THE MINES MAGAZINE

AROUND THE WORLD WITH THE MINERAL INDUSTRIES

MINERAL ENGINEERING

Covering The Field Of

- ★ Mining Engineering
- ★ Metallurgical Engineering
- ★ Fuel Engineering
- ★ Petroleum Engineering
- ★ Geological Engineering
- ★ Geophysical Engineering
- ★ Ceramic and Non-Metallic Engineering

Featuring—

ELASTICITY IN RUBBER TECHNOLOGY

AEC NEWS

MAGNETIC SURVEY DATA

FUNCTION OF PETROLEUM ENGINEERING DEPARTMENTS

GOLD MINER PUBLIC RELATIONS PROGRAM "MINES" ENGINEERS' DAY

APRIL • **1950**

VOLUME XL Number 4

PERSONAL NOTES

H. W. Addington, '43, Petroleum Engineer for The California Company, has been transferred from New Orleans, La., to their Denver office, U. S. National Bank Building. He and Mrs. Addington and son, Gary Kent, are at home at 1501 East Street, Golden, where he receives mail.

Luis A. Baldo, '46, has accepted a position with Creole Petroleum Corporation and is addressed in their care, Caracas, Venezuela.

H. J. D. Bambrick, Ex-'38, Senior Mining Engineer for Johns-Manville Company, Ltd., Asbestos Fibre Division, has a new mailing address, Box 882, Asbestos, Quebec, Canada.

Robert D. Bowser, '49, is employed by the Mene Grande Oil Company, in whose care he is addressed, Apartado 234, Maracaibo, Venezuela.

A. F. Boyd, '26, has sold his interest in the G and M Hardware Company, but will remain in Bishop, California, for the present with P. O. Box number 311.

Roy F. Carlson, '48, has been promoted by The Oil and Gas Journal to the position of District Editor and transferred from Tulsa, Oklahoma, to their office in Dallas, Texas, 1238 Mercantile Bank Building.

C. M. Chappell, '49, is being addressed in care of Shell Oil Company, Box 1861, Corpus Christi, Texas.

James W. Clemens, '48, was recently assigned to the position of Operating Engineer for The Homer-Wauseca Mines of the M. A. Hanna Company. He was formerly Safety Engineer for the company. His address is Iron River, Michigan.

William S. Cole, Jr., '35, Chief Engineer for Reynolds Mining Corporation, is being addressed c/o Reynolds Jamaica Mines, Ltd., Lydford P. O., St. Ann, Jamaica, B. W. I.

Dwayne M. Coleman, '49, has been promoted to Petroleum Enginer by Magnolia Petroleum Company and has been transferred from Louisiana to Alice, Texas, where he is addressed 1231 Belmont Street.

Robin J. Corbett, '48, who is employed by the Sharples Oil Company, has been transferred from Worland, Wyoming, to Denver, with Post Office Box number 180.

Ralph T. Duffner, '42, Geologist for U. S. Geological Survey, is now in Albuquerque, New Mexico, his home address being 113 No. Mulberry.

Jack D. Duren, '48, Junior Exploitation Engineer for Shell Oil Company, is now in Great Bend, Kansas, where he is addressed Box 744.

Major John C. Dyer, '27, has been assigned Staff Engineer, Hqs. MARBO, APO 246, c/o Postmaster, San Francisco, Calif.

William A. Elser, '48, is now in Royalty, Texas, with address Bin B, where he is serving as Petroleum Engineer for Standard Oil Company of Texas.

George H. Fentress, '49, has been advanced from Technical Trainee to Computer by Phillips Petroleum Company, with new address in care of the company, Marshall, Texas.

Arthur E. Ferguson, Jr., '43, is Methods Technician for Remington-Rand, Inc., with address 1940 Page Street, San Francisco, Calif.

Albert H. Fleitman, '49, has accepted a position as Metallurgist with the Inland Steel Company. His new address is 241 Clinton Street, Hammond, Indiana.

(Continued on page 5)

The Mines Magazine published monthly by the Colorado School of Mines Alumni Association, Inc. Entered as second-class matter, at post office at Denver, Colorado under act of Congress, March 3, 1879. U. S. Subscription rate $4.00 yearly, foreign rates $5.00, single copy $.50.

Professional . . . CARDS

Letters . . .

RETURNING TO THE STATES

From GENE MEYER, '37, *1214 South Westmoreland Ave., Los Angeles 6, Calif.*

Enclosed find my personal check to be distributed as indicated on the enclosed card. Am leaving here shortly and until further notice will you please send any correspondence to the above address, not using my Bolivian address in the future.

At present I am finishing up a pilot plant run on a process I worked out for flotation of cassiterite. The results have been pretty good and I have gotten much interested in research work on non-metallic flotation.

WILL MAKE COLORADO THEIR PERMANENT HOME

From MAURICE NAFTALY, '38, *815-14th Street, Golden, Colo.*

Although I am dropping you this line from New York City you will note at the head that I give my Golden address. This is to tell you that until further notice both my permanent and home address will be as shown and, therefore, please send all my mail regarding the Alumni Association to the Golden address.

Mrs. Naftaly and I are leaving New York to return to Colorado for good. We have roamed all over the world for the last twelve years and we have finally decided that it is about time we return to the place we really want to be in for always—*Colorado.*

I will come in to see you after my return to Golden.

APPRECIATES MINES ALUMNI ASSOCIATION

From ROBERT E. ZIMMER, '49, *The California Company, Box 177, Stamps, Arkansas.*

I am sending check to cover my initiation fee and dues for membership in the Alumni Association.

It has been encouraging and heartening for me to find the alumni of the Colorado School of Mines so highly respected in industry. I have met many since my graduation last spring and all still carry a large charge of that "Mines Spirit" with them. I am proud to become an active member of an association comprising so many illustrious members.

SETTLED IN BOMBAY, INDIA, FOR AN INDEFINITE STAY

From MRS. M. C. IRANI, *Box 804, Bombay, India.*

Just a note to let you know we reached our destination and are now settled and to give you our present address. We are in Delhi just now where Meherwan is concerned with the usual "Government troubles."

We reached Bombay on Sunday, January 22, and have been there until a few days ago. Thus far our visit has been most pleasant.

When we return to Colorado we will have a variety of movies as we have been using the camera liberally. There are such magnificent government buildings here in Delhi and some historic structures nearby that we plan to visit before leaving.

Sorry we could not see you before leaving Denver but actually we had only ten-days notice. (M. C. Irani, M.Met. '42)

TAKING GRADUATE WORK TOWARDS MASTER'S DEGREE

From DUDLEY L. RAINEY, '42, *31 West 101st St., Orangeburg, N. Y.*

Enclosed is a check for my 1950 dues; sorry I'm a bit late.

Last September I left the New Jersey Zinc Company to return to school to study for my Master of Science degree in Mining. I am now at Columbia University and expect to receive my degree next October. My address while here is given above.

HAS POSITION AND NEW ADDRESS IN STATES

From FLOYD L. STEWART, '43, *1082-A San Antonio Drive, Long Beach 7, Calif.*

This is to inform you that I have taken position of Petroleum Engineer with the Hancock Oil Company of California and now am residing in that city-by-the-Pacific, Long Beach, at the address shown above.

After having been in Venezuela for three years the United States looked like the place in which we most wanted to settle down. We did enjoy our stay in South America though but, again, the United States is a most wonderful place.

(Continued on page 42)

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.

(1030) SMELTER AND MILL SUPERINTENDENTS. An engineering company now building a concentrating mill and smelter in Turkey have positions open for a smelter superintendent who has had experience in smelting flotation concentrates in a reverberatory furnace and also in the conversion of copper matt by convertor into refined copper, and a flotation mill superintendent capable of operating a 1500 ton mill on chalcopyrite ore. Salary of both positions open, depending on experience and ability of applicants.

(1100) MINE FOREMAN. A position is open for mine foreman in Africa who has had experience in top-slicing methods and the use of square sets. Must be capable of handling bad ground in wide veins. Production will probably run several hundred tons per day. Applicant must have had wide experience and be able to produce with native labor. Salary open.

(1142) TOPOGRAPHICAL ENGINEERS. One of the Federal Bureaus has positions open for Topographical Engineers covering work in the Rocky Mountain Region. These will be rated as GS-5 grade. Starting salary per year, $3100, plus expense allowance when away from headquarters.

(1143) DESIGNING ENGINEER. One of the Rock Drill Manufacturing Company's has a position open for a Rock Drill Designer who has had three to five years experience in the designing of rock drills. Salary open.

(1146) JUNIOR SALES ENGINEER. A company selling construction equipment in the Rocky Mountain territory has a position open for a Junior Engineer to train in connection with sales and service. Moderate salary to start on but good opportunity for advancement for the right man.

(1147) SALES ENGINEER. A company located in Ohio manufacturing and selling concrete masonry construction materials has a position open for Sales Service Engineer who has had engineering experience in concrete construction and estimating costs. Should have good personality and ability to sell concrete products. Salary will depend on experience and ability of applicant.

(1148) JUNIOR MINING ENGINEER. An eastern manufacturer of iron products has a position open for young mining engineer in connection with their iron mines. Applicant should have some mining experience and ability to supervise men. Salary will depend upon experience and ability of applicant.

(1153) PHYSICISTS AND RESEARCH ENGINEER. A research organization established in the middlewest has positions open for physicists, and electrical engineers with good background in physics, electronics and electrical research. Applicants should have Master's or Doctor's degrees. Salary open.

(1154) MINING OR METALLURGICAL ENGINEER. A well established company operating in foreign countries has a position open for an engineer who has ore-buying experience and a good knowledge of the Spanish language. Salary open.

(1155) MINING AND METALLURGICAL ENGINEER. A company operating non-metallic mines in the south has a position open for graduate engineer to work in open pit mining and carry on research work for the flotation of non-metallics. However, several months training will be required before taking on an executive position. Salary open.

(1160) METALLURGICAL ENGINEER. A position is open for a metallurgical engineer with a well established company operating in Mexico. Applicant should have had some experience in the operation of flotation equipment. Salary open.

(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.

(1171a) MINE FOREMAN. A South American mining company has a position open for Mine Foreman. Must be a college graduate with mining experience and a good working knowledge of Spanish. Must report single status for six months. Salary open and includes air transportation to South America together with liberal vacation allowance and salary. Free living quarters.

(1172) RESEARCH CHEMICAL ENGINEERS. A South American mining company has a position open for Research Chemical or Metallurgical Engineers under 30 years of age. Must be familiar with analytical procedures in the determination of all elements, including rare metals. Salary open.

(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.

(1177) MECHANICAL DRAFTSMAN & DESIGNER. A mining and smelting company operating in the middle-west has position open for a mechanical draftsman and designer capable of designing equipment. Applicant should have four to five years experience. Salary open.

(1178) JUNIOR METALLURGIST. A mining company in South America has position open for Junior Metallurgist with some experience in ore-dressing and laboratory work. Knowledge of Spanish is desirable. Starting salary, $3000 per year plus living quarters. Transportation by air, free. Yearly bonus of 1 month. 3-year contract.

(1181) MINE MANAGER. A mining company with extensive operations in Central America has a position open for Mine Manager. Applicant should have extensive Latin-American experience and a successful record as General Supt., Asst. Mgr. or Mgr. Only top men will be considered. Good opportunity for a qualified man. Salary open.

(1182) SALES ENGINEER. A large steel company has position open for Sales & Service Engineer. Must be thoroughly acquainted with oil-field practice and have had 5 to 10 years experience. Applicant must have administrative ability and excellent personality. Fine opportunity for the man who can meet requirements. Salary depends upon experience and ability of applicant.

(1184) JUNIOR SALES ENGINEER. Well known manufacturing company producing equipment used in petroleum production has an opportunity open for Junior Sales Engineer. Must possess natural ability for sales and engineering and designing. Must have good personality and be enthusiastic. Starting salary will be sufficient to cover all expenses. Car furnished. Territory, probably Wyoming.

(1186) JUNIOR MINING ENGINEER. Well known mining company operating in Central America has position open for Junior Mining Engineer who is qualified to make underground and surface surveys and maps. Good opportunity to advance into production. Salary open.

(1187) JUNIOR SALES ENGINEER. Well known manufacturing company has position open as Junior Sales Engineer for a livewire young engineer. Good opportunity to advance. Territory eventually to be covered will be in the Rocky Mountain Region. 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.

(1192) SURVEYOR & DRAFTSMAN. A prominent engineer located in Colorado has position open for young man with experience surveying and drafting. Salary open. Good opportunity for the right man.

(1193) DRAFTSMAN AND DESIGNING ENGINEER. A company operating in California has position open for experienced designer and draftsman. Must have knowledge and experience covering steel and concrete design and also working knowledge of typical underground layouts, including car dumps, chutes, loading pockets, haulage systems, etc. Probable starting salary, $450 to $500 per month.

PERSONAL NOTES

(Continued from page 3)

Wilfred Fullerton, '12, President of The Fairmount Cemetery Association, has a new residence address, 1344 Locust Street, Denver 7.

Robert H. Gallaher, Jr., '43, has been transferred by The Texas Company from Wilder to Caldwell, Idaho. He is now being addressed 204 West Ash Street, Route 6, Caldwell, Idaho.

Lee W. Gibson, '40, Independent Oil Producer and Consultant in Reservoir Engineering, has moved from Huntington Beach to Riverdale, California, with post office address Box 34.

Arnold G. Hampson, Ex-'51, Magnetometer Operator for Inter-mountain Exploration & Engineering Company, is addressed Hudson Bay, Sask, Canada.

(Continued on page 7)

CONTRIBUTORS TO PLACEMENT FUND 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.

M. T. Honke, Jr., '48
George Baekeland, '22
Max Schott, Hon., '40
J. L. Fusselman, '42
H. V. Stewart, '49
G. F. Kaufmann, '21
N. J. Christie, '35
H. D. Graham, '48
V. G. Gabriel, '31; '33
Wilfred Fullerton, '12
M. John Bernstein, '47
H. L. Muench, '40
G. N. Meade, '41
T. N. Allen, '41
G. W. Schneider, '21
H. J. McMichael, '39
Robert McMillan, '41
E. E. Davis, Ex-'29
C. W. Desgrey, '26
Floyd L. Stewart, '43
M. S. Patton, Jr., '40
D. M. Davis, '25
John Biegel, '39
L. F. Elkins, '40
R. G. Finlay, '39
L. E. Smith, '31
F. C. Bowman, '01
F. F. Frick, '08
Franklin Crane, '43
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J. A. McCarty, '35
Hildreth Frost, Jr., '39
H. W. Evans, '49
J. R. Medaris, '49
P. B. Shanklin, '48
M. W. Miller, '49
T. A. Hoy, '49
J. R. Newby, '49
J. P. Bonardi, '21
C. A. Weintz, '27
F. D. Kay, '21
J. C. Andersen, Jr., '45
T. L. Goudvis, '40
R. E. Buell, '41
Daniel H. Dellinger, '31
A. C. Harding, '37
R. L. Scott, '42
P. W. Crawford, '22
M. L. Gilbreath, '33
R. F. Dewey, '43
J. A. Kavenaugh, '38
J. G. Johnstone, '48
Wm. C. Lieffers, '48
F. E. Woodard, '42
Wm. H. Bashor, Jr., '49
T. H. Allan, '18
T. F. Adams, '29
C. V. Woodard, '44
Otto Herres, '11
E. J. Brook, '23
J. W. Gabelman, '43
J. B. Ferguson, '30
D. W. Butner, '15
A. G. Hoel, Jr., '40
R. L. McLaren, '32
J. A. Davis, '39
C. D. Reese, '43
W. F. Distler, '39
G. W. Mitchell, '23
N. H. Donald, Jr., '39

Parker Liddell, '03
G. M. Miner, '48
J. B. Larsen, '36
J. A. Clark, '21
H. E. Lawrence, '48
F. W. C. Wenderoth, Ex-'36
V. R. Martin, '41
T. J. Lawson, '36
Marvin Yoches, '40
C. C. Towle, Jr., '34
J. N. Gray, '37
D. W. Reese, '48
S. E. Anderson, '32
Herbert Schlundt, '43
F. E. Johnson, '22
W. E. Norden, '34
P. A. Jennings, '34
W. R. Parks, '38
Masami Hayashi, '48
G. R. Rogers, '48
G. O. Argall, Jr. '35
J. R. McMinn, '42
R. M. Frost, '48
R. D. Eakin, '48
K. B. Hutchinson, '39
W. S. Chin, '49
K. W. Nickerson, Jr., '48
T. V. Canning, '32
L. O. Green, '32
James Colasanti, '35
W. E. Bush, '41
R. C. Pruess, '42
B. E. Coles, Jr., '49
Finley Major, '47
W. J. McQuinn, '46
R. E. Cheek, '43
G. H. Shefelbine, '35
W. H. Nikola, '41
S. E. Zelenkov, '36
G. H. Fentress, '49
J. L. Bruce, '01
W. L. Falconer, '41
G. P. Mahood, '24
J. A. Bowler, '39
W. C. Kendall, Ex-'47
J. C. Smith, Ex-'35
E. L. Durbin, '36
W. D. Caton, '35
W. A. Conley, '19
H. H. Christy, '22
F. E. Lewis, '01
E. C. Royer, '40
E. A. Berg, '41
G. A. Smith, '34
H. L. Jacques, '08
S. C. Sandusky, '48
J. W. R. Crawford, III, '48
O. P. Dolph, '25
A. M. Keenan, '35
W. H. Breeding, '39
N. S. Whitmore, '29
R. G. Hill, '39
L. E. Wilson, '27
L. P. Corbin, Jr., '40
W. J. Rupnik, '29
F. C. Aldrich, '48
R. H. Sayre, Jr., '34
R. W. Evans, '36
J. D. Moody, '40
M. F. Barrus, '43

A. E. Perry, Jr., '37
E. F. Petersen, Jr., '37
W. H. Friedhoff, '07
R. R. Allen, '40
F. A. Seeton, '47
W. C. Pearson, '39
N. M. Hannon, Jr., '47
M. W. Ball, '06
M. M. Tongish, '43
J. E. Tuttle, '49
E. E. Fletcher, '45
R. D. Segur, '41
W. A. Elser, '48
E. S. Rugg, '43
R. L. Bradley, '47
F. Clinton Edwards, '41
E. D. Hyman, '48
Nikolai Belaef, '27
G. S. Schonewald, '48
S. J. Marcus, '45
A. H. Logan, '38
P. M. Howell, '38
A. D. Swift, '23
H. D. Campbell, '42
R. R. Bryan, '08
R. W. Knapp, '40
S. H. Hochberger, '48
G. V. Atkinson, '48
Robert Bernstein, '42
C. G. Hayes, '41
I. R. Taylor, '48
E. G. Snedaker, '14
R. L. Brown, '44
H. C. Bishop, Jr., '43
G. G. Griswold, Jr., '14
V. N. Burnhart, '32
K. E. Bodine, '48
H. F. Holliday, '42
R. D. Locke, '44
B. E. Duke, '39
W. D. Lord, Jr., '44
Christian Kuehn, '41
Douglas Ball, '43
L. I. Railing, Jr., '47
H. F. Carpenter, '23
R. P. Olsen, '49
E. M. Watts, Ex-'26
L. O. Storm, '40
W. B. Barbour, '37
J. R. Hallock, '49
E. W. Steffenhagen, '41
W. W. Simon, '15
R. F. Corbetta, '48
J. H. Vose, Jr., '39
J. L. Bolles, '49
B. W. Knowles, '08
G. B. Harlan, '49
Gene Meyer, '37
G. A. Parks, '06
C. W. Campbell, '47
J. N. Wilson, '42
J. S. Phillips, '49
A. F. Beck, '25
F. J. Weishaupl, '49
Victor Bychok, '42
C. F. Fogarty, '42
M. M. Aycardo, Jr., '41

Preston Grant, Ex-'33
Lester S. Grant, '99
T. H. Garnett, '11
Jno. C. Mitchell, '39
W. W. Lowrey, Ex-'41
Robt. E. Simon, '48
R. E. Watson, '43
R. C. Cutter, '49
C. E. Stiefken, '41
Heine Kenworthy, '32
Ardris Haig, '36
F. M. Nelson, '25
W. P. Morris, '32
C. E. Dismant, '31
G. Keith Taylor, '23
T. L. Wells, '29
Jean Goldsmith, '41
Oscar Davila, '47
V. L. Mattson, '26
D. C. Deringer, Jr., '24
J. W. Hyer, Jr., '42
M. G. Zangara, '48
C. E. Prior, Jr., '13
LeRoy G. Hall, '35
Ralph Bowman, '48
G. Featherstone, Jr., '43
Orville P. Smith, '49
John A. Bowsher, '34
J. C. Stipe, '40
Chas. L. Wilson, '44
Victor R. Martin, '41
D. J. McMullen, '44
Paul B. Davis, '39
W. K. Dennison, Jr., '40
John J. Rupnik, '33
E. C. Philpy, '49
V. G. Gabriel, '31; '33
Robert G. Wheeler, '49
Dale Nix, '26
E. E. Hand, Jr., '12
W. E. Burleson, Ex-'26
John C. Dyer, '27
Geo. M. Thomas, '44
Ninetta C. Davis, '20
William S. King, '49
Chas. M. Tarr, '38
George E. Norris, '27
A. W. Heuck, '36
William G. Park, '49
L. D. Turner, '41
J. L. Soske, '29
Jno. B. Botelho, '42
D. B. Mazer, '47
Joe T. Robison, '49
James W. McLeod
Douglass F. Evans, '25
Chas. T. Pease, '48
John H. Winchell, '17
D. M. Coleman, '49
C. J. McGee, '47
Andrew Milek
Chas. B. Hoskins
Jack F. Frost, '25
C. E. Osborn, '33
John M. Suttie, '42
H. Z. Stuart, '36
R. E. Lintner, '43
M. O. Whitlow, '49
Clark W. Moore, '32
Ben E. Terry, '33
Jack D. Duren, '48
P. M. Ralph, '48
W. E. Ellwanger, '43
John Robertson, Jr., '49
F. L. Stewart, '43
K. E. Lindsay, '40
L. H. Shefelbine, '43
L. E. McCloskey, '47
C. A. Einarsen, '47
J. H. McKeever, '47
A. N. Nelson, '26
C. W. Gustafson, Ex-'34
M. L. Talley, '49
L. F. Bombardieri, '41
T. E. Howard, '41

Geo. A. Kiersch, '42
H. K. Schmuck, Jr., '40
R. L. Hennebach, '41
Roy F. Carlson, '48
Ralph L. Bolmer, '44
Jas. D. Alderman, '49
Jos. R. Soper, Jr., '44
K. T. Lindquist, '46
Robt. F. Barney, '35
Charles S. Pike, '39
Clyde O. Penney, '36
Jack Q. Jones, '40
Thos. E. Gaynor, Jr., '48
R. P. Comstock, '41
H. L. Gardner, '27
G. A. Golson, '42
C. N. Bellm, '34
K. H. Matheson, Jr., '48
Charles O. Clark, '49
R. K. Lisco, Ex-'47
Fred C. Sealey, '17
Wm. G. Cutler, '48
J. E. Serrano, '20
D. R. MacLaren
A. E. Calabra, '48
John A. Fraher, '44
B. B. LaFollette, '22
N. S. Morrisey, '42

A. C. Levinson, '47
W. M. Traver, '16
George D. Tarbox, '38
Julian B. Willis, '40
John J. Butrim, '42
David P. Morse, '49
N. H. Norby, '49
Wm. M. Aubrey, Jr., '43
Robert W. Price, '35
A. A. Bakewell, '38
W. P. Gillingham, '47
Geo. O. Argall, Jr., '35
Theodore W. Sess, '34

PERSONAL NOTES

(Continued from page 5)

Eugene M. Howell, '30, Public Health Engineer, San Mateo Local Health Department, resides at 3916 Edison Street, San Mateo, California, where he receives mail.

Cecil B. Hull, '09, has a change of residence address in Butte, Montana, to 646 West Galena Street. He is Resident Inspector for U. S. Bureau of Federal Supply.

(Continued on page 9)

January 24, 1950

To the Certain Members of Congress of the United States
Washington, D. C.

Gentlemen:

This communication is from a management-labor committee initiated during the early days of World War II. It is composed of the active heads of the major labor organizations of the State of Colorado and the City of Denver, and a number of business leaders of the community, all meeting under the auspices of the Denver Chamber of Commerce. The purpose of this committee has been to perpetuate the friendships formed at a time when the common defense was paramount and factional disputes were subordinated in the all-out effort to win the war.

The committee holds regular meetings about twice a month to explore in a friendly fashion the many areas in which such widely diverse groups can think and act in concert for the common good of all.

This committee has been much concerned over the failure of the Congress to take action on more than a small part of the recommendations made by the Hoover commission on reorganization of the executive branch of the government. They feel very deeply that the present situation of an outgo of money exceeding by billions the income is deplorable. They believe that obvious waste in many quarters, overlapping of functions in government, excessive red tape, unnecessary expenditures, and unwarranted extension of bureaus should be eliminated at the earliest possible moment.

The committee therefore urges the Congress, and specifically the representatives from this territory in both branches of Congress, not to forget the principles expressed in the Hoover commission report, but to constantly keep these principles in mind as a possible means of reducing governmental expenditures and promoting efficiency. Bills for this purpose should be introduced, kept free from entangling riders, and be constantly pushed forward to the end that some reasonable economy in government will be attained.

It is the intention of this committee to make detailed study of the various recommendations contained in the Hoover report, and from time to time to express the views of this committee to the members of Congress with respect to the items so studied.

O. A. Knight — President, Oil Workers International Union, C. I. O.

Michael Livoda — Regional Director, C. I. O.

A. R. Kinsley — Vice President, Oil Workers International Union, C. I. O.

George A. Lavender — President, Colorado State Federation of Labor

Charles O. Voigt — President, Stearns-Roger Mfg. Co.
President, General Iron Works Co.

Ray R. Mead — Secretary-Treasurer, Mead and Mount Construction Company

B. Kosig — Vice-President, Gardner-Denver Company

Paul Ducey — President, Local Union 111 International Brotherhood of Electrical Workers

President, The Denver Fire Clay Company

Fred Funk — Business Representative, Denver Building and Construction Trades Council

John A. Ferguson Jr. — Vice-President and Secretary, Morey Mercantile Company

R. S. McIlvaine — President, Rainbo Bread Company

PERSONAL NOTES

(Continued from page 7)

George E. Hulpiau, '49, Engineer for Sinclair Refining Company, has been moved from Casper to Rawlins, Wyoming, where his mailing address is 1314 Cherry Street.

Fred Jones, '00, Mine Commissioner for the State of Colorado, recently suffered the loss of his wife and has moved from his former home to 1260 Sherman Street, Apt. 7, Denver.

William C. Kellogg, '43, Assistant Publisher, Santa Paula Chronicle, resides at 2807 Scripps Lane, Altadena, Calif.

Robert D. Kesler, '48, Research Engineer for Battelle Memorial Institute, receives mail in their care 505 King Avenue, Columbus, Ohio.

Myron C. Kiess, '25, has been transferred by The Pure Oil Company from Tulsa, Oklahoma, to their offices in Houston, Texas, to fill a newly created position of Division Geophysicist. His address is now Box 239, Houston 1.

William S. King, '49, receives mail through P. O. Box 577, Douglas, Wyoming. He is serving as Technology Trainee for Phillips Petroleum Company.

Robert W. Knapp, '40, Assistant Works Manager, Vancouver Fabricating Division, Aluminum Company of America, resides at 2405 East 7th Street, Vancouver, Washington.

Edmond A. Krohn, '43, has accepted a position with the Robinson Brick and Tile Company of Denver. He resides in Golden, 817-15th Street, where he is addressed.

Robert E. Lintner, '43, Branch Manager, Denver Equipment Company, has a change of address in El Paso, Texas, to 508 Robinson Boulevard.

Richard K. Lisco, Ex-'47, Party Chief for Intermountain Exploration & Engineering Company, was on vacation last month from his duties in Canada and was in Denver for a few days. He has a new address, Box 147, Regina, Sask., Canada.

Ralph C. Loring, '37, Seismologist with the Shell Oil Company, has been transferred to New Orleans, La., where his address is 6237 Curie Street.

M. A. Mantooth, '48, Petroleum Engineer for The California Company at Rangely, Colorado, called at the Alumni office last month when in Denver.

John H. Mason, former head coach at *Mines,* has returned to the athletic field after several years spent with a Denver sporting goods firm, having accepted position of head football coach at Montana State college, Bozeman, Montana. He assumed his new duties March 1.

Nicholas J. Matthews, '43, is now in Elk City, Oklahoma, engaged in his duties with the Shell Oil Company.

Thomas O. May, '49, is employed by The California Company, with headquarters at their New Orleans, La., office, 1818 Canal Building.

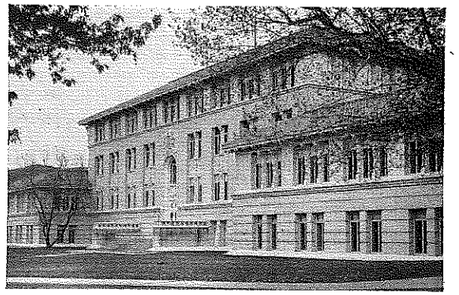
John E. McCall, '43, District Geologist for The California Company, is now located at Shreveport, La., with P. O. Box number 1744.

Henry G. McCleary, '48, has a new mailing address, Box 701, Morton, Texas. He is employed by Stanolind Oil & Gas Company.

Charles J. McGee, '47, has a change of residence address, 409½ So. Main Street, McAllen, Texas. He is serving as Engineer for Petroleum Service Company.

The Mines Magazine

VOLUME XL APRIL, 1950 NO. 4



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Dr. John W. Vanderwilt, new president of the Colorado School of Mines, who assumed his duties as president on April 1, 1950.

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PHOTO-ELASTICITY

In Rubber Technology

By
JAMES A. HURRY *

Photo-elasticity in Rubber Technology is of great value to rubber product design engineers and to rubber compounders. Both of these groups are constantly striving to improve the quality and service life of the products which they design and which the consumer uses. Since rubber is a most versatile material it finds its way into most of the recognized fields of engineering (Petroleum, Mining, Mechanical, Electrical, etc.) one way or another. From contacts which the author has made with Technical groups it has become evident that a deep interest is being shown by engineers not only in quality and service life of products but also in the basic technology used in the design of the products. It is with the latter thought in mind that the material of this paper is being presented.

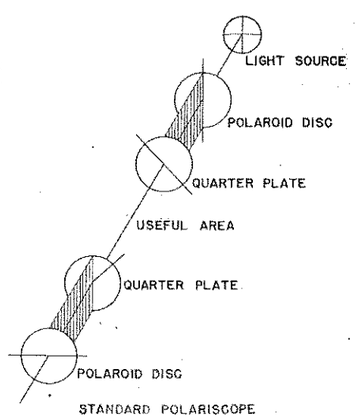
Photo-elastic Analysis and Product Design

Photo-elasticity as applied to rubber product design, although a relatively new development, has become a most useful tool in rubber technology. The fundamental technique involves the use of suitable low modulus model materials. There are illustrated qualitative applications and a brief extension of the method to quantitative analysis will be presented with reference to physical and photo-elastic constants of the materials used. The effect of the non-linear stress strain condition will be included.

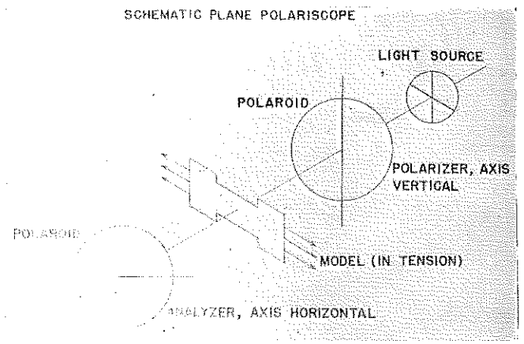
The General Problem of Product Design

Product design, expressed simply, is the distribution and profiling of selected structural materials in order that they will best withstand service requirements. These requirements may be related to simple tension, compression and shear stresses. They may be more complex, such as encountered in torsion, and bending which are made up of combinations of tension, compression and shear.

The force reactions which products must undergo may be further complicated by time and frequency factors. High force magnitudes in short times of application represent "shock" or "impact" problems. More moderate forces applied over a long-time period introduce "creep" or "flow"



▼Figure 2—The Standard Polariscope.



▼Figure 1—The Simple Polariscope.

phenomena. These represent permanent deformation because of the plastic phase found to some degree in all materials. Forces may be applied in cycles over a wide range of frequencies. Such cyclic forces may be in directions causing flexing in tension, compression, shear, torsion, simple bending and combinations of these.

Structural materials of substantially rigid nature have been found to obey such predictable relations as Hooke's Law over a measurable range of their ultimate strength in any direction. This simply says that any force (stress) produces a proportional deformation (strain)—*"Ut tensio sic vis."*

A measurable physical relation like this, coupled with the tools of mathematics such as graphical analysis, analytic geometry, trigonometry and the calculus, make reasonably practical the "drawing board" design of rigid materials into immediately successful products and structures. Many phases of engineering, mechanical, civil, electrical, lend themselves to such a high degree of technical control of design.

It is also a frequently encountered principle of dynamic design that the maximum life is associated with cyclic stresses at the lowest possible percentage of rupture stress. This is the so-called "stress-minima" criterion of optimum design for longest dynamic life. Effective design, therefore, entails not only selecting materials of known ultimate strength, but with a knowledge of the ratio of actual service stress to ultimate strength.

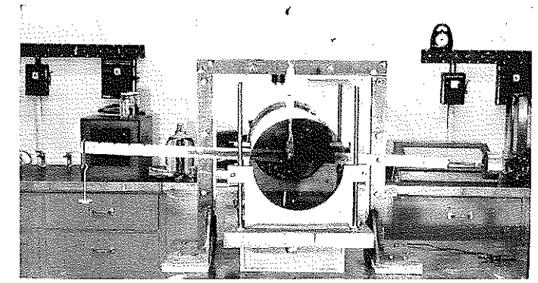
Design Limitations in Rubber Technology

The rubber product design engineer too frequently finds that the generalized equations of the basic engineering sciences do not adequately cover the conditions and variables encountered in his problem. The rubber product is usually non-homogeneous. In dynamic service it is usually subjected to high states of strain in tension, compression and bending. These aspects are further complicated by the fact that rubber-like materials show non-linear relation of stress and strain. This non-linear relation would be no great design problem if it were constant or even practicably controllable. Generalized expressions could then define it. Unfortunately the non-linear condition is not only greatly affected by material composition and method of preparation, but also by time and temperature of testing or service. Those relations the rubber product designer does find and measure are therefore generally complicated beyond the practical use of conventional mathematics of even the highest order in so far as using them to predict service behavior is concerned.

The Role of Photo-Elastic Analysis

This paper suggests the practice of the use of "models" for rubber product design on which photo-elastic effects can be produced to show the location of stress distribution. Low modulus material is used and deformation (strain)

* Development Physicist and Research Engineer, Gates Rubber Company, Denver.



▼Figure 3—Apparatus Used.

imposed is usually high. Models may be actual molded products. By having such an actual picture of his problem, the engineer can safely distribute and profile his material on a "model" scale. Quantitative application of this method provides a means for determining actual service stresses. These can be related to material ultimate strength for the purpose of approaching the "stress-minima" criterion of maximum dynamic life. This eliminates uncertainty, speeds design, reduces experimental material losses and minimizes much expensive product testing.

Other Methods of Stress Analysis

Photo-elastic analysis is simply one of several methods the engineer has employed in the problem of determining the magnitude and direction of principal stresses in products and structures of rigid materials.

Stress coat, strain gauges, grid or photo-grid techniques have also been used. However, in rubber product design, because of the large strains encountered and because of the complicated nature of the stress-strain relation, these methods apparently have not found favor.

ELEMENTS OF THE PHOTO-ELASTIC METHOD

Principles and the Apparatus Employed

Certain chemical substances, by virtue of their molecular structure or their state of subdivision, have the capacity for polarizing light. Such materials, when laminated between suitable glass plates, form a polaroid plate which allows the transmission of light vibrating in but one plane. An additional optical principle is of importance in this technique. This is the fact that transparent or translucent materials are generally birefringent to some degree when under stress. That is to say, they develop two different indices of refraction under stress. Assume a model to be studied is made of such material, and a polarized beam of light from the polarized plate (the polarizer) falls upon this model. It will be refracted at two different angles, depending on the magnitude of the stress. Upon emerging from the model, these refracted beams of light either interfere with or reinforce each other. This action will form dark and light bands, or colored bands, which can be related to the stress concentrations in the model. In order to observe these effects upon light waves, after they have passed through the model, it is customary to view the model through a second polaroid plate. This plate (the analyzer) is on the opposite side of the model from the polarizer.

Schematics of the simple and standard polariscopes are shown in Figures 1 and 2 respectively and the apparatus used by the author is shown in Figure 3. In order to produce certain stresses upon models and model sections, jigs were prepared for each type of loading. Mechanical lever system, air pressure, hydrostatic pressure and spring loading have been used in this work.

Interpretation of Photo-Elastic Lines

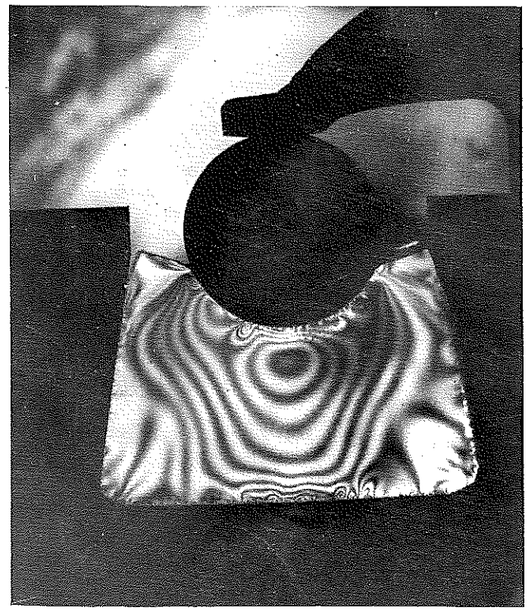
The condition of stress at a given point in a model can be determined by the magnitude and direction of two principal stresses. The apparatus will produce photo-elastic lines indicating the difference in magnitude and the direction of these principal stresses. Isoclinic lines represent the inclination, or direction of the principal stresses. A simple polariscope, employing polarizer model, analyzer, and white light will show black and colored lines on the model as viewed from the analyzer side. The black lines are isoclinic lines.

When the plane of polarization of the incident light from the polarizer coincides with the direction of one of the principal stresses, the light passes straight through the model. The analyzer plate must be rotated so that its plane of polarization is at right angles to that of the polarizer (see Fig. 1). This means that light passing straight through the model will be extinguished or cut out when passed through the analyzer. Therefore the isoclinic lines are dark.

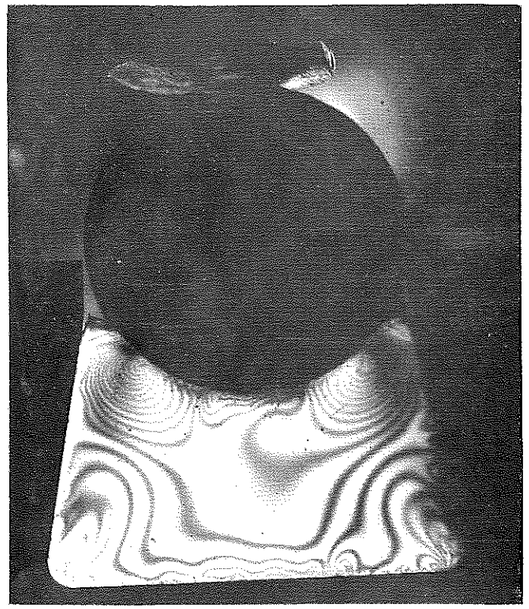
The direction of principal stresses are also perpendicular to planes free from shear in the model. Planes free from shear are called principal planes.

Isochromatic lines are the colored lines popularly associated with the photo-elastic effect. It is often desirable to examine the model from the point of view of determining the magnitude of the difference between principal stresses rather than simply their inclination. For this purpose the isochromatic, or colored lines, will be observed. In order to produce isochromatics only (no isoclinics present), it is necessary to use circularly polarized white light. In an ideal sense, complete circular polarization is possible only with monochromatic light. To obtain circularly polarized light, it is necessary to use a quarter-wave plate on the model side of the polarizer and analyzer (see Fig. 2). The quarter-wave plates are simply additional polaroid-like disks whose light planes are rotated 45 degrees from the light plane of the polarizer and analyzer. They are so rotated that the light planes of both quarter-wave plates are 90 degrees to each other.

It is a principle of the photo-elastic effect (stress-optic law) that at any point on any isochromatic line the difference between the value of the principal stresses is constant. If the model is progressively stressed, lines will appear and move



▼Figure 4—Sheave Liner—Actual Stress Pattern.



▼ Figure 5—Sheave Liner—Redesigned Stress Pattern.

steadily outward from some source point or origin of stress. The order, or "fringe order" of a line is determined from the number of lines emanating from the origin. For example the line of fringe order five is the fifth line to have appeared at the origin as loading progressed.

For quantitative interpretation of the photo-elastic effect it is necessary to determine the actual stress concentration to produce each line by a separate calibrating test on the model material. This is accomplished in the same apparatus set-up. A strip of the model material, cut from the same sheet or plate from the model itself was constructed (or molded), is separately loaded. With the use of appropriate jigs and loading devices the stress necessary to produce each order of line is noted on the sample tension or compression strip. For example, if a stress of 100 psi is needed to produce a line in the speciman under tension, then the difference in magnitude of the principal stresses along a fifth order line would be five times 100, or 500 psi. This assumes a linear stress-strain relation holds for such a speciman.

By definition, the maximum shear stress (S_{max}) is equal to one half the difference between the two principal stresses.

$$S_{max} = \frac{P - Q}{2}$$ where P and Q are principal stresses.

In the above example substantially pure tension is the single principal stress. The maximum shear stress along a fifth order line, therefore, would be 500 divided by 2, or 250 p.s.i.

QUALITATIVE APPLICATIONS — MATERIALS AND METHODS

Fringe Value, Definition and Units

In photo-elastic work it is necessary to refer to "fringe value." This term might be broadly considered an index of modulus. In photo-elastic work it is conventionally expressed in pressure units for shear per unit thickness per band, (photo-elastic line or fringe). It is, for example, the pounds per square inch (p.s.i.) per inch thickness necessary to produce two successive repetitions of a photo-elastic light band.

In classical photo-elastic work this definition has made possible one value, "f," for each material at a given temperature. In the extension of this technique to rubber-like materials the non-linear condition again makes necessary modification of classical definition.

We must modify the term "fringe value" in this work to p.s.i. shear per one inch thickness per whatever particular fringe order or band is associated with the subject load. When fringe value is used in this sense we will identify the fringe order involved; otherwise the classical definition will hold.

Selecting Suitable Low-Modulus Photo-Elastic Material

Most of the work which has been done in the science of photo-elasticity has employed Bakelite and celluloid. Some work has also been done with gelatin. It has been used, for example, to study stresses imposed upon underground structures by soil. The author and his colleagues have used it to study movement of material through mold sprues. Bentonite clay suspended in water has been used in flow studies. Because of the large strains which usually must be imposed on the model, we have not found Bakelite and celluloid to be suitable when a stress condition is being simulated on a rubber product. Naturally, where information is desired on stresses set up in molds or rubber manufacturing machinery, Bakelite and celluloid play the same role as in the general analysis of rigid bodies by photo-elastic methods.

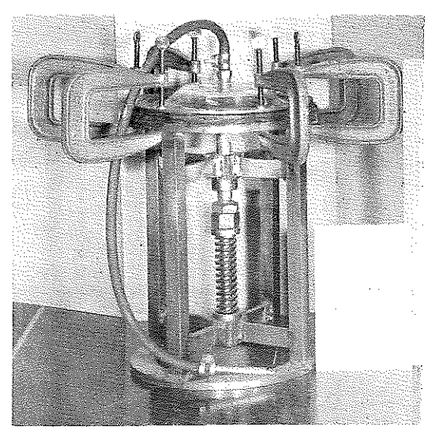
For work in rubber we have found a pure gum rubber compound and Geon 1437 (a vinyle-chloride plastic) to be most suitable as low modulus photo-elastic materials. Both are easily cut to model section dimensions and both may be molded as complete products in conventional rubber molds. Because of the limited scope of this article a detailed discussion of fringe values of these low modulus materials compared to Bakelite and celluloid cannot be given. Should the reader desire further information it may be found in a more complete paper published in India Rubber World, March, April and May, 1949, by the author and Mr. Douglas Chalmers (also Rubber Chem. and Tech., October, 1949).

Simple Applications of Photo-Elastic Analysis

A qualitative interpretation of the photo-elastic effect in a model or model section can be obtained by simply noting the concentration of the principal stresses from a general examination of the lines, their origin and contouring.

Milking Machine Inflations

A flex cracking problem was being encountered in a certain milking machine inflation (teat cup) design. Stresses in this particular inflation were studied by molding inflations from photo-elastic gum rubber compound. Sections were cut and stressed. Isochromatic lines were produced in the



▼ Figure 6—Pressure Diaphragm Loading Jig.

sections, using standard polariscope and quarter wave plates and white light. Weakness in the sectional design were revealed by this study. Since the inflation mold was the property of the customer, no design changes were possible. The study, however, make possible the only alternate solution to the problem—that of adjustment in the modulus of the rubber compound used. Field testing and accelerated product testing of the recompounded inflations confirmed the findings of this analysis and the service problem was substantially eliminated.

Rubber Sheave Liners

Large metallic load-carrying sheaves are sometimes made with rubber liners so as to minimize cable wear and to reduce noise, etc., in the operation. Figure 4 shows the condition of stress in the sheave liner under the action of the compressive forces of the load carrying cable in the uncorrected design. High stress concentrations are shown at two points directly under the cable. These stresses appear as boundary stresses at the interface between the sheave liner and in metallic inside edge of the sheave. Figure 5 shows the redesign in which the high concentration of stress is eliminated with the boundary stress conditions substantially improved. The redesigned liner was so constructed that installation compressive stress was laterally imposed upon the liner thereby guaranteeing a normal component at the interface with subsequent beneficial results. The redesigned sheave liners are giving satisfactory service.

Pressure Control Diaphragms

Rubber diaphragms, as employed in some pressure control instruments have been studied by molding them in the regular rubber product mold from photo-elastic gum rubber compound and from Geon. Model diaphragms (product size) have been made both with and without fabric.

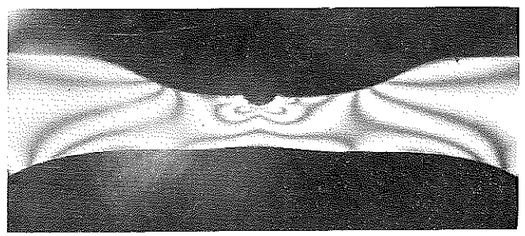
The apparatus used to load the diaphragms is shown in Figure 6. A transparent rigid plastic top with a pressure connection enables us to clearly observe the photo-elastic diaphragm's behavior. The apparatus could be placed in the polariscope and any desired diaphragm displacement could be observed and maintained. Four or five fringe orders were observed in the region of high stress, suggesting improvements in design with respect to reinforcing rigs and location of fabric reinforcement.

It should be noted, however, that diaphragms must articulate with spring constants specified by the customer. Design changes, therefore, must satisfy not only redistribution of stresses, but also mechanical compatibility with springs used.

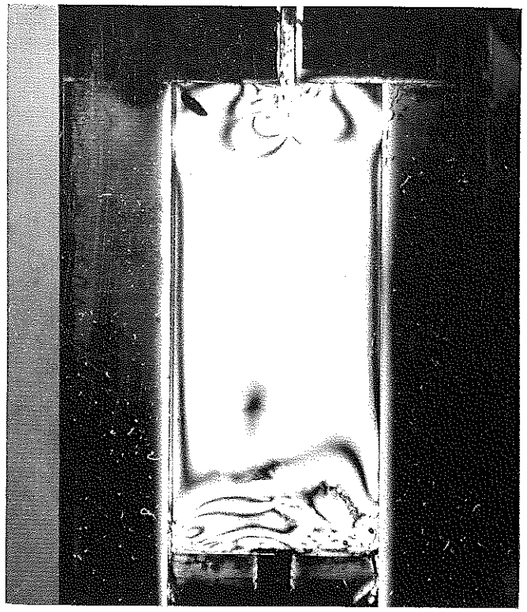
Mold Sprue Design

Because of a molding problem it was desired to study the flow of stock through the sprue of a mold. Significant information was obtained by forcing a 13% aqueous solution of a good grade of gelatin through an orifice (simulated sprue) in a lucite cell and piston (see Fig. 7).

Photo-elastic patterns in low modulus material can best be shown with photographs of stress patterns obtained with Winkleman "B" (Figure 8) and Gates modification of the Graves (Figure 9) tear specimens. These photo-elastic studies were used in designing the Gates modification of the Graves tear.



▼ Figure 8—Winkleman "B" Tear Stress Pattern.



▼ Figure 7—Lucite Cell.

An accurate measure of tear resistivity is most important in rubber product design. We are interested in obtaining the highest shear concentration when measuring tear resistivity. Figures 8 and 9 show these stress patterns. The pictures clearly show the high stress concentration in the Graves specimens. The design of the Graves specimen permits the use of an "unnicked" specimen which is most desirable (eliminates variations in cutting). The Winkleman is a "nicked" specimen. The photographs show the stress to be largely tensional in the highly stressed Winkleman specimen. Using the same stock (rubber compound) the ratio of tear values, Winkleman to Graves, is approximately two to one depending on the gauge values and rubber stock employed. This is in agreement with the photo-elastic data. The rubber technologist uses these measures as a means of improving product service life and quality in the products which all of us as consumers use.

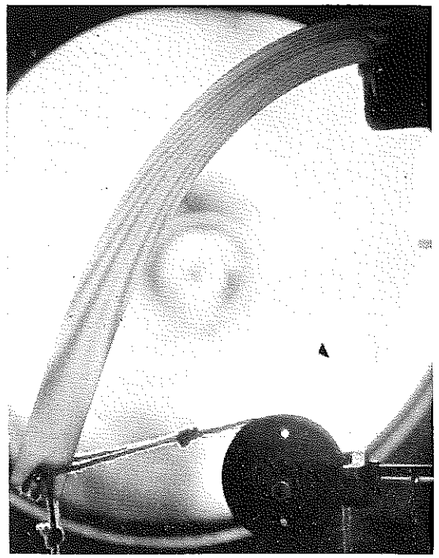
Quantitative Application

There are applications in rubber technology where it is desirable to compute actual stresses in some part of a product under some condition of deformation encountered in service. This information may be desired to insure the material selected has ultimate strength to withstand maximum service stresses. In certain rubber products ultimate stresses and strains are rarely encountered. The actual stress to be encountered in service is of particular value in such applications in order to design toward the stress—minima criterion of maximum dynamic life.

Considerable work has been done, for example, in which Bakelite beams and other structures have been stressed, and the stress which was obtained photo-statically has been checked against calculated values. In this case we can say that the photo-elastic determination of stress in a beam has an "analytic counterpart" in the sense that these are mathematical expressions for the calculated stress in the beam. Degree of bending in the case of a rigid beam is usually small.

Lack of Analytical Counterpart for Cases of "Large Bending"

As we have pointed out, in rubber-like materials in serv-



▼ Figure 10—Rectangular Beam—Cantilever "Large Bending."

ice, such as hog beater paddles, milking machine inflations, diaphragms, tires, belts, etc., the deformation or unit strain is relatively large. For such relatively large strains a complete analytical (mathematical) background is usually not available. We say, therefore, that the "analytic counterpart" for cases of "Large Bending" is lacking. Because of this we are denied the opportunity in many applications for checking photo-elastic stress determinations against theoretical or calculated values.

Let us illustrate this principle further by a purely mathematical picture of the complication introduced by the condition of so-called large bending.

The basic expression applied to beams in small bending is an approximation:

$$M = EI\frac{d^2y}{dx^2} \quad \text{where } M = \text{bending moment}, \; E = \text{modulus of Elasticity}, \; I = \text{moment of inertia of the beam section}$$

and $\frac{d^2y}{dx^2}$ is the curvature expression describing the beam deflection.

For large bending, as exemplified by service conditions in rubber products, the complete expression must be used. This introduces obvious complications in the analysis. The complete expression would then be:

$$M = EI\frac{d^2y}{dx^2} \div \left[1 + \left(\frac{dy}{dx}\right)^2\right]^{3/2}$$

The Non-Linear Relation

Photo-elastic analysis on rigid structures and using substantially rigid photo-elastic materials, such as Bakelite, lends itself to the use of Hooke's Law. In such cases the stresses and strains obtained show both a linear relation to each other and to the "fringe value."

In rubber-like materials the stress-strain relations are not linear, nor is the "fringe value" linear proportional to the stress-strain. This is a limitation in the use of this method only in the sense that it is therefore necessary to determine the "fringe value" across the entire range of strain encountered by the product in service and therefore introduced into the model.

Proof of the Quantitative Possibilities

In order to "prove" the method we will employ an example correlating beam theory results with those from photo-elastic analysis. It will be evident that quantitative application of photo-elastic analysis is both feasible and reliable to a practical degree.

Example 1: Calculation of Beam Stress from Photo-elastic Analysis:

A rectangular beam of Geon 1437 was placed in pure bending. The beam was stressed until 5½ fringes appeared. The bending moment was 2.17 lb. in. The data for the beam were:

Initial span	9.00″
Span under bending moment of 2.17 lb. in.	7.26″
Modulus for fringe order 5 for Geon	1165 psi
Beam width	.550″
Beam depth	.563″
Stress for fifth fringe order	641 psi
Stress for sixth fringe order	970 psi
Interpolated stress for 5½ fringe orders	806 psi
Similarly, interpolated calibration tensile specimen thickness at 5½ fringe orders	.057″

Therefore, actual tensile stress on outer beam fibers:

$$= \frac{(806)\,(0.057)}{0.550} = 83.5 \text{ psi}$$

From Beam Theory

$$(\text{Strain}) = \frac{\dfrac{\text{Thickness (depth)}}{2}}{\text{Radius of Curvature}}$$

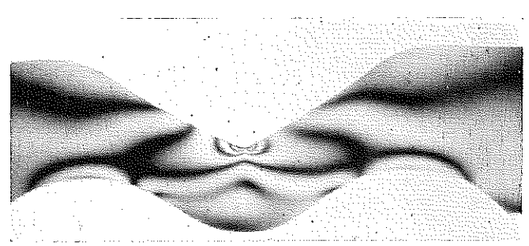
$$= \frac{\dfrac{0.563}{2}}{4.05} = \frac{0.563}{8.10}$$

$$= 0.0695 \; (6.95\%)$$

$$\text{Tensile Stress} = (0.0695) \times (1165)$$

$$= 81 \text{ psi.}$$

It will be seen, therefore, that the values check fairly well considering the degree of strain (6.95%) involved.



▼ Figure 9—Gates Modification of the Graves Tear Stress Pattern.

Complete tabular values of constants used in the above calculation may be found in the reference previously cited.

Example 2: Milking Machine Inflation Section:

At the high stress point in the milking machine inflation (previously referred to) we were able to generate five bands. The section was 0.125 inches thick. From calibration data we find the stress to be 182.7 psi at the specimen thickness of .047 inches. This gives:

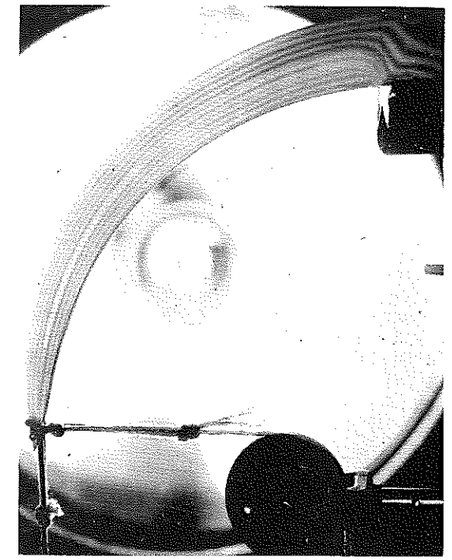
$$\text{Tensile stress in the milking machine inflation section} = \frac{(182.7)\,(0.047)}{0.125}$$

$$\text{Maximum shear stress} = 34.3 \text{ psi}$$

Note: At a high frequency of flex a shear stress value of 30-40 psi is considered to be a good working range for rubber product.

A tapered beam (cantilever) Figure 11, was mathematically calculated to give uniform maximum fiber stress. Figure 11 shows the "calculated" Geon cantilever at 90 degree bending (Large Bending). The fringes are parallel to the beam contour indicating uniform maximum fiber stress. Photo-elasticity in this case "proved" the mathematical calculations. This can be readily compared to a rectangular beam (Figure 10) in which the maximum fiber stress is not constant.

The content of this paper should clearly indicate that we are seriously attempting to "engineer" quality and service life into rubber products not by "guess and by God" but through basic scientific application. Photo-elastic analysis has been shown to be a feasible and reliable method for anticipating design problems in rubber products. It lends itself qualitatively and quantitively to the selection of materials, designs, and profiles for products, test specimens and certain processing equipment. In the words of a colleague, "Rubber Technology need not be an art—it can be a science." With this thought in mind we leave our readers hoping that we have been able to impart an increased appreciation of the technical methods which we use to improve the quality and service life of rubber products which are used in so many ways.



▼ Figure 11—Tapered Beam Cantilever "Large Bending" (Designed for Uniform Maximum Fiber Stress)

Acknowledgements

We are indebted to those colleagues who contributed to the original work: A. White, W. Redmond and R. Schneider for selection of several materials and products; Paul Carter for most able assistance in techniques, measurements, photographs; D. Stechret for useful calculations; Mrs. Goldie Calkins for the typing of the manuscript.

We gratefully acknowledge the permission of the Gates Rubber Company to have this work published.

PROGRESS NEWS
U. S. ATOMIC ENERGY COMMISSION

The United States Atomic Energy Commission announced March 12, 1950 that it will establish a small purchase depot at Marysvale, Utah for the purchase and stockpiling of uranium-bearing ores recently discovered in that area. The purchase depot will be operated for the Commission by the American Smelting and Refining Company, which also operates the Commission's ore buying station at Monticello, Utah. It is expected that the Marysvale purchase depot will be ready to receive ores about March 15, 1950.

The uranium deposits near Marysvale, Utah were discovered about a year ago and exploration, which began last summer, has continued during the winter. These ores are of the autunite-torbernite variety and cannot be treated by the process used in the Commission's plant at Monticello, Utah.

Although considerable additional work probably will be required to determine whether sufficient ore is available to justify the construction of a process plant at Marysvale, the Commission is establishing the purchase depot in order to provide the miners with a market for development ore. If and when sufficient ore is developed to justify the cost of construction, a process plant will be built. In line with the Commission's policy of encouraging private industry to develop, mine, and concentrate uranium ores, it is anticipated that processing facilities for Marysvale ores will be privately owned and operated and that uranium concentrate will be sold to the Commission under unit price contracts.

The autunite and torbernite type uranium ores to be purchased at the Marysvale, Utah ore purchase depot are not covered by the Commission's domestic uranium Circular No. 5, which applies only to the carnotite-type ores of the Colorado Plateau. Also, since the surface ores in the Marysvale district are generally low-grade, they probably cannot be concentrated to meet the specifications of the Commission's domestic uranium Circular No. 1. The Marysvale ores will therefore be purchased under contractual agreements to be negotiated with individual producers. These agreements with producers will provide, among other things, for the price, minimum grade of acceptable ore, maximum tonnage which may be delivered, and period of the agreement. The initial purchase program will be for ores expected to average at least 0.30% U_3O_8 and containing not less than 0.20% U_3O_8.

The price schedule for the U_3O_8 content of the Marysvale ores will be approximately the same as that contained in Circular No. 5 for the carnotite ores of the Colorado Plateau. Payment will be made only for uranium as the Marysvale ores contain no other metals in commercial quantities.

In addition to the autunite-torbernite ores, the Commission may purchase other types of uranium ore at the new depot if, in the opinion of the Commission, such ore could be satisfactorily processed in a plant designed to treat autunite and torbernite ores. Producers may be required to furnish representative samples for met-

(Continued on page 26)

INTERPRETATION OF MAGNETIC SURVEY DATA

By
ERIK U. GARPNER, '27
and
DAVID E. REED

Of the three universally accepted methods of prospecting for oil,—seismic, gravimetric, and magnetic,—each has its own peculiar advantages and disadvantages, but in all three cases, their advantages far outweigh their disadvantages. In the magnetic method there is a prevalent, though

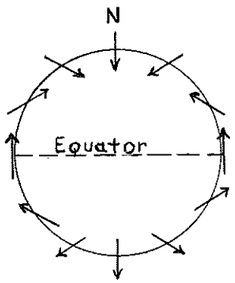


Fig. 1.

erroneous belief that "magnetic highs" should be structural highs, and that "magnetic lows" should be structural lows. Neither that theory, nor any other simply stated rule can be applied to the structural interpretation of magnetic data, any more than it can to gravimetric data.

Therefore it is the purpose of this article to present pertinent facts concerning magnetic anomalies with which the authors have had first hand experience over a period of many years, and from these to make some generalized statements regarding their structural interpretation.

In order to describe any interpretative approach, it is first necessary to discuss briefly the general background of the magnetic method.

From Physics it will be recalled that the earth itself acts as a large magnet with a negative pole near the geographic North Pole, and a positive pole near the geographic South Pole.

Figure 1 shows diagramatically the direction and relative intensity of this total magnetic field for various points on the earth's surface. The intensity at the Poles is about twice that at the equator.

In the United States, the dip of the total field ranges from 60 to 75 degrees below the horizontal. Its direction varies from 20 degrees west to 20 degrees east of true north from

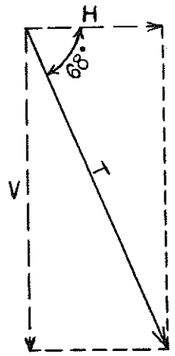


Fig. 2.

the eastern to the western borders of the country.

The total intensity, "T," (see Fig. 2) can be resolved into two components, one vertical, "V," and the other horizontal, "H." Only the vertical component is generally of interest in surface prospecting for oil, because variations in the magnitude of this component are greater than those of the smaller horizontal, and therefore more easily detected.

The instrument used for measuring the variation in the strength of the vertical component is called a vertical magnetometer. As shown in Figure 3, it consists essentially of a strong magnet to which is attached a quartz knife-edge which rests on semi-cylindrical quartz bearings. The position of the magnetic system at each point of observation is read on a scale through a telescope. In order to eliminate the effect of the horizontal component, the magnet is oriented to swing in a vertical plane at right angles to magnetic north.

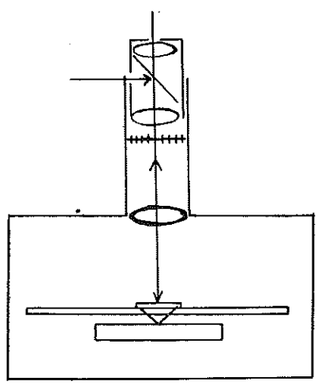


Fig. 3.

Because of the increase in dip and intensity of the total magnetic field from the equator toward the poles, there is a corresponding increase in the strength of the vertical component. This northward increase, or normal change, has to be taken into account. The corrections are obtained from the U. S. Coast & Geodetic Survey Magnetic Charts of the United States, showing the distribution of the intens-

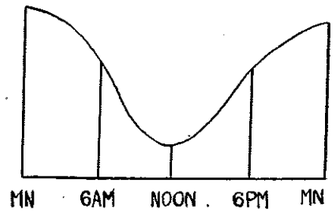


Fig. 4.

ity of the vertical component of the earth's field, as well as its annual change.

The magnetic field of the earth is not constant. It has a slow cyclic variation with a period of about 500 years, and a daily variation with a maximum about local midnight and a minimum around local noon. (See Fig. 4.)

These changes may be corrected for by using a stationary base instrument that is read every 15 or 20 minutes, or an instrument that automatically makes a continuous photographic record. Lacking a base instrument, the field instrument is returned to base for check reading every two hours or less. The difference in the base readings is then distributed proportionately with time among the stations occupied on that particular "run."

In addition there may be sudden or irregular disturbances of large magnitude, called magnetic storms, which however, can be corrected for only when a continuously recording base instrument is used. If no such base instrument is available, the field work should be discontinued until the storm is over.

After the field readings have been reduced to a common datum and corrected for the effect of the normal earth's field, they are placed on a base map in their correct geographic positions, and contoured. On the contoured map, the local differences, or departures from normal, are clearly delineated as local "highs" and "lows." These are usually referred to

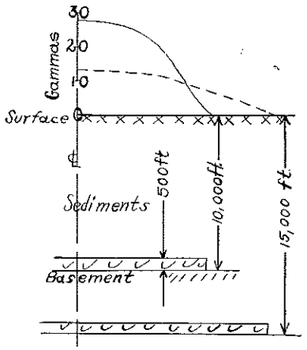


Fig. 5.

as maximum and minimum anomalies.

It is easily seen that such variations would exist where the structural elevation of a more magnetic body has placed it adjacent to a body of lesser magnetization. The best example of this is the case of an elevation of the basement complex, where the igneous rocks are off-set laterally by sedimentaries.

Most sedimentary rocks have low magnetic susceptibilities, which is to say that they do not become magnetized easily in the presence of a magnetic field. Rare exceptions to this are beds containing appreciable quantities of magnetite, secondary iron, serpentine, and other magnetic minerals. Igneous and metamorphic rocks, on the other hand, usually have high magnetic susceptibilities, increasing from acid to basic types.

An area of low magnetic relief usually indicates either a deep basement, or one composed mainly of acid igneous rocks, while one of high magnetic relief suggests a shallower basement, or one composed chiefly of basic types of rocks. Certain formulas have been worked out for determining the depths to disturbing rock masses from the widths of their magnetic anomalies.

Therefore, a structure in a pure sedimentary section would rarely bring about great enough lateral contrast in magnetic properties to create a magnetic anomaly measureable at the surface. Hence for all practical purposes, we can consider that nearly all magnetic anomalies met with in prospecting for oil are due either to elevations of the basement surface, or to polarization contrasts within the basement, or to a combination of the two.

Anomalies of the type which arise from the first mentioned source are of limited areal extent and magnitude if the basement rock is magnetically homogeneous. For example, (See Fig. 5) in an area where the depth to the basement is 10,000 feet, a 500 foot elevation of the basement, causing a polarization contrast of .003 CGS units, will produce a surface anomaly of less than 30 gammas. Magnetic effects are usually measured in gammas, one gamma being one one-hundred-thousandth part of a CGS unit. If this same structure were at a depth of 15,000 feet, the magnetic anomaly produced purely by the structural elevation would amount only to 10 or 15 gammas (see dotted curve of Fig. 5).

It would be well to point out here that observational and instrumental precision are imperative, if the magnetic effects actually due to deep structures are to be picked up.

A fact which complicates the structural interpretation of magnetic results, is that any high susceptibility rock has a tendency to display polarity of its own, by induction in the earth's field.

Thus, at the south edge of any high susceptibility rock mass where the magnetic lines of force enter, a south pole will be induced, giving rise to an increase in the vertical component. Similarly a north pole is induced at the north edge, where the lines of force leave the mass. (See Figure 6) The negative anomaly is usually less pronounced than the positive one, owing to the greater depth of the induced north pole. The distance between the positive and negative anomalies will depend upon both the dip of the total field and the depth to the high susceptibility rock mass.

As a rule, the deeper the source of an anomaly, the greater its areal extent, but the less its magnetic relief. However, large anomalies of thousands of gammas and covering whole townships, could not possibly be caused by basement structure alone. A simple calculation shows that such anomalies have their origin in large polarization contrasts within the basement (See Fig. 7). This large effect will partially mask the effect from basement structure within the area, although it will often show up as a minor closure

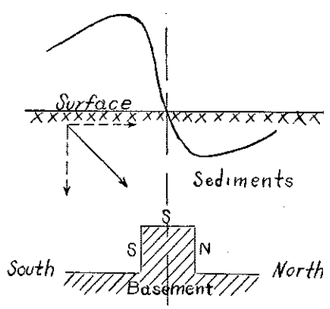


Fig. 6.

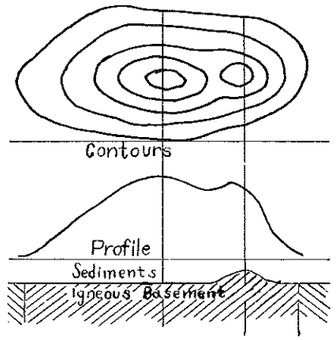


Fig. 7.

or "nose," distorting the otherwise more or less symmetrical contours of the main polarization anomaly.

Since lateral variations in susceptibility are often present in rocks forming the basement complex, it is not uncommon for a magnetic map to display a great many polarization contrast anomalies, which may have no relation to structure. This of course, is also true of gravity maps, since the same variations in susceptibility are usually accompanied by variations in density. The same general methods of separating the structurally significant from the non-significant anomalies have been applied in both cases.

"Residual" maps are often made of an area in order to take out the regional effect so that smaller features show up more clearly. Space does not permit discussion of these here. Let it suffice to say, however, that the interpretation of both gravimetric and of magnetic data is not unique. This means that any magnetic *or* any gravity anomaly may be explained by a number of different distributions of magnetic *or* of density contrasts. Therefore, in order to interpret anomalies in terms of structure, the magnetic as well as the gravimetric data must be combined with all geological information available.

There has been a tendency in the past to use the results of a magnetic survey without any attempt at interpretation in terms of geology, thus leading to sometimes disastrous results. However, many major oil companies as well as independent operators are coming to realize that a properly interpreted magnetic survey can give valuable information, in both reconnaissance and detail, as to what portions of an area may be successfully explored for oil and gas,—at the same time eliminating areas of less interest. And when they also consider that the magnetic survey is the most economical of all methods, the advantages of prospecting with the magnetometer are obvious.

THE FUNCTION OF PETROLEUM ENGINEERING DEPARTMENTS AND THEIR RELATION TO MANAGEMENT

By
D. V. CARTER*

Introduction

Petroleum Engineering is now a formally recognized branch of Engineering. It has evolved within the past twenty-five years and, in a broader sense, includes the engineering phase of not only the producing and drilling activities but also that of refining operation.

To most people the term "Petroleum Engineering" is connected with the engineering activities of drilling and producing operations. Therefore, the comments contained herein are made with reference to drilling and producing operation. The scope of this paper, as indicated by the title, is confined to petroleum engineering departments, their function and relationship to managements. Consequently, most of the remarks made here will apply to companies or operators whose operations are of sufficient magnitude to justify at least a semblance of a petroleum engineering organization. In many cases smaller operators avail themselves of the benefits of petroleum engineering but most of them do not attempt to establish or maintain a formal department.

Development of Petroleum Engineering

Petroleum Engineering came into being for several good reasons. Like many other great and important industries, the growing importance of development and recovery of hydrocarbons has necessitated the application of engineering in order to attain a higher degree of efficiency and to maintain or gain a competitive position within the industry. Then, too, ever deeper drilling has demanded the assistance of technical aid as to procedure, technique, and design of mechanical equipment.

Industry and management were not attracted too quickly by the possibilities to be derived from the application of engineering to their drilling and producing operations. The insufficiency of the methods developed by trial and error were probably as much responsible for trial experiments with engineers; also, it was the idea of some alert operators and companies to make use of engineering in an attempt to gain a competitive position. Once started, in spite of many "warm-up" mistakes on the part of engineers, petroleum engineering has made consistent headway in the industry.

Like geology and geologists in the exploration field, petroleum engineering has become indispensible to the producing and drilling business.

The field of petroleum engineering involves many facets of oil and gas operations. In fact, petroleum engineering has now been developed to the point where specialization has appeared. To mention a few of the recognized fields of specialization, viz: the reservoir engineer; the secondary recovery engineer, a specialized reservoir engineer as some prefer; the engineer who chooses to devote his talents and attention to drilling problems and drilling equipment, which also includes the important field of mud control. Other equally important specializations are the proration or conservation engineer, which requires considerable knowledge of development problems as well as proration and conservation work as it relates to regulatory body activities. This specialized engineer is facetiously referred to as "lawgineer." It is enough to say that this fusion of two distinct professions requires exceptional training and experience. One of the more important specialists is the engineer who works in reserve and evaluation. This type of work provided one of the early opportunities for application of geology and engineering to the producing end of oil and gas business. Obviously the above mentioned specializations overlap to a considerable degree. Last but not least is the engineer who chooses, partly by inclination and by choice, to become a petroleum engineer familiar and competent to a more or less degree with the entire gamut of petroleum engineering. All of these specializations, together with general petroleum engineering, occupy their important roles in the petroleum industry.

The field of petroleum engineer consultant has assumed major importance and serves to widen the opportunity of employment for the petroleum engineer adapted to this field of endeavor. Then, too, many petroleum engineers have become operators in their own right. This trend can be expected to continue and to swell the ranks of so-called independent operators. This is a healthy condition for a highly competitive industry.

The impact and effect of petroleum engineering, like geology and geophysics, on the industry were not entirely painless.

Early petroleum engineering pioneers as well as adherents and believers in what is now a recognized profession, experienced the same trials and tribulations as did other trail breakers. Now you younger members, and soon-to-be members of this profession and industry, can confidently look forward to participating to a more or less degree, as far as your ability will permit, in one of the most engaging and fascinating businesses of all.

Functions

The functions of a petroleum engineering department of a company or operator, whose operations are of such a magnitude as to warrant such a department, are many and diverse. These functions may be briefly summarized as follows:

(1) To act in an advisory and consulting capacity to management and the operating departments which are responsible for the production and field processing of oil and gas and drilling operations.

(2) To study, plan and recommend the feasibility of operating procedures and in general to effect economies and efficiency. Some of the specific items are reservoir development including unitization and cooperatives, pressure maintenance and field processing including cycling; drilling technique including drilling mud control, production and drilling equipment, secondary recovery, salt water disposal, reserve and valuation studies, cost analysis, affairs pertaining to regulatory agency proceedings and numerous other matters.

(3) To train and develop personnel suitable for advancement within and without the department is one of the principal functions of a petroleum engineering department.

The primary function of a petroleum engineering department, in general, is to act in an advisory and consulting capacity to management and the producing department in the technical aspects of drilling for and producing oil and gas and some phases of processing. Such an all-inclusive basic function necessitates group specialization within the department. To this end most departments have subdivided, to some extent at least, their activities into groups, each one responsible for a particular group activity.

A good example of a petroleum engineering department with multiple function—and of course the one with which I am most familiar, is the Petroleum Engineering Department of Magnolia.[1] Hence, I shall briefly describe its varied activities and responsibilities, as examples of the petroleum engineer's varied interests.

There are essentially two phases of activity carried on in the department: field work under the direct supervision of a district engineer who in turn is supervised, to the extent necessary, by a division engineer, and the administrative work of the chief petroleum engineer's office.

The work of the chief petroleum engineer's office is divided into six sections, each under the supervision of a section chief or specialist. The principal responsibility of each of these groups may be briefly described as:

(a) Reserves and valuations;
(b) Proration, hearings, rules and regulations, and lawsuits;
(c) Secondary recovery and salt water disposal;
(d) Mechanical equipment;
(e) Production problems and special studies;
(f) Reservoir engineering.

The reserves and valuation group prepare economic analyses of oil and gas properties, and reserve studies.

The legal aspects of the departmental work are the responsibility of the section in charge of proration, hearings, rules and regulations, and lawsuits. This includes the recommendation of field rules and regulations such as well spacing and production.

Secondary recovery, salt water disposal and related problems are handled by one group.

The section working with mechanical equipment renders opinions and recommendations for the purchase, maintenance, and repair of virtually any sort of equipment found in the field. It may range in size from a floating rig foundation to a new type wrench.

Production problems, as the term implies, can be almost any situation which may arise in the field. Hence this section performs primarily a consulting function in field problems.

Now getting away from the chief petroleum engineer's office, the field personnel of the petroleum engineering department carries its responsibilities in their respective areas. Their work may be divided roughly into two parts: the gathering of technical field data, such as bottom hole pressures, gas-oil ratios, well tests and reservoir data, and working with and advising the producing division in field operations. The field engineers make recommendations and reports. More detailed operational planning is done, when necessary, in conjunction with the central office.

The Relationship of Petroleum Engineering to Management

The prospective engineer or recent graduate petroleum engineer should do some self analyzing, and consider some fundamentals in connection with carving out a career in his chosen profession. The writer considers the following points as "musts" to those entering or contemplating a career in the drilling and producing end of the oil and gas business:

First:

Anyone considering joining the ranks of the petroleum industry would do well to consider the route by which he will become initiated either through a professional door such as the law, geology, or engineering, or by starting in any number of jobs in the office and the several operating departments. If the decision is engineering, with which we are concerned, one should first decide that he is a likely candidate by natural inclination and temperament. Having made this important decision, he may or may not decide until midway or thereabouts through his higher education as to the particular branch of engineering in which he wishes to specialize. An early decision has advantages, assuming that it is a wise one, for several reasons. One reason is that he can both prove his choice to a considerable extent by working summer vacations, usually doing roustabout, roughneck or various other jobs of an outdoors nature, or it may consist of a variety of related indoor work. This work gives him a dual opportunity of not only becoming familiar with the industry at the "grass roots," so to speak, thereby confirming his earlier belief in his choice of industry specialization, but also, if correct gives him experience that he will have to have after graduation. He becomes acquainted with a prospective employer whether it be a major company, contractor, or non-integrated operator, or independent operator. Likewise, the employer comes to know the summer student employee. In many cases this acquaintanceship results, if his services are satisfactory, in an invitation to repeat the employment during the next summer vacation period and so on to the time the prospective engineer graduates. This connection may prove to be permanent and highly satisfactory to both the employee and the employer. Practical experience is absolutely necessary whether it is gained during summer vacation periods or after finishing school. One should not let his professional feeling prevent him from enthusiastically performing non-professional duties which amplify his professional career. An inclination to "caste" feeling should be suppressed, likewise the non-technical supervisor should avoid decisions based on "caste" prejudices. Obviously, the young engineer or anyone else does not blindly enter a business, except under rare and special cases, without working at the business to gain experience.

Second:

Anyone should realize early in life when preparing to enter the selected field of activities for making a livelihood that all of his compensation will not be in dollar remuneration. George T. Christopher, the president of the Packard Motor Company, was recently quoted by John S. Crout[2] as saying:

" . . . 'Management must abandon once and for all the lingering belief that workers are interested only in their pay checks. People work to live. They don't live to work. It is up to us in management to see that the worker finds satisfaction in his job beyond and in addition to his financial reward.' "

Then Crout[3] goes on to say:

"This challenge to the engineer offers a new opportunity for service. In our highly technical production system, it will require the engineer to discover and develop the mechanisms that will give the individual that inner satisfaction of personal accomplishment. It will take the engineer to provide that psychic income which man needs to enjoy his work and to feel that he has some degree of individual importance as a person."

This is a fundamental in which I heartily believe. One should never lose sight of the fact that contentment and the ability to accomplish and contribute something constructive has its rewards. Therefore, whether one is self-employed or works for the other man, in order to attain an average or more than average sense of accomplishment, a direct hand or participation in doing things is one basic remuneration quite separate and apart from the digits on the pay check for those employed or profits above ordinary expense for those self-employed. Economic success usually accompanies and is a result of a job well done. Dollar remuneration alone will never be a substitute for a fair degree of participating in the planning and executing stage of work. This point is of the greatest importance to employee-employer relationship. It is basic and must be considered and put into operation when planning the

(Continued on page 22)

* Chief Petroleum Engineer, Magnolia Petroleum Company.
Presented before the joint meeting of Texas Section, A.I.M.M.E. at College Station, Texas, December, 1947, and published by permission.

[1] Anon. by the writer. "Magnolia's Petroleum Engineering Department." *Magnolia News 11* (6) 3-7, Jan. (1947).

[2] John S. Crout, "Engineering Training for Professional and Civil Life," *Mining and Metallurgy 28* (490) 493, Oct. (1947).

[3] Ibid., Reference 2, page 9.

DR. AND MRS. BEN PARKER HONORED AT TESTIMONIAL DINNER

On the evening of March 23rd, a testimonial dinner was given by the Board of Trustees of the Colorado School of Mines, the Alumni Association and friends in honor of Dr. Ben H. Parker and Mrs. Parker as an appreciation of the fine services rendered to the School of Mines while Dr. Parker was president.

This group of one hundred and seventy assembled in the Silver Glade room of the Cosmopolitan Hotel, Denver, first for a cocktail party and then followed by a fine dinner and after-dinner speeches.

James Colasanti, president of the Alumni Association, presiding as toastmaster, introduced Governor and Mrs. Knous, Lester C. Thomas, president of the Board of Trustees and other members of the Board who were present with their wives, several members of the faculty present with their wives, Dr. James Boyd, Director, U. S. Bureau of Mines, Washington, D. C., Dr. John W. Vanderwilt, who has been appointed by the Board to succeed Dr. Parker as president of the Colorado School of Mines on April 1st, all of whom paid tribute to Dr. and Mrs. Parker.

The guest speaker, Governor W. Lee Knous, told the guests of the fine work that Dr. Parker had done for the School of Mines during his term of office as president and expressed his high regard for Dr. and Mrs. Parker. In closing, he announced that he and Lee Thomas had decided that Ben Parker should be appointed as member of the Board of Trustees to fill the vacancy that would exist on the Board when Dr. Vanderwilt assumes his duties as president of Mines. Governor Knous expressed his hope that Dr. Parker would accept the appointment as a member of the Board so that he would still continue in his fine work of building the School of Mines.

Those in attendance, besides Dr. and Mrs. Parker and Governor and Mrs. Knous, were: Dr. M. F. Coolbaugh, President Emeritus, Dean Jesse R. Morgan, Dean Emeritus, Dean and Mrs. M. I. Signer, Col. and Mrs. Wendell W. Fertig, Major and Mrs. James B. Gray, Coach and Mrs. Fritz S. Brennecke, Dr. James Boyd, '32 and '34; Professors and Mesdames James O. Ball, Frederick M. Carpenter, John M. Coke, Delton D. Flanders, Ivan L. Hebel, J. Harlan Johnson, Robert T. Phelps, William M. Richtmann, Leon S. Ward; Messrs. and Mesdames C. J. Abrams, Victor W. Bauman, (Faculty); B. M. Bench, '30; Robert L. Bolmer, '44; Max W. Bowen, '24; Frank C. Bowman, '01; Frank E. Briber, '16; William V. Burger, (Faculty); William J. Chapitis, (Faculty); James Colasanti, '35; Carl I. Dismant, '31; Earl L. Durbin, '36; Luther B. Eames, '05; John H. East, '10; Ben E. Essig, '15; J. Claire Evans; Edward G. Fisher, (Faculty); Hildreth Frost, Jr., '39; Frank Geib, '40; Horace N. Goodell, '42; E. Sidney Hanley, '34; Thomas S. Harrison, '08; Alfred A. Holland; John C. Hollister, '33; William P. Huleatt, '21; John W. Hyer, '42; Neil Johanson, '22; George W. Johnson, (Faculty); Oscar H. Johnson; Dave C. Johnson; Vincent K. Jones, '10; Vincent K. Jones, Jr., Ex-'36; Albert M. Keenan, '35; John J. Kelley, '40; Edward F. Kingman, '34; Robert T. Krueger, '34; Bruce B. LaFollette, '22; Addison B. Manning, '40; V. L. Mattson, '26; Harry L. McNeill, '24; William J. Morris; Charles C. O'Boyle, '43; Robert S. Palmer; Robert W. Patterson, '42; Warren C. Prosser, Ex-'07; Maurice H. Robineau, '23; John L. Roche, Ex-'38; George W. Salzer, '21; George E. Schade, (Faculty); Roger M. Schade, '21; A. George Setter, '32; Gurnett Steinhauer, (Faculty); Ted P. Stockmar, '43; Harrison E. Stommel, '41; Frank Strawn; Ray Summer; Edward F. Taylor; Lester C. Thomas, '12; James R. Torpey, '49; Will M. Traver, '16; Arthur B. Van Tine, '39; Russell H. Volk, '26; Edwin F. White, '36; Paul Wigton; Dr. and Mrs. John W. Vanderwilt; Mesdames Maude Gates; Fred C. Steinhauer; Dart Wantland; Messrs. Benjamin Arkin, '27; Julius A. Heeren, '34; William B. Patrick, '09; Everett Patterson, (Faculty); H. W. C. Prommel, Ex-'20; Robert Spalding, '33; Lynn W. Storm, '02.

PETROLEUM ENGINEERING DEPARTMENTS

(Continued from page 21)

mode of petroleum engineering department operation with which we are here concerned. The dual compensation mentioned above is a basic requirement of the human being. Its need exists for group members of large organizations or departments as well as in the case of the self-employed or small organizations. To be a part of an organization and participate in its activities is as important as monetary return. Moses said "Man doth not live by bread only."

By these remarks concerning the importance of accomplishment and direct participation in all petroleum engineering affairs, the writer does not intend to minimize the importance of adequate compensation for the petroleum engineer.

We must then conclude that the dual remuneration discussed above is the most necessary requirement for the maintenance of contented workers in any mass effort, such as is required in the corporate style of organization of which petroleum engineering departments are a part and with which we are here concerned. These requirements are of such moment that the organization and functioning of petroleum engineering departments require initiative and controlled aggressiveness if a competitive position is to be maintained or an additional competitive advantage gained. In either event the public is the gainer because increased efficiency intensifies competition, resulting in better products at the lowest possible price to the consumer. Carried a step further, the full import of efficient operation means greater recovery of hydrocarbons for the nation as well as a higher level of economy.

Third:

It should be mentioned that one of the principal ways of obtaining team work and at the same time individual sense of accomplishment together with overall good results in any sizeable corporate effort is a well planned and thought out means of decentralizing authority by delegating to key supervisors the maximum possible amount of authority in petroleum engineering work. Delegation of authority does not necessarily mean that control is sacrificed or that necessary managerial safeguards are endangered. In regard to decentralized authority, Gwilym A. Price, [4 5] president of

[4] Anon., "Westinghouse and Mr. Price," *Investor's Reader* 9 (8) 17-18, October 15 (1947).
[5] Gwilym A. Price, letter of November 26, 1947.

(Continued on page 43)

THE GOLD MINER AND PUBLIC RELATIONS☆

By
JOSEPH STAGG LAWRENCE
Vice President of Empire Trust Co., New York City, New York

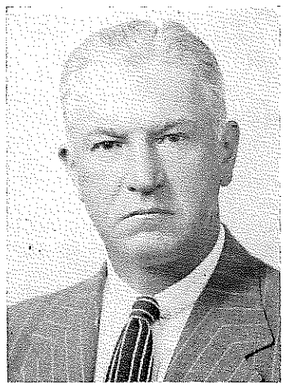
This problem of gold and the national economy goes far beyond those who make a living out of mining gold. It has been a matter of profound interest to every intelligent citizen in the United States. In looking back over the last twelve months at what we have done and what we have failed to do, I think it a fair statement that we have had more occur in that year, the year 1949, of great importance to the gold mining industry and to the currency of this country than in any other year since 1933.

Let me briefly mention what has happened in this year, what has happened that is of prime concern to all of us. Back in May, hearings were held before the full Banking and Currency Committee of the U. S. Senate on two measures introduced by members of the Senate. One was S13 by Senator McCarran and the other was S286 by your distinguished Senator from Colorado, Mr. Johnson.

Hearings lasted for two days and the Committee accorded us very courteous attention. To be sure the bill was not reported out of the committee and I must say we were not surprised by that. After all, we did recognize the tremendous obstacles confronting us, in the attempt to get the country back on the gold standard, and we didn't expect that committee to report that bill out. However, we did draw to the attention of the Upper House the fact that sooner or later some action would have to be taken on this question. The hearings gave us a platform from which to state our case.

Those hearings also had the great virtue of bringing out in the open for the first time the position of the executive agencies in Washington. While, through an unfortunate accident, which I will describe to you in a moment, it was not necessary for the spokesmen of the Treasury and of the Federal Reserve Board to offer their testimony orally, the fact is that they did have to submit statements in black and white which presented for the first time the alleged reasons for the objections of the executive agencies against any return to gold. Insofar as those written presentations revealed for the first time the hand of the executive branch of the government itself, those hearings can be regarded as having achieved something that was definitely constructive.

The other development at those hearings—a development which I am sorry to say all of us must deplore—it the discovery that within the ranks of those citizens who believe it wise and who believe it necessary ultimately to bring this country back to a gold standard, there is a serious division



JOSEPH STAGG LAWRENCE

as to the best means of getting back to the gold standard. At those hearings we had as oral opposition a group of several witnesses whom I would describe, not maliciously, not unfairly, as academicians. They were all—with one exception, professional economists. They were men who had spent their time—all their lives—in ivory towers. Practically none of them had had any contact with the realities of the outside world. These men offered reasons why, if we returned to gold, we would necessarily have to return at $35.00 an ounce. These fellows were purists. They were economic fundamentalists, if you please. They were fellows who refused to permit their convictions to be compromised in any way by the realities of the world no matter how convincing and how impressive those realities might be to practical minds. These fellows labored under a great fallacy. That fallacy is at the basis of all the efforts of the Economists National Committee on Monetary Policy. It is the conviction that the standard of value, the currency unit which is used to measure prices and values in the market place, must remain forever as inviolable a standard as is the yard, or the quart, or the pound.

Now, offhand it might seem that if you have standards for measuring distance, if you have standards for measuring weight, and those standards must remain inviolable, then likewise the standard which you use to measure prices must remain inviolable.

However, let me call this to your attention, if it has not already occurred to you. In the Bureau of Standards in Washington is a metallic rod which measures a yard. It is in a glass case and the temperatures are very carefully controlled in order that this bar may never expand or shrink. The yard which that bar represents is an abstraction. That yard can't mean anything unless it is applied to rope, or to lumber, or to distance. That yard does not require the expenditure of labor, if you please. It does not require the expenditure for materials. It does not require the payment of taxes. It does not require the use of plant and equipment. In other words, that abstraction known as the yard involves none of the ordinary business costs that must be incurred whether you are producing a ton of coal or a pound of zinc or an ounce of gold.

And the same thing applies to the pound. It applies also to other standards which you use for measuring physical quantities. However, when you are discussing a standard of values, you are not using an absolute standard, you are simply expressing a ratio between two commodities. When you say something is worth $35—and $35 is at that time the value of an ounce of gold—you are simply expressing a ratio between gold, which has required labor and effort and plant and material to produce, a ratio between that ounce of gold and between, let us say, five pairs of shoes which have also required labor and plant and managerial effort to produce.

Therefore, you can't expect that the standard of value will remain over a long period of time absolutely inviolable in the same sense as the pound, or the yard, or the quart, remain inviolable because your standard is an entirely different thing. Actually your price and your market values are simply ratios between two things and not the imposition upon a mass or upon a distance or upon a volume of a standard which is a complete abstraction.

☆Address Delivered before annual meeting Colorado Mining Association, Denver, Colorado, February 2, 1950.

I have spent some time in stressing that because it is basic and it lies at the bottom of the fallacy that is driving these well-meaning academicians on in their opposition to us. I think in the course of the past ten or eleven months we have made some headway in modifying the views of those fellows. I don't want to deceive myself or deceive you. I don't want to leave with you the impression that we have overcome the objections which those men feel to a rigid standard of $35. But I can assure you that we have some converts, and that we have made an impression upon some of the men that are members of this Economists National Committee.

Now, let's move on to the next event of major interest to us which occurred this last year. This event has received astonishingly little publicity. And yet, it is an event which has the greatest moment as far as our problem is concerned. On the 13th of September, during a meeting of the Board of Governors of the International Monetary Fund, Nicholas Havenga, the Finance Minister of the Union of South Africa, made a speech. Nicholas Havenga was a disturbed and agitated man. He was angry and this was the gist of his complaint. I'll relieve the complaint of all formalities.

He said—Boys, we gathered over here about four and one-half years ago and organized the two Bretton Woods institutions—the bank and the fund. At the time the fund was organized, it was clearly stated by the major proponents of the plan, that in the period following this great world war it would not be safe—it would not be advisable to permit commodity prices to collapse as they had collapsed after the Napoleanic wars, as they had collapsed after the Civil war, and as they had collapsed after the first World War.

These proponents said, in view of the tensions which are likely to prevail in the post war world ahead of us, it will be necessary for us to so manage our credit and our currency that prices will remain at a high level —a level reached during the war. They will have to be kept at that level without danger of the collapse.

Well now, how were they going to do that? They were going to do that by keeping outstanding an amount of credit and currency sufficient, under the reasoning of the quantity theory of money, to maintain prices at the level prevailing at the end of the war. At that point, Mr. Havenga and his associates representing gold said to the fellows that wanted to prevent a deflation after war—Well, that's fine. We are all for that. But how can you accomplish that without sacrificing the gold producer? After all, the fellow that turns out gold has to lay out money to pay labor and to buy material. And this gold, as I just explained to you a moment ago, is not an abstraction.

It is a commodity which must be produced under very much the same kind of conditions that anything else is produced. And if you fellows are going to maintain a price level that is 150% higher than the pre-war level, how can you expect us to survive under costs that reflect that higher price level, while at the same time our product brings a price of only $35 an ounce, the price that prevailed before the war. Then to placate and to assure the gold miners, the delegates at the conference said—if and when, after the war, it appears that the price level will be stabilized at a level so high that, with the costs carried by that level, you fellows can't survive, can't make any money, there will then take place a uniform universal devaluation.

In other words, at some such point after the war we will all get together and raise the price of gold. That is the commitment which Havenga said was made by the Bretton Woods conferees to the gold miners of the world. Continuing, Havenga said — We have waited here — we have waited here for almost five years and you fellows haven't d o n e anything and unless you do something, I serve notice on you now that this is what the Dominion of South Africa is going to do.

I haven't time to explain what it is that Havenga threatened to do, but the important fact is that the delegates of the Bretton Woods conference clearly envisioned the maintenance of a price level after the war considerably higher than before the war. They recognized that the maintenance of such a price level would impose unfair, intolerable hardships upon the gold producers and, finally, that they would do something about it on a suitable occasion after the war.

Five days after Havenga made his statement, Sir Stafford Cripps rose in the House of Parliament in London and raised the price of gold 44%. What happened is a matter of history. Over 30 nations have followed suit. All the important nations, with the exception of the United States have since that time reduced the value of their currencies in terms of gold. In other words, they have raised the price of gold.

Now those two things, the charges of Havenga and devaluation, have a certain relationship to each other. Both constitute in a sense an admission of the very arguments that the gold producers have been making in the past four and five years. Namely, that they have been the victims of economic circumstances which have been fashioned deliberately to achieve what might seem to be a worthy social and economic end, but they had been fashioned in such a way that they couldn't help but crucify the gold producer. And, therefore, the action of Sir Stafford Cripps and the complaint of Nicholas Havenga constitute in my judgement, and I am sure in the judgement of any fairminded student, a full support of the position which the gold miners have held during the past five years.

Now, let me move on to the fourth event which I consider of major importance. On November 2nd, at a meeting of the American Bankers Association in San Francisco, Mr. Allen Sproul rose and delivered a speech on the subject of gold.

Allen Sproul said in effect to the gold miners—You fellows are pleading for a lost cause. Gold is a barbaric relic of an age that is past. We don't need gold anymore. Furthermore, you fellows are getting $35 for gold—and $35 for an ounce of gold is an ample price. He said—Look at this ratio; i.e., the relationship between the price of gold and the general price level back in 1926. That is the year that the U. S. Bureau of Labor Statistics took as the base for its famous index. That was the par year.

Sproul said gold was selling at $20.67 in 1926. That was the mint price. Since that time — the general commodity price level had moved up approximately 55%. You fellows who produce gold today get $35 instead of $20.67. You are actually, therefore, the beneficiaries of a price increase for your product which is greater than the increase that has taken place in the general price level. To a great many people who don't have access to all the figures and who believe that this statistical reference was honest and not selective and not slanted, that seemed like a very damning argument against the position of the gold miners. I'll come back to that in just a moment.

To the non-miners who are concerned with the restoration of honest money, he offered the following doubtful comfort — Stop worrying about gold and about gold standard. He said there had been a brief period of about 100 years in which we did have an international gold standard and it seemed to have worked fairly well, but even the appearance of that effective operation was an illusion. It was

due to an accident of historic circumstance. It could never happen again quite that way.

Mr. Sproul said—You boys stop worrying about gold. The management of this currency in the United States is in the hands of—I quote—"in the hands of competent and responsible men." And, of course Allen Sproul intimated that he was one of the "competent and responsible men."

Well, let's look at these two contentions. The one addressed to the gold miner that he ought to shut up because he has a price of gold at $35, which in itself represents a 59% increase over the 1926 level, that commodity prices in general are only 55% higher and, therefore, there has been an adjustment in the price of gold more than adequate.

If you draw a chart that shows the movements of the wholesale price index from 1800 down to 1949, you will find three distinct periods that have been completed—three distinct post war price cycles, and a fourth, the current; namely, the current cycle which has not yet been completed. And in each one of those you will find a very marked distortion as a result of war. You will find that, after the Napoleanic wars were ended, there was a sharp precipitate drop in prices. About half way along this post war adjustment, a pause of 3 or 4 years occurred, after which the downward trend was resumed until the prewar level was reached. The same thing exactly happened in the period after the Civil war. Again, after the first World War, we had a very sharp drop in prices, in 1920 and 1921 and then a temporary stabilization, a shelf again, if you please, in the 20's and then, finally, in '30, '31 and '32 you had the complete adjustment to the relationship between commodities on one hand and gold on the other.

Now, if you take the period from 1834 to 1933, you've got a period in which, with the exception of the years from 1862 to 1879, the price of gold has been officially set at $20.67. Now I take 1834 as my starting point because it was in that year that the gold content of the dollar was fixed at 23.22 grains of pure gold. Prior to that time, there were several price changes not of any great importance but, certainly, in 1834 we did have the price that prevailed, with that one Civil war exception, for an entire century.

Now, let's take that hundred year period. I want to apologize for using figures, but I feel it's fairly important in getting at the root of this—in that hundred year period, let's take the years '62 to '79 and kick them out. After all, we weren't on a gold standard in that period. Also, let's take the years 1916 to 1920 and remove them. I remove them because we were in the midst of a war. There was no free movement of gold. Actually, there was an embargo in this country on the movement of gold and while nominally we were on the gold standard in that period, actually we were not. Removing those two periods and taking the average of prices in the remaining part of that whole century, you get an average index level of 67, a level that was actually 33% below the year 1926 which Allen Sproul selected as his base.

I hope you follow me. I'm taking a hundred year period in which the price of gold was $20.67. In that period, the relationship between gold and other commodities was such that you had an average commodity price level represented by the figure 67. You may regard that figure 67 as the position of rest in a commodity price pendulum movement. The relationship between goods on one side and gold on the other established that point, 67, as the position of rest. In a period of war, the pendulum swung over to one side —in a period of great depression, it swung over to the other, but it always tended to come back to that point of 67.

If you are going to compare, or rather if you are going to test the adequacy of the $35 price, in terms of a base that had prevailed before, you should in all honesty pick not the year 1926, but pick this average level that had prevailed for a hundred years. And, if you do that gentlemen, you will find that a fair price, based on a similar relationship of gold on the one hand and commodities on the other, at the present time ought to be not $35, but $47 or $48. That, of course, was something w h i c h Mr. Allen Sproul didn't mention. And he, therefore, left with his hearers the impression that the gold miners had already secured for themselves a price increase that was entirely adequate in view of the purchasing power of gold.

I can't explore that any further on this occasion though there are other interesting aspects of it. Let me move now to the other argument that Mr. Sproul addressed to the bankers. He advised them to stop shedding tears for gold. He said — Trust us, "the competent and responsible men" and we will manage credit and currency in such a way that you won't have to worry about this silly yellow metal anymore.

Now, it so happens that we have in the world today a number of very striking illustrations of managed currencies, currencies that have been managed by men who unquestionably consider themselves just as competent and just as responsible as Mr. Allen Sproul. I would say, I think without any danger of being contradicted, that the boys who sit in the Kremlin today consider themselves "competent and responsible men." And they have a degree of power, enjoyed for a period of 30 years, which we can never in our wildest moments conceive our own government as exercising. Those fellows managed the currency and they managed the credit of the Soviet Republic for a period of 30 years. In the latter part of 1947, the boys in the Kremlin found so much paper money outstanding that they had to go to their citizens and tell them — Tomorrow, we are going to take away from you nine-tenths of all your paper money. There is too much of it outstanding—prices are too high. We are going to take it away from you. And, those of you who don't have paper currency and have bank accounts — and there are some savings accounts— we won't be quite as rough with you as we are going to be with fellows that have paper rubles. We are going to take only two-thirds of your deposit money away from you. And, then, to the fellows who had Russian bonds— We will be still easier on you. We won't treat you as roughly as we have handled the fellows with the deposits and the fellows with the rubles—we will take only half your bonds back. Only half your bonds.—And, there, gentlemen, you have a grand illustration of a currency managed by "competent and responsible men" — managed for a period of 30 years.

And, in spite of the seizure of Ivan's cash and bonds, which in my limited lexicon is plain robbery, prices today still haven't any visible contact with the prices that prevailed in Russia twenty years ago. Now, naturally, Allen Sproul didn't refer to the Russian experience in complimenting himself and in urging the bankers to rest easy under the kind of currency management that he and the other "competent and responsible men" were going to provide.

I just want to leave one more word with you. These things that have happened, I characterize in the aggregate as the most important occurances since 1933. They are important because they have placed this entire subject of price and gold on the public stage where everybody has had to look at it. The fellows in Washington who had hoped that they would continue to exercise their great power undisturbed have been forced to step up

(Continued on page 36)

ENGINEERS' DAY PROGRAM COMPLETE

A complete and diversified program for the 16th Annual Engineers' Day, April 21 and 22, at the Colorado School of Mines in Golden, has been announced by Martin S. French, Chairman of the 1950 Engineers' Day Committee. The event will consist of optional technical sessions, contests, undergraduate awards, industrial exhibits and campus tours.

To date nearly 40 industrial exhibitors have requested space for exhibitions in Steinhauer Field House and more are expected to apply for space before the celebration date. New equipment of interest in all phases of mineral industry engineering is expected to be shown in the industrial exhibits.

Guest speakers have been obtained in Geophysics, Geology, Mining, Metallurgy, Petroleum Production and Petroleum Refining. The optional technical sessions at which the guest speakers will be heard will begin at 2:00 P.M. and continue until 4:P.M. At the conclusion of the technical sessions Mr. Talbert Abrams, President of the Abrams Aerial Survey Corporation will deliver a speech on "Engineering Around the World."

Keynote and highlight of the celebration will be the address to be delivered by Paul V. Keyser, Jr., manager of the Lubricating Division of Socony-Vacuum Oil Company, Inc. of New York. The subject of Mr. Keyser's address will be "The Place of the Engineer in Industry and His Responsibilities." Mr. Keyser will deliver the principal address at 10:30 A.M. in the Golden Theater.

Presentation of awards, scholarships and prizes will be made just prior to the address by Mr. Keyser. An award to the outstanding senior by the Colorado Engineering Council, to the outstanding sophomore by Sigma Gamma Epsilon, and to the outstanding freshman by Tau Beta Pi will be made at this time. Three four-year scholarships to the Colorado School of Mines will be awarded to high school seniors on the basis of the results of the competitive examination conducted by Tau Beta Pi. Three cash prizes, totalling $100.00 will be given the winners of the technical essay contest. In addition to the cash prizes, a Brunton Compass is being given the author of the best geological paper, a contribution of the Kendrick-Bellamy Co. of Denver.

PAUL V. KEYSER

Other prizes will be given the winners of the Mucking Contest sponsored by the Mines chapter of A.I. M.E., the Rock Drilling Contest sponsored by Theta Tau, and $75.00 in cash prizes to be given the hirsute winners of the Beard Growing Contest sponsored by VFW Post No. 4171 of Golden. Winners of the Beard Growing Contest will be chosen, tentatively, at the Engineers' Day Dance, Friday night, April 21, in Guggenheim Hall.

Action features of interest by exhibitors will be a demonstration of Lane Wells perforation technique and a fire fighting demonstration by the American-La-France Company using the latest in fire-killing apparatus. Both of these events will be held during Friday morning.

Luncheon will be served at the school cafeteria for all visitors at 12.00 A.M. Immediately following luncheon there will be an Alumni reunion in the Integral Club at the gymnasium.

Technical sessions for the visiting high school seniors will be held by representatives of the degree granting departments. These sessions will be held from 1:00 until 2:00 P.M. They are designed to familiarize the students with the school and the requirements of an engineering education.

The speakers for the optional technical sessions and their subjects are as follow:

Geophysics:
Dr. Morris M. Slotnick, Director of Exploration for the Humble Oil Co. — "Geophysics and Geophysical Exploration for Oil."

Mr. H. Wayne Hoylman, of the Fairchild Aerial Survey Corp. "The Airborne Magnetometer and Aerial Surveys."

Geology:
Mr. Theodore A. Link, formerly of the Imperial Oil Co., Ltd. "Theory of Transgressive and Regressive Reefs and the Development of Oil."

Coal Mining:
A representative of the Joy Mfg. Co. will present a short discussion of present day coal mining and the use of modern equipment.

Metal Mining:
Mr. O. W. Bilharz, of the Bilharz Mining Co. — "Mining Engineering."

Metallurgy:
Mr. D. Gordon Craig of the New Jersey Zinc Corp. "General Metallurgy Problems as Encountered at the Gilman Plant."

Mr. Thomas Fahey of the American Smelting and Refining Co. "The Smelting of Concentrates."

Petroleum Production:
Mr. P. E. Fitzgerald of Dowell Inc. — "The Use of Plastics in Drilling and Production."

Petroleum Refining:
Mr. Wyatt L. Walker of the Continental Oil Co. "Fluid Catalytic Cracking and General Processes" with respect to newly completed refinery at Billings, Montana.

Culmination of Friday's activities will be the Engineers' Day Dance to be sponsored by the Barb Organization.

PROGRESS NEWS AEC

(Continued from page 17)

allurgical testing prior to negotiating a purchase contract.

In order that all producers desiring to deliver autunite-torbernite ores may have an opportunity to make deliveries, individual contracts will be for limited tonnages so that total deliveries may be held to the ore receiving capacity of the depot. Should sufficient ore reserves be developed, and the production from sustained mining operations warrant, the capacity of the Depot will be increased.

The Commission's obligation to purchase autunite-torbernite ores from any producer will be limited to commitments contained in the contract with the producer.

Correspondence relative to the delivery of ores to the new depot should be addressed to the American Smelting and Refining Company, P. O. Box 986, Grand Junction, Colorado, or to the United States Atomic Energy Commission, P. O. Box 270, Grand Junction, Colorado. Verbal inquiries may be made at either of the above offices or at the Marysvale ore purchase depot.

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.

Allis-Chalmers Enlarges Magic-Grip Sheave Line (701)

Extension of its Magic-Grip sheave line to include A-B combination groove sheaves in sizes from 3 to 38 inches—one to six grooves—in both collar and no collar types has been announced by Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

Both the collar (Style C) and non-collar (Style NC) types operate on the same principle of clamping the sheave quickly and firmly to the shaft by compressing the split tapered bushing sleeve.

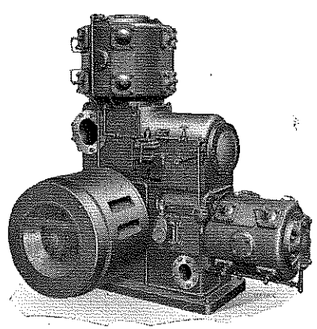
The Magic-Grip non-collar bushing is a new development. It has radially adjusted setscrews and is especially designed to allow maximum bores in the smaller pitch diameters. It can be mounted and demounted as quickly as the collar bushing. The sheave itself has four radial screw holes in the hub, two at 180 degrees marked "on" and the opposite holes marked "off." Two hexagon socket cone point setscrews, operating in cone shaped recesses, tighten or release the bushing from the shaft, depending upon their position in the holes. It is available only in the smaller pitch diameters.

The Magic-Grip collar type bushing is the original Texrope drive "fast mounting unit" featuring the tapered split bushing with separate collar and axially adjusted capscrews. The sheave is clamped to the shaft by tightening three capscrews. It is released easily and quickly by loosening the capscrews and using two of them as jackscrews.

New Air-Compressor Design (702)

A "New Look" and a new idea in air-compressor design has been incorporated in a new line of modern, packaged-type, heavy-duty electric-driven compressors announced by Ingersoll-Rand Company, 11 Broadway, New York 4, N. Y. Sizes range from 125 to 350 hp for continuous full-load service and two-stage compression to 80-125 psi discharge pressures. The manufacturer stresses simplicity of design, operation, and maintenance, as well as operating economy and compactness.

Designated as the XLE, this completely new L design embodies a single vertical low-pressure compressor cylinder, a horizontal high-pressure cylinder, and a synchronous motor mounted directly on the crankshaft. It requires only a very small foundation, and is engineered full of new ideas from the inside out.

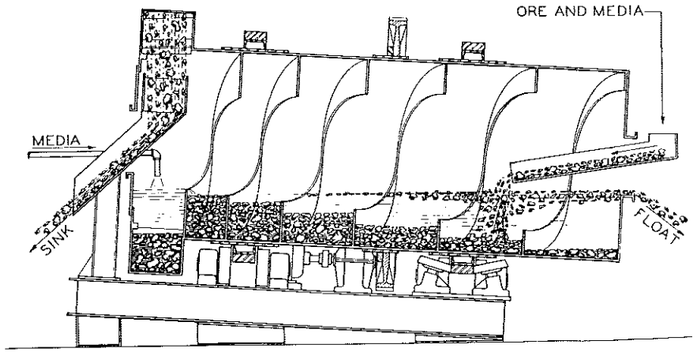


▼ XLE Air Compressor

One innovation is "Pipeless, Thru-Frame Air Flow." Air enters and leaves the compressor through main air connections on the frame, instead of on cylinders, and is led to and from both cylinders an intercooler through large passages within the frame itself. There is no interstage piping nor cylinder strain due to air piping.

Counterflow, tube-and-finned construction of the intercooler is said to give excellent cooling with very little pressure loss and a small quantity of water. It is made of all-copper alloy throughout. All bearings in the XLE are full-floating and rotate freely both on the bearing journal and within the rod or bearing housing. Main and crankpin bearings are of aluminum alloy.

The XLE is particularly suitable where ever skid-mounting, factory floor, or ground conditions require a well-balanced machine.



HARDINGE HEAVY-MEDIA SEPARATOR

New Heavy-Media Separator Popular on Mesabi Iron Range (703)

A new device has entered the heavy-media ore beneficiation field—the Hardinge Heavy-Media Separator, made by Hardinge Company, Incorporated, York, Pennsylvania. Two of these separators are now in operation on the Mesabi Iron Range, Minnesota, to improve the grade of iron ore. Due to the satisfactory operation of these first units, four additional Hardinge Separators are now being installed.

The Hardinge Separator is a slowly-revolving, inclined, cylindrical drum with spiral flights attached to the inner surface of the cylinder. The material to be separated, accompanied by heavy media,* is fed in at the lower end. As the drum rotates, the "sink" is carried by the spiral flights to the high end. The "float" overflows a circular weir at the lower end.

This simple but effective device has no internal moving parts to grind against each other. Thus, maintenance is extremely low. The quantity of media to fill this circuit is considerably less than with a cone of equal capacity. The separator will handle large pieces of ore—up to 4 inches. It can act as a medium reservoir and will start up easily after several hours shut-down

* (Note: The "heavy-media" separation process, sometimes referred to as the "sink-float" method, employs a liquid suspension of heavy mineral, or metal, whose density lies *between* that of the materials to be separated. A quiescent mixture of ore and heavy media will permit the heavier solids to sink and the lighter to float, thus making separation.)

Ultrasonics Clean Grease from Metal (704)

High frequency sounds can strip grease from metal in a matter of seconds, according to Dr. Robert O. Fehr, General Electric engineer.

Speaking before a meeting of the Albany Society of Engineers, he said that "ultrasonics," sounds pitched too high to be heard by the human ear, can be extremely useful to industry, particularly in tedious cleaning operations.

MINES MAGAZINE,
734 Cooper Building,
Denver, Colorado

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Street.....

The G-E engineer emphasized, however, that ultrasonics are not likely to be put to work cleaning dishes and clothes in private homes in the near future. The special needs of ultrasonic generators for these purposes would necessitate a large supply of electric power at a frequency hundreds of times higher than the usual 60-cycle household current.

In tests at the G-E General Engineering and Consulting Laboratory, small metal parts were cleaned of grime and grease in less than ten seconds by ultrasonics. Cleaning the parts by methods usually used would have required several separate operations and at least an hour's time, he said.

"Use of ultrasonics in the home is not yet practical, but the sound waves certainly can be put to good, economical use in industry," Dr. Fehr said.

He envisioned ultrasonics cleaning tanks along production lines, through which small parts would pass and be cleaned.

Improvements on Handy Moto-Bug (705)

Principal improvement noted in the 1950 model MOTO-BUG, a power wheelbarrow manufactured by the Kwik-Mix Company of Port Washington, Wisconsin, is a large steering wheel to replace the lever bar arrangement formerly used for guiding the unit.

The introduction of the steering wheel permits the operator to handle the MOTO-BUG in the same manner as an automobile and with the same ease. Steering gear ratio has been increased from 2 to 1 to 4 to 1. Sturdily built, the MOTO-BUG has a rated hopper capacity of 10 cu. ft., or 1200 lbs. on the platform body. It is powered by a standard 4 h.p. gasoline engine and travels at speeds of 1½ to 4 mph, both forward and reverse.

Whether walking behind the machine or riding on the optional step, the steering wheel arrangement provides a more con-

venient method of handling the MOTO-BUG. A direction indicator is also included with the new steering feature.

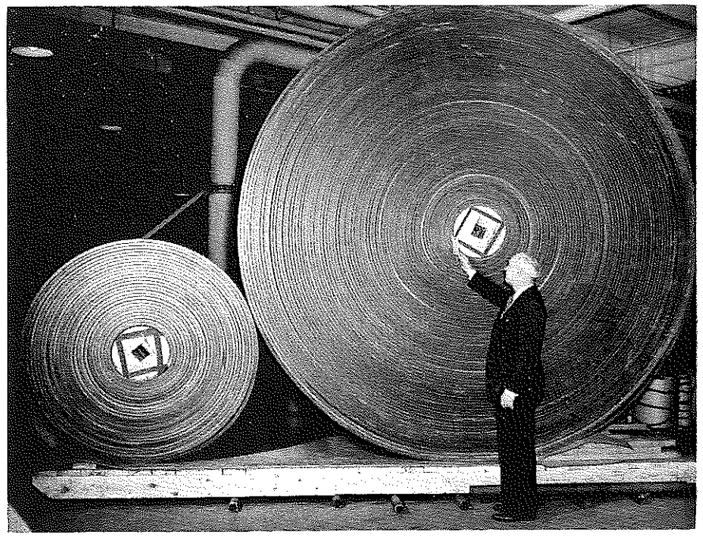
Plastic Covers Protect Welding Plates (706)

A new, clear plastic cover plate to protect costly welding plates from damage is announced by American Optical Company.

These new plastic plates—manufactured from methyl methacrylate, the material used for bombers' noses and navigators' turrets during the war—meet the optical requirements of the Federal Bureau of Standards.

The plates do not pit as readily from welding spatter as glass plates; are .060" thick assuring adequate impact resistance and will outlast ordinary glass cover plates many times over.

Two sizes available: standard, 2" x 4¼" and a slightly smaller size, 2" x 4⅛," provided on special order.



▼ R. Murphy, a Goodyear supervisor, examines 1200-foot conveyor belt.

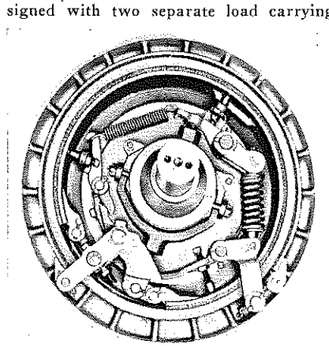
Goodyear Ships King-Size Conveyor Belt (707)

The 1200-foot conveyor belt shown above presented an unusual problem for the Goodyear Tire and Rubber Company's traffic department when the time came to ship the two-roll unit from the firm's mechanical goods plant here to a customer in Pennsylvania.

One of the longest conveyor belts ever shipped in one contiuous piece, it was necessary to acquire special permits from the states of Ohio and Pennsylvania to transport the belt on the highways. A low-slung truck, commonly referred to as a "lowboy," was called upon to make the haul, thus assuring bridge and underpass clearance. Weighing more than 13 tons, the 42-inch wide belt, resting on a skid, had to be loaded on the truck by means of pipe rollers. Photograph shows R. Murphy, a supervisor in Goodyear's packaging department, inspecting the shipping tag on the belt.

Koehring Booster Clutch Reduces Operating Effort (708)

A new mechanical booster clutch that reduces lever pull more than 50% for the operator has been developed by Koehring Company engineers for use on the Model 304 Koehring ¾ yard excavator. This remarkable reduction in operating effort is made possible because the clutch is designed with two separate load carrying



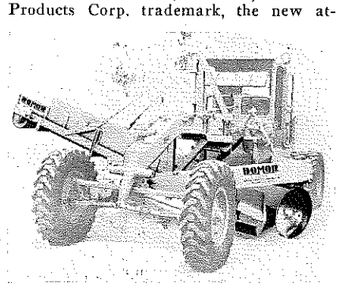
clutch bands, one of which helps to set the other.

By actual measurement, it has been found that only about ⅓ to ½ the operating effort is required on the new clutch to produce an engine stalling load of what was previously needed on a straight manual clutch. Other important advantages produced by the new clutch include marked increases in production figures, simplified operation and longer life for the excavator and its machinery parts.

The new booster clutch helps the operator retain a good "feel" of the load because the lever pull is directly in proportion to the pull produced by the clutch. Production increases, which have been noted, can be attributed to the introduction of a heat compensator spring that changes tension automatically. Full clutch efficiency is maintained at all times thereby and any time losses for manual clutch adjustments are eliminated.

New Attachment for Motor Grader (709)

A new product for converting a "Caterpillar" Motor Grader into a one-man self-propelled elevating grader has been announced. The Ulrich Products Corp. of Roanoke, Ill., in cooperation with Caterpillar Tractor Co., Peoria, Ill., has recently placed this product on the market. Sold under the trade name, DOMOR, an Ulrich Products Corp. trademark, the new at-



tachment will be marketed through "Caterpillar" dealers.

In making the conversion the standard blade, circle and drawbar are removed and the elevating carrier adjustably supported under the main frame. A 30-inch disk plow is drawn by a plow beam attached to the standard drawbar connection. The 42-inch carrier is driven by power take-off from the motor grader engine and has a normal speed of 400 feet per minute. It is equipped with a four ply corrugated top conveyor belt, firmly connected by metal hinges. Carrier rollers are mounted on ball bearings. An efficient, auger type pan cleaner is driven by well-protected gears.

The standard carrier is 19 feet in length, giving ample heights for loading. For casting work, a three foot section can be removed, thus reducing the length of the carrier to 16 feet. Carrier lift is operated by cables powered by regular blade controls.

New Respirators With Interchangeable Filters (710)

A new line of twin cartridge respirators specifically developed to provide protection against seven respiratory hazards through a basic face piece and seven interchangeable filters is announced by American Optical Company, Southbridge, Mass.

The company states the seven filters protect workers against (1) a combination of all dusts, (2) organic vapors, (3) acid gases, (4) combined acid and organic

gases, (5) ammonia, (6) combination of organic vapors and all dusts, and (7) metal fumes.

The new respirators will be distributed with one or more pairs of filters, depending upon the needs of the user.

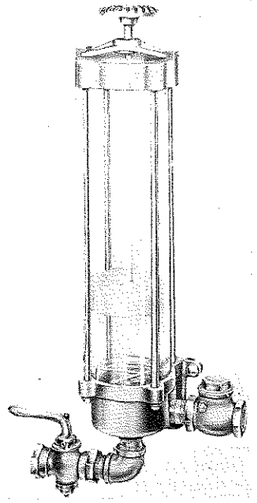
The basic face piece of the new respirators is molded from durable rubber and has a new "rolled" edge that curves inward to give a snug fit without leakage. Other features include a new flexible fitting brace for shaping the respirators to individual features, a highly efficient inhalation and exhalation system and increased field of vision through thinner filter cartridges.

New Automatic Hydroblender (711)

An automatic, self-draining Hydroblender for the introduction of chemicals that will "wet" water at the point of use, has just been announced by Mr. Miner W. Allen, president of the Aquadyne Corporation, 220 East 42nd Street, New York 17, N. Y.

The Hydroblender, made of brass castings and fittings and a tube of lucite, weighs approximately 35 pounds. It can be mounted on wall, machine or column by four lag bolts or screws.

The chemicals are placed in the lucite tube in the form of water-soluble capsules. There they dissolve in proper proportion



to the water passing through a built-in venturi nozzle. When used with the Aquadyne capsule which weighs 3 pounds the resulting solution has a surface tension of 30 dynes. Each Aquadyne capsule makes a minimum of 1,000 gallons of "wet water" (reduces surface tension from 72 to 30 dynes). The Hydroblender holds two capsules.

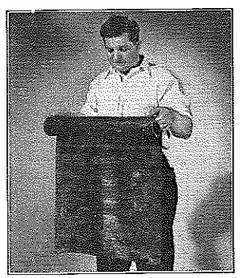
Principal applications of the Hydroblender are in industrial dust control and product wetting, blending, mixing and washing. It provides, as needed, the "wet water" required for these purposes without requiring special tanks and piping for its preparation and storage.

Literature is available from Aquadyne Corporation, 220 East 42nd Street, New York 17, N. Y.

Tapecoat Introduces Two Wide Protective Coatings to Line (712)

The Tapecoat Company, Evanston, Illinois, has just announced the development of 18 and 24-inch widths of Tapecoat to round out their line of coal tar protective coatings in tape form.

The new wide Tapecoat, it is stated, is adapted for coating field joints on large



diameter, pipe or conduit, protection of large bends, wrapping mechanical couplings and patching transmission lines.

According to A. W. Bohne, general manager, these large widths are cigarette-wrapped around the pipe or conduit, while the 2" to 6" widths of Tapecoat are spirally wrapped to give maximum protection against corrosion and the elements.

PLANT NEWS

Alan Probert and Wallace Agey, '39, in Mexico for U. S. Bureau of Mines

Alan Probert, metallurgical engineer, has recently resigned from the United States Smelting Refining and Mining Company after 23 years in the service of this organization and its subsidiaries to return to Mexico for the United States Bureau of Mines in charge of the cooperative program which the Bureau's Foreign Minerals Region is carrying out with the Mexican Government.

Following assignments at Nome, Alaska, Eureka, Colorado and Midvale, Utah, Probert was sent to Pachuca, Mexico, in 1935 as metallurgist, became General Superintendent of Mills in 1940, and when the Mexican subsidiary, Compania de Real del Monte, was sold two years ago, he was transferred to Fairbanks, Alaska.

Also attached to the Mexico City headquarters of the Bureau of Mines in the American Embassy, is Wallace Woods Agey, metallurgist, who has been transferred from the Salt Lake City metallurgical station. Agey, a *Colorado School of Mines* graduate of 1939, has been with the Bureau since 1940 except for eighteen months with the Army Chemical Warfare Corps in the Canal Zone.

The cooperative program of the Bureau

ALAN PROBERT

in Mexico involves interchange of methods and ideas between the two neighboring republics and is specifically devoted to the development of improved beneficiation practice of complex and refractory ores through the combined efforts of engineers of both governments, using the facilities and laboratories of both Mexico and the United States. Direct administrative control of the Mexican project, as well as all other foreign activities of the Bureau of Mines, is under Mr. E. W. Pehrson, Acting Director of the Foreign Minerals Region, in Washington, D. C.

International Minerals Declares Dividend

The board of directors of International Minerals & Chemical Corporation recently declared a regular quarterly dividend of 50 cents (50¢) per share on the common stock of the corporation and the regular quarterly dividend of one dollar ($1.00) per share on the four per cent (4%) preferred stock, according to Louis Ware, president of the corporation. Both dividends will be payable March 30, 1950, to stockholders of record March 17, 1950.

C. W. Schweers Heads Allis-Chalmers New England Region

Chester W. Schweers, manager of Allis-Chalmers Los Angeles district since January, 1947, has been named manager of the company's New England region with headquarters in Boston, according to an announcement by J. L. Singleton, vice-president and director of sales of the company's general machinery division. He succeeds W. F. Taylor, resigned.

Schweers entered the employ of Allis-Chalmers in 1930 and served as a sales engineer in the company's New Orleans office for nearly 10 years before becoming manager of the Houston office in 1942. Taylor, who had been associated with Allis-Chalmers since 1926, and A. B. Frost, manager of the company's Boston district, also resigned, are establishing their own business. Frost had been with Allis-Chalmers since 1937.

Allis-Chalmers Dealers Get Inventory Survey Check Lists

Suggestions to help users determine the exact condition of their V-belt drives are contained in a four-page inventory survey check list being made available to Allis-Chalmers Texrope drive equipment dealers for use by their customers.

The standards carried in the check list make it possible for users to decide which of their belt sets are satisfactory as is, which will shortly require replacement, and which need immediate replacement. The survey is designed to cover the drive problems in most plants.

The same categories prevail for the condition of sheaves with the addition of a fourth—those that are obsolete, and a fifth for entire drives—those that need re-engineering. Re-engineering may be desirable to take advantage of new developments, such as Allis-Chalmers variable speed drives with either stationary or motion control, or to correct mis-applications forced by past shortages.

The procedure recommended for the survey calls for checking the drive engineering with respect to diameters, centers, number and size of belts, belt speed, contact arcs, tension and alignment; inspection of V-belts for scuffing, slip burn, oil deteriorating and abrasion, and checking of sheave walls for smoothness and straightness.

H. E. Langdon Completes Quarter-Century with Goodyear

H. E. Langdon, manager of Goodyear Tire and Rubber Company's Mechanical Goods sales, Central division, was presented with a lapel pin honoring his 25 years' continuous service with the company by R. S. Wilson, vice president in charge of sales, at an executive luncheon meeting.

A native of Akron, Langdon joined Goodyear as a member of the mechanical goods department in Pittsburgh, in 1916, transferring to the export company in Australia, two years later. He returned to the United States in 1921 as mechanical goods salesman with the company's Boston branch. He left the company in December, 1921, returning to Goodyear's Western division of mechanical goods sales in 1925, from which his continuous service dates.

Langdon was promoted to manager of Western division, Mechanical Goods sales in 1931 and was named manager of Central division, Mechanical Goods Sales in 1949.

He is a brother of C. R. Langdon, manager of Goodyear's sales and office personnel.

Promotions in Goodyear Sales Departments

J. E. O'Conner, 28, has been appointed manager of Packing and Special Products Sales department, Goodyear Tire and

J. E. O'CONNER

W. F. ONG

Rubber Company, replacing W. F. Ong, who has been appointed manager of Wringer Rolls Sales department, according to announcement by H. D. Foster, manager of the company's Mechanical Goods division.

Goodyear Liberalizes Pension and Insurance Plans

Liberalization of the company-wide pension plan to guarantee 13,000 domestic salaried employees minimum retirement pay of $100 per month including Social Security at age 65 with 25 years of service has been announced by The Goodyear Tire & Rubber Company.

The management further announced that the company will assume the cost of group life and accident insurance policies now paid for by employees through payroll deductions, and the present maximum of $10,000 coverage is increased to $20,000. Policies generally equal the annual salary of the employee.

Minimum requirements for retirement under the pension plan are 15 years of service at age 65 and there are provisions for retirement with company consent after age 55 with 20 years of service. In such cases the minimum guarantee does not apply and benefits are scaled down on the proper actuarial basis.

There are also provisions for retirement after 15 years' service, regardless of age, for employees who become permanently and totally incapacitated.

T. R. Farley to Run Caterpillar's New Plant

A recent announcement by L. B. Neumiller, Caterpillar Tractor Co. President, disclosed that work will begin immediately on a new factory in which will be manufactured a large portion of the Company's line of bulldozers, scapers, wagons and rippers.

T. R. FARLEY

The new plant will be located near Joliet, Illinois, and, when completed, will include a modern steel fabricating and assembly building, an office building, a heating plant and a sewage and water treatment plant—a total of 700 thousand square feet of floor space.

Taking over as General Manager of the new factory will be T. R. (Ted) Farley, Vice President of the Company. Mr. Farley has been with the Company since 1919 when he joined the Holt Manufacturing Company which merged, in 1925, with the C. L. Best Tractor Company to form the present Caterpillar organization.

He has had extensive experience in all branches of the Company's operations.

Goodyear Official Notes Crisis in Rubber Technolgy

Dr. R. P. Dinsmore, vice president in charge of research of the Goodyear Tire & Rubber Company, told the Chicago Rubber Group of the American Society recently that the rubber industry is facing a technological crisis because of a shortage of young trained technicians.

Dr. Dinsmore stated that a solution lies in a recognition by management of the problem and its importance, and resourcefulness in creating methods by which younger men, as they prove themselves, may be advanced to positions of greater responsibility and given greater breadth of training without upsetting the organization training structure or retiring older men who are performing their functions efficiently and well.

CF&I Corporation Announces New Appointments Effective April 1st, 1950

James N. Counter, newly appointed General Manager of Commercial Steel Sales for CF&I's Western Division, recently announced several personnel changes for his Division.

Robert F. Bourne will assume the post of Manager of Rolled Product Sales.

To fill the vacancy left by Mr. Counter's recent advancement, Mr. J. R. Caten, for some time District Manager at Phoenix, Arizona, will return to Denver as Division Sales Manager for the Rocky Mountain Division.

Luke Helms, Jr., will leave his post as Assistant District Manager at Ft. Worth to become District Sales Manager at Phoenix, Arizona.

William J. Grant Appointed Manager Southern Sales for American Brake Shoe's National Bearing Division

William J. Grant has been appointed Manager Southern Sales for the National Bearing Division of American Brake Shoe Company, according to an announcement by T. W. Pettus, Division President. His headquarters will be in the Southern States Building in Richmond, Virginia.

Mr. Grant, formerly Sales Representative for the company's Brake Shoe & Castings and Southern Wheel Divisions, has been with Brake Shoe since 1940. During World War II he served as a Lieutenant with the U. S. Navy in both the European and Pacific theaters of operations. He attended Georgia Military Academy and is a graduate of Georgia Institute of Technology.

LETTERMEN'S DINNER
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CATALOGS AND TRADE PUBLICATIONS

(5425) JACKHAMER, Form 150 by Ingersoll-Rand, 11 Broadway, New York 4, N. Y. A 4 page illustrated bulletin describing the J-10 "Utility" jackhamer and the Pac-Air high speed trailer mounted compressor. Photographs show units in use on different type jobs. Specifications for both units are provided.

(5426) "WHITE METAL NEWS LETTER," March 1950, by The International Nickel Co., Inc., Nickel Information Service, New York 5, N. Y. Contains numerous items concerning new and interesting uses for platinum, stainless steel, nickel, monel, cadmium and other white metals and white metal alloys.

(5427) AUTOMATIC SAMPLERS, Bulletin No. 47 by Hardinge Co., Inc., 240 Arch St., York, Pa. An 8 page bulletin describing and illustrating automatic samplers giving operation, construction features, dimensions and a parts list. A list of other Hardinge publications is also provided.

(5428) "DECO TREFOIL," January-Februnry 1950, by the Denver Equipment Co., 1400 17th St., Denver, Colo. A 20 page, illustrated magazine featuring an interesting account of mountain lion hunting by Marvin Glenn, famous Arizona lion hunter. The very valuable engineering notebook section is devoted to a detailed description of phosphate mining and concentration practice at the Virginia-Caroline Chemical Corp. plant near Nichols, Fla.

(5429) U. S. STEEL, ANNUAL REPORT FOR 1949, Thirty-six pages, illustrated booklet, by United States Steel Corp., 51 Newark St., Hoboken, N. J. A report on the company's operations, production, sales and finances for the year 1949. Includes considerable information on ore reserves and newly discovered ore deposits.

(5430) "CORE DRILLING MACHINE," Bulletin No. 160 by Sprague and Henwood, Inc., Scranton, Pa. Eight pages describing the No. 142 core drilling machine giving specifications, construction features, and showing the machine in operation with various accessories such as derrick and hydraulic swivel head.

(5431) "NEW MEXICO MINER AND PROSPECTOR," March 1950, by the New Mexico Miners and Prospectors Association. A 12 page, illustrated magazine devoted to articles and items of interest to the New Mexico mining industry. This issue features articles on legislative problems of the industry, the percentage depletion question, some phases of the oil and gas industry and others.

(5432) MOBILCRANES A 4 page illustrated bulletin by the Osgood Co., Marion, Ohio, giving the specifications of the Model 725 one man controlled, one engine operated mobilcrane. Information given on working ranges, lifting capacities, speeds and dimensions.

(5433) ALUMINUM PRODUCTS, "Alcoa Aluminum News-Letter" February 1950, by the Aluminum Co. of America, 654 Gulf Bldg., Pittsburgh 19, Pa. Eight pages describing various products made from aluminum and emphasizing the advantages gained through its use.

(5434) "THE GRAPEVINE," Febraury 1950. An 8 page employee magazine by the United Geophysical Co., Inc., 595 E. Colorado St., Pasadena, Calif. Devoted largely to news (with photographs) of the activities of surveying parties in the field.

(5435) TUNGSTEN-CARBIDE BITS, Bulletin No. C-42 by the Joy Mfg. Co., Henry W. Oliver Bldg., Pittsburgh 22, Pa. Eight pages illustrating and describing "Sulmet" cutting machine bits, auger drill bits and finger bits for coal, and "Sulmet" rock drill bits. Sizes and specifications are provided.

(5436) "THE BUSINESS OF FARMING," Early Spring 1950, by the United States Gypsum Co., 300 W. Adams St., Chicago 6, Ill. A 16 page illustrated magazine containing articles and items of interest to farm families including home-making hints, redecorating ideas and farm market information.

(5437) "FLOCCULATION AND MIXING," Bulletin No. 6971 by The Dorr Co., 570 Lexington Ave., New York 22, N. Y. A 12 page bulletin describing and illustrating the Dorreo Flash Mixer and the Dorreo Flocculator for water treatment. Numerous photographs show these units installed and operating data is provided.

(5438) "INDUSTRIAL HOSE REPORTER," March 1950, by the Gates Rubber Co., 999 S. Broadway, Denver, Colo. Four pages containing illustrated information on various types of industrial hose. Lists of Gates suppliers and of the types and dimensions of hoses are also provided.

(5439) "THE TEXACO STAR," Winter 1950, by The Texas Co. A 24 page illustrated magazine. This issue accents the half century mark and carries articles concerning the growth and development of the industry and of Texaco in particular.

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.

(5440) "ALLIS-CHALMERS 1949 ANNUAL REVIEW," by Allis-Chalmers Mfg. Co., Box 512, Milwaukee, 1, Wisconsin. Forty pages describing and illustrating some of the more interesting installations of the company's electrical and industrial equipment, A. C. participation in atomic power projects, and progress reports on several experimental developments.

(5441) LOCKNUTS AND LOCKWASHERS, Folder No. 2348 by Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill. Describes and illustrates locknuts and lockwashers for effectively locking bearings in correct position on shaft. Gives complete information on sizes and dimensions.

(5442) ELECTROSTATIC PRECIPITATION, Bulletin GEA-5212 by General Electric Co., Schenectady 5, N. Y. Sixteen pages describing and illustrating this method of controlling small particles of matter. Explains how the process works, describes seven different installations and provides information on methods and equipment.

(5443) "MIN & CHEM," February 1950, by International Minerals and Chemical Corp., 20 N. Wacker Drive, Chicago 6, Ill. A 24 page employee magazine. This issue contains illustrated articles on transportation of phosphate, potash as used in making dynamite, soil conservation, fertilization and others.

(5444) "ROTARY KILNS," Bulletin 07B6368 by the Allis-Chalmers Mfg. Co., Milwaukee 2, Wisc. Thirty-two pages describing and illustrating A.-C. rotary kilns for cement, lime and chemical plants. Gives detailed descriptions of operation, construction and some installations plus data on flow of material through kilns, horsepower needed to drive kilns and dimensions of units.

(5445) PULP DENSITY SCALE TABLES, Bulletin No. SIC-B by the Denver Equipment Co., Denver 17, Colo. These tables in bulletin form permit the determination of pulp density, per cent solids and conditioning times required for given volumes of pulp. This bulletin covers pulps ranging from 5% solids at specific gravity 1.40 through pulps of 68% solids at specific gravity pulps 3.20. Bulletin S-1-C-B1 covers the low-range specific gravity pulps.

(5446) "THE BEACON," February 1950, by the Ohio Oil Co., Inc., Findlay, Ohio. A 36 page, illustrated, employee magazine. Feature article in this issue is entitled "Waterflooding . . . Important to our Jobs and our Oil Reserves" and describes various methods and installations throughout the country concerned with waterflooding operations.

(5447) BATTERY POWERED LOCOMOTIVE, Specifications RY-24276 by General Electric Co., Schenectady, N. Y. An 8 page booklet (illustrated) giving information on the 5 hp, 1½ ton Trammer, battery powered locomotive for mine operation. Gives dimensions, weight, speed, ratings and connection diagram plus a complete description of construction features and control equipment.

(5448) LOW-SPEED SYNCHRONOUS MOTORS, Bulletin GEA-5332 by General Electric Co., Schenectady, N. Y. Eight pages describing and illustrating Type TS (3 phase) and Type QS (2 phase) motors in the "6000 series." Covers construction features, mechanical modifications and performance data and illustrates some typical installations.

(5449) "LINK-BELT NEWS," March 1950. An 8 page paper by Link-Belt Co., Chicago 9, Ill. Describes and illustrates numerous applications of materials handling and power transmitting machinery in various industries. This issue describes conveyor installations in a solvent extraction plant, a television assembly line and others.

(5450) TRUCK-MOUNTED SHOVEL-CRANE, Book No. 2322 by Link-Belt Speeder Corp., Cedar Rapids, Iowa. Sixteen pages describing and illustrating the HC-51 truck mounted shovel crane. Photos show the unit in various operations and complete data is given on working ranges, ratings, speeds, dimensions and capacities.

(5451) TUNGSTEN MILL, Engineering Notebook, Bulletin No. M4-B29 by the Denver Equipment Co., 1400-17th St., Denver, Colo. Eight pages of illustrated information on the operations at the milling plant of Boulder Tungsten Mills, Inc., near Lakewood, Colo. With numerous photographs, describes the concentration of ferberite ores and concludes with a table of the metallurgical results of the operation.

(5452) DIAMOND CORE DRILLS, Bulletin 31-F by Sprague and Henwood, Inc. Twenty-seven pages (illustrated) listing complete line of diamond core drill equipment and supplies including bits, core barrels, couplings, drill rods, fishing tools, etc. Gives sizes and dimensions.

(5453) "NICKEL-CONTAINING MATERIALS IN TRACTORS AND FARM IMPLEMENTS," A technical paper by H. L. Geiger, published by International Nickel Co., Inc., 67 Wall St., New York 5, N. Y. Describes and illustrates the use of nickel and nickel-alloys in farm tractors and other farm implements such as fertilizer spreaders, plows, combines and mowers.

(5454) SECTIONAL CONVEYORS, Bulletin No. 132 by the Robins Conveyors Division of Hewitt-Robins, Inc., Passaic, N. J. Describes and illustrates the new sectional conveyor. Gives operating and construction features including dimensions and special advantages. Includes brief illustrated descriptions of four types of vibrating screens.

(5455) "COMPACT COMMENTS," March 1950, by The Interstate Oil Compact Commission, P. O. Box 3185, Oklahoma City 5, Okla. A monthly news-letter containing information of interest to the oil industry. This issue features an article entitled **"Industry Protests Change in Depletion Allowance."** The "Statistical Appendix" gives figures on production, state allowables, geophysical and core drilling activity, and other pertinent information.

(5456) "MINERAL INFORMATION SERVICE," March 1950, by the State of California Dept. of Natural Resources, Division of Mines, Ferry Bldg., San Francisco 11, Calif. A monthly news release covering the mineral resources and industry of California. This issue contains a historical sketch of the State Mining Bureau, an article on "Monazite and the Rare-Earth Elements," an "Estimate of California Mineral Production 1949" and other interesting material.

(5457) "RARIN'-TO-GO," February 1950, by The Frontier Refining Co., Cheyenne, Wyoming. A 12 page employee magazine. This issue contains an interesting article on the completion of Frontier's development program on the Fiddler Creek structure in Weston County, Wyo.

(5458) "SOUND BUSINESS," January-February 1950. An 8 page magazine by United States Gypsum. 300 West Adams St., Chicago 6, Ill., describing the use of acoustical materials in various types of buildings. In this issue, photographs and text describe the use of "Acoustone" and "Auditone" in a bank and elementary school.

(5459) GRINDING TESTS, "Northern Rhodesia Mufulira Copper Mines Ltd. Grinding Tests on Conical Trunnion Overflow and Cylindrical Grate Ball Mills" by Jack White, member of AIME. This paper gives details of the results of a test to determine which of two types of ball mill was the most economical to install for future extensions to the Mufulira Concentrator. Published by Hardinge Co., Inc., York, Pa.

(5460) DUST CONTROL, "Controlling Dust in Industrial Plants" by the Aquadyne Corp., 220 East 42nd St., New York 17, N. Y. A folder describing a method of dust control involving the use of a "wet water" arrangement. The equipment used is described and illustrated.

(Continued on page 35)

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HARRY J. McMICHAEL, '39
Capability Exchange
HERBERT W. HECKT, '36
Publications
LYNN W. STORM, '02
Research and Investigations
A. GEORGE SETTER, '32
Membership
JOHN H. WINCHELL, '17
Legislation
ED. F. WHITE, '36
Public Relations

PUBLICATION COMMITTEE

HERBERT W. HECKT, '36
Chairman
WILLIAM M. TRAVER, '16
Vice-Chairman
BERNARD M. BENCH, '30
HOWARD A. STORM, '29
CLYDE O. PENNEY, '36
MARVIN ESTES, '49

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 Office, 5 P. M.

Magazine Staff Meetings, Alumni Office on call.

EXECUTIVE COMMITTEE MEETING

The regular meeting of the Executive Committee of the Colorado School of Mines Alumni Association was held in the Alumni office, 734 Cooper Building, on Monday, March 20, 1950.

The meeting was called to order by President James Colasanti at 7:45 P. M.

The minutes of February 20 were read and approved.

Roll Call

Members present: James Colasanti, President; Robert W. Evans, Secretary; Carl I. Dismant. Committee chairmen: Addison B. Manning, Earl L. Durbin, Edwin F. White, Lynn W. Storm, Harry L. McNeill, Herbert Heckt. Frank C. Bowman, Executive Manager.

Members absent: A. George Setter, Vice-President; Malcolm E. Collier, Treasurer; Harvey Mathews, Robert J. McGlone. Committee chairmen: Roger M. Schade, Charles O. Parker, John W. Winchell.

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

Treasurer's Report

Mr. Bowman reported in Mr. Collier's absence. Dues and subscriptions are coming in very well this year. Financially, the Association is in good shape. For the first two months of 1950 the Association shows a net profit of $5319.14.

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

Alumni Endowment Committee

Mr. Bowman reported for Mr. Schade.

During February 1950, $84.50 was received in the Endowment Fund, leaving a cash balance as of February 28, 1950, of $2043.84.

The Placement Service had a balance of $1368.08 on February 1, 1950. Receipts during February amounted to $359.26; disbursements were $374.36, leaving a balance as of February 28, 1950 of $1352.98.

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

Athletic Committee

Mr. Manning reported receipts of $30.50 during February 1950, leaving a balance of $6130.32 as of February 28, 1950. Checking and Savings accounts amounted to $5607.32; outstanding loans amounted to $523.00 and of these $136.00 are delinquent. Letters have been written to the delinquents, however it is too soon to have replies.

The "M" Awards dinner will be held April 20, 1950, at the campus cafeteria. The meeting will be well publicized and it is hoped at least 40 alumni from Denver will attend.

The Athletic Council has voted the awards to be given at the dinner.

Mr. Manning reported the Athletic Council discussed the high cost per participant of minor sports as compared to the major sports. Available money may not be adequate to continue a full sports program. The student body is in favor of continuing minor sport activities even if major sports must be curtailed. A decision on the problem has not yet been reached. The major sports teams are operating on the minimum financial requirements now.

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

Capability Exchange

Mr. Durbin reported that the employers' lists and Active Men's list are being brought up-to-date before the listings are mailed out.

Placing all the Senior class of 1950 will be a little difficult, however the outlook is better than it was a few months ago.

More interest has been shown by the Alumni in the Placement Service. Records are being returned better and faster than has been done in the past.

During February there were 22 calls for men; 8 recommendations made; 2 placements reported; 735 letters mailed; 444 men are on the active list; and 57 calls for men remain unfilled.

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

Instruction Committee

Mr. McNeill reported that the committee had no formal report at this time, however they will start to function in the near future. He outlined the plan of procedure.

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

Budget & Finance Committee

No report.

Legislation Committee

No report.

Membership Committee

Mr. Bowman reported for Mr. Setter. Memberships are coming in very rapidly and are far ahead of previous years.

As of February 28, 1950, there were 194 Life members, 1002 Annual members, and 58 Associate members.

The committee will talk to the

(Continued on page 43)

Subsurface Geologic Methods

Mines Quarterly, compiled and edited by L. W. LeRoy, '33, associate professor of geology, received an unpredicted demand which resulted in a complete sellout of the first edition within six months. The book is being revised and will be available on or before June 1, 1950.

The specialized publication, containing detailed discussions of 43 separate methods used in subsurface geology, is being used in many colleges and universities throughout the United States and Canada. About 30 schools have already adopted the book as a text.

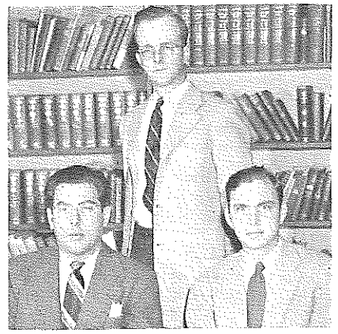
Tau Bates

have pledged two alumni in their spring class, Dr. Leslie W. LeRoy and Mr. Edward S. McGlone. These men were chosen on a basis of their attainments as alumni in the field of engineering.

LeRoy of the geology department, has been active in a number of professional and geologic societies and is a member of the American Association for the advancement of science. Prior to returning to Mines to teach, Dr. LeRoy served as chief micropaleontologist for Standard Oil of California in California, Venezuela, and the East Indies.

McGlone is a graduate of the School of Mines class of 1923. At the present time he is vice-president of Anaconda Copper company in Butte, Montana, and a member of the AIME, the American Mining Congress, and the Northwest Mining Association.

The national honorary engineering fraternity also included Mr. Alfred M. Staehle in the class of pledges. He is a graduate of the Carnegie Institute of Technology and at present is a vice president of McGraw-Hill Publishing company. He is a member of the AIME and the American Mining Congress and has won wide acclaim for work in the field of technical journalism. Mr. Staehle gave the principal address at last year's Engineers' Day at *Mines*.



▼ "Mines" Scholarship Winners, Left to right: Leo Borasio, John G. Smith, and Lawrence R. Wolf.

"Mines" Students Granted Scholarships

John G. Smith, standing, of St. Albans, Vermont, has been named to receive the Kennecott Copper corporation scholarship for 1949-50 at the *Colorado School of Mines*. This scholarship is for $750.

Leo Borasio, seated at left, of New York City, and Lawrence R. Wolff, seated at right, of Chicago, have been named to receive the American Smelting and Refining company scholarships of $500 each.

Two other *Mines* students, not pictured, also received the American Smelting and Refining company scholarships. These students are Louis L. Landers, Longmont, Colorado, and Roger R. Nelson, Golden, Colorado.

John G. Smith is a senior in mining engineering at the Colorado School of Mines and was selected for the Kennecott award on the basis of scholastic record and promise in the mining engineering field.

Leo Borasio, mining engineering senior, Lawrence Wolff, Louis Landers, and Roger Nelson, metallurgy seniors, were selected on a basis of scholastic record, personality, and promise of success in the fields of mining and metallurgical engineering.

All of the Mines students are members of the local A.I.M.E.

Albert M. Keenan, '35

Associate Professor of Mining Engineering at *Mines*, presented a paper entitled, "Coal Mining Curriculum Re-established at the Colorado School of Mines" to the Mineral Industry Education division of the American Institute of Mining and Metallurgical Engineers convention held in New York in February.

The paper constituted a report on the history of coal-mining education at *Mines* and the development of the new coal-mining option inaugurated last year.

Coming to Mines in 1948, Keenan organized and now heads the coal option of the mining department. A Mines graduate with wide experience in the coal fields of Pennsylvania and the German Ruhr, he was a consulting engineer to the U. S. government on mining equipment and machinery before coming to Mines.

Three reasons for the re-establishment of the coal option at Mines were given by Keenan: the increasing need for coal due to the recent depletion of all types of fuel reserves, the need for coal-generated electric power caused by the westward migration of American industry, and the present shortage of technically trained coal-mining men. He also pointed out the growing interest in the synthesis of liquid fuels from coal.

Mechanization and modernization of coal mines in the last 20 years, as well as growing emphasis on economics and labor relations in the industry, have increased the need for college-trained engineers, according to Keenan.

The new curriculum was designed with the help of various coal producers, particularly those in the Rocky Mountain area. A total of 208 credit hours are required for an engineer of mines degree in coal mining, of which 22 are field work, 25 are non-technical subjects, and 12 are elective.

A Series of Tests

designed for seniors by Professor George W. LeMaire, petroleum-refining department, and C. G. Nord-

(Continued on page 38)

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.

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.

A meeting was held in Casper, Wyoming, February 25, 1950, at which time petition was completed for submission to the Executive Committee of Mines Alumni Association for the issuance of a Charter to a newly organized section, to be known as the Central Wyoming Section.

Those in attendance who signed the charter were:

John J. Torpey, '41; Ben E. Terry, '33; Theo. J. Zagurski, '49; George N. Meade, '41; Robert E. McMinn, '49; Lynn D. Ervin, '40; John Brunel, '48; Herbert Schlundt, '43; Robert P. Shaw, Ex-'45; Ben R. Hudson, '45.

The following officers were unanimously elected:

President, Herbert Schlundt, '43.
Secretary-Treasurer, Lynn D. Ervin, '40.

It was decided to hold quarterly meetings on the first Saturday of March, June, September and December. Plans are being made to have the first meeting, June 3, 1950, a dinner dance.

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. Hockt, '36, Vice President; David Roberts, '40, Treasurer; William J. Holtman, '43, Secretary, 930 Downing St., Denver, Colo. Meetings upon call of Secretary.

EASTERN PENNSYLVANIA

Names of Officers and notice of Meetings to be announced later.

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.

The regular monthly meeting of the Houston Section of the C.S.M. Alumni Association was held at the Houston Club on Tuesday, March 7.

There were several visitors from the Class of 1949 who were in Houston in conjunction with the Shell Oil Company's training program. These '49ers were Fred Elton, John Tuttle, Jim Pittinger, Ervin Philpy and Richard Arnold. William E. Laspe, '44, with Ohio Oil Co., has moved to Houston and attended the meeting for the first time.

The regular members present were:

Irwin M. Glasser, '43; James L. Ballard, '25; Carl F. Beilharz, '25; Vernon Redding, '40; Stanley A. Wickstrom, '38; Richard M. Darling, '41; Raymond A. Kerr, '36; Donald I. Gahagan, '27; M. L. Gilbreath, '33; K. Pat Hurley, '22; Myron C. Kiess, '25; George W. King, '42; W. G. Noonan, Jr., Ex-'40; Fred M. Nelson, '25; Albert G. Wolf, '07; L. E. Wichmann, '21; T. J. Barbour, '47; Kenneth R. Bowie, '30; Howard K. Schmuck, '40; Lisle R. Van Burgh, '17; W. B. Barbour, '37; Samuel C. Sandusky, '48.

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, 854 W. Silver, Butte, Montana. Meetings upon call of Secretary.

NEW YORK

Russell J. Parker, '19, Rupert B. Lowe, '22, Co-Chairmen; 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, Secty.-Treas. (Ft. Worth) 506 Neil P. Anderson Bldg., Fort Worth, Texas, Telephone: 3-3058; Henry Rogatz, '26, Secty-Treas. (Dallas) 407 Southland Life Bldg., Dallas, Texas, Telephone: Riverside 4846. Four meetings during year, second Monday of month, February, May, September and November.

Where—Red Bryan's—Dallas
When—Monday, February 13, 1950
What—Winter Quarterly Meeting

Amid flaming chafing dishes containing succulent ribs at Red Bryan's Barbecue, Dallas, some fifteen Miners from the North Central Texas area met Monday, February 13, 1950 for the scheduled Winter Meeting to elect officers for the coming year.

By a unanimous vote the following officers were re-elected:

President, E. J. Brook, '23.
Vice President, J. W. Peters, '38.
Secretary-Treasurer, H. D. Thornton, '40 (Fort Worth).
Secretary-Treasurer, Henry Rogatz, '26 (Dallas).

Following the business meeting, Ted Nelson and Ed Brook brought the Miners present up-to-date on recent school activities, particularly the resignation of Dr. Ben Parker.

Ted Nelson, as Program Chairman, then posed the question: "Should Mines place more emphasis on graduate study?" This controversial question started a round table discussion of much interest. The concensus was, that the need is great and that the national education trend is toward more graduate study. It was believed by those in attendance, that the present excellent four year course in practical engineering should not be neglected or weakened, but that study should be given to enlarging the opportunities for graduate work. This can best be accomplished by encouraging and attempting by concentrated effort to obtain more fellowships from industry.

Those attending were:

E. J. Brook, '23; J. M. Prentiss, '21; R. R. Stootsberry, '33; Henry Rogatz, '26; Jack W. Peters, '38; Ralph S. Powell, '21; Leonard B. Lipson, Ex-'40; Ken Nickerson, '48; J. D. Perryman, '35; R. E. Roark, Guest; H. D. Thornton, '40; K. W. Carlson, '42; T. W. Nelson, '34; Jim Morris, '38.

OKLAHOMA

Neil Whitmore, '29, President; George W. Reed, '35, Vice-President; Carl R. Holmgren, '38, Sec'y-Treas., 2612 East 13th St., Tulsa, Oklahoma. Luncheon meetings each and every Tuesday noon in the Hotel Tulsa Coffee Shop. Always glad to have fellow Miners when in Tulsa.

OKLAHOMA CITY

J. S. "Monty" Montgomery, '31, President; H. M. "Hugh" Rackets, '42, Vice President; M. O. "Shorty" Hegglund, '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

William H. Sparr, '39, President; George G. Yeager, '40, Secretary, 3229 Circle Drive, Pittsburgh 27, Pa. Meetings upon call of officers.

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 each Quarter at Los Angeles Athletic Club, 431 West Seventh Street, Los Angeles, 6:30 P.M. Next meeting dates, April 10, July10, October 9, 1950, and Jan. 8, 1951. Phone Secretary for reservation.

ST. LOUIS

James E. O'Keefe, '37, President; Floyd M. Belleau, '23, Secretary-Treasurer, 955 Tuxedo Blvd., Webster Groves, Mo.

UTAH

H. J. Vander Veer, '30, President; Wallace W. Agey, '39, Secretary-Treasurer, 852 So. 19th East St., Salt Lake City 5, 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.

One of our most successful meetings was held on 23 February, 1950, at the Continental Hotel. Breaking a long standing tradition of our meetings being strictly stag affairs, we opened this one to our wives and friends and had a very enjoyable evening.

After refreshments to get us in a mellow mood and a dinner, we heard an interesting talk, illustrated by colored slides, by Mr. Evan Haynes of the National Park Service. His topic was "Enjoying Washington Out of Doors." Mr. Haynes was introduced by Warren Adams. At the conclusion of the talk, a short business meeting was held. Pi Warren, our president, had asked the secretary to inform the gang that his work was such that he would not be in town very much and, therefore, requested that he be replaced by another member of the section as president. The secretary and vice president had also been in office for some time so our election was held. The following officers were elected:

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

Fritz Brennecke, our coach at Mines, was kind enough to send us pictures of the Colorado College-Mines game and they were thoroughly enjoyed. It was decided that our next meeting be held in conjunction with Cal. Tech. and that J. Boyd would make the arrangements. The evening was apparently a success as the ladies asked that they be included at some of our future meetings.

Those present were:

George W. Leslie, '35; Mr. and Mrs. Frank E. Johnson, '22; Colonel P. S. Moses, '14; Mrs. Reid P. Webster; Dr. and Mrs. James Boyd, '32 & '34; M. G. Geiger, '37; Mr. and Mrs. D. D. Kerstetter, '39; Hugh A. Stewart, '12; Mr. and Mrs. Warren Adams, '25; Mr. and Mrs. P. A. Jennings, '34; Gerald V. Atkinson, '48; Fred W. Johnson, Jr.; A. H. Brookes, '36; S. A. Gustavson, '32; John Croston; Mr. and Mrs. John Poulin, '21; Mr. and Mrs. Joe McBrian, '23; Mr. and Mrs. Fred B. Hyder, '03; Col. and Mrs. E. M. J. Alenius, '23; Robert J. Black, '49; M. H. Levy, '47; Lt. F. L. Doty, '43; Leroy Otis, '14; Robert A. Long; Jean Gustavson; and the guest speaker, Evan A. Haynes.

CATALOGS AND TRADE PUBLICATIONS

(Continued from page 31)

(5461) **"NICKEL TOPICS,"** February 1950, by the International Nickel Co., Inc., 67 Wall St., New York 5, N. Y. Twelve pages describing and illustrating interesting applications of nickel and nickel-alloys. Featured in this issue is a description of the use of nickel-chromium-molybdenum steel in the bodies of "Kennametal" tungsten carbide rock bits. Also included with this issue is a folder giving technical data on the Type 4300 Series nickel-chromium-molybdenum steels.

(5462) **"ON TOUR,"** February 1950, by the Union Oil Co., 617 W. 7th St., Los Angeles 14, Calif. A 24 page employee magazine. This issue contains a very interesting illustrated article on the California smog (smoke & fog) problem. Other articles on a new employee benefit plan, well pulling operations and others.

(5463) **"ACI NEWS LETTER,"** January 1950. Journal of the American Concrete Institute, New Center Bldg., Detroit 2, Mich. Thirty pages of illustrated articles and items concerning the concrete industry. Featured in this issue is a program preview of the 46th Annual ACI Convention held on February 20-22 in Chicago.

(5464) **"THE LOUIS ALLIS MESSENGER,"** January-February 1950. A beautifully made-up magazine containing fine color photographs and other types of art work with poetry and epigrams interspersed with ads concerning electric motors.

(5465) **"STORAGE BATTERY POWER,"** February 1950, by Thomas A. Edison, Inc., West Orange, N. J. A 16 page magazine describing and illustrating various applications of storage battery power in industry. Included as an insert with this issue is a folder covering a speech by George E. Stringfellow entitled, "The Creeping Shadow of Socialism."

(5466) **OFFICE SUPPLIES,** "Kistler's Tele-Shopper" by W. H. Kistler Stationery Co., 1636 Champa St., Denver, Colo. An illustrated folder catalog listing (with prices) numerous articles of office supply including staples, mimeographs, furniture, typist's supplies and others.

(5467) **"H & B BULLETIN,"** January-February, 1950 by Hendrie & Bolthoff Co., P. O. Box 5110, Terminal Annex, Denver 17, Colo. Thirty-two pages describing and illustrating numerous products sold by H. and B. covers all kinds of industrial equipment and supplies.

(5468) **TARIFFS,** "Topics," February 1950, by the American Tariff League, 19 West 44th St., New York 18, N. Y. Four page newsletter containing information on U. S. tariffs and trade. Lead article in this issue entitled "U. S. Trade Policy Viewed as Tariff-Juggling."

(5469) **"PAY DIRT,"** February 17, 1950, by the Arizona Small Mine Operators Assn., 528 Title and Trust Bldg., Phoenix, Ariz. 16 pages of articles and items of interest to the Arizona mining industry. Featured article in this issue concerns the six point tax incentive plan proposed by the National Minerals Advisory Council.

(5470) **DRILLING MUD,** "Baroid News Bulletin," February 1950. Thirty-six page magazine by Baroid Sales Division, National Lead Co., Los Angeles 54, Calif. Contains illustrated articles and items of interest to employees and drilling mud users. This issue contains articles on drilling mud delivery, box cars and coffee making.

(5471) **WATER COOLING TOWERS,** Bulletin WLH-801 by the Water Cooling Equipment Co., New Hampshire Avenue and Weber Rd., St. Louis 28, Mo. Four pages describing and illustrating the series WLH Low Head cooling towers. Gives complete details on construction, capacities and physical data.

(5472) **SHAKER CONVEYORS,** Bulletin No. 120 by La-Del Division, Joy Mfg. Co., New Philadelphia, Ohio. Describes and illustrates Models U-12½, UL-12½, U-17, and UL-17 shaker drives and various other pieces of conveyor equipment. Photographs show the units in operation in the mine. Charts show various plans for using conveyors in different mine layouts.

(5473) **CRANE CLAMSHELL DRAGLINE,** Specifications No. 4848 by The Osgood Co., Marion, Ohio. Describes and illustrates the Model 727 crane clamshell dragline unit giving complete specifications including working ranges, capacities, speeds and dimensions.

(5474) **ELECTRONIC SPEED VARIATOR,** Bulletin GEA-5386 by General Electric Co., Schenectady, N. Y. Describes and illustrates this speed variator which is an adjustable voltage system combined with the latest advances in electronic regulating circuits. Gives construction features uses and technical data.

(Continued on page 36)

IN MEMORIAM

William A. Wasley

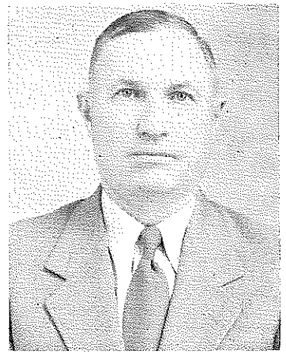
passed away at Cananea, Sonora, Mexico, February 7, 1950, coronary thrombosis being the cause.

Mr. Wasley had been in Cananea for the past six years as superintendent of the 12,000-ton open pit operations concentrator of The Cananea Consolidated Copper Company.

Prior to that service he was associated with Cia. Minera Santa Maria del Oro, S. A., in the state of Durango, Mexico, first as metallurgist and mill superintendent, then general superintendent, and later assistant general manager. He had also been with the Mexican Candelaria Company, The Fresnillo Company and The Tigre Mining Company in the capacity of general mill superintendent, metallurgical superintendent, surface superintendent, and manager.

A native of Platteville, Colorado, Mr. Wasley received his elementary education in Greeley, Colorado, and upon graduating from high school there, he entered *Mines* and received degree of metallurgical engineer in 1909. From then until he went to Mexico four years later, he gained experience as mill operator in the Utah Copper concentrator and at the Miami Copper Company in Arizona.

He is survived by his wife, the former Florence Eleanor Noll of Denver, to whom he was married in November 1913; two sons, William A. of Tucson, Arizona, and John S., of New



WILLIAM A. WASLEY, '09

York City; a daughter, Mrs. Wayne M. Canney of Memphis, Tenn.; and a sister, Mrs. Vera Wasley Scott of Long Beach, California.

Mr. Wasley was a member of the American Institute of Mining and Metallurgical Engineers and, while at *Mines* was affiliated with the Beta Theta Pi fraternity.

Frederick Thomas Bryan

died of a heart attack at his home in South Pasadena, California, on February 14.

He was a member of the class of 1911 at *Mines* but upon completing his sophomore year found it necessary to leave school and seek employment.

For a while he was engaged as a life insurance salesman and then becoming interested in the produce business, he operated his own firm in Denver until 1935 when he moved to Phoenix, Arizona, continuing his produce business there until 1948 when he went to California.

Mr. Bryan was married in 1916 in Denver and is survived by his wife, a daughter, Mrs. Fred Elder of Phoenix, and a brother, Russell R. Bryan, Mines '08, of Pachuca, Hidalgo, Mexico.

Mrs. Madeline Doolittle

wife of T. C. Doolittle, former registrar at *Mines,* passed away in Sacramento, California, on March 4, after a five-year illness of a rare disease, progressive muscular atrophy sclerosis. Mr. Doolittle resigned his position at *Mines* when she was stricken to take her to California and since then he had given her every attention possible.

In addition to Mr. Doolittle, she is survived by a daughter, Mrs. Katherine Labhard of Sacramento, and a son, Leonard, Mines '29.

GOLD MINER AND PUBLIC RELATIONS

(Continued from page 25)

on that platform and defend their positions. They did so at the hearings in Washington. They did so through their distinguished spokesman, Allen Sproul, in San Francisco. And, insofar as we, through our modest efforts have forced these fellows to get up and state their positions, we have achieved something that is distinctly constructive, not only in our cause but in promoting the welfare of the people of the United States.

What shall our future course be? I would like to urge that in developing this problem of gold and currency, we emphasize over and over again the interests which our fellow citizens have in gold as a currency base. As I have indicated to you in my discussion of the relationship between gold and prices in that century period which I used for an example, we have a good case. We have a good case on narrow industry grounds. But if we are going to get to first base in persuading the American public to bring pressure to bear on their representatives to do the right thing on currency and on gold, we will have to appeal to the interests of that public. We will have to appeal to the interests of that public by pointing out how important it is for them to have honest money—based on gold in order to protect the integrity, the purchasing power integrity, of the savings that they have accumulated in life insurance companies, in savings banks, in the form of pensions. There you are touching upon the self interests of every citizen outside the gold mining field.

Beyond that, you can point to the great political danger—the great political danger that rises when a government no longer collects from its citizens the taxes necessary to meet its current costs. When a government fails to do that, fails to raise the revenue necessary to pay its bills, or when a government is so extravagant that it always spends more than it can collect in the form of taxes, even in the most prosperous of years—then that government is slipping down the slope to dictatorship. The mere fact that this year it amounts to only 5 billion dollars mustn't blind us to the possibility that next year it might be 20 billion and that the year after that it might be 100 billion. All we have to do, ladies and gentlemen, is to look at China, and if we don't want to take an example quite as extreme as that look at France. We get no comfort from either direction.

CATALOGS AND TRADE PUBLICATIONS

(Continued from page 35)

(5475) BAROID DISTRIBUTORS by Baroid Sales Division, National Lead Co., Los Angeles 12, Calif. A complete listing of Baroid distributors and sub-distributors for the United States and Canada. Also includes a list of Baroid field engineers.

(5476) "NICKELSWORTH," Volume XVI, Number 2, by The International Nickel Co., Inc., 67 Wall St., New York 5, N. Y. An 8 page magazine containing illustrated items concerning unusual applications of nickel and nickel-alloys in industry. Some items described are roof gutters, flare tips and welding rods.

(5477) "POPULAR HOME," Early Spring 1950, by United States Gypsum, 300 W. Adams St., Chicago 6, Ill. A 16 page illustrated magazine containing renovating and redecorating ideas and other articles and items of interest to home owners and home buyers. This issue contains an interesting article entitled "How to Arrange for Money to Build."

(5478) "LIME KILNS IN CANADA," by Department of Mines and Resources; Mines, Forests and Scientific Services Branch; Canadian Bureau of Mines, Ottawa, Canada. A complete list of Canadian lime kiln installations giving operator's name, address, location, product used, number of kilns, fuel used, rated daily capacity, product made and name of manager.

Book Reviews

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

Minerals Yearbook 1947

Prepared under the direction of E. W. Pehrson, Chief, Economics and Statistics Division, United States Department of the Interior. Allan F. Matthews, Editor. 1616 pages. For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. $4.25.

No one will be disappointed with the long awaited 1947 Minerals Yearbook, just off the Government Printing Office presses. This fine volume through the medium of facts, thousands of facts, presents a picture of the mighty American minerals industries in 1947, a near-record year for production.

It is a satisfying thing to leaf through this excellently prepared publication and see the tremendous scope and variety of American mineral resources and production. From diamonds to drilling mud—the list is long and impressive.

But *facts* are the forte of this book and, as a clear presentation of the facts of the minerals industries, its value is incalculable. There are sections on production in general; employment and injuries in the mineral industries; the metallurgic industry and many others. Minerals are considered individually in alphabetized chapters and not the least interesting is the extensive section devoted to uranium, radium and thorium.

To round out the picture, Part IV of the Yearbook provides a review, by countries, of the minerals industries of Middle and South America.

For facts unlimited, presented in a logical, intelligent fashion, the Minerals Yearbook for 1947 is the answer.

Petroleum Engineering

Volume 45, Number 3B of the Quarterly of the *Colorado School of Mines* by the Department of Publications, Colorado School of Mines, Golden, Colorado. 51 pages. $ .50.

This issue of the Quarterly of the *Colorado School of Mines* is a number of the 75th Anniversary Volume entitled "Mineral Resources in World Affairs," which will make available all of the papers presented and much of the discussion at the conferences on the occasion of the 75th Anniversary of the school.

The current issue of the Quarterly contains the papers delivered at the Conference on Petroleum Engineering Sept. 30 and Oct. 1, 1949. Included are "Gas - Condensate Fields" by William Emmett Brown, chief engineer, Mid-States Oil Corp., Tulsa, Oklahoma; "The Valuation of Oil Properties for Secondary Recovery" by R. C. Earlougher, consulting engineer and owner, Earlougher Engineering, Tulsa, Oklahoma; "Secondary Recovery of Petroleum" by Paul D. Torrey, president, Lynes, Inc., Houston, Texas; "Petroleum Conservation and Conservation Laws" by D. V. Carter, chief petroleum engineer, Magnolia Petroleum Co., Dallas, Texas.

The high standard of excellence which was maintained in the papers presented at the 75th Anniversary Celebration makes this and all the other numbers of the 75th Anniversary Volume "must" reading for anyone concerned with the minerals industries.

How I Raised Myself from Failure To Success in Selling

By Frank Bettger. Prentice-Hall, Inc., New York 11, N. Y. 1949. 276 pages. $3.95.

The story of Frank Bettger's rise from adject, hopeless failure in selling to his position as one of the greatest producers in the sales field is a story that deserves the attention of every ambitious, intelligent reader regardless of his position or occupation. The secrets of salesmanship which the author reveals in this book are applicable in almost any enterprise.

Bettger begins the story with an account of his discovery, while still a baseball player, of the first of many personality aids which he later applied so successfully to selling. He tells how the determination to *become enthusiastic by forcing himself to act enthusiastic* improved his game and his income practically overnight.

A few years later, as a result of an injury, Bettger found himself an ex-baseball player, selling insurance. A year of dull, plodding work and it became evident that, as a salesman, he was a complete washout. But a chance discovery of some near-magical sales secrets put Bettger back on the road to success. The rest of the story describes these secrets in detail; how they work, why they work, what they did for the author and what they can do for anyone who applies them earnestly.

A man who was able to put to work a few simple selling rules and make a $250,000 sale in 15 minutes is worth listening to and Bettger states his case with a verve and enthusiasm which, in themselves, are object lessons to the discerning reader.

For the salesman whose sales record chart is showing a plateau rather than a sharp upward grade; for *anyone* who is looking for a simple but effective pattern of success, this well written, sincere book has a great deal to offer and might well mean the difference between success and failure to the conscientious reader.

Geology and Mineral Deposits of an Area North of San Francisco Bay, California

Bulletin 149. State of California, Department of Natural Resources, Division of Mines, Ferry Building, San Francisco, California. September 1949. 135 pages, 24 illustrations.

This excellent work is the result of a survey covering approximately 2,215 square miles immediately north of San Francisco Bay and involving nine standard topographic quadrangles, namely, the Vacaville, Antioch, Mount Vaca, Carquinez, Mare Island, Sonoma, Santa Rosa, Petaluma and Point Reys. The survey comprises part of six counties: Contra Costa, Napa, Sonoma, Marin, Solano and Yolo.

The importance of this particular survey, which is one of a series being published by the California Division of Mines, is heightened by the proximity of the district described to the industrial and market areas in the San Francisco Bay region.

The textual material in the bulletin is divided into sections on descriptive geology, structure, geologic history and economic geology and includes an extensive bibliography.

Among those minerals described in the Bulletin are asbestos, clay, coal, diatomaceous earth, gold and silver, graphite, limestone, magnesite, manganese, mineral water, oil and gas, perlite, pumice, quicksilver, crushed rock, building stone, travertine and other structural materials.

Particularly fine are the twenty large maps in color enclosed in a separate map pocket as a part of the Bulletin. There are economic and geologic maps of each of the nine quadrangles, geologic sections across the area north of San Francisco Bay and a generalized stratigraphic section of the sedimentary rocks in the Coast Ranges of California located in the same area.

Considering it either on its own merits or as a part of a series, this fine Bulletin is a very valuable addition to basic geologic knowledge.

Coal and Metal Mining

Volume 45, Number 2B, the Quarterly of the *Colorado School of Mines.* By the Department of Publications, *Colorado School of Mines,* Golden, Colorado. April 1950. 381 pages. Illustrated. $3.00.

Volume 45, the 75th Anniversary Volume of the C. S. M. Quarterly, provides complete coverage of the technical papers and addresses presented during *"Mines"* 75th Anniversary celebration and, in so doing, becomes a repository for a broad and varied collection of information on all phases of the mineral industries.

A case in point is the book at hand; profusely illustrated with photographs, tables, graphs and charts, it covers the papers given during the conference on coal and metal mining, Sept. 30 and Oct. 1, 1949. Included among the fifteen lengthy papers given were: "Mechanization of Western Coal Mines" by James Cassano; "Synthetic Oil from Coal" by Joseph D. Doherty; "Seventy-five Years of Rock Drill Progress" by M. L. McCormack; and "Mining Practice at the Climax Molybdenum Mine" by W. K. McGlothlin.

These and the other papers given at the coal and metal mining conference provide an overall picture of mining both as to its development and present techniques. As presented in this issue of the *"Mines"* Quarterly, they make a unique and highly useful publication.

California Journal of Mines and Geology

January 1950. State of California, Department of Natural Resources, Division of Mines, Ferry Building, San Francisco, California. 8 plates, 14 maps (In Pocket), 184 pages. Free on request.

The current issue of the California Journal of Mines and Geology contains seven fine articles concerning the mineral resources of the state. In the order of their appearance they are: "Submarine Phosphorite Deposits off California and Mexico;" "Geology Along the Electra and West Point Tunnels, Amador County, California;" "Geology and Tungsten Deposits of the Tungsten Hills, Inyo County, California;" "Perlite Deposits in Sonoma County, California;" "Mines and Mineral Resources of Sonoma County, California;" and "Annual Report of the State Mineralogist, Chief of the Division of Mines for the One Hundredth Fiscal Year."

This excellent collection of articles is profusely illustrated with photographs and

charts and very fine maps, some as large as 27" x 38" which are carried in a pocket on the back cover of the book.

Perhaps the most interesting article in this issue is the first one which describes and discusses the phosphorite deposits on the sea floor off the California coast. These deposits apparently provide an almost unlimited supply of this very useful mineral and, though the present state of our land reserves of phosphates make its utilization unnecessary, this undersea supply presents the interesting possibility of miners someday wearing oilskins and "souwesters" instead of hard hats and hard toed shoes; using dredges instead of power shovels and mining machines; and transporting their ore in barges instead of ore cars.

The Minnesota Geologist

Official Bulletin of the Geological Society of Minnesota, First Quarter. 10 pages. Free to members.

This little publication, though not pretentious in appearance, always manages to present one or two articles of real interest in every issue.

In addition to the announcements and notices which are of particular interest to Society members, this issue contains an article simply entitled "Time," written by Dr. Edward H. Mandel. This short piece is carefully thought out and beautifully written, the kind of thing one would expect to find in a nationally known magazine of the "slick paper" variety.

Another very interesting feature in this issue is the conclusion of a three-part article entitled, "The Search for Uranium." With the accent on facts, this article, which offers prospecting advice as well as information on the location of deposits, is both timely and valuable.

"The Minnesota Geologist," without fanfare or fancy format, remains one of the finest geological society publications in the field.

The Interstate Oil Compact Quarterly Bulletin

December 1949. 100 pages. Free on request.

This issue of the Interstate Oil Compact Bulletin is particularly valuable in that it contains a complete coverage of the Compact's Annual Winter Meeting held in New Orleans, La. Always an important meeting, this year's Winter Meeting was especially fine and provided an opportunity for the presentation of many excellent technical papers and reports. The Bulletin carries these papers and reports in their entirety along with speeches by Governor Earl Long of Louisiana, Governor Allen Shivers of Texas, Governor John Bonner of Montana and Governor Frank Carlson of Kansas. Governor Carlson's speech on "Free Enterprise Versus Socialism" was one of the high points of the Meeting.

Among the papers presented were: "Oil Recovery Research in the Oil-Producing States" by Dr. George H. Fancher, '30, and "Offshore Operations" by A. L. Vitter, Jr.

The main theme of the meeting was: "Pressure Maintenance and Recycling Increase Recovery and Prevent Waste" and the many state reports considered this subject from every angle.

The very fine coverage of this important meeting makes the current issue of the Interstate Oil Compact Bulletin particularly valuable and anyone who wants to know what is going on in the legislative, political and technical phases of the oil industry will want to get a copy.

TECHNICAL SOCIETIES and ASSOCIATIONS MEETINGS

PROGRAM FOR AMC COAL CONVENTION ANNOUNCED

Some 1500 to 2000 coal mining men and allied equipment manufacturers are planning to attend a three-day Coal Convention of the American Mining Congress at Cincinnati, Ohio, April 24-26.

The coal industry at this meeting will consider such important subjects as improved public relations, educational programs to develop supervisory personnel, mine safety with particular emphasis on reduction of mine accidents, pension plans for coal company employes, improved methods of preparing coal for the market, mine roof bolting, problems of coal stripping, mine haulage and power use, and operations with continuous mining machines.

The convention will open on Monday, April 24, with three sessions scheduled for that day. The first, held in the morning, will be devoted to improved public relations and educational programs to develop supervisors. A. C. Spurr, president, Monongahela Power Co., Fairmont, W. Va. will address this session on the subject of public relations, with particular emphasis as to how a better understanding of coal's problems can be developed in local communities, coal fields and in markets. Other speakers will discuss the efforts being made through cooperation of industry and educational institutions in training men for supervisory positions in coal mining. In the afternoon, two sessions will be held, one a symposium on mine roof bolting and the other devoted to strip mining problems.

Five convention sessions will be held on Tuesday, April 25, devoted to discussion of practices of drying and dewatering fine coal, methods to reduce mine accidents, power and haulage for underground mines, time studies to improve operating efficiency, equipment maintenance, and problems of strip mining including use of high voltages for large equipment, wheel excavators for removing overburden, and cost reduction in open pit mining.

The importance with which safety is regarded by the industry is shown by the fact that one entire session on the morning of April 25 will be devoted to considering ways of reducing coal mine accidents.

Three sessions will be held on Wednesday, April 26, devoted to pension plans, coal preparation, and continuous mining.

The session on continuous mining will be of real interest since this method of mining appears to have significant importance to the future of the coal industry.

Participating in the aforementioned technical sessions will be more than half a hundred speakers from the largest industrial organizations in the minerals industries and from the nation's more important educational and research institutions.

I.O.C.C., PLANNING SPRING MEETING

Committees of the Interstate Oil Compact Commission are planning excellent discussions for the Compact's spring quarterly meeting in the Buena Vista Hotel, Biloxi, Miss., May 4-6, it has been announced by Earl Foster, Executive Secretary of the Commission. Governor Fielding L. Wright of Mississippi will deliver the welcoming address at the meeting, and, in keeping with the theme of the meeting, will speak on conservation in Mississippi and its benefits to the people of that state.

The Legal Committee of the Compact Commission has as a project for this meeting a study of the conservation activities in the states during 1949, and will consider the form of oil and gas conservation statute which was presented to the Commission last summer.

The Secondary Recovery Advisory Committee will hear reports from committees which have been formed in several of the member states to study secondary recovery reserves within their respective states. The Stripper Well Committee will consider bringing up to date, as of Jan. 1, 1950, its survey of stripper wells and reserves.

The proposed book of engineering principles will be presented by the Engineering Committee in final form.

A study of pressure base upon which gas is reported in the various member states of the Compact will be presented by the Regulatory Practices Committee, and a study of well spacing and the controlling factors will be reported by the Research and Coordinating Committee by state.

MINES TODAY

(Continued from page 33)

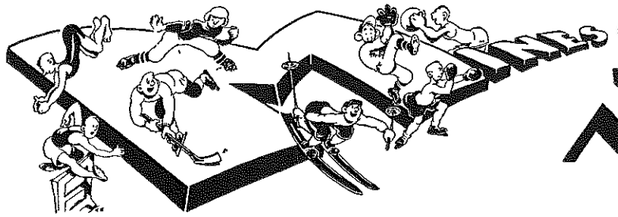
quist and D. D. Flanders, economics department, will aid in proper job placement for this year's graduates at *Mines*. The quizzes will reveal not only what the student wants to do but also what he is qualified to do. Professor LeMaire has said that this will be the first year for this type of counseling at the school.

Bids for Contracts

for the new chemistry building at *Mines* will be in some time this month as announced by Dr. Leon Ward, head of the chemistry department. The contracts will call for the main construction of the building, including plumbing, heating, and electrical fixtures.

After the board of trustees has voted on the bids, construction is expected to begin within thirty to sixty days. The building which will cost approximately $1,250,000, will be erected next to the physics building, and the architects have estimated that it will be completed in about two years.

The board of trustees has officially accepted the name of Coolbaugh Hall for the building.



Sports MARCH

By
BILL ANDERSON

Mermen Set Two Records, Place Third in RMC Meet

Two RMC swimming records were broken Saturday, March 11, by Mines in the conference swimming meet held at Greeley. In the preliminaries, held Saturday morning, Mines qualified only seven men, while Colorado college had ten and Colorado State had eighteen. In spite of this, the Oredigger splashers took three firsts and led in points for over half the meet.

Qualifying for Mines were: Wiswell, backstroke; Connelly, freestyle; Ogg, freestyle; Naugle, freestyle; Head, freestyle; MacGregor, diving; Tarbox, diving; Frost and Meyer, relays. Captain Howard Wiswell broke the RMC record set by him last year in the 150 yard backstroke, while the 150 yard medley relay team also set a new record. This team consisted of Wiswell, Meyer, and Connelly.

Outstanding swimmer of the day was Dean Fair of Colorado State, who broke two of his own records in the 220 and 440 yard events.

This conference meet winds up the swimming season this year, and leaves Mines mermen with plenty of determination and high hopes for next year's RMC title. The only man on the team graduating will be Art Meyer, and several new freshmen hope to replace his loss.

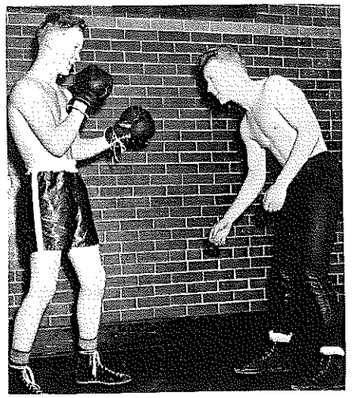
Ski Team Ends Season

The Mines Ski Team placed sixth out of eight entries beating out Colorado College and Colorado A and M in the Intercollegiate Ski Meet at Western State on Feb. 26.

A full team of five men was entered for the Blasters. The outstanding skier in this meet was Team Captain Tyler Brinker.

In the Regional Championships of the Rocky Mountain Region, Mines placed seventh finishing ahead of Aggies, Colorado College, and the University of Arizona. Tyler Brinker and Carl Bidinger were Mines chief threats in this meet.

Coach R. T. Phelps once more devoted his time to the ski team and



▼ Mines' Fighting Twins: Bob Wilson, Boxer and Dave Wilson, Wrestler.

notes that the interest in skiing at Mines is on the up-grade as it is in other schools in this region. The ten teams in the Rocky Mountain Intercollegiate Ski Association are unique in that they comprise members of three different athletic conferences.

Team members for Mines Ski Team during the past season were Tyler Brinker, Carl Bidinger, E. E. Howard, Dave Jonson, Jim Paden, and Paul Swanson.

Wrestlers Take Second in RMC Championship

The Colorado State Bears won the Rocky Mountain Conference Wrestling Meet in Steinhauer Field House on March 4, taking seven of eight division titles. The Orediggers finished second with 4 seconds, 1 third, and 3 fourths.

Wrestling in the 136 pound class, Ray Govett of Mines lost a close decision to Fleiger of Colorado State after being ahead on points until the last minute of action. John Servatius of Mines won the shortest match of the evening in the consolation bracket by pinning Tremper of Western State in 48 seconds.

The final tally was Colorado State 47, Mines 25, Montana State 18, Western State 18, and Colorado College 4.

Championship Results:

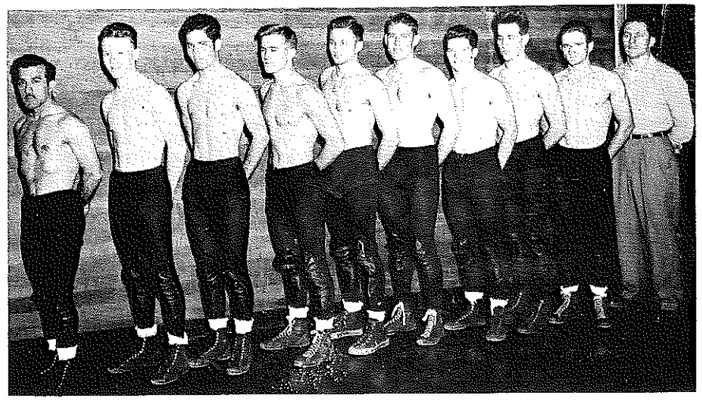
121—Oglesby, WS, dec. Diker, Mines.
128—Knaub, CS, dec. Wilson, Mines.
136—Flieger, CS, dec. Govett, Mines.
145—Schmoker, CS, decisioned Brewster, MS.
155—Govoni, CS, decisioned Jackson, MS.
165—Spence, CS, pinned Coombs, Mines.
175—Rusk, CS, dec. Berg, MS.
Heavyweight—Priest, CS, dec. Blagg, CC.

Denver University defeated Mines in a dual meet at DU on February 23 by the score of 25 to 5. Dave Wilson of Mines pinned Garcia of DU in 4:04 for the Orediggers lone win.

The season's dual meet record showed three wins and six losses. There were no seniors on this year's wrestling team which was predominantly sophomore.

Oredigger Sluggers Finish Undefeated

The Colorado School of Mines



▼ Mines Wrestling Team (2nd Place in R.M.C.) Left to right: Salahi Diker, Dave Wilson, Ray Govett, John Servatius, Gene Hudson, Vernon Coombs, Lloyd Best, Gerald Jeffries, Gene Darnell, and Coach Bowen.

stellar boxing team concluded a brilliant undefeated season by pounding their way to a 4 to 2 victory over the Camp Carson leather pushers on February 24, 1950. The season's record was 8 wins and no defeats against tough Army base competition.

Bob Wilson showed the partisan crowd in the Steinhauer Fieldhouse why he is undefeated in two seasons by boxing his way to a clear-cut decision over Junior Peeweewardy, Carson's vicious Indian Slugger. Peeweewardy was a runner up in the recent News Elks tournament in Denver but could not keep Wilson's left hand out of his face long enough to land his own vaunted right.

In the other outstanding bout of the evening, John Rademacher and Terrell Parton battled to a draw. Rademacher clearly was the aggressor for the first two rounds as he jabbed Parton silly with a stiff left hand. In the third round Parton landed several upper cuts which seemed to stun the Mines boxer and slow up his furious two-fisted attack.

Stu Chuber and Joe Troyan fought to a draw. Though Troyan landed numerous wicked left hooks, Chuber was the aggressor as he pounded his opponent from one corner of the ring to another.

Results:

Bob Wilson (143), Mines dec. Junior Peeweewardy (143)
John Brickner (169), Mines dec. Harold Murray (171)
Dick Martin won by forfeit over Jim Policastro
Stu Chuber (139), Mines drew with Joe Troyan
John Rademacher (148), Mines drew with Terrell Parton
Jim Parks (157), Carson dec. Bill Watts (163)

The boxing squad with each man's individual record for 1949-50 is as follows:

John Keogh 112 Won 2 Lost 1
Tom Riley 137 Won 3 Lost 1
Bob Turley 139 Won 4 Lost 0 (1 TKO)
Bob Wilson 143 Won 5 Lost 0 (2 TKO's) (1KO)
Stu Chuber 145 Won 3 Drew 1 (2 TKO)
Lynn Brown 145 Won 2 Drew 1 (1KO)
John Rademacher 145 Won 5 Drew 1 (1 TKO)
Dick Martin 145 Won 3 Lost 1
Ron Lestina 150 Won 4 Lost 3 (1 TKO)
Bill Watts 171 Won 4 Lost 1 (1 TKO) (2 KO)
John Brickner 175 Won 2 Lost 1 (1 KO)
Bill Johnston 187 Won 4 Lost 0 (2 KO)

▼Mines Undefeated Boxing Team, 1949-1950 Left to Right: Bill Johnston, John Brickner, "Kelley" Bolender, Ron Lestina, John Rademacher, Bill Watts, Lynn Brown, Coach Brennecke, Bob Wilson, Dick Martin, John Keogh, Stu Chuber, Tom Riley, and Tom Ellis.

Final Basketball Statistics

	G	FG	FTA	FT	AVG	PF	TP
Johnson	23	109	139	53	40.8	45	271
Waterman, D.	25	90	70	36	51.5	71	216
Kerns	22	71	115	58	50.5	78	216
Landers	22	53	46	28	60.9	39	134
Earl	19	49	11	7	63.9	46	105
Noll	24	29	32	18	56.3	50	76
Waterman, H.	21	21	42	31	73.9	52	73
Ault	21	25	45	17	37.8	23	67
Ruehle	20	24	17	10	58.8	28	58
Einarsen	22	18	21	8	38.0	16	44

United Press All Rocky Mountain Conference basketball team, picked by players, coaches and sports writers, has honored two Miners. Doug Waterman, Mines Guard, was picked on the second team and Tom Johnson, high scoring center, was given honorable mention. Both of these boys are Sophomores.

Cagers End Season with Win

The Colorado School of Mines basketballers ended their season on February 28 with a 57-52 victory over Idaho State. By virtue of their 52-41 win over Mines the previous night, the Idaho State Bengals escaped the cellar in that they played one less game than Mines.

The first game of this two game series was easily notched by the Idaho State team as the Mines team came apart at the seams during a disastrous second half; Clyde Kerns played his usually steady game and was the brightest spot in the Mines picture.

The second game showed a complete form reversal with the Orediggers jumping into an 18-8 lead in the first ten minutes. Idaho State rallied to within three points at halftime. The lead changed hands several times with Mines reaching the 4 minute mark with a four point lead that was never relinquished. Seniors Clyde Kerns and Lou Landers led the Miners with great performances in the final game of their college basketball careers.

The Orediggers beat Continental Air Lines 47-36 on February 25. Clyde Kerns led the scorers with 11 points.

Sophomore Tom Johnson led all scorers for the season with 271 points. Clyde Kerns and Doug Waterman tied for runner-up honors with 216 points apiece.

Intramural Notes

The S. A. E. Splashers won the intramural swimming championship registering 45 points on four firsts, three seconds, three thirds and three fourths. The S. P. E. team tallied 24 markers to take second place honors and were followed by Sigma Nu with 12 points. The Betas and the A. T. O.'s tied for fourth with 11 points each, with the Barb organization winding up sixth with 6 points.

The SPE basketball five ran away from the field in the intramural basketball championship by soundly trouncing the ATO basketeers 45-24. Don Van Orden bucketed 20 points to lead all scorers.

SAE Wins in Boxing

The SAE boxing team won the IM boxing crown handily running up a score of 41 to their nearest competitors, the Barbs, 13. The Sigma Nu team was third with 6 points.

Track Season Gets Underway

The Colorado School of Mines Track season got underway Saturday, March 18 when the Blaster team took on Denver University in an indoor dual meet at D. U.

Thirteen returning lettermen from last year's conference runner-ups form the nucleus of Coach Joe Davies 1950 Track Edition at Mines. The returning lettermen are:

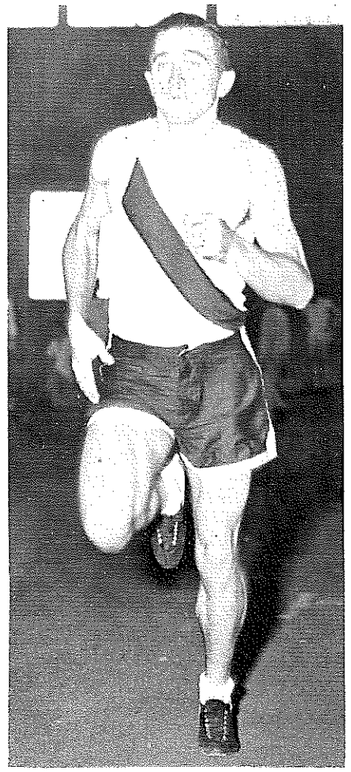
Thomas Allan	Sprints
Henry Beardsley	Hurdles (1948 Conference Low Hurdles Champ)
Carl Bidinger	High Jump and Broad Jump
Lynn Brown	440 and Relay
Stewart Collester	Javelin
Arthur Dickinson	880, 440 and Relays
Roy Essary	Shot and Discus
Paul Hodges	Two-Mile
Charles Irish	High Jump and Broad Jump
Robert Marsh	Broad Jump
Robert Owen	440 and Relay
Paul Vaughn	Two-Mile and Mile and 880; 1947 Conference Champ in mile and two mile; 1948 Conference Champ in Mile and 880.
Howard Worzel	Sprints and Low Hurdles

Lost by Graduation from last year's squad are Ignace Yakoushkin, 440, 220, and Javelin, Robert Sloan, pole vault, and Dave Rowland, 880, 440, and Relay.

Reinforcements from last year's frosh squad include: Johnny Servatius, pole vault; Don Adams, high jump; Ed Gaulke, high hurdles; Wes Bitzer and Bob Pozzo, dashes; and Abdul Zakhmi, two miler. Doug Waterman, along with Claude Jenkins, Ray McGraw, Bill Johnston, and Paul Hamilton, four transfer students, should give added power to the squad.

The 1950 Track schedule is as follows:

March 11	Indoor Invitational meet at Denver University
March 18	Indoor dual meet at Denver University
April 1	Indoor invitational meet at Colorado University
April 15	Outdoor dual meet with Greeley at Golden
April 22	Outdoor dual meet with Colorado College at Colorado Springs
April 26	Outdoor dual meet with Denver University at Golden
May 6	Outdoor dual meet with Colorado A and M at Fort Collins
May 13	Outdoor dual meet with Lowry Air Base at Golden
May 19, 20	Conference meet at Bozeman, Montana



▼Paul Vaughn

Mines Trackmen Lose to D.U.

Mines track team met defeat at the hands of Denver university's powerful track and field squad in a recent indoor meet at the DU field house, by a score of 82½ to 30¾.

Paul Vaughan contributed his usual ten points for the Orediggers by winning both the one mile and two mile runs. Jerome Biffle, DU ace, did not participate in any dashes but still managed to rack up 7½ points by taking the broad jump and tieing for first in the high jump.

The Pioneers eight-lap relay team set a new field house record with a time of 2:32 minutes.

Roy Essary, 1949 RMC shot put champion, took first in the shot for the Miners with a heave of 44 feet. Henry Beardsley seems to have regained his 1949 form as he missed winning the 50 yard low hurdles by a whisker. Other point getters for the Mines cause were Art Dickinson, Lynn Brown, Stu Montgomery, Abdul Zakhmi, Ed Gaulke, Wesley Bitzer, Chuck Champion, Graham Gibson, John Servatius, Don Adams, Chuck Irish, Bill Connelly.

The Mines team did as well as expected. Field house conditions at Mines are a far cry from those at Denver, and consequently the Miners were somewhat behind the Pioneers in conditioning.

The next meet is the Colorado university indoor invitational on April 1.

Baseball Practice Begins

Coach John Karamigios opened baseball drills at the Colorado School of Mines March 6 with ten lettermen, including two all conference choices from the 1949 team, reporting with 21 other hopefuls. A tough 20-game schedule featuring Sunday baseball will be shortly at hand.

Senior First Baseman, Norm Korn and Jack Weyler, centerfield, were 1949 All Rocky Mountain Conference selections.

A check of the roster shows the Miners well fortified behind the plate with catchers Dick Bench and Fred Hohne returning from last year's squad. Lettermen pitchers, Hurley Pepper a righthander and "Lefty" Joe Alberts should receive help from two portsiders Russ Nelson and Ralph Anderson.

Second Baseman Art Self and Left Fielder Jerry Bond round out the hold overs from last year's team.

The team is particularly weak on the left side of the infield and a right fielder must be found. Several who may fit into the picture are Tom McLaren, Wally Arnold and Stu Chuber.

The Schedule:

1950

Fri. Mar. 31—Denver University at Colorado School of Mines
Sat. April 1—Colorado School of Mines at Denver University
Tues. April 4—Colorado School of Mines at Colorado College
Fri. April 7—Colorado University at Colorado School of Mines
Sat. April 8—Colorado School of Mines at Colorado University
Sun. April 16—Western State College at Colorado School of Mines (2)
Tues. April 18—Colorado School of Mines at Regis
Fri. April 21—Colorado College at Colorado School of Mines
Sat. April 22—Colorado School of Mines at Colorado College
Tues. April 25—Colorado College at Colorado School of Mines
Fri. April 28—Colorado State College at Colorado School of Mines
Sat. April 29—Colorado School of Mines at Colorado State College
Tues. May 2—Regis at Colorado School of Mines
Fri. May 5—Colorado School of Mines at Colorado A. & M.
Sat. May 6—Colorado A. &. M. at Colorado School of Mines
Sat. May 13—Lowry Air Base at Colorado School of Mines
Sun. May 14—Colorado School of Mines at Lowry Air Base

Sat. May 20—Fitzsimons at Colorado School of Mines
Sun. May 21—Colorado School of Mines at Fitzsimons

Practice Begun in Preparation For Next Fall

Forty hopeful football candidates reported to Coach Fritz Brennecke March 6 at the Colorado School of Mines for spring football practice that will be climaxed by an intra-squad game on Friday, April 14.

Football candidacy at Mines will be on an invitation basis for next fall.

With Varsity members from last year's conference runners-up exempt from spring ball, if they are participating in another spring sport, the field is wide open for all aspirants, regardless of experience, to show their football wares. Practice session will consist mainly of work on fundamentals and basic play.

Mason to Montana State

John H. Mason, former Director of Athletics and head football coach at Mines, has been appointed head football coach at Montana State College at Bozeman, Montana. Mason will report to the Bobcat stronghold in time for spring football practice.

LETTERS *(Continued from page 4)*

NEWS FROM THE PHILIPPINES

From CLAUDE FERTIG, Ex-'27, *Balatoc Mining Company, Baguio, Philippines.*

Enclosed herewith is the long delayed check for my dues. The long delay is caused mostly by the new currency control laws, the rules and regulations are changed daily and by the time you get to town with the proper forms, they are obsolete, and so I finally decided to write a check on my fast dwindling dollar reserve in the States.

The import control law has eliminated most of my worries about sending money home. Food has risen almost 100% and with four in the family to feed I have no dollars to worry about exporting. There is really no excuse for the food going up so, as very little of the food falls under the import quotas.

If these laws have worked a hardship on the working man they have really been beneficial to the gold producer. The new exchange law requires the producer to turn over 25% of his gold to the Central Bank at $35.00 per ounce; the balance he may sell on the free market. These and other restrictions have sent the open market price up to P117.00 per ounce or giving us a net price after the 25% to the Bank of P98.00 per ounce, compared to the P84.00 before the restrictions.

Our goal here for the two mines feeding a central mill was 4000 tons a day, but mill construction was stopped at 2000 until things cleared up a bit. Our present tonnage is divided between the two mines with Balatoc carrying about 2/3 of the load, which is a lot of rock to be mined and gathered every day from a series of small veins (about 14) scattered thru 66 miles of working. Our veins run from 18" in width to 15 feet, averaging 6 ft. We have gradually increased our grade.

It looks as though several other mines may open up soon. You may have calls for men. I think that this is one of the best places in the world to work and live, however anyone coming here must not be mislead by the peso salary as this is the highest place in the world to live at this time. Cigarettes are 30¢ a package, ham $2.00 a pound, milk 25¢ a can. My grocery bill for last month was $252.00 which leaves very little of the starting salary offered by most companies. Single men living in the company mess are OK as they get their board and room for $45.00 per month. Recreation is expensive; lunch in town is $3.00. Anyone coming here now should be sure that their salary is high enough or that it carries a cost of living bonus. I feel that an American family here should have household servants which will cost for a couple $40.00 a month and with children $60.00 a month. If the wife is going to do all the house work, I believe that the States is the place then. We do have free medical service for the family and free hospitalization for the man, as well as tuition paid at good protestant or a good catholic school for children. I figure that a man with two children needs $500.00 a month to break even and that is not allowing for too many drinks at the club.

I had one short bull session with Delahunty since he returned but it was a very crowded weekend at the club and so we still have lots to talk about, especially the time that he had at the 75th.

Best regards to all.

ALUMNI BUSINESS

(Continued from page 32)

Seniors in the near future.

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

Nominations Committee

No report.

Public Relations Committee

Mr. White reported the testimonial dinner for Ben Parker be held at the Cosmopolitan Hotel on Thursday, March 23, 1950, cost to be $3.50 per plate. Governor Knous will talk. Jim Boyd will attend. Attendance of about 200 is expected. 110 have made reservations to date.

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

Publication Committee

Mr. Heckt reported that, financially, the magazine is in good shape. For the 16-2/3% budget period, 20.7% of the budgeted income has been earned and 11% of the allotted expenditures has been spent.

The March issue is in the hands of the printer and should be ready for mailing any day. Material is on hand for the April issue and it should be out on schedule.

The Yearbook and Directory is planned for mailing early in April. The 1949 Index will be ready for the printer this week and should go out with the April magazine.

The Special Petroleum Number is planned for September. Letters will be written to prospective authors in March.

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

Research & Investigation

Mr. Storm reported that there had been no further meetings of the committee since the last Executive Committee meeting. The committee is in the process of cataloguing the graduates with regard to the options graduated in and the jobs now held. Some conclusions can be drawn after the list is completed and studied. This information can be used as a basis for further study.

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

General Report

Mr. Bowman reported that every thing had been covered in the previous reports.

Special Business

Two applications for Associate membership were presented:

1—Burton William Barnes, Denver, Colorado. He met all the qualifications and had tendered the necessary fees. Moved by Mr. Dismant his application be accepted; seconded by Mr. White; passed.

2—Francis David McKenzie, Springfield, Vermont. He met all the qualifications and had tendered the necessary fees. Moved by Mr. Manning his application be accepted; seconded by Mr. Durbin; passed.

An application for a Charter for a local section in Casper was presented. The section to be called Central Wyoming Section. President to be Herbert Schlundt; Secretary-Treasurer to be Lynn D. Ervin. The application carried the proper number of signatures of members in good standing. Moved by Mr. Dismant the Charter be granted; seconded by Mr. McNeill; passed.

Adjournment

No further business appearing the meeting was adjourned at 9:20 P. M.

PETROLEUM ENGINEERING DEPARTMENTS

(Continued from page 22)

Westinghouse Electric Corporation, says:

"...Put men in the right job, give them their head, full responsibility, don't tell them how to do their work. Westinghouse is decentralized. It must be that way or be a bureaucracy—an impossible way to run a business. Each division manager acts as the president of an independent company, is expected to make his own decisions but according to the overall policy . . . I believe the company should be a team of individuals loyally bound together by common interests. With a set up like that, there's not much chance of anything but success."

Fourth and Lastly:

The matter of promotion and generally getting ahead in an organization is one of critical concern to the petroleum engineer as well as to management. The ability of an individual in the entirety is difficult of measurement —however, over a period of time it is revealed provided each man has the opportunity to demonstrate his ability. The system of maximum delegation of authority with adequate control permits a ready testing of the ability to assume responsibility. Many individuals fail or do not have the capacity or ability to assume responsibility. The ability to assume responsibility, coupled with good judgment, technical ability, and getting along with people on a sound basis, without becoming a "yes man," probably sums up the worth of an individual as to promotional possibilities.

All of us often hear the expression: "He got the breaks." This expression or figure of speech is essentially very broad in its meaning. Its meaning to some is quite different from its interpretation to others. Some may consider a promotion purely as a matter of chance—in other words, being available at the right time. Others think it was by influence on the part of management without regard to ability—in other words: "pull." No doubt unmerited reward has been and will be given in the way of awarding or deciding of promotions. However, in corporate circles, particularly, this is rarely the case for the simple reason that promotion in reality requires the satisfactory handling of the greater responsibility and thereby requires proof of worthiness to receive increased compensation. Therefore an unmerited promotion is still subject to proof by performance on the part of the individual promoted. Promotion then becomes opportunity and opportunity must be taken advantage of—opportunities, if used, demand action. Action and the resultant depends on ability in the broad sense—therefore it seems to the writer that management is pretty well hemmed in so far as treating the matter of promotion unfairly.

It is quite another matter to answer the question of what every ambitious and capable engineer will ultimately ask himself, namely: "Will there be enough places to promote all the "good men." In the first place, let me say that here again many avenues of promotion must remain open and stay open by managerial planning for petroleum engineering. Inasmuch as some engineers will have the ability to supervise non-engineering operations, many of the larger companies who maintain petroleum engineering departments are constantly placing and later promoting men in the drilling and production departments. Those whose ability as engineers and whose chief talents lie in straight engineering are promoted in engineering. The "breaks" for "mass promotion" can and do occur if a particular company suddenly finds itself in the fortunate position of making important discoveries of oil and gas—or in less frequent cases purchase of property. Usually purchase of property involves the inheritance of some employees, although not always technical personnel.

The engineer who is changed over to non-technical supervisory work should guard against the abandonment of his technical training and experience. T. C. Frick[6] has the following to say:

"Occasionally, petroleum engineers promoted to supervisory positions delight in casting off their engineering cloaks

[6] Thomas C. Frick, "The Petroleum Engineer as a Supervisor," *Petroleum Engineer 18* (4) 160 Jan. (1947).

and boasting that they are no longer engineers but that they can handle all problems. Such men were either poor engineers to begin with or have not been able to keep abreast of petroleum engineering developments nor acquire the skills that a supervisor must possess. *Every supervisor has five fundamental responsibilities in carrying out his duties; a supervisor is responsible for equipment, costs, methods, men and policy. Problems involving equipment costs, and methods are familiar to the petroleum engineer because he has been trained to work with these items. Problems involving men and policy are strange to the petroleum engineer so he must train himself to handle these problems in order to become a good supervisor."*

This has happened. One of the objectives of creating multiple opportunities for promotion of the petroleum engineer is that a common ground of understanding will ultimately be achieved by having experienced men of scientific and engineering background dealing with each other. If a former engineer allows himself to disregard sound fundamental engineering thinking it will defeat the objectives of providing trained men in all key positions. Instead a former engineer occupying the position of superintendent or manager should grow individually as well as promote and encourage better engineering relationship with engineers. The engineer who progresses within the petroleum engineering department will devote more and more of his time to administrative and supervisory duties—thus his line of promotion may be ultimately into management and executive departments as well as the engineer who left petroleum engineering earlier to transfer into field operating departments. In other words an engineer should be able to arrive in top management by several different routes, under broad gauge management policy.

The promotion of trained personnel in the oil and gas business has been evolutionary in character as in other industries. *Higher education is no guarantee of a position of influence within an organization nor is it assurance of success.* Such a man does have the advantage. He must compete, because his employer must compete. If he is in business for himself he still must compete—therefore *ability is always a fundamental requirement and agrees with his rights to "Liberty and the pursuit of happiness."*

The engineer will with time analyze and weigh his future with his present employer and compare promotional opportunities with those offered by other companies. He will not fail to consider any opportunities to go into business for himself. This is a natural and oftentimes profitable venture for experienced engineers. Like life itself, it involves chances. The success of going into business for himself or in partnership with others offers opportunity for the self-reliant and capable engineer. It does not, of course, offer as much security in all cases as that provided by large company employment. So much depends on the individual and innumerable other factors —many of which are common to being employed or self-employed. It is repeated that in the writer's opinion it is a healthy condition for the industry that a portion of the experienced technical men do enter the exploration, producing and drilling phases of the industry. The fact that they can and do succeed is unquestionable proof that the petroleum industry is extremely competitive and not controlled or dominated by anyone individual or group or groups of companies. The appearance of engineers and geologists in the rank of individual or so-called independent operators will result in still greater competition. This is as it should be.

And lastly, permit me to say that *every individual, whether he be an executive, engineer or occupying a managerial position in production and drilling departments, has his respective "boss." The executive head has probably one of the most exacting "bosses"—the stockholders. The independent operator is responsible for his own success and well being.*

(To be continued)

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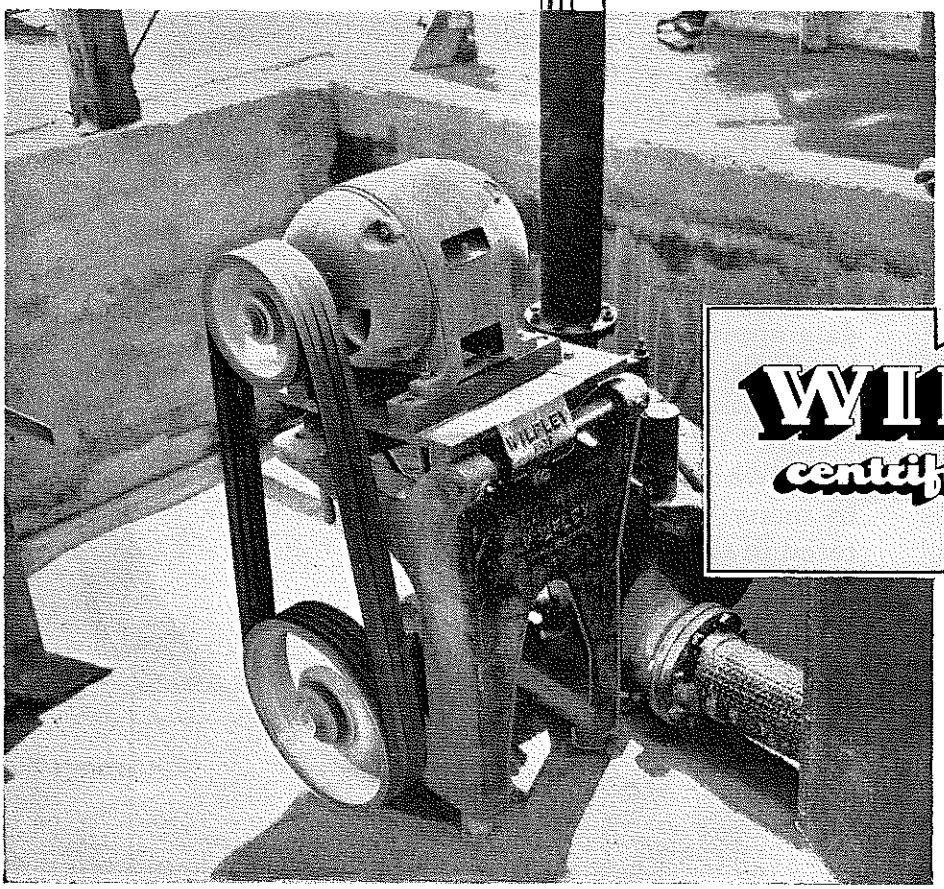

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