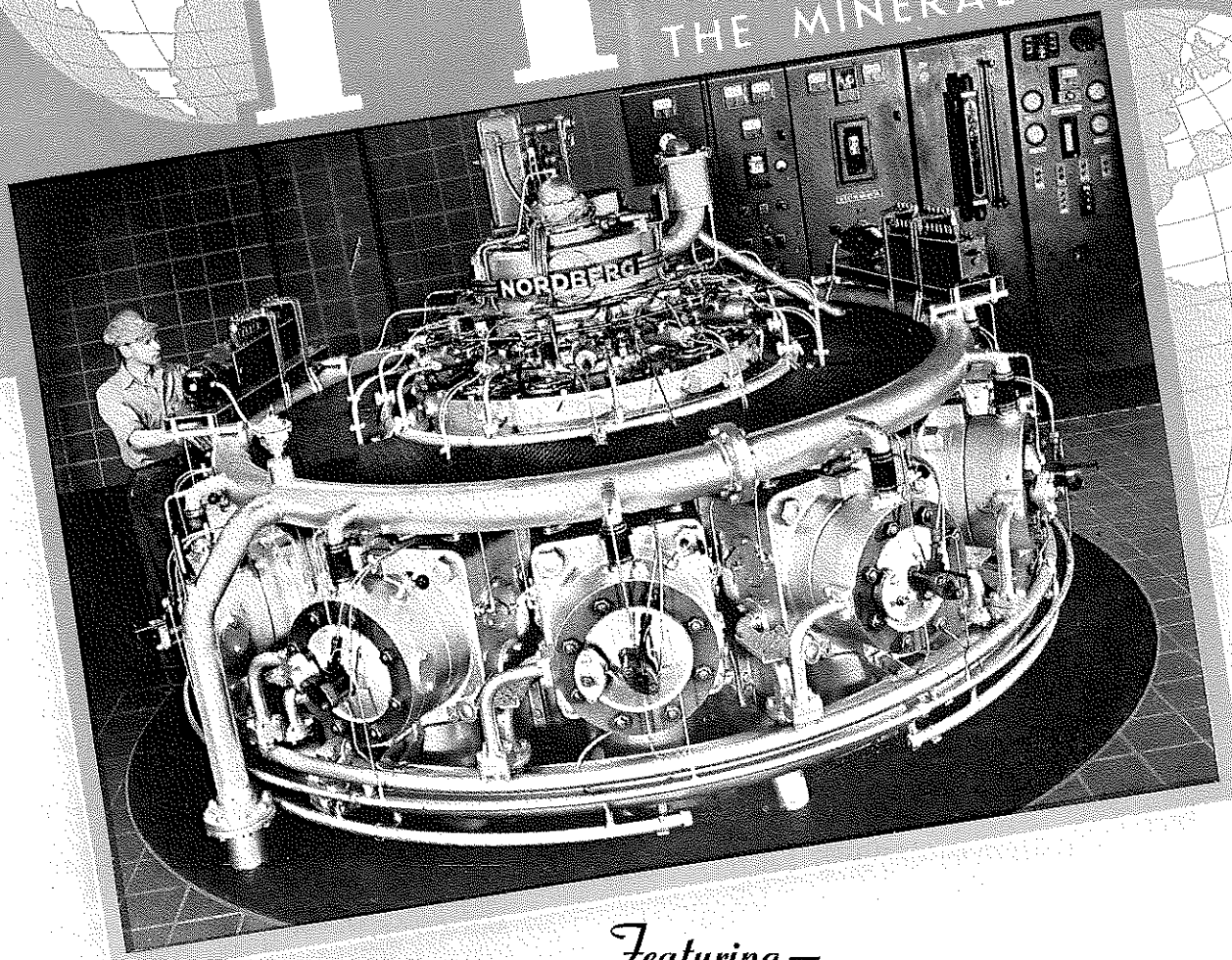
THE MINES MAGAZINE

AROUND THE WORLD WITH THE MINERAL INDUSTRIES



Featuring—

ALCOA PLANT IN TEXAS

AIR COMPRESSOR SELECTION

BELT CONVEYORS

SQUARE ROOTS BY AUTOMATIC CALCULATOR

RADIAL DIESEL ENGINE

AUGUST • 1950

VOLUME XL NO. 8

PERSONAL NOTES

Burton S. Goldberg, '49, Research Engineer for Kerr-McGee Oil Company, has a change of residence address to 6909 N. W. 13th, Oklahoma City, Okla.

Frank A. Goodale, '10, who retired last January from his duties with the Los Angeles County Road department, was a Denver visitor last month. His home address is 1007 El Paso Drive, Los Angeles, Calif.

Gene W. Hinds, '49, Metallurgist for Geneva Steel Mill, is addressed Box 103, Orem, Utah.

Richard B. Hohlt, '47, Geologist for The California Company, has moved his residence in New Orleans to 8424 Dixon Street.

William J. Holtman, '43, has a change of residence address to 475 Garfield Street, Denver. He is Metallurgist for the Denver & Rio Grande Western Railroad.

Thomas A. Horr, '36, Outside Plant Engineer for the Mountain States Tel. & Tel. Company is addressed at his home, 200 Brentwood Street, Lakewood, Colorado.

Warren O. Johnson, '49, Field Engineer, Republic Natural Gas Company, receives mail in care of the company, M. & W. Tower Building, Dallas 1, Texas.

Robert Wm. Knapp, '40, Assistant Works Manager, Vancouver Fabricating Division, Aluminum Company of America, resides at 413 West 41st Street, Vancouver, Washington.

Harry E. Lawrence, '48, was on vacation in Denver the early part of June and called at the Alumni office. He is Assistant Superintendent, Lead Smelting division, Goldsmith Brothers Smelting & Refining Company, in whose care he is addressed, 1300 West 59th Street, Chicago, Ills.

Robert F. Lesage, '48, was also on vacation last month, part of which he spent in Denver. He is Mechanical Engineer for Empire Star Mines Co., Ltd., with mailing address Box 60, Grass Valley, California.

Elbert E. Lewis, '42, Mining Engineer, St. Joseph Lead Company, has moved from Leadwood to Flat River, Missouri, where his address is 501 Wash Street.

Norman V. Lovett, '42, has a change of residence address to 407 South Race Street, Denver. He is Production Manager for Benjamin Moore & Company.

J. A. McCarty, '35, General Production Superintendent for Ashland Oil Refinery Company, has been transferred from Henderson, Kentucky, to Salem, Illinois. His address there is 206-A West Main Street.

E. H. Murchison, '12, has been transferred by the Baroid Sales Division, National Lead Company, from El Portal, California, to Hot Springs, Arkansas, where he is in charge of the Magnet Cove Plant. His post office address at Hot Springs is Box 768.

Major Allan P. Nesbitt, '38, has been returned to the States from Alaska, his new address being 6511 ASU Instruction Group, P. O. Box 53, Idaho Falls, Idaho.

Henry H. Nogami, '42, Computer, Atlantic Refining Company, is, at present, being addressed Box 1106, Bay City, Texas.

Donald W. Roe, '44, received the Jaffa Memorial Prize from the university of Denver college of law on June 8.

The prize was established in honor of the late Joseph S. Jaffa, professor of mining law at the university. The trophy is a bronze plaque upon which is placed each year the name of the student having

(Continued on page 7)

Letters . . .

DOES NOT WANT TO MISS COPIES OF MINES MAGAZINE

From ROBERT L. OLUND, '37, *c/o Ingersoll-Rand Co., General Sales Dept., 11 Broadway, New York, N. Y.*

This is to advise you of my new address which is given above.

My new position with Ingersoll-Rand Company will be that of representative for the mining industry throughout the United States.

I am anxious not to miss any of *Mines Magazines* and will, therefore, appreciate having them mailed to my new address.

RECEIVES DEGREE FROM UNIVERSITY OF TULSA

From NORMAN S. MORRISEY, '42, *1530 East 14th St., Tulsa, Okla.*

I completed my work at the University of Tulsa for master's degree in geology and received my degree the last of May. My thesis was a study of the Madison limestone of the Wind River Basin, Wyoming, correlating surface sections of the Madison with a subsurface section by means of insoluble residues.

While pursuing my graduate studies, I worked at the research laboratory of the Stanolind Oil and Gas Company. Since last June I have been engaged in full time research with this company, completing my thesis in spare time.

I am currently employed by Stanolind, doing geological research work.

GAINING EXPERIENCE AS TRAINEE-ENGINEER

From ANDREW T. VALESCU, Ex-'39, *c/o Continental Oil Co., Drawer 1267, Ponca City, Okla.*

Due to moving around the country, I am having quite a time catching up with *Mines Magazines*. My last address was Basile, La. and, although it was properly changed at the post office, my mail is still being retained from time to time. A notice from them just received indicates that one magazine was held for postage due, so now I hope I have made them understand in my last letter to them, where and how to send my future mail.

Being a trainee-engineer with the Continental is a wonderful experience with a good company.

The family and I are enjoying a pleasant summer in Ponca City. In August will go to Louisiana, at Ville Plate, and three months after that, I will be a full-fledged petroleum engineer in the organization. That will seem like Heaven when stationed permanently somewhere!

TRANSFERRED TO TEXAS

From GEORGE A. KIERSCH, '42, *Box 1022, Alpine, Texas.*

Please change my address to that given above.

I was transferred to the State Department, International Boundary and Water Commission, Alpine, Texas, in late June to be supervising geologist under the project engineer, *L. H. Henderson,* '28, of a large geologic investigational program underway along the Rio Grande river throughout the Big Bend country.

I had been project geologist for the Folsom Dam Project, Corps of Engineers, California, during the geologic investigations and early construction phases.

My best regards to all.

IS BEING KEPT PLENTY BUSY

From PAUL SVENDSEN, '43, *906 Security Avenue, Pueblo, Colorado.*

What with buying a house in Pueblo, starting on a new job, traveling for C. F. & I., building a garage onto the new house, I'm so far behind in my personal correspondence that I hardly know where to start.

However, I am starting with you to give you the information for which you recently asked. And while I am at it, I might as well take this opportunity to notify the Association of a coming change of address. Effective August 1, 1950, my new address will be as given above.

NOW LOCATED IN NEW YORK CITY

From ROBERT G. HILL, '39, *301 East 38th Street, Apt., 10 H, New York 16, N. Y.*

I shall be grateful if you will change my address in your records from Box 277, State College, Pa., to that given above.

I am now employed as administrative assistant in the foreign producing department of The Texas Company.

I'll look forward to receiving *Mines Magazine* at this new address.

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
B. F. Zwick, '29
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

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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.

(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.

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

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

(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.

(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.

(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.

(1194) MINING ENGINEER. A well known company operating a gold mine in Central America has position open for mine manager. Applicant must have had several years experience in operation of mines in Latin America. Salary depends upon qualifications and experience of applicant.

(1197) RESEARCH METALLURGIST. A well known research organization is setting up a new department covering research in connection with projects for pyro- and hydro-metallurgy. Applicant must be able to direct research and be well grounded in physical chemistry and especially thermodynamics. Should have few years experience in concentration of ores. Salary will depend upon the experience and ability of applicant.

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

(1208) MINING ENGINEER. Position open for Mining Engineer in connection with Greek mining. Applicant must have broad experience in operation, examination and report work in connection with non-ferrous metals. Probable salary, about $9000 per year plus living allowance.

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PERSONAL NOTES

(Continued from page 3)

the highest scholastic average in the first two years of law work.

Roe, who received a certificate marking the award, is the son of Mrs. Harry B. Roe and the late Mr. Roe of Denver.

William C. Schafer, '49, has moved from Pacific Grove to Bakersfield, California. He is Sales Engineer, Decay Control Division, Wallace-Tiernan Corporation. His address at Bakersfield is 2114 - 20th Street.

John F. Schultze, '48, resigned his position with the Leadville Mining Unit, A. S. & R. Company, to accept one with Northern Peru Mining & Smelting Company. He is addressed in care of the company, Casilla 162, Trujillo, Peru, S. A.

Lt. Col. Thomas J. Skeahan, '27, has a change of address to Engineer Section, Headquarters Sixth Army, Presidio of San Francisco, California.

Robert E. Simpson, '42, is Superintendent for Slate River Mining Company, Crested Butte, Colorado.

C. W. Tucker, '47, Junior Petroleum Engineer, Stanolind Oil and Gas Company, is being addressed 2210 Blum, Alvin 1, Texas.

Douglas V. Watrous, '40, President, Mountain Empire Mills, Inc., has moved his residence from Denver to Idaho Springs, Colorado.

Fred P. Wehrle, '49, completed the first year on obtaining his master's degree from the Illinois Institute of Technology. He has accepted employment for the summer with the Colorado Interstate Gas Company as a junior engineer but will resume his studies in the fall in Chicago. Mail for these few months is being sent to his home in Denver, 954 So. Corona Street.

Thomas L. Wells, '29, who has been associated with North American Mines, Inc. of Boston, Mass., for the last two years, is now engaged in independent consulting work, with offices at 452 Fifth Avenue, New York, N. Y.

Vincent D. Barth, Ex-'37, was on vacation in Denver the early part of July and called at the Alumni office. He is Research Engineer for Battelle Memorial Institute. He is addressed, 505 King Avenue, Columbus 1, Ohio.

Charles S. Beech, '26, is in Grand Junction, Colorado, at present where he is addressed in care of The Stearns-Roger Manufacturing Company, Box 774.

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PERSONAL NOTES

(Continued from page 7)

Marion S. Bell, '49, has been promoted to Assistant Plant Metallurgist by the Phelps Dodge Refining Corporation and, at present, is being addressed Ysleta, Texas.

Joseph Q. Berta, '41, has been advanced by the Union Pacific Coal Company from Assistant Superintendent to Mine Superintendent and transferred from Superior to Reliance, Wyoming.

Earl L. Bilheimer, '22, Manager, Employee Relations Department, St. Joseph Lead Company, is addressed Box 626, Bonne Terre, Missouri.

William L. Burch, '44, resigned his position with the Linde Air Products Co. to become associated with the Bell Aircraft Corporation of Niagara Falls, N. Y. His home and mailing address is 250 Heim Road, Williamsville 21, N. Y.

John T. Burnett, '49, is Shift Boss for The Galigher Company at Monticello, Utah.

Harry W. Carlson, '42, Geologist for The California Company, has moved from New Orleans to Shreveport, Louisiana, where he is addressed 2205½ Centenary Boulevard.

John M. Coke, '28, Associate Professor of Descriptive Geometry at *Mines,* resides at 24 Mines Park, Golden, Colorado where he receives mail.

John T. Crawford, '27, Vice President in Charge of Operations for North Western-Hanna Fuel Company, has moved his residence to 16 St. Albans Road, Superior, Wisconsin.

William G. Cutler, '48, has again moved his residence in New Orleans, La., this time to 4529 Duplessis St., Apt. B. He is Petroleum Engineer for the California Company.

D. C. Deringer, '24, General Manager, Patino Mines & Enterprises Consolidated, at Catavi, Bolivia, has been vacationing in the States this summer. He and Mrs. Deringer came the latter part of May to attend the graduation exercises of their daughter from Smith college.

Ernest W. Dissler, '40, Division Geophysicist for Cities Service Oil Company, is on duty in Canada at present, mail being addressed to him at 117-B 8th West, Calgary, Alberta.

S. Reeve Duhme, '40, has moved his residence to 1301 Florida Avenue, Apt. 2C, Richmond, California. He is serving as Geologist for U. S. Engineer Corps.

Charles A. Einarsen, '47, has been transferred by Stanolind Oil and Gas Company from Midland to Fort Worth, Texas, in whose care he is being addressed. His position is District Mud Engineer.

Marvin H. Estes, '49, has a new residence address in Golden, 1006 Sixteenth Street. He is District Engineer for Frigidaire Sales Corporation with offices in Denver.

Glen E. Fassler, '29, of 1510 West 8th Street, Freeport, Texas, was a Denver visitor in July.

John E. Feather, '49, is now being addressed Box 1033, Lubbock, Texas, while serving as Junior Observer for Cities Service Oil Company.

Robert M. Frost, '48, Metallurgical Engineer for Westinghouse Electric Corporation, resides at 607 Delaware Avenue, Norwood, Pa. where he receives mail.

John M. Gardner, '33, who is associated with International Derrick & Equipment Company, is addressed in their care, Box 2369, Dallas, Texas.

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TECHNICAL MEN WANTED

(Continued from page 7)

(1209) MINING ENGINEER. Company operating in South America has position open for assistant to Mining Superintendent. Man must have had a few years mining experience, be able to stand high altitudes and report single status. Three year contract. Probable salary, $400 to $500 per month.

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

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

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

(1227) SAFETY AND VENTILATION ENGINEER. A permanent well established company has position open with its foreign operations for a Safety and Ventilation Engineer with experience in large underground mines, technical background. Three year contract. Generous vacations. Housing and utilities furnished. Travel expenses paid. Must be in good physical condition. Salary liberal, depending upon experience.

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

(1229) METALLURGICAL SUPERINTENDENT. A mining company operating a sulphuric acid plant in connection with copper leeching plant where pyrite roasting is used has position open for a Superintendent of sulphuric acid plant. Should have broad chemical knowledge. Good academic background and practical experience. Three year contract with liberal salary. Housing furnished, traveling expenses paid. Vacation allowed. Applicant must be in good physical condition.

(1230) MINING GEOLOGIST. A well established company with foreign operations has position open for Mining Geologist with broad experience in connection with ore deposits and geological field work. Salary open, depending upon experience and ability.

(1232) GEOPHYSICIST. A geophysical company with headquarters in New York City, has position open for a young geophysical engineer familiar with seismic operations in connection with mining work. Must be willing to travel extensively, both domestic and foreign. Salary open, depending upon experience and ability.

(1233) MINING GEOLOGIST. A mining company has position open for Chief Geologist with good academic background and experience in mine examination work and mine reports. Salary will depend upon experience and ability of applicant.

(1236) REFINERY ENGINEER. A refinery construction company has position open for a Refinery Engineer with several years experience in actual operation, who is capable of developing specifications and requisitions for instrument equipment from working sheets and process data for petroleum refinery units. Salary depending upon experience and ability of applicant.

(1238) REFINERY ENGINEER. A company constructing refineries and refinery equipment has position open for a Refinery Engineer with at least four years experience in actual operation. Must be capable of supervising and inspecting instrument installations during construction, and able to check calibration and adjust control functions. Must be able to assist operators during starting up period. Headquarters in New York but work will be both foreign and domestic. Salary open.

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

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

(1244) SMELTER FOREMAN. A foreign operated copper smelter has position open for a smelter

(Continued on page 44)

The Mines Magazine

VOLUME XL AUGUST, 1950 NO. 8

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Front Cover—

1685 Horsepower Nordberg Radial Engine used in the Point Comfort Works, Aluminum Company of America, near Port Lavaca, Texas.—Courtesy of Nordberg Manufacturing Company.

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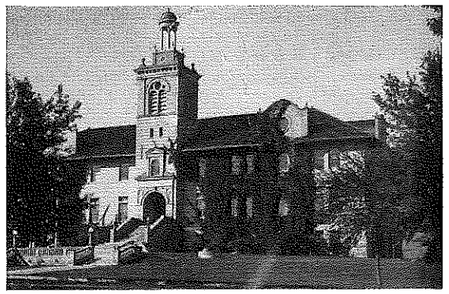

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ACCURATE SQUARE ROOTS USING A SLIDE RULE AND AUTOMATIC CALCULATOR

By
JOHN S. SOUTHWORTH, '38
North Fork, Calif.

There has not been enough study and publicity given the best and most rapid method of extracting square roots using a slide rule and an automatic calculator. This article is a step in the right direction.

Assume that the square root of 54656.67848 is desired. With a slide rule and an automatic calculator available, the fastest method of obtaining the desired quantity is to average the most accurate square root value available from the use of the slide rule (in this case 234) with a quotient (in this case 233.576) obtained by dividing 54656.67848 by 234 on the automatic calculator. The average of 234 and 233.576 is 233.788 which shows in one simple calculation more decimal places than the number of significant figures in the original square warrants and which compares very favorably with 233.7876782 which is the desired square root carried out to seven decimal places. If, in the above example, four new decimal places rather than three were picked up in the quotient from the calculator, the average would be 233.7877, a result of amazing accuracy. However, experimentation has shown that it is usually best to pick up only as many new decimal places on each quotient as there were significant figures in the divisor used to obtain that quotient.

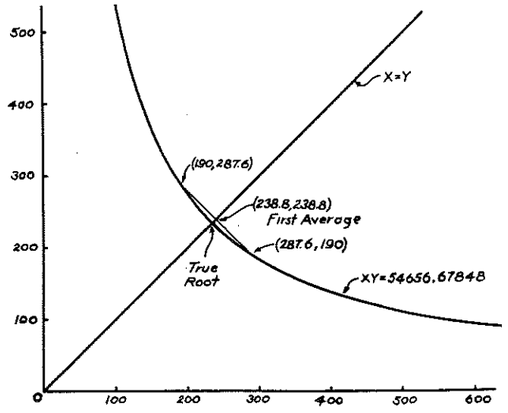
The accompanying Table I shows an interesting truth about this method of extracting square roots. In this demonstration of the original example, use of the slide rule has been dispensed with, an estimate or guess being used as the first "estimate" and the basic method being repeated in steps using each new average as the "estimate" for the next step until seven decimal places (nine significant figures and the ordinary limit of the machine on which the examples were run) has been reached.

Table I
To Obtain the Square Root of 54656.67848

	Example 1 (Normal Estimates)	Example 2	Example 3 (Obviously Wrong Guess)
Est.	230	210	190
Quot.	237.6	260.3	287.6
Av.	233.8	235.2	238.8
Quot.	233.775	232.384	228.880
Av.	233.7875	233.792	233.840
Quot.	233.7878564	233.7833564	233.7353681
Av.	233.7876782	233.7876782	233.7876840
Quot.			233.7876724
Av.			233.7876782

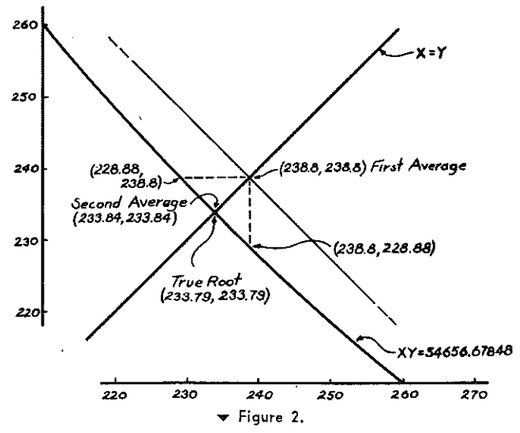
Note that the final averages are identical.

The accompanying Figures show graphically the first two steps of the third example in Table I and indicate how the method uses a trial and error procedure to rapidly bring about an exceedingly accurate solution of the problem by substantially solving a pair of simultaneous first order equations. The two equations are always (1) $xy = K$ in which x and y are equal roots of K and (2) $x = y$ by definition.



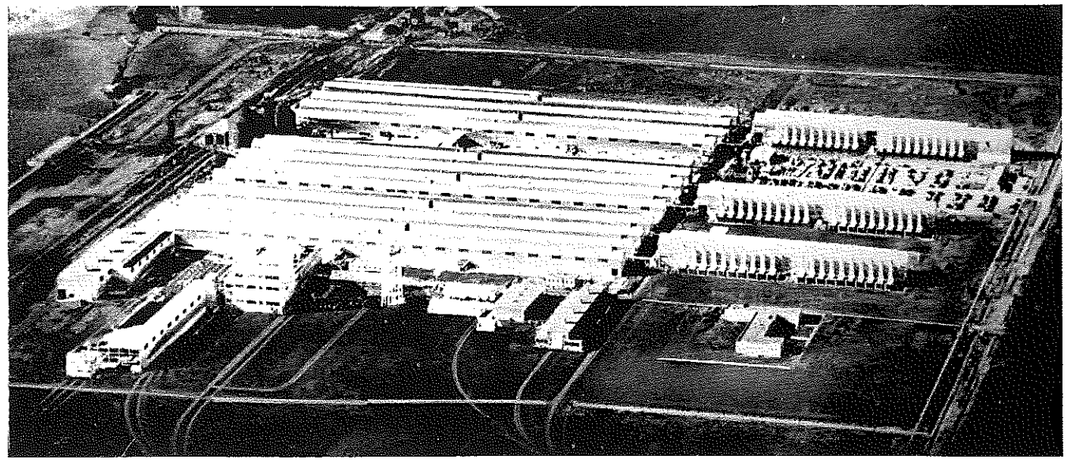
▼ Figure 1.

The judicious use of the slide rule in solving square roots by this method obviates the use of an unsupported guess and at least one division on the calculator to ordinarily give a sufficiently accurate result at the first average, the solution having been *begun,* through the use of the aided estimate, at a point comparable to the result shown graphically in Figure 2. The final possible accuracy of the root obtained by this method is limited only by the order of accuracy of the original square.



▼ Figure 2.

In addition to its speed and accuracy, the big advantage of this method is that it requires no special tables or techniques. It may also be used to determine roots of higher order by increasing the number of divisional operations per step and pro-rating the last quotient rather than just splitting it with the original "estimate."



▼ Aerial view of plant, showing powerhouses on right and pot rooms on left.

ALUMINUM COMPANY OF AMERICA

POINT COMFORT WORKS

Matagorda Bay near Port Lavaca, Texas

Plant and Location

Grading and excavation for the Point Comfort Works began in August, 1948. The first aluminum ever made in Texas was poured at the works on February 11, 1950. Between these two dates, a modern aluminum reduction works was constructed on what had been a stretch of Texas ranch land.

Point Comfort Works, located on a tract of 3000 acres on Matagorda Bay near Port Lavaca, Texas, consists of 25 buildings with approximately 18½ acres of floor space. Included among these buildings are the pot rooms where aluminum is made; the engine rooms for the production of electric power necessary for making aluminum; a carbon plant; and various plant service facilities.

The covering of the production buildings represents the largest single application of aluminum industrial corrugated roofing and siding to date. The greater portion of the aluminum roofing and siding was fastened to the buildings by the stud welding process.

The modern, air-conditioned office building contains about 15,000 sq. ft. of floor space. The brick structure includes such applications of aluminum as doors, windows, lighting fixtures, and trim and decorative effects.

Among the many other applications of aluminum found at the works are the fence, lamp poles, and electrical conductors.

The works has several miles of reinforced concrete pipe in its storm sewer system. Sanitary sewers lead to the works' own sewage disposal plant, where a considerable amount of aluminum is employed.

A concrete and steel dock was constructed at the works. A channel, complete with turning basin, connects the dock with the Pass Cavallo-Port Lavaca channel.

The Point Comfort and Northern Railroad, a subsidiary of Alcoa, owns fourteen miles of track between the plant site and Lolita, Texas, where a junction is made with the Missouri-Pacific Line. The railroad uses Diesel engines.

ALUMINUM — ITS ORE AND SMELTING

Aluminum is made by the electrolytic reduction of aluminum oxide. This reduction or "smelting" process is the heart of operations at the Point Comfort Works, which has a capacity to produce about 114,000,000 pounds of aluminum per year. The story behind this production actually begins with the ore.

Aluminum Ore

One-twelfth of the earth's crust is aluminum. Although aluminum compounds can be found in any clay bank, it is not practical to use such sources of the metal for economical production.

At present, the ore used commercially is called bauxite, which contains aluminum in the form of aluminum hydroxide. Because of the impurities it contains, bauxite occurs in various colors and textures. Bauxite deposits are known to exist in Africa, Asia, Australia, Europe, and North and South America. Much of the ore used in Alcoa's plants originates in Suriname, Dutch Guiana. In the United States, the principal source of ore is Arkansas.

Some ore beds lie close enough to the surface to be mined by the "open-pit" method. Other beds are so deep that shafts and tunnels have to be dug in order to remove the ore. The mining method for either type of deposit is much the same as that used for other materials.

Dirt and other loose impurities are removed from newly mined bauxite by washing and screening. The ore is then crushed into pieces no larger than a walnut. After it has been thoroughly dried in great kilns to remove excess moisture and save transportation costs, the ore is shipped to other plants to be refined. Bauxite itself cannot be used for making aluminum. Pure aluminum oxide is obtained from the ore, and it is the oxide which is actually reduced.

While there are a number of ways to refine bauxite, the Bayer process is generally used. In this process, the bauxite

is first crushed to a powder and then mixed, in large pressure tanks, with a hot solution of caustic soda. The caustic soda dissolves the aluminum hydroxide but not the impurities. The solution is filtered and the impurities, collected in the form of red mud, are discarded. High-grade bauxite is desirable because the presence of silica as an impurity in the bauxite causes loss of some alumina and soda in the red mud.

The filtered solution is then pumped into great tanks. As it slowly cools, pure aluminum hydroxide settles out in the form of fine crystals. These crystals are washed with water to remove soda and are then ready for the next step in the process.

The aluminum hydroxide crystals are fed into large revolving kilns and heated until white hot. The heat drives off all the chemically combined water in the form of steam. What is left is white, powdery aluminum oxide, more commonly called alumina.

Alumina is not made at Point Comfort, but it is the basic material used in the production of aluminum.

Cryolite

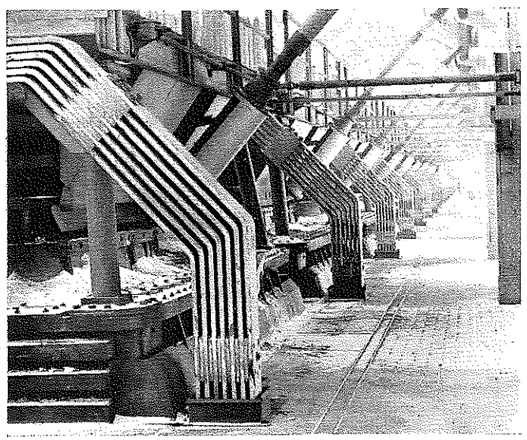
Another important material in the production of aluminum is cryolite, a double fluoride salt. Alumina is dissolved in the molten cryolite in the reduction cells so that the oxide may be reduced by the electric current. Cryolite is found in the natural state only in Greenland, but its synthetic equivalent is made.

Reduction Process

Aluminum is made in buildings known as "pot rooms." Several pot rooms normally comprise one "pot line," a reduction unit in which the electrolytic cells are arranged in series.

The electrolytic cell in which reduction takes place is a large, carbon-lined steel shell, commonly called a reduction pot. The pot is partially filled with cryolite, which is kept molten by means of the heat generated by the electric current. Current is introduced through a carbon anode which dips into the molten cryolite. The carbon lining of the pot acts as the second electrode or cathode of the cell.

There are various procedures in use today that employ a continuous, self-baking type anode, such as those used at Point Comfort. This anode consists of a large, single, rectangular casing supported by a superstructure mounted on the pot shell. A carbon paste is added to the casing from the top. The lower portion of the anode is baked by the high temperature of the molten cryolite in which it is immersed and serves to carry electric current into the cell. The baked carbon is consumed at the lower surface of the anode during electrolysis, and more paste is added at the top as required.



▼ Line of electrolytic cells where alumina is reduced in making aluminum.

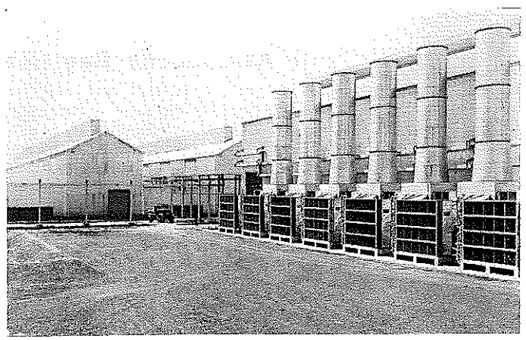
The preparation of carbon paste for use in the pots is an important function of a reduction works, since approximately ¾ lb. of carbon is consumed for every pound of aluminum produced. High-purity carbon is necessary for the anode because impurities in the carbon contaminate both the electrolyte and the reduced metal. The carbon plant facilities at Point Comfort keep the pot lines supplied with this essential material.

The process of making paste starts with petroleum coke, which is ground to the required fineness in a mill. The coke dust is then blended and thoroughly mixed with hot pitch. The resulting paste-like material is delivered to the pots as needed.

At appropriate intervals during reduction, alumina is added to the molten cryolite. Electric current flowing through the molten solution decomposes the alumina into its component parts, aluminum and oxygen. The oxygen combines with the carbon anode and the aluminum, being heavier than the cryolite, remains at the bottom of the pot where it is liberated. At scheduled intervals molten aluminum is drawn off and poured into pig form.

POWER GENERATION

Power for the production of aluminum at Point Comfort has its source in the natural gas fields of Texas. By means of generators driven by internal combustion engines, this gas is converted into the electric power required to make aluminum. It takes about ten kilowatt-hours of electricity to produce one pound of the metal.



▼ Exterior of powerhouse with two pot rooms in background.

Natural gas is delivered to the works at a pressure of from 400 to 500 lbs./sq. in. This pressure is reduced in two stages to 60 lbs. Two 8 in. gas lines connect each of the three power houses with the pressure reducing station. A regulator at each engine further reduces the intake pressure, and in actual operation, gas enters the engine at a pressure of about 6 lbs.

Each engine consumes gas at a rate of 13,000 cu. ft./hr. under load. Normally, the plant will use more than 30,000,000 cu. ft. of gas per day.

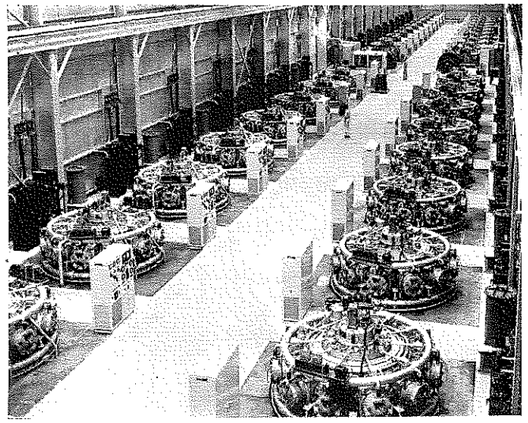
Nominal generating capacity of the power plant is 120,000 kw. Under normal operating conditions, the total output of the plant will be approximately 2,750,000 kw.-hrs./day.

Gas Engines

One hundred twenty engine-generator units convert the gas into electrical energy. Forty units are housed in each of three engine rooms, one for each pot line.

The engines are a two cycle, radial type, built by Nordberg Manufacturing Company, Milwaukee, Wisconsin. With slight modifications, the engine can be adapted to gas, diesel fuel or dualfuel operation.

The eleven cylinder engine has a 14 inch bore and a 16 inch stroke. At Point Comfort, the engines are normally



▼ One of three engine rooms, each containing 40 engines. Generators and auxiliary equipment are located on lower floor.

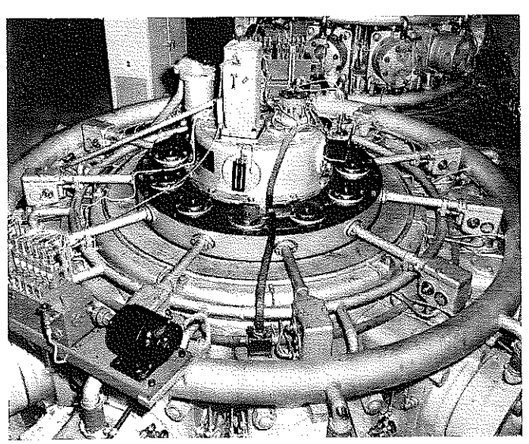
operated at 360 rpm, producing 1600 horsepower. They operate at a thermal efficiency of about 29 to 30 percent.

The crankshaft is set vertically with the crank at the top. The cylinders are bolted radially to a cast frame, having a central hub that carries both the lower crankshaft main bearing bushing and also the thrust bearing which supports the load of the crankshaft. The heavy, bolted cover contains the upper crankshaft main bearing bushing. The governor, fuel pumps, mechanisms for gas operation and controls are located on this cover. Circular manifolds for scavenging and exhaust are located in the lower level of the engine room. Intake and exhaust are timed by the pistons uncovering ports in the cylinder walls, and no valves are required.

Balanced operation is accomplished by use of a master gear, a stationary gear bolted to the cover, two pinions and rotating counterweights. The eleven connecting rods are attached to the master gear by means of knuckle pins mounted in bronze bushed bearings. The master gear gyrates instead of rotating. There is no master connecting rod, commonly associated with radial type engines.

(For more details on engine, see Page 27.)

When set up for gas burning, the engine operates on reduced compression, with spark ignition. Natural gas is admitted by cage mounted gas valves. The valves are operated by a cam on the crankshaft and are so located that gas is admitted into the path of incoming scavenging air. This assures thorough mixing and efficient use of the fuel. A valve inserted in the gas line and controlled by a governor varies the amount of gas delivered to the cylinders according to the load on the engine.

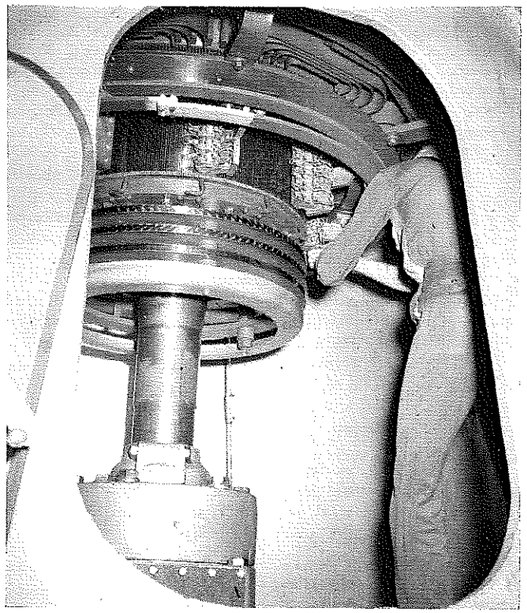


▼ Close-up of engine showing governor, distributor, lubricator, and gas valves.

Generators

The electric generators are located in the lower level of the power houses and are joined to the engines by direct coupling. Each engine-generator unit, with its auxiliaries, operates independently. Forty generators were supplied by each of three manufacturers: Elliott Company, General Electric Company, and Westinghouse Electric Corporation.

Each generator produces 1000 kw (DC) at 667 volts and 125 kva (AC) at 425 volts and 24 cycles. The AC power is used for driving the engine auxiliaries. This eliminates the need for a common auxiliary power system and possibility of a total station interruption.



▼ Inside engine base showing 1000 KW, 667 volt, DC generator. Slip rings provide 24 cycle power for engine auxiliaries.

The generator is used as a motor in starting the engine.

Auxiliary Equipment

Each engine-generator unit has its own control panel, which includes engine protective equipment. Protective equipment causes the engine to shut off automatically for such reasons as low oil pressure, high water temperature, high exhaust temperature, overspeed, high generator temperature, or loss of auxiliary power.

In addition to unit control panels, each powerhouse has a master control room with recording and indicating equipment registering the operation of each of the forty engines and generators. No unit can be shut off from this master control room, but it provides a central point from which the operation of forty units can be observed.

Centrifugal type scavenger air blowers, which provide air under pressure to the engine cylinders, are driven by a 100 hp. motor. These blowers supply air at the rate of 7,000 cu. ft./min.

The axial flow type, generator cooling air fan is driven by a 7½ hp. motor. The fan supplies air at the rate of

12,000 cu.ft./min. Along the wall behind each generator are the high speed, generator switch gear, generator control and starting equipment.

Combination oil and water, engine coolers were built by The Trane Company of LaCrosse, Wisconsin. Heat exchangers for the system are approximately 15 x 11½ x 3 ft. in size. The exchangers are all-aluminum in construction except for cast iron headers. Alclad aluminum alloy 3S is used for both tubing and fin stock. The tubes are arranged in banks of three with the water tubes in front of the oil tubes.

An 84 in. diameter heat exchanger fan, having six adjustable blades, is driven by a 2 speed, 25 hp. motor. Oil and water circulating pumps are driven by a common 15 hp. motor.

Each engine room has forty building air washing units. These all-aluminum units have housings 14 x 5 x 5 ft. in size. Each unit, containing thirty all-aluminum washer cells, has an air capacity of 35,000 cu.ft./min. Water is sprayed through the unit at a rate of 125 gal./min.

Sixty cycle, 4000 volt, alternating current is produced by four 667 volt DC motor driven generator sets. This power is for general works use. There is also a 250 volt, 250 kw generator on each set which provides power for cranes throughout the works.

Each engine-generator unit has its own stack, which handles engine exhaust, generator cooling air, and the air from the heat exchanger. 7½ ft. diameter stacks, having an overall height of 50 ft., were made from ⅛ in. aluminum sheet. The all-riveted stacks were fabricated on the job.

Electrical Conductors

Practically all electrical conductor in the works is aluminum. Approximately 5½ million pounds of aluminum bus conductor alone was used. The bus is arranged in three 5,000 ft. circuits, each including one powerhouse and one pot line. The bus joints were made largely by the inert gas shielded arc method of welding, and a complete welding shop was set up on the site for this purpose. The main bus consists of 22 aluminum bars, each having a cross section of ¾ x 10 in.

Aluminum wire, cable and conduit were also used extensively. Because of their resistance to atmospheric corrosion, aluminum towers and substations were used for the 4,000 volt, auxiliary power distribution system.

NATURAL GAS SYSTEM

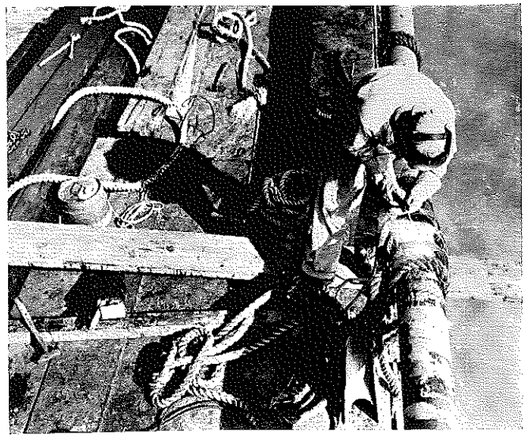
Except for short periods during World War II and the early days of the industry, hydro-electric power has always been used for the production of aluminum in Alcoa's plants. Since low cost electric power is an important consideration in making aluminum economically, the industry is constantly looking for new power sources. It was for this reason that the Point Comfort area, with its natural gas, was chosen for the construction of Alcoa's new reduction works.

The Lavaca Pipe Line Company, a subsidiary of Alcoa, was organized for the purpose of operating the pipe line necessary for gathering and distributing the gas to be used in the works.

Gas is received from both on-shore and off-shore wells. One pipe line, built in the fall of 1949, runs between the Point Comfort Works and the Francitas Gas Company's recycling plant near Francitas, Texas. There are approximately 11 miles of 10 in. pipe and 5½ miles of 8 in. pipe in this line.

Another line, consisting of 7½ miles of 8 in. pipe, ties into the off-shore line in Matagorda Bay.

The main underwater line, in Lavaca and Matagorda Bays, consists of approximately 14 miles of 8 in. pipe, about 12½ miles of it under water. In addition, approximately 9 miles of 4 in. and 6 in. pipe are used for the off-shore



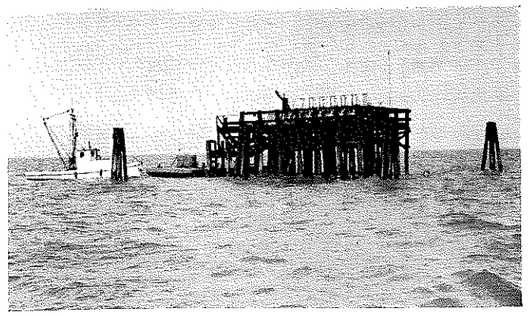
▼ Welding gas line on L.S.T. preparatory to casting off pipe.

gathering lines. The average depth of water in the gas field is about 14 ft.

Work on the off-shore line was started in April, 1948 and was completed the following October. The pipe was coated, wrapped and then welded in 1000 ft. sections. Next, five of these sections were welded in 5000 ft. lengths on dollies placed on greased launching tracks. River weights and buoys were attached to the pipe, and the sections were pulled into the water by tugs.

Off-shore welding was done with the pipe held out of the water by an outrigger at the stern of a converted L.S.T. and by the boom of a dragline extending beyond the bow of the boat. After the welding was finished, the buoys were cut free and the pipe was allowed to sink.

A control and metering station, built well above the water level, is located on a platform constructed of creosoted piling. The gathering system, which includes lines from eleven wells, leads to a 12 in. header on the platform; the header, in turn, discharges into the 8 in. transmission line. Meter runs on the platform are in parallel, and the entire station layout is compact.



▼ Gas Control and metering platform in Matagorda Bay.

Magnesium anodes for cathodic protection were installed at the shore end of the line, at the metering platform and at several intermediate points on the line.

One experimental gathering line consists of about 4,000 ft. of 4 in. aluminum pipe instead of the steel pipe used for the rest of the system. One half of this aluminum line was left bare and the other half was wrapped in the usual way.

On-shore and off-shore lines terminate at the pressure reducing station located on the reduction works site.

The system supplies the 30,000,000 cu.ft. daily requirement for gas at the works.

AIR COMPRESSOR SELECTION AND APPLICATION*

By
JOHN E. MOODY, '39
Joy Manufacturing Company

Basically there are two main types of air compressors, the CENTRIFUGAL, sometimes called the ROTARY, and the RECIPROCATING. Both of these have their place in industry. However, due to the limited application, for the purpose of this report, the centrifugal type will be mentioned only slightly.

The Centrifugal Compressor is primarily used in the lower pressure field, under 50 PSIG. However, it is also used for high pressure applications with a varying amount of success. Here its economical use is limited due to a stalling characteristic under partial loads. This type of compressor is normally controlled by throttling the intake. Being similar in design to a fan, throttling of the intake causes the unit to stall. This stalling characteristic results in high H.P. at partial load and the type is no longer competitive with a reciprocating compressor. There is also indication that the maintenance of this type of compressor is increased when it runs under partial load. This limits its economical use to large installations where reciprocating compressors can be used to trim the load and the centrifugal compressor is allowed to operate under full load all the time.

The Reciprocating Compressor can be broken down into two main types, the AIR COOLED and WATER COOLED. Both of these can be further classified into two categories, the *single* and *two stage*. These will be discussed further as follows:

AIR COOLED COMPRESSORS

These are normally two stage and as their economical and useful application is limited, no further subdivision will be made in this report.

This type of compressor is designed similar to the automotive engine. It is single acting, compressing only on the upward stroke. Thus the bottom of the piston is exposed directly to the crank case. The connecting rod converts power direct from the crankshaft to the piston. The bearings and cylinder walls are lubricated either from a force feed or splash system. The cylinder walls and on some models parts of the frame are arranged with fins for better cooling. A fan is mounted on the unit and arranged to blow air across the cylinders and crank case. If it is two-stage the air passes through a radiator mounted between the cylinders and arranged so the cooling fan can suck air through the radiator then blow it onto the cylinders.

The main disadvantage of this type of compressor is its higher operating speed and light construction. These units have a much higher maintenance cost and a shorter life. Actually the life of this compressor is approximately one-fourth that of the heavy duty type. As in an automobile when the piston rings start to wear, the unit uses oil. In the case of the compressor, this oil is pumped out into the air lines in the plant.

The use of this compressor is limited to intermittent work. It can be used very effectively for standby protection and for intermittent jobs where it will run only a small percentage of the time. It is used on construction jobs and in industry where there is no water or where there is danger of freezing. Because of its lower first cost, it is sometimes purchased for jobs which will only last a short time. However, frequently it is bought for continuous use strictly because of its low first cost and without giving consideration to future maintenance and life.

WATER COOLED COMPRESSORS

Single Stage

The heavy duty single stage compressor is most commonly seen in the small factory. This type is built in sizes ranging from 15 to 100 HP. By single stage is meant that air is taken into the cylinder at atmospheric pressure and compressed to the final discharge pressure in one step. This type of compressor is normally double acting, compressing on both sides of the piston. It is heavy duty and constructed of heavy cast iron. The cylinder walls are thick and surrounded with an efficient water cooling jacket. The cylinder is separated from the crank case by a distance piece which prevents oil in the crankcase from entering the cylinder.

The connecting rod transmits power from the crankshaft to a cross head, which in turn carries it to the piston by means of a piston rod. This crosshead absorbs all the side thrust resulting from the conversion to reciprocating motion.

The only disadvantage of this type of compressor is its low over-all efficiency and its high discharge temperature. In compressing air adiabatically the theoretical discharge temperature of a single stage compressor with 70 degrees intake air and 100 PSIG discharge pressure is 485 degrees. Actually a compressor does not follow true adiabatic compression condition. The water jacket removes some of the heat and the discharge temperature is about 385 degrees.

The average volumetric efficiency of a single stage compressor is about 71% and it takes an average of 22.4 BHP to compress 100 cubic feet of air.

There are many advantages of the heavy duty water cooled compressor over the air cooled type but these are principally longer life and lower maintenance cost.

Multiple Stage

These units are found in the larger plants and run in sizes from 50 HP to over 1000 HP. Although in arriving at high pressures, multiple stages are used, for the purpose of this report, only the two-stage unit will be discussed. This type of compressor is just what the name implies. The air is compressed to its final pressure in two stages. It is taken into the low pressure (the larger) cylinder at atmospheric pressure and temperature. It is there compressed to about 27 PSIG and discharged into an intercooler. Here the air passes around a number of copper tubes through which cooling water is flowing. This reduces the air temperature to approximately room temperature and it is then drawn into the high pressure (smallest) cylinder, where it is compressed to its final pressure, usually 100 PSIG and discharged into the receiver.

The two-stage air compressor accomplishes the following: Reduces final temperature, reduces power consumption, partially eliminates entrained moisture and increases volumetric efficiency by reducing the clearance and expansion loss. Generally piston loads are below those which would be found in similar sizes of single stage units.

* Presented at Great Lakes Power Club, Fort Wayne, Indiana, May 26, 1950.

The two-stage air compressor has definite advantages in its overall efficiency. The volumetric efficiency averages about 85% while it only takes an average of 18.8 BHP to compress 100 cubic feet of air. Comparing these figures with the single stage compressor, the final discharge temperature is about 265 degrees F.

The only disadvantage of the two-stage air compressor is the higher first cost compared to that of the single stage unit.

Cost of Compressed Air

Before final selection as to the type of air compressor is made, consideration should be given to the cost of compressing air.

Although air cooled compressors are normally two-stage and their volumetric efficiency is around 85%, the HP per 100 CFM is equal to or higher than that of the water cooled single stage compressor. Accordingly, for the purpose of this report the cost of compressing air by *air cooled* units can be considered equal to or slightly higher than that of the *water cooled stage compressor.*

Listed below are operating costs, based on dollars per 1000 cubic feet of air for the HEAVY DUTY TYPE OF COMPRESSOR.

	Single Stage	Two Stage
Energy cost	$.0331	$.0265
Operating and maintenance	.0200	.0200
Depreciation	.0110	.0118
	$.0641	$.0583

These figures were arrived at by taking an average energy cost throughout the Midwest and placing it at $.01 per KWH. In some localities such as central and Northern Wisconsin, this figure will be low, while in Central Indiana this figure is high.

Small compressor installations never have an operator tending them full time. To arrive at some average figure it was estimated that an installation of 400 HP size, or 2200 CFM would require a man's full time. Smaller and larger sizes have been pro-rated on this basis. Wages were pegged at $1.75 an hour. Lubricating oil and cooling water are figured in the operation cost. Maintenance was figured at a flat $.005 per 1000 cubic feet. This still allows for a small amount of overtime if it is needed.

Depreciation was calculated on the basis of 100% writeoff in 15 years time.

Final Selection

The type of compressor to be purchased should take all the above subjects into consideration, whether it is *air cooled* or *water cooled* and if the latter, whether it should be *single* or *two stage.*

It should never be hard to decide between the AIR and WATER COOLED compressor. If the unit will run eight or more hours a day for more than four years, a person should never buy an air cooled compressor if water is available. The short life and high maintenance cost will be the deciding factor.

In choosing between the single and two stage air compressor, more thought will have to be given to this decision. In sizes running from 15 to 50 HP, there are no two stage units so only the single stage compressor can be purchased. However, from 50 to and including 100 HP sizes, both the single stage and two stage compressors are built. Above 100 HP only the two stage air compressor is manufactured.

The hardest decision to make is on compressors between 50 and 100 HP size. Two factors should be taken into consideration—local energy cost and number of hours the unit will be operated per day.

A look at the power bill will show the energy cost. This is usually prorated and decreases as the volume of energy used goes up. If an additional air compressor is being added to the plant, then one can say that the energy consumed by this compressor can be charged off on the lowest scale. However, the only fair way to record the energy cost is to take an overall average cost of the plant and charge that to the compressor.

When this is obtained then the operating cost for either a single stage or two stage air compressor can be accurately figured. This will amount to so much an hour and then knowing the number of hours a day the compressor will operate, the amount saved over a period of a year can be arrived at. At the same time initial costs of both the single and two stage compressor should be obtained. If the savings in operating cost in the two stage compressor is enough to pay off the difference in first cost in less than five years, then the two stage compressor should be purchased.

This, of course, is looking at the picture from a long range stand point. It is known that some management will not buy any piece of machinery that is more expensive unless it will pay for itself in two years. Others won't buy it regardless of the savings. They are only interested in first cost. Thus some air cooled compressors are bought when they could not otherwise be justified. Many large single stage air compressors are bought instead of the two-stage unit just for this reason.

APPLICATION

Today compressed air is almost as essential to the operation of a plant as electricity, water and fuel. Practically every plant has an air compressor of one size or other. The air line is piped throughout the plant along with water and steam. In spite of the heavy demand for compressed air and for its ever increasing use, this is the most inefficient power found in the industrial plant.

It is not meant that compressed air is inefficient in its work. It is based only on the ratio of energy used to manufacture the compressed air to that energy arrived from the compressed air itself. One very good example of this is the air motor. Here it takes a 60 HP electric driven air compressor to operate a 10 HP air motor. Another example is the air cylinder. Here the ratio is a little better—about 4 to 1.

Why then is compressed air so much in demand? The primary advantages of compressed air over electricity and steam are these: It is flexible; unlike electricity an air motor cannot be damaged when it is overloaded and stalled. Unlike steam, air does not lose its power in transportation. It is safe, needing no special installation such as the power line. It is cool and will not burn as the steam pipe does. Then there are many things which can be done with air that cannot be done either by electricity, steam or hydraulic power.

Use of compressed air falls into three major categories which will be discussed below. There are many other special uses which properly cannot be classified in any of these three categories but for the most part, one either uses compressed air in a *pneumatic tool,* an *air cylinder* or he uses it in *free blowing.*

The Pneumatic Tool

This is one of the oldest and most popular uses of compressed air. In the quarry the old steam driven rock drills were soon converted over to air. Most of these tools listed below are piston operated—some are the vane type.

A few of these are: the screw drivers, wrenches, chipping hammers, grinders, nail drivers, riveters, rock drills, concrete breakers and many other mining and contracting tools. Most of these could be replaced by electric driven tools. However, experience has proven that the pneumatic tool is much more dependable and the maintenance cost is much less. Small electric tools operating off 110 volt have a tendency to stray away from the plant and end up in an employe's basement. Air tools do not create this temptation as few people have air compressors in their homes to operate them. In some plants such as radio manufacturers, high cycle electric tools interfere with the testing of radios and pneumatic tools must be used.

The Air Cylinder

The machine tool industry has found many uses of the air cylinder on their equipment—some of these being the automatic chuck, air clutch, small punch presser, spot welders, and many others.

The air cylinder is used equally as well for driving as it is for lifting. In the form of a pile driver or drop forge, it has replaced steam to drive. The air hoist of the air cylinder type is used to lift objects and to open and close large heavy doors.

Free Blowing of Air

Some of the uses are sand blasting, paint spraying, pneumatic conveying, cleaning off equipment, air ejection on rapid punch presses and many others.

Of these three the air cylinder is the most economical with regard to the consumption of air. Normally this is a positive displacement action and the amount of air required can be calculated if the volume of the cylinder and number of operations per minute are known. It should be remembered, however, that compressed air at 100 PSIG has a compression ratio of 7/8 that of free air.

The most uneconomical of the three is the free blowing of air. Here a large amount of air is usually wasted. In spite of this many jobs can now be accomplished that could never have been done. Many other jobs can be done faster.

SPECIAL APPLICATIONS

Special applications of compressed air are found in the use of the non-lubricated air compressor which delivers oil-free air. By non-lubricated it is meant that no oil is allowed to enter the cylinder. This called for a special design which resulted in the use of carbon piston rings.

In the early '30's certain industries were well aware of the limitations of their compressed air plant. Breweries and food industries found that oil in the air was spoiling some of their products. A great deal of time and money was spent trying to manufacture a filter or separator which would eliminate oil from the air. Although some of these traps worked to a certain extent, none of them were perfect.

In order to produce absolute oil-free air, the non-lubricated or carbon ring compressor came into being. At first, work along this line progressed very slowly due to the high maintenance problem connected with the rings. The primary difficulty encountered was the wearing of the rings. Horizontal compressors, which allowed the piston to drag on the cylinder wall were in their nature alone objectionable.

To overcome this some manufacturers added an extra stuffing box on the far end of the cylinder and an extended piston rod. This acted like an outboard bearing which apparently was effective to a point. However, it was still necessary for the operator to tear down the compressor every few hundred hours and turn the piston a quarter of turn. This distributed the wear on the rings. In order to speed up this operation, special heads had to be designed.

The vertical or semi-vertical compressor lends itself to the carbon ring application much better. This is only natural as the drag on the cylinder wall is much less and in the full vertical compressor it is practically eliminated.

At first the demand for this type of compressor was limited to the food industries but in the last few years, many other industries are trying it out. The Central Power Station was quick to take advantage of this type. In using compressed air for instrument control, a great deal of trouble had been encountered when oil got into the air. Now most Central Stations are installing small units, approximately 30 HP in size.

During the last few years other industries such as chemical companies, television tube manufacturers and food container manufacturers have installed non-lubricated compressors in their plant.

Most of these companies have both the standard air compressor and the non-lubricated units. However, at least one company in one of their new plants has gone over to non-lubricated air 100%.

Because the demand for this type of compressor has been accelerated during the last year, a good deal of development work is going on right now. In a cylinder where no oil is used for lubrication, steps should be taken to prevent corrosion. One manufacturer is now using chrome plated liners in their cylinders and stainless steel valves and piston rods. One other change in design which has become necessary is the length of the piston rod and distance piece. In the standard air compressor, part of the piston rod which passes through the crank case also enters the cylinder. This rod has a microscopic film of oil and some of it is bound to be wiped off in the cylinder. To prevent this a longer piston rod and distance piece is used which prevents any part of the rod that has been in the crank case to enter the cylinder.

The use of non-lubricated air being new to the industry, creates a lot of unknowns. One of these, which cannot be answered definitely right now, is the life of the air pipeline. In the standard air compressor installation, a mixture of oil and water enters the pipeline with the air. This oil forms a film around the inside of the pipe and prevents oxidation. In the non-lubricated system, the lack of oil may decrease the life of the air line greatly. Water and air cause oxidation and both of these are present in the line. This being the case, the installation of non-lubricated compressors should also include galvanized air pipe lines.

CONSERVATION OF AIR

It has been shown that compressed air is expensive, accordingly every means should be taken to conserve this air and see to it that leaks and waste are eliminated. Frequently, when the compressor is overloaded, it is not necessary to buy a new one. Sometimes as much as 25% of the entire compressor output is being lost in leaks. A lot more is probably being wasted.

LEAKS in an air compressor installation can occur anywhere. These are more frequently found in old pipeline installations. Usually they are found in the pipe fittings such as couplings, tees, unions, elbows and valves. The air hose is a common place for leaks to occur. The hose itself might leak but more often the nozzle or the pneumatic tool on the end of the hose is leaking. Packings on air cylinders are always a source of trouble.

In order to stop these leaks a frequent check of the air compressor installation should be made. As the noise of operating machinery hides the sound of escaping air, a thorough check can best be done while the plant is shut down. A good procedure for making this check is as follows:

Start up the compressor and make a tour through the plant turning off all valves and fittings that are using air. These can easily be found because escaping air makes a very distinctive hissing noise. Return to the compressor room and watch the pressure gauge on the receiver. If this falls off rapidly and the compressor is forced to pump more air into the sys-

tem, then it is known that leaks do occur. To find these leaks, follow the air line through the plant. Listen for the sound of escaping air. Hold your hand over the end of the nozzles and pneumatic tools and particularly check valves with open connections.

Leaks found this way should be corrected as soon as possible. Some of them can be taken care of while the plant is in operation but a lot of the work will probably have to be done over the week-end or at night. A good time to make this type of check is during the normal two-week vacation. This will give plenty of time to go over the entire pipe line stopping the leaks.

Even after this type of check is made and the leaks corrected, there will probably be a lot of small ones which cannot be heard or felt. To find these, go over the connections with soapy water.

WASTE OF compressed air usually results from careless operators and can only be corrected by strict policing of the system. Wasting of air means that more is used than is required. Sometimes this is very hard to determine and can only be done by actual tests.

Some of the more common places where air is wasted are as follows: Air ejectors in rapid punch presses; ejection of chips from lathes; failure to use foot or cam operated air valves; allowing nozzles in sand blasting operations to become worn.

One of the most frequent means of wasting air is to use it for cooling purposes. In the summer time a constant check must be made to prevent this. Men find that by cracking open an air valve and allowing the expanding air to blow over them, they have a very effective cooling system. It is much cheaper to buy fans.

To prevent this waste it is a full time job. Tests should be run to find out just how much air must be used to do an efficient job. Care should be taken that the volume of air is not reduced to a point where efficiency is hurt. In the case of air ejectors, cam operated valves should be used so air is only allowed to blow when the stroke of the press is completed and the object is ready to be ejected. The amount of air consumed should be regulated so that just enough is used to eject the object. In the use of air for blowing chips away from a lathe, checks should also be made to determine the minimum size copper tube that can be used. Many plant engineers then crimp the end of the tube so as to decrease the size of outlet. In places where air is used for testing tanks, etc., foot valves should always be used so the operator can readily shut off the air while he is reaching for another tank.

A word of caution should be injected at this point. Some manufacturers actually have become too cautious in the use of air. Today, the price paid for labor is more than double that of a few years ago. At the same time, power cost, electricity, has actually gone down. As shown earlier in this report energy cost represents over half the cost of compressing air. In certain types of jobs the conserving of air will actually increase the length of time to do the job. When this happens then management is paying more for their production cost. For this reason careful tests should be run to find out just how much air is required to do the job without any loss of time.

OVERTIME VS. PREVENTATIVE MAINTENANCE

Today, due to the high cost of labor, many plants are eliminating all overtime which is not absolutely necessary. Unfortunately, some plant managers feel that preventative maintenance on air compressors is unnecessary. Normally in these same plants the compressor operates continuously and with the exception of the noon hour, there is no time that maintenance work can be done.

An example of how inconsistent this can be was found in a Chicago plant. There were two 75 HP single stage compressors—one being a couple of years older than the other. Last winter the plant manager became alarmed because the air pressure was falling off and as far as he could see, his production was actually lower than it had been a few months before. Accordingly, he rightfully reasoned that less air should be used, so a check of his installation was made by the compressor manufacturer's representative.

In the morning while the plant was operating the compressors could only be inspected from the outside and from all outward appearances, they were in good condition. It was, however, noticed that the intake filters were inside of the room and on one installation, this filter had become so dirty that it was super-saturated and dirt was falling onto the floor. The operator mentioned that one of the compressors had been gone over about four weeks previously and all the valves and the filter had been cleaned. The other compressor had not been touched for at least four months. He went on to state that management would not allow any overtime and there wasn't time during the normal days operation to do this work as both compressors were operating continuously.

In the morning a trip around the plant was made to look over the pipe line to find out how the air was being used. This being a steel fabricating plant, most of the air was used in pneumatic tools. For every five tools in the plant, two were in operation. The other three were laying on the floor and in a lot of cases air was leaking through the valves. Before any further check was made the plant engineer was told that probably 20% of his compressed air was being lost in leaks. It was also pointed out that barring any broken valves or piston rings in the compressor, the only thing that could cause a drop in efficiency was dirty valves and the air filter. Either one of these could decrease the overall efficiency of an air compressor ten to fifteen per cent.

During the noon hour when the entire plant was down and no air was being used for production, a check was made of the above statements. First the compressor which had recently been cleaned was operated. It was found that exactly 20% of the entire plant's compressed air was being lost in leaks. This amounted to 128 CFM. After this check was made, the second compressor, which was the newest of the two, was operated in order to check it against the clean one. It was found that this compressor put out 34 CFM less than the clean one. This represented about 11% of its output.

Knowing that single stage compressed air costs about $.064 per 1000 cubic feet, it was shown that leaks in this plant were costing them $3.98 an hour and the dirty compressor was costing them $1.01 an hour. The plant operated about 16 hours a day.

In order to go over one of these compressors completely cleaning the valves and the air filter, it would take about a total of eight man hours. Figuring this on the basis of $1.75 an hour at time and a half, it would cost them about $21.00. In less than two days time this plant was losing enough money to pay for a good cleaning of their compressor. Yet management would not allow this even after four months.

The surprising thing about the leaks in this plant was that they were so located that most of them could have been corrected during normal operating time.

PROGRESS BY BELT CONVEYORS*

By
HAROLD VON THADEN

To illustrate materials handling magic, I should like to point to a few examples of belt conveyors in action. Then I would like to explore what I believe are the three most promising newer fields in which belt conveyors can, and will, benefit industry.

The building of our great dams in the West to produce hydro-electric power, with which Buffalo is so richly and naturally endowed, gave the belt conveyor one of its finest opportunities to prove its worth in a most spectacular way. In fact, the whole idea for super-long conveyor lines may have been born with the construction of these dams.

Shasta Conveyors

The longest conveyor system ever operated was constructed at Shasta, on the Sacramento River in California, where a ten mile belt conveyor system was able to handle the 12,000,000 tons of aggregates at a cost approximately one-third below the railroad. Before deciding on a conveyor, engineers had estimated that aggregates would fill six freight trains a day and the operation would require the building of many spur lines and sidings, making the project too costly for a railroad to attempt.

Grand Coulee Conveyors

At Grand Coulee in Washington, the only practical means of transporting construction aggregates was on a straight-line belt conveyor, with sections averaging 1000 feet in length, that carried 1000 tons an hour and finally spanned the river on a low-cost, 3500-foot suspension bridge. A second conveyor system removed the principal excavation at a rate of 4000 tons an hour. Had this operation been attempted by truck, it would have required a super-highway some three miles long, filled with trucks operating continuously about a hundred feet apart.

Bull Shoals Dam

After these successful and cost saving experiences, it was natural that the same system be used in the construction of the Bull Shoals dam in Arkansas. Today a seven-mile conveyor—the longest now in operation—is rolling steadily at the job of moving about 4,000,000 tons of aggregates needed to build this giant hydro-electric power project.

Sand and Crushed Rock

Another phase of conveyorization in the aggregates field is well depicted in this area by the conveyor systems at the Federal and Buffalo crushed stone companies, the Genesee Sand and Gravel Company and the Leroy Lime and Crushed Stone plant not far from here, as well as at the companies, like Buffalo Sintering and Buffalo Slag, who turn slag into roofing and road-building materials.

Grain Industry

Another industry that is important to Buffalo and to conveyors is the grain industry, both in its elevator and flour and feed stages.

Large grain elevators like Standard, Canadian Pool, and Concrete Central are completely conveyorized and can handle tremendous quantities of barley, wheat, corn and oats on belts at an average of 18 to 20 thousand bushels an hour. Often the conveyors serve another purpose, for when stored corn or wheat generates too much heat, it is put on belts and run around the system until it cools down.

Often the operation is continuous. Grain is pulled up from the ships on a marine leg conveyor, elevated and run through an empty bin to be weighed, and immediately discharged into waiting railroad cars in a single rapid conveyor movement. In one instance, Marine Elevator began work on a shipload of 458,000 bushels of barley at seven o'clock in the morning. By 11:45 that night the grain was loaded in 250 railroad cars and everybody was ready to go home. That day they had loaded about 15 car-loads an hour!

From grain and flour to coal and iron ore is a long gap, but it is bridged by the ever-present belt conveyor system. Conveyorization in the mines has become as essential to greater productivity as it has in the flour and feed mills of Washburn Crosby and General Mills. As labor production costs in the mines rise and as the demand for coal increases, the necessity for more mechanization increases too. And the mechanical mining devices for digging more coal cannot operate unless there is continuous removal of the coal.

Coal Mining

As long as twenty-five years ago, a large coal company in Pennsylvania replaced its six-mile underground railroad with a belt conveyor system. Today, this system regularly delivers upwards of 1800 tons of coal an hour from the work facings, through a mountain, to waiting barges on the Monongahela River. This was more than a major achievement in heavy materials handling — this was the proving ground of an entirely new mode of transportation. A similar installation notable for its single conveyor with 10,900 foot centers, is going into operation shortly near Morgantown, West Virginia.

On the coast of Southern Chile a remarkable conveyor installation is at work today in a coal mine some three hundred feet under the bed of the ocean. Through a mine tunnel running out under the ocean a 4700-foot belt conveyor hauls coal back to the shore line where it is passed on a series of slope conveyors through a four thousand foot tunnel up to the preparation plant 600 feet back of the water's edge. Here it is cleaned and sized for transportation to the docks for export all over the world.

To date some 1000 miles of belt conveyors have been installed in our mines, leaving 4000 miles to go for complete conveyorization. This first step, however, has already helped increase production to six tons of coal per man-day, while England turns out a little over a ton a man-day and Germany and France less than that.

Throughout the industries that depend upon coal, belt conveyors are today making themselves indispensible. One of the largest coal and coke handling installations in the country operates at the Donner Hana Coke Corporation, where one hundred percent conveyorization insures the production of vital fuel for industry in the Niagara Frontier. At the Semet-Solvay plant a belt conveyor picks up coal directly from barges on the river, tunnels under a road, and carries it to the works half-a-mile away. In both these installations the same conveyors reverse themselves and transport the finished coke.

Industrial Plant Material Handling

The Bethlehem, Republic and Wickwire-Spencer steel plants in this area are all conveyorized for handling bulk materials as well as for handling steel. For Bethlehem, designs are progressing for a system of conveyors and vibrating machinery for transporting and sizing ores, coal and coke that will make up the largest and most modern sintering plant in the country.

* Part of an address by Harold Von Thaden, Vice President of Hewitt-Robins Incorporated and General Manager of Robins Engineers Division, before the Engineering Society of Buffalo, Statler Hotel, Buffalo, N. Y., Thursday, April 20, 1950, 8:00 P.M.

On a somewhat smaller scale, although every bit as successful, coal yards such as Hedstrom, Yates-Lehigh and Bettinger, use one or two main conveyors operating in conjunction with elevators for easier and quicker handling.

Two other local industries that duplicate the national picture in relying on conveyors for economic handling of materials are industrial chemical plants and power stations. Buffalo Electro-Chemical and Hooker Electro-Chemical among the former group, and the Niagara - Mohawk Power Company's Huntly Station—largest in State—and the new Dunkirk station all are conveyorized.

Belt conveyors are not limited to carrying huge quantities of rugged materials for long distances. Soft goods like bulk and bagged sugar, sulphur, nitrates and fertilizer are all transported on conveyors, as are baggage and dishes in hotels and spinach in food processing plants. Often a very ingenious use of a belt opens up a new field to conveyors and exemplifies the varied problems that are solved every day by the conveying industry.

The Norton Laboratories, a plastic manufacturing firm, had some difficulties caused by too much reflection from a certain section of moulded plastic camera part they were making. Sandblasting by hand to rough up the surface of one area of the part, while leaving the remainder smooth, proved to be too expensive. By taking their problem to the J. M. Cranz Company, Hewitt-Robins distributors in this area, they came away with a 30-foot conveyor belt cut with windows exactly fitting the area of the part to be sandblasted. The camera parts rode along the belt; the exposed portions took a sandblasting from below; and the finished products were neatly discharged into boxes at the far end of the line.

Three Promising Fields

These, then, are some of the problems the conveying industry and the materials handling engineer have already been called upon to solve and some of the solutions they have developed. A significant fact is that many of these installations were first designed to overcome difficulties in one particular company and later went on to become standard practice for an entire industry. New developments will continue to come forth in those industries where conveyors are already employed. Three new fields, however, seem to offer the most challenge and the most promising reward for the materials handling engineer. They are: long lines belt conveyors; the processing of raw materials; and maritime conveyors.

In long lines belt conveyor systems we have one of the most imagination-provoking—as well as one of the most practical — projects in present-day transportation. These belt conveyor systems that would carry bulk materials for hundreds of miles overland may, in time, completely revolutionize certain segments of our present transportation system.

Riverlake Belt Conveyor Line

The most ambitious of these projects is the proposed Riverlake Belt Conveyor Line—a $210,000,000 two-way belt conveyor that would connect Lake Erie and the Ohio River, carrying iron ore south and coal north at a saving of between twenty and forty-five million dollars a year.

This system would extend for 103 miles from the port of Lorain on Lake Erie to a point on the Ohio River near East Liverpool. With spur lines serving Youngstown and Cleveland, the total system would measure 130 miles. Composed of some 172 sections of separate belts, as presently designed, Riverlake will include the most modern dockage facilities on the Lake and a preparation plant for washing and grading coal enroute. Stockpiles will be constructed to enable mines to work a year-round schedule.

Running straight toward its objective, over hills and through valleys, the two-belt system will be encased in a metal cylinder and elevated over twenty feet from the ground. Ingenious design at the junction points of the separate flights permits the northbound belt carrying coal to flip over, after it has passed on its load, and become the southbound ore-carrying belt.

The savings on transportation costs anticipated by this system are amazing. At a maximum yearly tonnage of 32,000,000 long tons of ore going south and 20,000,000 tons of coal going north, savings of about $1.50 a ton on coal and about 68 cents a ton on iron ore are estimated. Minimum cargo requirements will be a total of 30,000,000 tons for the entire system.

A year has now passed since the first proposals for Riverlake were made. In the intervening time engineers from several companies in the conveying industry have been working with the Riverlake people on the tremendous number of details comprising a project of this nature, and frequent planning meetings are held.

Riverlake has the support and endorsement of both management and labor in most of the industries in the area to be served by the system. Although legislation affecting a right-of-way was tabled in the Ohio Legislature last year, a major effort to have the bill passed will be made at the next session in 1951.

The advantages and economics offered in support of Riverlake are those inherent in all belt conveyor systems. I should like to touch on them briefly in passing.

Advantages of Conveyor Systems

Conveyor systems offer the lowest cost-per-ton transportation for bulk tonnages. As tonnages rise, the cost-per-ton drops.

Whether a conveyor is carrying maximum or minimum loads, it requires the same minimum equipment and personnel.

Its installation, operation, and maintenance costs are lower than any other type of overland common carrier.

It can travel in a straight line, following the contours of the land to grades as high as 34 per cent.

A framework of structural steel or timber is sufficient, for the heavy tonnages carried travel in a continuous flow; therefore no costly bridges are needed to span rivers, ravines, highways or railroads.

A belt conveyor can—and usually does — operate continuously without time lost for loading and unloading, for starting and stopping.

Critics of Riverlake popped up as soon as it was announced, but none of them could challenge it seriously along practical and feasible engineering lines. In this country where we already have extensive transportation facilities and in other countries where current transport is inadequate, I believe, long-line conveyor systems are the bulk cargo carriers of tomorrow.

I mentioned before that the conveyor idea was not new, but that some of its applications were not only new, but revolutionary. The second of the newer fields for materials handling —the processing of raw materials— comes under this heading.

Conveyors in Processing Materials

If, while we are moving a material from A to B, we do something to it—wash it, grade it, or blend it—we have added the operation called processing to conveyorization. This step adds to the economy of the system, for when a material is reposing in a storage pile awaiting the next step in its preparation for use, it is costing someone money.

Processing, in a general sense, can mean a material entering a plant as a solid, passing through several stages of transformation, and emerging as a liquid—all in a continuous motion. In a specific sense, it can mean the flow of coal leaving a mine and entering a preparation plant to be sized, crushed, washed, blended and delivered in the form and at the rate required to be burned to generate electricity.

One of the main cost-saving factors of processing is the engineering of the installation so that the material moves continuously through the plant at a controllable rate. Thus the belt conveyor becomes important and necessary to the operation.

Blending Materials

Possibly the most valuable form of processing at work today is the system by which raw materials of varying grades are blended to produce a more uniform product for further use. These systems are designed to make a true blend of uniform quality, rather than an ordinary mix. There seems to be some confusion about the difference between the terms mixing and blending. Perhaps the advertising boys who tell us how they blend our tobacco and our whiskey are to blame for the mixing of the two terms.

A mix is merely the combination of two or more materials. A blend is combining them to produce a final product in which each sample contains an exact proportional amount of each of the component materials as they appeared in the original mass.

For a number of years some of our leading steel companies have been using a blending system by which iron ores of high and low grades are combined to produce an amazingly uniform product for the blast furnaces. When the ore is properly blended the rarity of burden changes, such as limestone and coke, is remarkable.

The job of altering the basicity of the materials going into the furnace is greatly reduced.

Since the introduction of this blending system, many blast furnaces have shown increases in output of better than five per cent. Metallurgical coke consumption has decreased about 300 pounds of coke per ton of iron ore produced, and the iron quality and regularity has improved, a vital and important factor in the manufacture of steel.

Successful as blending has been in increasing the yield from iron ores, it has never before been used in coke-making to blend the coal going into the steel industry's metallurgical coke ovens. This year in England, for the first time a blending system has been designed to blend coal for the steelmakers.

Blending of coal is most important to the steel industry, where full production means an average of 203 tons of coal per minute for 24 hours a day. The high rate of mechanization necessary in the coal mines today produces a coal that is widely variable in content. However, to compete successfully with one another and to produce steel at a profit, steel mills must work at an operational efficiency peak. They must function within the narrowest possible range of variation in raw materials content. Thus a blending system incorporated in their coke plant's conveyor system becomes almost a requisite.

Steelmen will be watching this year the installation and initial operation of this first system for blending coking coal at the John Sumners Works, one of England's largest steel plants. As the carloads of coal of varying grades of high and low volatility enter the plant, the system immediately takes charge. The different grades of coal are first distributed by conveyor in thin layers running the length of long piles or beds. When the beds reach the required height, a reclaimer goes into operation. This machine has a large harrow-like face, the size of the cross section of the bed. Working into the bed lengthwise at about four feet a minute, the harrow rakes down coal simultaneously from each layer of the bed. As the coal piles up at the base of the reclaimer, a conveyor collects the fully blended material and carries it to a belt conveyor for transportation to the coke ovens. Thus the blends that go into the ovens are always physically and chemically substantially the same.

Further possibilities for coal blending systems strike the imagination when one thinks of chemical plants using coal, by-product coke plants and the blending of coke itself for various large-scale uses. With proper blending, public utility steam generating stations would find they could produce more steam per pound of coal consumer. In fact, any industry concerned with large quantities of varying grades of materials would do well to consider blending for increased production.

Conveyors in Maritime Industry

The third field offering the most promise for the materials handling engineer touches not only the greater productivity of industry in general but it concerns one of the most basic factors in our national defense—the maritime industry. A healthy shipping industry, operating out of efficient and well designed ports, is vital to our economic and political security.

Many forward steps are being undertaken today by both private companies, and municipal port authorities toward the modernization of our port facilities and in the development of new designs in cargo carrying ships. This is just surface scratching, however, for we have a long way to go before we can feel satisfied that our waterborne cargo carrying facilities have reached their peak of efficiency and development.

For example, it is estimated that some two million tons of general cargo are now by-passing one East Coast port because of a lack of adequate port facilities. This situation is being repeated all over the country in many ports where our domestic fleet operates. The cost of loading and unloading general cargo has crept higher and higher, until today it consumes at least fifty per cent of total operating costs. These operating difficulties are partly responsible for the fact that in the past ten years our domestic salt water merchant fleet has declined from 470 to 175 ships, according to the United States Maritime Commission.

Bulk Cargo Handling

Gentlemen, I feel the answer to these high cargo handling costs, and therefore the solution to one of our maritime industry's most pressing problems, is a conveyorized dock installation for handling general cargo.

Already we have made great strides toward lowering both bulk and packaged cargo handling costs by the use of conveyor systems. The task will not be a simple one, but I believe the materials handling industry is well equipped to design conveyor systems that will handle any sort of cargo with the same ease and economy that we now handle tons of iron ore and boxes of canned pineapple.

The problems presented in handling general cargo are formidable for it appears at the dock in every conceivable shape and size—from pickle barrels to steel structural shapes. New types of conveyor systems must be designed that will handle these varied shapes, or perhaps a form of palletization must be worked out to reduce them to standard shaped units. When we accomplish these tasks, I can see general cargo conveyors running down a pier and discharging their loads to inclined conveyors that will take the cargo aboard the ship in a time and effort saving operation that might cut cargo handling costs as much as 50 percent.

The heavy physical labor of stevedores would be decreased, loading and unloading time would be cut, as would demurrage and damage. In

short, overall handling costs would come down.

One of the problems that always must be faced by the modern port designer is the space required for both storage and for trucks delivering goods. If conveyor systems were used, this space could be given over entirely for storage, while trucks could pass their loads on to conveyors at points some distance from the highly congested dock area.

Older and smaller piers could be modernized and made more useful by conveyor systems. For example, a new conveyor system at a grain dock in an East Coast port increases the rotation of ships carrying both grain and general cargo by cutting the unloading time of the grain ships by six days.

Bulk cargo handling is one phase of the maritime field where conveyors have been notably successful.

Ore Cargo Problems

With experts anticipating the gradual exhaustion of our chief source of high grade iron ore, the Mesabi Range, steel company geologists have been scouring the world for years for new, and untapped, deposits of iron ore. You have, undoubtedly, read of some of their notable discoveries.

One of the most recent has been made in Liberia, West Africa, by the Republic Steel Corporation, where a new mine has been located in the Bomi Hills offering a high grade ore that is equivalent to the ore now being obtained in Brazil and Venezuela.

Chief among the problems of getting this ore aboard ships and delivered to its destinations at Philadelphia, Baltimore and Mobile, is the construction of adequate docking and loading facilities in Liberia to insure a steady flow of shipments.

To handle the huge quantities of this vital material, a dockside conveyor installation has been designed that will stockpile 150,000 tons of ore at all times and will deliver ore to ships at a rate of 2500 tons an hour. Provisions have been made to handle double that capacity in the future.

The ore is brought from the mines, about a hundred miles inland, on railroad cars to the installation at Monrovia, capital and main port of Liberia. Here it is taken by belt conveyors to the storage area where it goes into stockpiles.

Upon the arrival of a ship the system reclaims ore from storage and delivers it directly to the dock where a traveling ship-loading tower with a boom conveyor takes over. The tower moves along the dock the length of the vessel with the boom shuttling across the ship at the same time. Thus the ore is neatly and properly stowed in the hold. This double action of the tower and the boom makes it unnecessary to move the ship during loading operations.

The entire dockside installation, estimated to cost half a million dollars, will take a year to build, and when completed will have seven conveyors totalling 2400 feet in length and using 5000 feet of belting.

Rich iron ore deposits in two other widely separated countries, Labrador and Venezuela, were spotlighted recently and had materials handling engineers reaching for their maps and slide rules.

First in order of discovery is the Hollinger-Hanna concession in Labrador, where rough terrain would make it almost mandatory to have a belt conveyor feeding ore to the projected railroad. Because they can run through country where no railroad can operate, conveying systems can make possible profitable railroad operations. This ore would be loaded on railroad cars at the mines by conveyor and delivered to the St. Lawrence River where a conveyorized port installation would speed it aboard ships bound for Buffalo and the West or down the East Coast.

Perhaps even more important than the iron in Labrador are the three exceedingly rich deposits in Venezuela. One, at El Pao, is already being developed by the Bethlehem Steel Company and a loading and stockpiling port installation consisting of four 1000 foot Hewitt-Robins conveyors and the necessary loading machinery is being readied for operation this Spring. It is entirely possible that shipments of ore from the heights of South American mountains will find their way next year into the Bethlehem plant in this city.

Recently the United States Steel Company announced its discovery of an amazing 2000 foot mountain of iron, at Cerro Bolivar, which has been called the richest single iron deposit in the world. A nearby area, said to be equally as rich, has been uncovered by the Venezuelan government.

Plans have been announced for the development of both these deposits and for one, a long line belt conveyor has been suggested that would cut through the jungle carrying ore from the mine to water transportation. Because Venezuela has little coking coal, the emergence of a home-grown steel industry seems remote, so it is believed that most of the ore will be shipped to this country.

Modern port facilities are already planned at several places on the East Coast for the receipt of shipments of this ore. Conveyors will play a large part in unloading and transferring ore to railroad cars, and future years may see long lines conveyors carrying the ore directly to the steel plants.

Self-Unloading Ships

Another facet of the bulk cargo handling field appears here in Buffalo and on the Lakes where fleets of self-unloading ships are delivering bulk materials for such ship operators as Boland and Cornelius, Bradley Transportation, the Hutchinson and other important lines. Throughout the Lakes more and more ship owners are turning to self-unloaders when the time comes to replace out-moded ships in their fleets.

These self-unloading ships, chiefly developed by Hewitt-Robins, can discharge 10,000 tons of bulk cargo and neatly pile it ashore in about five hours with as few as three men handling the conveyors, and, if dock space permits, without the assistance of any shore-based facilities. At the local Buffalo docks of the Michigan Limestone and Chemical Company, for example, you can see the ease with which these self-unloaders handle their cargoes of limestone.

These ships were not all built specifically for self-unloading. Many very successful conversions have been made of cargo ships that had been operating for as long as thirty years by grab-bucket unloading methods. In general, a self-unloader consists of a pair of belt conveyors served by a hoppered hold. These conveyors deliver to an inclined pan conveyor which carries the load to the deck and feeds it to a boom conveyor. The boom pivots out to the delivery area where it discharges the cargo.

Until recently, only shippers of bulk materials could keep down their costs by utilizing conveyors. Today, however, a system of portable conveyors and elevators has been designed to load and stow packaged cargo. It is estimated that 25 percent of the total man-hours involved in loading go toward stowing this boxed cargo. With the introduction of these conveyors, shippers can now reduce this time considerably. These systems appearing for the first time as an integral part of a ship's structure, are nearing completion aboard three of the newest and fastest round-the-world passenger-cargo ships, now being built for the American President Lines. By means of the system, 1500 pieces of boxed cargo, of a maximum weight of 250 pounds, can be loaded in an hour. The cargo is brought aboard through side loading ports where portable conveyors, carry

(Continued on page 42)

PROGRESS NEWS
U. S. ATOMIC ENERGY COMMISSION

STUDIES OF JAPANESE ATOMIC BOMB SURVIVORS

Japanese survivors of the atomic bombings at Hiroshima and Nagasaki have apparently recovered from the acute or immediate effects of the bombings, but within recent months the first evidence of delayed effects—the formation of eye cataracts—has come to light, according to records of the Atomic Bomb Casualty Commission of the National Research Council.

Since 1947, with the support of the Atomic Energy Commission, the ABCC has conducted continuous studies of the medical and genetics effects on the populations of the two bombed cities.

The findings will be reported in the scientific literature and will be made available to the Department of Defense, National Security Resources Board, U. S. Public Health Service and other agencies, who will be responsible for defense and relief measures in the event of an atomic disaster in this country. To date ABCC has accumulated some data on more than 150,000 persons in the bombed areas.

Dr. George Hardie, AEC Medical Branch, and John V. Lannan, AEC Finance Division, are now in Japan to study operations of the ABCC program. A similar survey was made in 1949 by Dr. John Z. Bowers, of the Division of Biology and Medicine. Dr. Hardie was formerly associated with the Division of Preventive Medicine, Johns Hopkins University. Mr. Lannan went to Japan from Formosa, where he has been on a special assignment for the Economic Cooperation Administration, on loan from the AEC.

Following the discovery that radiation similar to that released in an atomic bomb burst had caused cataracts to form in the eyes of research workers in this country, a preliminary ophthalmic survey was started at Hiroshima last year. This survey, led by Dr. David G. Cogan and Dr. S. Forrest Martin of the Harvard Medical School, revealed ten cases of cataracts believed to have been caused by the atomic bomb. Subsequent examination of 1000 persons, most of whom were within 3,000 feet of the point above which the bomb exploded, has led to the discovery of about 40 certain cases of radiation cataract and an additional 40 suspected cases.

Much of the effort of the ABCC has necessarily been expended in learning more about the normal state of health of the Japanese people. This has been made more difficult by the great social changes resulting from the war and the artificial type of population control resulting from the strong regulation of civilian activities during almost 10 years of war.

The initial arrangements for the genetics program were organized in January 1947 by Dr. James V. Neel, University of Michigan, the first Director of ABCC. The current program is under the direction of Dr. H. Grant Taylor and Dr. William J. Schull.

One of the primary operating problems in the past has been the lack of housing at Hiroshima for the 135 American personnel working on the program. At present these persons must commute from Kure, 30 miles away, where they have been living, often in sub-standard housing, and have been spending about three and a half hours per man per day in travel. A housing construction program designed to accommodate all American personnel working in Hiroshima is contemplated.

ATOMIC ENERGY SCIENTISTS MEASURE LONGEST KNOWN TIME INTERVAL AND BRIEF HALF-LIFE OF NEUTRAL MESON

The longest time interval ever measured has been reported within recent weeks by atomic scientists at the Argonne National Laboratory, Chicago. At the other end of the time scale, another group of scientists has clocked the life-span of the most ephemeral known sub-atomic particle at the Radiation Laboratory, University of California, Berkeley.

The two newly measured time intervals make a striking contrast. The longer interval is 5×10^{41} (5 followed by 41 zeros) times greater than the smaller.

The half-life of a radioactive species or isotope of the sulfur-like element tellurium, known as tellurium 130, was measured at 1.5 sextillion (15 followed by 20 zeros) years by Dr. Mark G. Ingraham and John Reynolds of the spectroscopy laboratory at Argonne National Laboratory. Up until now tellurium 130 was thought to be a stable or non-radioactive isotope of tellurium.

The half-life of a radioactive isotope is the period of time in which half of the atoms in a sample will undergo radioactive decay. The half-life for any given radioactive isotope is unique and is characteristic of that isotope. Stable isotopes do not undergo radioactive decay and hence appear to have an infinite half-life.

The measured half-life of tellurium 130 is about 500 billion times greater than the age of the earth which is estimated at about 3 billion years. Thus, only an infinitesimal amount of the earth's original tellurium content has so far decayed.

According to relativity theory, the speed of light (about 186,000 miles per second) is the top velocity for any material particle. The measured half-life of the meson is so short that during this time light itself can move only about one-thousandth of an inch.

NEW PLAN FOR DISTRIBUTION OF ATOMIC ENERGY TECHNICAL REPORTS

American business firms will have easier access to non-secret atomic energy technical reports under a new distribution plan announced jointly by the Atomic Energy Commission and the U. S. Department of Commerce.

Under the plan the Office of Technical Services of the Department of Commerce will become the sales agency and reference source for non-secret AEC technical reports.

Both the Atomic Energy Commission and the Department of Commerce expect the new plan to extend the use by American business firms of the valuable technological results of atomic energy research. These findings frequently relate to fields other than nuclear physics, and have proved to be of interest to all types of manufacturers, small as well as large.

NON-SECRET ATOMIC ENERGY REPORTS AVAILABLE IN 31 LIBRARIES

Thirty-one American libraries in all parts of the country have been named as official depositories for complete sets of atomic energy declassified and unclassified research reports by Atomic Energy Commission.

The complete list of depository libraries are:

University of California, Berkeley and Los Angeles.
Denver Public Library, Denver, Colorado.
Yale University, New Haven, Connecticut.
Library of Congress, Washington, D. C.
Georgia Institute of Technology, Atlanta.
University of Chicago, Chicago, Illinois.
John Crerar Library, Chicago, Illinois.
University of Illinois, Urbana.
Iowa State College, Ames.
Louisiana State University, Baton Rouge.
Harvard University, Cambridge, Massachusetts.
Massachusetts Institute of Technology, Cambridge.
University of Michigan, Ann Arbor.
Detroit Public Library, Detroit, Michigan.
University of Minnesota, Minneapolis.
Linda Hall Library, Kansas City, Missouri.
Washington University, St. Louis, Missouri.
Princeton University, Princeton, New Jersey.
Cornell University, Ithaca, New York.
Columbia University, New York, New York.
New York Public Library, New York.
Duke University, Durham, North Carolina.
Cleveland Public Library, Cleveland, Ohio.
Ohio State University, Columbus.
University of Pennsylvania, Philadelphia.
Carnegie Library of Pittsburgh, Pittsburgh, Pa.
Joint University Libraries, Nashville, Tennessee.
University of Texas, Austin.
University of Washington, Seattle.
University of Wisconsin, Madison.

ATOMIC ENERGY SOURCEBOOK

The *Sourcebook on Atomic Energy* by Dr. Samuel Glasstone, has been awarded to the D. Van Nostrand Company of New York by the Atomic Energy Commission.

The *Sourcebook on Atomic Energy* is a 450-page treatise on the non-secret scientific and technical aspects of atomic energy, particularly suitable for use by college students, teachers, textbook authors, and publishers. The publication date will be about December 1, 1950. Price $2.90.

TECHNICAL SOCIETIES AND ASSOCIATIONS MEETINGS

AMERICAN MINING CONGRESS PLANS CONVENTION

Salt Lake City, Utah
August 28-31, 1950

The essential role of the mining industry in the nation's defense will be clearly emphasized at a forthcoming meeting of some 2,000 metal and nonmetallic mining men who will convene at Salt Lake City, Utah, August 28-31 for sessions of the American Mining Congress.

Members of Congress, high Government officials, and leading men of the mining industry will participate in important discussions ranging from stockpiling for national security, atomic energy developments, and the foreign aid program, to labor relations, taxation, public land policies, mineral tariffs and the outlook for the metals. In addition to these economic and legislative matters, one of the most comprehensive programs on operating and production problems ever prepared will be presented at a series of special sessions on new developments in mining and milling.

GOVERNMENT SPEAKERS

Feature speakers from Government at the meeting will include Senator Harry P. Cain of Washington, who will discuss "The Future of Gold"; Representative Clair Engle of California, who will outline "Problems of the Small Mine Operators"; Representative Carl T. Durham of North Carolina, Chairman of a House Armed Services subcommittee on stockpiling, who will present a review of the nation's stockpiling program for strategic and critical materials; Representative Graham A. Barden, also of North Carolina, Chairman of the House Committee on Education and Labor, who will address the meeting on "The Future of Our Labor Law"; and C. Girard Davidson, Assistant Secretary of Internor who will explain current proposals that the Interior Department has made for changing the mining laws.

Other Government spokesmen and the subjects of their addresses include: Carl Rolle, stockpile advisor, Munitions Board, Washington, "Progress in Stockpiling for National Security"; R. L. Wilcox, Economic Cooperation Administration, Washington, "The Foreign Aid Program and its Relation to the Mining Industry"; Sumner T. Pike, Member, U. S. Atomic Energy Commission, Washington, "Atomic Energy for Industrial Power"; Jesse C. Johnson, manager, Raw Materials Operations, AEC, Washington, "Uranium Procurement Policies and Plans"; Frank H. MacPherson, manager, Colorado Raw Materials Operations, AEC, Grand Junction, Colo., "Economics of Domestic Uranium Production"; and Doris H. Blackman, geologist, U. S. Geological Survey Grand Junction, Colo., "Prospecting for Carnotite Deposits."

SPEAKERS FROM INDUSTRY

Outstanding leaders from industry will share the spotlight with these Government officials. Among those scheduled to address the Convention are: Simon D. Strauss, vice president, American Smelting & Refining Co., New York, on "Outlook for the Nonferrous Metals and for Silver"; Paul H. Hunt, vice president, Park Utah Consolidated Mines Co., Salt Lake City, "Trend of Metal Production, Wages and Prices"; J. W. Tapp, vice president, Bank of America, San Francisco, "Sound Currency for a Sound Economy"; Joseph Stagg Lawrence, vice president, Empire Trust Co., New York, "Gold"; Paul B. Jessup, vice president, Day Mines, Inc., Wallace, Idaho, "Tariff Needs of the Mining Industry"; David D. Baker, consulting mining & metallurgical engineer, Bishop, Calif., "Domestic Supplies of Strategic Minerals"; Dan H. Harrington, for many years head of the Health & Safety Branch of the U. S. Bureau of Mines, Washington, "Safety Progress in Metal Mining"; A. C. Thornton, industrial relations manager, International Minerals & Chemical Corp., Chicago, "Labor Relations Today"; Donald A. Callahan, president, Callahan Consolidated Mines, Inc., Wallace, Idaho, C. Jay Parkinson, Attorney, Salt Lake City, and Charles F. Willis, State Secretary, Arizona Small Mine Operators Assn., Phoenix, Ariz., on "Proposed Changes in the Mining Laws"; P. J. Shenon, head, Department of Mining, University of Utah, Salt Lake City, "The Phosphate Industry—What it Means to the West"; M. G. McGrath, manager, Vitro Manufacturing Co., Grand Junction, Colo., "Processing of Uranium Ores—Engineering and Metallurgical Aspects"; Charles M. Hackett, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., "Public Relations and Public Opinion"; and James E. Hogle, president, Rico-Argentine Mining Co., Salt Lake City, "Public Relations —The Importance of the Stockholder"; and speakers on Federal taxation and the mining industry.

A special "Welcoming" Luncheon will be held Monday noon, August 28, with D. D. Moffat, Salt Lake City, chairman of the Western Division of the American Mining Congress presiding. A welcome to Utah will be extended to Convention visitors by Governor J. Bracken Lee, while Mayor Earl J. Glade will greet them on behalf of the city. Howard I. Young, St. Louis president of the AMC, Roy A. Hardy, Reno, chairman of the Convention Program Committee, and M. L. McCormack, chairman, Manufacturers Division, AMC, will respond for the mining industry.

PRODUCTION PROBLEMS CONSIDERED

The special sessions devoted to production problems will be participated in by leading operating personnel from mine operations, both in the United States and in Canada. The sustained effort of the industry to raise its productive efficiency and reduce costs through improvement in operating practices, in both mining and milling, will be given serious consideration by those in attendance. Among the major subjects to be discussed at these sessions are "packaged" timber handling; the application and performance of new milling equipment; the construction of a new mill by the Golden Cycle Corp., at Cripple Creek, Colo., which will renew the life of an old and important gold mining district; the development of the White Pine mine at Painesdale, Mich., which has added several million tons of copper ore to the nation's reserves; progress toward production at the Blackbird cobalt mine on the fringe of the Idaho wilderness area, an important addition to our strategic reserves; geochemical prospecting, which may lead to the finding of untold hidden mineral wealth; the use of trackless mechanized mining methods in the great mines of the Lead Belt of southeastern Missouri; a means of increasing grinding efficiency; hydraulic ore hoisting; and developments in rock drilling and blasting.

Special round-table conferences will be held on August 31 for discussion of mine taxation, gold, strategic minerals, and public lands.

A Resolutions Committee will draft a Declaration of Policy for the industry, undertaking this task on August 26 and 27. The resolutions on various subjects will be submitted at appropriate points in the general sessions of the convention, thus allowing full consideration of the important issues on which the position of the mining industry is to be set forth.

In addition to the convention sessions, over 110 manufacturers of mining equipment and supplies will be represented with displays in the largest metal mining exposition ever held. Delegates to the meeting will have an opportunity to inspect the latest equipment developments and to talk over their equipment problems with the experts in the manufacturing field. Both the convention and exposition will be held at the Utah State Fair Grounds.

CONVENTION TRIPS PLANNED

A Convention Trips Committee has scheduled an airplane inspection trip from Salt Lake City airport on Friday morning, September 1, consisting of an hour and a half flight over mining operations at Bingham, Tooele, Tintic-Eureka, Cottonwood, Alta, Park City and returning to Salt Lake City. Visitors will be furnished maps of the various mining districts showing the general geologic and structural features and a geologist will accompany each flight to describe points of interest.

On the afternoon of September 1 convention visitors will have an opportunity to inspect the Geneva Steel Plant near Provo, Utah. Company guides will conduct the mining men through this great western steel plant.

On Saturday, September 2 a trip will be made to the Garfield smelter, the Magna and Arthur mills, and the open-pit operations of Kennecott Copper Corporation's Utah Copper mine at Bingham Canyon, Utah.

The U. S. Bureau of Mines has also invited mining men attending the American Mining Congress meeting to visit its oil shale demonstration project at Rifle, Colo. Special pullman cars are being made available by the Denver and Rio Grande Western Railroad to transport convention visitors from Salt Lake City. The trip will start from Salt Lake City late afternoon on September 1, with September 2 being spent at Rifle.

WITH THE *Manufacturers*

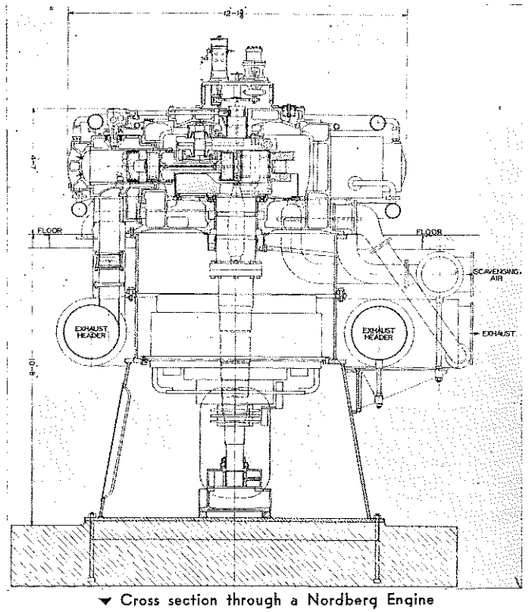
Equipment News

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.

Nordberg Radial Engine (743)

Recent addition to the extensive line of internal combustion engines built by Nordberg Manufacturing Company, Milwaukee 7, Wisconsin, is a two-cycle, 11-cylinder, 14" x 16" radial engine. It is built as an oil burning Diesel engine, as a spark fired gas engine or as a Duafuel engine. The engine develops from 1650 HP net at 400 RPM.

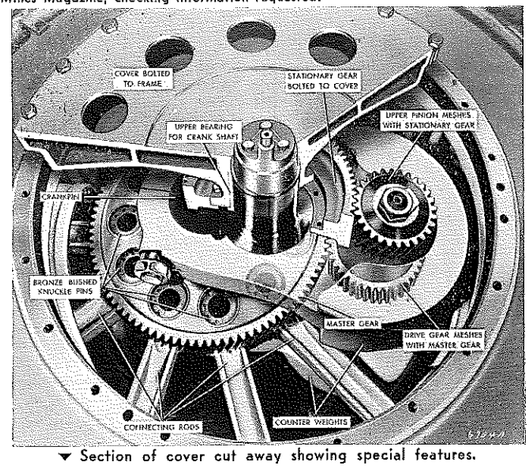
The Nordberg Radial Engine is the result of a long period of development to produce an engine with advantages not found in conventional types of internal combustion engines. Among the unusual design features of the Nordberg Radial engine is the patented method whereby the forces exerted by the pistons are conveyed to the crankpin resulting in completely balanced operation that eliminates vibration. This is accomplished by the use of a master gear, a stationary gear bolted to the cover, two pinions and rotating counterweights.



▼ Cross section through a Nordberg Engine

The eleven connecting rods are attached to the master gear by means of knuckle pins mounted in bronze bushed bearings. This master gear does not rotate around the crank but gyrates instead, the distance of gyration amounting to 16 inches or the piston stroke. This gyrating action is obtained by restraining the master gear from rotating by means of the two pinions, the lower one meshing with the master gear and the upper one meshing with the stationary gear which is bolted to the frame cover and thus held in a fixed position. With this unique design balanced operation is obtained without the use of the master connecting rod commonly associated with radial engines of other design.

The completely balanced operation makes possible a simple, inexpensive foundation. The compact design of the unit reduces engine room space to one-half the usual requirements and a minimum of necessary headroom lessens building height. These space economies greatly reduce required building costs or provide more power in an available building.

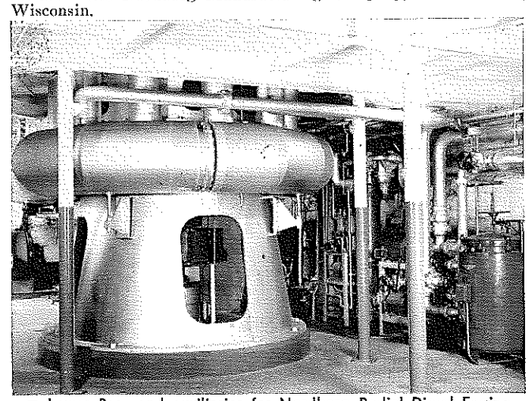


▼ Section of cover cut away showing special features.

Maintenance cost on the Nordberg Radial engine is kept to a minimum as the result of several of the design features. The short, sturdy counterweighted crankshaft has but two bearings to be maintained and both of these are of the bushing type. All bearings are of the renewable bushing type easily replaced at minimum expense. There are no split bearings on the engine. Friction is materially reduced and higher mechanical efficiency is obtained. All heads, piston cylinders and bearings are interchangeable and this reduces the number of spares required. Pistons can be serviced from the floor and this eliminates the need for heavy crane and supports.

There are two systems of lubrication—mechanical force feed and pressure. Two motor-driven multiple pump, force feed lubricators deliver oil to two points of each cylinder for piston lubrication. The pressure system serves a dual purpose. It provides oil to all parts requiring lubrication and also provides oil for piston cooling.

This Nordberg Radial engine is applicable wherever compact, economical, dependable power is required. For additional information write Nordberg Manufacturing Company, Milwaukee 7, Wisconsin.



▼ Lower Base and auxiliaries for Nordberg Radial Diesel Engine

MINES MAGAZINE,
734 Cooper Building,
Denver, Colorado

Please have copies mailed to:

Referring to Equipment News, please send as checked:

No. Prices ☐, Bulletins ☐; No. Prices ☐, Bulletins ☐;
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Name..... Position.....

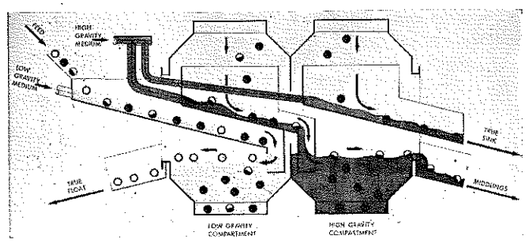
Company.....

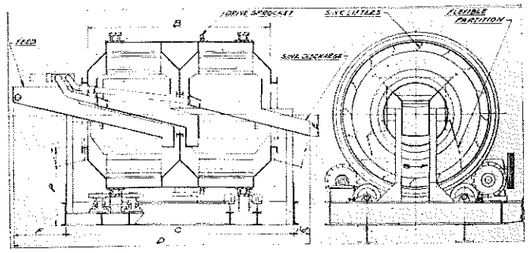
Street.....

Wemco Introduces Two-Compartment Drum Separator (744)

An important, completely new drum separator, designed to reduce the cost of multiple stage heavy-media separation, has been announced by the Western Machinery Company. Because it greatly reduces the equipment needed to produce a middling product, this multiple drum separator is expected to have wide application in the cleaning of low grade coal and in the beneficiating of iron ores. Other ores and minerals can also be handled.

In order to efficiently obtain a middling product in the heavy-media separation process, two stages are required using heavy-media liquids of different gravities. The new WEMCO process reduces the complexity of two-stage separation by using a partitioned drum with a lighter media in one section and a heavier media in the other as illustrated in Figure 1. Material is passed



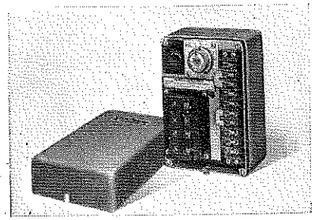


from one section of the drum to the other, eliminating screens, conveyors and ductwork necessary when separate vessels are used. Only three conveyor systems leave the drum; they carry a true mineral product, a true waste product and a middling product. Recrushed portions of the middling product join the feed material and are returned to the drum. This very compact and efficient arrangement (see Figure 2) makes substantial savings in three important ways: fewer items of equipment, lower construction and installation costs and greatly reduced floor space.

It is expected that the new WEMCO Two-Compartment Drum Separator process (patent pending) will obtain a clean product from coal and ore deposits for which profitable exploitation has not been heretofore feasible. All inquiries should be addressed to Western Machinery Company, 760 Folsom Street, San Francisco.

New Electronic Timer Announced by G-E (745)

A new, compact electronic timer which provides automatic control of operation, limit, and sequence timing for literally thousands of industrial processes has been announced by General Electric's Control Divisions, Schenectady, New York.



According to G-E engineers, the new timer was designed to fulfill industrial requirements for flexibility of application, accuracy and reliability in operation, low maintenance, and simplicity in servicing. It is available in three time ranges: .06-1.2 seconds, .6-12 seconds, and 6-120 seconds.

Some applications of the new device are: (1) operation timing to control duration of such processes as paint spraying, car washing, photoprinting, electroplating, and heat treating; (2) limit timing to stop conveyor belts if material piles up; and (3) sequence timing with two or more timers in combination to control duration of operations on bearing-grinding machines, rod-coiling machines, commercial potato-peeling machines, centrifuges, illuminated signs, etc.

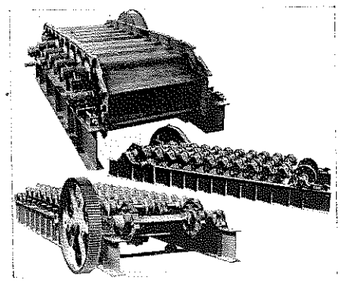
Mechanical wear is cut to a minimum with the electronic device, engineers said, because the relay armature is the only moving part. The G-E 6J5 electronic tube in the timer is a standard model readily obtainable at most radio stores.

Life tests conducted by G. E. indicate that the new timer can perform a million or more operations at these controlled load requirements: inrush—15 amps, carry—10 amps, and break—5 amps. As the controlled load demand is reduced, more operations can be expected, it was said. Publication, GEA-5255 contains additional information on G-E electronic timer.

New Primary Feeder for Extra Heavy Duty (746)

Now available in a 72" width and in lengths up to 60 feet is the Pioneer-Oro Jumbo feeder built by Pioneer Engineering Works, Minneapolis, Minnesota. Feeder pans, and all other wearing parts such as drive sprocket and supporting rollers are cast manganese steel.

Patented features include interlocking support points on the pans proper, and clean out wedges in the pans links to remove dirt on the return side. An outstanding patented feature is the design of the pan which casts the drive links integral with the pan to eliminate bolts and rivets. Pans are cast with upturned lugs at the ends to form an interlocking continuous lip for reducing spillage. These pans, which are corrugated and overlapping, are spaced at 15" pitch, are one inch thick at the smallest section, and weigh close to 1000 pounds each.



Supporting the pans and load are three cast manganese steel rollers keyed to heavy shafts, each shaft turning in three special alloy bearings. These bearings rest on transverse I-beams, supported on deep longitudinal beams on which the head and tail shafts are also mounted. Return idlers and a screw take-up are provided. For complete specifications address Pioneer Engineering Works, Minneapolis 13, Minnesota.

Hydraulic Fluid for Mining Equipment (747)

A flame-resistant industrial hydraulic fluid, also said to have high lubricity, has been developed by Monsanto Chemical Company, St. Louis, Mo.

In announcing the fluid, designated as OS-16, Charles H. Sommer, assistant general manager of the company's Organic Chemicals Division, revealed that the product had been thoroughly field-tested in hydraulically operated mining equipment.

"It was the opinion of experienced observers," he said, "that OS-16 had proven eminently satisfactory under every operating condition imposed on it. The test results were accepted as a complete demonstration of its suitability."

In the tests, a coal-cutting machine was operated on a 24-hour, three-day week in underground mining service. Hydraulic pressure was 1500 pounds per square inch. A complete examination at the conclusion of the test, Mr. Sommer said, showed no signs of wear in the hydraulic system, pumps or other moving parts in contact with OS-16.

Because the fluid is an ester base compound, containing no halogenated hydrocarbons, salts or waters, Mr. Sommer explained, it will not corrode bearings or other metal parts, and is a non-conductor of electricity. Tests also show, he said, that OS-16 does not irritate the skin, and requires no special precautions in handling or use.

Improved Foundry Goggles (748)

American Optical Company, Southbridge, Mass., announced that its two foundry goggles, the No. 305 and the No. 306, will now be supplied with a rugged plastic face mask, proved through long extensive testing to be superior to the leather mask formerly used.

Leather face masks, according to the company, possessed a major disadvantage in that they could not be sterilized. This was a handicap not only when the mask became dirty, but when it was to be worn by another worker.

The new vinyl plastic mask, now standard on the two foundry goggles, can be sterilized by spraying, wiping or dipping (not boiling), and will retain its shape

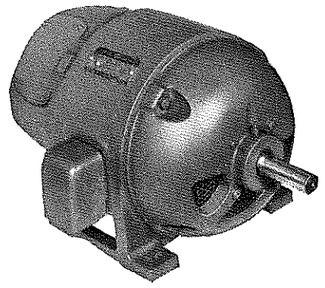
and properties. When wet, it will not shrink or curl. Perspiration will not make it hard; exposed to any moisture it remains flexible and soft. Because of these features, the company points out, the plastic masks which cost no more, will last much longer than leather face masks.

G-E Announces New Tri Clad* Single-Phase Motor (749)

For use where a constant-speed high-torque single-phase motor is required in large ratings, a new replusion-induction motor has been announced by General Electric's Small and Medium Motor Divisions.

Designated as Type SCR, the motor is available in 5-, 7½-, and 10-hp ratings, all 1800 rpm. The 5-hp unit operates on 115/230 volts, while the other two use 230 volts.

Typical applications include air and



refrigeration compressors, pumps, stokers, floor surfacers, and farm uses such as barn hay curing, wood sawing, silo filling, cold storage, feed grinding, etc.

The new motor features high starting torque and low starting current with positive operation on low voltages, making it well adapted for severe starting duty. It is of the open (dripproof) type, and has many features that contribute to long life and aid in installation and maintenance. The sturdy cast-iron frame has a damping effect on noise and vibration, and covers are easily removed to facilitate inspection and maintenance of brushes. To assure good alignment between stator and rotor, the ball bearings are mounted directly in the end shields of the new motor. Improved brush holders give good brush stability, and brushes and rigging are easily serviced. Efficient cooling is provided by a single large-diameter cast-aluminum fan.

*Reg. Trade-Mark.

PLANT NEWS

Wemco Opens Mineral Testing Laboratory

The Western Machinery Company announces the opening of a Mineral Testing Laboratory serving the metallic and non-metallic mining industries, coal preparation industry, the sand and gravel aggregate industries and other industries whose products or by-products require that type of material processing common with the mineral engineering industries.

A newly created Mineral Testing Department, made up of experienced metallurgical engineers, has been organized to operate the well equipped laboratory located at the Company's Home Office 760 Folsom Street, San Francisco. The service is to be provided to industry on a cost basis.

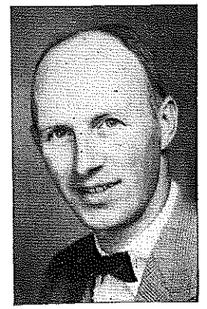
Wemco's new laboratory is equipped to investigate mineral engineering problems involving: heavy liquid testing, heavy media separations, flotation concentration, gravity concentration, amalgamation, scrubbing, agitation and washing operations, wet classification problems, dewatering and thickening problems, crushing and grinding characteristics, cyanidation, preliminary microscopic mineralogical examinations, and others. Each investigation includes the presentation of a completely detailed metallurgical report with recommended flowsheet to be used as a basis for commercial plant design.

Crane Co. Makes Personnel Change

Joseph E. Bradbury has been promoted to Manager of the Alloy Sales Section of the Valve & Fitting Department, Crane Co., Chicago, Illinois. Mr. Bradbury is well qualified for this position having been a member of the department since it was first organized in 1940. He has been with the Company since 1928.

Mr. Bradbury is an active member of the National Association of Corrosion Engineers.

Flexible Steel Lacing Co. Appoints New England Representative



LESTER B. COLEMAN

Flexible Steel Lacing Company, 4607 Lexington Street, Chicago, Belt Fastener manufacturers, announces the appointment of Lester B. Coleman as New England and New York State representative. "Les" was formerly associated with a New England mill supply distributor. He makes his home in Roxbury, Connecticut.

Model Stripping Operation to be Displayed by Link-Belt Speeder at Metal Mining Show, Salt Lake City, August 28-31, 1950

A fully operating 1" scale model of a Link-Belt Speeder K-375 Shovel-Crane will be working at the Link-Belt Speeder Exhibit, Booth No. 228. The exhibit will be supplemented with a backwall display to include transparencies and color enlargements of Link-Belt Speeder Shovel-Cranes on the job.

Attending the show and representing Link-Belt Speeder Corporation of Cedar Rapids, Iowa, will be D. W. Lehti, Pres., G. H. Olson, Vice Pres., R. B. Barnes, Sales Manager, D. F. Van de Roovaart and N. V. Chehak.

Statement of Condition
THE CENTRAL BANK & TRUST COMPANY
Denver, Colorado
AT THE CLOSE OF BUSINESS JUNE 30, 1950

Resources

Loans and Discounts		$15,640,512.22
FHA Loans, United States Guaranteed		7,546,859.78
Real Estate Owned (Future Bank Site)		75,000.00
Safe Deposit Vaults—Furniture and Fixtures		197,707.53
Stock in Federal Reserve Bank		48,000.00
Income Earned, Uncollected		170,411.60
Other Resources		43,113.50
U. S. Government Bonds	$11,962,274.55	
Other Bonds and Securities	2,173,189.75	
Cash and Due from Banks	14,408,399.55	28,543,863.85
Total		$52,265,468.48

Liabilities

Capital Stock	$ 1,000,000.00	
Surplus	600,000.00	
Undivided Profits and Unallocated Reserves	345,288.78	1,945,288.78
Reserved for Interest, Taxes, etc.		136,620.86
Reserved for Dividend Payable July 3, 1950		30,000.00
Income Collected, Unearned		372,637.53
Other Liabilities		8,776.70
Deposits		49,772,144.61
Total		$52,265,468.48
Total Resources June 30, 1934	$ 3,032,039.64	
Total Resources June 30, 1939	5,967,192.25	
Total Resources June 30, 1944	17,202,788.41	
Total Resources June 30, 1949	44,621,667.21	
Total Resources June 30, 1950	52,265,468.48	

Link-Belt Expands Public Relations

Link-Belt Company announces that its Public Relations activities are being expanded, and that a separate Public Relations Department has been established at executive headquarters, 307 N. Michigan Avenue, Chicago, headed by Harlan B. Collins, Secretary of the company and Russell B. Kern who will continue in the capacity of Editor of Link-Belt News, the company's well known house magazine.

The Advertising Department, under the direction of Julius S. Holl, Advertising Manager, has been strengthened by the appointment of Bertram V. Jones as Executive Asst. Advertising Manger. Mr. Jones will be directly assisted by John F. Kelly, Asst. Advertising Manager.

Link-Belt Company's Exhibit at The Metal Mining Show.

The theme of the exhibit is "Link-Belt Conveying and Processing Equipment." The backwall display follows this theme through the use of large photographs of recent outstanding installations in the metal mining industry. A few of the newer component parts of recent installations will be exhibited on the floor. A display of ball and roller bearing pillow blocks and other Link-Belt power transmission units including popular chains used by the industry will also be exhibited.

The Link-Belt exhibit will be attended by experienced specialists, who will be glad to consult with visitors. Among them will be Vice-President D. E. Davidson, L. O. Millard, H. V. Eastling, J. F. Strott, B. K. Hartman, H. A. Garland, W. W. Muehl and E. H. Bughee.

Allis-Chalmers Five-Year Labor Contract

The signing of a five-year labor contract between the Allis-Chalmers Manufacturing Co. and Local 248, UAW-CIO, covering approximately 10,000 production employes at the West Allis plant, has been announced jointly by the firm and the UAW-CIO. The contract is subject to ratification by the membership.

It covers wages, pensions, health and accident and group life insurance, union security and other contract provisions. The contract will expire June 30, 1955.

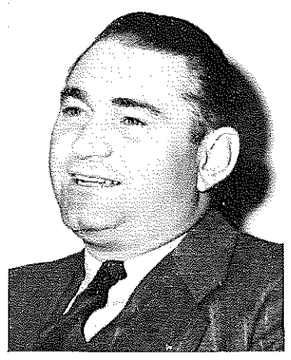
Walter Geist, Allis-Chalmers president, said, "An agreement on a contract has been reached that marks a new era for our employes, the union, stocholders, and customers."

John W. Livingston, vice president of the UAW-CIO and director of the Agricultural Implement division, said that the agreement "affords an opportunity for the building of mutual respect between the parties. I believe that it may be the foundation of a strong and lasting peace."

Charles Schultz, president of Local 248, termed the contract, "The most outstanding agreement, insofar as personal security and union security are concerned, ever to be negotiated between the company and our local union."

Koehring Names Bansemer Assistant Sales Manager

The appointment of R. E. Bansemer to the position of Assistant General Sales Manager has been announced by the



R. E. BANSEMER

Koehring Company of Milwaukee, heavy-duty construction equipment manufacturer. At the same time, Koehring named three new district sales representatives: R. K. Patterson will be stationed in the New England sector, C. Byron Walker in the Pacific Northwest and Al. W. Schlosser in the Southeast.

In his new post, Bansemer succeeds John E. Chadwick who will join the Dalrymple Equipment Company organization, Koehring product distributor in the state of Mississippi.

G-E Opens New Service Shop-Warehouse In Salt Lake City

Construction of new and expanded repair, maintenance, and warehousing facilities for improving service to users of General Electric apparatus in the Rocky Mountain area has been completed in Salt Lake City, according to L. M. Stauffer, Manager of the Company's Salt Lake City Office.

These facilities, located at 301 South Seventh West Street, provide approximately 50 per cent more warehouse space, Stauffer said, and more than double the former capacity for service and repair of motors, control devices, generators, transformers, switchgear, and other types of electrical apparatus, serving concerns in Utah, Idaho, Montana, and Nevada.

Du Pont Stockholders Increase

E. I. du Pont de Nemours & Company, Inc., was owned by 118,732 stockholders as of June 30, 1950, an increase of 2,861 over the number of holders recorded at the close of the first quarter of 1950, and an increase of 19,069 over the number as of June 30, 1949.

There were 101,701 holders of common stock, and 23,611 holders of preferred stock as the second quarter period of 1950 ended. These figures include 6,580 holders of more than one kind of stock.

Of the individual stockholders women comprise about 57 per cent, and every state in the union continued to be represented among the owners of the company.

Robins Conveyors Division Moves Cleveland Office

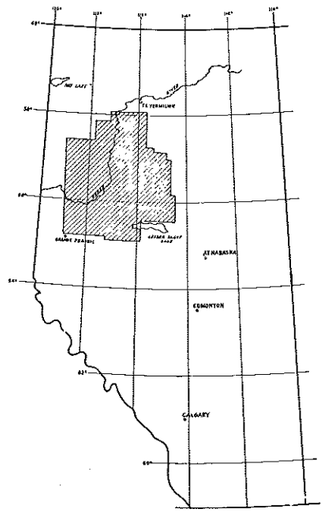
The Cleveland office of the Robins Conveyors Division, Hewitt-Robins Inc., has moved from 215 Rockefeller Bldg. to 8905 Lake Ave. effective June 12.

Airborne Magnetometer Survey Of Peace River Area

By Canadian Aero Servict, Limited

The tempo of the oil search in northwest Alberta received new impetus today when the first large scale airborne magnetometer survey of the Peace River area was begun for four major oil companies by Canadian Aero Service Ltd. Because of the largt expense of the operation, and because of the general nature of the data which will be obtained, the survey is being undertaken on a co-operative basis by Socony Vacuum Exploration Co., Stanolind Oil and Gas Co., Imperial Oil Ltd., and Canadian Gulf Oil Co. Other oil companies have been invited to participate in the survey to extend the area of the operation, and it is believed there may be a fifth and possibly sixth company sharing in the exploration in the near future.

This pattern of jointly financed reconnaissance of a large area was first seen in a five-company oil search in the Bahamas, followed by other cooperative airborne magnetometer surveys in Venezuela, Colombia, and Saskatchewan. The sharing of costs and data make it possible for all participants to obtain the regional picture important to geologists and geophysicists in their interpretation of magnetic data.



The aerial method is especially useful in the Alberta survey because the greater part of the area is heavily forested or muskeg country. Ground exploration is therefore slower, more costly, and more difficult than usual. Aerial magnetics will deliver a quick picture of one phase of the geophysical evidence for this very large area to the participating companies. From the survey the oil companies hope to learn something of the basement depths, basement structures, and other aspects of the rocks underlying the sediments. The precise magnetic map of the area which will be the end product of this extensive survey will enable the companies to make a valid evaluation of the magnetic method's worth in this exploration area. The Canadian oil industry is watching the survey for answers to the difficult problems of exploring the remote country of the north.

According to Thomas M. O'Malley, President of Canadian Aero Service, Ltd., one or two Anson twin-engine planes will be used in the survey. The planes have been outfitted as complex flying labora-

(Continued on page 44)

CATALOGS AND TRADE PUBLICATIONS

FOR YOUR CONVENIENCE

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

(5623) RESEARCH & TESTING. Bulletin No. 07B6419A, by Allis-Chalmers Co., S. 70th St., Milwaukee, Wisc., contains 32 pages illustrating and describing research and testing facilities which Allis-Chalmers has available for minerals' beneficiation and comminution, grain and flour milling, pulp and wood processing and oil extraction. This book carries a cross-section of laboratory investigations conducted and industries served.

(5624) CLASSIFICATION & ORE DRESSING. Bulletin No. 2291 by Dorr Co., Stamford, Conn., contains 20 pages illustrating and describing equipment and methods of classification and their application.

(5625) CONTINUOUS FILTERS. Bulletin No. 4710 by Morse Bros. Machinery Co., Denver, Colo., contains 16 pages illustrating and describing various types and sizes of filters manufactured by this company together with auxiliary vacuum machinery. The operation of this equipment is fully explained and tables included furnish detailed engineering data.

(5626) CORE DRILLING EQUIPMENT. Bulletin No. 305 by Sprague & Henwood, Inc., Scranton, Pa., illustrates and describes core drilling machines manufactured by this company and calls attention to the important features included.

(5627) RADIAL ENGINE. A recent bulletin by Nordberg Mfg. Co., Milwaukee, Wisc., illustrates and describes the Nordberg Radial Engine convertible for use with natural gas, diesel fuel or both. The bulletin gives a very good idea of the design, construction and operation of this new type of engine. 120 of these engines were installed for power production in the Point Comfort Works of the Aluminum Company of America at their plant near Port Lavaca, Texas, each consuming 13,000 cubic feet of gas per hour under load and producing 1600 h.p.

(5628) "ELECTRICAL DEVELOPMENTS OF 1949" by General Electric Co., Schenectady, N. Y., contains 50 pages illustrating and describing electrical developments for the year and advancements in research power development, industrial illumination, testing and measuring equipment, aviation, rail and rapid transit, marine, chemistry and metallurgy, electro-medical, appliances, air conditioning, construction materials and electronics.

(5629) GOLD PAN. Bulletin No. P1-B17, by Denver Equipment Co., Denver, Colo., illustrates and describes the construction and application of the mechanical gold pan manufactured by this company.

(5630) "HARDINGE HIGHLIGHTS," June 1950, by Hardinge Co., York, Pa., contains 6 pages including an interesting article "Flying Impressions of Europe and Africa" by Harlowe Hardinge and an illustrated article on Hardinge thickeners.

(5631) "TEXACO STAR," Summer, 1950, by the Texas Co., 135 E. 42nd St., New York, N. Y., contains interesting articles on "Conserving Nature's Bounty," "Working with Steel" and others.

(5632) RECORDING INSTRUMENTS. Leaflet No. 776 by Mine & Smelter Supply Co., 1422—17th St., Denver, Colo., describes recording barometers and thermometers and other meteorological instruments.

(5633) V-BELTS. "Industrial News," June 1950, by Gates Rubber Co., 999 S. Broadway, Denver, Colo., contains several short illustrated articles showing new applications of Gates Vulco Ropes in the driving of machinery. Some of these applications may furnish you with good ideas for eliminating some of your power drives that give trouble.

(5634) "H & B BULLETIN," Jan.-Febr. 1950, by Hendrie & Bolthoff Co., Denver, Colo., contains 32 pages illustrating and describing new equipment and supplies which this company has in stock ready for delivery. There are many items here that may be used to advantage by almost every industrial operation.

(5635) CLASSIFICATION. Bulletin No. 48 by Colorado Iron Works, Denver, Colo., contains 14 pages illustrating and describing the construction and advantages of the Akin Classifier in economically solving classification problems. Tables of capacities are included for different size machines. Much information is included that will be very useful to mill operators.

(5636) INSULATION PRODUCTS. Form No. 48-967-A by Union Asbestos & Rubber Co., 1821 S. 54th Ave., Cicero, Ill., contains 32 pages illustrating and describing products manufactured by this company which will be found advantageous in helping you to solve your insulation problems. Drawings and engineering data are included which will be very helpful in working up designs. Temperature tables show BTU losses from pipe radiation. Data tables show the thickness of insulation necessary to be used.

(5637) LABORATORY EQUIPMENT. "Announcer" No 50-6-39 by Burrell Corp., 2223 Fifth Ave., Pittsburgh, Pa., contains 16 pages devoted largely to laboratory equipment making use of centrifugal force. Much information is contained in this publication that will be of value to the chemical or research laboratory.

(5638) BALL RUD MILL. Bulletin No. B2-B4, by the Denver Equipment Co., Denver, Colo., contains 32 pages illustrating and describing the construction and operation of the Denver Steel Head Ball-Rod Mill. Sectional drawings are included and also tables of engineering data. Included is a sliderule, showing, at a glance, much information covering the capacity of Denver Mills together with examples showing its application.

(5639) TARIFF INFORMATION, "Topics," June 1950, by American Tariff League, 19 W. 44th St., New York, N. Y., contains 4 pages of short news items that will be found valuable to those interested in tariffs on exports and imports.

(5640) ROTARY KILNS. Bulletin No. 07B6368 by Allis-Chalmers Co., Milwaukee, Wisc., contains 32 pages illustrating and describing the construction and use of Allis-Chalmers' Rotary Kilns for cement, lime and chemical plants. Illustrations and drawings of auxiliary equipment are also included. Methods of solution of engineering problems are included.

(5641) SEPARATOR. Bulletin No. 906, by Southwestern Engineering Co., 4800 Santa Fe Ave., Los Angeles 11, Calif., contains 4 pages illustrating and describing the operation of the new Sweco separator for the separation of products in the laboratory. This machine will handle, wet or dry, fine or course, or heavy or light products.

(5642) CLASSIFICATION UNIT. A leaflet by the Dorr Co., Barry Place, Stamford, Conn., illustrates and describes the Dorr Clone, a compact classification unit utilizing centrifugal force in place of gravity. It provides a new method of separating finely divided solids in liquid suspensions.

(5643) "LINK-BELT NEWS," July 1950, by the Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill., contains 8 pages illustrating and describing conveying equipment and its uses. One article of special interest covers conveyor equipment at the Baltimore plant of the National Gypsum Co. An article is also included on automatic speed controls for Link-Belt variable speed drives and another illustrates the handling of logs by conveyors.

(5644) "RARIN'-TO-GO," June 1950 issue of this publication by The Frontier Refining Co., Denver, Colo., and Cheyenne, Wyo., contains descriptions of the operation of the company and also photographs of men responsible for its growth and management.

(5645) X RAY MEASURING INSTUMENTS. Bulletin No. 1002 by the Baldwin Instrument Co., Dartford, Kent, England, contains 4 pages illustrating and describing scientific measuring instruments for X rays and other ionizing radiations.

(5646) "TOMORROW'S TOOLS — TODAY!" 2nd Quarter, 1950, by Lane-Wells Co., 5610 So. Sota St., Los Angeles 58, California, contains 40 pages of interesting and valuable articles related to technical oilfield services. Among these will be found the final installment on "Koneshot Perforating," the 6th installment of Lane-Wells Packer Handbook entitled "Locating and Shutting Off Casing Leaks," "A Practical Valuation of the Neutron Log for Canadian Oilfields" and "Radioactivity Well Logging Provides Needed Data for Operations in North Central Texas." These articles all contain charts and diagrams as well as other illustrations.

(5647) GEOPHYSICS. "The Grape Vine" by United Geophysical Co., Inc., Pasadena, Calif., June 1950, contains 8 pages with interesting letters from men in widely distributed areas. The sheet included gives the addresses of field parties.

(5648) ALUMINUM. "Alcoa News — Letter," June 1950, by Aluminum Company of America, Pittsburgh, Pa., contains 8 pages illustrating and describing many new uses for aluminum in connection with sports and also manufacturing.

(5649) "A NEW OIL REFINERY." Bulletin No. 150 by C. F. Braun & Co., Alhambra, California, containing 24 illustrations picturing the new oil refinery of the Standard Oil Company of California, built at Bakersfield, California shows views approximately 8" x 10", giving one a very good idea of the extent and the large expense entailed in the construction of this plant. This publication is a real piece of art.

(5650) SYNCHRONOUS MOTORS. Bulletin No. 200-SYN-31 by Electric Machinery Mfg. Co., Minn. 13, Minn., contains 24 pages including articles on wound rotor motors, excitation for synchronous motors, air coolers for generators and motors, articles pertaining to the gas industry, the modern Parke Davis antibiotic plant at Detroit and other articles of interest to those associated with the power industry or uses of electric power. Included in this issue is a map, showing some of the natural gas pipe lines in the United States.

(5651) POWER-SHOVEL. Specification No. 4841 by the Osgood Co., Marion, Ohio, contains information covering their Model No. 720 with 1¼ cubic yard dipper. Included in this Bulletin are tables of data covering the operation of this machine, including full specifications for shovel, dragline, clamshell, crane and hoe.

(5652) "MINERAL INFORMATION SERVICE," July, 1950, by California Department of Natural Resources, Ferry Bldg., San Francisco, Calif., contains 20 pages discussing new publications on industrial minerals and largely devoted to the price list on available publications of the California State Division of Mines.

(5653) ELECTRONIC TIMER. Bulletin GEA 5255 by General Electric Co., Schnectady, N. Y., describes an electric timer which provides automatic control for operation, limit, and sequence timing in thousands of industrial processes. Three time ranges are available. Operation and applications for the use of this equipment are described.

(5654) "FLUOR-O-SCOPE," July 1950, by The Fluor Corp., Ltd., 2500 S. Atlantic Blvd., Los Angeles 22, California, contains 16 pages largely devoted to employee activities, although articles descriptive of the Shell Wasson plant constructed by Fluor in Texas and an article on prefabricated piping are included. List of articles available published by Fluor Research and Engineering Personnel are summarized.

(5655) METAL CLEANING. "Oakite News Service," June 1950, by Oakite Products Inc., 22 Thames St., New York, N. Y., contains 24 pages of short illustrated articles descriptive of methods used in cleaning equipment of different kinds.

(5656) CONCRETE. News Letter by the American Concrete Institute, 18263 W. McNichols Rd., Detroit, Michigan, June 1950, contains 38 pages of information pertaining to concrete construction largely of interest to members of the institute.

(5657) ROLL CRUSHERS. Form No. 617 by Pioneer Engineering Wks., Minn. 13, Minn., contains 14 pages descriptive of roll crushers and their use in connection with crushing rock and gravel. Dimensional drawings and tables of capacities are included.

(5658) VENTILATION. Bulletin J-607 by Joy Mfg. Co., Henry W. Oliver Bldg., Pittsburgh 22, Pa., contains 8 pages describing "Axivane" portable mine blowers for mines and tunnels. Performance of the blowers through tubing of various lengths and diameters given in both graph and tabular form for easy comparison. Blowers are provided for either electric or air motors.

(5659) "BAROID NEWS BULLETIN," for June 1950, by Bariod Sales Co., P. O. Box 2558, Terminal Annex, Los Angeles 54, Calif., contains 28 pages including articles on the use of heavy drilling mud and equipment for testing clay samples. Found in this issue is an 8 page insert on oil humor from the era around 1865.

(5660) TELEVISION. "Sylvania News" by Sylvania Electric Products, Inc., P. O. Box 431, Emporium, Pa., contains illustrated articles covering television and related subjects.

(5661) FLOTATION AGENTS. A 16 page publication by Hercules Powder Co. Wilmington, Delaware, gives up-to-date information on Hercules flotation agents. Included is a general discussion on the flotation process and also a description of flotation agents, frothers, collectors, and modifiers. Mathematical formulas used in the operation and control of modern ore-dressing

(Continued on page 44)

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✦

MEETINGS

Executive Committee Meetings
3rd Monday of each month, Alumni Office, 7:30 P. M.

Alumni Council Meetings
4th Thursday of each month, Argonaut Hotel, 6:30 P. M.

Publication Committee Meetings
2nd Monday of each month, Alumni Office, 5 P. M.

Capability Exchange Committee, Meetings Wednesday 7:30 Week preceding Executive Committee Meeting.

EXECUTIVE COMMITTEE MEETING

The regular meeting of the Executive Committee of the Colorado School of Mines Alumni Association was held in the Alumni office on Monday, July 17, 1950.

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

Roll Call

Members present: James Colasanti, President; Carl I. Dismant, Robert J. McGlone. Committee chairmen. Addison Manning, Roger Schade, Harry McMichael, Edwin White, Herbert Heckt. Executive Manager, Frank C. Bowman.

Members absent: George Setter, Vice President; Robert Evans, Secretary; Malcolm E. Collier, Treasurer; Harvey Mathews. Committee chairmen: Charles O. Parker, Lynn W. Storm, Harry McNeill, John Winchell.

Minutes of the previous meeting, June 19, 1950, were read and approved.

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

Treasurer's Report

Mr. Bowman reported for Mr. Collier. The status of the Association is about the same, financially, as it was this time in 1949. For the 50% budget period 53% of the budgeted income has been earned and 45.8% of the allotted expenditures have been spent. Receipts for subscriptions were down somewhat in June but the yearly total is up.

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

Alumni Endowment Committee

Mr. Schade reported June receipts of $100.50, leaving a balance as of June 30, 1950, of $2305.63.

During June the Placement fund showed receipts of $132.94 and expenditures of $392.24.

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

Athletic Committee

Mr. Manning reported that as of June 30, 1950, the Alumni Loan Fund showed a balance of $918.15 in the checking account, and out standing loans amounted to $503.00.

Twenty-two men are available for alumni scholarships, thirteen were passed on by the committee but not necessarily accepted.

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

Capability Exchange Committee

Mr. McMichael reported there are still more calls for men than there are men available. Further study will be made on the proposed employment bulletin to determine if the activity should be carried on.

Contributions from alumni in general and from those placed dropped off in June.

Kirk Forcade has been added to the committee.

During June there were 30 calls for men; 29 recommendations made; 6 placements reported; 836 letters mailed; 453 men on the active list; and 97 calls for men remain unfilled.

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

Membership Committee

Mr. Bowman reported for Mr. Setter. On June 1, 1950, there were 192 life members, 1676 annual members, and 90 associate members in good standing. During June 94 annual dues were paid and 2 associate.

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

Nominations Committee

Mr. Colasanti reported for Mr. Parker. The following nominations for officers for the year 1951 were presented:

President—
Harvey Mathews, '13
A. George Setter, '32
Roger M. Schade, '21

Vice President—
Robert McMillan, '41
Robert W. Evans, '36
R. Lee Scott, '42

Secretary—
Herbert W. Heckt, '36
A. B. Manning, '40
D. J. Drinkwater, '42

Treasurer—
Malcolm E. Collier, '22

Member, Executive Committee—
John H. Winchell, '17
Max E. Coates, '35
James Colasanti, '35

C.S.M. Foundation—
Wilfred Fullerton, '12
Edward P. Kingman, '34
Frank E. Briber, '16

The proposed ballot was approved unanimously.

Public Relations Committee

Mr. White suggested that a letter be sent to the Salt Lake City chapter requesting that a *Mines* dinner be held during the convention of the American Mining Congress in Salt Lake City the latter part of August.

Publications Committee

Mr. Heckt reported that for the 50% budget period, 48.5% of the budgeted income for the year has been

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Excavation Work is Under Way

for construction of Coolbaugh hall, a new million dollar chemistry building on *Mines* campus. This is the first completely new building the school has added since 1940.

Estimated cost of the three-story structure of brick and reinforced concrete is a million dollars, including three large contracts to Denver construction firms and $300,000 for furnishings and equipment. With an over-all size of 256 x 104 feet, the building will accommodate 12 classrooms, a lecture hall with a seating capacity of 350 persons, and a number of special research laboratories, ranging in size from two-and-three man workshops to one with a capacity of 90 students.

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

The new building will be dedicated in honor of Dr. M. F. Coolbaugh, president emeritus of the College since his resignation in 1945. He served as head of the chemistry department at Colorado School of Mines in 1917-18 after teaching at a number of other institutions, returning in September, 1925 as president, a position he held for 20 years.

Well known as an outstanding metallurgist, he is still active on the campus and maintains a laboratory in Berthoud hall where he is engaging in studies of cobalt.

Two Members of Mines Faculty

attended a convention of the American Society of Engineering Education in Seattle held in June, Dean M. I. Signer and Assistant Professor Frank Campbell of the mechanical engineering department.

The five-day gathering was held entirely for instructors in engineering, with more than seven hundred delegates participating.

Dean Signer, accompanied by his wife, later visited the army installation at Fort Lewis, Washington, where 39 *Mines* ROTC men are taking a six-weeks course.

Mines R.O.T.C.

received a "satisfactory" rating as a result of the annual inspection for 1949-50.

Announcement was made by Major General John B. Coulter, deputy commissioner, headquarters fifth Army. He said only "satisfactory" and "unsatisfactory" ratings were given. The department at the Colorado School of Mines was given an over-all satisfactory rating and similar scores for both administration and training.

The report also complimented the Colorado School of Mines for its continued maintenance of high standards for ROTC training and for commendable interest shown in the military training program by institutional authorities.

Enrollment last year in the Colorado School of Mines ROTC totaled 375.

Colonel Wendell W. Fertig, Corps of Engineers, professor of military science and tactics, heads the program at the college.

Seventy-one of the young men are now undergoing six-weeks training—32 at Ft. Belvoir, Virginia, and 39 at Ft. Lewis, Washington.

Six Members of Mines ROTC

now participating in the six-weeks field training at Fort Lewis, Washington, have been designated as distinguished military students: Keith G. Comstock, Frank I. Hiestand, Karl Knutson, Robert A. Martin, Robert B. Morrison, and Roderick K. Rawlins.

These men were selected for the honor because of their outstanding qualities of military leadership, high moral character and aptitude for the military service, in addition to their academic grades and leadership in campus activities at *Mines*.

Upon graduation from *Mines* and successful completion of their ROTC course, they will receive a commission as second lieutenants in the Organized Reserve Corps. In addition they will be eligible for consideration for commissions as second lieutenants in the Regular Army.

LeRoy W. Goodwin

29-year old University of Colorado graduate, is the new director of the publication department at Mines, announcement having recently been made by President John W. Vanderwilt.

Goodwin, succeeding Harry M. Crain, who resigned earlier this year, will handle public relation as well as publications work for the country's outstanding mining college.

He attended grade and high school at Ellicott near Colorado Springs and was graduated from the Colorado university journalism school in June, 1947, where he was initiated into Sigma Delta Chi and Kappa Tau Alpha, national professional and honorary journalism fraternities respectively. His World War II record included three and one-half years service with the air force as pesonal sergeant major and the infantry as rifleman and ordnance non-commissioned officer.

The new publications director worked for the past three years in the newspaper field. He was first reporter and later city editor of the Scottsbluff, Nebr. Daily Star-Herald and more recently employed as feature writer and photographer of the Grants Pass, Oreg. Daily Courier.

PERSONAL NOTES

(Continued from page 8)

Clem G. Hayes, '41, Construction Superintendent for Heron Engineering Company of Denver, is in Stockton, California, where he is supervising the construction of a ski lift in the vicinity.

Martin Hemker, Ex-'38, Resident Engineer for Black & Veatch, Consulting Engineers, has moved his residence to 3582 Outlook Avenue, Cincinnati 8, Ohio.

Harley F. Holliday, '42, resigned his position with the Standard Oil Company of Texas, to accept one as Petroleum Engineer with the Republic National Bank of Dallas, Oil Department. His new address is 1106 Odeans Drive, Apt. D, Dallas, Texas.

David A. Kellogg, '49, has accepted a position with Anaconda Copper Mining Company at Butte, Montana. His mailing address there is Room 516, Y. M. C. A.

T. J. Lawson, '36, is now associated with the Bosseck Co-op Corporation and is residing at 521 Forest Avenue, Canon City, Colorado.

(Continued on page 36)

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.
"Basket Picnic," Redwood Regional Park, Redwood Canyon, Oakland, Calif., Sunday, August 20. Families and friends invited. Phone secretary for further information.

BIRMINGHAM

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

CENTRAL OHIO

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

CENTRAL WYOMING SECTION

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

CLEVELAND

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

COLORADO

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

EASTERN PENNSYLVANIA

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

GREAT LAKES

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

HOUSTON

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

KANSAS

All activities suspended.

MANILA

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

MONTANA

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

NEW YORK

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

The last meeting of the season of New York Section, Mines Alumni Association was held at the Mining Club on June 8th.

The group started gathering for refreshments before 6 P. M., and at 6:30 P. M. the following sat down to dinner:

Harry J. Wolf, '03; Donald Dyrenforth, '12; Clare L. French, '13; Fred D. Kay, '21; R. B. Lowe, '22; Domingo Moreno, '22; A. K. Seemann, '22; M. L. McCormack, '26; A. L. O'Toole, '26; C. F. Allen, '34; J. S. Kennedy, '34; M. A. Lagergren, '33; R. E. Buell, '41; W. H. Nikola, '41; J. Parks, Guest.

At our last previous meeting a nominating committee, consisting of Don Dyrenforth, Harry Wolf and Art Seemann, were appointed to nominate candidates to a Board of Governors with a recommendation as to terms of office, having full powers to act for the New York Section. This Committee proposed a division of the Section personnel into five groups covering the years 1874 to date, and then nominated as follows: 1874-1914, C. L. French, '13—Term 2 Years; 1915-1925, F. D. Kay, '21—Term 4 years; 1926-1936, M. L. McCormack, '26—Term 5 Years; 1937-1942, J. B. Peeso, Jr., '41—Term 3 Years; 1943-Date, Hans Warmbrunn, '43—Term 1 Year.
With power to appoint the Section chairman & secretary from within or without the Board as they saw fit.

These groupings of representation will stand until future committees find a change necessary to restore equitable group representation.

After a short discussion, the whole program as set up by the committee, was unanimously adopted.

The evening's entertainment was two sound color movies of Saudi-Arabia, arranged for by Dick Buell '41, of Cal. Tex. Oil, and shown by Joe Parks, of the same Company. Both were enjoyed and the season ended on a light note.

Three members of the new Board being present and constituting a quorum, held a short session and named Domingo Moreno, '22, as Section president for the ensuing year. The appointment of a secretary will be made at a full Board meeting.

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) 1215-16 First Natl. Bank Bldg., Dallas, Texas, Telephone: Riverside 4846. Four meetings during year, second Monday of month, February, May, September and November.

The North Central Texas Section held its spring quarterly dinner meeting at the Texas Hotel, Fort Worth, on Friday 21 April, 1950. The guest of honor and speaker of the evening was Fritz Brennecke, Mines Moleskin Mentor, who favored us with a visit during a tour of Alumni sections in the Southwest. Fritz gave us a frank and candid story of the work of the Athletic department at Mines and showed excellent colored movies of the 1950 Mines-Idaho State game which was played at Pocatella, Idaho, last fall.

Breaking all precedents John Beville presented Fritz with a real, gaint-sized orchid on behalf of the Section. It is doubtful if any other football coach in the U.S. has ever been presented with an orchid by an Alumni group. The usual presentation is the axe. Fritz also received as a souvenir of his trip a Texas stetson and shirt.

▼ Seated, left to right—Mesdames Lugenbill (only partially visible), Jones, Holman, Corn, Sparr, Sheriger, Goodale, Dowlin, Ritter, Hatch, and Yeager. Standing, left to right—Miners Holman (only partially visible), Jones, Dowlin, Lugenbill, Ritter, Corn, Sheriger, Yeager, Hatch, Goodale, and Bender. Photography by Bill Sparr.

The latter presents were to make the Texas boys who will be playing under his direction next fall feel at home. Those boys, who include some pretty fair country football players, attended the meeting as guests of the section. They were Wilson and LeRoy Little, Bob Darney, Wallace Oliver and Dick Self. In a couple of years they will be known as "That Good Old Texas Line."

Those in attendance at the meeting were:

H. D. Thornton, '40; Henry Rogatz, '26; J. F. Neill, '35; R. W. Tesch, '33; John B. Beville, Ex-'26; Jack W. Peters, '38; H. S. Beeler, Ex-'30; J. D. Perryman, '35; Lloyd W. Madden, '41; E. J. Brook, '23; Fritz Brennecke, Guest; Dick Self, Guest; Phil Garrison, '39; H. E. Itten, '41; Wilson Little, Guest; Richard Hatfield, Guest; John R. Evans, '23; R. L. McLaren, '32; Roy F. Carlson, '48; James L. Morris, '38; LeRoy Little, Guest; Ken Nickerson, '48.

Coming from near and far, the North Central Texas Alumni Association gathered in Dallas to hold their second annual barbecue.

Encircled by tubs of ice cold beer, the traditional bull session got underway to an early start and was admirably sustained by the product of the hops.

Several of the members traveled well over 100 miles to attend the conclave with R. L. McLaren and son garnering the honors for coming the greatest distance from home plate.

Henry Rogatz and Jack Peters who had the whole affair well planned and under control supervised the serving of the barbecue beef and beans.

Those attending were:

E. J. Brook, '23; Ken Nickerson, '48; Herb Thornton, '40; Eddie Brook, '63; R. L. McLaren, '32; R. L. McLaren, Jr., '51; Henry Rogatz, '26; Jack Peters, '38; Jim Perryman, '35; Jim Neil, '35; Leonard Lipson, '47; Claude Jenkins, '52; Howard Itten, '41; A. W. Musgrave, '47; Chuck Andrew, Guest.

OKLAHOMA

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

OKLAHOMA CITY

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

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

The Pennsylvania-Ohio Section of the Colorado School of Mines Alumni Association met at the University Club in Pittsburgh on March 25, 1950. Twelve Miners and their ladies were present for food, films, and dancing. Max Sheriger, '23, furnished an interesting picture showing Joy Mfg. Co. equipment at work in various mechanized mines. The film was in color, and the excellent photography greatly enhanced our quick trip through the coal fields. Pictures of the Homecoming game were also on the movie bill with Bill Sparr,'39, acting as narrator.

▼ The happy outgoing officers, George Yeager, '40, Secretary, left, and Bill Sparr, '39, President.

▼ The somewhat smiling new officers, John Hatch, '36, President, and Bob Jones, Ex-'37, Secretary, right.

By the time the double bill was run off everybody was famished and ready for the main event—food, of course. After dinner a short business meeting was called, with the big feature the election of officers for the coming year. After the smoke had cleared, John Hatch, '36, was declared to be duly qualified and was elected president. Bob Jones, Ex-'37, less duly qualified, was named secretary.

Bill Sparr, '39, having been relieved of his duties as president, now ventured into a new field. As photographer he snapped the priceless pictures submitted with this manuscript. At the conclusion of the posing, everyone was more than ready to spend the rest of the evening in dancing and/or talking.

Present for the dinner and meeting were:

Martin Bender, '26; Larry Corn, '40; Don Dowlin, '40; S. L. Goodale, '04; John Hatch, '36; Bill Holman, '38; John Lugenbill, '41; Wayne Ritter, '36; Max Sheriger, '23; Bill Sparr, '39; George Yeager, '40; and Bob Jones, Ex-'37.

SOUTHERN CALIFORNIA

John Biegel, '39, President; A. J. Heiser, '43, Vice President; C. J. Cerf, '41, Treasurer; Franklin S. Crane, '43, Secretary, c/o Oilwell Supply Co., 934 North Alameda St., Los Angeles. Telephone: MUtual 7311.
Scheduled meetings second Monday of January, April, July and October, at Officers'

(Continued on page 36)

CONTRIBUTORS TO PLACEMENT FUND

(Continued from page 6)

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
C. W. Gustafson, Ex-'34
M. L. Talley, '49
L. F. Bombardieri, '41
T. E. Howard, '41
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
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
Robert L. Garrett, '45
V. L. Easterwood, '49
A. F. Suarez, '41
P. Alber Washer, '26
James E. Werner, '36
Thomas H. Cole, '43
Alex A. Briber, '48
C. F. Cigliana, '41
W. W. Fertig, Ex-'24
L. E. Sausa, '38
Charles P. Gough, '48
James M. Perkins, '49
R. A. Marin, '45
J. W. Bodycomb, '48
R. B. Nelson, '47
Charles W. Tucker, '47
Billy F. Dittman, '49
W. Fred Gaspar, '43
Louis Hirsch, '49
H. A. Bruna, '41
C. C. Crawford, '40
R. S. Warfield, '48
R. S. Bryson, '49
Ernest E. Braun, '49
C. D. Frobes, '24
Louis C. Rubin, '27
W. T. Townsend, '48
Edmond A. Krohn, '43
Wm. G. Robinson, '48
John Robertson, '22
T. A. Manhart, '30
John M. Carpenter, '35
N. E. Maxwell, Jr., '41
M. B. Seldin, '48
John F. Whalen, '49
A. L. Carver, '43
J. P. McNaughton, '42
Harry E. Lawrence, '48
John W. Chester, '44
W. T. Millar, '22
John M. Tufts, Jr., Ex-'38
A. F. Boyd, '26
David P. Morse, '49
Thos. P. Bellinger, '47
Robert J. Black, '49
R. W. Parker, '49
Lester B. Spencer, '44
G. H. Lancaster, '41
Marvin E. Lane, '44
A. G. Hampson, Ex-'51
C. W. Gustafson, Ex-'34
T. E. Phipps, '49
D. W. Thompson, '42
R. J. Arnold, '49
Vincent Miller, '35
W. H. Kohler, '41
Masami Hayashi, '48
R. K. V. Pope
Robert D. Bowser, '49
Marvin H. Estes, '49
W. F. Edwards, '48
Russell Badgett, Jr., '40
L. G. Truby, '48
Glenn E. Worden, '48
A. E. Calabra, '48
E. C. Robacker, '42
S. H. Stocker, '42
Marion S. Bell, '49
A. E. Falvey, '34
V. R. Martin, '41
Edw. C. Bryan, '42
Frank DeGiacomo, '32
R. W. Moyar, '41
E. L. Honett, '47
V. L. Lebar, '36
J. C. Carlile
P. E. Leidich, '43
C. B. Larson, '23
C. L. Fleischman, '30
Jos. E. Hatheway, '41
Mario Fernandez, '39
Vincent L. Barth, Ex-'41
R. E. Marks
C. M. Hales, '48
Walter H. Ortel, '49
Peter C. Cresto, Ex-'50
William H. Volz, '39
Gene W. Hinds, '49
R. E. Morrison, '41
Stanley W. Parfet, '42
J. J. Sanna, '41
M. W. Mote, Jr., '49
E. E. Ruley, '43
John Labriola, '49
Charles B. Foster, '27
Edmond A. Krohn, '43
M. L. Euwer, '25
David P. Morse, '49
A. B. Carver, '25
D. W. Gunther, '39
Eugene F. Klein, '43
Silas DoFoo, '41
John E. Moody, '39
Edw. S. Larson, '23
Alan E. Hall, '39
Edw. W. Anderson, '43
L. S. Woeber, '22
D. L. Cedarblade, '44
Earl H. Miller
Charles S. Knox, Ex-'27
S. R. Licht, Jr., '43
R. E. G. Sinke, '39
H. Dell Redding, '47
F. W. Mann, '43
E. H. Shannon, '36
Arthur G. Wood, Jr., '41
George E. Wagoner, '28
H. Y. Yee, '38
R. W. Deneke, '43
Frank E. Love, '36
Paul M. Tyman, '44
John J. Folger
Charles F. Allen, '34
R. A. Gustafson, '47
Donald W. Roe, '44
David P. Morse, '49
Pitt W. Hyde, '22
Joseph C. Knight
R. J. Knox, '49
W. M. Gebo, '23
D. F. Sylvester, '38
G. S. Schoenwald, '48
Howard C. Parker, '41
Ed F. Porter, '40
Bert J. Shelton, V, '44
Raymond T. Burns, '48
E. C. Bengzon, '21
D. A. Kellogg, '49
Ben F. Angus, '29
Robert J. Rose, '35
A. William Parisi, '41
David P. Morse, '49
J. W. Caldwell, Ex-'49
Paul B. Davis, '39

FROM THE LOCAL SECTIONS

(Continued from page 35)

Club, 2626 Wilshire Blvd., Los Angeles, 6:30 P.M. 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. David Squibb, '34, 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.

ALUMNI BUSINESS

(Continued from page 32)

earned and 35.5% of the allotted expenditures have been spent.

Mines Magazine is $1034.00 below the advertising budget for the period, however taking into account the Year Book the magazine is $126.00 ahead of the budget.

The July issue should be mailed about the 20th.

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

Adjournment

The meeting was adjourned at 9:20 P. M.

PERSONAL NOTES

(Continued from page 33)

Frank M. Lee, '27, is Engineer in Charge of the Oregon Shore contract of McNary Dam with address McNary, Oregon.

Joseph M. Maxwell, '30, in the Land Department, Union Oil Company of California, has moved his residence to 923 Pershing Street, Bakersfield, California.

John R. McMinn, '42, resigned his position with Trigood Oil Company at Worland, Wyoming, to become associated with Fred M. Manning, Inc. He is being addressed in care of the company, Box 232, Breckinridge, Texas.

J. R. Medaris, '49, has been transferred from Pauls Valley, Oklahoma, to Eureka, Kansas. He is serving as Junior Engineer for Phillips Petroleum Company.

(Continued on page 42)

Book Reviews

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

Hydrology-Fundamental Basis of Hydraulic Engineering

By Daniel M. Mead, Former Professor, Hydraulic and Sanitary Engineering, University of Wisconsin. Revised by Mead and Hunt, Inc., Consulting Engineers. McGraw-Hill, N. Y., N. Y., 1950. 728 pages, 6 x 9. 397 illustrations. $7.50.

This book discusses the most important facts and principles in connection with modern hydrology. Subjects covered are the occurrence, utilization and control of water; fundamental conditions which underlie all problems concerning the earth and continual changes in progress; winds and storms; hydrography; atmospheric moisture and evaporation; precipitation; rainfall measurements and records; droughts; relation of rainfall and altitude; geological agencies and their effect upon hydrological phenomena; geology; ground water; stream flows and their variation; floods, their occurrence and control; and finally, the application of hydrology.

Throughout the book will be found many tables, charts and maps besides illustrations which help the reader to obtain a much clearer understanding of the subject. In connection with each chapter will be found an important list of literature which may be referred to for additional information on any particular subject covered by the book.

To the Hydraulic Engineer, this book will be a valuable and important addition to his library. To others, who are interested in gaining additional knowledge pertaining to factors controlling weather conditions and water supply, this book will prove to be a valuable reference library. It combines in one publication elements affecting weather and rainfall which are only partially covered by other technical and scientific publications.

Principles of Petroleum Geology

By Cecil G. Lalicker, Professor of Geology, University of Kansas. Appleton-Century-Croft, Inc., New York. 1949. 377 pages, 6" x 9". Illustrated. $5.00.

This book gives the stratigraphic and geographic distribution of petroleum in considerable detail. The principles of petroleum geology, origin of oil and gas structures and petroleum discovery methods are well covered. Examples, representative of oil and gas fields from various petroliferous provinces in the world have been well selected. The influence of geological factors on recovery methods and valuation of oil and gas properties has been given careful consideration.

A good idea of the extensive coverage of this book will be gained from the following list of main subjects discussed: Geographic and Stratigraphic Distribution of Petroleum, Chemical and Physical Properties of Petroleum and Related Substances, Origin of Petroleum, Migration and Accumulation of Petroleum, Reservoir Rocks, Classification of Oil and Gas Pools, Origin of Structures, Anticlines, Domes, and Synclines, Reservoirs Caused by Faulting, Salt Dome Oil Fields, Buried Hills, Stratigraphic and Porosity Type Fields, Petroleum Discovery Methods, Geological Considerations in Recovery Methods and Valuation of Oil and Gas Properties.

In discussing various subjects, many maps and drawings are used for illustration. Examples from well known oil fields have been selected for illustration and structural maps with geological sections increase the educational and practical value of the book. Over 100 drawings and 60 tables are used throughout the book which will be found to be of a great help to the reader in becoming better acquainted with such an important subject.

The author is to be commended upon the fine work he has done in the preparation of this volume that should be in the library of every petroleum geologist and all of those who are interested in the subject.

Ore Genesis-A Metallurgical Interpretation

By John Stafford Brown, Ph. D., Chief Geologist, St. Joseph Lead Co., Hopewell Press, Hopewell, N. J. 204 pages, 5½ x 8½. $3.50.

The author of this book proposes a new hypothesis as to the origin of ore deposits. It is the main belief of the author that the facts available in the history of ore deposits do not justify the formulation of some of the present working hypothesis. In view of the data accumulated over recent years, the author believes that the sequence of deposition of the minerals is directly related to their specific gravity and such a sequence is shown to correspond very closely to accumulation of mixed sulphides in the blast furnace.

Case studies of sulphide ores illustrating hypothermal ores, mesothermal deposits and epithermal deposits are included. Gold, silver, bismuth and mercury are considered in the sulphide sequence.

The author discusses the broader implications of the metallurgical hypothesis and its relationship to ore deposits. In this discussion he thoroughly analyzes the facts that exist and reasons for conclusions. Supporting evidence and opinions are discussed and the application of the metallurgical hypothesis to some controversial problems in widely distributed areas.

The author is very convincing in his arguments and discussions and certainly much food for thought can be obtained by all geologists interested in ore genesis by a study of this book.

The Interstate Oil Compact Commission

Bulletin May 1950. This bulletin containing 90 pages covers the 1950 Spring Meeting at Biloxi, Miss. In it will be found addresses and papers delivered and reports from various state governors and committees.

One report of special interest is on the experiment in the underground gasification of coal at the Gorgas Mines of the Alabama Power Company by James L. Elder and another by R. B. Anderson brings out the value of conservation while a third discusses the relation between market demand and physical waste together with the necesisty for limiting production of oil to within reason. Besides these there is much valuable information contained throughout the bulletin.

Subsurface Geologic Methods

2nd Edition, compiled and edited by Dr. L. W. LeRoy, Colorado School of Mines. 1950. 1056 pages and index. Fabrikoid bound. $7.00.

A number of articles and illustrations have been added to the first edition published in 1949—in total the book now contains 600 drawings and the works of 50 contributors writing on 60 subjects. It is a distinctive contribution to the literature of subsurface geologic procedures.

Subjects covered are: stratigraphic, structural and correlation considerations; unconformities; sedimentary rocks; micropaleontologic analysis; calcareous algae; detrital mineralogy; insoluble residues; petrofabric, micro, size, settling, stain, shape, electron-microscope, X-Ray, multiple-differential thermal, water, core, shale, density and fluoro analyses; sampling and examination of well cuttings; electric, induction, radioactivity-well, caliper, temperature, drilling-time, driller's spectrochemical sample and composite-cutting-analysis logging; well logging by drilling-mud and cutting analysis; controlled directional drilling; oil well surveying; oriented cores; magnetic core orientation; core techniques and applications; application of dipmeter surveys; design and application of rock bits; deep-well camera; the electric pilot in selective acidizing; permeability determinations and water locating; the porosity and permeability of clastic sediments and rocks; drilling fluid chemistry; hydrafrac treatment; formation testing; oil well cementing; well acidization; geochemical methods; secondary recovery of petroleum; valuation and subsurface geology; duties and reports of the subsurface geologist; graphic representations; subsurface maps and illustrations, subsurface methods as applied in mining geology and geophysics; geologic techniques in civil engineering and sources of well information; and subsurface and office representation in mining geology.

Motor Oils and Engine Lubrication

By Carl W. Georgi, Technical Director, Research Laboratories, Quaker State Oil Refining Corp., Vice-President, Enterprise Oil Co., Inc., 1950. 515 pages. Illustrated. Tables and Charts. $8.50.

This subject is one that has received a great deal of attention from research workers in trying to produce improvements and new lubricants to fill the needs of ever increasing temperatures and speeds of engines and equipment. The author approaches the subject by discussing classifications, definitions and specifications which play an important part. Specifications covering various types of engine tests and properties of lubricants are covered in detail. Methods of testing and evaluating performance characteristics of motor fuels are discussed. Attention is called to the importance of viscosity index in all phases of motor lubrication.

In the chapter on oil refining, typical examples are given of the chemical structure of petroleum hydrocarbons. The subject of motor oil additives and synthetic

fuels is an important part of the book. Many types and varieties of engine failures and operating conditions are discussed together with causes and remedies. A large portion of the book is devoted to the application of motor oils and their relation to engine design, operation maintenance and failures. Valuable information is given to aid in the correction of such failures and in the improvement of engine design.

Throughout the book many illustrations are used together with charts showing performance and much tabular information. Many references are included which will be especially valuable to research workers on this subject. The book is one that will not only be valuable to lubrication engineers and service engineers but also to the average layman interested in this particular subject. Engine designers as well as technical service and sales engineers will find this publication a valuable reference book.

The information contained has been well selected and arranged to furnish the maximum information on a broad subject. Its value and importance will soon be discovered by those who are fortunate enough to obtain copies for study and reference.

Quality Control and Statistical Methods

By Edward M. Schrock, Refrigeration Quality Control Division, General Electric Co., Erie, Pa. 1950. 250 pages. Tables and charts. $5.00.

This book presents modern techniques of quality control and statistical methods that may be applied to industrial problems in order to insure a product with quality. Quality control charts are thoroughly covered and in this connection, their application and interpretation is explained so as to make use of important data in the solution of problems at hand.

Those who are new in this field will find a fund of information that will assist them in improving their effectiveness in appraising and controlling the quality of products to be produced. Standard methods of sampling deviations and their significance is covered in a separate chapter; also a chapter is devoted to the methods of least squares and correlation. It is pointed out that this is one of the simplest and most effective ways of approach to the solution of many problems.

The author, by reason of his many years of experience in metallurgical statistical quality control work, is well qualified to select and combine into one publication such factors as will be of greatest value to others. This book is a marvelous example of the author's ability to clarify the difficult subject.

Index to Well Samples

By Dan E. Feray and Jasper L. Starnes, University of Texas, Austin, Texas. 1950. 148 pages, 8½ x 11¼. Paper bound. $1.65.

This publication listed as No. 5015 is published by the Bureau of Economic Geology, Dr. John T. Lonsdale, Director, University of Texas, Austin, Texas, and is an index to a collection of well samples which the Bureau has been accumulating since its establishment in 1909. The collection includes samples from nearly 30,000 wells from all parts of Texas.

The information in the index is arranged alphabetically, by counties, then by companies and then by fee owner and number. The well sample library reference number is given as well as the depth range of samples in each well. The index includes samples processed up to June 1, 1948.

Geology of the Quien Sabe Quadrangle California, and Quicksilver and Antimony Deposits of the Stayton District, California

Bulletin 147, 1949. By Carlton James Leith, California State Division of Mines, Ferry Bldg., San Francisco 11, Calif. 60 pages. 7 geological maps in color. $1.75.

The Quien Sabe quadrangle, located 90 miles southeast of San Francisco and 13 miles east of Hollister, covers portions of the counties of San Benito, Merced, and Santa Clara. It includes a portion of the crest of the Diablo Range of the central Coast Ranges of California, and lower rolling country toward the San Joaquin Valley to the east.

This bulletin has sections on geomorphology, stratigraphy, structure, geologic history and economic geology (including discussions on the manganese, antimony, and quicksilver prospects located in the area). It contains 2 figures and 7 plates, including colored geologic and economic mineral maps, scale 1:62,500, an index map, stratigraphic column, and a structure section. The book also contains 4 pages of pictures.

Included in this same bulletin is a detailed economic report prepared by the Geological Survey, Department of the Interior, Quicksilver and Antimony Deposits of the Stayton District, California, by Edgar H. Bailey and W. Bradley Myers. The Stayton district is located within the Quien Sabe quadrangle and is the principal commercial mineral-bearing area in it. It contains 4 plates and 4 figures, including economic maps and sections, an index map, and 3 geologic maps. It includes a description of the history and production, geology, ore deposits, reserves, suggestions for prospecting, and a description of the mines.

Drilling and Sampling Bituminous Sands of Northern Alberta

By Dept. of Mines and Resources, Ottawa, Canada. In three volumes. Vol. I—$.25, Vol. II—$5.00, Vol. III—$10.00.

Volume I contains results of investigations from 1942 to 1947 with sketch maps showing the area covered.

Volume II contains detailed drilling and sampling records.

Volume III contains cross-sections and plans of the ores drilled.

These publications may be obtained from the Department of Mines and Technical Surveys, Ottawa, Canada.

America Under Socialism

By The National Research Bureau, Inc., 415 N. Dearborn St., Chicago 10, Ill.

This new booklet designed especially for distribution to employees of members of civic groups contains 16 pages of 4-color illustrations telling the story by pictures of what happens when Jack Hanson, a "regular fellow," becomes blinded by the bright promises of so-called security. As the story unfolds, the Socialist State gradually controls more and more of his life and freedom. This booklet gives a good idea of the "road ahead." May be obtained free by writing to the above address.

New Geological Publications

The new geological publications listed below, are now available at 214 New Customhouse, Denver, Colorado, at the prices shown.

Colorado Scientific Society Proceedings, Volume 15, No. 4
Stratigraphy of the Pando Area, Eagle County, Colorado,
By Ogden Tweto, 1949, $2.00.

Colorado Scientific Society Proceedings, Volume 15, No. 5
The Gunnison Forks Sulfur Deposit, Delta County, Colorado
By McClelland G. Dings, 1949, 75c.

Colorado Scientific Society Proceedings, Volume 15, No. 6
Geology and Fluorspar Deposits of the St. Peters Dome District, Colorado
By Thomas A. Steven, 1949, 75c.

Saving Your Oil

By Interstate Oil Compact Commission, Box 3127, State Capitol, Oklahoma City 5, Okla.

This book contains 20 pages of examples of conservation achievements of the states as told by their Governors. Factors necessary for a good conservation program are briefly listed. The outline is given of the problems of conservation and its importance to the petroleum industry. Copies may be obtained free by writing to the address above.

California Oil Fields, 35th Annual Report

By Division of Oil and Gas, San Francisco, California.

This summary of operations covering the period from January to June 1949, contains a report on Paloma oilfield including structural maps and logs of wells.

Recent developments in Tar Sands of the Huntington Beach Oil Field are reported on. The Kirby Hill Gas Field is covered for the first half of the year. Statistical data on production of California fields gives the production of both oil and gas.

An index is covered including all state oil and gas publications.

No Ghost Towns—No Empty Fuel Tanks

By R. B. Anderson, President, Texas Mid-Continent Oil and Gas Assn., and H. B. Fell, Exe. Vice Pres., Independent Petroleum Assn. of America., Interstate Compact Commission, Oklahoma City, Okla. 1950. 27 pages. Free.

This booklet explains the benefits derived by the general public from the states' conservation program and how this conservation is an insurance against ghost towns and empty fuel tanks. It also explains the relation between market demand and physical waste. The material in this publication was presented at the meeting of the Interstate Compact Commission, Biloxi, Miss., May 6, 1950. Copies may be obtained free.

IN MEMORIAM

Ralph T. Duffner

passed away in Albuquerque, New Mexico, on March 22, 1950, following an operation.

RALPH T. DUFFNER

At the time of his death he was serving as geologist in the Fuels branch of the U. S. Geological Survey. He entered the employ of the Geological Survey in the fall of 1947 as an airborne geophysicist in the Geologic division, from which he was transferred to the Fuels branch in July 1948.

Mr. Duffner was a native of New Baden, Illinois, but received most of his elementary education in Denver. Upon his graduation from South Denver high school he entered *Mines* and received his degree in geophysics with the class of 1942.

His first employment was with the National Geophysical Company from which he resigned in February 1943 to enter the Navy. He served for three years as personnel and electrical maintenance officer, being discharged with the rank of Lieutenant. The following year he took graduate work at *Mines* and then accepted a position with Schlumberger Well Surveying Corporation which he held until going with the Geological Survey.

In August 1949 Mr. Duffner was married to Miss Barbara Ann Whirry of Denver who survives him. Other survivors are his mother, Mrs. Cecil Duffner, and a sister, Mrs. Virginia Arthur, of New Baden, Illinois, and a brother Comdr. G. J. Duffner, Md., of San Diego, California.

He was a member of the Society of Exploration Geophysicists and the Mathematical Association of America.

Alfred H. Bebee

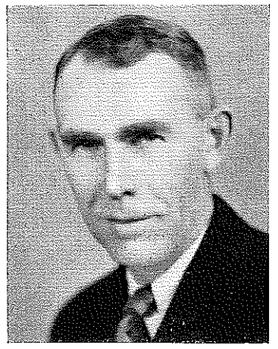
one of the outstanding mining men of the west, passed away at the Cripple Creek, Colorado, hospital on May 4 after some months of failing health.

Born in Denver in 1891, Mr. Bebee was taken to Cripple Creek when he was a young boy and there he spent his entire life, with exception of the years of World War I in which he served throughout with the army engineers.

Having been reared, as he was, in an active mining camp, it was only natural that he should desire education as a mining engineer and, upon completing his high school work, he entered *Mines* and was graduated with the class of 1915.

After his return from the army he became associated with the Vindicator and Cresson mines and was promoted rapidly. In March 1938 when he was superintendent of these properties he was appointed general manager of all the Carlton interests in the district and later was named vice president of the Golden Cycle Corporation. This took him to Colorado Springs for part of his time.

He was devoted to the mining profession and to the Cripple Creek district and was always planning improvements for the district and carrying them through. One of the outstanding monuments to his memory is the Carlton drainage tunnel which has prolonged the life of the mining area. It was also his decision which led to the building of the new Carlton gold reduction mill which is being constructed to process the ore near to the mines.



ALFRED H. BEBEE

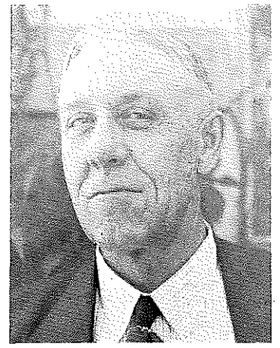
At the 75th Anniversary celebration at *Mines* last fall Mr. Bebee was awarded a distinguished service medal for his outstanding achievement in the field of mining.

He is survived by his wife, the former Nettye Nicholson of Cripple Creek, to whom he was married in 1919, a son Alfred, Jr., *Mines* '42, of Cripple Creek, a daughter, Mrs. Robert Thomas of Fort Collins, Colo., his mother, Mrs. E. H. Bebee of Beaumont, Calif., three brothers, five sisters, and three granddaughters. Two sons were killed in World War II, John in Luxenbourg in January 1945, and Eben in Okinawa in May of the same year.

While at *Mines* Mr. Bebee was a member of Beta Theta Pi, social fraternity, and Tau Beta Pi, honorary engineering fraternity. He was an active member of St. Andrew's Episcopal church, a member and Past Master of the Cripple Creek Lodge No. 96, A.F. and A.M., the Cripple Creek Elks lodge, the American Mining Congress, the Colorado Mining Association, and the American Institute of Mining and Metallurgical Engineers.

Herbert E. Badger

of the class of '02, died at his home in Greeley, Colorado, after a six-weeks illness of cardi thrombosis.



HERBERT E. BADGER

Mr. Badger was a native of Greeley and returned there to reside in 1930 after 22 years as a contractor, doing wet and dry excavation, coal stripping, and drainage work in Iowa, Illinois, North and South Dakota. Upon his return to Greeley he established himself as a real estate broker.

Through his business and his activities in the Knights of Pythias lodge, Mr. Badger became well known throughout the state and made many friends. In 1946 he was made Grand Chancelor of Colorado of the Knights of Pythias.

Mr. Badger was twice married, first to Mamie Graham of Greeley and several years after her death to Mrs. Ethel C. Colyer of Omaha, Nebraska, who survives him. He is also survived by two daughters, Mrs. Mary B. Mitchell of Grover, Colorado, and Mrs. Alice B. Booth of La Jolla, California, and a son, Robert E. Badger of Denver, and a step-son, Richard C. Colyer of Austin, Minn.

GOVERNMENT PUBLICATIONS

The following publications are free, only one copy to person applying. Write to Section of Publications, U. S. Bureau of Mines, Washington, D. C.

MINERAL MARKET REPORTS
U. S. Bureau of Mines

MMS 1769. Production of rolled zinc in 1948—final annual figures. 2 pp.
MMS 1770. Sand and gravel in 1948. 6 pp.
MMS 1771. Portland and other hydraulic cements in 1948—final annual figures. 8 pp.
MMS 1772. Secondary aluminum in 1948—final annual figures. 5 pp.
MMS 1773. Secondary antimony in 1948—final annual figures. 2 pp.
MMS 1774. Secondary copper and brass in 1948—final annual figures. 6 pp.
MMS 1775. Secondary lead in 1948—final annual figures. 4 pp.
MMS 1776. Secondary magnesium in 1948—final annual figures. 2 pp.
MMS 1777. Secondary nickel in 1948—final annual figures. 2 pp.
MMS 1778. Secondary tin in 1948—final annual figures. 2 pp.
MMS 1779. Secondary zinc in 1948—final annual figures. 4 pp.
MMS 1782. Distribution of Pennsylvania anthracite for the coal year April 1, 1948, to March 31, 1949. 25 pp. 4 figs. Gives detailed data on distribution of anthracite in the United States and Canada, by sizes and by States and Provinces, for the coal year 1948-49.
MMS 1783. Distribution of oven and beehive coke in 1948. 34 pp. 3 figs.
MMS 1784. Mineral earth pigments and manufactured iron oxide pigments in 1948. 2 pp.
MMS 1784. Mineral earth pigments and manufactured iron oxide pigments in 1948. 2 pp. (Revised.)
MMS 1785. Feldspar in 1948. 3 pp.
MMS 1786. Iron ore in 1948—final annual figures. 12 pp.
MMS 1787. New record consumption of industrial explosives in 1948. 9 pp.
MMS 1788. Manganese in 1948—final annual figures. 10 pp.
MMS 1789. Gold and silver in 1948—final annual figures. 4 pp.
MMS 1790. Abrasive materials in 1948—general summary. 5 pp.
MMS 1791. Bromine in 1948. 2 pp.
MMS 1792. Magnesite and other magnesium compounds in 1948. 3 pp.
MMS 1793. Calcium chloride in 1948. 1 p.
MMS 1794. Boron minerals in 1948. 1 p.
MMS 1795. Natural sodium sulfates and carbonates in 1948. 1 p.
MMS 1796. Lime in 1948—final annual figures. 6 pp.
MMS 1797. Dimension stone in 1948. 5 pp.
MMS 1798. Barite and barium chemicals in 1948. 3 pp.
MMS 1799. Chromium in 1948—final annual figures. 4 pp.
MMS 1800. Ferro-alloys in 1948—final annual figures. 6 pp.
MMS 1801. Crushed and broken stone in 1948. 4 pp.
MMS 1802. Distillate and kerosene sales up in 1948, residual deliveries decline. 28 pp.
MMS 1803. Statistical summary of lignite in 1948. 4 pp.
MMS 1804. The asbestos industry in 1948. 1 p.
MMS 1805. Lead industry in 1948—final annual figures. 6 pp.
MMS 1806. Marketed production of natural gas increased 12 percent in 1948. 4 pp.
MMS 1807. Bituminous coal and lignite in 1948. 81 pp. 11 figs.
MMS 1808. Phosphate rock in first half of 1949. 2 pp.
MMS 1809. Metal mining in Utah, 1949—preliminary annual figures. 6 pp.
MMS 1810. Metal mining in Montana, 1949—preliminary annual figures. 4 pp.
MMS 1811. Metal mining in Arizona, 1949—preliminary annual figures. 5 pp.
MMS 1812. Metal mining in Washington, 1949—preliminary annual figures. 3 pp.
MMS 1813. Titanium in 1949—preliminary figures. 3 pp.
MMS 1814. Metal mining in Nevada, 1949—preliminary annual figures. 4 pp.
MMS 1815. Metal mining in South Dakota, 1949—preliminary annual figures. 2 pp.
MMS 1816. Metal mining in Wyoming, 1949—preliminary annual figures. 2 pp.
MMS 1817. Metal mining in New Mexico in 1949—preliminary annual figures. 4 pp.
MMS 1818. Metal mining in Missouri, Oklahoma, Kansas, and Arkansas, 1949—preliminary annual figures. 8 pp.
MMS 1819. Metal mining in Colorado, 1949—preliminary annual figures. 10 pp.
MMS 1820. Mercury in 1949—preliminary figures. 2 pp.
MMS 1821. Metal mining in Texas, 1949—preliminary annual figures. 2 pp.

INFORMATION CIRCULARS
U. S. Bureau of Mines

7529. Phosphate-rock mining in southeastern Idaho, by D. W. Butner. 18 pp. 5 figs.
7530. Routine ventilation surveying in South Wales anthracite mines, by Cloyd M. Smith. 11 pp. 2 figs. Describes how a British anthracite-mining company conducts periodic ventilation surveys of its 24 collieries in South Wales.
7531. Publications of the Bureau of Mines on coal washing, compiled by William L. Crentz. 7 pp. Lists 64 publications on coal washing issued during the past 39 years.
7532. Report of Petroleum and Natural-Gas Branch, fiscal year 1948, by R. A. Cattell and others. 64 pp. 30 figs. Gives results of research program conducted by the Petroleum and Natural-Gas Branch during the fiscal year.
7533. Suspension roof support. Progress report 1, by Edward Thomas, A. J. Barry, and Arthur Metcalfe. 13 pp. 19 figs. How the Bureau of Mines has adapted suspension supports to conditions found in American coal mines, in an intensive attack upon the problem of preventing mine roof and rock from falling prematurely.
7534. Revised bibliography of Bureau of Mines investigations on the production of liquid fuels from oil shale, coal, lignite, and natural gas (to 1949), by Norma Golumbic, Hazel C. Anderson, and Robert C. Grass. 53 pp.
7535. Part I. Guide to prospecting for lode gold. by E. D. Gardner. Part II. Locating mining claims on the public domain, by Marion Clawson. 21 pp. Revision of I. C. 6843, Prospecting for lode gold, by E. D. Gardner, and Locating claims on the public domain, by Fred W. Johnson, part I of this publication offers many useful suggestions on prospecting outfits and provisions, tools, cooking equipment, clothing, and first-aid supplies and discusses such topics as gold lodes and ore shoots, searching techniques, associated minerals, sampling and panning, and surface weathering. Part II is a digest of Federal laws pertaining to the location of mining claims on the public domain and covers lands to which mining laws apply, mineral discovery, location of lode claims, assessment work, mining claims on stock-raising homesteads, timber rights, adverse claims, fissionable materials, and other similar topics.
7536. History of Premium Price Plan for copper, lead, and zinc, 1942-47, by H. E. Olund and S. A. Gustavson. 210 pp. Gives history of the Premium Price Plan used by the Government during World War II to expand production of critically needed copper, lead, and zinc and to keep prices for these scarce metals on a reasonably even keel.
7537. Petroleum refineries, including cracking plants, in the United States, January 1, 1949, by F. S. Lott and I. S. Culver. 21 pp. Lists capacity of petroleum refineries and cracking plants in the United States on January 1, 1949.
7538. Average heating values of American coals by rank and by States, by George J. Flynn, Jr. 11 pp. Lists average heat contents of the various coals produced in the United States.
7539. Mining methods and practices at the Iron King mine, Shattuck-Denn Mining Corp., Yavapai County, Ariz., by Charles A. Kumke and H. F. Mills. 17 pp. 11 figs.
7540. Mines and mineral deposits (except fuels), Meagher County, Mont., by Robert N. Roby. 43 pp. 4 figs.
7541. Summary of published information on large-capacity compressed-air receivers for underground mines, by Andrew Allan, Jr. 7 pp. Contains list of published articles pertaining to large-capacity compressed-air receivers for underground mines, with a brief summary of the contents of each.
7542. Observations of safety practices and conditions in Japanese coal mines, by Russell G. Warncke. 38 pp.
7543. Mining methods at the brucite deposit, Basic Refractories, Inc., Gabbs, Nye County, Nev., by George H. Holmes, Jr. 10 pp. 7 figs.
7544. Mines and mineral deposits (except fuels), Fergus County, Mont., by Almon F. Robertson. 76 pp. 6 figs. Describes principal metal mines and prospects and points out that metal mining has been confined mainly to gold and silver deposits.
7545. The National Safety Competitions of 1944-47, by Forrest T. Moyer, Joseph H. Schuster, J. I. Davis, and E. K. Elsner. 81 pp. Summarizes the safety records of individual companies and industry groups during the 1944-47 period and the injury experience of each industry group as a unit over the 23-year period, gives the individual records of injury experience of each entrant for 1944-47, and includes a list of all winners of awards during the 1944-47 period.
7546. Mines and mineral deposits (except fuels), Park County, Mont., by Glenn C. Reed. 68 pp. 16 figs.

REPORTS OF INVESTIGATIONS
U. S. Bureau of Mines

4453. Investigation of Rush Creek lead-zinc deposit, Mono County, Calif., by E. J. Matson. 4 pp. 3 figs.
4454. Investigation of Running Wolf iron deposits, Judith Basin County, Mont., by Robert N. Roby. 7 pp. 3 figs.
4455. Petroleum-engineering study of Atlanta oil field, Columbia County, Ark., by C. H. Riggs. 55 pp. 23 figs. Describes reservoir conditions and oil-production history of the Atlanta oil field.
4459. Physical properties of mine rock. Part 1, by S. L. Windes. 79 pp. 10 figs.
4460. Explosive properties of hydrazine, by Frank E. Scott, John J. Burns, and Bernard Lewis. 18 pp. 5 figs.
4461. A method for the spectrochemical determination of thallium in ores, concentrates, dusts, and chemicals, by Graham W. Marks and E. V. Potter. 13 pp. 8 figs.
4462. Lime-soda sinter process for alumina from high-silica bauxites: Laboratory and pilot-plant tests, by John E. Conley and Milford L. Skow. 67 pp. 11 figs.
4465. The "carbon-oxygen complex" as a possible initiator of explosions and formation of carbon monoxide in compressed-air systems, by H. W. Busch, L. B. Berger, and H. H. Schrenk. 22 pp. 13 figs. Discusses explosions and formation of carbon monoxide in compressed-air systems and the carbon-oxygen complex and describes experiments with carbon deposits from air compressors.
4466. Concentration of oxide manganese ores from Columbia and Elberta mining districts, Tooele and Juab Counties, Utah (Wildcat, Sharp, and Aeronaut No. 1 properties), by K. C. Dean and K. C. Vincent. 11 pp.
4467. Some chemicals from synthetic liquid fuels processes, by Norma Golumbic. 58 pp. 6 figs. Describes the Fischer-Tropsch and related processes and discusses primary and secondary products and their uses.
4468. Sampling the Kennedy zinc tailing pile, Lafayette County, Wis., by A. M. Cummings. 7 pp. 2 figs.
4469. Investigation of Red-Back magnetite mine, Sterling Lake, Orange County, N. Y., by W. T. Millar, H. O. Hammond, and Robert S. Sanford. 4 pp. 9 figs.
4470. Investigation of Coyote Creek antimony deposits, Garfield County, Utah, by W. M. Traver. 18 pp. 6 figs.
4471. Investigation of Virgin River manganese deposit, Clark County, Nev., by William H. King, John H. Soule, and Russell R. Trengove. 6 pp. 4 figs.
4472. Investigation of silica deposits near the Skagit River, Skagit County, Wash., by C. C. Popoff. 16 pp. 5 figs.
4473. Flammability of methyl alcohol vapor-air mixtures at low pressures, by G. W. Jones and F. E. Scott. 5 pp. 1 fig.
4474. Investigation of the Star mine, Neihart district, Cascade County, Mont., by J. A. Herdlick. 12 pp. 3 figs.
4475. Investigation of tungsten occurrences in Darwin district, Inyo County, Calif., by D. W. Butner. 6 pp. 10 figs.
4476. Investigation of Sublette Ridge vanadium deposit, Lincoln County, Wyo., by Paul T. Allsman, Forest H. Majors, Stanford R. Mahoney, and W. A. Young. 8 pp. 2 figs.
4477. Method of assaying oil shale by a modified Fischer retort, Revision of R. I. 3977, by K. E. Stanfield and I. C. Frost. 13 pp. 8 figs.
4478. Investigation of the Mohawk lead-zinc mine, San Bernardino County, Calif., by Frank J. Wiebelt. 7 pp. 4 figs.
4479. Investigation of the Waukon iron deposit, Allamakee County, Iowa, by Paul E. Pesonen. 22 pp. 2 figs.
4480. Investigation of South Carthage zinc-lead deposit, Jasper County, Mo., by Louis C. Brichta. 49 pp. 2 figs.
4481. Diamond drilling in the Metaline district, Pend Oreille County, Wash., by N. L. Wimmler and W. B. Cole. 25 pp. 11 figs.
4482. Electrolytic manganese in acid electric steel foundry practice: Tests at National Malleable & Steel Castings Co., Sharon, Pa., by Frederick Sillers, Jr. 23 pp. 1 fig.
4483. Investigation of Jamestown fluorite deposits, Boulder County, Colo., by John H. Hild and E. W. Ames. 10 pp. 8 figs.
4484. Investigation of tin-bearing pegmatites in the Tinton area, Lawrence County, S. Dak., by William F. Jahn and Paul E. Pesonen. 25 pp. 8 figs.
4485. Investigation of the M. C. zinc mine, Lafayette County, Wis., by G. A. Apell. 8 pp. 2 figs.
4486. Investigation and laboratory testing of vermiculite deposits, Llano County, Tex., by W. D. McMillan and A. W. Gerhardt. 42 pp. 10 figs.
4487. Investigation of the Townsite zinc and lead mine, Ottawa County, Okla., by Clinton C. Knox. 13 pp. 6 figs.
4488. Investigation of Rush Creek zinc district, Marion County, Ark., by Louis C. Brichta. 15 pp. 2 figs.
4489. Investigation of the Kline and Frey zinc tracts, Wentworth mining district, Lawrence and Newton Counties, Mo., by Louis C. Brichta. 27 pp. 6 figs.
4490. Zinc-lead ore reserves of the Tri-State district, Missouri-Kansas-Oklahoma, by Otto Ruhl, Simeon A. Allen, and Stephen P. Holt. 59 pp. 8 figs. Zinc-lead ore reserves of the Tri-State district of Missouri-Kansas-Oklahoma are estimated at 66,100,000 tons of minable ore.
4491. Investigation of Vest nickel prospect, Floyd County, Va., by Wesley A. Grosh. 4 pp. 4 figs.
4492. Investigation of the Scarlet copper mine, Randolph County, N. C., by M. H. Kline and H. G. Dosh. 10 pp. 7 figs.
4493. The Leadville drainage tunnel, Lake County, Colo., by Robert A. Elgin, M. E. Volin, and James W. Townsend. 37 pp. 21 figs.
4494. Investigation of copper-bearing pyrite ores, Pyrites, Clay County, Ala., by H. D. Pallister and J. R. Thoenen. 15 pp. 7 figs.
4495. Investigation of the Irwinton bauxite district, Wilkinson County, Ga., by William A. Beck. 16 pp. 2 figs.
4496. Investigation of the Thompson magnesium well, Grand County, Utah, by C. L. Severy, M. H. Kline, and Paul T. Allsman. 21 pp. 8 figs.
4497. Investigation of Idol and Dalton zinc deposits, Grainger County, Tenn., by Richard L. Sayre and Austin B. Clayton. 4 pp. 7 figs.
4498. Pilot-plant production of steel from sponge iron, by W. W. Stephens and J. L. Morning. 21 pp. 5 figs.
4499. Coal hydrogenation: The effect of variations in the coal-to-vehicle ratio, by Milton Orchin, G. L. Goldbach Margaret Wolak, and H. H. Storch. 10 pp. 7 figs.
4500. Anthracite mechanical mining investigations. Progress report 1. Preliminary underground tests of the Bureau of Mines scraper-shaker loading machine for driving gangways, by John W. Buch and Andrew Allan, Jr. 9 pp. 3 figs.
4501. Anthracite mechanical mining investigations. Progress report 2. Preliminary testing of Eickhoff shearing machine, model DEK, by John W. Buch and Andrew Allan, Jr. 17 pp. 17 figs.
4502. Report of research and technologic work on explosives, explosions, and flames, fiscal years 1947 and 1948, by Bernard Lewis. 92 pp. 71 figs. Describing 2 years of explosives research, this report includes tests on new and safer explosives for mines, on the explosibility of ammonium nitrate fertilizer, the hazards of industrial gases, vapors, and dusts, and improved methods of rock-dusting to prevent the spread of coal-dust explosions.
4503. Investigation of Salt River Range vanadium deposits, Lincoln County, Wyo., by Paul T. Allsman, Forest H. Majors, Stanford Mahoney, and W. A. Young. 18 pp. 6 figs.
4504. Investigation of Keystone and St. George copper-zinc deposits, Cochise County, Ariz., by T. M. Rounsle. 21 pp. 14 figs.
4505. Investigation of Antimony Peak, Kern County, Calif., by G. D. Jermain and Spangler Ricker. 5 pp. 5 figs.
4506. Investigation of Montezuma and Chinati zinc-lead deposits, Shafter district, Presidio County, Tex., by W. D. McMillan. 26 pp. 8 figs.
4507. Investigation of mica deposits at the Victory Jack Rabbit, Rainbow, and Midas mines, Custer County, S. Dak., by A. B. Needham. 26 pp. 9 figs.
4508. Lead-zinc-silver in the Poughkeepsie district and part of the upper Uncompahgre and Mineral Point districts, Ouray and San Juan Counties, Colo., by Scott W. Hazen, Jr. 110 pp. 34 figs. Reconnaissance work, mapping, and sampling were done in this area in 1946.
4509. Investigation of the Alfred Davis soapstone deposits, Gillespie County, Tex., by W. D. McMillan. 9 pp. 3 figs.
4510. Investigation of Whitehorse limestone deposits, Snohomish County, Wash., by Constantine C. Popoff. 9 pp. 4 figs.
4511. Investigation of concentration sections at the Central mill of the Eagle-Picher Mining & Smelting Co., Cardin, Okla., by H. Kenworthy, W. A. Calhoun, and M. M. Fine. 37 pp. 8 figs. Describes methods of increasing the efficiency of milling operations.
4512. Investigation of Casper Mountain chromite deposits, Natrona County, Wyo., by F. W. Horton and Paul T. Allsman. 26 pp. 10 figs.
4513. Investigation of Henderson Gulch tungsten deposit, Granite County, Mont., by Robert J. Hundhausen. 8 pp. 11 figs.
4514. Investigation of Capitan iron deposits, Lincoln County, N. Mex. Supplement to R. I. 4022, by John H. Soule. 5 pp. 8 figs.
4515. Titanium minerals in central and northeastern Florida, by J. R. Thoenen and J. D. Warne. 62 pp. 26 figs. Describes an exploration project conducted by the Bureau in 1947 and 1948 in 10 northeastern and central Florida counties.
4516. Investigation of Little Castle Creek chromite deposit, Shasta County, Calif., by E. J. Matson. 6 pp. 3 figs.
4517. Analytical distillation of crude oils at high altitudes by the Bureau of Mines routine method, by Welton J. Wenger and John S. Ball. 9 pp. 4 figs.
4518. Examination, mapping, and sampling of mine shafts and underground workings, Leadville, Lake County, Colo., by Norman E. Ebbley, Jr., and John I. Schumacher. 115 pp. 60 figs.
4519. Production of ductile titanium at Boulder City, Nev., by F. S. Wartman, J. P. Walker, H. C. Fuller, M. A. Cook, and E. L. Anderson. 37 pp. 2 figs. Gives an account of the production of ductile-grade titanium powder in 100-pound batches by reduction of purified titanic chloride with magnesium.
4520. Investigation of coal deposits in south central Alaska and the Kenai Peninsula, by Albert L. Toenges and Theodore R. Jolley. 37 pp. 8 figs.
4521. Bauxite investigations, Eufaula district, Barbour and Henry Counties, Ala., by S. A. Allen. 85 pp. 112 figs. Describes an investigation that added 820,000 tons of recoverable, commercial grade bauxite to the Nation's known reserves.
4522. Investigation of Carbonate King zinc mine (Crystal Cave group), San Bernardino County, Calif., by Frank J. Wiebelt. 10 pp. 4 figs.
4523. Laboratory study of asphalts from native bitumens and bituminous sandstones, by Rethel L. Hubbard and K. E. Stanfield. 22 pp. 2 figs.

BIRTHS

Mr. and Mrs. Richard M. Stewart are the parents of a daughter, Marilyn, who arrived at their home in June 1949. The family is living in a house trailer which is installed on lots they have bought in Butte, Montana. They are conveniently located to superintend the building of their home which is now under construction. The new address is 3001 Wharton Street, Butte.

Mr. Stewart, of the class of '48, is employed by Anaconda Copper Mining Company.

Mr. and Mrs. John Herbert McKeever, Jr., welcomed a son, Timothy Abbott, into their home on June 16, 1950.

They reside at 336 Eighth Ave., West, Calgary, Alta., Canada, Mr. McKeever, '47, being geologist for Stanolind Oil & Gas Company.

WEDDINGS

Hudson - Fertig

John E. Hudson and Miss Patricia Louise Fertig, daughter of Col. and Mrs. Wendell W. Fertig, were married the afternoon of June 29 in Calvary Episcopal church of Golden.

The bride was attended by her sister Miss Jeanne Fertig, and the groom's best man was his brother, Robert E. Hudson. Both brothers were graduated from *Mines* in May.

After a honeymoon spent in Lake Wales, Florida, the home of Mr. Hudson, and in Cuba, the couple returned to Golden for a short time before going to Camp Carson at Colorado Springs, Mr. Hudson having accepted a commission in the army.

Irish - Shepherd

Another member of the 1950 class at *Mines* exchanged marriage vows in June, Charles W. Irish, whose bride was Miss Joan Clare Shepherd, daughter of Mr. and Mrs. George W. Kinsey of Denver. The marriage took place in Christ Methodist church of Denver.

Mr. Irish is now associated with General Electric Company at Pittsfield, Mass., where the couple are making their home.

Rugg - Brause

The Chapel of the Transfiguration, the little log church at the Snake river in Jackson Hole, Wyoming, was the scene of the marriage on June 24 of Edwin S. Rugg and Miss Betty Lou Brause.

The bride, daughter of Mr. and Mrs. A. L. Brause of Calpet, Wyoming, is a graduate of Wasatch Academy at Mount Pleasant, Utah.

Mr. Rugg, of the class of '43, is Engineer for the Texas Company at Calpet, where he and Mrs. Rugg are now at home.

Howard - Davis

Miss Donna Lee Davis and Edward E. Howard were united in marriage the evening of June 24 in the Wheatridge Methodist church.

Both of them are graduates of the Wheatridge high school. The bride then attended and was graduated from the Southern seminary and junior college at Buena Vista, Virginia, while the groom studied at *Mines* for his degree in metallurgy which he received this past May.

The couple are now at home in El Paso, Texas, where Mr. Howard accepted a position with the Phelps-Dodge Refining Corporation.

Bradley - Mitchell

Hugh E. Bradley, who was graduated from *Mines* this year, and Miss Betty L. Mitchell, daughter of Mr. and Mrs. Walter Mitchell of Denver, were married the evening of May 27 at the Washington Park Community church in Denver.

The bride is a graduate of North Denver high school and for the past four years has been employed in the billing department of the Denver office of the Mountain States Telephone company.

Mr. Bradley is the younger son of Mr. and Mrs. J. C. Bradley of Golden. He was a member of the Alpha Tau Omega fraternity, Blue Key and the "M" club. He was prominent in athletics, playing football for three years, and lettered two years.

The couple are at home at Rangely, Colorado, where Mr. Bradley has a psoition with Stanolind Oil and Gas Company.

Mark - Proctor

Miss Charlotte Ann Proctor, daughter of Mr. and Mrs. G. O. Proctor of Golden, and Clifford A. Mark, son of Mr. and Mrs. L. A. Mark of Las Animas, Colorado, were married on June 5 at the home of Rev. E. W. Ferrin of Lakewood. A reception at the bride's home followed the ceremony for members of the families and a few friends.

The bride was graduated from Golden High school this year and Mr. Mark received his degree in Geology from *Mines* with this year's class.

Kaufmann - McDonald

Mr. and Mrs. Thomas P. McDonald of Fort Worth, Texas, have announced the marriage of their daughter, Helen Elizabeth, to Godfrey F. Kaufmann which took place in Fort Worth, June 5.

After a honeymoon in Old Mexico the couple are now at home in New York City where Mr. Kaufmann, of the class of '21, is geophysical research co-ordinator for Standard-Vacuum Oil Company.

They have as their guest this summer Mr. Kaufmann's daughter, Jean Ann, who was graduated from high school in Golden the 1st of June.

Robison - McCullough

Joe T. Robison and Miss Martha McCullough, daughter of Mr. and Mrs. William McCullough of Ouray, Colorado, were married June 11 in the Presbyterian Church of Ouray.

Upon his graduation from *Mines* last year Mr. Robison entered the Army and until several months ago served as Captain at the Artillery School, Fort Bliss, Texas. He is now junior engineer with Shenandoah-Dives Mining Company at Silverton, Colorado.

PROGRESS BY BELT CONVEYORS

(Continued from page 24)

it to the elevators that automatically discharge it to any of the lower cargo decks. In unloading the ship, the same flexible system saves a similar amount of time and money by reversing the operation.

We believe this conveyor system as it is widely adopted, will go far toward solving for shippers the particular problems of packaged cargo.

Future of Conveyor Industry

The future of the conveyor industry is, I feel, already mapped out. We know what industrial problems must be solved; we know what achievements we can accomplish; we know what designing and engineering advances must be made.

Some of these advances will be made in belt construction. Belts of half their present width and twice their speed will do an even more economical job than at present. Narrower belts will reduce installation costs, take up less space and, by using smaller parts, bring our operating expenses down.

Already we have high tension belts, reinforced with steel cables, that will permit operation of a single belt carrying a greater load a longer distance. One of these belts has been estimated as being able to carry 2000 tons an hour at 500 feet a minute for a distance of half a mile up an 18 degree incline. This would be roughly double what we can now do with our strongest belts.

A belt of this strength, however, is an expensive proposition. The solution that would make possible future single conveyors of twenty miles or more in length lies in another direction. Materials handling engineers today have a full scale operating model of a new method of applying power to a conveyor system and a new method to keep the proper tension on the belt, that will probably in the future, obsolete the numerous sections of the belt conveyor system as we know them today. And this new system will operate with the much less expensive types of belt now in general use. The elimination of many costly transfer points, alone, would represent a tremendous saving to a project such as the Riverlake with its proposed 172 separate sections.

With the possibility ahead of longer single belt conveyors, Gentlemen, we can look forward to accomplishing things that are today impossible.

Speaking to you this evening has been a pleasure, Gentlemen. I hope that you will not confuse my enthusiasm for the conveyor idea with boasting about its prowess. We in the conveying industry think its potential is almost unlimited.

I wish to thank you very much on behalf of Hewitt-Robins for the opportunity that your president, Mr. King, and your program chairman, Mr. Zacher, have given us to tell you something about our industry and how the name of Buffalo on rubber belts is being conveyed around the world. I thank you.

PERSONAL NOTES

(Continued from page 36)

Sydney A. Mewhirter, '17, Consulting Engineer, has a change of address to Carrera 7-No. 48-12 Bogota, Colombia, S. A.

John C. Mitchell, '39, who is associated with the American Smelting & Refining Company at Leadville, Colorado, receives mail there thru Box 258.

Frank M. Monninger, '49, Testing Engineer for Inspiration Consolidated Copper Company, is addressed Box 86, Inspiration, Arizona.

G. L. Neumann, '21, Mining Engineer, U. S. Bureau of Mines, has a change of address to P. O. Box 29, 145 Clinton Street, Gouverneur, N. Y.

V. A. Peterson, '30, has been transferred to the Denver office of Sinclair Oil Company, 410 Continental Oil Building. He is residing at 3428 Fillmore Street, Denver.

Earl C. Phillips, '31, Chief Electrician for Golden Cycle Corporation, is at present in Victor, Colorado, with address Box 469.

Changes of address have been received from the following members of the class of 1950: *Donald I. Andrews,* c/o Continental Oil Company, Box 1506, Shreveport, La.; *Samuel D. Ayres,* Geological Department, Arkansas Natural Gas Co., Shreveport, La.; *Douglas F. Benton,* 2334 E. Oklahoma St., Tulsa Okla.; *Peter B. Bike,* The Pure Oil Co., Southwestern Producing Div., The Pure Building, Tulsa, Okla.; *Wayne F. Bohanan,* McComb, Miss.; *C. W. Bowlby,* Box 345, Winlock, Wash.; *Hugh E. Bradley,* Stanolind Oil & Gas Co., Rangely, Colorado; *Tyler Brinker,* 734 Third Ave., Durango, Colo.; *Daniel W. Butner, Jr.,* Box 124, Uravan, Colo.; *Melvin Carlson,* Ophir, Colorado; *Walter M. Chapman,* c/o National Lead Co., Tahawus, N. Y.; *Stewart M. Collester,* General Delivery, Whittier, Calif. (with Union Oil Co. of Calif.); *Daniel M. Copper,* General Delivery, Dragerton, Utah (with Geneva Steel Co.); *Emory V. Dedman,* Phillips Petroleum Co., Box 694, Houma, La.; *Arthur S. Dickinson,* 4125 East 3rd Ave., Denver (with Shell Oil Company); *George Dolezal, Jr.,* 1405 E. 1st St., Casper, Wyo.; *William F. Dukes,* General Delivery, Woodson, Texas (with Fred M. Manning, Inc.); *Foster E. Endacott, Jr.,* c/o General Geophysical Co., Box 145, Sidney, Nebraska; *Leroy L. Fournier,* 501-14th St., Golden, Colo. (with Standard Oil Co. of Calif.); *Richard H. Fulton,* 1427 East St., Golden, Colo. (with Mid-States Oil Co.); *Forrest W. Grubb,* 2312 So. Harvey, Oklahoma City, Okla. (with Midstates Oil Corp.); *Harry E. Haynes,* c/o The Pure Oil Co., Box 1398, Billings, Mont.; *J. H. Heinicke,* Great Lakes Carbon Corp., Bldg. Products, Box X, Socorro, New Mexico; *William H. Hommel,* Exploration Service Co., Box 305, Haskell, Texas; *Edward E. Howard,* 2930 Eaton St., Denver 14, Colo. (with Phelps Dodge Refining Corp.); *Robert E. Hudson,* c/o W. W. Whitaker, Douglas, Wyo. (with The Texas Company); *Charles W. Irish,* 648 Cook St., Denver, Colo. (with General Electric Co.); *Gordon L. James,* 312 Sherman St., Denver, (with Standard Oil Co.); *Donald L. Johnson,* 4015 Eaton, Denver 14, (with Allis-Chalmers Co.); *Einar L. Johnson,* 2327 C, Chester Lane, Bakersfield, Calif. (with Capital Company); *Robert E. Keith,* 2500 Fourth Ave., Pueblo, Colo. (with Triplex Corp.); *Andrew G. Keleher,* 1476 Pennsylvania St. Apt. 231, Denver 3 (with Royal Oil Co.); *Clyde W. Kerns,* Box 422, Lander, Wyo. (with Phillips Petroleum Co.); *Robert J. Lamm,* c/o The Atlantic Refining Co., Box 58, Comanche, Okla.; *Allan J. Loleit,* c/o

(Continued on page 44)

AIRBORNE MAGNETOMETER SURVEY OF PEACE RIVER

(Continued from page 30)

tories. Their equipment includes a precise aerial mapping camera, the Sonne continuous strip camera which records the path of the plane during the magnetometer survey, and several electronic recording devices. The new, improved, high sensitivity Gulf airborne magnetometer will be used for the survey.

The survey will be flown at an altitude of 1,000 feet in a series of parallel lines spaced at 1 ½ mile intervals, with many intersecting control lines to correct for the severe daily variations of the magnetic field found in this part of the world. Over 16,000,000 acres will be mapped. Flying will be completed in the early fall, and the data reduction and map compilation will be a continuing operation. The map sheets will be delivered simultaneously to all participants as they are compiled. Final deliveries of the maps will be made before the end of the year. The magnetic maps will be compiled at a scale of one mile to the inch, with a 5 gamma contour interval. The magnetic record will be precise to 2 gamma, a quantity only one twenty-five thousandth as great as the earth's magnetic field being measured.

Project engineer for the survey will be Jack C. Webster. Canadian Aero Service, Ltd. will draw on its affiliate companies. Aero Service Corporation of Philadelphia for some technical assistance, and on Spartan Air Services, Ltd. of Ottawa, who will provide the plane and flight personnel for the survey. The pilots are former RCAF men, with extensive aerial mapping experience over the bush country.

CATALOGS AND TRADE PUBLICATIONS

(Continued from page 31)

mills are also included. This book will be found useful to all persons interested in modern ore-dressing and others.

(5662) "THE NEXT FIVE YEARS" is a story giving the pertinent facts in connection with a contract recently signed by Allis-Chalmers Mfg. Company, Milwaukee, Wisc., and United Auto Workers CIO. This publication will be found of great interest to all Public Relations Departments of industrial companies and many others.

(5663) INTERNATIONAL NICKEL REPORT. In his address to stockholders, Robert C. Stanley, Chairman of the Board, International Nickel Co., at their annual meeting April 26, Toronto, Canada, gave a complete financial and operating statement covering the year 1949. Among other activities discussed is that of the development and research organization.

(5664) "ON TOUR," June 1950, by the Union Oil Co. of Calif., Union Oil Bldg., Los Angeles 17, Calif., contains 24 pages including "76 Views of Refining" continued from the May issue. Other illustrated articles will be found of great interest as well as news items pertaining to the company operations.

(5665) "LINDE TIPS," July 1950, by Linde Air Products Co., 30 E. 42nd St., New York, N. Y., contains 24 pages of short illustrated articles discussing methods of welding, useful hints and new ideas. Those with welding problems will find much valuable information in this publication.

(5666) PIPE LINE CONSTRUCTION. "Tic-In" by H. C. Price & Co., Bartlesville, Okla., for the 2nd Quarter, 1950, contains 20 pages illustrating and describing some of the difficult pipe line construction that this company has under way at the present time. Ilevicote process of pipe coating developed by the Price Company is illustrated and described in this issue.

(5667) NICKEL ALLOYS. Technical Bulletin T-7 by International Nickel Co., Inc., 67 Wall St., New York, N. Y., contains 24 pages of charts, tables on composition and properties, working instructions and other information of a technical nature pertaining to "Inconel X," one of the newer age-hardenable Inco Nickel alloys.

(5668) "PROGRESS NEWS," July 1950 Gates Rubber Co., 999 S. Broadway, Denver, Colo., contains 28 pages, largely pertaining to personnel activities of the company. News items covering company operations are also included.

(5669) "THE BEACON," June 1950, by The Ohio Oil Co., Findlay, Ohio, contains 36 pages largely devoted to the personnel activities of this company. In this issue is an account of the 63rd Annual Meeting of the company and also a story covering the Billings Gas Co., Billings, Montana.

(5670) CONSTRUCTION EQUIPMENT, 1950 catalog by H. W. Moore Equipment Co., 120 W. 6th Ave., Denver, Colo., contains 140 pages illustrating and describing construction equipment to meet the needs of every job. Much information and data included in this well arranged catalog besides specifications covering most of the equipment listed. Engineers and contractors will find this catalog a very useful addition to their everyday reference library.

(5671) FLOTATION INDEX. The 20th Annual edition of the Flotation Index published by the Dow Chemical Co., San Francisco, Calif., contains an alphabetical listing of all important material published during 1949.

(5672) "MIN & CHEM," June 1950, by the International Minerals and Chemical Corp., 20 N. Wacker Drive, Chicago, Ill., contains a summary of the consolidated earnings of the company for the year ending June 30, 1949, also news items covering the activities of the company and the inspection trip made to the Carlsbad Mines, April 28, by the directors of the company and a large group of guests of internationally known men.

(5673) CATERPILLAR TRACTOR. Form 12992 by the Caterpillar Tractor Co., Peoria, Ill., contains a large sectional view of Diesel DW10 tractor showing all of the important mechanical parts of this equipment.

(5674) "STORAGE BATTERY POWER," June 1950, by Edison Storage Battery Division, West Orange, N. J., contains 16 pages illustrating and describing many new uses for storage battery equipment. Attention is especially directed toward storage battery trucks for movement of material in industrial plants.

(5675) "THE LOUIS ALLIS MESSENGER," June 1950, by the Louis Allis Co., Milwaukee, Wisc., is largely devoted to illustrations associated with summer vacations.

(5676) "PAY DIRT," June 23, 1950, by Charles F. Willis, Phoenix, Ariz., contains 16 pages of short articles and news items of interest to the mining industry. Two articles of great importance at this time are one on filing procedure in connection with annual labor required on mining claims and one showing the need of excise tax protection for the copper industry.

(5677) "NICKEL TOPICS," by International Nickel Corp., 67 Wall St., New York, N. Y., contains 12 pages of short illustrated articles covering the industrial use of nickel and nickel alloys. Special attention is given to current applications of ductile iron castings.

Breakfast For Mines Men
ELKS CLUB
SALT LAKE CITY
Wednesday, August 30

TECHNICAL MEN WANTED

(Continued from page 9)

foreman, with experience in smelting flotation concentrates in reverberatory furnace with pulverized coal as fuel. Must have had experience with horizontal copper converters and copper casting machine. Good living and housing conditions. Salary open depending upon experience and ability of applicant.

(1245) ASSAYER AND CHEMIST. Employment is offered to experienced assayer and chemist who is interested in foreign work. Must be able to assay copper ores and make analysis for various base metals and also rare metals. Salary open.

(1246) JUNIOR MINING ENGINEER. Position open with a well established mining company for young mining engineer who can handle underground surveying, mapping and other work that he may be called upon to do in connection with mining. Probable starting salary, around $275 per month.

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

(1258) JUNIOR PETROLEUM ENGINEER. An old established company with operations in the mid-continent oilfield has position open for Junior Petroleum Engineer. The work will embrace the preparation of isobaric maps, reserve studies, well performance studies, gas supply and reservoir engineering. Salary will depend upon experience and ability of the applicant.

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

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

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

(1264) MINING GEOLOGIST. An eastern mining company has position open for Mining Geologist with sufficient experience in mining geology to be capable of supervision in the directing of work as well as scouting and field mapping. Salary open.

(1266) JUNIOR MINING ENGINEER. A company located in the Rocky Mountain Region has position open for Mining Engineer who can handle surveying, mapping, stope measurement and mine sampling. Starting salary, $300 per month.

(1267) JUNIOR PETROLEUM GEOLOGIST. A well established petroleum company has position open for Junior Petroleum Geologist who is interested in a training program. Work will probably be in mid-continent field. Salary open.

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

PERSONAL NOTES

(Continued from page 42)

Exploration Service Co., Box 305, Haskell, Texas; *Bernard A. Mass, Jr.,* 905 West Towanda, El Dorado, Kansas (with Skelly Oil Co.); *Charles W. Matthews,* 233 No. Catherine Ave., LaGrange, Ills. (with Universal Oil Products Co.); *William W. May,* c/o The Texas Co., Box 828, Thermopolis, Wyo.; *George T. McCall,* Box 721, Wallace, Idaho (with Sullivan Mining Co.); *Clifton M. McDaniels,* Box 122, Golden, Colo. (with The California Co.); *Sol Meltzer,* Cities Service Oil Co., Box 6606, Roswell, New Mexico; *Pierre A. Meyer, Jr.,* 105 Main St., Bonne Terre, Mo. (with St. Joseph Lead Co.); *Robert H. Muench,* 3818 Quitman, Denver (with C. S. Card Iron Works Co.); *Robert G. Myers,* 701 Euclid Ave., Rock Springs, Wyo. (with Mountain Fuel Supply Co.); *Robert S. Padboy,* Box 301, Roundup, Mont. (with The Texas Co.); *James R. Patch,* Box 371, Rushville, Nebraska (with Superior Oil Co.); *Douglas L. Reese,* 1640 Madison St., Denver (with Mountain Fuel Supply Co.); *Kenneth J. Schneider,* 4476 Raleigh, Denver (with General Electric Co.); *Richard C. Siegfried,* c/o Superior Oil Co., 220 Cretney Bldg., Plainview, Texas; *David H. Singer,* 1508 Bennett, Wichita Falls, Texas (with Arkansas Fuel Oil Co.); *Raymond M. Stewart,* Room 618, 401 W. Park, Butte, Mont. (with Anaconda Copper Mining Co.); *Gustave Stolz, Jr.,* 910 Classen, Norman, Okla. (Student on Stanolind Oil & Gas Co. fellowship at University of Oklahoma); *James M. Taylor,* Box 638, Midwest, Wyo. (with Continental Oil Co.); *John E. Thornton,* The Pure Oil Co., Box 1398, Billings, Mont; *Jasper N. Warren,* Hotel LaFette, Seadrift, Texas (with Brazos Oil & Gas Co.); *L. R. Wolff,* 153 So. Bennett, Fontana, Calif. (with Kaiser Steel Co.)

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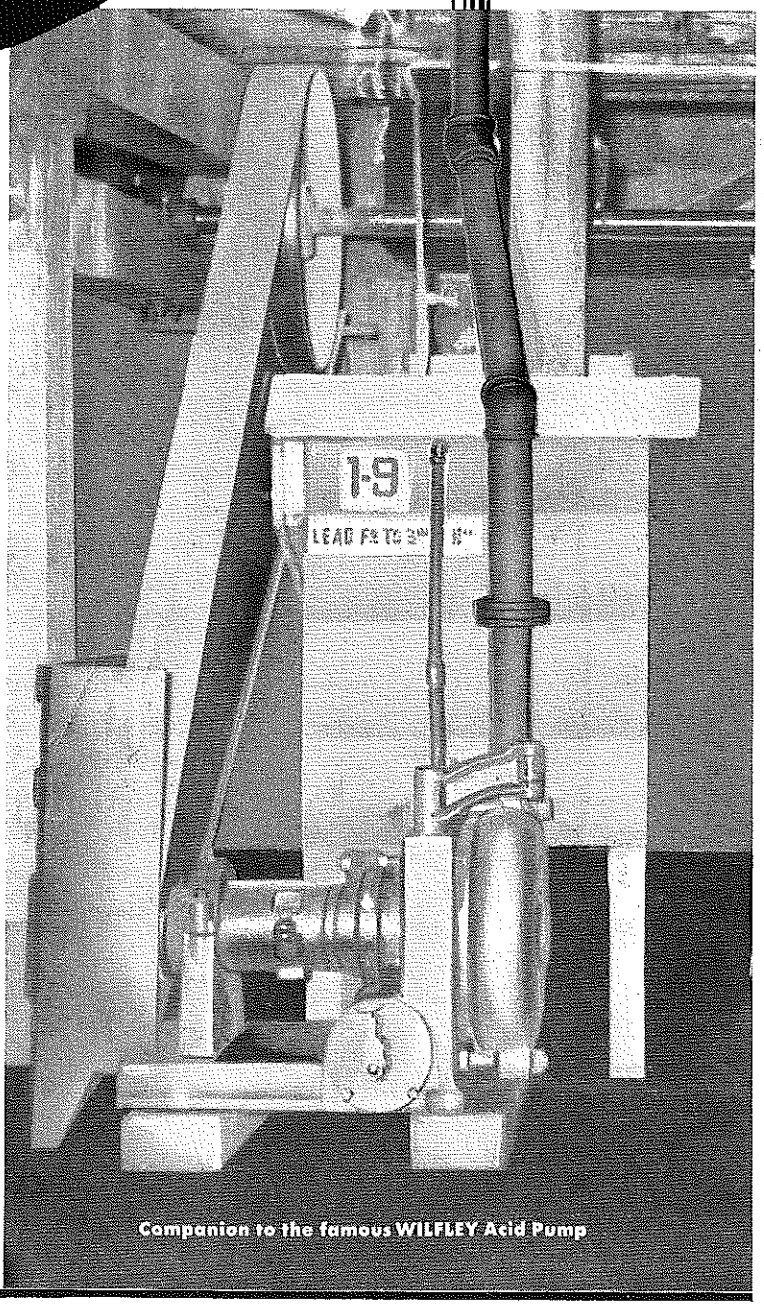

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