and would continually be distributed between the final cleaner concentrates and the copper circuit tailings. These cleaner tailings consisted for the most part of the more readily floatable pyrite and carried considerable gold but little copper, as previously mentioned.

By adding 0.04 to 0.08 pound of xanthate and no additional frother reagent to the copper circuit tailings, a "scavenger" concentrate was produced as a dull brassy froth. When more xanthate was added, the froth took on a brighter silvery appearance caused by the flotation of the remaining pyrite. This latter pyrite contained very little gold, and after several tests had been made to study optimum conditions only enough xanthate was used to float the dull pyritic mineral. The "scavenger" concentrate thus made amounted to about one-third of the weight of the ore. As about half of the original ore was pyrite, it would ap-

pear that at least one-third of the total pyrite was nearly barren of gold.

About 40 percent of the total gold was contained in the scavenger concentrates when high-grade copper concentrates were made by two-stage cleaning, and about 30 percent when copper concentrates carrying about 21 percent copper were made. The gold content of the "scavenger" concentrates varied from 0.25 to 0.12 ounce per ton of concentrates and the copper content from 0.4 to 0.1 percent. In one test, an attempt was made to clean the scavenger concentrates, and a small amount of cleaner concentrates containing 2.25 ounces gold and 4.50 ounces silver per ton with 5.62 percent copper was produced.

However, the cleaner tailings from this operation still contained about half the total gold in the original "scavenger" rougher concentrates. It was also attempted to produce a smaller amount of "scavenger" concentrates by using less xanthate. This effort resulted in production of primary and secondary concentrates, the latter containing 0.08 ounce gold per ton, which was too much to discard. It is possible that by very close control of reagents in plant operation, a smaller amount of higher-grade "scavenger" concentrates could be produced without materially sacrificing gold recovery; say, 25 percent of the original weight of ore instead of 30 to 35 percent, as done in the laboratory tests.

The "scavenger" concentrates produced in a typical laboratory test contained 0.17 ounce gold per ton, 0.42 ounce silver, and 0.23 percent copper, representing 29.4 percent of the total gold in the ore, 32.0 percent of the silver, and 8.1 percent of the copper in 35.9 percent of the original weight of ore.

The corresponding copper concentrates in the same test carried 20.57 percent copper, 3.13 ounces gold, and 9.06 ounces silver per ton, representing 85.4 percent of the total copper in the ore, 64.7 percent of the gold, and 64.0 percent of the silver in 4.2 percent of the original weight of ore.

The final flotation tailings contained 0.11 percent copper, 0.03 ounce gold, and 0.04 ounce silver per ton, representing losses of 6.5 percent of the total copper in the ore, 5.9 percent of the gold, and 4.0 percent of the silver.

CYANIDATION OF FLOTATION PRODUCTS

Cyanidation of Copper Flotation Tailings

As described under "Flotation of Copper," concentrates containing 86.4 percent of the copper, 62.7 percent of

the gold, and 61.2 percent of the silver were made by 1-stage cleaning. The cleaner tailings from this operation were then returned to the rougher tails. This combined material contained 0.15 percent copper, 0.085 ounce gold, and 0.26 ounce silver per ton and comprised 95.8 percent of the original weight of ore. This pulp had a pH of 7.2 and contained about 20 percent solids. It was settled and decanted, corresponding to the recovery of water from the flotation tailings, which is normal practice in many plants. The thickened pulp was then diluted with fresh water, a step corresponding to the re-use of barren solution in standard cyanidation practice. Lime and cyanide were added, and the pulp was agitated for 4 hours. The pregnant solution was recovered and the pulp washed. Both pregnant and wash solutions were assayed for gold, silver, and copper, and were also tested for lime and cyanide consumption.

The washed residue was assayed for gold, silver, and copper. The assays showed that an additional 28.5 percent of the gold and 35.8 percent of the silver in the original ore had been extracted by cyanidation, bringing total gold recovery to 91.2 percent and silver to 97.0 percent. Of the copper in the cyanide feed, about 40 percent had been dissolved during cyanidation, leaving 0.09 percent copper in the residue.

Consumption of cyanide in this test was 4.7 pounds per ton of original ore, and the lime consumption was 1.4 pounds in addition to the 2.5 pounds used in the flotation circuit. In similar tests, cyanide consumptions of 4.7 to 5.5 pounds per ton of ore were obtained, so it is probable that in plant practice about 5 pounds of cyanide would be required. This consumption of cyanide is still high but would show a profit under usual plant operating conditions while treating the type of ore tested, in which a considerable portion of the gold was not recovered with the copper during flotation of the latter metal.

Tests also were made to reduce the time of agitation with cyanide to less than 4 hours, but results were unsatisfactory.

Cyanidation of "Scavenger" Concentrates

In the manner as described under "Flotation of Copper," concentrates containing 85.4 percent of the copper, 64.7 percent of the gold, and 64.0 percent of the silver were made by 1-stage cleaning. The rougher tailings from this operation were treated to produce "scavenger" concentrates as described under "Scavenger Flotation

of Gold." These concentrates were combined with the cleaner tailings from the copper flotation, the combined product containing 29.4 percent of the gold in the original ore, 32.0 percent of the silver, and 8.1 percent of the copper in 35.9 percent of the weight of the original ore. This product carried 0.17 ounce gold per ton, 0.42 ounce silver, and 0.23 percent copper. The final flotation tailings assayed 0.03 ounce gold per ton, 0.04 ounce silver, and 0.11 percent copper.

The combined "scavenger" concentrates and copper cleaner tailings were dewatered and ground in a laboratory pebble mill to pass a 400-mesh screen. Apparently, considerable oxidation occurred during grinding, as the pulp had a pH of 5.9 when discharged from the mill. The ground pulp was diluted during removal from the pebble mill and washed by decantation. Fresh water was used for cyanidation, corresponding to the use of barren solution in plant practice. Lime and cyanide were added, and the pulp was agitated for 4 hours. 88 percent of the gold and 92 percent of the silver in the pulp were extracted, corresponding to 25.9 percent of the total gold in the ore and 29.6 percent of the total silver. These extractions, together with the precious-metal values recovered in the copper flotation concentrates, indicated over-all recoveries of 90.6 percent of the total gold and 93.6 percent of the total silver.

Cyanide consumption during treatment of the "scavenger" concentrates was 2.5 pounds per ton of original ore and 0.6 pound lime.

The cyanide residue assayed 0.02 ounce gold per ton and 0.04 ounce silver and carried 0.05 percent copper. Apparently, most of the cyanide consumption during this treatment was due to solution of copper from the reground "scavenger" concentrates. Washing the product after grinding removed most of the iron and copper salts formed by oxidation during grinding which otherwise would also have consumed cyanide.

RESUME OF RESULTS

Grinding the ore to minus 100-mesh gave satisfactory liberation of the minerals.

Standard flotation procedure with potassium ethyl xanthate, cresylic acid, and lime produced good-grade copper concentrates with over 85 percent recovery of copper and about 60 percent recoveries of gold and silver. This step was employed in two methods of treatment developed during laboratory testing.

Following flotation of copper in the first method of treatment, the com-

bined flotation cleaner and rougher tailings, amounting to 96 percent of the ore, were cyanided for 4 hours, with resulting further recovery of about 30 percent of the gold and silver, giving total recoveries of about 90 percent of the gold and silver. Cyanide consumption during this treatment was 5 pounds per ton of ore.

In the second method of treatment, copper was recovered by flotation in the same manner. This step was followed by flotation of "scavenger" concentrates amounting to about 35 percent of the original ore. More xanthate was used for this purpose. The "scavenger" concentrates were re-ground to pass a 400-mesh screen, washed, and then cyanided for 4 hours. This treatment yielded substantially the same over-all recoveries of gold and silver as the first method. Cyanide consumption was 2.5 pounds per ton of ore. The advantages of this method of treatment are the reduction in amount of material to be cyanided from about 96 percent of the ore to about 35 percent together with reduction in cyanide consumption. Offsetting these advantages are the cost of additional flotation treatment and cost of regrinding and washing the "scavenger" concentrates.

Economic considerations together with plant capacity and equipment must determine which of these treatment methods is preferable.

The test work had demonstrated that the present ore contains gold and silver associated only in part with the copper sulfides, and that the remaining precious-metal values occur in pyrite. Also, part of the pyrite is nearly barren of precious-metal values. "Scavenger" flotation of only the readily floated pyrite recovers satisfactory amounts of gold and silver.

Reduction of agitation time during cyanidation to 4 hours showed satisfactory extraction of gold and silver, indicating that much of the excessive cyanide consumption was due to oxidation of the sulfides while being treated.

Cyanide consumption was reduced to about 5 pounds per ton of ore during treatment of the entire copper flotation tailings and to 2.5 pounds per ton of ore during treatment of the re-ground and washed "scavenger" concentrates.

THE SUCCESS PRINCIPLE

(Continued from page 23)

ple. Capacities, abilities, instincts, physical form, which lead to success, that is to preservation of life and to reproduction are preserved by inheritance. The success principle is the basis

of natural selection. It determines survival of the individual and of his species.

For the principle itself to apply it appears that there must be a possibility of selection, and for a preservation of the successful idea, or maxim, or method, or way of life, or trait, or capacity, or physical feature, either by intelligent choice, or less intelligent acceptance through trial and error, or by natural selection, where that which we call intelligence does not apply at all—or does it? The selection is by an automatic basic something that acts like intelligence and may even be of the ultimate nature of intelligence.

This "something" is like intelligence operating without mind, merely because like reproduces like as a general rule in living things; but with exceptions, mutations, that also tend to be preserved. These changes may fit the creature better to its environment or help it to succeed in the competition for existence. By this simple operation it would seem that every possibility of life has been utilized by some creature large or microscopic, independent or parasitic with a variety and completeness which are like the work of an intelligence utterly minute in its operation and ingenious beyond all comprehension.

Is the principle even more fundamental and universal in its application? Does it apply to inanimate things which do not reason, nor remember, nor reproduce their like? Perhaps some analogy can be carried further but it would be strained and hardly satisfactory. To choose that which works properly and discard what does not fit seems a possibility that was brought along when life came into the cosmos.

Here is a thought to take with you—anyone who is not quite satisfied with himself or with what he has done. Everything that lives now is the result of success. Success, not failure, is your background. You are the present link in an unbroken chain of success that leads back at least to the beginning of life on earth.

PERSONAL NOTES

(Continued from page 22)

to 58-37th Way, Sacramento 19, California.

V. L. Easterwood, '49, has mailing address of Box 577, Douglas, Wyoming, in care of Phillips Petroleum Company.

Ralph G. Ehret, '33, Partner in Ehret Engraving Company, resides at 2980 So. Marion Street, Englewood, Colorado, where he receives mail.

R. B. Fischer, '42, is addressed at his home, 1175 King Avenue, Columbus 12, Ohio. He is Assistant Supervisor, Metallurgical Research, Battelle Memorial Institute.

Melih I. Genca, '50, is attending the University of Oklahoma, for graduate study in petroleum engineering. His address is 726 Asp Street, Norman, Oklahoma.

Lester S. Grant, '99, accompanied by Mrs. Grant, stopped over in Denver for a few days the middle of last month en route home from a trip through the Canadian Rockies and a visit with their son in Seattle. His mailing address is Box 912, Midland, Texas.

Donald C. Gregg, '22, Instructor in Geology at Mines, has moved his residence to 960 Lamar Street, Denver 14, Colorado.

Stanley C. Haney, '37, was on vacation last month from his duties as Process Engineer, Sinclair Refining Company, and called at the Alumni office. His home and mailing address is 400 East Sibley Boulevard, Harvey, Illinois.

J. E. Hawkins, D. Engr. '40 Vice President Seismograph Service Corporation, has moved his residence from Tulsa to R. R. No. 1, Broken Arrow, Okla.

Masami Hayashi, '48, resides at 2860 Humboldt Street, where he is addressed. He is serving as Topographical Engineer for U. S. Geological Survey.

George E. Hulpiau, '49, Engineer for Sinclair Refining Company, is addressed 1415 Gallup Street, Rawlins, Wyoming.

M. C. Irani, M.Sc. '42, accompanied by his wife and young son has returned to Denver from Bombay, India, and is now at home at 445 So. Ivy Street.

Edward L. Karn, Jr., '50, is, at present, being addressed in care of The Texas Company, Box 828, Thermopolis, Wyoming.

Robert E. McMinn, '49, has been transferred from Casper, Wyoming to Kansas City, Mo., by Black-Sivalls & Bryson, for whom he is serving as Sales Engineer. He is residing at Independence, Missouri, 128 West Sea Street.

Major Charles E. Michaels, '35, has a new residence address in Schenectady, N. Y., 1306 Glenwood Boulevard.

Donald T. Moore, '50, has been awarded a regional scholarship to Harvard University's graduate school of Business Administration where he is now in attendance. His mailing address is Chase Hall D-23, Harvard Business School, Soldiers Field, Boston 63, Mass.

Forty-nine such awards were made, the entering class being from 40 different colleges and universities and 26 states

(Continued on page 42)

Christmas Mail

Christmas cards for Denver delivery should be mailed in sufficient time to permit processing and delivery preferably not later than December 18, 1950. The rate of postage on first-class mail is 3¢ per ounce or fraction thereof. The rate of postage for unsealed Christmas cards—with no writing enclosed—is now 2¢. Use of this class of postage does not give your card forwarding or return service. Cards mailed under the 2¢ rate are considered circulars and are not returnable. Forwarding and return service is applicable only to first-class mail. To avoid the last minute crowds, purchase postage stamps and postal supplies that you will need for Christmas mailing now.

WITH THE Manufacturers

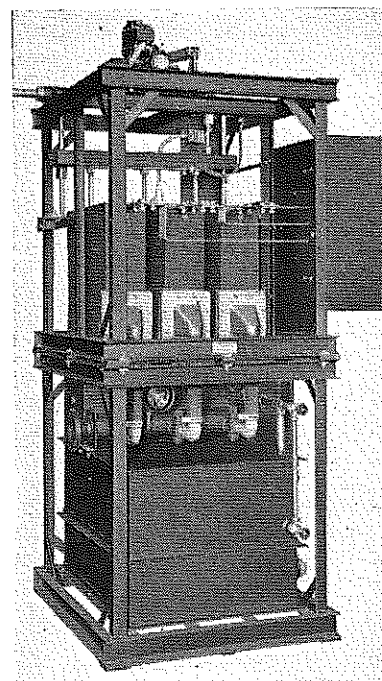
Equipment News

In these columns the latest in equipment of interest to our readers is reviewed. Many readers request additional information and prices. For their convenience each article is numbered. Fill in the number on the coupon at the bottom of the page and mail your request to Mines Magazine, checking information requested.

Liquid Rheostat Provides Stepless, Wide Range Speed Control (775)

Allis-Chalmers liquid rheostat—Type 257—provides economical, smooth, accurate and wide range speed control of wound rotor motors.

The rheostat is being used for speed regulation in applications where there is a definite speed versus load characteristic. It is particularly suitable on drives which require stepless and precise control. Such applications include induced and forced draft fan drives, centrifugal pumps, and blower and compressor drives. It is also well suited for load absorption and motor starting applications.



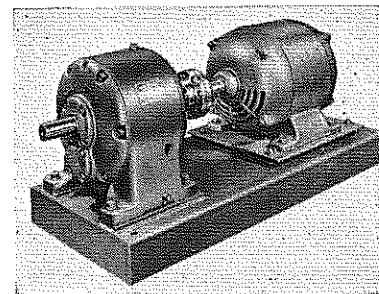
In operation, the electrolyte enters the cell through the insulating tube. After it has filled the cell to the level of the weir, it continues to discharge into the reservoir directly beneath the cell. From the reservoir it passes into a heat exchanger, through the pump, and back into the header, repeating the cycle.

With the weir in its lowest position, the length of the current path through the electrolyte is the longest, giving maximum resistance. When the weir is raised, the liquid level will also rise, always keeping the neutral electrode covered, and the length of conducting path will be gradually decreased, until the electrodes intermesh at the upper limit to give minimum resistance.

Complete information concerning Allis-Chalmers latest type liquid rheostat is carried in a new bulletin released by the company—14S7544. Copies of this bulletin are available upon request from Allis-Chalmers Mfg. Co., 982 S. 70th St., Milwaukee, Wis.

Motogear Drives Announced (776)

Link-Belt Company announces that it has developed a new packaged power unit, called Link-Belt Motogear, consisting



of a compact, enclosed helical gear drive with separate standard motor, flexibly coupled and mounted on one welded steel base plate.

A movable plate between motor feet and welded base plate provides for convenient adjustment, should shaft realignment be necessary for any reason.

Link-Belt Motogears are built in a variety of sizes, in double or triple reductions, and in a wide range of ratios and horse powers.

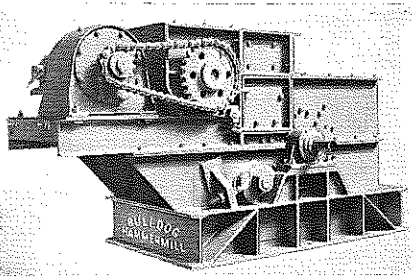
The Helical Gear Drive used on Motogears is like that employed in the corresponding Link-Belt Gearmotor but on the Motogear the motor is coupled to input shaft and mounted on a base plate instead of being integrally secured to side of drive.

The Helical Gear Drive is also available as a separate self-contained unit without the motor.

Complete information on Gearmotors, Motogears and separate Helical Gear Drives, 1 to 75 H.P., is given in a new 16-page Link-Belt Book No. 2247, which may be obtained from Link-Belt Company, 307 N. Michigan Avenue, Chicago 1, Illinois.

New Moving Breaker Plate Non-Clog Hammermill (777)

C. M. Bindner, President, Hammermills, Inc., div. of Pettibone Mulliken Corp., Chicago, Ill., has just announced the completion of new designs and improvements for the 1951 line of Bulldog



<input type="checkbox"/> MINES MAGAZINE, <input type="checkbox"/> 734 Cooper Building, <input type="checkbox"/> Denver, Colorado		Referring to Equipment News, please send as checked: No. _____ Prices <input type="checkbox"/> Bulletins <input type="checkbox"/> No. _____ Prices <input type="checkbox"/> Bulletins <input type="checkbox"/> No. _____ Prices <input type="checkbox"/> Bulletins <input type="checkbox"/> No. _____ Prices <input type="checkbox"/> Bulletins <input type="checkbox"/> Name _____ Position _____ Company _____ Street _____	
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Moving Breaker Plate Hammermills for crushing sticky or high moisture materials.

Through the facilities of the Pettibone Mulliken Corp. Laboratories and manganese steel foundry, special analysis steels are used in construction for greater resistance to excessive wear and abrasion. Hammers, liners, breaker plates and grate bars will wear longer, thus reducing maintenance costs with the new machines.

For complete details write to Hammermills, Inc., div. of Pettibone Mulliken Corp., 4703 W. Division St., Chicago 51, Ill.

New Balphot Metallograph (778)

Metallographs are widely used in the microscopic examination of metals to determine many important characteristics such as the crystalline structure, composition, grain size, and non-metallic inclusion content. These precision optical instruments are one of the metallurgist's most useful tools in research, production and quality control work.



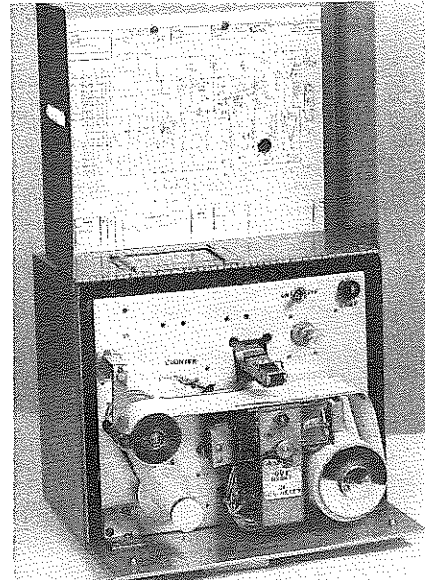
The Bausch & Lomb Balphot Metallograph permits normal examination and photography with its inverted microscope and camera. An important new feature is the Magna-Viewer Projection Screen which eliminates the fatigue of prolonged eyepiece observation and also makes it possible for several persons to view a structure at the same time.

The Balphot Metallograph includes equipment for bright field, dark field, and polarized light; metallographic phase contrast accessories can also be accommodated. Operation is convenient, fast, and does not require specialized training outside of that possessed by any metallurgist of average experience in his field.

Full information covering the Balphot Metallograph may be obtained by writing to Bausch & Lomb, Rochester 2, New York, for Catalog E-232.

The Spinlab Model 102 Printing Timer (779)

The Spinlab Printing Timer is a mechanical instrument for precise time recording. It is highly versatile in application; adaptable to meet requirements



which may arise in interval or accumulative timing or counting problems.

The double coding feature operated from separate electric impulses allows accumulation of coded data from as many as 120 different categories.

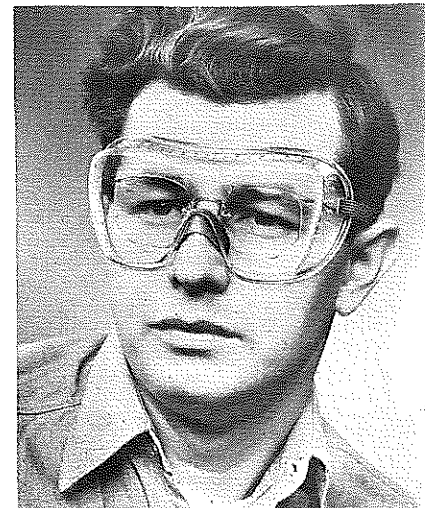
This Timer is ideally suited to monitor many industrial processes. With the coding features of the equipment it is possible to "spot check" a great number of individual machines or operations.

Your inquiries concerning this precision equipment are invited. Write to Special Instruments Laboratory, Inc., 1003 Highland Avenue, Knoxville, Tennessee.

New One-Piece Safety Goggle (780)

A new one-piece, one ounce all plastic safety goggle designed to fit all faces is announced by American Optical Company, Southbridge, Mass.

Made of impact resisting plastic, this one-piece goggle is "optically correct." It affords exceptional wide angle vision and



can be worn over most standard types of personal glasses and most prescription spectacles and goggles.

Other features are a comfortable plastic nose-piece, many perforations to minimize

fogging and provide adequate ventilation, non-inflammable plastic construction, and four point contact with face by means of rolled edges for greater comfort.

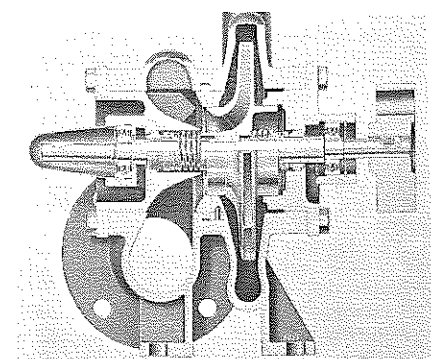
This new goggle is recommended for protection against foreign particles striking from any direction on the following types of work: babbling, chipping, cutting rivets, grinding, hand-tool operations, machine operations, spike driving and similar operations.

Write to manufacturer for complete information.

New Centrifugal Pump (781)

The outstanding feature of the new De Laval GS pump is that it is designed to fit the idea of a Service and Exchange Plan. All parts of the GS pump except the bare pump casing are contained in one easily replaceable rotor assembly. This means that when maintenance does become necessary, you simply remove the top cover and end plate studs, remove the old rotor assembly and drop a new one in place. The old one is then returned for credit on serviceable parts.

Other features of the pump include: Pre-lubricated bearings
Mechanical seals
Stainless steel shaft
Horizontally split cast iron casing
Arrangement for clockwise or counter-clockwise rotation
Interchangeable end covers, shafts, shaft seals and bearings between all sizes of pumps



The GS pump is built in three sizes from 2-1/2" to 4" for capacities to 400 gpm and heads to 230'.

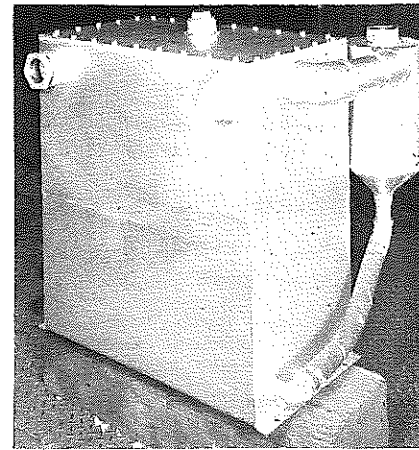
Write to De Laval Steam Turbine Company, Advertising Department, Trenton 2, New Jersey, for Bulletin No. 1001 giving complete detailed information.

Ruth Diesel Engine Exhaust Gas Conditioner (782)

The conditioner operates by the air lift principle, the column of liquid with the exhaust discharging through the tubes into it being lighter than the column without. This unbalance of the two columns causes circulation of the conditioner liquid.

The circulation is rapid and violent, which gives the exhaust high liquid gas contact which is necessary for the absorption of the aldehydes, which are water soluble in all proportions. The circulation is effected at the expense of engine back-pressure and consumes about one percent of the engine horsepower. This conditioner is designed to use less than one and one-half inches of mercury back-pressure.

The water level is determined by the overflow plug in the front of the conditioner. When filled with cold water the hot exhaust will expand the water and the surplus will discharge from the tank and reach the correct level corresponding



with the work that the diesel engine is doing.

Above the water level is a stainless steel tray which holds briquets to strip out the mechanically entrained water from the exhaust and permit the gases to expand in the interstices of the briquets, exposing a relatively large surface of conditioner liquid to the exhaust gas and neutralize the acids and the aldehydes that have been absorbed by the liquid. The tray of chemical briquets will last several months. The water of the conditioner normally has a pH of 3 without the briquets and about 6 with the briquets which is approximately neutral.

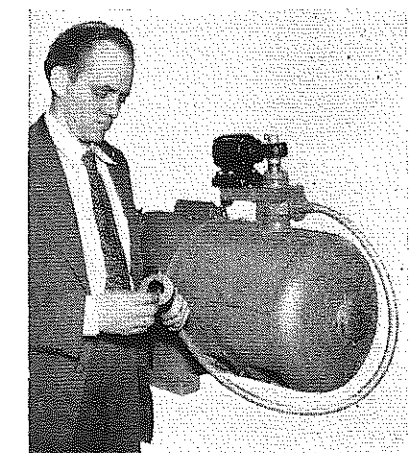
The exhaust pipe issuing from the conditioner can be discharged directly into the mine atmosphere but by the use of a cyclone separator, furnished with the conditioner, much of the condensate can be returned. In some cases, two cyclone separators are found advisable, one on either side, which reduces the velocity of the exhaust as it issues from the conditioner by one-half. This precludes mechanically entrained water from discharging from the conditioner even under continuous heavy loads.

Write to THE RUTH COMPANY, Denver, Colo., for recommendations.

G-E ACA Motor Now Available With Preset Speed Device (783)

The General Electric ACA motor (a-c adjustable-speed) is now available with a mechanical follow-up control for achieving a fixed preset speed without the use of expensive control equipment, it was announced recently by the G-E Small and Medium Motor Divisions.

According to the company's engineers, the new device enables a predetermined speed to be set manually by a knob either directly on the ACA motor or at the end of a flexible cable 10 or 15 ft. away. The



speed adjustment can be made while the motor is at a standstill or while it is running.

Speed control of the ACA motor, the engineers explained, is obtained by rotating brushes around the commutator. Since speed is a function of brush position, any device that will automatically bring the brushes to an adjustable predetermined position on successive starts will serve the desired purpose of establishing preset speed operation. This is now compactly and conveniently provided in the preset speed device, they said.

In operation, the new mechanism actuates a pilot motor which drives the brushes to a position corresponding to the setting of the speed adjustment knob. A stop or automatic slow-down returns the brushes to the lowest speed position without disturbing the original setting. When the ACA motor is restarted, the brushes again come back to the preselected speed without any attention from the operator. Accelerating time is dependent upon pilot motor speed.

According to G-E engineers, preset speed operation is an advantage in practically any adjustable-speed drive. Some of the applications for the ACA motor with the new device are on offset printing presses, can-sealing machines, planer-feed-roll drives, conveyor drives, ball mills, small rolling mills, mixers, punch presses, fan drives, and others, they said.

New Respiration-Goggle (784)

American Optical Company, Southbridge, Mass., announces that it has combined its popular No. 700 Rubber Frame Goggle and R2000 Respirator—fastened with either snap or rivet—to provide respirator-goggle protection in one handy unit.



This respirator-goggle combination is recommended for protection against chemical splashes, spray, light impact of foreign particles and exposures to fine dusts.

The R2000 Respirator protects against a variety of dusts or gases by means of specific cartridges or disc filters; has a face mask of pliable rubber providing universal, comfortable fit for fatigue-free wear over long periods. The inhalation valve admits air freely at the lightest intake of breath, seals easily on exhalation.

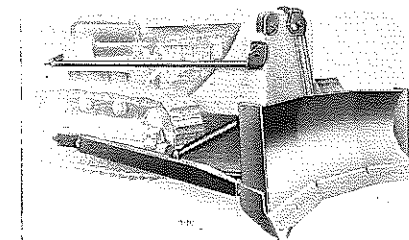
The No. 700 Goggle has a frame molded from non-irritating, acid-resistant, synthetic rubber giving an airtight fit against acid and dust. Ventilation is indirect to keep acid and dust from eyes. The shatter-resistant, easily replaceable acetate lens provides exceptional wide-angle vision.

For further information write to American Optical Co.

A New Bulldozer (785)

A new, large capacity, U-shaped bulldozer, designed for universal use in a variety of earthmoving applications with the Caterpillar Diesel D8 track-type Tractor, has been added to the heavy earthmoving equipment line of Caterpillar Tractor Co., Peoria 8, Ill.

Designated as the No. 8U, the new bulldozer is similar to the standard Caterpillar 8S Bulldozer except for the U-shaped blade which necessitates longer push arms. The complete unit is cable-controlled and consists of blade, push arms, trunnions, cable, sheaves, and sheave brackets.



Cutting width of the blade is 11 feet, 11 inches, and it is 45 1/4 inches high. Maximum lift above ground at the center point of the blade is 47 1/2 inches, and 54 3/4 inches at the end points. The limit of blade pitch adjustment is 10 degrees, and the maximum blade tilting adjustment is 16 inches.

The No. 8U Bulldozer has a box-type moldboard construction, one-inch steel cutting edge, and heat-treated carbon steel end bits. It may be operated with the Caterpillar No. 24 Front Single Drum Cable Control or the No. 25 Rear Double Drum Cable Control. Write Caterpillar Tractor Co. for full specifications.

New Line of Room Conveyors (786)

The Joy Manufacturing Company, Henry W. Oliver Building, Pittsburgh 22, Pa., announces a new line of room conveyors of the chain-and-flight type. Three models are available, the 12-FA, the 15-FA, and the 20-FA. In each case the model number indicates the pan width.

An entirely new drive design is said to offer many advantages to the user. The conventional herringbone reducer has been replaced by a helical and spur reducer which is considerably more efficient. The reducer is built into the discharge section, which permits a reduction of approximately 5 1/2 square feet in the space required by the drive. The reducer is V-belt driven, which provides cushioned-starting for the conveyor and is little effected even by substantial misalignment.

All three models may be supplied with flights spaced either for machine or hand loading. Three types of chain are available: a C-60 chain with an ultimate strength of 19,000 lbs.; a fully heat-treated C-60 chain with an ultimate strength of 22,000 lbs.; and an H-79 Promal heat-treated chain with an ultimate strength of 27,000 lbs. Flights are drop-forged steel, with the flight integral with the link.

Write to the manufacturer for complete information on any of this equipment.

Electrifugal Pump (787)

A redesigned close-coupled Electrifu-gal pump and motor with internal and external design changes to provide improved operating characteristics and greater ease in maintenance has been announced by Allis-Chalmers Manufacturing Company, 982 S. 70th St., Milwaukee, Wisconsin

The improved unit has new sealed motor bearings; a unit-cast frame which provides perfect and permanent alignment; double seal on front motor bearing which keeps liquid out of the bearing under normal operating conditions, and a large opening in the frame between the pump and motor to make packing maintenance quick and easy.

The pump is available with removable casing in some sizes and with removable cover plate in others. It can be had in ratings from 10 to 500 gallons per minute at heads to 220 feet.

The motor is designed and built especially for the Electrifu-gal pump. Motors range in size from 3/4 to 10 horsepower. They are available in drip-proof, splash-proof, totally-enclosed fan-cooled or explosion-proof types.

Write to the manufacturer for full information on this pump.

New Gearing for Reduced Wear (788)

New Gearing designed to reduce wear and vibration has been announced by Allis-Chalmers Manufacturing Company, 982 S. 70th Street, Milwaukee, Wisconsin, as standard for its grinding mills, kilns, coolers and dryers.

The new gearing has a tooth profile generated as a true involute with a 20° pressure angle, long addendum pinion and a short addendum spur gear. It replaces the 15° tooth form.

The 20° pressure gives 25 percent stronger pinion tooth per inch of pinion face for a given pitch diameter. With the new gearing, a high percentage of tooth contact is rolling rather than sliding action. Then too, tooth contact pressures are reduced, permitting better lubrication.

Complete information covering this new gearing design will be supplied by the manufacturer.

PLANT NEWS

Death Takes Julius S. Holl, Link-Belt Advertising Manager

Mr. Julius S. Holl, advertising manager of Link-Belt Company for almost 40 years, died at the Presbyterian Hospital, Chicago, Tuesday evening, Oct. 24, after a prolonged illness.



JULIUS S. HOLL

Mr. Holl was born in Philadelphia in 1886 and entered the employ of Link-Belt Company at a subsidiary company, The J. M. Dodge Company, Philadelphia, in 1905, as stenographer and clerk.

He was subsequently transferred to the parent company's Philadelphia plant sten-

ographic department and soon became drafting room clerk.

He later joined the Link-Belt advertising department and on March 1, 1911, was made advertising manager at Philadelphia, with instructions to "move our small advertising department to Chicago headquarters, where he (President Charles Piez) could personally supervise it."

The Link-Belt advertising department of today consists of about 40 people and uses over 200 business and industrial publications to reach the trade. Mr. Holl has done much through the years to popularize Link-Belt Company and its products, and is well known throughout the advertising profession.

He had a very active hand in the development of the Engineering Advertisers Association of Chicago (now CIAA), founded in 1919, and was elected president in 1920.

He helped also in the organization of the National Industrial Advertisers Association and, as vice president of this national group, he conducted a three-day industrial advertising session and exhibit that NIAA held in London, England in 1924. He was elected president at this meeting.

Just prior to entering the hospital this year, Mr. Holl attended the annual meeting of the NIAA in Los Angeles as one of its honored guests. He was also a member of the Association of National Advertisers (ANA).

Roebling Names Spofford to New Position

Robert K. Spofford has been named director of purchases for John A. Roebling's Sons Company, Trenton, N. J. The appointment, which became effective on October 30, was announced by Charles R. Tyson, president. In his new position, Mr. Spofford will be in charge of the procurement of materials used in the manufacture of wire rope, electrical wire and cable, woven wire fabrics, cold-rolled steel and related products.

For the past seven years, Mr. Spofford was associated with The Okonite Company, five of which he served as pur-



ROBERT K. SPOFFORD

chasing agent. Prior to that he was assistant to the supervisor of purchases for the Continental Can Company, Inc. He is a member of the National Association of Purchasing Agents and a graduate of Yale University.



New Office of Magnaflux Corporation

Magnaflux Corporation has moved into its new office at 2823 Manor Way, Dallas, Texas.

A complete office serving the entire southwest has now been set up. Included in the new building is an Inspection Laboratory where local inspection work can be done. Magnaflux is also equipped

to handle work in the field; it has several trucks operating, doing field inspection work.

Magnaflux inspection is one of several non-destructive testing methods used and sold by Magnaflux Corporation for inspection of parts during manufacture or overhaul, to insure that the parts are free from discontinuities which would cause failure during production or in use.

Statement of Condition THE CENTRAL BANK & TRUST COMPANY Denver, Colorado AT THE CLOSE OF BUSINESS OCTOBER 4, 1950 Resources

Loans and Discounts	\$17,423,041.32	
CCC Loans, United States Guaranteed	132,166.88	
FHA Loans, United States Guaranteed	8,349,228.98	
Real Estate Owned (Future Bank Site)	75,000.00	
Safe Deposit Vaults—Furniture and Fixtures	217,123.44	
Stock in Federal Reserve Bank	48,000.00	
Income Earned, Uncollected	177,900.10	
Other Resources	64,222.22	
U. S. Government Bonds	\$13,959,108.42	
Other Bonds and Securities	2,219,840.43	
Cash and Due from Banks	15,204,352.92	31,383,301.77
Total		\$57,869,984.71

Liabilities

Capital Stock	\$ 1,000,000.00	
Surplus	600,000.00	
Undivided Profits and Unallocated Reserves	416,108.87	2,016,108.87
Reserved for Interest, Taxes, etc.	133,754.54	
Income Collected, Unearned	423,841.25	
Bills Payable	1,200,000.00	
Other Liabilities	20,899.33	
Deposits	54,075,380.72	
Total		\$57,869,984.71

Crane Co. Announces Personnel Change

J. W. Greene has been appointed to the newly created position of Assistant Manager of the Valve & Fitting Department, Crane Co., Chicago.

Mr. Greene is particularly well qualified for this new responsibility as a result of twelve years experience in the oil fields of the southwest; ten years in the New York and eastern industrial markets, and five years in the mid-west. His most recent position with the Company was Sales Manager of the New York branch.

Hewitt-Robins Inc. Change Chicago Offices

Chicago locations of Hewitt-Robins Inc. have been consolidated at 402 West Randolph. (Continued on page 33)



J. W. GREENE

CATALOGS AND TRADE PUBLICATIONS

FOR YOUR CONVENIENCE

Send your publications to Mines Magazine, 734 Cooper Building, Denver, for review in these columns. Readers will please mention Mines Magazine when requesting publications from the manufacturer. Readers may order publications from this office by giving index number. These publications are FREE.

- (5812) PLACER JIG. Bulletin PL8, Dorr Company, Barry Place, Stamford, Connecticut, contains 6 pages illustrating and describing the two-cell Pan-American Jig used for placer mining. Skeleton drawing shows dimensions and information included shows special feature of construction, and also the application of the machines.
- (5813) MOTOR STARTERS. Catalog 14B6410A, Allis-Chalmers, Milwaukee, Wisconsin, contains 12 pages illustrating and describing the construction and operation of Type H Motor Starters for 2300 to 5000 volt squirrel cage wound rotor and synchronous motors. From this bulletin you can obtain enough information to help you in the proper selection of a starter for your motor.
- (5814) RAKE CLASSIFIERS. Bulletin No. 447, Morse Bros. Machinery Co., Post Office Box 1708, Denver, Colorado, contains 8 pages of information illustrating and describing Morse "True-line" Rake Classifiers. Special features are explained, and tables of data include capacities of the equipment, as well as dimensions for different sizes.
- (5815) ALUMINUM. Alcoa News Letter, September, 1950, by Aluminum Company of America, Pittsburgh, Pennsylvania, contains 8 pages illustrating and describing many new uses of aluminum for equipment, and also building construction. Among items shown in this issue are the air-filter, aluminum as protection to insulation, aluminum shelving for self-service stores, and other interesting items.
- (5816) GEARMOTORS. Book No. 2247, by Link-Belt Company, 301 West Pershing Road, Chicago, Illinois, contains 30 pages of illustrations, information, and data, as well as general dimensions covering Link-Belt gearmotors, motors, and helical gear drives. Complete information is furnished showing the method of selection of the proper equipment to meet your particular requirements.
- (5817) "MIN & CHEM." October, 1950, by International Minerals and Chemical Corporation, 20 North Wacker Drive, Chicago, Illinois, contains 24 pages illustrating and describing by charts, which give at a glance statistical information covering the 41st year of operation of this company. Part of this issue is taken up with activities of employees of the company.
- (5818) "HARDINGE HIGHLIGHTS." September, 1950, by Hardinge Company, York, Pennsylvania, contains 6 pages giving impressions of Harlowe Hardinge as obtained from a trip to Europe and Africa. Included in this issue is an article on washing plant and scrubber of Consolidated Rock Products Company, Los Angeles, California.
- (5819) MATERIAL LOADER. Bulletin LO 200, by Service Supply Corporation, Philadelphia 32, Pennsylvania, contains 8 pages illustrating and describing the "lodover" one yard combination overhead front end shovel for International Harvester Tractors. This machine eliminates the necessity of making turns, which largely increases its capacity. Construction and operation are fully illustrated, and specifications are included.
- (5820) SCIENTIFIC EQUIPMENT. The Burrell Announcer Number 50 10 49, by Burrell Corporation, 2223 Fifth Avenue, Pittsburgh 19, Pennsylvania, contains 16 pages of short articles illustrating new equipment and its use in the chemical and metallurgical laboratories. Particular attention is paid to catalytic laboratory appliances in this issue, illustrating and listing some of these, together with prices.
- (5821) "TREFOIL." September-October, 1950, by Denver Equipment Company, Post Office Box 5268, Denver, Colorado, contains 16 pages including full pages for your engineering notebook, descriptive of cyanide regeneration as applied at Pachuca, Mexico. Also included in this issue are five cyanide mill flowsheets and equipment necessary for operation, together with approximate total cost.
- (5822) "RARIN'-TO-GO." By Frontier Refining Company, Denver, Colorado, for October, 1950, contains 12 pages, largely devoted to activities of the personnel of this company, and their progress in the petroleum industry.
- (5823) SPECIAL STEEL FABRICATION. Recent Bulletin by Eaton Metal Products Company, 4800 York Street, Denver, Colorado, pictures and describes the products and facilities of this company in Albuquerque, New Mexico, Billings, Montana, and Denver, Colorado.
- (5824) "MINERAL INFORMATION SERVICE." By Division of Mines, Ferry Building, San Francisco, California, for October, 1950, contains 8 pages principally devoted to the reference table of strategic minerals, tabulating information that is published by California Division of Mines, United States Geological Survey, United States Bureau of Mines, and others. This table will be found very convenient for references. Also included is a list of recent publications by the California Division of Mines.

- (5825) INDUSTRIAL CLEANING. Oakite News Service, September and October, 1950, by Oakite Products, Inc., 22 Thames Street, New York 6, New York, contains 24 pages of short illustrated articles largely devoted to problems in connection with industrial cleaning. A list of Oakite technical service representatives is included.
- (5826) "ELECTRICAL REVIEW." Third quarter, 1950, by Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin, contains 36 pages of technical articles covering important recent development and electrical trends.
- (5827) COAL PREPARATION. Bulletin No. M-3-M-4, by Western Machinery Company, 760-766 Polson Street, San Francisco 7, California, contains 8 pages showing the advantages in the use of "Mobil-Mill" in modern coal cleaning. The bulletin includes a flowsheet, illustrations of the equipment used, and complete information covering the operation. General specifications are given, and also tables of capacities.
- (5828) BALL MILL. Bulletin AH-414, by Hardinge Company, Inc., York, Pennsylvania, contains 12 pages illustrating and describing the principals of the Tricone Mills for wet or dry grinding. Included is a discussion of the advantages of the design, and also illustrations showing special features of construction. Tables cover the general dimensions of the various types of mills.
- (5829) "PROGRESS NEWS." October, 1950, by Gates Rubber Company, 999 South Broadway, Denver, Colorado, contains 28 pages principally devoted to personnel activities of the employees of this company.
- (5830) OPTICAL INSTRUMENTS. Bausch and Lomb Magazine, Volume 26, No. 3, contains 24 pages of short articles pertaining to cameras, magnifying equipment, and glasses to improve your sight.
- (5831) AIR BREAK CONTACTOR. Bulletin 14B6410A, by Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin, contains 8 pages illustrating and describing the construction and application of Type 260, high voltage contactor, particularly adaptable for applications requiring frequent starting, inching, reversing, and plugging or dynamic braking.
- (5832) "COMPACT COMMENTS." October, 1950, by Interstate Oil Compact Commission, Post Office Box 3127, Oklahoma City 5, Oklahoma, contains 16 pages covering news on meetings of the Compact Commission recent publications and statistical data, covering recent drilling activities, crude oil production, natural gas production, and geophysical exploration during the summer months in the oil producing states.
- (5833) CONCENTRATE DRYER. Bulletin No. D4-B1, by Denver Equipment Company, 1400 - 17th Street, Denver, Colorado, contains 4 pages illustrating and describing the construction and operation of Denver "Standard" dryers for concentrates, for drying concentrates and other mineral products, as well as industrial by-products.
- (5834) "STORAGE BATTERY POWER." Volume 20, No. 6, by Thomas A. Edison, Incorporated, West Orange, New Jersey, contains 16 pages of short illustrated articles showing how storage battery power can be used to advantage. The principal article covers material handling in the James Vernor Company's plant, Detroit, Michigan.
- (5835) "DU PONT MAGAZINE." October and November, 1950, by Du Pont Company, Wilmington, Delaware, contains 36 pages illustrating and describing new products by this company, and their uses. This magazine contains much that will be of interest to every reader, from those who enjoy hunting to others who may be considering an ocean trip.

- (5836) "PUMP POWER." Bulletin Form 12809, by Caterpillar Tractor Company, Peoria, Illinois, contains 8 pages illustrating pumps used for irrigation, dredge, water works, repressuring, and water supply, all driven by caterpillar diesels. One page is devoted to Caterpillar diesel engines and electrical sets.
- (5837) CONVEYOR EQUIPMENT. Link-Belt News, October, 1950, contains 8 pages of illustrated articles pertaining to conveyors and conveyor equipment. Among the articles in this issue are Link-Belt conveyors for hot steel strip at Crucible Steel Company of America. Another article covers rock and clinker handling at modern cement mill.
- (5838) "SOUND." This 8 page magazine for September and October, 1950, by United States Gypsum, 300 West Adams Street, Chicago 6, Illinois, contains latest up-to-date information in regard to sound-proofing construction.
- (5839) CLAY PRODUCTS. Bulletin No. 6-3, Department of Mines and Technical Surveys, by Mineral Resources Division, Ottawa, Canada, contains 14 pages listing the producers and manufacturers of clay products in Canada, and tabulates their production for the last seven years.
- (5840) "FARMING." Early Fall, 1950, issue, by United States Gypsum Company, 300 West Adams Street, Chicago, Illinois, contains 16 pages with short illustrated articles covering farm buildings and equipment. This particular issue shows a well equipped machine shed, methods of roof raising, interior decoration, and house improvements.
- (5841) IRRIGATION GATES. Catalog 49, by Morse Bros. Machinery Company, Post Office Box No. 1708, Denver, Colorado, contains 48 pages illustrating and describing the construction and use of Pekrul gates. Skeleton drawings and dimension tables cover the various types of gates used and manufactured. This is a very complete catalog for useful data for irrigation engineers.
- (5842) MAGNAFLUX UNIT. Recent circular by Magnaflux Corporation, 5926 Northwest Highway, Chicago 31, Illinois, illustrates and describes a new Magnaflux inspection unit for oil tools using 110 volt AC or DC voltage, a portable unit.
- (5843) BLOWERS. Bulletin J-607, by Joy Manufacturing Company, Henry W. Oliver Building, Pittsburgh 22, Pennsylvania, contains 3 pages illustrating and describing the "Axivane" portable blower for mines and tunnels with 1/2 to 5 H. P. motors. Blowers may be driven by air or electric motors. Tables and specifications are included. Performance characteristics are shown by charts.
- (5844) CHEMICALS AND SCIENTIFIC EQUIPMENT. Catalog No. 450, by Burrell Corporation, 2223 Fifth Avenue, Pittsburgh 19, Pennsylvania, contains 986 pages plus the index. This new up-to-date catalog contains all kinds of laboratory equipment and supplies, and lists over 25,000 items, including improved methods and aids for chemical analysis and testing. Items are listed by name and function with a convenient cross index system, which is a remarkable time saver.
- (5845) V-BELTS. Industrial News for October, 1950, by Gates Rubber Company, 999 South Broadway, Denver, Colorado, contains 4 pages of short illustrated articles showing important uses of the V-Belt. Two items of special interest cover the installation of V-Belts in a sand dredge, and one in connection with main lineshaft drive.
- (5846) "TOPICS." September, 1950, by American Tariff League, 19 West 44th Street, New York 18, New York, contains 4 pages covering short items pertaining to tariff news, and especially covering Torquay Parley of England. The chart included shows at a glance United States exports and imports.
- (5847) "ELECTRIFUGAL PUMP." Bulletin No. 52B6140B, by Allis-Chalmers, Milwaukee, Wisconsin, contains 6 pages illustrating and describing construction and operation of the new electrifugal pump, with drip-proof, splash-proof, totally enclosed, fan-cooled, or explosion-proof motor, available in units from 10 to 500 gallons per minute up to 220 foot head, motors 1/2 to 10 H. P. A sectionalized photograph shows the main construction features of this equipment.
- (5848) PACKER HANDBOOK. Section 2.2 of Packer Handbook, by Lane-Wells Company, Post Office Box 2194, Terminal Annex, Los Angeles 54, California, contains 8 pages of useful information and technical data covering the setting of the packer. Included are tables of technical data covering oil, water, and mud specific gravity weight and pressure, and also, a setting chart for packers. Examples are included, together with formulas for solution.
- (5849) "DRILLING MUD." September, 1950, by National Lead Company, 830 Ducommun Street, Los Angeles 12, California, contains 24 pages

(Continued on page 36)

I am interested in the following publications:

MINES MAGAZINE
734 Cooper Building
Denver, Colorado

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Alumni Business

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ROGER M. SCHADE, '21
Alumni Endowment
MALCOLM E. COLLIER, '22
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HARRY J. McMICHAEL, '39
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Public Relations



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MEETINGS

Executive Committee Meetings
3rd Monday of each month, Alumni Office,
7:30 P. M.
Alumni Council Meetings
4th Thursday of each month, Argonaut
Hotel, 6:30 P. M.
Publication Committee Meetings
2nd Monday of each month, Alumni Of-
fice, 5 P. M.
Capability Exchange Committee, Meetings
Wednesday 7:30 Week preceding Ex-
ecutive Committee Meeting.

EXECUTIVE COMMITTEE MEETING

The regular meeting of the Execu-
tive Committee, Colorado School of
Mines Alumni Association, was held
in the Alumni office on Monday, Sep-
tember 18, 1950.

The meeting was called to order at
7:45 P.M. by acting president, R. J.
McGlone.

Roll Call

Members present: Malcolm E.
Collier, Treasurer; Robert J. Mc-
Glone, Carl I. Dismant, Donald J.
Drinkwater. Committee chairmen:
Herbert Heckt, Roger M. Schade, E.
L. Durbin; Executive Manager,
Frank C. Bowman.

Members absent: James Colasanti,
President; George Setter, Vice Presi-
dent; Robert W. Evans, Secretary;
Harvey Mathews. Committee chair-
men: Addison Manning, Harry J.
McMichael, Lynn W. Storm, Charles
O. Parker, Edwin F. White, Harry
McNeill, John H. Winchell.

Minutes of the previous meeting,
August 31, 1950, were read and ap-
proved.

Acting President, Robert J. Mc-
Glone, called for the Treasurer's re-
port and the reports of the standing
committees, as follows:

Treasurer's Report

Mr. Collier reported that finan-
cially the Association is maintaining a
healthy and normal condition.

Moved by Mr. Collier the report
be accepted; seconded by Mr. Dis-
mant; passed.

Alumni Endowment Committee

Mr. Schade reported that the
Alumni Endowment fund showed re-
ceipts during August, 1950, of \$13.00,
making a balance of \$2411.73.

The Placement Service showed re-
ceipts of \$335.26 during this period
and disbursements of \$489.37, leaving
a balance of \$845.56. Comparing the
years of 1950 and 1949, this shows
a gain of \$324.87.

Moved by Mr. Collier the report
be accepted; seconded by Mr. Heckt;
passed.

Athletic Committee

Mr. Bowman reported that some
payments have come in, showing a re-
duction in the outstanding loans. As
of August 31, 1950, the checking ac-
count showed a balance of \$1090.15,
the savings account \$4784.17, and
\$338.00 remained outstanding on
loans. This showed a total balance of
\$6212.32.

Moved by Mr. Dismant the report
be accepted; seconded by Mr. Schade;
passed.

Budget and Finance Committee

No report.

Capability Exchange Committee

Mr. Durbin reported for Mr. Mc-
Michael. During August, 1950, there
were 53 calls for men; 42 recommen-
dations made; 6 placements reported;
1231 letters mailed; 519 men were on
the active list; and 140 calls remained
unfilled.

Mr. Schade reported quite favor-
ably in regard to the Airmail Place-
ment Service Bulletin and that there
was good reaction as indicated by sub-
scriptions being received. Letters to
prospective employers have yet to be
submitted.

Moved by Mr. Heckt the report be
accepted; seconded by Mr. Collier;
passed.

Instruction Committee

No report.

Legislation Committee

No report.

Membership Committee

Mr. Bowman reported for Mr.
Setter. During August, 1950, there
was a gain of 77 members in good
standing. This was higher than ex-
pected for this period of the year and
shows good progress. The total of
2193 members shows a 62½% figure
of the possible membership.

The receipts from dues is \$301.00
more than for the same period of 1949.

Moved by Mr. Heckt the report
be accepted; seconded by Mr. Schade;
passed.

Nominations Committee

No report.

Public Relations Committee

No report.

Publication Committee

Mr. Heckt reported that for the
66-2/3% budget period, 55% of the
budgeted income has been earned and
45/5% of the allowed expenditures
has been spent. The total earned
credits for this period is \$6793.43
which is \$2237.83 more than the
budget calls for. This is \$224.60 more
than the same month last year and
\$32.63 more than shown for the same
budget period of 1949.

It was reported that the September
magazine will be released on schedule.
The Special Petroleum number has
now received 4 of the 22 promised
articles and the advertising space ap-
pears to be equaled to that of 1949.

Information cards for the 1950
Year Book and Directory have been
mailed and the advertising campaign
will be started about October 1st. It

is planned to have this issue with the
printers during the early part of Janu-
ary 1951.

Moved by Mr. Dismant the report
be accepted; seconded by Mr. Schade;
passed.

Research and Investigation Committee

No report.

General Report

Everything has been covered by
previous reports.

Special Business

None.

Adjournment

The meeting adjourned at 8:55
P. M.

EXECUTIVE COMMITTEE MEETING

The regular meeting of the Execu-
tive Committee, Colorado School of
Mines Alumni Association, was held
in the Alumni office on Monday, Oc-
tober 16, 1950.

The meeting was called to order at
7:40 P. M. by President Colasanti.

Roll Call

Members present: James Colasanti,
President; Robert W. Evans, Secre-
tary; Malcolm E. Collier, Treasurer;
Robert McGlone. Committee chair-
men: Harry McMichael, Edwin
White, Lynn Storm, Herbert Heckt.
Executive Manager, Frank C. Bow-
man.

Members absent: A. George Setter,
Vice President; Harvey Mathews,
Carl Dismant. Committee chairmen:
Addison Manning, Roger Schade,
Charles Parker, Harry McNeill,
John Winchell.

Minutes of the previous meeting,
September 18, 1950, were read and
approved with one correction, chang-
ing Mr. Schade to Mr. Durbin, un-
der Capability Exchange Committee
report.

President Colasanti called for the
Treasurer's report and reports of the
standing committees, as follows:

Treasurer's Report

Mr. Collier reported that finan-
cially the situation is about the same as
it was in 1949. Operations for the
year should show a profit; the last
three months of the year should show
a loss because most of the available
income has been earned in the first
part of the year.

Moved by Mr. Collier the report
be accepted; seconded by Mr. Mc-
Glone; passed.

Alumni Endowment Committee

Mr. Bowman reported receipts of
\$20.00 during September 1950, mak-
ing a cash balance of \$2431.73.

The Placement Service receipts
during September 1950 were \$646.91
and disbursements \$352.51.

Moved by Mr. McMichael the re-
port be accepted; seconded by Mr.
White; passed.

Athletic Committee

Mr. Bowman reported that during
September 1950, \$73.00 was received
from contributions and payments on
outstanding loans. As of September
30, 1950, the checking account showed
a balance of \$1163.15, the savings ac-
count \$4784.17, and \$268.00 re-
mained outstanding on loans. This is
the best showing the fund has ever
made.

Mr. Bowman reported that the
savings account had been transferred
to the Midland Federal Savings and
Loan Association.

Moved by Mr. McGlone the report
be accepted; seconded by Mr. White;
passed.

Budget and Finance Committee

No report.

Capability Exchange Committee

Mr. McMichael reported that the
Placement Service will end the year
well within the planned budget.

During September 1950 there were
45 calls for men; 18 recommendations
made; 7 placements reported; 537
letters were mailed; 533 men remain
on the active list; and 150 calls for
men remain unfilled.

Subscriptions for the Airmail Bul-
letin are still coming in, and the first
will be mailed on November 1, 1950.

Moved by Mr. White the report
be accepted; seconded by Mr. Heckt;
passed.

Instruction Committee

No report.

Legislation Committee

No report.

Membership Committee

Mr. Bowman reported that during
September 1950, 38 memberships were
paid, making a total of 2226 members
as of September 30, 1950.

Moved by Mr. Evans the report be
accepted; seconded by Mr. Collier;
passed.

Nominations Committee

No report.

Public Relations Committee

No report.

Publications Committee

Mr. Heckt reported that for the
75% budget period, 58.6% of the
budgeted income has been earned and
51% of the allowed expenditures has
been spent.

The Special Petroleum issue is
shaping up very well and will be out
shortly. Advertising is ahead of last
year.

Information and advertising for the
Year Book and Directory are coming
in which should allow the Directory

to be printed shortly after the first of
the year.

Moved by Mr. McMichael the re-
port be accepted; seconded by Mr.
Collier; passed.

Research and Investigation Committee

Mr. Storm reported that the tabu-
lation of jobs of the classes of '00, '10,
'20, '30 and '40 has been completed
and a report will be made consolida-
ting the information. He asked for
suggestions as to what could be done
with the information and where it
could be used to the best advantage.
He was given several suggestions by
the committee.

Moved by Mr. White the report
be accepted; seconded by Mr. Mc-
Glone; passed.

Special Business

An application for Associate mem-
bership, submitted by Mr. Arthur
Todd of Wheatridge, Colorado, was
read by President Colasanti. Mr.
Todd met all requirements and had
remitted the proper fees.

Moved by Mr. White the appli-
cation be accepted; seconded by Mr.
McMichael; passed.

Moved by Mr. Collier that Presi-
dent Colasanti appoint a committee
of 5 to investigate the need of obtain-
ing additional funds for the Associa-
tion and securing assistance for Frank
Bowman and to report back to the
Executive Committee. Seconded by
Mr. Storm; passed.

Adjournment

The meeting was adjourned at
9:30 P. M.

PLANT NEWS

(Continued from page 30)

dolph Street, L. D. Bigelow, vice-presi-
dent in charge of central division opera-
tions has announced.

Offices and warehouses of the Hewitt
Rubber, Robins Conveyors and Robins
Engineers Division are now located at the
new address. Hewitt Restfoam will con-
tinue to maintain its office in the Furniture
Mart.

Goodyear Announces \$1,000,000 Expansion

Installation of equipment to produce
Airfoam cushioning material here as well
as at Akron, O. was made known recently
by The Goodyear Tire & Rubber Com-
pany, now observing the 30th anniversary
of its West Coast operations.

Announcement of the expansion program,
costing more than \$1,000,000, was made
by D. W. Sanford, Vice President of
Goodyear's local subsidiary company, The
Goodyear Tire & Rubber Company of
California.

HERON ENGINEERING CO. PE. 6097

Plant layout and design of mine, mill and
smelter facilities, including structures,
aerial tramways, and waste disposal sys-
tems.

2000 So. Acoma St., Denver, Colo.

"MINES" TODAY

Construction Work on Coolbaugh Hall

the new million dollar chemistry building on the campus, is now well under way, with the foundation to be completed next month.

Estimated cost of the three-story structure of brick and reinforced concrete includes three large contracts to Denver construction firms and \$300,000 for furnishings and equipment.

With an over-all size of 256 x 104 feet, the building will accommodate twelve classrooms, a lecture hall with a seating capacity of 250 persons, and a number of special research laboratories, ranging in size from two-and-three man workshops to one with a capacity of 90 students.

The present chemistry building was constructed in 1879 and added to in 1882 and again in 1890.

The new building will be dedicated in honor of the late Dr. M. F. Coolbaugh who, until the time of his death, had been president emeritus of the college since his resignation in 1945. He served as head of the chemistry department at the school in 1917-18.

Enrollment at Mines

for this semester totals 1012 which is 122 less than that of a year ago.

Of these, 229 are seniors; 246 jun-



▼ Freshmen and sophomores alike got wet during a recent Colorado School of Mines tug-of-war contest when the rope students were pulling on broke. Underclassmen claimed the sophomores cut the rope in order to avert a defeat and also used a power winch to aid in pulling. The grudge fight across Clear Creek is an annual event heralding the opening of school. Miners started to class on Sept. 13.

iors; 204 sophomores; 224 freshmen, and 109 graduate students. The last number is an increase of 8 over 1949 enrollment for graduate work and the largest so far in the school's history.

The veteran enrollment is 370 out of the total.

The foreign students number 102, about the same as last year.

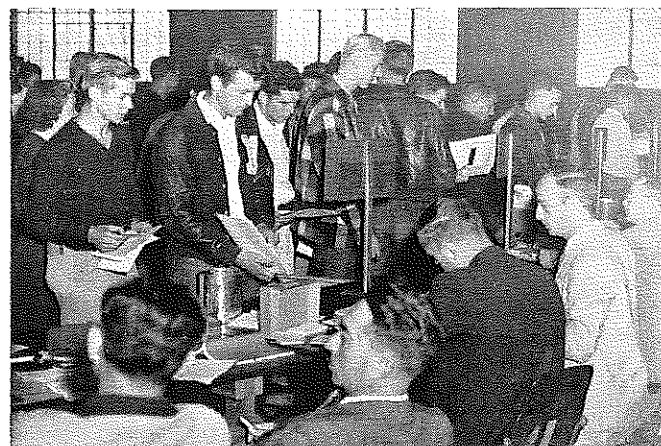
Three Mines' Officials

were among those participating in the American mining Congress con-

vention in Salt Lake City, the last week of August.

These were: Dr. John W. Vanderwilt, president of the school, Dean M. I. Signer; and Vernon L. Mattson, '26, director of the Colorado School of Mines Research foundation and of the experimental plant. Dr. Vanderwilt and Dean Signer attended the full conference and Mr. Mattson arrived to attend the sessions of the last two days.

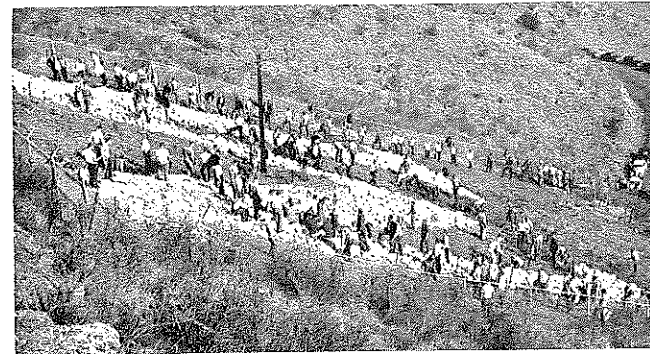
Dr. Vanderwilt remained over in Salt Lake City to attend a meeting



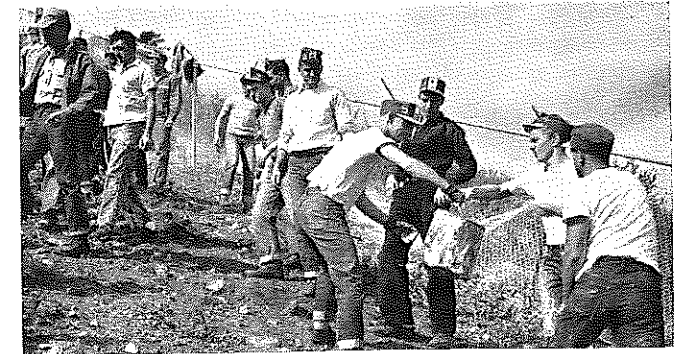
▼ Upperclassmen ranks, shown going through registration line at the Colorado School of Mines, were hard hit by draft and enlistments. Nevertheless the total enrollment at 965, although below last year, is well above the pre-war years average.



▼ Franklin F. Clark, freshman adviser, seated left above, helps register first year Colorado School of Mines students during freshman week activities, Sept. 7, 8 and 9. Freshman registration totaled 195.



▼ The Colorado School of Mines "M", object of an annual white-washing recently, is 104 x 107 feet in size and is the largest electrically lighted letter in the world. Located on Mt. Zion, west of the Mines campus at Golden, it was laid out in 1905 and constructed by student body and faculty in 1908. It was lighted in impressive ceremonies in 1932 and is now protected by a high fence and the ever-watchful Miners against possible ravage by students of rival schools.



▼ Colorado School of Mines freshmen (above) form a bucket brigade to carry up whitewash material to spruce up their big "M" on Mt. Zion west of Golden. Clean-up of the largest electrically lighted sign in the world is an annual affair under supervision of the Blue Key, campus pep organization.

of the National Minerals Advisory council, called into session by Secretary of the Interior Chapman.

Mines' R. O. T. C.

boasts 500 basic and advanced students this semester.

This unit sent the largest group to summer camp of all the national colleges participating. Thirty-two men went to Fort Belvoir, Virginia, while 38 others went to Fort Lewis, Washington. Those at Fort Lewis won the national marksmanship trophy.

Col. W. W. Fertig, professor of military science and tactics, stated recently: "Freshmen should understand that the prime emphasis on the ROTC is to provide officers for the expanding army so that there will be no necessity of increasing Officer Candidate Schools and hatching out any more '90-day wonders'."

The military science department is expecting three new additions to their staff. One of these is already on duty, Capt. Donald H. Dennis who received his bachelor's degree in electrical engineering from South Dakota State Teachers College.

Alumni Scholarships

were granted to the following this fall: Ted Bergstrom, Chicago, Ill.; Burley Scales, Boonville, Ind.; Jack Fowler, Bartlesville, Okla.; Kent Miller, Midland, Texas; and John A. Masek, Casper, Wyoming.

Three of these are freshmen and the other two transfer students. They were selected on recommendations of alumni and by being in the upper half of their graduating class.

The Sohio Scholarship

an annual award of the Sohio Company, has been granted to Robert Arrendiell, a senior in petroleum production. It carries \$600 to be applied to tuition and fees.

Mr. Arrendiell did summer work with the company in the Hayes area in Kansas, satisfying the requirement that the scholarship winner should work one summer for the Sohio company.

Col. W. W. Fertig

has been named acting assistant to the president of *Mines* and took over the post last month. He will continue as professor of military science and tactics and head of the school's ROTC program, positions held since joining *Mines'* faculty in 1947.

Colonel Fertig, a former *Mines* student, reached fame as the Colorado leader of Philippine guerrillas during World War II and was cited ten times for his actions. Although with the engineers, he was awarded the combat infantry badge and the air medal for his daring undertakings in guerrilla warfare. He had joined the engineers in 1941 after working in mining in Colorado, Arizona and the Philippines for 16 years.

His first assignment in 1941 was to take charge of the enlarged construction program designed to fortify the Philippine Islands. He was in Bataan, then Corregidor and later Mindanao before moving across the bay to establish a center of resistance.

Fertig's unit contributed to the early conquest of the islands by supplying the armed forces with vital information on enemy installations and ship movements and by pinning down large forces of Jap troops. At one time Fertig's unit numbered 40,000 Filipino troops and 126 Americans.

After the war he served on the staff of Paul V. McNutt, high commissioner to the Philippines. In May, 1946, he came to Fitzsimons hospital and was discharged from there to accept the position with the Colorado School of Mines.

The Oredigger

has received an honor rating of All-American from the Associated Collegiate Press for the spring semester of 1950.

This is the first time in the 31-year history of the publication that this paper has received this top honor. The *Oredigger* was classified as a weekly college paper at a college or university with an enrollment of between 1000 and 2499 students for this contest.

The honor ratings include: All-American, superior; first class, excellent; second class, good; third class, fair; and fourth class, no honors. Of the 71 colleges and universities in Mines classification, 15 received All-American ratings; 33 received first class ratings; 19, second class; two, third class; and two, fourth class. These ratings are re-evaluated each semester and the number of schools receiving All-American rating is decreasing.

A breakdown of the scoring on editions of last spring's *Oredigger* revealed a total of 230 points in the news values and sources category, 255 points for news writing and editing; 260 points for headlines, typography, and make up; and 240 points for the department pages and special features. The total score of the *Oredigger* was 985 points. This year, 975 points out of a possible 1000 were required for the superior rating.

Dr. L. W. LeRoy

associate professor of geology, spent the past summer as a consultant to the Socony-Vacuum Oil company of Venezuela. Sub-surface investigations in the eastern part of the country were of primary concern.

Considerable time was devoted to the study of Cretaceous stratigraphy exposed on the islands lying off the north coast. He had the opportunity

of examining several of the world-famous iron ore deposits south of the Orinoco river as well as visiting the rich gold country of El Callao.

Through the courtesy of the Socony-Vacuum company considerable data were presented Dr. LeRoy for use in his advanced subsurface geological courses.

Mention was made by Dr. LeRoy of the tremendous wealth in gold and diamonds of the Grand Sabana country of extreme southeastern Venezuela—a country of vast escarpments, dense rain forests, and open grass lands—an area which was not touched by the early Spanish explorers.

Albert L. Gosman

graduate of University of Michigan, has joined *Mines* faculty as an instructor in the mechanical engineering department.

While studying at the university for his B. S. degree he had two years teaching experience as a substitute instructor. During World War II he spent seven months stateside and two years in Europe in S-3 (plans and training) of the army engineers as an engineer's assistant. Experience along industrial lines includes three years with the Hoffman Combustion Engineering Company.

In addition to his instruction duties at *Mines*, Mr. Gosman is studying for his masters degree in mechanical engineering at the C. U. extension in Denver.

A Good Will Gift

from the University of Alaska was received the past summer. It is an Alaska birch tree from the slopes of Mount McKinley, tallest peak on the continent. The tree was worked into the summer landscaping plan and stands in the lawn in front of the gymnasium.

Dr. R. H. Carpenter

has returned to duty as associate professor of geology after spending the past year in Honduras, Central America. He was consultant-in-charge of the geological examination of the Rosario properties of the New York and Honduras Rosario Mining Company at San Juancito. He was aided by three assistant geologists.

The work consisted of regional mapping of the San Juancito mountains, a thorough examination of the surface geology of the Rosario district, and detailed underground mapping of key levels in the extensive Rosario mines.

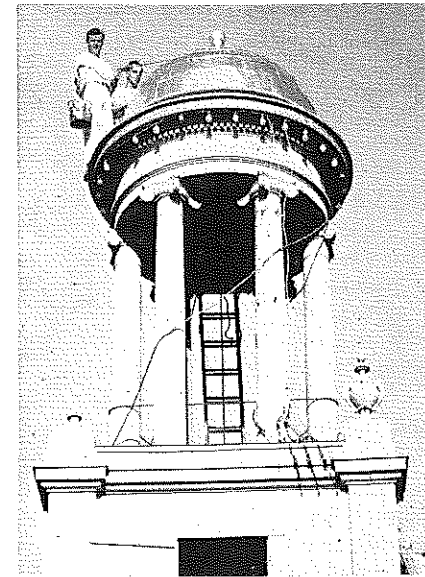
The properties have been in production since the 1880's, having produced approximately 7,000,000 tons of ore from about eighty veins and

splits. Over \$20,000,000 has been paid in dividends.

Dr. Carpenter will return each year during the winter to supervise the exploration program through 1953.

Dome of Guggenheim Hall

recently has received a new coat of gold leaf. All expenses for this project are being furnished by the Blue Key honor fraternity.



Two ounces of gold were used to gild the small dome of Guggenheim hall on the Colorado School of Mines' campus. It was donated by the Golden Cycle Mill, formerly of Colorado Springs and now located at Cripple Creek. The improvement, started in June and completed last week by the U. S. Steeple Engineers, actually was accomplished in only a few days, after being interrupted by the larger order on the state capitol dome.

The gold has been donated by the school from a 32-ounce gold button presented by the Golden Cycle Mining company.

Mines' Band

starts the year with new uniforms and equipment, the purchase of which was authorized by the Student council last spring. The uniform, one of the most distinctive in the nation, has now been made identical for all band members by the purchase of plaid shirts and shoulder emblems.

The band appears at all home games and rallies, and is making two trips this season; one to Greeley and the other to Gunnison. Just prior to the Christmas holidays the band will give a concert of popular and Christmas music in conjunction with the *Mines* Glee club and the Dames Glee club. The high spot of the spring semester is the Colorado Mining Association's Sowbelly dinner, to which the *Mines* band has a standing invitation. The remaining part of the spring is devoted to preparation for the spring

concert which will be held sometime in April. The band also plays at commencement in May.

Mr. Ed H. Kehn, conductor of the Mines band, is also the director of music for Arvada schools. An outstanding clarinetist of the region, Mr. Kehn has performed with many musicals such as "Oklahoma" and the "Ice Follies." He is ably assisted in the management of the band by Mr. F. E. Smiley of the civil engineering department, who is faculty advisor, and Harry Kent, student director.

Andrew J. Anderson

sophomore in the geology option, was the outstanding *Mines* ROTC rifleman for the 1949-50 school year.

Anderson won third place in the national competition sponsored by the American Military Engineer Rifle association. He shot 378 out of a perfect score of 400 in this match.

His score placed Mines ROTC rifle team to second place in the national competition. The CSM ninerods scored 1822 out of a possible 2000 points. First place team was that of Clarkson Institute of Technology.

CATALOGS AND TRADE REVIEWS

(Continued from page 31)

of short illustrated articles covering apparatus and procedure for the field testing of drilling muds. Subjects covered are density, viscosity, gel-strength, filtration properties, hydrogen-ion determination, sand content, etc.

(5850) OXY-ACETYLENE WELDING. Linde Tips, October, 1950, by Linde Air Products Company, 30 East 42nd Street, New York 17, New York, contains 24 pages of short illustrated articles, showing methods for welding different metals and types of equipment. Many practical kinks are included, and methods of cutting time and improving results. In this issue is a special article on pipe welding.

(5851) "THE BEACON." September, 1950, by The Ohio Oil Company, Findlay, Ohio, contains 48 pages largely devoted to personnel activities among the employees throughout the operations of this company. Included in this issue is a story covering the pipe line from Worland, Wyoming, to St. Louis, Missouri. An interesting 12-page insert, entitled "Go Ahead with Oil," shows the progress brought about since 1850 through the use and development of petroleum products.

(5852) STEEL. "The Steel Rush," a 16-page pamphlet, by Benjamin F. Fairless, President of United States Steel Corporation, gives a good idea of the steel industry and its production capacity at the present time.

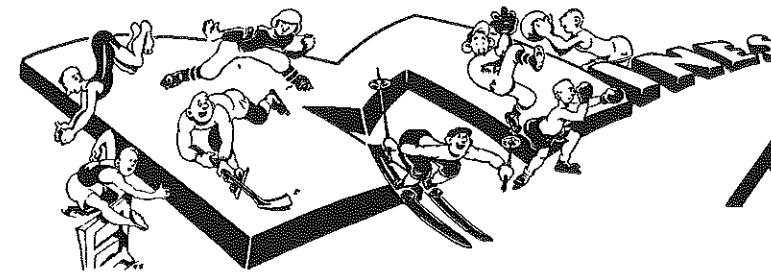
(5853) "POPULAR HOME." Autumn, 1950, by United States Gypsum Company, 300 West Adams Street, Chicago 6, Illinois, contains 16 pages illustrating and describing many ideas that may be used in connection with improving the present home, and in making plans for new construction. Included in this issue are general plans for the ranch-type home. Improvements for the kitchen are discussed on the minimum sized house.

(5854) PUMPS. Bulletin 52B6059G, by Allis-Chalmers, Milwaukee, Wisconsin, contains 16 pages of information useful for the selection of centrifugal pump for different purposes. Head capacity charts and tables for various types of pumps are given, along with data on sizes, capacities, and construction features.

(5855) CATERPILLAR EQUIPMENT. Form No. 12987, by Caterpillar Tractor Company, Peoria 8, Illinois, contains 12 pages illustrating and describing caterpillar equipment for stripping overburden, maintaining haul roads and operations in mining and quarrying, trip mining in Arizona, coal stripping in Kentucky, and shot-hole drilling in Illinois are all included in this issue.

(5856) "NEW MEXICO MINER AND PROSPECTOR." September, 1950, published in Albuquerque, New Mexico, contains 28 pages largely devoted to mining in New Mexico. Considerable space is taken up in this issue to cover "Inter-

(Continued on page 41)



Sports MARCH

By BILL ANDERSON

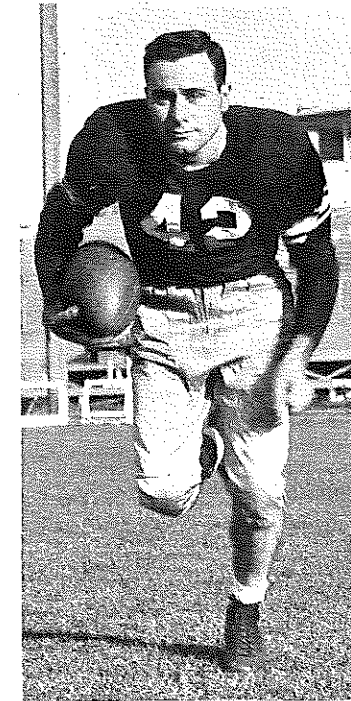
The Colorado School of Mines opened their 1950 football slate with a 7-6 victory over Chadron, only to lose their two ensuing conference games to Idaho State, 7-19, and to Colorado State 6-13.

Mines 7—Chadron 6

The Blaster team journeyed to Chadron, Nebraska on September 16, 1950 and encountered almost as much difficulty in arriving in Chadron as they did in downing the Eagles, 7-6.

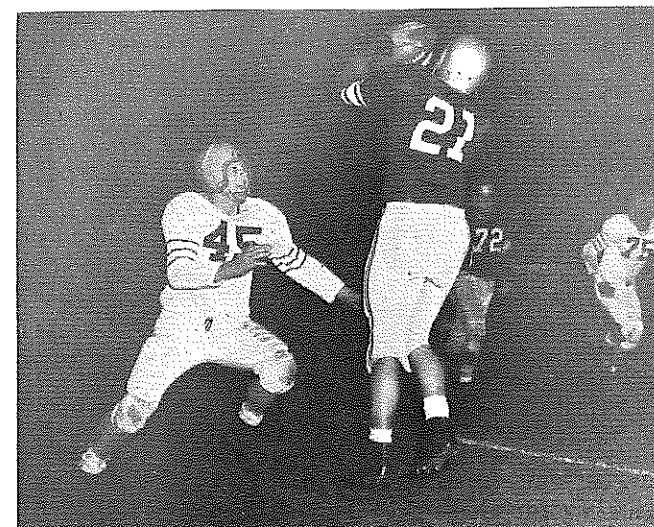
The Orediggers flew to Chadron in two chartered planes but low ceilings and wet runways at Chadron detoured the Miners to Alliance, Nebraska. The Alliance chamber of commerce formed a car pool and motored the Mines' team the additional sixty miles to Chadron.

The Chadron aggregation showed signs of running the Orediggers right off the field with Mines' first quarter jitters giving an assist. Joe Zowada, a hard-running 180 pound All-conference back swept Mines left flank for 28 yards and a TD midway in the first period. The try for point from placement was low. Controlling possession of the ball most of the first quarter, the Eagles outplayed the Mines' team in every department. The second quarter was even with no scoring threats by either team.

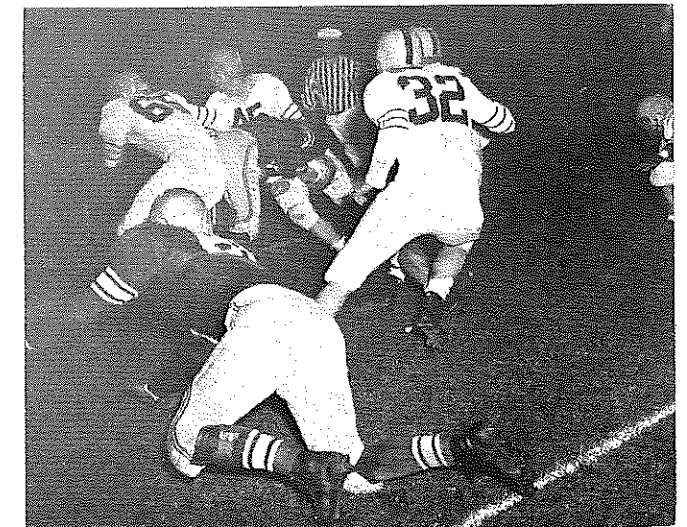


Bob Pozzo, Mines 155 pound Tailback who has gained 218 yards in the first two games against Chadron and Idaho State.

After the half-time intermission the Miners dominated the game. The Blasters were led by Bob Pozzo, a speedy 155 pound tailback, who ac-



Dick Bench being tackled by Jack Frisch, (45) and Jim Sponsler, (65) for four yard gain. Mines No. 23 Jason Johnson, Idaho State No. 32 Halfback Chet Lee.



Wally McGregor (21) receives pass from Ray Govett, not shown, for nine-yard gain in Idaho State game. Idaho State Fullback No. 45 about to make the tackle. No. 72, Tackle Dick Barnes, Idaho State No. 75 Tackle John Walker, No. 45 Jack Frisch, I. S. Fullback.

Idaho State 19—Mines 7

The Idaho State Bengals came to Golden on September 22 and unloaded a dynamiting 189 pound fullback in Jack Frisch, who operated behind a hard charging 208 pound line. The inexperience of the Mines' secondary both offensively and defensively played a major role in this loss to the Bengals.

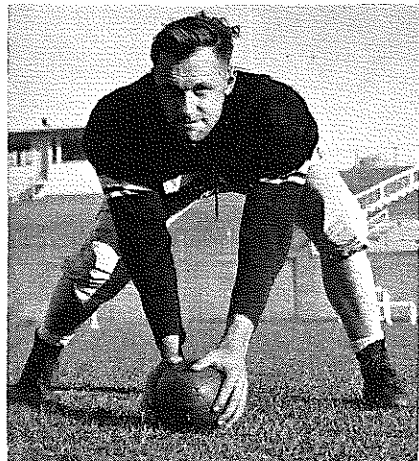
Carl Piercy returned the opening kick-off for Mines 17 yards to the 38 yard line. Ray Govett hit Dick Bench with a pass in the flat on the opening play from scrimmage good for 18 yards to the Bengals 44 yard line. Govett carried for six off tackle and Young made five more through the middle for another first down to the State 33 yard line. The drive ended as Govett lost five trying to pass and two more passes fell incomplete. Bill Johnston kicked into the end zone.

On Idaho State's first scrimmage play, Jack Frisch bulled his way through the middle and broke clear for 35 yards to the Mines' 45 yard line. Vern Adams made eight only to lose the ball on a fumble the next play, as Mines' tackle, Paul Hamilton, pounced on the ball.

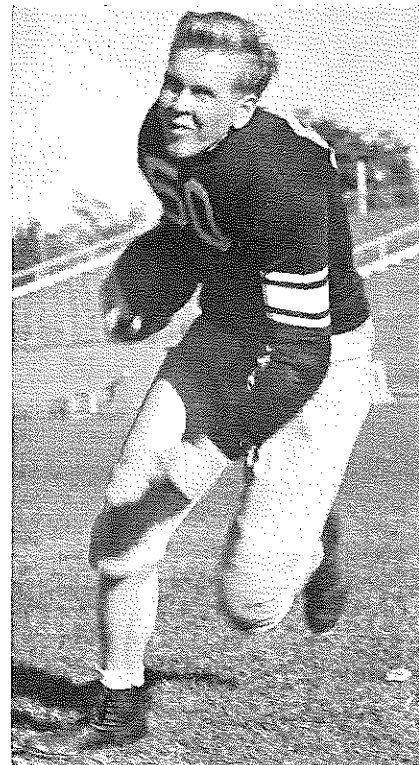
A Mines' fumble two plays later was recovered by Idaho State on Mines' 38. On the third down Lyle Anderson passed to Vern Adams on the Mines' 19 and Adams went all the way. Frisch kicked the extra point and the Bengals lead 7-0.

Mines again made two consecutive first downs in the first part of the second quarter before being forced to kick on Idaho State's 37 yard line. Pozzo's 15 yard aerial to Dave Brown and eight yard pass to Wally McGregor featured this abbreviated drive.

On the next series of downs Mines' again made 2 first downs in a row on Chuck Young's 13 yard and 6 yard gallops and another of 7 by Pozzo. Mines lost the ball on downs at the Idaho State 33. The Bengals moved



▼ Adam Thomas, 165 pound Offensive Center.



▼ Chuck Young, Mines 179 pound Fullback who scored against Idaho State.

on four plays to the Mines' two yard line on a completed pass, pass interference, and Frisch's 21 yard sprint. Jack Frisch, who gained 100 yards on 13 carries in the first period, rammed at the Blasters' middle for one. He was thrown for a loss of two on the next try and picked up a yard on the third down.

With fifteen seconds remaining in the first half Ray Govett, Mines' safety, completed the Miner's goal line stand by intercepting Anderson's fourth down pass and running it out to the 15 yard line.

The Third quarter was less than a minute old when a Mines' fumble was recovered by Idaho State on the Orediggers' six yard line. Frisch scored on the first scrimmage play.

Ed Gaulke of Mines returned the Idaho State kick-off 17 yards to the 32 where on the second down Govett's pass was intercepted and returned to the 22. Five plays later Compton scored from the one.

Mines again received the kick-off and marched from the 35 to the Idaho State 35 yard line. The running of Dave Brown and Ray Govett sparked the drive. Bill Johnston kicked to Adams on his own eight, where he was hit hard and fumbled. Chuck Young recovered for Mines on the Idaho State 12 yard line. Young fought his way over on three cracks at the Bengals center. Tackle Dick Barnes converted from placement.

Idaho State had another drive underway at the end of the third period

when Tom Wyman, sophomore defensive left end, spilled Adams for an eight yard loss. Don Adams duplicated Wyman's job in spades by dumping Adams for an 11 yard loss on the next play.

Mines dominated the fourth quarter but failed to tally. Ray Govett brought the Mines' stands to their feet with a 46 yard punt return to the Idaho State 27 yard line. Mines drove to the 12 only to lose the ball on downs.

The game ended with Drexel Lee's pass being intercepted on the Idaho State five.

Colorado State 13—Mines 6

After three scoreless periods the lid blew off at Greeley September 29 as four touchdowns were scored in the first five minutes of the fourth quarter.

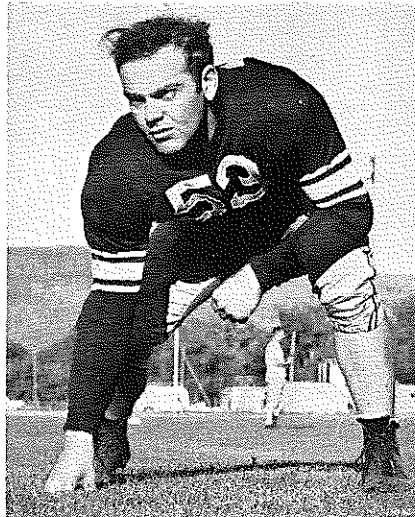
Mines was unable to muster a serious scoring threat in the first half until late in the second quarter when Drexel Lee passed to Claude Jenkins for consecutive gains of 42 and 32 yards to the Greeley 10. Time ran out to stop this bid for a tally.

Les Wall, Colorado State speedster, swept his own right end for 55 yards and a touchdown with the fourth quarter less than two minutes old. The try for point was blocked.

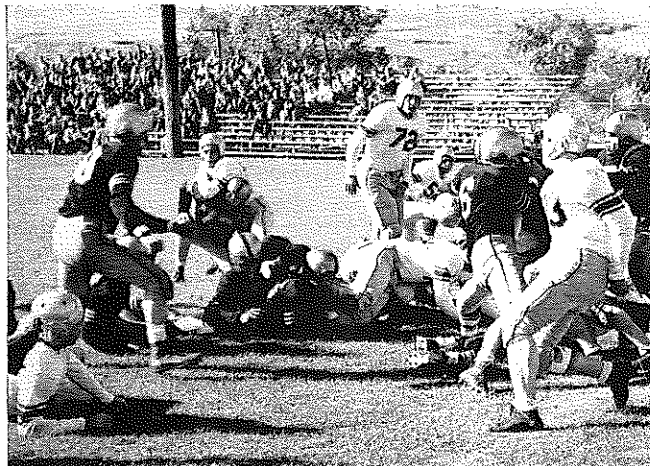
After one exchange Bob Pozzo connected with end John Volosin on a 30 yard toss, and Volosin rambled the distance for the Oredigger score. The play covered 80 yards. Dick Barnes' placement was wide.

Wall again sparkled as he took the following kick-off on the ten yard line and raced 90 yards for a score. John Wilborn made the point from placement.

On the first play after the next kick-off, Drexel Lee threw 45 yards to Bob Pozzo who fought his way the additional 55 yards to the Greeley goal line. A personal foul by the Orediggers nullified the score.



▼ Bob Johnson, 180 pound rough and rugged defensive Left Tackle.



▼ Homecoming Game—Mines about to make score.



▼ Homecoming Game—Mines scoring extra point.

A Bear touchdown was called back in the second quarter by an offside penalty. Mines penetrated to Greeley's 25 in a short first quarter drive.

12-21, Western State 13-21, and Omaha university 0-21.

Homecoming—Mines-CC

A Homecoming-crowd of 5000 saw the Mines' team take the opening kick-off against C.C. and not relinquish the ball until Ed Ziolkowski had bulled over the one-yard line for the initial score. Bob Pozzo fielded the kick-off on his own four-yard line and raced back to his 45 before being dropped. Dick Bench and Ray Govett were the top ground gainers in this 55-yard drive. The try for point from placement by Ziolkowski was blocked.

Dick Bench made a sensational interception of Bob Jones' pass only to have Wes Boucher return the compliment by intercepting Bob Pozzo's pass on the following play and return to the Mines' 29-yard line. Four plays later, Dwight Brothers cracked over from the two-yard line and Don Linger added the point.

Mines drove for 78 yards early in the second quarter for another touchdown after C.C. had been held for downs and punted to Carl Piercy who returned to his own 22. The running and passing of diminutive Bob Pozzo sparked the drive. The longest gain in the series resulted from a Pozzo to Claude Jenkins' pass good for 38 yards to the C.C. 25. Fullback Chuck Young punched the Tiger's middle for the score from two yards out. Dick Barnes' placement was blocked and Mines led 12-7.

The Tigers were not to be denied as they raced back for another touchdown after the next kick-off. Bruce Carson's run of 43 yards and a personal foul penalty against Mines placed the ball on the Oredigger's two-yard line. On fourth down Wes Boucher barely hit pay-dirt. Linger again converted.

At the opening of the third quarter Boucher fumbled on his own 25 and Ziolkowski recovered for Mines. A scoring push was lacking and the

Blasters' lost the ball on the C.C. 22-yard line.

Roy Govett intercepted Jones' second down pass on the Tiger 32 and returned to the C.C. 15-yard line to give the Mines' faithful new hope, but once more a scoring punch could not be found, and C.C. again took over.

A spirited goal line stand was made by the Miners late in the third period when C.C. had first and goal to go on the four-yard line. The Blasters' took over on their own one-yard line. On first down Bud King arched a high spiraling 69-yard punt out of bounds on the C.C. 30-yard line.

Late in the fourth quarter a Jones to Brig Young pass clicked for 55 yards and the last C.C. touchdown.

The Orediggers fought back as Ed Ziolkowski blocked Bruce Carson's kick on the Colorado College 48. End Tom Wyman picked the ball up and was run out of bounds on the C.C. 31-yard line.

A five-yard off-tackle slant by Bill Morgan and King's pass to Drexel Lee gave the Miners a first and ten on the C.C. 20-yard line. The drive fell short on the Tigers' 14-yard line as the game ended.

Mines - Western State

A stubborn Mines' team that failed to capitalize on scoring opportunities lost to Western State at Gunnison with a belated fourth period rally falling short.

Western State's Leon Mark scored from 40 yards out shortly after the opening kick-off to put the Mountaineers in a lead that was never relinquished.

The Orediggers moved for five consecutive first downs in the second quarter on the passing and running of tailback Bill Morgan but lacked the punch to score.

A Bill Morgan pass went astray in the third quarter as Francis Visconti

(Continued on page 41)

REMAINING SPORTS SCHEDULE FOR 1950-1951

Sat. Nov. 18, 1950 Varsity football CSM at New Mexico A & M 2:00 p.m.
 Fri. Dec. 8, 1950 Frosh preliminary game at 6:45 p.m.
 Varsity basketball Adams State at CSM 8:15 p.m.
 Sat. Dec. 9, 1950 Frosh preliminary game at 6:45 p.m.
 Varsity basketball Adams State at CSM 8:15 p.m.
 Sat. Dec. 16, 1950 Frosh preliminary Varsity basketball Continental Air Lines at Golden 8:15 p.m.
 Tue. Dec. 19, 1950 Varsity basketball CSM at Idaho State.
 Wed. Dec. 20, 1950 Varsity basketball CSM at Idaho State.
 Fri. Dec. 22, 1950 Varsity basketball CSM at Montana State.
 Sat. Dec. 23, 1950 Varsity basketball CSM at Montana State.
 Fri. Dec. 29, 1950 Varsity basketball Denver Chevrolet at CSM.
 Fri. Jan. 5, 1951 Frosh preliminary game at 6:45 p.m.
 Varsity basketball Lowry Field at CSM 8:15 p.m.
 Sat. Jan. 6, 1951 Varsity basketball CSM at Lowry Field.
 Fri. Jan. 12, 1951 Wrestling Omaha University at CSM.
 Sat. Jan. 13, 1951 Wrestling Colorado A & M at CSM.
 Sat. Jan. 13, 1951 Boxing Idaho State at Pocatello 8:00 p.m.
 Fri. Jan. 19, 1951 Frosh preliminary at 6:45 p.m.
 Varsity basketball Western State at CSM 8:15 p.m.
 Fri. Jan. 19, 1951 Wrestling, Colo. University at Boulder.
 Sat. Jan. 20, 1951 Frosh preliminary at 6:45 p.m.
 Varsity basketball Western State at CSM 8:15 p.m.

Mines Loses to Colorado College, Western State & Omaha University

The Colorado School of Mines' football team wound up on the short end of the scoring in their last three outings, losing to Colorado College

FROM THE *Local Sections*

ARIZONA

Two meetings in year, second Saturday in April and October. H. Z. Stuart, '36, Bisbee, Vice-Pres.; C. A. Davis, '27, Phoenix, Vice-Pres.; W. W. Simon, '15, Superior, Vice-Pres.; B. G. Messer, '36, Secretary-Treasurer, Rt. 1, Box 40, Globe, Ariz.

BAGUIO

Frank E. Delahunty, '25, President; Luther W. Lennox, '05, Secretary-Treasurer, Benguet Consolidated Mining Co., Baguio, P. I. Meetings upon call of secretary.

BARTLESVILLE

Burt R. Kramer, '42, President; John W. Tynan, '41, Vice President; Richard M. Bradley, '36, Secretary, Cities Service Oil Co., Bartlesville. Luncheon meetings every Friday noon in the Burlingame Hotel Coffee Shop.

BAY CITIES

Louis DeGoes, '48, President; George Playter, '30, Vice President; Clyde Osborn, '33, Secretary; James N. Peros, '38, Treasurer. Visiting Miners contact Secretary, c/o Western Machinery Co., 762 Folsom Street, San Francisco, Calif., Exbrook 2-4167. Meetings, last Friday of October, November, January, February, March and April at the Bellevue Hotel, Geary and Taylor Streets, San Francisco, Calif. Time: 6:30 P. M.

BIRMINGHAM

Robert J. Blair, '39, President; Stanley M. Walker, Ex-'11, Vice President; Hubert E. Risser, '37, Secretary-Treasurer, Bradford Mine, Dixiana, Alabama. Meetings held upon call of secretary. Visiting "Miners" please contact secretary.

CENTRAL OHIO

Roland B. Fischer, '42, President; Frank M. Stephens, Jr., '42, Secretary-Treasurer, Battelle Memorial Institute, Columbus, Ohio.

CENTRAL WYOMING SECTION

Herbert Schlundt, '43, President; Lynn D. Ervin, '40, Secretary-Treasurer, c/o Stanolind Oil & Gas Co., Casper, Wyoming. Meetings, first Saturday, March, June, September, December.

CLEVELAND

Joseph R. Gilbert, '42, Secretary, 14513 Northfield Ave., East Cleveland 12, Ohio. Meetings last Friday of each month at the Carter Hotel, Cleveland.

COLORADO

E. S. Hanley, '34, President; Herbert W. Heckt, '36, Vice President; David Roberts, '40, Treasurer; William J. Holtman, '43, Secretary, 930 Downing St., Denver, Colo. Meetings upon call of Secretary.

EASTERN PENNSYLVANIA

Samuel M. Hochberger, '48, President; Arthur C. Most, Jr., '38, Vice-President, Secretary-Treasurer, 91-7th Street, Fullerton, Penna. Meetings upon call of Secretary.

On September 20th a meeting of the Eastern Pennsylvania Section, Mines Alumni Association, was held in the Fountain House, Doylestown, Pa.

Unfortunately, because of the conflict with other meetings held in this area, there were only seven in attendance as follows:

Robert M. Wheeler, '39; Leslie W. Worth, '38; Alec Jamieson, '43; Wm. M. Aubrey, '43; Charles W. Muller, '42; Porter L. Gillespie, '29; A. C. Most, Jr., '38.

Tentative plans for the next meeting, which will be held in December, are for a dinner meeting in Allentown, Pa. Alumni in the local area will be notified of the meeting date by mail.

GREAT LAKES

Francis W. Mann, '43, President; R. D. Fernald, '37, Vice President; Stanley Ohlswager, Ex-'49, Secretary. Meetings: Fourth Friday, January, April, October. Visiting Miners contact President, c/o Standard Oil Co. (Ind.), Pipeline Dept., 910 So. Michigan Ave., Chicago 1.

HOUSTON

Albert L. Ladner, '27, President; McKay G. Donkin, '29, Vice President; W. Bruce Barbour, '37, Secretary, c/o The Second National Bank of Houston, Oil & Gas Div., Houston. Monthly luncheon meetings held on the first Tuesday at Noon, Tenth Floor of the Houston Club. Visitors please contact the secretary at The Second National Bank of Houston.

KANSAS

All activities suspended.

MANILA

John R. Wagner, Jr., '40, President; Ernesto C. Bengzon, '21, Vice-President; M. M. Aycardo, Jr., '41, Secretary-Treasurer, 3rd Floor Soriano Bldg., Manila, P. I. Luncheon meetings second Saturday all even months of the year.

MONTANA

A. B. Martin, '23, President; M. R. Hoyt, Ex-'08, Vice-President; C. B. Hull, '09, Secretary, 646 Galena, Butte, Montana. Meetings upon call of Secretary.

NEW YORK

Domingo Moreno, '22, President; Fred D. Kay, '21, Secretary-Treasurer, Room 2202, 120 Broadway, New York 5, N. Y. Telephone: Worth 2-6720. Monthly meetings.

NORTH CENTRAL TEXAS

E. J. Brook, '23, President; J. W. Peters, '38, Vice President; H. D. Thornton, '40, Secy.-Treas. (Ft. Worth) 506 Neil P. Anderson Bldg., Fort Worth, Texas, Telephone: 3-3058; Henry Rogatz, '26, Secy.-Treas. (Dallas) 1215-16 First Natl. Bank Bldg., Dallas, Texas,

Telephone: Riverside 4846. Four meetings during year, second Monday of month, February, May, September and November.

The fall meeting was one of the most successful get togethers of the year old North Texas Section of the Alumni Association. Some twenty-five Miners and their guests gathered at the Texas Hotel in Fort Worth on October 19, 1950 to hear a guest speaker from the Federal Bureau of Investigation and to see the excellent color pictures of the Homecoming game with Colorado College.

Mr. Sam C. Cotten of the Federal Bureau of Investigation related some very amusing stories of the work of confidence men operating in the Dallas and Fort Worth area.

All of the members were unanimous in their statement that the football pictures were some of the finest that we had ever seen. We, of this section, recommend that other Alumni groups get their hands on these football pictures, if they can, as the photography and action is excellent.

Those in attendance were:

H. D. Thornton, '40; Ed Nowland, Guest; R. W. Tesch, '33; T. W. Nelson, '34; B. E. Cole, Jr., '49; Wm. F. Dukes, '50; Eddie Horton, Guest; Chuck Einarson, '47; Harley P. Holliday, '42; Geo. Y. McCoy, Ex-'34; Robt. McCart, '05; E. J. Brook, '23; John B. Beville, Ex-'26; Richard Carlisle, Guest; S. W. Johnson, '32; James L. Morris, '38; D. G. Tittle II, 1950; Henry Rogatz, '26; H. G. Schneider, '18; Mark Gardner, '33; J. D. Moody, '40; John H. Wilson, '23; Sam C. Cotten.

OKLAHOMA

Carl R. Holmgren, '38, President; M. E. Chapman, '27, Edgar R. Locke, '28, C. O. Moss, '02, Vice Presidents; Philip C. Dixon, '31, Secretary-Treasurer, Midstates Oil Corporation, National Bank of Tulsa Bldg., Tulsa, Okla.

OKLAHOMA CITY

J. S. "Monty" Montgomery, '31, President; H. M. "Hugh" Rackets, '42, Vice President; M. O. "Shorty" Heggland, '41, Secretary-Treasurer, c/o Stanolind Oil and Gas Co., First National Building, Oklahoma City, Okla. Meetings, first and third Thursdays of each month at the Oklahoma Club. Luncheon 12:00 Noon. All Mines Men are cordially invited to drop in.

PACIFIC NORTHWEST

A. R. Kesling, '40, President, 2915 Holgate, Seattle; Phone: PR-7392. W. I. Sedgely, '40, Secy.-Treas., 6040-36th Ave., S. W., Seattle 6; Phone: AV-8641. Meetings upon call of Secretary.

PENNSYLVANIA-OHIO SECTION

John E. Hatch, '26, President; Robert W. Jones, Ex-'37, Secretary, 85 Aluminum Terrace, New Kensington, Pa. Meetings upon call of officers.

PERMIAN BASIN

Norman E. Maxwell, '17, President; Perry A. Gill, '36, Vice President; M. S. Patton, Jr., '40, Secretary, c/o Sunray Oil Corporation, 407 Midland Tower, Midland, Texas. Meetings to be announced later.

SOUTHERN CALIFORNIA

John Biegel, '39, President; A. J. Heiser, '43, Vice President; C. J. Cerf, '41, Treasurer; Franklin S. Crane, '43, Secretary, c/o Oilwell Supply Co., 934 North Alameda St., Los Angeles. Telephone: MUTual 7311.

Scheduled meetings second Monday of January, April, July and October, at Officers' Club, 2626 Wilshire Blvd., Los Angeles, 6:30 P.M. Phone Secretary for reservations.

ST. LOUIS

Jewel E. Morrison, '26, President; George C. Bartholomew, '29, Secretary-Treasurer, St. Joseph Lead Company, Bonne, Terre, Mo.

UTAH

H. Dave Squibb, '34, President; Geo. H. Allen, '37, Vice President; James Cassano, '31, Secretary, c/o Kaiser Steel Co., Judge Building, Salt Lake City, Utah.

WASHINGTON, D. C.

Marcus G. Geiger, '37, President; Frank E. Johnson, '22, Vice President; Leroy M. Otis, '14, Secretary-Treasurer, Muirkirk, Maryland.

Scheduled evening meetings called for the third Thursday of every other month at the Continental Hotel, Washington, D. C. Special meetings arranged when warranted.

CATALOGS AND TRADE REVIEWS

(Continued from page 36)
national Mining Days' celebrated in El Paso October 12 through 14, 1950. News items will be found covering the principal mining districts in New Mexico, plus information pertaining to the American Mining Congress Convention Exposition in Salt Lake City the last of August. (5857) GRINDING. A 6-page reprint by Hardinge Company, Incorporated, York, Pennsylvania, reports the progress of grinding at Tennessee Copper Company, using Hardinge's Tricone Mill. (5858) "PAY DIRT." September 22, 1950, by Charles F. Willis, Phoenix, Arizona, contains 16 pages largely devoted to activities of the American Mining Congress Meeting in Salt Lake City, Utah, August 28 to 31, 1950. The state of the mining industry is very well covered by the editor of this magazine. It is well worth reading by all of those interested in the mining industry.

SPORTS MARCH

(Continued from page 39)

intercepted and went untouched 40 yards for the score. The conversion was good, leaving Mines 14 points in arrears at the end of the third frame.

Tackle Paul Hamilton opened the fourth quarter by recovering a Western State fumble on the Mountaineers' 35-yard line. In five plays the Orediggers had their first score with Chuck Young going over from the one. Dick Barnes' placement was good.

Mines again gained possession on their own 29-yard line after Western State was held for downs and forced

to kick. End Claude Jenkins and fullback Ziolkowski made fine catches of Morgan's passes to spark this drive. Morgan, after taking the ball on a reverse, passed to Ziolkowski on the Western State 15. Big Ed reversed his field and rambled the distance to score standing up.

Ray Govett's short kick-off was recovered by end Ken Dunn on the Mountaineers' 40, and it appeared Mines might pull this one out as they promptly drove to the Western State 15-yard line. A fourth down pass was dropped in the end zone, however, and Western State took over. On first down Western State's quarterback, Stan passed 40 yards to Lou Mikkelsen who was finally brought down on the Mines 30 by Ray Govett. After a series of two first downs, Western State again scored, making the final score 21-13.

Statistics:	M	WS		
First downs	14	8		
Running yardage	220	188		
Passing yardage	156	110		
Passes attempted	13	12		
Passes completed	8	6		
Punts	3	5		
Punting average	33	43		
Fumbles lost	0	2		
Yards penalized	45	60		
Score by periods:				
Colorado Mines	0	0	0	13-13
Western State	7	0	7	7-21

Mines - Omaha University

A fighting band of Orediggers took the field against Omaha university on October 20. The brisk wind from the foothills decided the final score against Mines of 0-21 as much as any other factor, as two Omaha touchdowns were set-up by short kicks into the goal and another on a blocked kick.

The first quarter action featured the punting of end Bill Johnston who booted the ball out-of-bounds twice within the Omaha 10-yard line. His first kick traveled 52 yards and rolled out on the nine-yard line and his second, 54 yards from scrimmage, bounded out on the Omaha one-yard line.

Mines rolled for a first down to their own 42-yard line early in the second quarter on the running of tailback Bill Morgan and fullback Ed Ziolkowski. After an "illegal use of hands" penalty, the Orediggers were held and forced to kick on fourth down from their 24. Bob Einarson's kick was caught by the wind and bounced backwards and out-of-bounds on the Blasters' 32. Eight plays later, Joe Arenas, a 193 lb. speedster dived over from the Mines one-yard line. Bob Redden kicked his first of three extra points from placement.

Midway in the second period after holding the Omaha attack for downs on their own 20, Mines started a drive that ended on the Omaha 18-

yard line. Ray Govett engineered the drive with help from the hard-driving Ziolkowski.

Neither team threatened in the third period and when the fourth quarter opened, Mines was again facing the big draft. Near the end of the fourth frame, Bill Johnston, kicking from his own thirty, saw his punt land beyond the 50-yard marker and then bounce and blow back out of bounds on his own 29. The Omaha team went for a first down to the 17-yard line. Three running plays left three more yards for the first down, when Arenas threw to Bob Johnson in the end zone for the score.

After the ensuing kick-off, the Miners drove for two consecutive first downs to their own 43-yard line where Wally McGregor fumbled, after making a nice catch of Drexel Lee's pass, and Omaha recovered. Four plays at the Mines fighting forward wall netted three yards and Omaha lost the ball on downs. Bob Einarson was called on to kick from his own 36 when the Orediggers were held for downs. End Bob Stedman broke through from his end position to block the punt. Bob Rose picked the ball up on the 16 and raced over for the final score with one and a half minutes remaining.

The Orediggers fought back for another first down after the kick-off as time ran out.

Fullback Chuck Young, tailback Bob Pozzo, wingback Dave Brown, tackle Bob Johnson, and center Wayne Siltanen watched proceedings from the stands due to injuries.

Mines Freshmen - Sterling Junior College

The Orediggers' freshman team opened a four-game schedule with a rollicking 48-6 victory over Northeastern Junior College of Sterling, Colo.

The scoring went like this:

1. Milton Stenseth went over standing up on a reverse from the Sterling 15-yard line after four and a half minutes of the first quarter had been played.

2. Fullback Allan Fulton scored from the one-yard line culminating a 54-yard drive.

3. End Chuck Andrews scored on a 33-yard jaunt on the Statue of Liberty play, with two minutes remaining in the first quarter.

4. Al Brungardt of Sterling raced 52 yards on a bootleg after one and a half minutes of second quarter.

5. Fulton drove over from one yard line after Andrews had set-up score by intercepting a Sterling pass on the Northeastern 46-yard line.

(Continued on page 43)

Book Reviews

These books may be obtained through the Book Department of The Mines Magazine.

Civil Engineering Handbook, 3rd Edition

Leonard C. Urquhart, Consulting Engineer, Editor-in-Chief, McGraw-Hill Book Co., New York, 1950. 6x9. 1002 pages, illustrated, \$8.50.

This new edition presents a wealth of essential theory and standards, practice and data to meet the needs of civil engineers and others engaged in fields where civil engineering is needed. The book is divided into ten sections, each covered by a separate author, who is one of the country's leading authorities on the particular subject.

This handbook furnishes principles, rules, working instructions and engineering pointers on surveying, railway, airport and highway engineering, mechanics of materials, hydraulics, stresses in frame structures, steel design, cement and concrete foundations, sewage and sewage disposal, water supply and purification and many other subjects especially pertaining to construction.

Many references are found throughout the book which will be especially valuable in research work. An index covering 25 pages enables the user of the book to turn quickly to subjects sought.

Handbook of Chemistry and Physics, 32nd Edition

Charles Hodgman, Editor-in-Chief, Associate Professor of Physics, Case Institute of Technology, Chemical Rubber Publishing Company, Cleveland, Ohio, 1950. 2879 pages, including 34 pages of Index, \$7.50.

This book is a complete library condensed in a single volume covering the subjects of chemistry and physics. The book is divided into five principal sections: 299 pages devoted to mathematical tables; 1111 pages covering properties and physical constants of the elements, inorganic compounds, metallic organic compounds, metal-organic compounds, industrial organic compounds and plastics; 430 pages including general chemical tables such as solubilities, heats of formation, specific gravity and other information; 660 pages including physics data pertaining to subjects such as specific heat, melting and boiling points, sound, electricity and magnetism and light and 336 pages include quantities and units, including definitions and conversion formulas, miscellaneous receipts, etc.

This book is one that will be found especially valuable by those interested in chemistry and physics as well as research.

The Advanced Atlas of Modern Geography

By John Bartholomew, Meiklejohn and Son, London, and McGraw-Hill Book Co., New York, 1950. 108 pages of maps, tables, and descriptive text. 47 pages of index. \$8.50.

Fully in keeping with the long and worthy tradition of the Bartholomew atlases and admirably adapted to the needs of the new age, this latest publication of The Geographical Institute in Edinburgh is engraved and printed in Great Britain. It is an outstanding example of skillful and artistic cartography, covering the entire globe in all its geographic aspects. Regional maps for much of Europe are reproduced with scales of either 1 to 1/4

million or 1 to 3 million, those for North America are on a scale of 1 to 5 million, and those for South America and Africa 1 to 12 1/2 million.

In addition to the usual "place" maps with altitude colors, there are maps showing climatic and demographic data, physiographic and geologic features, vegetation, agriculture, and commercial routes. Great-circle routes in Polar and North Temperate Zones are shown on specially constructed oblique projections. Other new features include a simplified system of geographical coordinates which readily pinpoints any place on the globe. Place names are spelled in local official form, with the traditional forms in brackets.

It is difficult to see how any more information could possibly be made available in such compact and useful form. American map-makers will be hard put to compete with this splendid atlas. *American Scientist, July 1950.*

Black Bonanza

By Frank J. Taylor and Earl M. Welty. McGraw-Hill Book Co., New York, 1950. 7x10. 280 pages. 196 illustrations. \$4.00.

This book is largely devoted to the history of the Union Oil Company of California and includes many interesting stories and glimpses of personalities connected with the growth and success of the petroleum industry. It is an exciting account of how the pioneers battled with early day conditions in both the discovery of oilfields and financing necessary to carry the operations on to success. It illustrates the vision, persistence and enterprise necessary to overcome the hardships and obstacles confronting those who are responsible for the present success of the great petroleum industry.

One of the most interesting features of the book is its many illustrations covering events and personalities and especially in connection with the development of the petroleum industry in California. This book is not only a fascinating book to read but also highly instructive for those who are interested in getting a better picture of the petroleum industry.

Word Finder

Compiled and edited by J. I. Rodale. Rodale Press, Emmaus, Pa. 6x9. 1317 pages. Thumb Index. \$6.50.

This book combines three books previously published into one convenient volume which arranges nouns, verbs and adjectives alphabetically and in connection with each such word, a list of augmentatives are given that may be used to condition such noun, verb or adjective. By studying any word in this publication along with expressions and synonyms, it is possible to develop a concept and build a thought in such a way that sentences may be constructed relating to the particular subject. This aids in the developing of an increased vocabulary and a greater power of self expression.

A 26 page preface to the book fully explains how it can be used to advantage. The book will be found especially valuable to those interested in becoming more proficient in the art of writing. The thumb alphabetical index used throughout the book makes for speed of reference.

Sun in the Sky

The Hopi Indians of the Arizona Mesa Lands

By Walter C. O'Kane. University Oklahoma Press, 1950. XVII+261 pages. 54 phot. plates. \$4.00.

Ten years ago, one of America's foremost entomologists met, by chance, a Hopi grandfather. Ever since, he has returned again and again to the twelve villages that compose the Hopi reservation in Arizona, and has learned to know intimately the people there and their ancient and modern ways of life. He has put this knowledge into a remarkably attractive book, full of personal conversations with his friends, embellished liberally with excellent photographs, and, incidentally printed on fine paper in a good binding.

Not only is the reader given exact data on the history, land, homes, food, crops, trades, family and community life, medicines, religion, and rituals of these sturdy, honest, and independent people; Dr. O'Kane shows also how their resilient spirit, their "world of imagination and free-ranging vision," their buoyant and boundless faith sustain them in their daily lives. He evaluated their attitude toward the white race, what white culture has done for them, and in turn what contributions the Hopis themselves have made. *American Scientist, July 1950.*

Annual Report of Bureau of Mines of State of Colorado, 1949

By Walter Scott, Commissioner of Mines, State Capitol, Denver, Colorado. 44 pages.

This report covers the mineral production of the state by counties. Fatal accidents, both underground and on the surface are listed. A complete list of operating mines for the year 1949 are given with locations, post office addresses, character of the product and the parties operating is supplied. Also given is a list of operating mills, smelters, placers, dredges and road projects, tunnels and dams. Copies of this report may be obtained from the Commissioner of Mines, State Capitol, Denver, Colorado.

Mining Laws of Canada, Bulletin 828

Prepared by Arthur Buisson. Canada Department of Mines and Technical Surveys, Ottawa, Canada, 1950. 133 pages. \$5.00.

The report covers the synopsis of the mining laws at present in force; a summary of special Acts relating to mining; mine taxation; lists of Acts, Amendments and Regulations at present in force; royalties; bounties; schedule of fees; and personnel. This book will be found especially valuable to those interested in mining in any of the Canadian provinces.

PERSONAL NOTES

(Continued from page 26)

of the United States. Students attend the school for two years, at the end of which time they receive the degree of Master of Business Administration.

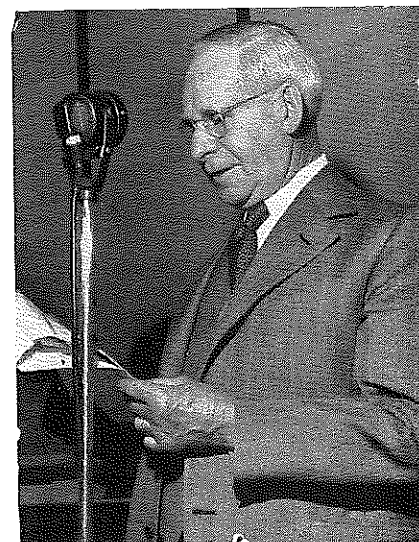
Fred A. Nagel, '40, Salesman for Prefabricated, Inc., has moved his residence to 3010 So. Elm Street, Denver.

IN MEMORIAM

Arthur H. Buck

of the class of '97 and formerly prominent in mining, milling and smelting, passed away at his home in Denver on September 8.

A native of Boston, Massachusetts, he received his elementary education in Denver, after which he entered *Mines*.



ARTHUR H. BUCK

Shortly after his graduation he accepted a position in Mexico and remained in that country for five years gaining experience in assaying, surveying, construction work, mine engineer and superintendent for several companies, including Cia. Minera de Penoles.

In 1904 he accepted a position with the New York & Honduras Rosario Mining Company in Honduras as mine superintendent. Returning to Mexico he was engaged in mine examinations, as mine and mill superintendent until 1913 when he returned to the States and shortly afterwards became associated with the Empire Zinc company at Gilman, Colorado, where he served as superintendent, mining and smelting until 1931. From then until his retirement he did consulting work.

Mr. Buck was married in 1903 to Miss Margaret Douglas of London, Ontario, who died in 1937. He is

survived by a daughter, Mrs. C. W. Turner of Denver; two sons, Donald of Seattle, Washington, and Douglas of Denver; and six grandchildren.

Harry J. McCready, Jr.

died the middle of July, having suffered an attack of amnesia and wandered a short distance from Dallas, Texas, where he was en route to Denver to visit his parents. His body was not found until September 14.

For the past two years he had been in Brazil with Exploration Surveys and had returned to his home last June. He had visited with his family who were temporarily in Pampa, Texas, and left them to go to Denver.

Mr. McCready was born and reared in Denver, and graduated from *Mines* with the class of '37. His first position was with Seismic Explorations in Texas, from which he transferred to Socony-Vacuum Oil Company who sent him to Colombia where he was promoted from gravity meter operator to party chief. He returned to the States in 1941 to enter the U. S. Navy, serving through 1945 when he was discharged with the rank of Lieutenant (j.g.).

The following two years he was associated with Seismograph Service Corporation in Colombia before going with Exploration Surveys.

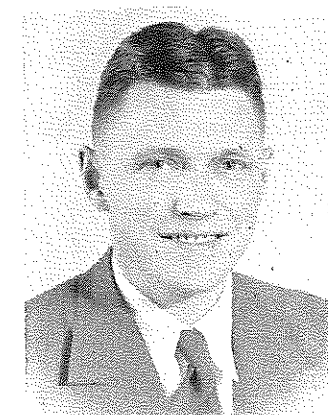
Surviving him are his wife, the former June Phillips to whom he was married in April 1946, two children, and his parents, Mr. and Mrs. Harry J. McCready, Sr., of 5441 West 48th Avenue, Wheat Ridge, Colorado.

John H. Wilson

of the class of '31, was killed in an airplane accident at Porto Segure, Brazil, September 6. He had been in Brazil for six years, the past two as manager of field operations for Bradshaw, Goodrich & Cia., Ltd. The company operations included lumber, cocoa and rubber.

Prior to this position he was field engineer for Drilling and Exploration Company and Fraser-Brace Engineering Company, making industrial surveys and estimates for possible new industries in Brazil; engineer for a Brazilian affiliate of Baroid Sales Division of National Lead Company; and operating manager of Empreza

Lopes Marques Industrial y Agricola, Ltd., the largest producer of lumber and lumber products in the state of Bahia and probably in all north Brazil.



JOHN H. WILSON

Upon his graduation from *Mines* he gained experience in mining and milling with companies in Western United States, then accepted a position with Electro-Metallurgical Company and Union Carbide & Carbon Co. at Niagara Falls, N. Y. where, for seven years, he was development engineer for all electric furnace design, construction and repair.

Born and reared in Berlin, New Hampshire, Mr. Wilson came to *Mines* in 1929, after having attended U. S. Naval Academy for one year and Pratt Institute for one year, completing his work in Metallurgy in two years.

He was married in December 1931 to Dorothy Bodine of Denver. She with their four children, three daughters and a son, returned to the States from Brazil in 1947. Besides these he is survived by his mother, Mrs. Mary C. Wilson of Bethel, Maine.

SPORTS MARCH

(Continued from page 41)

6. John Masek off-tackle from the two yard line with one minute remaining in third quarter after 61-yard drive.

7. Center LeRoy Little intercepted a Brungardt pass on the Sterling 31-yard line and scored standing up.

8. John Masek scored from one-yard line after 24-yard drive after tackle Ken Miller had recovered a Sterling fumble.

9. Allan Fulton raced 73 yards with one minute to play on line buck.

DR. MELVILLE F. COOLBAUGH DIES

(Continued from page 12)

rado; three sons, Jack, *Mines*, '31, consulting metallurgist and managing director of Mine-Elect, Ltd., Southern Rhodesia; Franklin, *Mines*, '33, assistant gen-

eral superintendent, Climax Molybdenum Co., Climax, Colo.; and David, *Mines*, '43, graduate student at St. Louis University; a sister, Miss May O. Coolbaugh of Austin, Texas; and nine grandchildren.

Funeral services were held in Golden, with cremation following at Fairmount cemetery, Denver.

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PLACEMENT FUND**

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TECHNICAL MEN WANTED

(Continued from page 7)

practical experience preferred, including core drilling and plane table work. Salary open.
(1330) DRAFTSMAN AND DESIGNER. A position is open with a well known mining company planning extensive operations in the Rocky Mountain region. Applicant should have five to ten years experience, including plant design, using heavy crusher equipment running as high as 1000 tons per hour. Probable starting salary, \$450 to \$500 per month.
(1331) JR. PETROLEUM ENGINEER. A well established service company has position open for petroleum engineer as oilfield service man. Should

(Continued on page 45)

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TECHNICAL MEN WANTED

(Continued from page 44)

have some experience in connection with oilfield operations and preferably in the operation of diamond drill equipment. Starting salary, \$250 per month plus car and expenses.
(1332) GEOLOGICAL DRAFTSMAN. One of the major oil companies has position open in the Rocky Mountain region for geological draftsman. Applicant should be interested in following this type of work. Starting salary, \$250 to \$300 per month, depending upon experience.
(1333) MINING ENGINEER. A South American mining company has position open for engineer in one of their base metal mines. A recent graduate will be considered. Should have some knowledge of Spanish. Standard three-year contract with travelling expenses both ways. Salary depending upon experience and ability of applicant.
(1335) ASSISTANT GEOLOGIST. Position is open with mining company located in the middle

west and carrying out extensive exploration work. Work will consist of open pit mine maps and section together with field supervision of ore drilling and sampling program as well as examination and reports. Probable starting salary, about \$300 per month.

(1336) JR. MINING ENGINEER. An industrial company located in Texas has position open for jr. mining engineer with experience in mine, land and road surveying together with mapping and calculation of ore reserves. Probable salary, \$325 per month to start.

(1337) COAL MINING ENGINEER. One of the large coal companies operating in the Rocky Mountain region has position open for young mining engineer who has had some practical experience in coal mining, a knowledge of state coal mining safety laws and the ventilation of coal mines. This man will be trained in coal mining operation. Salary depends upon previous experience and ability of applicant.

LETTERS (Continued from page 4)

ON ACTIVE DUTY WITH THE NAVY

From W. CLARK GROVE, '36, Route 1, Box 125, Alexandria, Va.

I am well situated with a nice little house on the Potomac, near Mount Vernon. Am a navy lieutenant on active duty in the office of Naval Intelligence in the Pentagon. Hope to look up all the *Mines* soon.

MISSES COPY OF MINES MAGAZINE

From FORREST W. GRUBB, '50, 200 N. W. 17th, Apt. D, Oklahoma City, Okla.

During the last two months I have been living at an address different from the one I furnished you in July. In the future please send my copies of *Mines Magazine* to the one given above.

I haven't received copies for August or September which is probably due to my delay in notifying you. If these were returned, I would really appreciate your sending them on now.

Thank you very much.

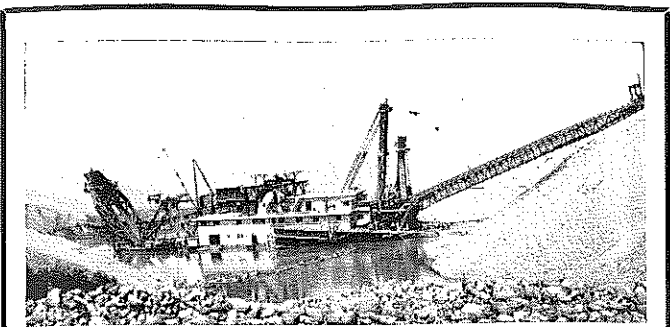
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(1338) SALES ENGINEER. One of the leading manufacturers of milling equipment has a position open for sales engineer between the ages of 40 and 50 years who has had considerable experience in the sale of mining and milling equipment and understands its construction and operation. Salary will depend upon ability of applicant to produce.

(1339) ADVERTISING ASSISTANT. A well established machinery manufacturing company with a well organized advertising department has position open for advertising assistant who is well acquainted with mine and mill equipment and able to write fluently. Salary open.

(1341) MINING ENGINEER. A mining company with extensive operations in South America has position open for assistant superintendent of mines. Should be able to handle all phases of mining operation and have a good speaking knowledge of the Spanish language. Substantial mine experience in Latin-America preferred. Salary open.

(1342) METALLURGICAL ENGINEER. A South American company has position open for a man with at least five years experience in the operation of concentration plants using both flotation and gravity methods. Preference will be given to single man with good knowledge of Spanish language. Three-year contract. Transportation both ways. Three months vacation. Salary open.

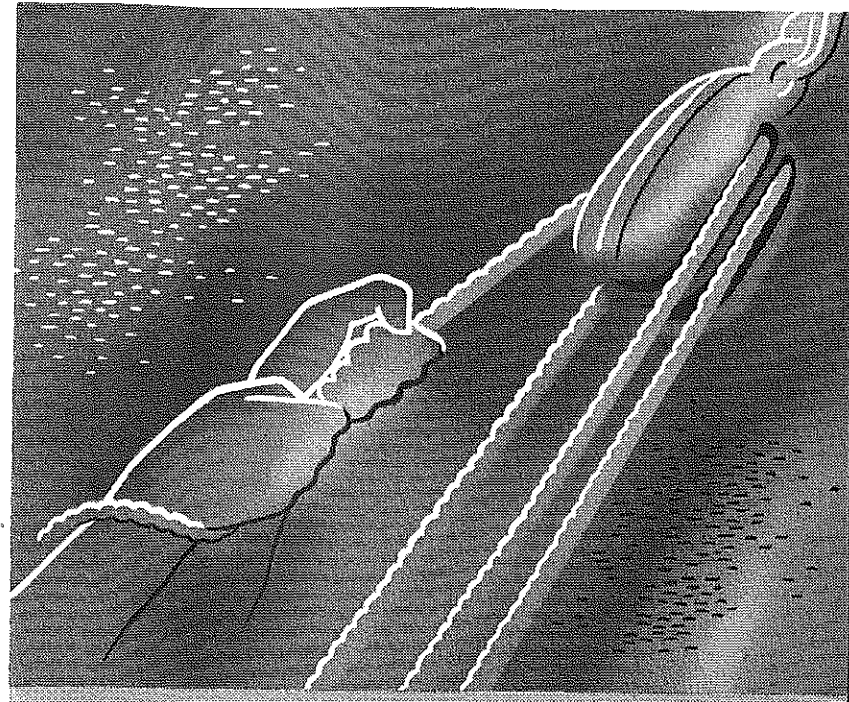
(1343) RESEARCH ENGINEER. One of the large research organizations has position open for geophysical trainee. Applicant must have B.S. degree in either Physics, Geophysics, electrical engineering or Geology, and have a good background in mathematics and physics with high academic standing. Position includes training in technical phases of instrument construction, operation and maintenance, interpretation and mapping of geophysical data and in field operation procedures.

(1344) PHYSICIST. A position is open with an eastern research organization for a physicist, who has at least an M.S. degree in Physics or Mechanical Engineering with a good working knowledge of electronics. His duties will be the design and development of electronic and geophysical instruments and mechanical equipment related to oilfield production, drilling and transportation. Salary open.

(1346) JR. REFINING ENGINEER. One of the major oil companies operating gasoline plant producing gasoline butane and propane from gas has position open for trainee willing to start as a roustabout and progress as experience justifies. Probable starting salary between \$250 and \$275 per month.

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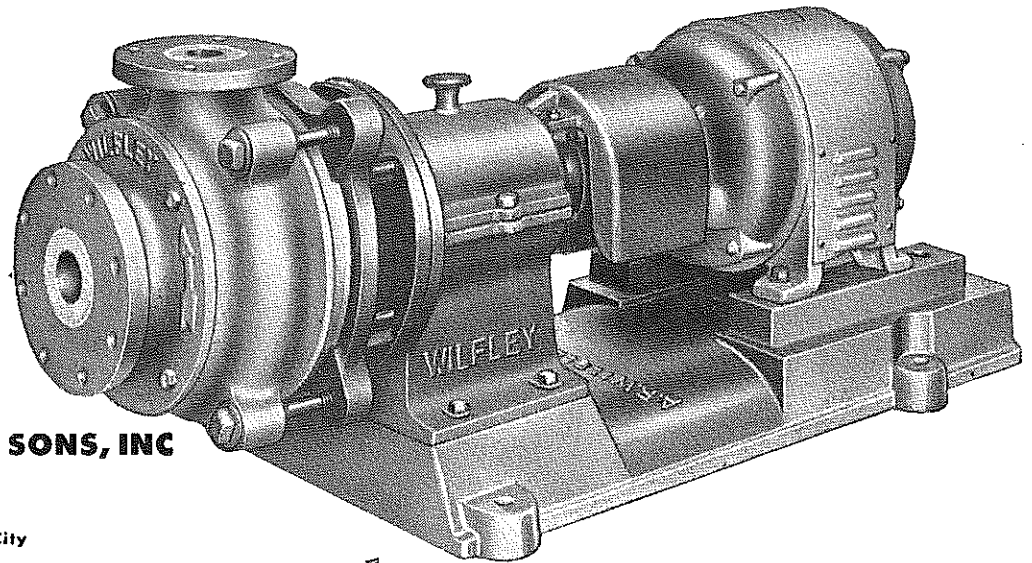
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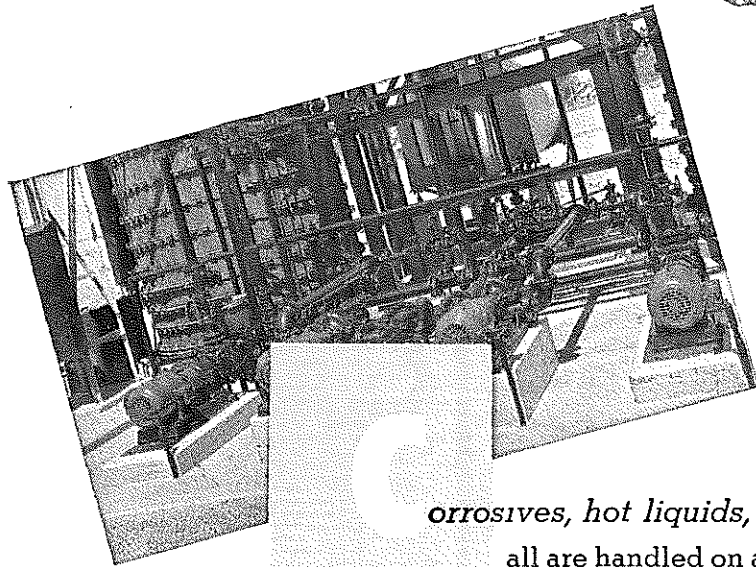


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