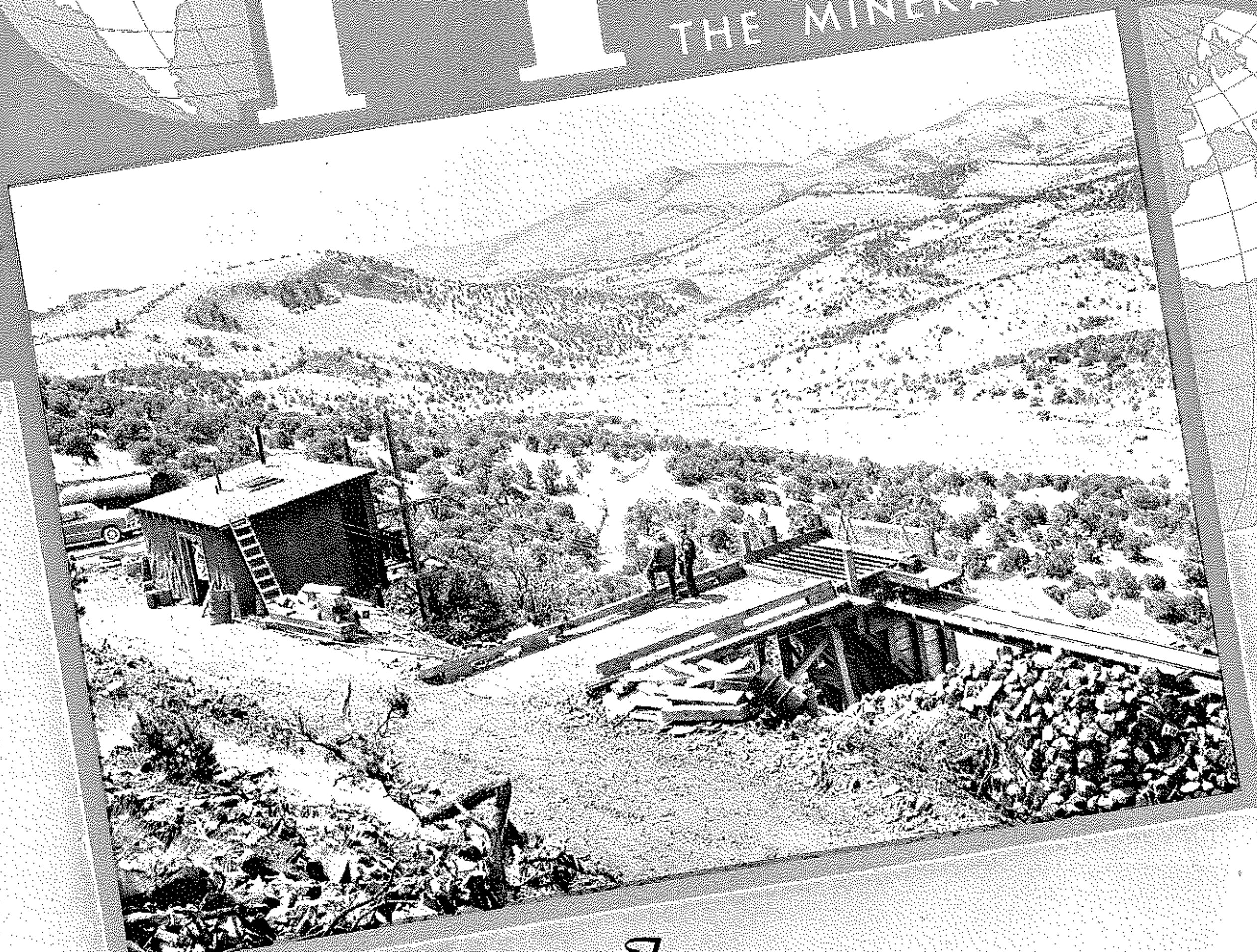
THE MINES MAGAZINE

AROUND THE WORLD WITH THE MINERAL INDUSTRIES



Featuring—

AMERICAN MINING CONGRESS IN SALT LAKE
SALT-BATH CHROMIZING
FUTURE OF GOLD
ROUND MOUNTAIN GOLD
URANIUM POLICIES
FLOTATION & CYANIDATION TESTS
NEW EQUIPMENT

SEPTEMBER • 1950

VOLUME XL NO. 9

PERSONAL NOTES

Richard D. Potter, '41, Assistant Professor of Physical Metallurgy, University of California, is addressed Hearst Mining Building, University of California, Berkeley 4, California.

H. Dell Redding, '47, Assistant District Rig Superintendent, Phillips Petroleum Company has a new residence address, 3929 Caldwell Street, Houston 4, Texas.

Angus L. Robertson, '42, Party Chief, United Geophysical Company, is now being addressed Box 1004, Glendive, Montana.

W. G. Robinson, '48, Mining Engineer, Inland Steel Company, was vacationing in Denver last month. His mailing address is Box 133, Marion, Kentucky.

Major William C. Rogers, '38, is returning to the United States with his family, following a twenty-two month tour of duty with the U.S. Armed Forces in the Philippines.

The Major who has been serving as armament supply officer and ground safety officer for the 24th Supply Group Depot at Clark Air Force Base in Central Luzon, has been ordered to report to Fort Mason in California for further reassignment.

A resident of Colorado Springs, Colorado, he has been in the service career since 1942 and served at Watertown Arsenal and completed Command and General Staff College at Fort Leavenworth, Kansas, prior to leaving for assignment to the Philippines in August 1948.

John H. Ross, '34, has a new residence address, 1228 Arno Road, Kansas City, Missouri. He is Vice President of Ross Manufacturing Company.

L. E. Sausa, '38, called at the Alumni office while on vacation in Denver from his duties as Mill Superintendent, U. S. Vanadium Corporation, at Bishop, California.

David B. Schulz, '49, Roughneck for George P. Livermore, Inc., Drilling Contractors, is at present in Odessa, Texas, with address 1010-B No. Adams Street.

Paul W. Smith, '35, has a change of residence address, 1151 So. Williams Street, Denver. He is Specification Reviewer for U. S. Bureau of Reclamation, Design and Construction Branch, Administrative Engineering Division.

Howard A. Storm, '29, Engineer for Colorado Iron Works Company, has moved his residence from Golden to 1875 Glen Dale Drive, Lakewood, Colorado.

Jack G. Sutton, '49, was on vacation in Denver this summer. He is Metallurgist for Aluminum Company of America, with address in care of the company, Metallurgical Department, H Plant, 2210 Harvard Avenue, Cleveland, Ohio.

Frank H. Storms, '24, is now associated with Iron Mines Company of Venezuela in whose care he is addressed Apartado Postal 22-71, Caracas, D. F., Venezuela.

John W. Tynan, '41, called at the Alumni office the eary part of July while on vacation from his duties as Senior Reservoir Engineer for Phillips Petroleum Company. His home address is 206 So. Shawnee, Dewey, Oklahoma.

Jerry F. Whalen, '49, resigned his position with Eastern Gas & Fuel Associates of Minneapolis to accept one as Engineer Trainee with North Western-Hanna Fuel Company. He is residing at 2601 West Third Street, Duluth 6, Minn., where he receives mail.

(Continued on page 7)

Letters . . .

RETURNED TO THE STATES

From Ben F. Rummerfield, '40, *Century Geophysical Corporation, Box 6216, Tulsa 17, Okla.*

I have recently returned from Mexico to the United States. Please change my address from the one you have to that given above.

In returning to the States I have taken a position as Manager of Seismic Operations for Century Geophysical Corporation.

Needless to say I am very pleased with my present position and it is very nice to be back in the States after an absence of five years.

INSTALLED IN HIS FIRST JOB

From Edward E. Howard, '50, *265 Princeton Road, Pasodale, El Paso, Texas*

I have gotten started all right in my job in the casting department of Phelps Dodge Refining Corporation. The first work assigned to me is to write an operating manual of the casting house.

There are a couple of other *Mines Men* here, Marion S. Bell, '49, and B. B. Kunkle, '31. Mr. Kunkle is the Plant Metallurgist and I am working with him at the present time.

Please send my copies of *Mines Magazine* and other mail to the above address.

ADVISES OF EMPLOYMENT OF MINES MEN

From R. D. Karns, *Stanolind Oil and Gas Company, Tulsa, Okla.*

These graduates of Colorado School of Mines have recently been employed by Stanolind Oil and Gas Company:

Hugh E. Bradley, '50, Producing department, Rangely, Colo.
Vance J. Driscoll, '50, Producing department, Box 832, Brownfield, Texas.
Wilfred P. Hasbrouck, '50, Exploration department, Seismograph Party No. 14, General Delivery, Ferriday, La.
Marvin R. Hewitt, '50, Exploration department, Seismograph Party No. 43, Box 16, St. John, Kansas.
Peter A. MacQueen, '50, Producing department, Box 1713, Beaumont, Texas.
Kenneth W. Paul, '49, Producing department, Salt Creek Area, Box 128, Midwest, Wyoming.

APPRECIATES WORK OF PLACEMENT SERVICE

From Paul J. Hinds, '50, *2 Finady Avenue, Bethlehem, Penna.*

I wish to inform you and the Placement Service that I accepted a job with The Bethlehem Steel Company at their Lehigh Plant located at Bethlehem, Penna.

I started work as of August 1, 1950.

Thank you for the interest and consideration you have given my application with the "Capability Exchange."

HAS CANDIDATE FOR CLASS OF 1967 AT MINES

From M. Jordan Nathason, '36, *193 So. Holliston, Pasadena, Calif.*

Enclosed is my check in payment of dues for 1950-1951. Please accept my apologies for not getting my 1950 dues in sooner, but, as often happens, one's household bookkeeping is never too good. To make certain of my 1951 dues, I have paid them in advance.

This is a good opportunity to let other *Miners* know that I have a candidate for the 1967 class. He arrived two months ago—name of Neil, and will follow his brother, Bobby, who will be in the 1963 class. That makes three in the family, including Alasya, who is six and a half.

The firm of Western Sealant, Inc. has a process which eliminates micro-porosity in metal castings designed to be pressure tight. We have licensed our process and are installing plants to do this work on a custom basis in all of the principal cities in the East and Midwest. The process and materials are approved by Army, Navy and Air Force, and it has been highly successful. My associate and I are both Reserve Officers, and we hope we can complete the installation of these plants in the East before Uncle Sam wants us back.

Sorry again about the dues, and pass my regards along to the *Miners* in Denver.

TWO INTERESTING NEWS ITEMS

From Charles E. Melbye, '50, *Tecopa, California.*

I have just noticed that my change of address was omitted from the Personal Notes in *Mines Magazine.* My new address is that given above where I am employed as assistant engineer and geologist by Anaconda Copper Mining Company.

I also wish to announce my marriage on June 20 to Miss Audrey J. Nelson at the First Evangelical Free Church, Benson, Minnesota. My wife is the daughter of Mr. and Mrs. Henry D. Nelson of Benson where she had always resided until the past year and a half when she was employed in Denver.

Enclosed is coupon, listing three publications I would like to have sent.

AMERICAN MINING CONGRESS BREAKS ALL RECORDS WITH METAL MINING CONVENTION AND EXPOSITION

SALT LAKE CITY, AUGUST 28-31, 1950

It is estimated that over 5000 visitors attended the technical sessions and machinery and equipment exhibits.

Over 125 exhibitors were represented from nationally known manufacturers of all kinds of equipment used in the mineral industries. There is very little question but what this was the largest assemblage of up-to-date equipment used in connection with the mineral industries that has ever been displayed in an exhibit of this nature.

Those who were fortunate enough to attend the Convention had the opportunity of examining the latest improvements in over 75 classifications of modern machinery. Technical sessions were held almost continuously throughout the four days. All types of subjects were covered by men well known to the mining industry and thoroughly familiar with the various subjects which were covered. Even though the temperature was rather uncomfortable, all sessions were well attended. Some of the general subjects covered were: Monetary Policy, Mine Operation Problems, Strategic Metals and Stock Piling, Tariffs and Taxes, Milling Methods, Development and Exploration, Safety and Labor Relations, Public Lands Policy, Atomic Energy, Public Relations and Silver and Milling Processes.

The Convention was climaxed with an annual banquet which was attended by approximately 3000 people.

Julius D. Conover is to be congratulated on his ability to organize such a Convention and carry it through to a successful conclusion. The fine cooperation he received from the various Chairmen and all of those who took part in making the Convention a success, shows that he has the solid support of the whole mining industry.

UTAH "MINES" ALUMNI SECTION BREAKFAST VISITING MINERS

Due to the crowded schedule of events for the American Mining Congress, the Salt Lake Section decided that an early breakfast would suit the convenience of most Miners attending the convention. No formal announcement of the event was made and all invitations were made by "word of mouth" as Miners met each other in Salt Lake's spacious fairgrounds.

On Wednesday morning at 8:00 A. M., over 100 Miners met at the Elk's Club for an informal get-together followed by an excellent breakfast of ham 'n eggs with all the trimmings.

Dave Squibb, '34, President of the Utah Section introduced the President and Vice President of the Alumni Association, Jim Colasanti and Tony Setter, Mines Prexy, Dr. Vanderwilt and Dean Signer.

Dr. John Vanderwilt, "Mines" Prexy

Dr. Vanderwilt gave a brief talk on "What is happening at Mines Today" followed by a few remarks from Dean Signer.

President Jim Colasanti thanked the Alumni for their excellent cooperation in Alumni affairs and wound up the meeting with his hilarious alphabet story.

The following Miners attended this most successful breakfast:

S. E. Zelenkov, Leadville, Colo., 1936; George W. Wunder, Tahawus, N. Y., 1936; Arthur C. Daman, Denver, Colo., 1915; Douglas E. Newton, Denver, Colo., 1948; Howard A. Storm, Denver, Colo., 1929; John W. Vanderwilt, Golden, Colo., Prexy; H. David Squibb, Salt Lake City, Utah, 1934; Daniel C. Frobes, Salt Lake City, Utah, 1924; Frank M. Stephens, Jr., Columbus, Ohio, 1942; A. George Setter, Denver, Colo., 1932; Edwin F. White, Denver, Colo., 1936; Percy S. Gardner, Jr., Philipsburg, Mont., 1934; George H. Allen, Salt Lake City, Utah, 1937; H. Van W. Donohoo, Jr., Salt Lake City, Utah, 1939; Nevin F. Wetzel, Salt Lake City, Utah, 1934; Walter N. Wetzel, Price, Utah, Guest; Philip A. Pelton, Salt Lake City, Utah, 1935; Edwin H. Crabtree, Jr., Miami, Oklahoma, 1927; George K. Burnhart, Kenilworth, Utah, Guest; Vincent N. Burnhart, Minneapolis, Minn., 1932; Armor B. Martin, Butte, Mont., 1923; Louis C. Rhodes, San Francisco, Calif., 1922; Maxwell L. McCormack, New York City, N. Y., 1926; Edward S. McGlone, Butte, Mont., 1923; William A. Beck, Jr., Birmingham, Ala., 1923; John H. Dismant, Salt Lake City, Utah, 1939; Philip W. Simmons, Lark, Utah, 1929; William E. Haldane, Grand Junction, Colo., 1942; Owen Kingman, Ducktown, Tenn., 1942; Franklin H. Persse, Salt Lake City, Utah, 1948; Richard F. Dewey, Spring Canyon, Utah, 1943; Victor R. Martin, Denver, Colo., 1941; R. W. Persons, Bayside, N. Y.; Alfred E. Perkins, Denver, Colo., 1910; Charles R. Cutler, Salt Lake City, Utah, 1939; Charles E. Golson, Denver, Colo., 1934; T. R. Weeks, Salt Lake City, Utah; W. G. Polisson, Hartford, Conn., 1928; Edmund C. Bitzer, Golden, Colo., 1929; William L. Jude, Gilman, Colo., 1925; Robert L. Stark, Denver, Colo., 1931; John F. Myers, Copperhill, Tenn., 1913; Gerald E. Gould, Keetley, Utah, 1947; Robert L. Bolmer, Denver, Colo., 1944; James G. Cox, Denver, Colo., 1938; Otto Herres, Salt Lake City, Utah, 1911; Jack P. Bonardi, New York City, N. Y., 1921; Paul L. Goddard, Denver, Colo., 1947; Jack Aldred, Denver, Colo., Guest; Frank L. Johnson, Jr., San Francisco, Calif., 1945; Will M. Traver, Jr., Denver, Colo., 1916; Frederick B. W. Hynes, Salida, Colo., 1941; Joseph J. Sanna, Salt Lake City, Utah, 1941; Everett M. Paris, Uravan, Colo., 1940; Luther S. Helms, Jr., Phoenix, Ariz., 1941; Joe E. Hopkins, Jr., Uravan, Colo., Ex-'39; M. I. Signer, Golden, Colo.; William F. Koch, Salt Lake City, Utah, 1911; William W. Little, Jerome, Ariz., 1934; Herbert Z. Stuart, Bisbee, Arizona, 1936; Malcolm C. Brown, Kellogg, Idaho, 1937; J. Ross

(*Continued on page 37*)

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.

(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.

(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.

(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.

(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.

(Continued on page 9)

PERSONAL NOTES

(Continued from page 3)

Thomas N. Allen, '41, Field Engineer for Stanolind Oil and Gas Company, has a change of address from Thermopolis, to Box 61, Elk Basin, Wyoming.

Benjamin F. Angus, '29, has a change of address in Caracas, Venezuela; he is now addressed there in care of Alberto Reyna, Apartado 28F.

Byron L. Applegate, '49, accompanied by his wife and two children, was vacationing in Denver last month. He is Sales Engineer for Bethlehem Supply Company, receiving mail at his home, 1436-A East 38th Street, Tulsa, Oklahoma.

John W. Barnes, '34, Construction Engineer, Mining department, for Stearns-Roger Manufacturing Co., has a new assignment at Carlsbad, New Mexico, where he is addressed in care of Duval Sulphur & Potash Company.

George C. Bartholomees, '29, was on vacation in Denver and Idaho Springs in August. He was accompanied by his wife and son. Mining Engineer for St. Joseph Lead Company, he resides at 330 Church Street, Bonne Terre, Missouri.

John A. Brandon, '49, Metallurgist for American Smelting & Refining Company, has been tranferred from Deming to Bayard, New Mexico.

Charles S. Burriss, Ex-'40, Engineer and Geologist for American Smelting & Refining Company, has a change of address from Mike Horse to Trident, Montana.

Robert P. Comstock, '41, is, at present, in Moorcroft, Wyoming, in connection with his duties as General Superintendent for Boyles Brothers Drilling Company.

Col. Louis E. Cotulla, '25, has been transferred from Washington, D. C., His new address is A.P.O. 331, c/o Postmaster, San Francisco, Calif.

Salvador del Rio, '28, is President, Mundial Commercial Company, and receives mail at his home, 2346 Hollywood Drive, Baton Rouge, Louisiana.

William A. Elser, '48, Petroleum Engineer for Standard Oil Company of Texas, was transferred to Canada last month, his new address being 1728-13th Street, West, Calgary, Alberta.

(Continued on page 16)

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
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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

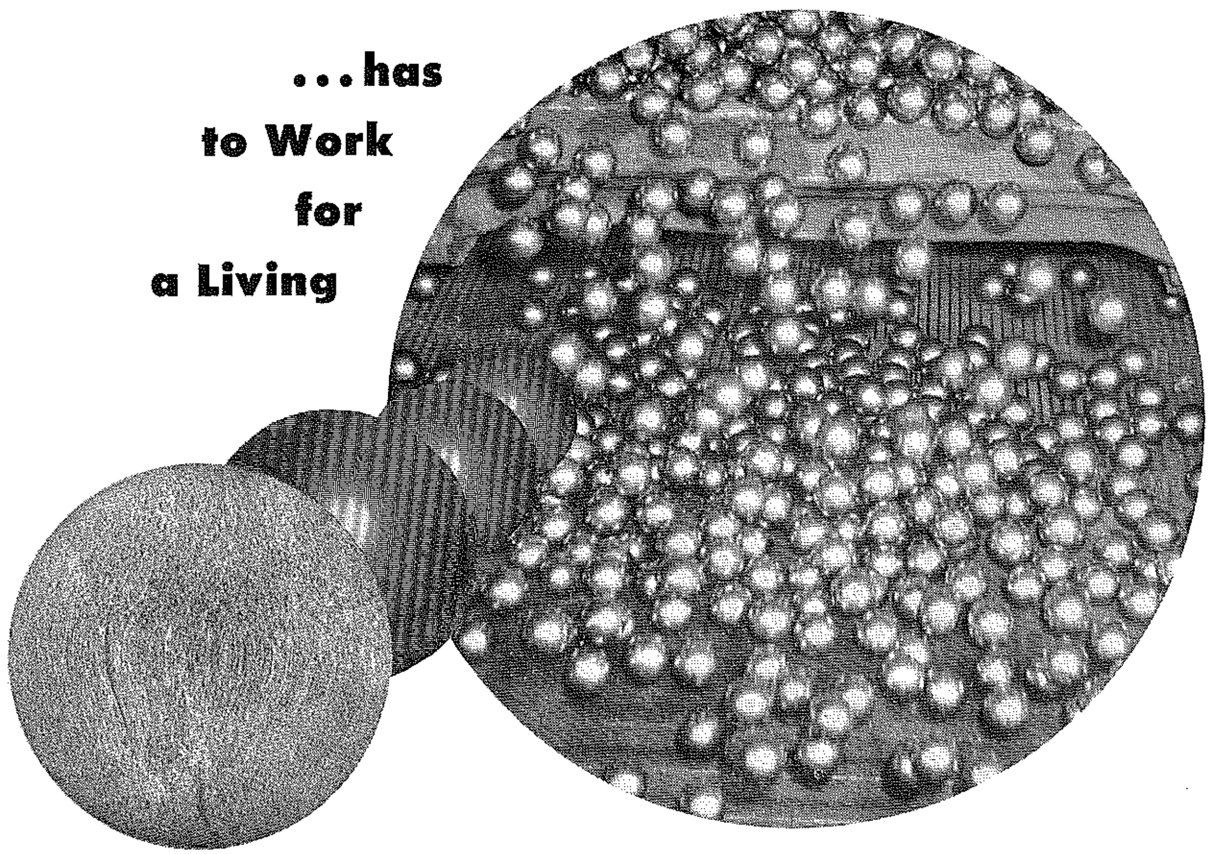
(Continued on page 45)

TECHNICAL MEN WANTED

(Continued from page 7)

(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 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.

(Continued on page 44)



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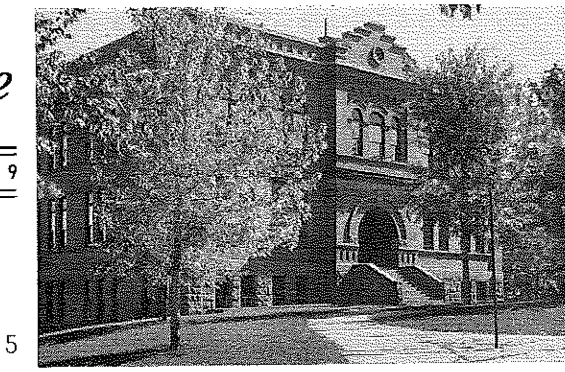

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Mining operations of the Crystal Hill Mining Company located 30 miles west of Center, Colorado. Caterpillar Diesel Electric Unit provides power for the operation.—Courtesy of the Caterpillar Tractor Company.

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SALT-BATH CHROMIZING[1]

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ABSTRACT

A variety of ferrous materials has been satisfactorily chromized at temperatures from 900 to 1200 C by immersion in fused salt baths containing from 5 to 30 weight per cent chromous chloride. The rate of case formation is equal to or greater than that obtained with the various pack methods at corresponding temperatures. The chromous chloride may be prepared in situ by the reduction of chromic chloride with chromium metal.

INTRODUCTION

The resistance of chromium and chromium-containing alloys to corrosion under oxidizing conditions is well known. The maximum temperature for stability in air, for example, increases from about 500 C for iron to about 900 C for chromium and up to 1050-1100 C for a 25-30 per cent chromium steel.

Since only the surface of a corrosion-resistant alloy is effective in opposing destructive attack, there are many instances in which ordinary iron or steels having a protective high-chromium alloy surface are as satisfactory from a performance standpoint as a continuous "stainless steel" structure. Recognition of this fact has led to the development of the various chromizing processes in which a protective case containing from 40 to 70 per cent chromium at the surface is produced by heating the base either in contact with chromium metal or in an atmosphere containing a chromium halide.

The principal method in use at present is the pack process in which a chromium-containing mixture is packed around parts in a tubular furnace, and the charge heated to 1300-1400 C in a hydrogen atmosphere (1). Variations which permit the use of lower temperatures include the use of a H_2-HCl atmosphere with a charge of chromium metal or ferrochromium, and the use of a chromous chloride-impregnated ceramic pack in an inert or reducing atmosphere.

A much more flexible process is the salt-bath method used in experimental work in Germany during the war. In this process, chromizing is obtained by simply immersing the work in fused salt containing chromous chloride (2), (3), (4).

Obvious advantages of this method include such factors as greater latitude in chromous chloride concentration during treatment, elimination of packing and unloading operations and furnace heating and cooling, and the possibility of chromizing, simultaneously, articles requiring different periods of treatment. These advantages prompted a more thorough investigation of the process to determine its feasibility. This investigation was undertaken at Battelle Memorial Institute in 1948 under the sponsorship of the Army Air Forces' Air Material Command, which was interested in chromized steels as replacements for strategic materials in aircraft. Results of this work are summarized here.

THE CHROMIZING MECHANISM

Salt-bath chromizing, like all of the pack processes except those depending solely on the diffusion of metallic chromium, is a displacement process. In the chromizing of steel, chromous chloride reacts with iron to form a chromium-iron alloy and ferrous chloride (5), (6). To prevent the accumulation of ferrous chloride which would restrict the chromizing reaction, metallic chromium is added to the bath. At the surface of the chromium the reverse reaction occurs, with the reduction of ferrous chloride and the formation of additional chromous chloride. The surface of a chromized part as ordinarily prepared is never pure chromium, but is of the order of 40 to 70 per cent chromium. The concentration gradient beneath the surface drops to about 13 per cent at the interface between the case and base metal.

The rate of case formation in the salt-bath is dependent upon two processes: (*a*) the exchange reaction outlined above and (*b*), the interdiffusion of chromium and iron. In salt-bath chromizing with a high chromousion activity, the limiting factor is the diffusion process, and the exchange process can, for practical purposes, be assumed to be instantaneous. Since the diffusion rate is an exponential function of the temperature, the rate of case formation increases rapidly with a small temperature increase.

Preparation of Reagents

Chromic chloride.—It was first necessary in this investigation to work out a convenient method for the preparation of chromous chloride in quantities required for the salt-bath operations. Although several methods are available, the reduction of anhydrous chromic chloride in a hydrogen-hydrogen chloride atmosphere was selected at the most convenient for laboratory-scale operations.

High-purity anhydrous chromic chloride was prepared by chlorination of electrolytic chromium flake, with tank chlorine in a horizontal silica-tube furnace at temperatures from 700-900 C. The rate of reaction was controlled by regulating the rate of gas flow and the furnace temperature. In the initial stages of the chlorination, the furnace temperature was maintained at 700 C, the higher temperature being used at the end of the run to obtain complete conversion of the metal to the chloride. Since the anhydrous chloride is stable toward moisture and air, no handling precautions were necessary.

Chromous chloride. — Chromous chloride is extremely hygroscopic and it must be prevented from coming into contact with air or moisture if contamination is to be avoided. Although it can be prepared in the bath by reducing chromic chloride with chromium metal, in the exploratory work it was prepared by reducing the chromic chloride at 500 C in a hydrogen atmosphere containing 2 per cent hydrogen chloride by volume (7). By preparing each charge separately in individual ampules, a high-purity product was obtained that could be transferred to the salt bath with a minimum of contamination. Hydrogen chloride was added to the hydrogen to prevent reduction to the metal in localized areas. When a high-purity product is not required, however, the hydrogen chloride can be eliminated from the reduction treatment since there is, under proper conditions, only limited reduction to metallic chromium in its absence. Completion of the reduction was determined by visual examination of the charge, although control could have been effected by checking the evolution of HCl. To avoid contamination, the chromous chloride was poured directly into the bath under a protective atmosphere.

[1] Reprinted by permission of the Electrochemical Society from Vol. 96, No. 4, October, 1949.
This paper was awarded the Turner prize of the Electrochemical Society.

Production of chromous chloride by reacting chromium metal with dry hydrogen-chloride gas was unsatisfactory because it was difficult to obtain complete conversion. The chromous chloride produced in this way formed a protective barrier on the residual metal, thus retarding further reaction.

Internal reduction of the anhydrous chromic chloride proved very successful. The fused diluent components of the bath were held at 900 C or below for 1 to 3 hours to permit rapid conversion to chromous chloride with a minimum loss of the chromic chloride from volatilization. The bath temperature was then increased to the previously selected chromizing temperature.

Salt-bath Chromizing

Essentially, the laboratory salt-bath chromizing furnace consisted of a heated crucible with provisions for manipulation of specimens and maintenance of predetermined temperatures and atmospheres (Fig. 1). A replaceable cylindrical ceramic crucible was placed at the bottom of a closed end vertical stainless-steel tube. The lower part of this tube containing the crucible was located in a globar-heated sheet steel and insulating brick shell. The globar elements were arranged vertically and concentrically around the steel tube. Protection of the lower tube exterior against scaling at chromizing temperatures was obtained by painting the surfaces adjacent to the heating elements with a high-temperature porcelain-type ceramic enamel developed at Battelle Memorial Institute. The tube top projected far enough above the shell so that it remained cool during operation. It was fitted with a large rubber stopper, gas inlet and outlet tubes, and openings for suspension wires.

Several runs were made in an internally heated type P Ajax electric salt-bath furnace. This furnace has a 15-kw, 220-volt, 72-ampere rating. The furnace was equipped with a ceramic pot 10 inches (25.4 cm) in diameter and 15 inches (38.1 cm) in depth. A stainless-steel and brick cover was built over the top to retain an atmosphere over the bath.

The primary salt-bath composition used in a majority of runs consisted of the following mixture:

30% $CrCl_2$
49% $BaCl_2$
21% NaCl
Sufficient Cr flake to cover the crucible bottom.

An argon atmosphere was provided to shield the bath against air. Comparative case formation determinations were made in the above bath and with this atmosphere. However, variations were made on both bath composition and atmosphere to estimate results on chromizing.

The sodium and barium salts were first charged into the crucible and heated to the fusion point under argon atmosphere. Then the chromous salt and chromium metal were introduced, also under atmosphere. After the charge had reached operating temperature suspended specimens were lowered into the bath, and then pulled out after required treatment times. It was found necessary to cool the specimens in an inert or reducing atmosphere to avoid superficial staining of the work. Variations in this basic procedure included variations in salt-bath composition, atmospheres, temperature, time, materials, and minor manipulative details.

Some work on pack chromizing was carried out to provide a basis for comparison with the salt-bath method. A vertical globar-heated steel-tube furnace was employed in this connection. In addition to temperature controls, a hydrogen-anhydrous hydrogen chloride gas system for providing a steady gas flow through the furnace was used. This included a hydrogen purification train for removing traces of oxygen and moisture. Following general procedures for pack chromizing, specimens were lowered into the tube, a mixture of two parts ferrochromium to one part alumina was poured in around them after which the tube was capped and heated during inflow of the gas mixture.

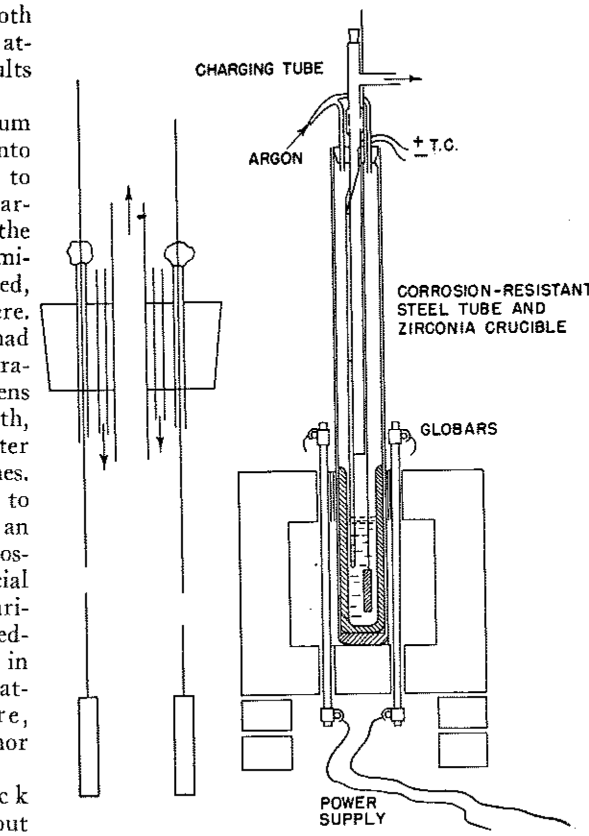

FIG. 1. Chromizing furnace

Examination of Specimens

Specimens, after treatment, were first inspected visually as to uniformity, continuity, and appearance of the surface, and then subjected to acid-immersion tests and metallographic examination.

The acid test employed consisted of immersion in a 1:2 concentrated nitric acid, water solution at room temperature. Specimens having continuous cases were unaffected in 3- to 4-month test periods. Those having slight porosity or excessively thin cases failed within a few hours. Information from this test could not, of course, be used as an indication of corrosion resistance under different conditions.

The principal criterion used in evaluating the cases was metallographic examination. This involved transverse sectioning of the piece, mounting in bakelite, polishing, etching, and examination under various magnifications. Case-thickness measurements were made either on a Bausch and Lomb Research Metallograph using a measuring eyepiece, or on a Tukon hardness machine. Thickness, regularity, soundness, and structural details were noted.

In a few instances Knoop hardness, bend, and Magnegage tests were employed.

RESULTS OF EXPERIMENTAL WORK

Successful salt-bath chromizing was carried out on a variety of ferrous materials. Smooth, nonporous, deformable, nitric-acid resistant cases were produced at temperatures between 900 and 1200 C, with chromous chloride concentrations of from 5 to 30 per cent by weight, over one- to six-hour periods. Satisfactory chromizing was also obtained in the Ajax internally heated furnace. The rate of case formation was found to be equal to, or greater than, that obtained with the various pack methods at corresponding temperatures.

The Salt Bath

The basic salt-bath composition (49% $BaCl_2$, 21% NaCl, 30% $CrCl_2$ plus chromium metal) was found to be quite fluid at operating temperatures. Progressive solidification of this melt apparently began between 500 and 550 C. Penetration into recesses proved to be favorable judging by the uniformity of cases formed. This is illustrated in Fig. 2, showing chromizing in a defect.

The chromous chloride fraction is sensitive to atmospheric oxidation and, therefore, required protection of some kind. Although an enclosed atmosphere top was employed, it is possible that some kind of floating cover might be satisfactory.

In the open air, especially at temperatures above 1000 C, the bath began to lose salt rapidly by evaporation. With enclosed furnaces as used in this work, losses were not significant.

Several initial attempts to chromize in the absence of chromium metal in the charge were unsuccessful. This was true even of runs in which a single specimen was treated in a virgin bath. Therefore, all succeeding runs were made with this present, as previously mentioned.

Although good cases were formed on iron and steel in the reference bath, some variations were investigated in a search for more economic operation. Calcium fluoride and sodium fluoride were substituted for the more volatile barium and sodium chlorides. The fluoride bath proved to be sufficiently fluid at operating temperatures (900-1200 C), salt vaporization was reduced, and good case structures were formed. A disadvantage appeared to be the difficulty in rinsing adhering salt after chromizing.

To determine how much the chromous chloride concentration could be reduced and still permit the production of satisfactory cases, a series of runs were made in which the chromous chloride varied from 50 to 2 per cent by weight. A 5 per cent bath appeared to constitute the practical lower limit, but a 10 to 20 percent bath yielded more satisfactory results.

Attempts to substitute chromic chloride for the chromous salt failed in repeated trials. In every instance, severe corrosion of the specimens occurred. Favorable results from the use of a chromic chromous mixture as reported by Bennek *et al.* (4) could not be duplicated in this work. In every case, the specimens were badly corroded by the bath.

Nitrogen, carbon dioxide, and air atmospheres were also tried. The first two provided protection without interfering with chromizing. Good cases were obtained in air where bath vapors were sufficiently undisturbed to provide a barrier at the bath surface. Where air currents had free access to the bath surface, severe oxidation and vaporization occurred. Fig. 3 shows a structure typical of those obtained from an oxidizing bath.

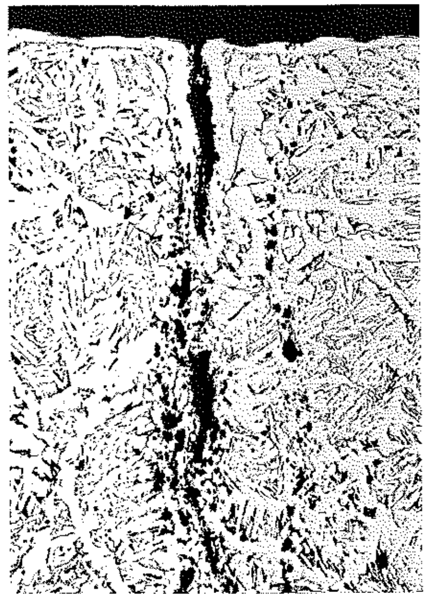

FIG. 2. S.A.E. 5115 steel, salt-bath chromized at 1100 C (2000F) showing penetration into defect. Nital etch, × 50.

Materials Chromized

Metals and alloys chromized in the small experimental furnace are listed in Table I. The 49%-21%-30% salt bath was used, and an argon atmosphere was provided. Rates of case formation on Armco iron are shown in Fig. 4. The effect of temperature on the rate of diffusion is evident.

Case Structure

The relation of structural details to the Fe-Cr constitution diagram is shown in Fig. 5 and 6. The outer band is alpha, solid solution of chromium in iron. The inner band, separated by a fine line, is transformed gamma phase. The two-phase gamma loop appears as an interface between these bands, in conformance with phase rule considerations. The heavy line represents the limit of chromium penetration. Heavy lines in the outer section of the case are crystal boundaries and not cracks.

Case Thicknesses

Case thicknesses on the steels of Table I varied from .015 mm to .03 mm after a three hour treatment. An "IK" type steel, used in German chromizing practice (8), (9), accumulated a .06 mm case under identical conditions. This provides an example of greater penetration by the use of a steel having superior chromizing properties. The penetration rates in the steels investigated did not always vary inversely as their carbon contents, because of other variables. In general, however, the presence of carbon sharply restricts the rate of case growth as illustrated in Fig. 7 and 8. In German "IK" type steels, it has been the practice to hold the carbon content down and/or to stabilize it with titanium or some other strong carbide former.

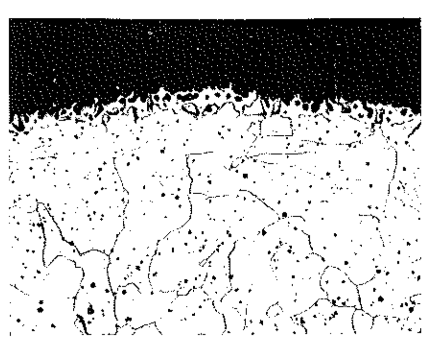

FIG. 3. Irregular porous case on Armco iron, salt-bath chromized at 1100 C (2000 F) under air. Nital etch, × 50.

In a number of runs, cast iron was found to chromize without difficulty, a uniform corrosion-resistant .025 mm case being formed in three hours at 1035 C (Fig. 9). The effect of excessive carbon is partially offset in the case of cast iron by its lower melting point. Decarburization did not increase chromium case thickness. Heavy cases were produced on the stainless steel and nickel of Table I. Molybdenum received only .010 mm after 3 hours at 1200 C, and tungsten only .005 mm at this temperature.

Results of runs made in the Ajax internally heated furnace were similar to those covered by Table I. Barium chloride and sodium chloride were first melted. Sufficient chromic chloride was then added to produce a 20 per cent chromous chloride bath by reduction with chromium metal. After addition of the chromium, the bath was held at 900 C or below for 3 hours to avoid excessive $CrCl_3$ loss during the reduction period allowed. Following this, the temperature was increased to 1000 C and the specimens were introduced. No operational difficulties were encountered. Results were similar to those obtained in the smaller bath. It was necessary to cool specimens in atmosphere on their way out of the furnace to avoid heat stain.

Case hardness on iron were found to be fairly soft (170-180 Knoop), and deformable, confirming previous reports in the literature (10). Although no hardness measurements were made on higher carbon steel cases, these are reported to be considerably harder.

None of the materials listed in Table I failed to pass the nitric acid test after chromizing. Even continuous cases as thin as .005 mm passed tests of several months duration.

Comparisons of cases formed in the salt bath with those formed by the pack method are shown in Table I.

TABLE I. *Effect of treating time on case thickness of various chromized materials*

Material	Shape	Chromizing temperature	Case thickness (mm) Salt-bath method 1 hr	3 hr	6 hr	Pack method 6 hr
Armco iron	5 mm rod	1200 C	0.109	0.208	0.305	—
Armco iron	5 mm rod	1100 C	0.061	0.112	0.147	—
Armco iron	5 mm rod	1000 C	0.020	0.046	0.058	0.018
Armco iron	5 mm rod	900 C	0.009	0.018	0.025	—
SAE 1015 steel	6.5 mm x 6.5 mm bar	1100 C	0.013	0.028	—	—
SAE 1045 steel	6.5 mm x 6.5 mm bar	1100 C	0.010	0.020	0.030	—
SAE 2315 steel	6.5 mm x 6.5 mm bar	1000 C	0.010	0.020	0.030	0.013
SAE 3140 steel	6.5 mm x 6.5 mm bar	1000 C	0.013	0.025	0.033	0.010
SAE 4120 steel	6.5 mm x 6.5 mm bar	1000 C	0.013	0.015	0.023	0.015
SAE 4130 steel	6.5 mm x 6.5 mm bar	1100 C	0.015	0.020	0.025	—
SAE 5115 steel	6.5 mm x 6.5 mm bar	1100 C	0.010	0.015	0.020	—
2% Mn, 0.15% C, 0.8% Si steel	5 mm rod	1100 C	0.015	0.030	0.048	—
1.5% Mn, 0.08% C, 0.4% Si, 0.64% Ti ("IK" type steel)	6.5 mm x 6.5 mm bar	1100 C	0.035	0.058	—	—
18-8 Type 347 stainless steel	5 mm rod	1200 C	—	—	0.084	—
3.3% C, 1.7% Si, 0.8% Mn, cast iron	8 mm rod	1035 C	—	0.024	—	—
3.4% C, 1.9% Si, 0.08% Mn, castiron*	8 mm rod	1000 C	0.010	—	0.023	0.015
Nickel	6.5 mm rod	1200 C	0.018	—	0.051	—
Molbydenum	2 mm rod	1200 C	—	—	0.033	—
Tungsten	8 mm rod	1200 C	—	—	0.005	—

* Partially decarburized to depth of 8 mils.

Allowing for temperature differences in some instances, the salt-bath method compares favorably.

Estimation of the Diffusion Coefficient

The diffusion constants D for chromium in Armco iron calculated from the equation $\frac{x^2}{4Dt} = K$ (11), where x is case thickness and t is time, are given graphically in Fig. 10. Assuming the same surface concentration as determined by Hicks (12), K is approximately one.

No provision has been made in these calculations for variation in D with concentration. Good agreement among values of D calculated at the same temperatures for different times shown in Fig. 4 was taken as an indication that the concentration of chromium at the surface is approximately constant.

The calculated values for the diffusion constant at 1100 C and 1200 C were found to be 2.5×10^{-9} and 9.7×10^{-9}, respectively. These values are of the same order as those obtained by Grube (13) (i.e., $D_{1100} = 8$ to 12×10^{-10} and $D_{1200} = 60$ to 170×10^{-10}) and by Bardenheuer and Muller (13) (i.e., $D_{1150} = 6.8 \times 10^{-10}$ and $D_{1300} = 5.3 \times 10^{-8}$). The characteristic diffusion curve relating the diffusion constant to the absolute temperature as shown in Fig. 10 is an indication of the precision of the experimental values.

Evaluation of the Process

From the standpoint of costs, the salt-bath method compares favorably with other chromizing processes. The bath can be operated in a more or less continuous manner so that packing, furnace heating, furnace cooling, and unloading cycles are avoided. Although chromium metal was used in producing chromic chloride in this project, this salt can be more cheaply made from ferrochromium (14), (15). Operation at lower temperatures for shorter times is possible and many of the inherent advantages of heat treating salt baths carry over to the chromizing bath. A principal advantage, compared to pack methods, is the greater range of $CrCl_2$ concentration available.

The effectiveness of the fused-salt chromizing is dependent to a considerable extent, as in other chromizing methods, on choice of material. Although protective cases will form on a wide variety of materials, deeper penetration at lower temperatures requires the selection of lower carbon steels (16). Silicon appears to increase the diffusion rate, but specific effects of other elements, alone or in combination, are not well known.

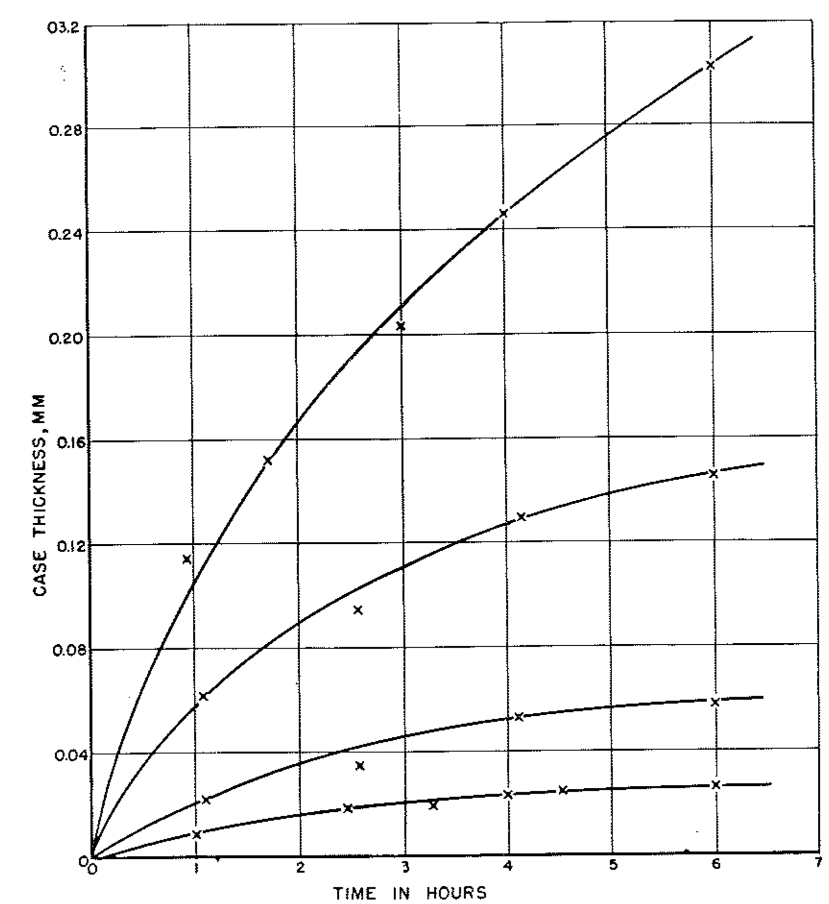

FIG. 4. Effect of time and temperature on thickness of case obtained in chromizing Armco iron by the salt-bath method.

Acknowledgment

The authors wish to express their appreciation to the Air Material Command, Wright-Patterson Air Force

Base, for permission to present and publish information developed on Contract W-33-038-as-19608(19252). Appreciation is extended particularly to Mr. C. A. Naugle of the Intelligence Department, Air Material Command, Wright-Patterson Air Force Base, for his interest and assistance in this work especially in the evaluation of the relative merits of various chromizing methods.

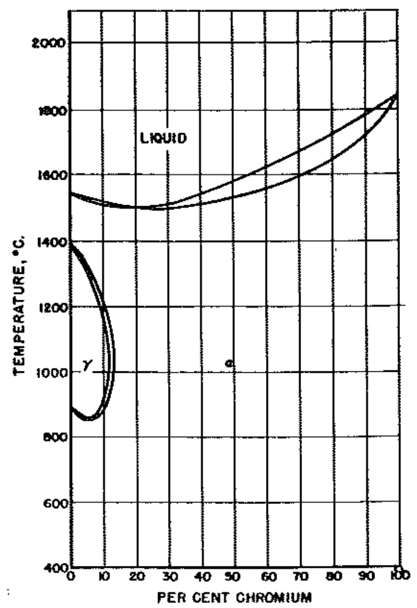

FIG. 5. Iron-chromium temperature-composition diagram

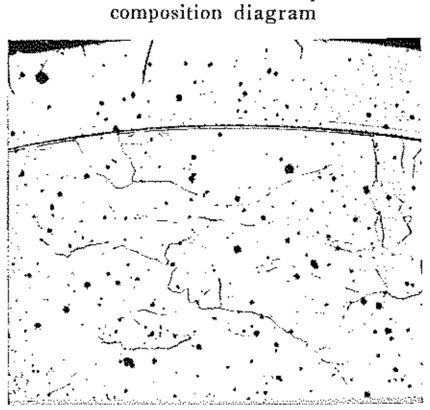

FIG. 6. Armco iron chromized at 1200 C (2200 F). Concentrated HCl etch followed by nital, × 50.

Any discussion of this paper will appear in the discussion section of Volume 96 of the Transactions of the Society.

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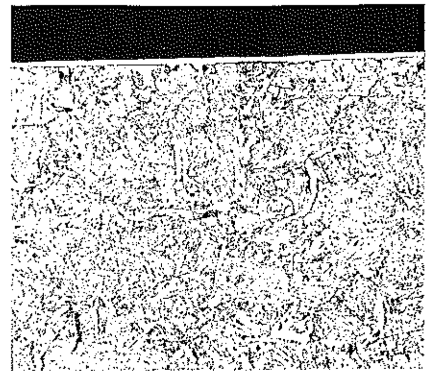


FIG. 7

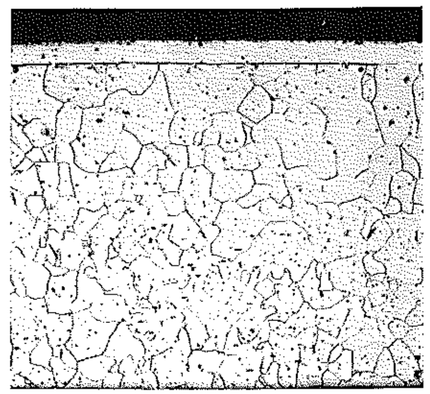


FIG. 8

FIG. 7 and 8. Showing comparative case-formation rates. Upper (Fig. 7) is an S.A.E. 4120 steel, chromized for 2 hours at 1100 C. Lower (Fig. 8) is iron chromized for 2½ hours at 1000 C. Nital etch, × 50.

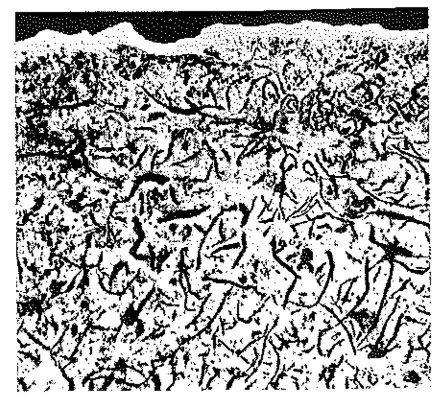


FIG. 9. Cast Iron, salt-bath chromized for 3 hours at 1035 C (1900 F). Case thickness: 0.0009 inch (.0029 cm). Picral etch, × 50.

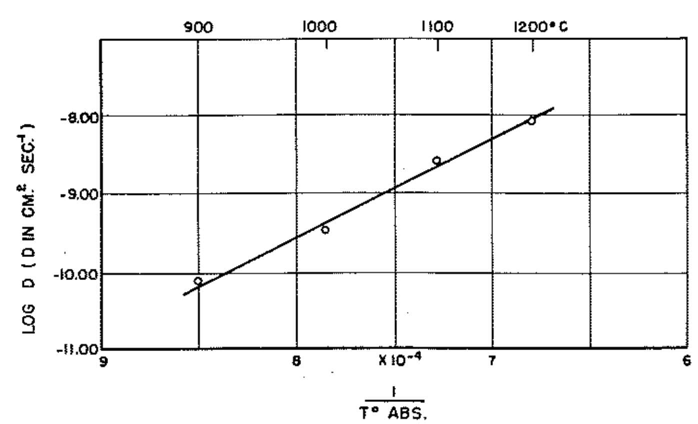


FIG. 10. Diffusion of chromium in Armco iron

PERSONAL NOTES

(Continued from page 7)

Hugh Evans, Jr., '49, has a change of address from Aransas Pass, to Tahoka, Texas. He is serving in the Geophysical department of Continental Oil Company, in whose care he is addressed, Box 418, Tahoka.

George J. Featherstone, Jr., '43, Sales-Service Engineer for American Cyanamid Company, Explosives department, has been transferred from Kentucky to Harrisburg, Penna. His mailing address there is 2938 Wilson Parkway.

Paul V. Fillo, '40, is Salesman for K-C Construction Supply Company. His home and mailing address is 3615 E. Iliff, Denver 10, Colorado.

John F. Finn, '42, Field Engineer for Stanolind Oil & Gas Company, is addressed in their care, Thermopolis, Wyoming.

Theo. N. Francis, '24, is on vacation in the States from Lima, Peru, and while here, mail addressed to him in care of Mrs. Alice M. Rink, 1111 Columbine Street, Denver, will reach him.

Raymond B. Franklin, '49, has a new residence address in Shreveport, La., 107 East Lister. He is serving as Geologist for The Texas Company.

(Continued on page 35)

THE FUTURE OF GOLD*

By
U. S. Senator HARRY P. CAIN
Washington, D. C.

Two months have passed since the carefully trained and secretly mobilized legions of communism erupted across the 38th parallel in Korea. During that brief period of sixty days this country and the entire community of peaceful nations have been subjected to a series of unparalleled shocks. Unprovoked aggression, accompanied by the flaming violence of tanks and heavy ordnance is always a jolt to men who believe in law and order, in peace and equity, in the just precepts of religion and in the fair progress of a free society.

I do not exaggerate when I say that the greatest shocks were reserved for Americans. In the first place, the assault of the red marauders came as a complete surprise to a government which had spent billions of our taxpayers' hard earned income to create a military establishment able to protect this country against aggression. The events of the past sixty days demonstrate that our intelligence was defective — I use the most charitable word—that the military power on which we had spent so much was not able during a period of two months to discipline and destroy the predatory divisions of a third rate power.

Some cherished illusions have suffered. The notion that air power alone could protect us and defeat the most powerful foe must be revised. The naive faith that a huge output of fuel, an enormous capacity to produce steel, aluminum, automobiles and food could take the place of trained troops in being, and eliminate the need for armored divisions, must be abandoned. The simple notion that a high living standard constitutes an automatic roadblock against the deadly thrusts of a ruthless ideology must join the great fallacies of history.

We may be certain that our antagonists of the future will read the record and profit by it no less than we. We will not always be fortunate enough to have an enemy who considerately gives us due warning and obligingly waits until our great industrial capacity provides us with the weapons and material to defeat him. Nor will the great arbiter of future conflict give us any credit for the billions spent on social security and soft living which should have been spent on tanks and guns.

American Public Alarmed

The American public today is alarmed and disappointed. It is alarmed because the challenge to peace in violent form has come somewhat sooner than was generally expected. It is disappointed because the means for self defense have proven in bitter battle to be less than adequate.

In the minds of thoughtful Americans there is a deeper disturbance. There is fear—a well founded fear—that our domestic institutions will be exposed to an internal corrosion as dangerous in its ultimate effects as the threat posed by any external aggressor. I refer to the opportunity which the Korean incident gives to native planners to impose the shackles of arbitrary control upon our citizens. The record of the last sixteen years shows that the planner, eager to acquire power not contemplated in the constitution and the statutes, is ready to contrive emergencies which will afford the pretext for exceptional powers. The record also shows that once these powers have been granted, a tenacious and ambitious bureaucracy is most reluctant to relinquish them. During the last war rent controls were imposed as a wartime measure. Five years after the Germans laid down their arms some of those controls were still in effect, the most energetic efforts by members of Congress to repeal them notwithstanding.

The owners of real estate are not the only ones who have suffered from the power aspirations of our planners. Back in 1933 a succession of emergencies — some of them real — confronted this country. A variety of remedies, devised by the fertile minds of irresponsible young braintrusters, were presented to Congress with peremptory demands for their immediate adoption. It is pertinent to note that some of these urgent young men, as since proven by open testimony, owed primary allegiance to an alien power responsible for the death of American soldiers in Korea today.

Among the measures adopted during its early months to implement the "new order" was the raw deal in gold. Under executive order all the gold in the possession of private citizens was called in to the Treasury. The solemn obligation of this government to redeem its promises to pay gold, explicitly set forth on millions of instruments, was callously repudiated. The repudiation, I regret to say, was subsequently upheld by a complacent Supreme Court. In one of those cloying and hypocritical fireside chats the President of the United States averred that the action was necessary because there was not enough gold in the country or in the world to meet all the potential demands for it.

Scheming Planners Push U. S. Off Gold Standard

The United States was pushed off the gold standard by scheming planners. In a matter of the deepest concern to every citizen and in spite of repeated professions of solitude for the ultimate welfare of that citizen, the government of this country was very careful never to give him an opportunity to express his views on the subject. In fact the administration, which was probably already contemplating repudiation, deliberately deceived the voting public up to the very eve of the election.

I would like to digress for just a moment to recall the deliberate deception practiced on the electorate by the victor at the 1932 polls. In a speech at Des Moines, President Hoover said that this country had almost been forced off the gold standard. This statement was immediately and vigorously challenged by Senator Carter Glass.

On the evening of November 4th, the Friday before election, Mr. Roosevelt undertook to reassure the voters on the question of gold. As to the possible necessity for abandoning gold, suggested by Mr. Hoover, he said "Senator Glass made a devastating challenge that no responsible government would have sold to the country securities payable in gold if it knew that the promise, yes, the covenant, embodied in these securities was as dubious as the President of the United States claims it was. Why, of course, the assertion was unsound."

In other words *the voter was told late in 1932, after the bottom of the depression had already been passed, that the contesting candidate for the White House had no intention of tampering with the currency. I have devoted a brief moment here to the record for a number of reasons.*

In the first place it is necessary to recall the fact that the public has

* Presented at the 1950 Metal Mining Convention and Exposition, Western Division, The American Mining Congress, Salt Lake City, Utah, August 28-31.

never had an opportunity to express itself directly on the issue of a sound currency.

In the second place it was deliberately deceived by false assurances into voting for an Administration which proposed to do deviously and indirectly what it did not dare to do openly.

In the third place the various measures adopted, sometimes explicitly but always implicitly, on the premise that they were strictly temporary, are still in effect although almost a generation has elapsed since they became the law of the land.

Finally, I wish to emphasize a wholly neglected aspect of the subtle machinations by which the money managers of the New Deal acquired their great power over the currency. Before this seizure of authority, this debauchery of the currency, could be effected, it was necessary to deny private citizens the right to own gold. It was necessary first to destroy the market for gold and prevent, under extreme penalties, the free trading in gold.

This fact requires emphasis for a special reason. There is in this country today an articulate organization of monetary scholars who have for some time been campaigning for the return of the gold standard. These men are actuated by the highest motives. They have done a splendid job in keeping alive the duty of government to protect the integrity of its currency. With all due deference for their special knowledge and exemplary intentions, I believe that these students are mistaken in urging the conversion of the dollar into gold at the rate of one ounce for every $35.

It may well be that this rate overvalued gold at the time it was fixed in the Gold Reserve Act of 1934. Actually gold at this time was selling for approximately that price in the open London market for gold. In other words an English market forum in which free and willing buyers and free and willing sellers were placing values on gold was saying that the price which the American government placed upon gold early in 1934, namely $35 an ounce, was not far from its real value at the time.

Much water has gone over the dam since January 1934. A great world war has intervened. The public debt has mounted from $23 billion to $256 billion. The total supply of currency, that is to say, demand deposits and currency in circulation is four times as great as it was when the gold equivalent of the dollar was fixed at one thirty-fifth of an ounce.

Purchasing Power of Gold Decreased

The housewife who spends a dollar today finds that it will buy just a little more than half as much as it bought at the end of 1933.

With the single exception of gold there is hardly a commodity or service which sells today for the same price that it sold for 17 years ago. It is little wonder that the use of gold for jewelry has increased during the post war period.

The manufacturer of gold rings and watches can buy his principle raw material at a fixed pre-war price. The Treasury of the United States intercedes on his behalf, compels the gold miner to sell his product at the fixed pre-war price of $35 an ounce—and then passes it on at the same price to the jewelry manufacturer.

The industrial consumption of gold since the end of the war has been more than twice the domestic production. *This constitutes an indefensible discrimination against the miner and an unwarranted privilege for the manufacturer.*

I need hardly tell the gold miners in this audience that the Treasury which grabs your gold at an arbitrary price does not fix your labor costs or enable you to buy material and equipment at the prices prevailing in January 1934.

The maintenance of a $35 price for gold is both unjust and unrealistic. It is unjust to the men who toil to produce it and are not permitted to expose their product in the open market for the best price which free bidders are willing to pay. This denial of market freedom applies to no other producer.

It is true that government does step into certain areas, notably transportation, communication and power production for the purpose of regulating rates. This is done because the nature of these industries makes competition impractical. Rates must be established with the consent of official authority to insure a fair price to the consumer.

But wherever such a price is fixed the statute establishing the regulatory authority is careful to direct that the rates be truly compensatory. The law, in other words, properly assures the producer the full recovery of his costs and a fair return on his capital.

There is no such statutory solicitude for the gold miner. He does not have the right, enjoyed by all unregulated producers, to take his product into the best market. Nor does he have the right, possessed by regulated producers, of recovering a price for his product which will meet his costs and give him a fair margin of profit.

This double inequity is completely alien, not only to our concepts of free enterprise, but to our basic Anglo-Saxon sense of fair play. If the government for any reason feels that a fixed price for gold is necessary as is the case in electric power, railroad transportation and the telephone, then even justice requires that a price be fixed which will cover the gold miner's costs even as utility rates are fixed at fair and compensatory levels.

Gold Miners Should Have Right to Offer His Product in Free Market

On the other hand, if public policy should not require a fixed price for gold then the gold miner should have the same right enjoyed by the maker of candlesticks and mousetraps, the right to offer his product in a free market for the best price which consumers are willing to pay.

The measure of unjust discrimination to which the gold miner is exposed is illustrated by a special dispatch to *The New York Times* under date of July 31, less than a month ago. This story came from Tel Aviv in Israel. It reported a strong gold market with British sovereigns in active demand at $25 a piece. Since the sovereign contains less than a quarter of an ounce of gold this shows a price of more than $100 an ounce.

I have said that the campaign to restore convertibility of the dollar at $35 is unrealistic. It is unrealistic because it fails to take into account the sharply higher value for gold in the limited free markets which prevail in other parts of the world. It is also unrealistic because it fails to take into account the effect which free convertibility at $35 might have on our gold stocks.

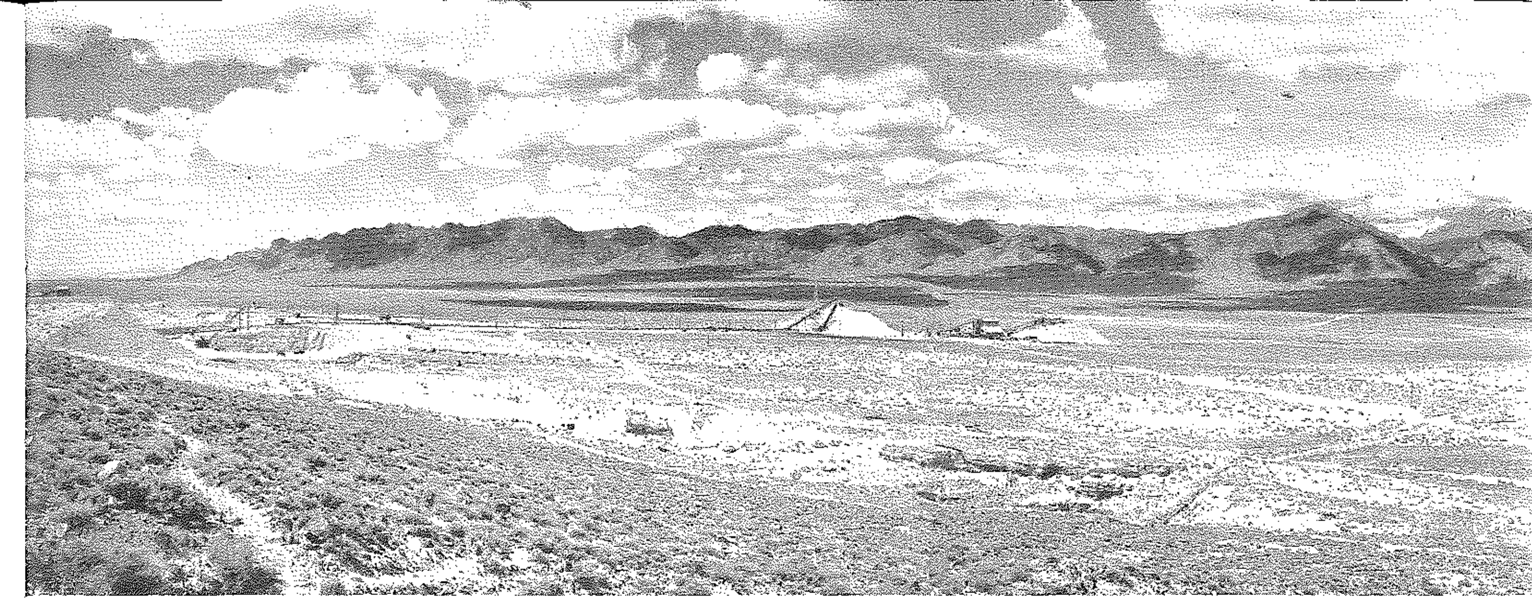
It is idle to argue that the ratio between our present gold stocks and total supply of currency is at least as high as it has been in the past during periods of free convertibility.

When the right to redeem our greenbacks in gold was restored on the first of January 1879 it marked the end of a postwar period totally different in character from the last seventeen years.

In the post Civil War period the government balanced its budget and instituted a vigorous program of economy. Taxes were cut substantially. Between 1865 and 1879 the federal debt on a per capita basis was reduced 44 per cent.

The heads of central banks in other parts of the world did not indulge in silly dogma to the effect that govern-

(Continued on page 25)



▼ Round Mountain Gold Dredging Company's gold mining and milling operation at Round Mountain, Nevada, is the largest post-war gold operation in North America. The picture above shows the size of the operation extending across the valley between two mountain ranges. Atop the bank of the open pit at the left can be seen the Bucyrus-Erie dragline which works ore down into the pit. Ore is transported out of the pit to the 200,000-ton stockpile. To the right are the mill buildings and the boom tailings stackers. The road in the right background follows the 14-inch pipeline which brings water for the mill from an underground lake in Jett Canyon.

ROUND MOUNTAIN GOLD*

Progress of the new Round Mountain Dredging Corporation gold project in Nevada has been the subject of widespread interest by informed mining technicians throughout this country and abroad. The reasons for the ripple of excitement within the industry are several:

From a tonnage standpoint, Round Mountain represents the largest gold mining development to be undertaken in North America since Alaska-Juneau. From the standpoint of investment in a new gold enterprise, the $3,000,000 project is the largest since well before the war. Considered from a technical and operating viewpoint, the mining and milling methods and equipment employed present an entirely new concept to the industry.

Round Mountain is located on the southwest flank of the mountain from which it derives its name, located some 57 miles northeast of Tonopah by highway. The mining and milling operation consists of a plant to extract and mill 17,000 tons of free-milling alluvial gold ore during each 24-hour day. Once scooped up by electric shovel, gold ore makes a fast trip through the mill. In brief, ore leaving the shovel goes through a primary crusher in the open pit, travels by belt out of the pit, into a stockpile, and then is drawn onto a conveyor system which carries it to the mill.

* Reprinted from MINING WORLD, June, 1950.

Leaving the mill, tailings are carried by two boom stackers to tailings piles that are clear of the plant site.

The plant, now in the shakedown stage, is being carefully tested at nearly full capacity.

Leaving Tonopah, Nevada, one travels six miles east on U. S. Highway 6, then turns left and goes north 51 miles on Nevada Highway 8A. There, off to the right, stands Round Mountain, a dark mass of rock, not tall in comparison to the surrounding mountains of the Toquima range, but hard and resistant to erosion in the way of most igneous rock. Looking to the west of the mountain, the dragline atop the bank of the pit, the big stockpile, mill building and tailings piles of the company's new plant may be seen.

Porphyry—Gold Ore—Not Gravel

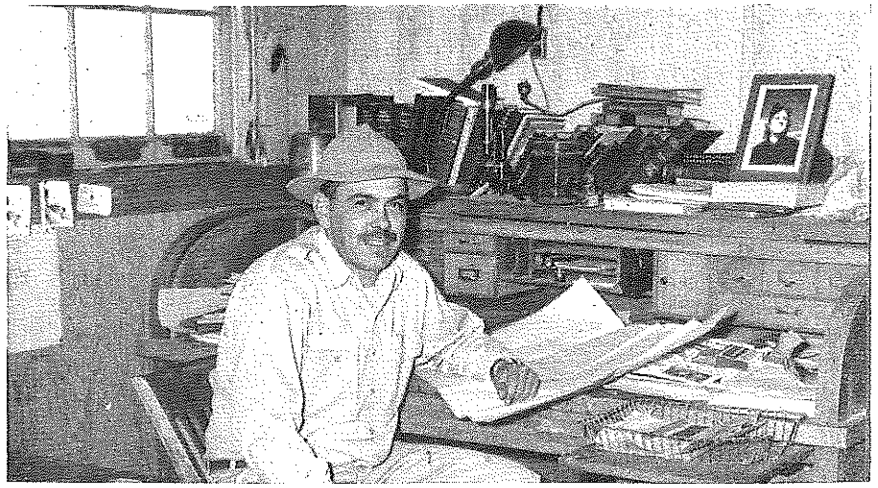
Round Mountain, tunneled, prospected and pitted from top to bottom, is mineralized by Tertiary rhyolites which intruded earlier Tertiary lake beds. Two systems of veins criss-cross and slice one another in a broad east-west shear zone on the southerly side of the mountain. The vein systems, occurring over a great area with low-grade but fairly consistent mineralization, make up what is called a "porphyry-gold orebody." The ration of recoverable gold to silver is about two to one.

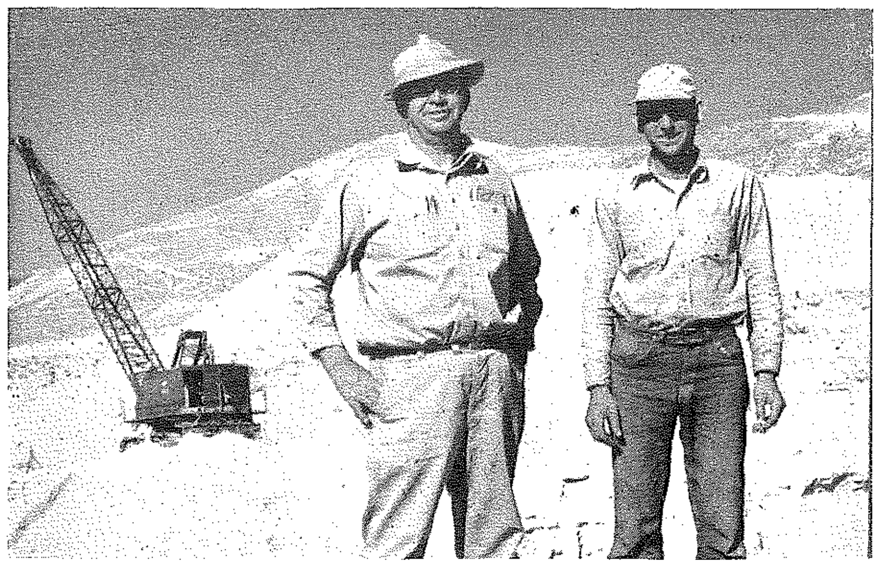
Talus slopes extend down the mountain from the porphyry area. Ore in these slopes is angular, brittle, typical of dryland erosion products; it is much different from the water-rounded gravels of the usual placer deposit. The angular shape of the particles gives the ore different milling and handling properties; it behaves differently from the gravel in the jig bed; it has a higher angle of repose, and thus can be conveyed on a belt at steeper angles than rounded gravel; and it has more of a tendency to set, to solidify when it is left in a pile.

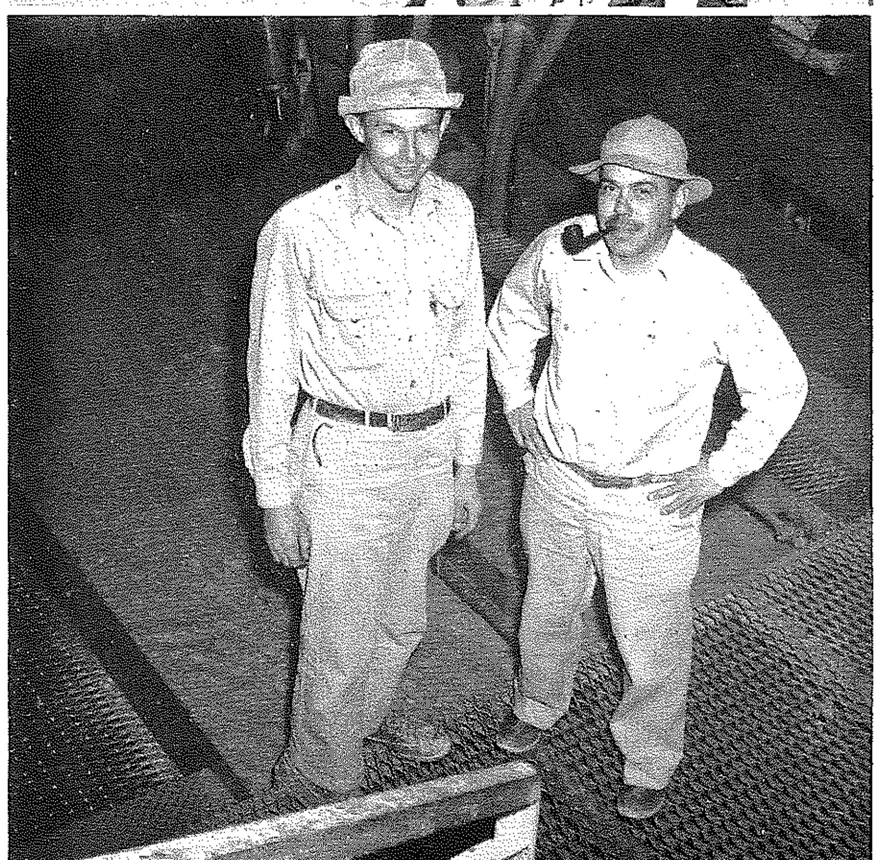
New System Was Required

The Round Mountain system of veins was discovered in 1906 by Louis D. Gordon, now engineer with the RFC in Reno. A year later, in 1907, Thomas "Dry Wash" Wilson discovered gold in the alluvium. By 1936, $8,000,000 had been recovered from the vein and placer deposits. The existence of a great tonnage of low-grade placer ground was not a secret; it had been worked by a smaller dry-land washing plant built in 1934.

The ground required low-cost treatment. A bucket-line dredge, which would have worked the ground cheaply enough, could not be used because of the great thickness of the deposit, averaging well over 200 feet. The deepest digging dredge ever built was Yuba's No. 20, which only digs 124 feet below water level. Other adverse factors for dredging were the large number of boulders in the alluvium, the steep slope of the bedrock and the fact that the ore was too porous to hold a dredge pond.







▼ Top: Edwin H. Oshier, field superintendent, sits at his desk studying the plans for a proposed plant alteration. A Stanford graduate, Ed likes to hunt deer and fish during his time off, of which there is none right now. Center: Macy Meisenheimer, general foreman, and Al Boni, relief operator, stand on the southerly bank of the north pit. On the left can be seen the Bucyrus-Erie 54-B dragline which works ore down to the pit floor. Macy gained his know-how on this system of mining when he worked in the gravel pits in the Los Angeles area. Bottom: Mort Pratt, metallurgist, and Edwin H. Oshier, field superintendent, are discussing replacement of screens on the four Tyler Tyrocks which effect a separation at eight-mesh after the trommel separation. In the background can be seen part of a battery of eight Yuba coarse rougher jigs, that are fed from the bed of the Tyrocks.

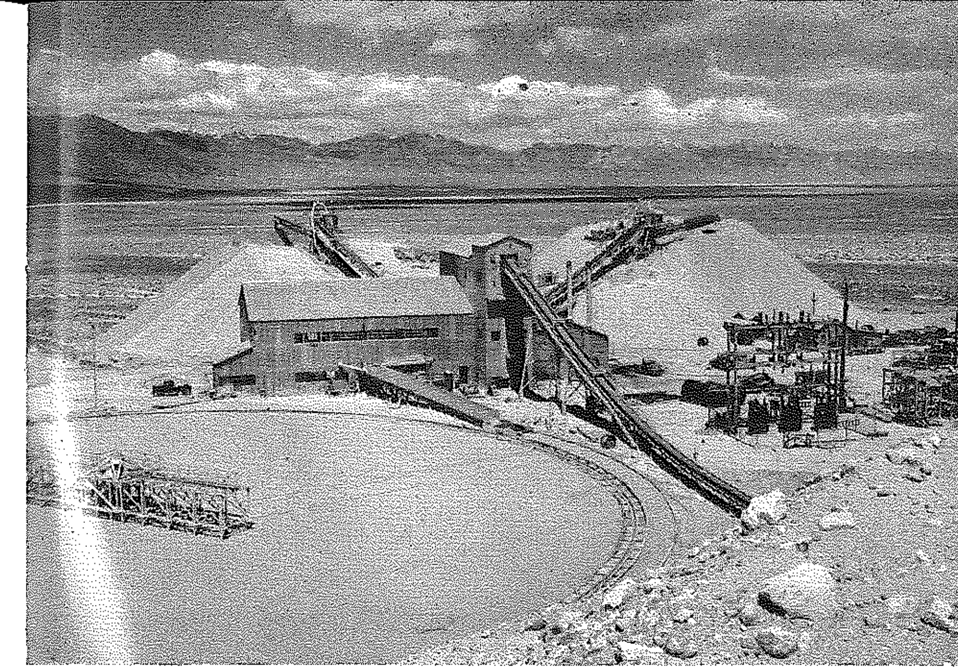
For many years, William C. Browning, consulting engineer of Los Angeles, had been thinking of possible methods for working the property. In 1945, Browning, now vice-president of Round Mountain Gold Dredging Corporation, started an exploration, sampling and equipment-study program which resulted in the plans for the recently completed plant. The final plans combined methods which have recently come into use in the lowest-cost systems of mining, milling, and material handling—gravel-pit, open-pit, dredge, and coal mining.

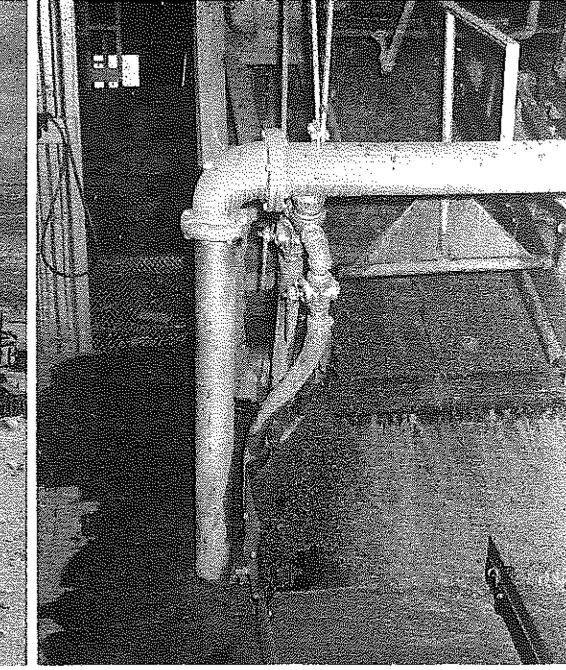
The Round Mountain Gold Dredging Corporation was formed to exploit the deposit; it is a wholly-owned subsidiary of Yuba Consolidated Goldfields, Ltd., and the Fresnillo Corporation. F. C. Van Deinse, a man with many years of experience in dredging for Yuba, was elected president of the new company. Round Mountain leases the ground from Nevada Porphyry Gold Mines, Inc., on the basis of a 10-percent royalty on gravels and alluvials and a 6½-percent royalty on lode deposits. The lease covers several thousand acres and runs for 30 years.

Preliminary designs were started in 1947, and actual engineering designs of the plant carried on in 1948 and completed early in 1949. Design work done by Yuba was under the direction of the company's chief engineer, Edgar von Bolhar. Actual construction work started early in 1949.

Yuba Integrates the Plant

A plant the size of the one at Round Mountain contains a great many separate pieces of equipment. The Yuba Manufacturing Company, at its plant near Benicia, California, built many of those pieces; but more important, it fabricated the connecting links, the pieces of machinery which tie the plant together. All in all, Yuba fabricated approximately 1,000 tons of machinery. Trusses for





▼ Left: The Dorr thickener, the tailings stackers and the mill building. The boom tailings stackers with 30-inch American belts, built by the Yuba Manufacturing Company, are extensible. The stacker, clearly seen on the left, works slowly from left to right in an arc to distribute the tailings on the pile. Right: One of a bank of four Tyler Tyrock screens which make a separation of eight-mesh between coarse and fine ore. Coarse ore feeds directly on the Yuba coarse rougher jigs below; fine ore is carried to a corresponding set of fine rougher jigs.

the conveyor-belt systems, the crusher car and pendulum conveyor, the trommel, jigs, gold tables, sand wheels, and tailings stackers were all built at Benicia. Yuba proceeded to assign it a boat number just like any bucket-line dredge, and went to work on it.

New System From Gravel Pits

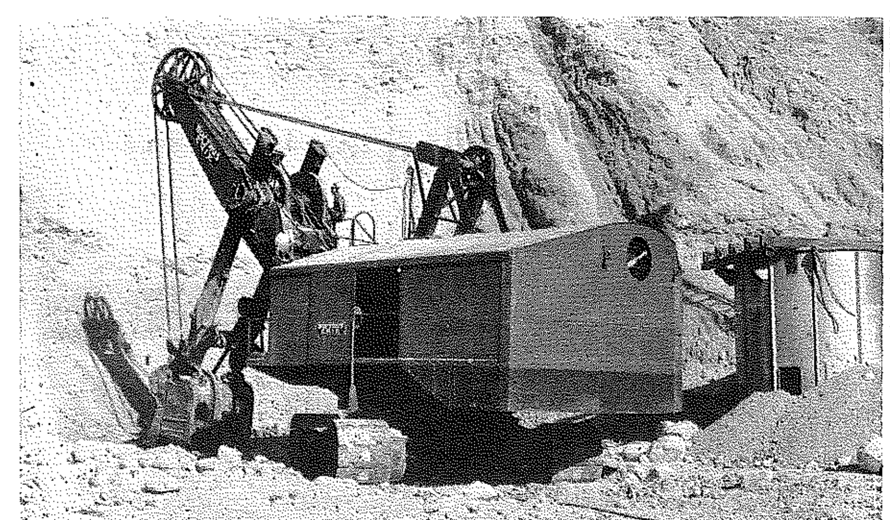
The mill at Round Mountain is now handling about two-thirds of its 17,000-ton capacity; it is worked 24 hours daily. The mine supplies the mill by working on a two-shift basis.

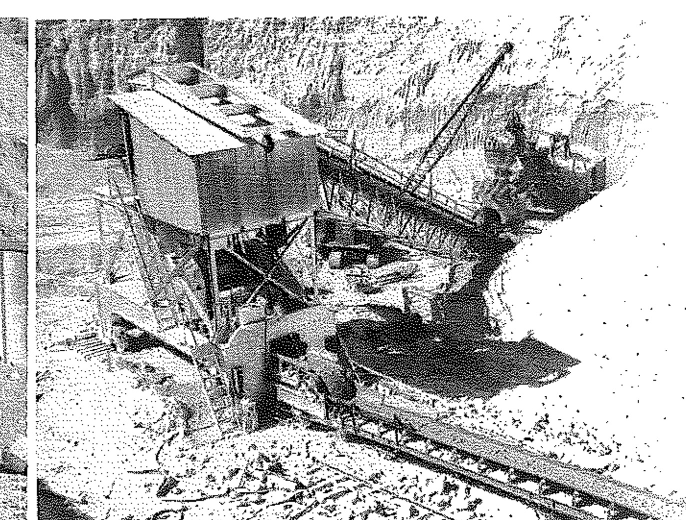
A brief description of the mining system follows: With the pit developed, a dragline, working on top of the bank, works ore down into the pit with a 7,000-lb. scarifying plate swung from the end of the boom against the pit bank. An electric shovel in the pit loads ore into a hopper on the end of a pendulum-conveyor section which carries ore to a crusher-car unit. The pendulum conveyor is flexible, can be rapidly moved with a dragline to bring it into position for mining a new area. This pendulum conveyor gets its name from the fact that it is moved in an arc to mine a half circle of ore in the pit from one placement of the crusher car.

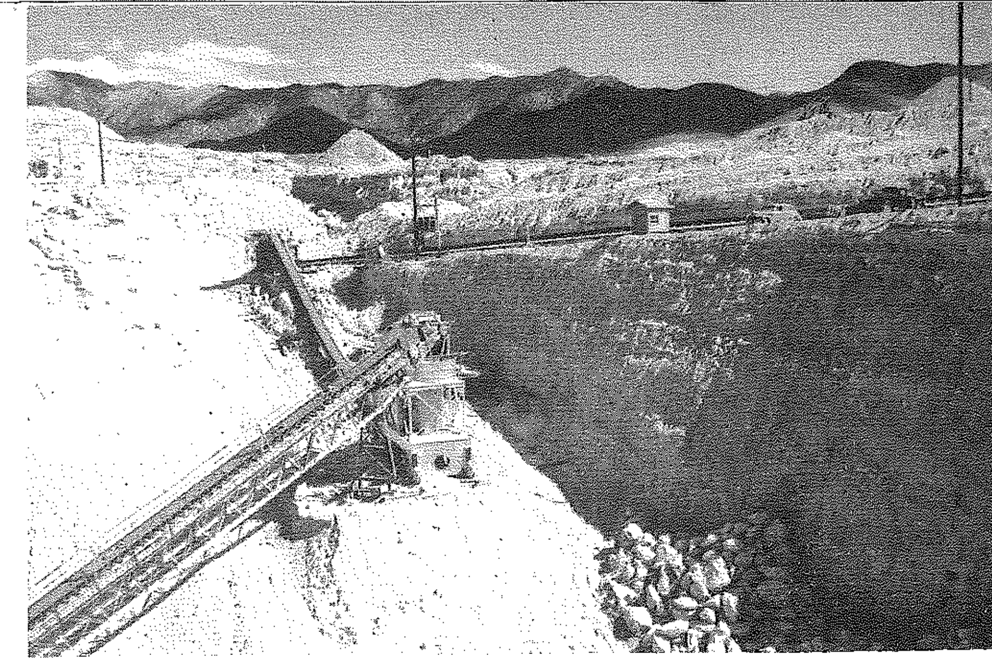
The radius of the circle of ore (225 feet) is equal to the length of the pendulum unit (150 feet) plus the working reach of the electric shovel (75 feet). The crusher car unit is lowered approximately 60 feet downward into the pit when all the ore has been mined that can be reached from the previous position. The crusher car, mounted on rails, sends crushed ore out of the pit to a junction box (a point where the coveyor turns), and then along a series of two belts to the stockpile. Two draw points, in a reinforced-concrete tunnel under the stockpile, draw ore at a controlled rate of feed from the stockpile and send it into the mill, where it enters the trommel for the first ore-waste separation.

The system of mining in the pit, something new to metal mining, was adapted from a practice that has proved itself in west-coast gravel pits in recent years, especially pits in the vicinity if Los Angeles. The require-

▼ Left: At 3:30 p.m., the shift changes and Frank W. Newman gives the Bucyrus-Erie 170-B electric shovel a good grease job. The bucket has five removable 6-inch teeth. Frank says "she'll dig anything you set in front of her." Tracks on the shovel are 36 inches wide, spaced at 16 feet from outside of track to outside of track. Right: The Bucyrus-Erie 170-B 6½-yard electric shovel is seen here dumping ore through the Grizzly into the hopper can. On the left the Birdsboro 42 by 36 inch jaw crusher receives rock from the 60-inch conveyor belt and crushes it to minus-10 inches.







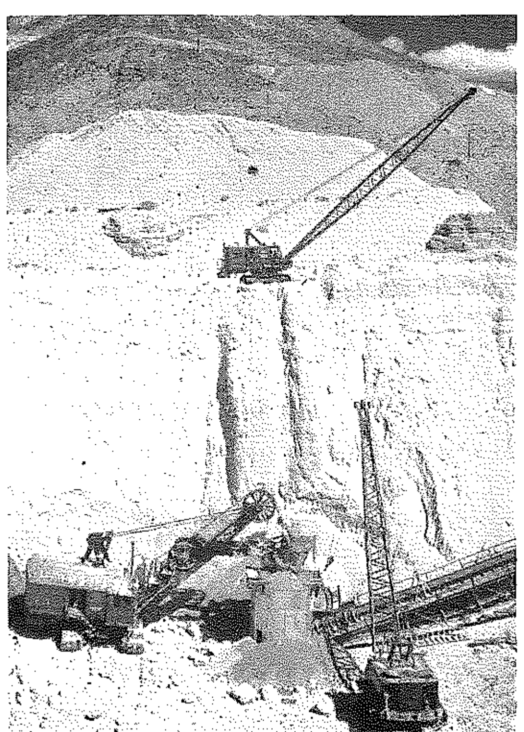
From the crusher car a 42-inch American belt carries the ore to the junction box which routes it westerly toward the stockpile. On the pit floor is a pile of boulders too large to pass through the 30-inch grizzly.

ments of the system are threefold:

1. A large, well-localized tonnage of material is required to pay for the high cost of installation.
2. Because of the nearness of conveyor belts and other exposed equipment, blasting of boulders or cemented rock must not be necessary.
3. The bank must stand firmly enough so that it will not slide to cover equipment in the pit or carry the dragline from the top of the bank into the pit.

The longest stretch of conveyor belting at Round Mountain is the stretch which runs easterly from the ore stockpile to the junction box at the entrance to the pit. A backbone of ore will be left under this stretch of conveyor belting to support the system. On the north side of that rib, the north pit, a kidney-shaped block of ore, is now being mined. On the south side of the rib, the south pit, also kidney-shaped, will be mined later. The picture in plan view is a backbone with a kidney on either side.

View of the ore stacker at the 200,000-ton stockpile. The truss supporting structure was built by Yuba Manufacturing Co. Ore drawn from below the pile at either of two draw-points continues to the mill over another belt.



To get a man who knew this system of mining, Edwin H. Oshier, field superintendent at Round Mountain, hired Macy Meisenheimer as general foreman. Macy, who had worked in the gravel pits near Los Angeles, understood the use of the dragline and scarifying plate, and the use of a flexible conveyor system working with an electric shovel in the pit.

Development For Mining

The reinforced-concrete tunnel under the future stockpile was built as a 10 by 10 by 190-foot tunnel with two draw points, one 131 feet and the other 182 feet from the portal. At each of these drawpoints, a Jeffrey vibrating pan feeder was installed to provide for continuous controlled feeding of ore to the mill. The feeders, a vital link in the continuous system of ore flow, receive direct current from converters in the mill through a rheostat; varying the current from the rheostat changes the rate of flow. A Merrick Weightometer records cumulative total tonnages that pass to the mill. The rate of flow is observed on a Ratograph that is connected to the Weightometer (but is installed near the rheostat in the mill) and adjusted to any desired rate of feed to the mill.

Running from the stockpile tunnel to the mill, a 36-inch belt carries ore from either drawpoint, but not from both at the same time.

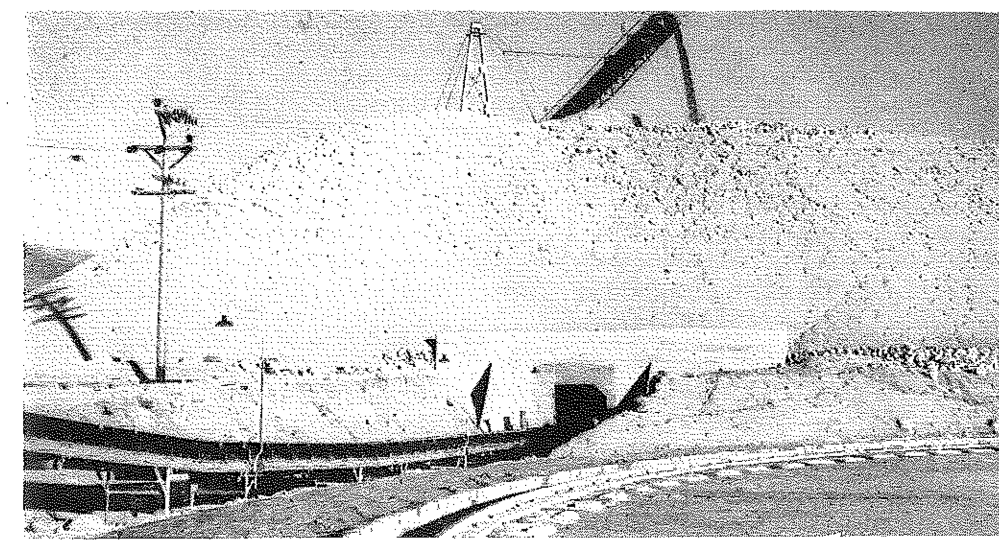
Two stretches of 42-inch belting, which run over a Link-Belt system of idlers and rolls, carry ore from the pit entrance to the stockpile. A transfer box is provided at the midpoint of this long stretch of belting.

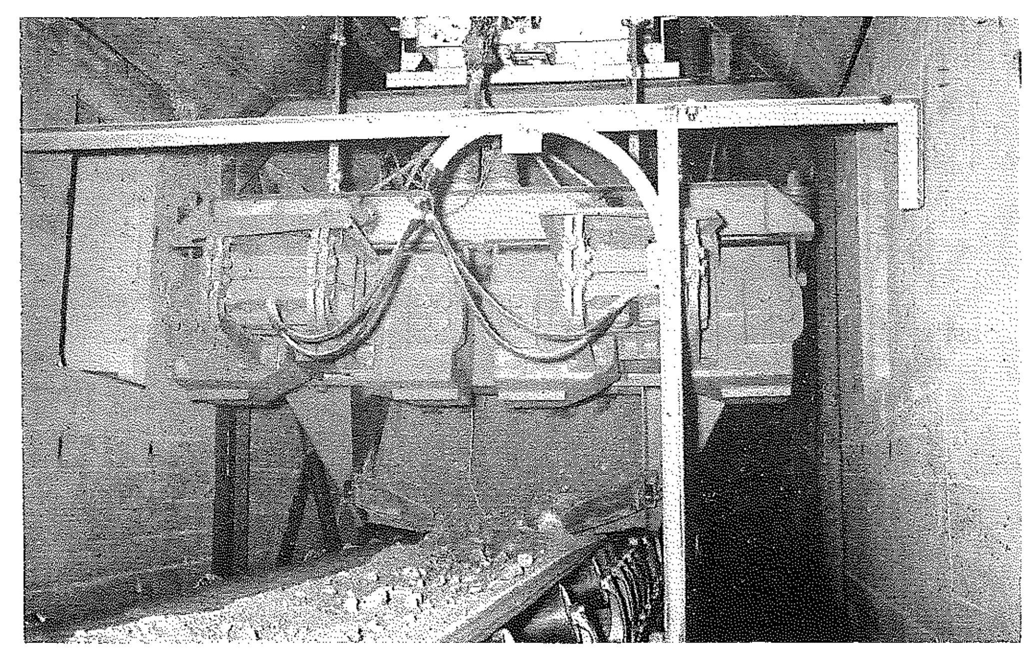
The next unit, extending down into the pit, is the crusher-car section. The crusher car is at the pit end of a 42-inch belt which was furnished by the American Rubber Manufacturing Company of Oakland, California. The crusher car runs down the slope into the pit on rails. In it the Birdsboro 42 by 36-inch jaw crusher is driven by a Westinghouse Linestart 100-hp induction motor through a system of 12 V-belts at a reduction ratio of about four to one. The crusher car is mounted on rails so that when a mining arc is completed from one position of the crusher car, it can be easily extended 60 feet futher into the pit to put the pendulum conveyor in position for a new mining arc. To move the car downward, the roadbed is prepared, rails are laid, a new section of belting is spliced into the conveyor belt, and the car is lowered into its new position. During these changes, or during breakdowns of equipment in the pit, the stockpile of ore keeps the mill going continuously. Edwin Oshier, field superintendent who formerly worked at the underground Golden Queen Mine near Mojave, California, likes the system of stockpiling—he says, "What do you think of our 200,000-ton orebin?"

The Pendulum Conveyor

The pendulum-conveyor section consists of a 150-foot stretch of Goodyear 60-inch belting, a hopper topped by a 30-inch grizzly, and in the hopper a vibrating feeder to control flow to the belt. The entire system sits on a base near the hopper end and is supported by two legs at the crusher-car end. The hopper is a steel can 14 feet in diameter and open at the top. The front of the hopper is open to receive the conveyor belt, and a shield, like an awning, is placed over the belt to prevent muck from falling onto the belt from the shovel. Five grizzly bars are spaced 30 inches apart and are built into an end-connected unit to fit loosely over the hopper can. The center three members, which are subjected to the ruggedest duty, weigh 3,200 pounds each and are made of high-grade manganese-steel plate.

The hoisting line from a Bucyrus-Erie 54-B diesel powered dragline remains hooked to the free end of the grizzly during most mining operations. Oversize boulders, which re-





Top: Al R. Boni, operating the Caterpillar D-8 bulldozer atop the stockpile, pushes a bladeful of ore into the south drawhole. The D-8 climbed a 40-degree slope to get to the top of the stockpile. Center: Ore from the stockpile is carried to the mill by conveyor belt shown here emerging from the concrete tunnel. At the top, ore from the pit drops onto the stockpile from the stacker conveyor. The Dorr thickener may be seen in the foreground. Bottom: Jeffrey electric vibrating pan feeder 131 feet from the portal of the ore-drawing tunnel. It, and the system of Merrick Weightometer and Ratograph, provide for controlling the rate of ore input to the mill.

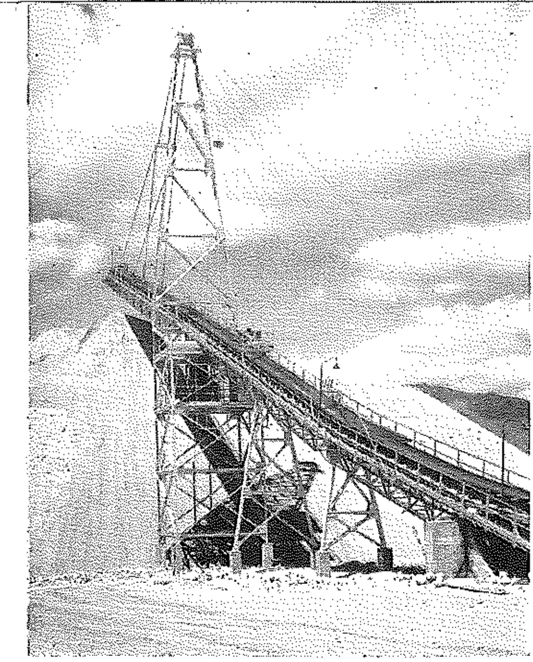
main on the grizzly, are dumped by the dragline, raising this end of the grizzly and allowing the boulders to roll off onto the pit floor, and are dozed into a far corner of the pit. Boulder disposal has thus been solved by piling those 30 inches or larger in a corner of the pit, and by crushing those smaller than 30 inches, so that they eventually end up on the tailings pile which is far away from the pit.

The hopper can is loaded by a Bucyrus-Erie 170-B 6½-yard electric shovel with special 7-yard dipper. The dipper is almost big enough to drive a car into. Equipped for working, the shovel weighs 250 tons. Carrying approximately 10 tons per trip, the shovel must make 1,700 swings in a 17,000-ton working day. The shovel, with its long reach, extends the working radius of the pendulum conveyor by 75 feet.

Scarifying Plate—Key Item

The pit at Round Mountain, now 120 feet in depth, will reach a maximum depth of 370 feet. Atop the bank which is carried at a 70° slope, a Bucyrus-Erie 54-B diesel-powered dragline is equipped with an 80-foot boom to reach out over the bank. Swung from the end of the boom is a 7,000-pound scarifying plate with seven teeth which dig into the bank. The dragline works this scarifying plate up and down the bank, loosening the somewhat-cemented alluvium and allowing it to slide down the steep slope to the pit bottom where it is picked up by the big electric shovel. Because the scarifying operation eliminates the need for blasting, it is a key feature of the Round Mountain system of mining.

If one belt near the center of the conveyor system goes out of commission, the belt which feeds it might build up a great pile of ore before the break in flow was discovered. To eliminate the chance of that happening, each belt is electrically interlocked to the others by a system of relays; when one belt fails, the entire system is automatically shut down.

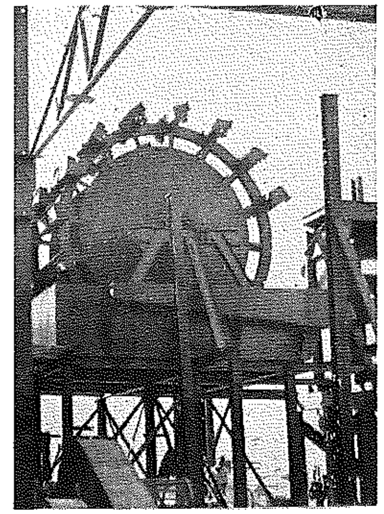


▼ Seen here against the background of Round Mountain are the workhorses of the north pit: Left, the Bucyrus-Erie 170-B 7½-yard electric shovel loads ore into the hopper. Center, atop the bank, the Bucyrus-Erie 54-B dragline works ore down to the shovel. Right, below, the standby Bucyrus-Erie 54-B dragline will upend the grizzly to tip oversize rock to the pit floor.

Water and Power

Water rights for use of the existing dam in Jett Canyon were acquired from Nevada Porphyry Gold Mines, Inc. Near the mouth of the canyon, the company has built a new dam. This dam is unusual in that it might be described as underground. Near the mouth of the canyon, loose overburden was excavated down to bedrock, and a cut was made into the bedrock. The retaining wall was built into the bedrock without removing the overburden upstream from the dam. The dam now forms an artificial artesian trap which backs water upstream but does not create a lake that shows on the surface. Because Jett Canyon water flows from the dam to the plant site by gravity, the dam and underground lake is the cheapest source of water. A 14-inch pipeline from dam to mill is capable of carrying an ample supply of water.

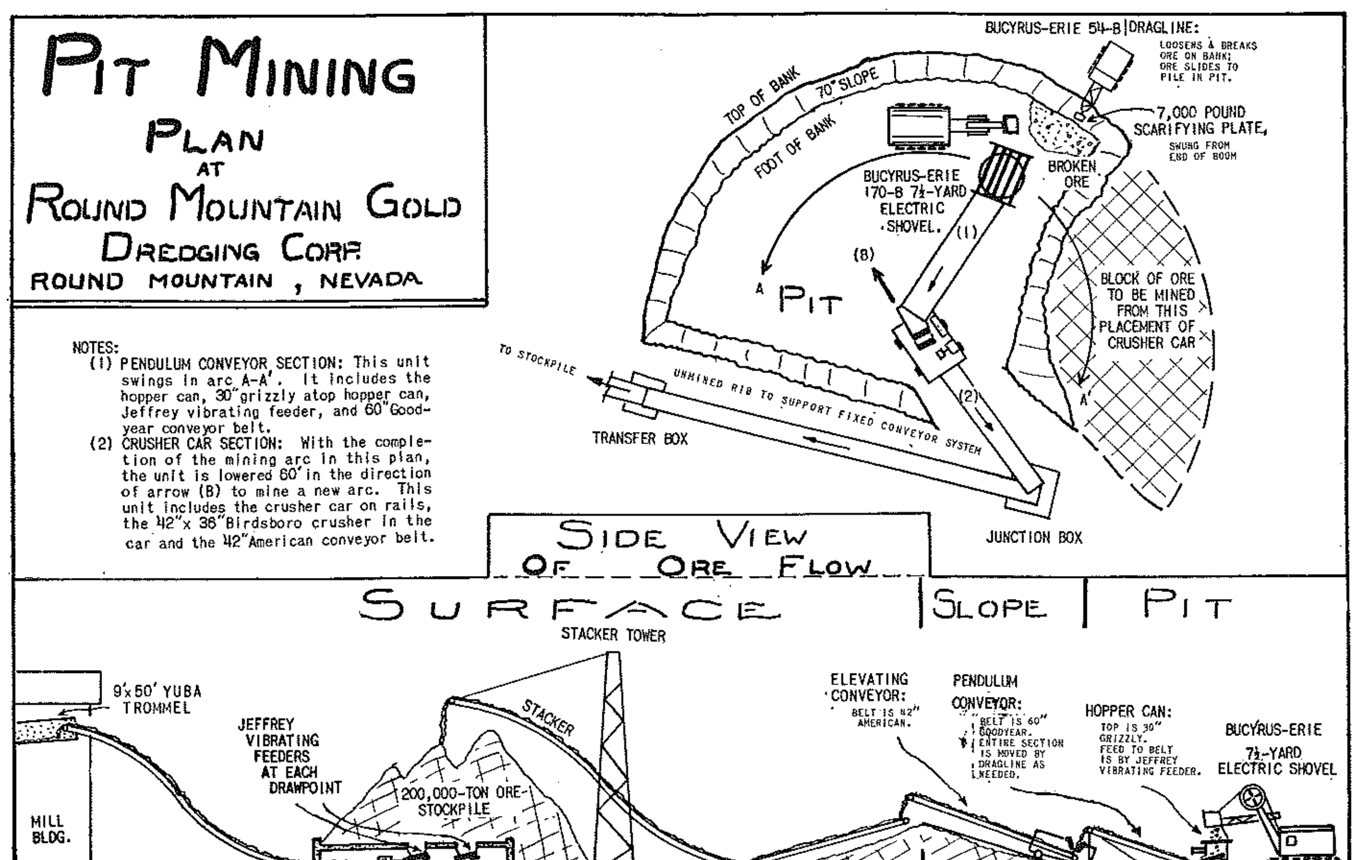
To create an assured source of water during the dry season when Jett Canyon is sometimes dry, two wells were drilled in Smokey Valley west of the mill, and along the main pipeline from Jett Canyon. One well, a 1,000-gpm well known as the "B" well is closest to the mill. The other well, a 2,000-gpm well known as the "A" well, is farthest from the mill. Both wells are similarly equipped. A deep-well pump made by Wintroath Pumps, Inc., of Alhambra, California, pumps water into a surface storage tank. A Fairbanks-Morse two-stage centrifugal pump is used to pump water from the well storage tank through the 14-inch pipeline to the mill storage tank. The centrifugal pump is driven at the "A" well by a Fairbanks-Morse 100-hp. synchronous motor through a magnetic clutch made by Electric Machinery Manu-

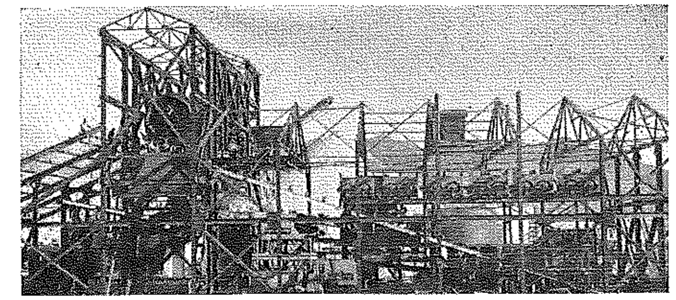


▼ YUBA patented sand wheel — a new, improved type, developed especially for handling sand and gravel on dredges — used to reclaim water and prepare sand for tailings conveyor.

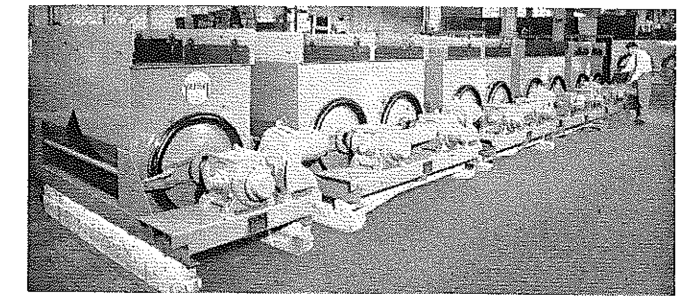
facturing Company of Minneapolis, Minnesota. The magnetic clutch, by allowing for continuous change of speed up to about 1750 rpm, makes possible a gradually increased controlled input to the line. The whole system is automatic, works through Regutron Electric Speed Controls and a float system in the storage tank at the mill; except for adjustments, the system works without the need for manpower at the pump stations.

Electricity to provide nearly all the power requirements for the plant,





▼ This view of treating plant shows similarity to dredge. A 9' x 50' revolving screen (upper left) separates gold-bearing fines from coarse over-size. Screens re-size fines into coarse sand and very fine sand, which go through YUBA rougher jigs, gold tables, cleaner jigs, ball mill, classifier, and amalgamation circuit.



▼ YUBA jigs used in Round Mountain treating plant are similar to those built by YUBA for placer dredges. Hutch water and jig action can be controlled closely to suit gravel. Screens are stainless steel — no rust, constant full openings.

other than that for the diesel motors of the two 54-B draglines, is purchased from the California-Nevada Power Company. It arrives at the Round Mountain plant via a 14-mile, 3-phase, 55,000-volt power line and is transformed to working voltages at the substation near the mill.

A Dredge-Like Mill

By way of a short preview, it is a big, fixed, dredging mill, of the kind that Yuba Manufacturing Company has found economical for low-cost treatment of free-milling gravels. It consists of a 9 by 50-foot trommel which separates the feed into a coarse oversize that is rejected to tailings and a fine product which contains the gold values. The fine product is then sized into coarse sand and a very fine sand by a battery of four Tyler Tyrock screens. The coarse sands go to four 4-cell Yuba rougher jigs, to gold tables, to cleaner jigs, and then to a ball-mill, classifier, and amalgamation circuit. The very fine sands are processed in a similar circuit.

Even the cleanup of jig beds is similar to dredge practice. As Mort Pratt, metallurgist for the big mill, says, "We clean up once each week, usually on Sundays, with a Long Tom." Mort is carrying a full load during the present testing period. He's on call 24 hours daily and must have the entire flowsheet in mind at all times.

Tonnage by Continuous Flow

The great guiding principal of the plant is tonnage by a continuous flow of ore. Looking at the stream of ore that comes into the trommel, an observer might not be impressed by it. But that stream of ore, carried on constantly and without interruption, makes possible the mining of this 67,000,000-ton deposit at Round Mountain.

The Round Mountain plant, originating as an idea and a vision some three years ago, is now complete. It is a new combination of methods and equipment, although considered piece by piece few parts of it are really new. The world of mining will do well to watch its progress.

FUTURE OF GOLD

(Continued from page 18)

ment debt could be ignored "because we owe it to ourselves."

Finance ministers everywhere, but particularly in this country, were allergic to deficits. They did not take pride in their continued ability to live off the cuff. The financial conduct of governments, and again this applied particularly to the United States, did not serve notice on one and all that the currency would be worth less tomorrow than it was today.

Yet this is precisely what the established fiscal policy of the American government is saying to the average owner of currency. During 17 of the last 19 years the budget has been in the red. Only last fall a member of the Board of Governors of the Federal Reserve System told a group of business men that their fears of growing government debt were unfounded since we "owed this debt to ourselves." Every citizen able to read knows that high level budgetary and monetary policy in Washington is directed by an echelon of technical advisors who believe in continuous inflation.

$35 Gold Price Unrealistic

Under these conditions the right to convert paper dollars, whose value is continuously evaporating, into real gold, the best known hedge against inflation, at $35 an ounce, would invite a stampede for conversion. The Treasury would find itself in the position of a trader who was offering $70 for $35. It is not necessary to have a Ph.D. in economics to forecast the result. Fort Knox would lose all its gold over night. It is for these reasons that the demand for convertibility at the present arbitrary, fixed price of $35 is unrealistic.

Nevertheless I believe that the right of conversion should be restored at the earliest possible opportunity. I do not think that the American dollar should continue to be a football kicked back and forth by the ivory tower specialists of the Treasury and the Keynesian pundits of the Federal Reserve Board.

This is an area in which the right of decision, and the power that goes with it, should be restored to the American public from whom it was furtively filched in 1933. The fighting in Korea must not be permitted to serve as a pretext for the perpetuation of bureaucratic authority to control the American dollar. It must not be the occasion which the self styled "competent and responsible men" of the Federal Reserve may seize to freeze forever their usurped authority to manage our money.

Let the dollar and gold find their own levels in a free open market during a limited period of probation. Let the level so determined be the new parity between gold and money.

With this tested parity the American holder of currency may again enjoy the right of conversion. Our government may then know that as long as its fiscal conduct commends itself to the people of this country there will be no run on our gold stocks.

We profess to be fighting for freedom and justice in Korea. I do not doubt that every patriotic American deeply believes this to be so. He is willing to reach into his pocket for added taxes to promote this purpose. He is willing to shed his blood if necessary to serve this cause. Let us beware, lest in our preoccupation with the foe on the other side of the world, unscrupulous thieves of power deprive us of our birthright at home.

PROGRESS NEWS
U. S. ATOMIC ENERGY COMMISSION URANIUM PROCUREMENT POLICIES*

By JESSE C. JOHNSON
Manager
Raw Materials Operations
Atomic Energy Commission

What is the Atomic Energy Commission's domestic uranium policy? Has this policy been effective in stimulating production and prospecting? How are domestic uranium ores and concentrates purchased and what is the market outlook? These are questions I shall attempt to answer.

Only two years ago last April the Commission announced a domestic uranium program designed to stimulate prospecting and to build a domestic uranium mining industry. The announcement stated that the Commission was leaving to the mining industry—the prospectors, the miners, and the mining companies—the job of finding, mining, and processing uranium ores. The Commission would assist by making geological surveys, by furnishing free testing and assaying service and, more important, by guaranteeing a market for the uranium ores.

Prospector Needed. The Government may be able to operate in some fields as efficiently as private industry. I know, however, that with a given price structure, the less Government there is in mining, the more production there will be. I am also convinced that the prospector, like the infantry-man, is not out-moded. We still need the prospector to find mineral deposits. The geologist's technical knowledge is no substitute for the optimism and persistence of the prospector, uninhibited by geological theories. Geological theories always can be developed to explain the occurrence of an ore deposit found under conditions previously considered unfavorable. I do not mean to belittle the importance of the geologist. The geologist is essential in evaluating and developing ore reserves and in finding ore, especially in broad mineralized areas such as the Colorado Plateau. However, even on the Colorado Plateau where vanadium-uranium ores have been mined for years, the prospector is still at work. Probably one of the most important carnotite discoveries on the Colorado Plateau during the last twenty years came to light only a few months ago. It was found by some Navajos on the reservation near Shiprock, New Mexico. They may have known about the deposits for some time, but said nothing about them until leasing regulations were modified so that they could profit personally from their find. There, perhaps, we have an example of the profit incentive at work.

Are the prices paid for uranium ore sufficiently attractive to induce mining companies to develop and operate mines and to construct milling plants? Let us take a look at the Colorado Plateau where uranium mines and plants are operating.

* Address by Jesse C. Johnson, Manager, Raw Materials Operations, United States Atomic Energy Commission, at the Meeting of the American Mining Congress, Salt Lake City, Utah, August 30, 1950.

When the Commission announced its domestic uranium program, the vanadium-uranium ores of the Colorado Plateau were the only known source of domestic supply. That area had been mined for nearly fifty years and, although it had produced a relatively large tonnage, at no time were ore reserves large, including proven, indicated, and inferred ore. This was because the individual ore bodies are small, usually ranging from a few hundred to a few thousand tons, and are sparsely distributed through flat-lying sandstone extending over hundreds of square miles.

During the early part of the war, mine production far exceeded past records because of special incentives offered by the Government to get out vanadium. This program was terminated early in 1944 when adequate vanadium stocks had been accumulated. By 1946 the Plateau was practically a ghost camp with little vanadium and no uranium production. Four of the five process plants had been closed, and the fifth was operating at half capacity. Partly as a result of contracts from the Atomic Energy Commission for by-product uranium, a second plant was opened early in 1947.

Colorado Plateau Operations. This was the condition in the spring of 1948 when the Commission announced an ore-buying program with a schedule of prices for uranium and vanadium. There were only 15 individual mining operations employing a total of 55 men, and a large part of the ore was coming from a vanadium deposit which contains very little uranium. Today there are over 200 different mining operations with total employment in excess of 1000. Ore production is at an all time high. The five process plants, three of them practically rebuilt, are now operating at capacity. The Climax Molybdenum Company has entered the field and is constructing a new mill at Grand Junction, Colorado. Several companies are studying the possibility of another new plant near Shiprock, New Mexico.

This increase in production has been achieved without Government financing of private operations. All of the ore is produced from privately-operated mines and over 80% is processed in privately-operated plants. Private investment in mines and mills during the two-year period has amounted to several million dollars. This indicates uranium mining can be a profitable business. A going operation may continue for several years on starvation wages but, unless reasonably profitable, new operations are not undertaken and existing ones expanded.

Exploration Colorado Plateau. The Commission's exploration program on the Colorado Plateau has been important in maintaining and increasing ore reserves. This program includes 300,000 to 400,000 feet of diamond drilling a year. Important new sources of production found on public domain are being made available for private mining under lease arrangements. Private industry also is carrying on extensive drilling programs. We hope not only to maintain adequate ore reserves for existing plants, but to provide ore for new plants.

Prospecting and exploration, both Government and private, has not been confined to the Colorado Plateau. Nearly one hundred Government geologists are studying uranium occurrences in other parts of the United States. However, the success of any nation-wide search for minerals depends upon enlisting the hundreds of prospectors, miners, and geologists who are out looking for all types of mineral deposits. They and their financial backers are the men who developed the American mining industry.

As an indication of public interest which followed the Commission's announcement of a domestic uranium program, during the past two years our laboratories have received more than 20,000 samples from various parts of the United States. We have had more than 12,000 letters about uranium occurrences. A prospector's handbook entitled, "Prospecting for Uranium," prepared by the Commission and the United States Geological Survey, has been a "best seller." Since publication in May 1949, nearly 70,000 copies have been sold. It is available from the Superintendent of Documents at thirty cents a copy.

Promising Prospects in 9 States.[1] Interest in searching for uranium has not been confined to inquiries. Prospectors have been out in the hills digging. Little was reported during the first season, that of 1948, but during the summer of 1949 samples and reports of interesting finds began coming in in volume. This year even more new discoveries have been reported and many of them are being prospected by surface cuts, underground workings and drilling. Many of our geologists are now engaged in examining deposits which have been found by miners and prospectors. Promising prospects have been found in Colorado, Utah, Arizona, New Mexico, Nevada, Wyoming, Idaho, Montana, and Michigan. It is too early to predict whether any of these new discoveries will become large mines, but I am confident from preliminary work that at least some will become important sources of uranium.

Marysvale, Utah. One of the most important of these new discoveries is near Marysvale, Utah, about 150 miles south of Salt Lake City. It was found by a prospector late in 1948, but little work was done until the summer of 1949. In the fall of 1949 it was brought to our attention. Although only a small amount of work had been done and only a limited amount of ore was in sight, the Commission decided to open an ore-buying station at Marysvale to furnish a market for development ore. This station began receiving ore on March 15th of this year and we now have a stockpile of about 10,000 tons.

At Marysvale, the low-grade surface ores (about 0.3% U_3O_8) contain the secondary uranium minerals, autunite and torbernite. Some of the underground workings, none of which are yet more than 100 feet below the surface, show uraninite, a uranium oxide considered by most geologists to be a primary mineral. Some recent shipments have assayed 0.8% U_3O_8 and we are hoping for important pitchblende deposits at greater depth. About a mile and a half from the deposits now being developed, a new discovery of autunite-torbernite ore was made recently, indicating an extensive area of uranium mineralization.

[1] See "Areas of Special Interest," Mines Magazine, June 1950, page 36.

Development of mines and construction of mills require capital. If uranium mining is to be left to private industry, established mining companies must take the initiative in developing promising prospects and in producing uranium wherever economically feasible. Unless this is done, the Government will be forced into the mining business. Uranium production must keep pace with expanding requirements for national defense.

COMPANIES ACTIVE

The mining companies are doing their part. On the Colorado Plateau, there are the U. S. Vanadium Corporation, Vanadium Corporation of America, Climax Molybdenum Corporation and a large number of smaller operators.

Among the companies investigating or developing uranium deposits in other parts of the country are Jones and Laughlin Ore Company, Sunshine, Newmont, American Smelting and Refining, New Park, Golden Cycle, and others.

I hope that all mining companies will have their geologists and mining engineers on the lookout for uranium. Geiger counters should be standard equipment for every exploration department. Underground workings and drill cores should be checked for radioactivity. A radiometric survey was responsible for discovery of pitchblende in the lower workings of the Sunshine mine in Idaho.

Progress is being made in the search for uranium but greater effort is needed. The Commission recognized at the start that if the mining industry is to make this effort, the chances of reward must be commensurate with the risks involved. Our buying program was designed to provide an adequate incentive with the flexibility needed to meet new conditions.

Program to Provide Incentive. Let me review briefly this program and show how it will apply to ores not covered by Circular No. 5, which relates to carnotite ores of the Colorado Plateau, or by Circular No. 1, which is for high-grade ores.

As previously indicated, the Commission's buying schedules and policies for carnotite ores of the Colorado Plateau already have resulted in active development and production in that area. Circular No. 1, which established a ten-year guaranteed minimum price for high-grade ores and concentrates, was designed for high-grade pitchblende deposits of the type which in the past had furnished most of the world's uranium. Except for the Colorado carnotite deposits, which were covered by a special buying schedule, we had little basis for predicting the kind of uranium deposits which would be found in the United States. There had been little interest in, and little prospecting for uranium. We considered it likely that other deposits might be found to which the Circular No. 1 schedule would not apply. Therefore, a provision was included in Circular No. 1 for special arrangements under negotiated contracts when justified by the quantity and the cost of production.

Our experience during the past two years indicates that most domestic uranium ores will require special schedules. Therefore, there is need for a more definite statement of price policy—a statement which gives the essential terms of ore-buying schedules that may be established and also the basis upon which the Commission will purchase high-grade mill concentrates and precipitates.

Ore-buying schedules for crude ore not covered by Circulars No. 1 or No. 5 will be established for each mill, based on the prices for uranium content set forth in Circular No. 5, the circular which applies to carnotite ore of the Colorado Plateau. Contracts for the construction and operation of mills will be arrived at by negotiation. It is expected that most of these contracts will be for the purchase of mill concentrates or precipitates at a unit price. The price paid for the mill product will be arrived at by taking into account ore cost and the estimated milling cost, including plant amortization, metallurgical losses and profit. For the purpose of such negotiations, all mills may be considered custom mills, even though the ore supply and mill may be owned by the same company. It is expected, however, that most mills will treat at least some custom ore.

Ore Buying Schedule. This is the way new ore-buying schedules will be set up:

1. Price: $2.50 to $3.00 per pound of U_3O_8 content, depending upon grade, delivered at a mill. This price includes a development allowance of fifty cents per pound of U_3O_8 content.
2. In addition, a haulage allowance may be granted to defray part of the cost of moving the ore from mine to mill.
3. Ore specifications will be established by each mill and ore which does not meet specifications will not be accepted. Metallurgical tests also may be required to determine acceptability. The minimum U_3O_8 content for an acceptable ore may be from 0.20% to 0.30% U_3O_8, depending upon the type of ore.
4. Payment may be made for other valuable constituents of the ore provided the receiving mill can recover them economically. In general, payment for these other constituents will be based upon their market value, less deductions to cover metallurgical losses and the cost of milling, transportation, smelting, refining, and marketing.

As in the case of other metals, a market for ore is contingent upon having a mill, which can treat the ore, within economic haulage distance. The Commission does not guarantee to provide a mill. We prefer that industry build and operate the mills, as it is doing on the Colorado Plateau, and sell the chemical precipitate to the Commission under unit-price contracts.

If in a local area sufficient ore is developed to justify the construction of a custom mill, and no contract is made with a private company, the Commission may construct and operate a custom mill. All of the domestic uranium ores we have tested to date require treatment by hydrometallurgical methods. This means an expensive plant. Depending upon the cost of the mill, the cost of milling and the grade of ore, a reasonable prospect of a five-year ore supply for a 50 or 100-ton operation probably will be required to justify construction of such a plant. It is obvious, of course, that neither the construction of a mill nor the purchase of ore would be undertaken until an economical process method is available for the particular ore.

You may ask, why not establish a price for high-grade concentrates and precipitates and eliminate the need for negotiated contracts. There are a number of reasons. Few private companies have had experience with uranium ores and, therefore, would not be in position to calculate milling costs without developing process methods. Furthermore, many of the chemical processes for treating uranium ores have been developed by the Commission and its contractors, and some important features of these processes are secret. However, such information will be made available to cleared personnel of prospective contractors negotiating with the Commission.

At this point, I might say this metallurgical information and uranium production figures are about the only classified data in the field of raw materials. Industry need have no fear about being hampered by a lot of secrecy restrictions. In mining and processing uranium ores, operations can be conducted with about the same freedom as in treating other ores.

Importance of Ore Buying Schedule. Another reason for establishing ore prices, rather than prices for mill products, is that much of our domestic uranium may come from a large number of relatively small operations. A simple ore-buying schedule, without complicated treatment and penalty deductions, that applies to nearly all types of uranium ores, gives the prospector and small operator a basis for estimating the potential value of his ore even though a custom mill has not yet been built in the area. As in the case of the Marysvale district, ore buying for stock piling may commence before the mill flow sheet and milling costs have been fully developed. Under this procedure the cost to us of uranium in finished product will vary, depending upon the type and grade of ore and local conditions affecting milling costs. This is contrary to normal commercial practice under which the price of ore is computed by deducting milling and selling charges from the market price of refined metal or standard grade concentrates. However, we want to encourage production from rather low-grade deposits, if they contain a sufficient quantity of recoverable uranium, and, therefore, we are paying nearly as much for the uranium content in low-grade ore as for that in high-grade. While we get a cost advantage in milling high-grade ore, there still is plenty of profit for the miner because a price that encourages mining low-grade deposits should provide attractive returns for the relatively rich deposits.

Although the formula I have outlined applies only to ores having a uranium content of 0.20% U_3O_8 or more, large deposits of lower grade material may be of interest to the Commission, depending upon the quantity of uranium available and the cost of production. For example, some very low-grade materials may be the source of by-product uranium. Every deposit of uranium should be brought to the attention of the Commission.

How long will the demand for uranium continue? In my opinion the market for uranium is here to stay, but when, if ever, there will be a free commercial market, I will not attempt to predict. As long as the Government is the sole purchaser of uranium, and industry must depend upon the Government for its market, the Government must give adequate guarantees both as to price and the period of purchase, if industry is to finance and operate uranium mines and plants.

(Continued on page 42)

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

By
A. L. ENGEL[1] and
H. J. HEINEN[2]

INTRODUCTION AND SUMMARY

Many western ores containing gold, silver, and copper can be mined and concentrated at a profit only when the recovery of these metals is high and treatment costs are low. Usually, ores containing easily dissolved copper minerals, or copper minerals that become soluble to some extent through oxidation during treatment, present a real problem in cyanidation. Copper cyanide compounds are formed that tend to precipitate and that cannot yield regenerated cyanide and metallic copper on contact with zinc. This results not only in some loss of copper through solution in cyanide, but in excessive consumption of cyanide above the amount required for the extraction of gold and silver. Any means, therefore, of minimizing the loss of cyanide while at the same time effecting high recoveries of the several values contained in the ore is of wide interest.

Ore Tested

A sample of typical low-grade ore of gold, silver, and copper, containing copper-sulfide minerals, was obtained from the MacLaren Gold Mines Co., Cooke, Park County, Mont., for laboratory investigation by flotation and cyanidation.

The sample contained about 50 percent pyrite, fine-grained and disseminated in a siliceous gangue. Copper was present as fine-grained chalcopyrite, and some covellite coatings were noted on both copper and iron pyrite grains. Analyses showed:

Gold, ounce per ton	0.23
Silver, ounce per ton	0.68
Copper, percent	1.10
Sulfur, percent	22.0
Arsenic, percent	less than 0.2

Satisfactory liberation of the minerals was obtained by grinding to minus 100-mesh.

Methods of Treatment

Two methods of treatment were developed, either of which gave good recovery of copper, gold, and silver with comparatively low consumption of cyanide. It was found that cyanide consumption could be minimized by shortening the period of agitation to 4 hours. Apparently, longer agitation resulted in increased consumption of cyanide by the products of oxidation of the sulfide minerals present in the pulp. The short agitation period was long enough to permit satisfactory extraction of gold.

By the first method of treatment, copper was concentrated by flotation according to standard procedure. In a typical test, 86.4 percent of the copper was recovered in concentrates containing 21.51 percent copper, 3.29 ounces gold, and 9.40 ounces silver per ton; 62.7 percent of the gold and 61.2 percent of the silver also were recovered in these concentrates. The copper flotation tailings were cyanided for 4 hours; 28.5 percent of the total gold and 35.8 percent of the total silver were extracted, giving over-all recoveries of 91.2 percent of the gold and 97.0 percent of the silver. Cyanide consumption was 4.7 pounds per ton of original ore. Lime consumption was 1.4 pounds per ton for cyanidation, in addition to 2.5 pounds required in the copper flotation circuit.

The second method of treatment consisted of production of copper concentrates in similar manner, followed by flotation of part of the pyrite from the copper tailings amounting to only one-third of the original weight of ore. These secondary concentrates were reground, washed to facilitate cyanidation, and agitated with cyanide for 4 hours. Total recoveries of gold and silver were 90.6 percent and 93.6 percent, respectively. Cyanide consumption was 2.5 pounds per ton of ore. Lime consumption during cyanidation was 0.6 pound. This method of treatment appears to be the more economical as gold recovery was nearly equal to that of the first method described, a much smaller portion of the original ore was treated by cyanidation, and cyanide consumption was considerably lower. These advantages were offset to some extent by the additional flotation treatment required along with the necessary regrinding and washing of the secondary concentrates.

ACKNOWLEDGMENT

The work described in this report was done under the general supervision of J. B. Zadra, superintendent and supervising engineer of the Rare and Precious Metals Experiment Station, Minerals Division, Bureau of Mines, Reno, Nev.

PREVIOUS TESTS (1937)

In the correspondence received from the MacLaren Gold Mines Co. concerning this work, previous testing done at the Reno Station under Project 270 was mentioned. A search of the Station files revealed a report dated October 27, 1937, describing tests made on a similar but higher-grade ore from the same property. The results of this previous testing are of interest, and are included for comparison with the results obtained in the present work These previous results were summarized in the report of Project 270, as follows:

1. Over 90 percent of the gold and over 80 percent of the silver were recovered in a low-grade concentrate by bulk flotation of the minus 100-mesh product.
2. About 80 percent of the gold and 60 percent of the silver were recovered with over 85 percent of the copper in a relatively high-grade concentrate by selective flotation of minus 100-mesh ore.
3. Cyanidation of the ore or tailing resulting from selective flotation did not appear practical owing to high consumption of cyanide.

The bulk flotation test referred to under (1) showed production of concentrates carrying 0.80 ounce and 1.88 ounces silver per ton in 44 percent of the original weight of ore. Copper content was not given.

In the selective flotation test (2), the concentrates contained 3.02 ounces gold and 6.00 ounces silver per ton and 17.00 percent copper in 9.1 percent of the original weight of ore. The reagents used were in pounds per ton of ore: lime, 8.0, and sodium cyanide, 0.5, ground with the ore; and potassium ethyl xanthate Z-3, 0.05, with cresylic acid, 0.15, for flotation. The pH of the pulp was 9.2.

One cyanidation test referred to in (3) was made on ore ground to minus 100-mesh and agitated for 68 hours, during which time 82.1 percent of the

(Continued on page 40)

[1] Metallurgist, Rare and Precious Metals Experiment Station, Bureau of Mines, Reno, Nev.
[2] Chemist, Rare and Precious Metals Experiment Station, Bureau of Mines, Reno, Nev.
Reprinted from Bureau of Mines Report of Investigations 4670.

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.

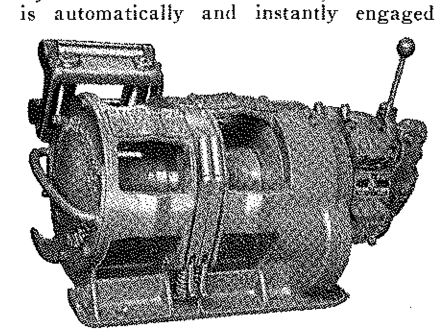
Gardner-Denver New Model "HEE" Airslusher (750)

The new Gardner-Denver Model "HEE" Airslusher is the result of many years experience in successfully designing and manufacturing airslushers in several sizes. The simple, compact and rugged design of this new model provides assurance that it will stay on the job longer with less maintenance.

It is powered by a five-cylinder radial air motor with high stalling torque which is so necessary for slushing service.

The same revolutionary roller clutch is used as on the larger HKE and HME models. In comparison with the planetary transmission generally used, the roller clutch design requires one-third the number of gears, one-third the number of bearings, one-third the number of oil seals and one-third the number of lubrication points. However, ball bearings are used where needed, and hardened materials are generously used to withstand the severe service.

Operation of the HEE is accomplished by finger-tip control of a single throttle lever. This lever controls both the power and direction of rotation of the air motor. By means of the roller clutch, one drum is automatically and instantly engaged



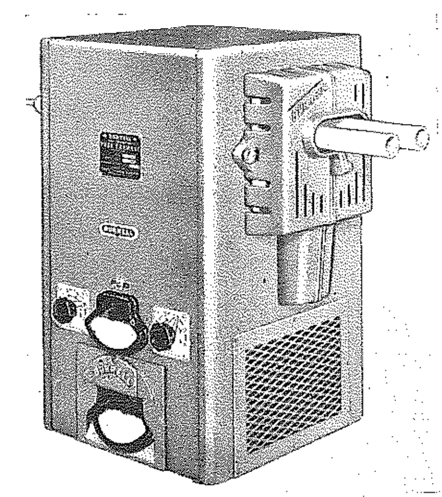
and the other drum is automatically and instantly engaged and the other drum is released when the throttle is reversed. The "dead man" throttle lever returns to neutral when released.

A large number of new Model HEE airslushers are already in service and they have the lugging and stamina so typical of other Gardner-Denver airslushers. Complete details may be obtained from Gardner-Denver Company, Quincy, Illinois or Denver, Colorado.

Burrell Offers High Temperature Combustion Tubes (751)

Burrell Corporation, manufacturer and distributor of chemical and laboratory apparatus, Pittsburgh, Pa., is now offering mullite and zircon high temperature combustion tubes.

The McDanel combustion tube, guaranteed by Burrell to perform satisfactorily up to 2900° F, is offered especially for high temperature furnaces. This high temperature mullite tube is made by an exclusive process which combines the ingredients to form the natural mullite crystals when fired at temperatures above 3100° F. Burrell states the tubes are made gas-tight, are straight and accurately sized, and remain free from devitrification.



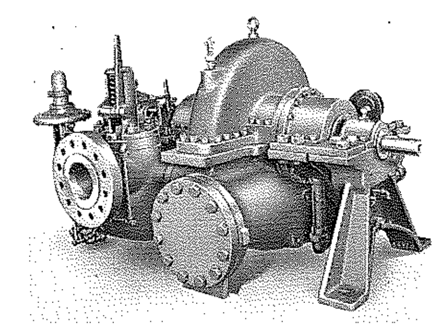
The Zircum high temperature combustion tube (from the McDanel laboratories also) is made from highly purified raw materials and matures at approximately 3100° F. Because of this high firing temperature and the high concentration of zircon. Burrell guarantees performance up to 2900° F.

Both tubes are offered in a variety of lengths and diameters, and come with straight uniform diameters or tapered ends. Bulletin No. 314 completely describes the tubes, gives sizes and prices.

New De Laval Single Stage High Pressure Turbine (752)

Recognizing the trend toward higher and higher pressures and temperatures, the De Laval Steam Turbine Company announces the first standard single-stage turbine designed especially for high pressure service. Initial pressures to 1450 psig, initial temperatures to 950 Ftt and back pressures to 300 psig.

The De Laval CP Turbine is more than an ordinary single-stage turbine in a "beefed up" high pressure casing. It is the first single stage, mechanical drive turbine with all labyrinth shaft seals. These seals consist of a series of shaft



grooves and mating tongues of stainless steel packing. The number of labyrinths in the shaft depends upon the exhaust pressure rating—as many as 52 labyrinths per side being employed for the highest pressures. The De Laval labyrinth seal prevents leakage effectively, reduces losses, lasts longer and requires less maintenance.

To provide for extreme thermal expansion encountered in high temperature service, the turbine is supported at the true centerline and the front end is mounted on a flexible channel. This method of mounting permits both radial and axial expansion to take place without disturbing the shaft centerline.

The turbine can be furnished with any of eight different types of governors including: mechanical shaft, vertical flyweight with or without oil relay, hydraulic with or without oil relay, pressure governors for pump and blower drives and auxiliary tripping devices. A separate trip operating independently of the governing system gives positive protection against overspeeding.

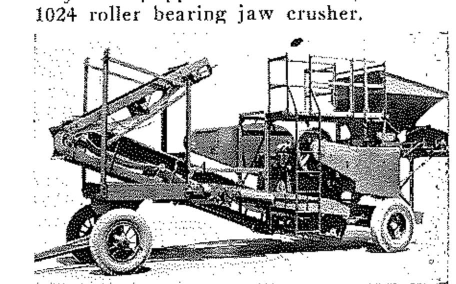
The De Laval CP Turbine is made in three sizes for capacities up to 2000 hp.

For further information write to the De Laval Steam Turbine Company, Trenton 2, New Jersey for Bulletin No. 4215.

New Portable Crushing Plant (753)

A new No. 6 portable crushing plant has been recently made available by Pioneer Engineering Works, Minneapolis, Minnesota.

This new plant, of the single pass type, for use in gravel or rock areas, has a mechanical (reciprocating plant) feeder, 2′ x 3′ two bearing vibrating screen and may be equipped with a 1016, 1020 or 1024 roller bearing jaw crusher.



A gathering conveyor which blends the material from the screen and crusher is built into the plant and can be used to load trucks, or to deliver to bin or stock pile. V-belts drive the crusher and screen. Other drives are high speed steel roller chain. The entire plant is mounted on a two axles chassis equipped with pneumatic tired wheels. A semi-trailer hitch is available. Complete information can be obtained from the factory.

MINES MAGAZINE,
734 Cooper Building,
Denver, Colorado

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Referring to Equipment News, please send as checked:

No. ______ Prices ☐, Bulletins ☐; No. ______ Prices ☐, Bulletins ☐;
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M-S-A Announces New Voice Powered Maskfone (754)

Direct telephone contact between wearers of gas masks or breathing apparatus over short or long distances is now possible with the new M-S-A Maskfone, announced by Mine Safety Appliances Company.

The M-S-A Maskfone is powered by the speaker's voice, and requires no batteries or other external power source. The new product permits the transmission of orders to individuals on the job, enables the relaying of immediate reports on job conditions in toxic atmospheres, and expedites operations with increased safety.

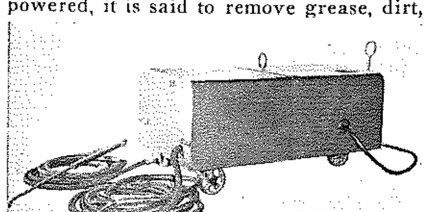
The complete M-S-A Maskfone assembly, including transmitter, earphones with head harness, hand set, and 125 ft. of cable on revolving reel, is adapted for use with all M-S-A respiratory protective equipment employing the M-S-A All-Vision Facepiece, when equipped with the company's Cleartone Speaking Diaphragm. The instrument is approved by the U. S. Bureau of Mines for use with the M-S-A Chemox Oxygen Breathing Apparatus, Demand Oxygen or Air Apparatus, Canister Gas Masks, and Hose Masks. Variations of the assembly are available where adaptation to individual installations is required.

For detailed information write for Bulletin No. B-21—from Mine Safety Appliances Company, Braddock, Thomas and Meade Streets, Pittsburgh 8, Pennsylvania.

New All-Electric Steam Cleaner (755)

The Homestead - Yeager All - Electric Steam Cleaner designed especially for use underground, or wherever gaseous or explosive mixtures have previously made cleaning impractical, is announced by the Hypressure Jenny Division of Homestead Valve Manufacturing Co., Coraopolis, Pa.

Electrically heated and electrically powered, it is said to remove grease, dirt,

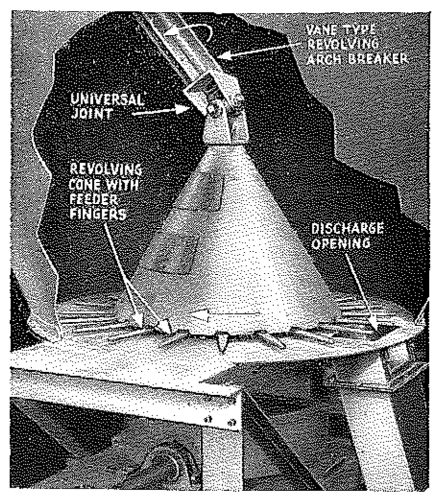


and other deposits from machinery, equipment, floors, etc., ten times faster than by hand-methods. It properly mixes a constant amount of water with the desired amount of dissolved cleaning compound, and dumps the mixture through a manifold where it is electrically heated in progressive stages. At 100 to 120 pounds normal operating pressure, the boiling hot solution and vapor are ejected from the cleaning gun in a powerful 60 gallons per hour blast that cuts, dissolves, and flushes away the heaviest dirt and grease deposits.

Portable either by means of its own wheels or its balanced crane hook eye, the Homestead-Yeager Steam Cleaner is made in the STANDARD, SPA series, approved by the Pennsylvania Department of Mines for use in fresh air underground; and in PERMISSIBLE BMA Series which will carry U. S. Bureau of Mines approval. The units are available for practically any power circuit; and have a demand of 50 kw. Approximate weight: 800 lb, dimensions: 66" x 36" x 32" high. The manufacturer will send free literature upon request.

Bin Discharger Feeder (756)

Stephens - Adamson Manufacturing Company, Aurora, Illinois, manufacture a Bin Discharger Feeder equipped with a rotary vane type arch breaker used for regulating the flow of fine material which has a tendency to arch-over in the bottom of a storage bin. The feeder fingers, rotating with a center cone, carry material over the discharge opening.



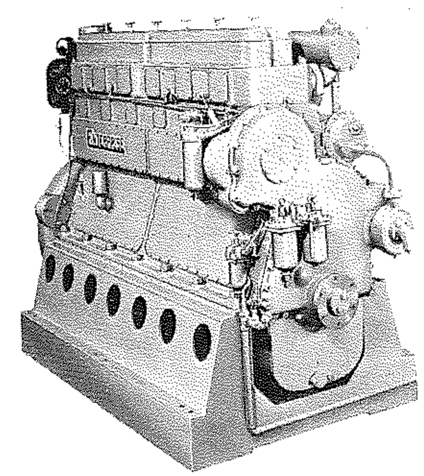
The arm of the vane-type arch breaker is given a rotary motion by means of a universal joint connection to the center cone. In a circular bin, the arch breaker arm resting against the bin wall, has a tendency to travel around the circumference of the bin. However, if the material offers too much resistance, the arm can simply rotate in place, cutting at the material until the way is cleared.

With more difficult material, particularly those of fine mesh, a two-stage discharger-feeder may be necessary. Special dischargers of this type are built to handle many bin discharge problems. Complete information will be furnished by the manufacturer.

New Stationary Diesels (757)

A new series of smaller, heavy-duty stationary diesel engines has been announced by Enterprise Engine & Machinery Co. They are designated as the Enterprise M-series Diesels. Built in 3, 4 and 6 cylinder models with 8" bore and 10" stroke, these engines range from 68 to 240 HP at medium speeds of 450 to 750 RPM. All models are of the long proven 4-cycle design.

The result of more than four years research, engineering, plant and field test-



ing, the M-series embodies all of the more advanced design, metallurgical and operational developments in the Diesel engine field. They are completely enclosed, while all accessories are conveniently mounted for easy accessibility and servicing.

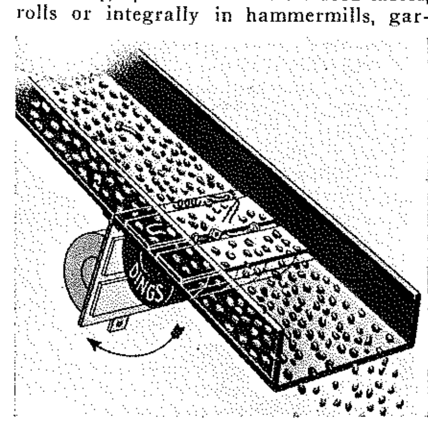
Cooling systems with radiators, cooling towers, or evaporative coolers, are available for all M-series models as optional equipment. The structural steel base may be extended for mounting radiators and driven equipment, making a compact, self-contained unit, portable if desired. AC and DC generator sets are available in this series as a highly economical continuous or standby source of electric power for all industrial applications.

Write: Enterprise Engine & Machinery Co., 18th and Florida Sts., San Francisco 10, California, for complete information.

Dings Announces Redesigned Perma-Plate Magnets (758)

Dings Magnetic Separator Co., 4740 W. Electric Ave., Milwaukee 46, Wisconsin, is now making available its non-electric Alnico Perma-Plate magnets in three magnetic field ranges. Types 1, 2 and 3 Perma-Plate magnets are designed for removing miscellaneous tramp iron from wet or dry materials in process in order to protect machinery or prevent sparks, as well as to purify non-magnetic substances. More powerful, lighter in weight than previous models, each of these types is made in 19 standard sizes from 4" wide through 72" wide and in 2, 4, 6 and 8 pole styles. The variation of the field strength between the three types is employed to allow selection of that magnet which best suits a particular tramp iron removal job.

These magnets can be installed above belt and slat conveyors, in open or closed wood or metal chutes, in ducts, spouts and troughs, above and below feed tables, rolls or integrally in hammermills, gar-

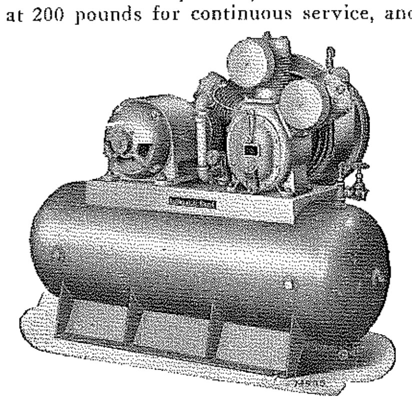


netts and various types of processing machinery.

Perma-Plate magnets are not affected by weather or high temperatures, will handle liquids or solids. Their magnetic strength is measured and certified. Magnetic permanence is guaranteed for the life of the installation. All Perma-Plate types are available in self- cleaning models which are fully automatic. Literature available upon request to the manufacturer.

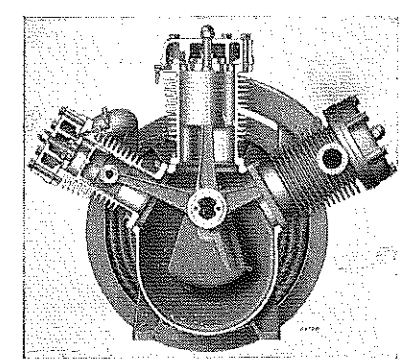
Ingersoll-Rand "T" Series Compressors (759)

Ingersoll-Rand "T" Series Stationary Air Compressors, consists of two lines, one designed for normal industrial pressures of 100-125 pounds; the other rated at 200 pounds for continuous service, and



▼ Tank-Mounted Unit.

up to 250 pounds on intermittent pump-up service. Both lines are available as tank-mounted, baseplate - mounted or bare units, with electric-motor or gasoline-engine drive. The units are air cooled



▼ Cut-Away Photo of Compressor.

by means of fan blades integrally cast on the flywheel.

Standard equipment includes a centrifugal unloader, intake filter and muffler, and automatic start-and-stop control on tank - mounted and baseplate - mounted units. Constant - speed and dual - control are optional equipment.

For additional information write Ingersoll-Rand, 11 Broadway, New York 4, New York or any of its branch offices, and request Form 1048, showing various sizes and models, cross-sectional views, engineering data, sizes and dimensions.

New Respirator Hood (760)

A new flyweight respirator hood—the No. 75—designed for protection against dust and paint spray operations has been developed by American Optical Company, Southbridge, Mass.

Extremely light and comfortable, the hood incorporates AO's R2000 Respirator which protects against a variety of dusts or gases by means of seven specific cartridges. Hood design assures full and free movements of the head and neck.

Manufactured of white nylon, olive green twill or white muslin, the hood provides complete protection for eyes, head, neck, shoulders and respiratory organs. Two drawstrings tieing under the wearers' arms assure snug fit.

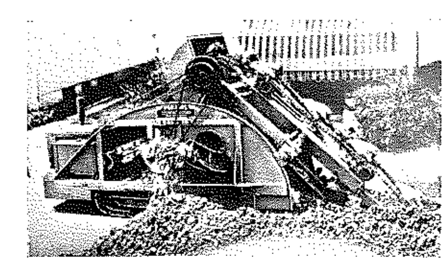
Other features include a 10" window of clear cellulose acetate and a 2¼" x 4" elastic strap sewn into the back of the hood assures a snug fit for various head sizes, eliminating adjustments.

For further information ask your nearest AO Branch for pamphlet S-1162.

Trenching Machine (761)

Built by Parsons Company of Newton, Iowa, the Model 221 Trenchliner, digging 8½ feet deep and 16 to 36 inches wide in a range of 12 variable cutting widths, is well suited to handle works project trenching assingments of cities, municipalities and utilities. High production performance records have established the 221's reliability for road and airport drainage work, underground conduit, water and gas main trenching.

It is fast and rugged, assures easy and quick operation, unhampered by close



▼ Model 221 Trenchliner.

quarter production requirements. This all-purpose Trenchliner cuts through all types of material short of solid rock. It is equipped with a selection of 15 digging feeds and, depending on depth, width and soil conditions, has a digging capacity up to 3 cubic yards per minute. The machine is equipped with 4 travel speeds and one reverse, and 3 bucket line and conveyor belt speeds. A full reverse on all operations makes undercutting easy.

Copies of a new bulletin may be obtained by writing to the Parsons Company at Newton, Iowa.

PLANT NEWS

Dawson, N. M., Dismantled

Dawson, a thriving community until school closed in June, was sold lock, stock and barrel, except for the land, to the National Iron and Metal Company of Phoenix, Ariz., by the Phelps Dodge Corporation.

The reason? The Diesel locomotive. The coal produced at Dawson was largely sold to the Southern Pacific Railroad. The coming of the Diesel-powered engines killed the market and that killed Dawson.

With the outlet for its coal gone, Phelps Dodge reluctantly decided to fold up the town. It didn't have to look far for a buyer. It found one in Samuel Shapiro, president of the National Iron and Metal Company, with whom it had done business on a smaller scale before.

Shapiro took the $500,000 salvage operation in his stride. He had just completed disposing of 5,000 tons of brass and 1,000 tons of lead which he had journeyed to Japan to purchase and ship to this country.

Pioneer Appoints Sales Manager

Carl R. Rolf has been appointed Assistant Secretary and Sales Manager of Pioneer Engineering Works, Minneap-

CARL R. ROLF

olis, Minnesota, according to K. E. Brunsdale, Vice President in Charge of Sales. The Company builds heavy equipment for quarries, gravel producers, mines, cement mills and asphalt paving contractors.

Mr. Rolf entered the employ of the Company as Factory Sales and Service Representative on January 1, 1922 with Russell Grader Company (predecessor to Pioneer), covering the northwest area, and later the State of Texas.

Allis-Chalmers Increases Earnings

Allis-Chalmers Manufacturing Company recently announced that while net earnings the first quarter of the year were down compared to last year, the second quarter earnings were ahead of 1949.

The net earnings of $5,917,742 in the second quarter were equal to $2.23 a common share after preferred dividends of $292,000.

In the first quarter of 1950, the net earnings amounted to $4,373,733 equal to $1.62 a common share after preferred dividends.

"The increased earnings," said Walter Geist, Allis-Chalmers president, "were due in part to the fact that we were not faced with the procurement problem of premium or conversion steel which last year considerably affected company earnings."

Allis-Chalmers Redesign Motors

Allis-Chalmers has announced the redesign of its standard line of large, bracket-bearing, squirrel-cage induction motors of four and more poles to provide more protection and greater accessibility.

Bracket-bearing, squirrel-cage induction motor construction in this Allis Chalmers line is standard for ratings up to 1 hp per rpm. However, for steady, non-overloading industrial drives (such as centrifugal pumps, blowers and fans) bracket-bearing construction may be used for ratings up to approximately 1.5 hp per rpm for motors in the high speed class up to 900 rpm.

DuPont Increases Parkersburg Unit

A new unit of the Du Pont Company's plastics plant near Parkersburg, W. Va., has gone into commercial production of "Teflon" tetrafluoroethylene resin, an industrial plastic highly resistant to chemicals and heat and one of the best insulating materials known.

The new unit makes available to the chemical and electrical industries and other users of "Teflon" a productive capacity several times that of a plant at Arlington, N. J., where manufacture of the plastic in relatively small commercial quantities was started in 1943.

The unit's full operation marks completion of the first expansion at the Parkersburg plant which less than two years ago began commercial manufacture of nylon molding powder, monofilament and tapered bristles; "Lucite" acrylic resin, and "Alathon" polythene resin.

Grasselli Appoints Technical Director

Dr. Max T. Goebel, assistant technical director of the Du Pont Company's Grasselli Chemicals Department, has been appointed technical director, succeeding Dr. John C. Woodhouse who has undertaken a special assignment with the company.

A native of Compton, Ill., Dr. Goebel attended Carthage College, Illinois, and received his A.B. and Ph.D. degrees in chemistry from the University of Illinois. He joined Du Pont in 1934 as a research chemist at the Experimental Station and was made assistant technical director of the department in 1948.

Distributor Appointed for Hewitt-Robins Inc.

Appointment of C. E. Thurston & Sons, Inc., 30-32 Commercial Place, Norfolk, Va., as distributor of Hewitt Rubber Division products in the Norfolk area has been announced by Hewitt-Robins Inc., of New York. Thurston & Sons will handle the Rubber Division line of materials including industrial hose and conveyor belting.

Ajax Flexible Coupling Co. Appoint Representatives

Appointment of three new representatives is made by Ajax Flexible Coupling Co. Inc., according to Wayne Belden, Vice President.

The Samson Sales Company operated by Elmer D. Samson, 420 Market Street, San Francisco, California, will represent Ajax Flexible Couplings, Ajax Shaler-Shakers and Ajax Lo-Veyors in Northern California.

J. S. (Steve) Thurlow, manager of the Thurlow Equipment Division of G. Donald Bradley Company, 4402 White Building, Seattle, Washington will cover the states of Washington, Oregon and Idaho on all Ajax products except Flexible Couplings.

Boyd Goodhart, 1425 Troost Avenue, Kansas City, Missouri will handle the complete Ajax line in Western Missouri and Kansas.

Goodyear Makes Personnel Changes

M. W. Sledge has been named to replace the late E. W. Stephens as manager of the Belt Sales Department at the Goodyear Tire & Rubber Company. The announcement was made by H. D. Foster, manager of the Mechanical Goods Division.


M. W. SLEDGE


C. F. SMITH

Formerly the assistant manager, Sledge will direct all belt sales activities and will work closely with C. F. Smith, newly appointed chief project engineer, on large conveyor belt prospects.

In a complete revamping of the department, H. R. Harrington, former senior


H. R. HARRINGTON


J. L. THORNTON

staffman, was designated as assistant manager and J. L. Thornton became manager of the belt sales coal division. A. B. "Dutch" Walter continues as chief engineer of the coal mine division.

Sledge joined Goodyear in 1935 as a member of the production squadron following his graduation from Auburn University.


A. B. WALTER

Harrington, a native of Utica, N. Y., joined Goodyear in 1922 following his graduation from Cornell.

A former senior sales engineer, Thornton has been a Goodyear employee since 1942. He will coordinate all coal field sales activity.

Prior to his present appointment, Smith was a senior sales engineer. A native of Parkersburg, W. Va., he attended Goodyear Industrial University, starting with the company in 1917 as a pipe fitter.

General Electric's "More Power to America Special" Soon to Start Second Lap of Nationwide Tour

The "More Power to America Special," the General Electric Company's mammoth mobile showcase of electric products for industry, headed west from Schenectady September 5 on the second lap of its nationwide tour.

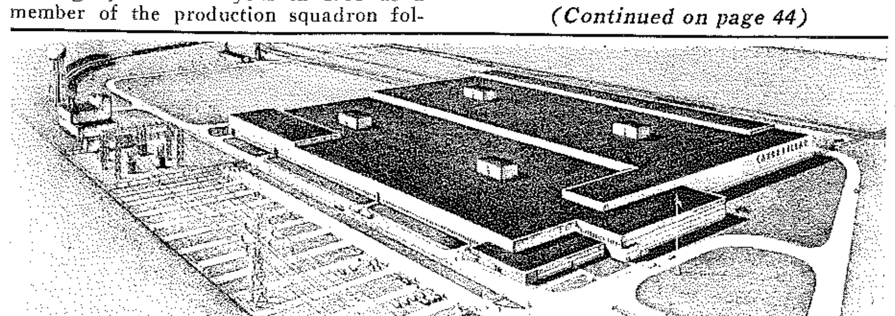
The ten-car exhibit train will visit 29 key midwestern industrial centers this fall before swinging south, down the Atlantic coast, according to C. H. Lang, vice president and manager of marketing of the G-E Apparatus Department.

Mobilization Planning Committee Formed in G-E Apparatus Department

The formation of a Mobilization Planning Committee within the General Electric Company's Apparatus Department has been announced by H. V. Erben, vice president and general manager of the department.

The new group's responsibilities, as outlined by Erben, are to co-ordinate for the department the "requests from the Department of Defense and its agencies

(Continued on page 44)



New Caterpillar Tractor Plant

First steel erection at the new Caterpillar Tractor Co. plant at Joliet, Ill., began August 8, according to T. R. Farley, Vice-President.

The new plant at Joliet marks an additional expansion of manufacturing facilities with which it is planned to achieve the greatest possible economy in the manufacture and distribution of Caterpillar products. In addition to its main plant at Peoria, Illinois, Caterpillar has a factory and Parts Depot at San Leandro, California and Parts Depots at Kansas City, Kansas; Atlanta, Georgia; Shreveport, Louisiana; Albany, New York; Minneapolis, Minnesota; Spokane, Washington and Indianapolis, Indiana.

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.

(5679) VARIABLE SPEED DRIVES. A new 88 page Book No. 2274 published by Link-Belt Co., 307 N. Michigan Avenue, Chicago, Ill., contains a world of information meeting almost every condition where variable speed drives can be used to advantage. It contains diagrams of automatic speed control applications and pages of photographs showing a great variety of P.I.V. installations throughout the industry. A special feature of the book is 36 pages covering "pre-selected drives" from which it is easy to select a variable speed drive to meet your conditions. Many drawings are included with tables of dimensions. A price list effective July 31, 1950, is included.

(5680) LABORATORY INSTRUMENTS. A recent bulletin distributed by the Mine & Smelter Supply Co., Denver, Colo., illustrates and describes several laboratory instruments which will be found very convenient for use in many chemical laboratories.

(5681) BALL MILLS. Bulletin No. 475 by Morse Bros. Machinery Co., 2900 Broadway, Denver, Colo., contains 8 pages illustrating and describing the construction of the Morse Bros. new ball mill for economical grinding in small and medium capacity, metallurgical and chemical industrial plants. Included is a table giving general dimensions, capacity, weights and other useful information.

(5682) "ON TOUR," August 1950, by Union Oil Co. of California, Union Oil Bldg., Los Angeles 17, Calif., contains 24 pages including a glance at the Los Angeles Refinery with a number of very interesting illustrations. It describes "Black Bonanza," a book being published that everyone ought to read. Company personnel notes are included.

(5683) PULSATOR JIG. Bulletin No. 2402 by the Dorr Co., Barry Place, Stamford, Conn., contains 6 pages illustrating the construction and operation of the Pan-American pulsator jig manufactured by the Door Co. Specifications including general dimensions and outlined drawings are included.

(5684) SYMONS CONE CRUSHERS. Bulletin 110 by the Nordberg Mfg. Co., Milwaukee, Wisc., contains 28 pages illustrating and describing the construction and operation of this well known crusher showing the many advantages it has in the reduction of ores and rock. Much information is contained which can be used to the advantage of everyone interested in crushing problems.

(5685) PIPE INSULATION. A four page bulletin recently published by Owens-Illinois Glass Co., Toledo, O., contains tables of information covering sizes and thickness of insulation required under different conditions. Also physical characteristics and tables of heat losses.

(5686) NICKEL CHROME STEELS. Publication NS 2 by the International Nickel Co., 67 Wall St., N. Y. contains 12 pages including charts and other information pertaining to nickel chrome steels, type 3100 series. A list of warehouses carrying this nickel chrome steel in stock is included.

(5687) DIAMOND DRILLING SAMPLING DEVICES. Bulletin 75-A by Sprague & Henwood, Inc., Scranton, Pa., contains 20 pages illustrating and describing sampling devices and equipment used in connection with diamond drilling and also in connection with other drilling methods for obtaining samples of soils—bedded and rock formations.

(5688) "RARIN'-TO-GO," August 1950, by Frontier Refining Co., 410 Boston Bldg., Denver, Colo., contains 12 pages describing the activities of this company both from an operating and personnel standpoint. A map shows Maudlin Pipe line.

(5689) "NEW MEXICO MINER & PROSPECTOR," August 1950, by New Mexico Mining Industry, P. O. Box 503, Albuquerque, N. M., contains many short articles pertaining to mineral activities in New Mexico. Included are tables of mineral production and petroleum production in that state.

(5690) "A CASE STUDY OF INNOVATION" by Elting E. Morison, reprinted by C. F. Braun & Co., Alhambra, Calif., from April 1950 "Engineering & Science Monthly" by the California Institute of Technology describes the introduction of a single technological change in the United States Navy. This is a very interesting article and well worth reading by all Americans.

(5691) "INDUSTRIAL HOSE REPORTER," August 1950, by Gates Rubber Co., 999 S. Broadway, Denver, Colo., contains a list of dealers of hose in the Rocky Mountain Region and warehouse stocks. Five special types of hose are shown in this issue and also short articles showing the advantages and long life of Gates industrial hose, are included.

(5692) "MIN & CHEM," August 1950, by International Minerals and Chemical Corp., 20 N. Wacker Drive, Chicago, Ill., contains 24 pages with short illustrated articles pertaining to the activities of this company from an operation and personnel standpoint. One article of particular interest is entitled "Does Finance Fool You?" The ideas supported by illustration will clarify many questions in the mind of the average individual.

(5693) MAGNAFLUX. Form No. B415-2 by Magnaflux Corp., 5900 Northwest Highway, Chicago 31, Ill., contains 8 pages illustrating and describing what magnaflux is and how it works. Everyone who has inspection of equipment problems on their hands, either raw materials castings, forgings or finished products should have a copy of this publication.

(5694) LEAD. Vol. 18, No. 2, 1950, by Lead Industries Assn., 420 Lexington Ave., N. Y., contains 8 pages of information on the subject of lead, including many of its uses. Among other items, there is a short article "New Liquid Lead Electrode Furnace."

(5695) "FINANCIAL ANALYSIS—30 OIL COMPANIES FOR 1949," by Joseph E. Pogue, Chase National Bank, N. Y. C. This analysis brings out many important facts in regard to the production and earnings of large oil companies. A large amount of statistical data is included in this analysis.

(5696) STEAM TURBINES. Bulletin No. 4215 by the De Laval Steam Turbine Co., Trenton, N. J., contains 4 pages illustrating and describing the construction and advantages in the use of the De Laval C. P. Turbine for high pressure service. Features and specifications of this equipment are given.

(5697) "H & B BULLETIN," July-August, 1950, by Hendrie & Bolthoff Co., 1659-17th St., Denver, Colo., contains 32 pages illustrating and describing many new equipment items and supplies which are carried in stock by this company for use in connection with mining, milling, smelting, construction and industrial operations.

(5698) CONVEYORS. Bulletin LD-100 by Joy Mfg. Co., Henry W. Oliver Bldg., Pittsburgh 22, Pa., illustrates and describes a complete line of belt conveyors for the mining industry. This bulletin includes 28 pages of photographs and dimension prints showing equipment that will be useful in solving many conveyor problems.

(5699) "MINERAL INFORMATION," by Division of Mines, California, Ferry Bldg., San Francisco, Calif., Olaf P. Jenkins, Chief, contains 8 pages of mining and industrial notes pertaining to California. Included is a list of strategic mineral reports published by this Division.

(5700) LUBRICATED PLUG VALVES. Reference Book 39, Section 5, by Homestead Valve Mfg. Co., Coraopolis, Pa., illustrates and describes the construction of this valve which is automatically adjusted for wear. Tables of dimensions, sizes and prices are included.

(5701) UNITED STATES STEEL QUARTERLY, August 1950, by United States Steel Corp., 71 Broadway, N. Y., contains a letter from Irving S. Olds, Chairman, on the unprovoked communist invasion of South Korea. Also tells of the increased capacity of steel mills in Pittsburgh and Chicago. A short item is included on the huge Mississippi River Detour Lock nearing completion between St. Louis and Granite City, Ill.

(5702) VIBRATING CONVEYOR. Bulletin No. 135 by Robins Conveyor Division, Hewitt-Robins, Inc., 270 Passaic Ave., Passaic, N. J., illustrates and describes the new Vibra-Veyor manufactured by this company. One unique feature claimed for this unit is its ability to produce from lengths up to 200 feet, activated by a single vibrator. This equipment produces balanced mechanical operation without counterweight.

(5703) DIESEL MINE LOCOMOTIVE. A recent 8 page bulletin by the Ruth Co., Denver 2, Colo., illustrates and describes the use of the Onan Horizontal Opposed, two cylinder, air-cooled diesel engine in the Ruth Two-Ton Diesel Trammer. Anyone who has underground haulage problems should obtain a copy of this new bulletin which furnishes information on this equipment as well as operating costs.

(5704) YOUR ENGINEERING NOTEBOOK. "Deco Trefoil," July-August 1950, by Denver Equipment Co., 1400-17th St., Denver 17, Colo., contains 8 pages illustrating and describing the beneficiation of barite in the plant of the Arizona Barite Company. This article contains operating and metallurigical data as well as flow sheet. In addition are included in this issue, flow sheet study of crushing plants. One page is devoted to laboratory notes illustrating the use of wet reagent feeders.

(5705) TARIFF INFORMATION, "Topics," July-August, 1950, by American Tariff League, 19 West 44th St., N. Y. C., contains 4 pages of pertinent facts relating to United States trade pacts and other information. A chart of United States exports and imports is also included.

(5706) ALUMINUM PIPE. Form No. AD-197 by Aluminum Company of America, Pittsburgh 19, Pa., contains 12 pages of information pertaining to Aluminum Pipe and fittings showing where they can be used to advantage. Information furnished is for installation. Tables of dimensions, weights and other data are included as well as engineering data relating to use of Aluminum Piping.

(5707) "POPULAR HOME," Summer 1950, by United States Gypsum Co., 300 W. Adams Ave., Chicago, Ill., contains 16 pages illustrating and describing the decoration of homes and color schemes to be used. Also in this issue, an article shows how to build for books and storage.

(5708) CRUSHER. Bulletin 07B 6006 E by Allis-Chalmers Co., Milwaukee 1, Wisconsin, contains 8 pages illustrating and describing Type R Reduction Crusher. Important features of construction and advantages offered for operation in the production of uniformity, high capacity and operating flexibility are discussed. Tables of capacity and dimensions showing weights and hose power consumption are included.

(5709) FILTERS. Catalog No. 150 by Sun Engineering Co., Oklahoma City, Okla., contains 20 pages illustrating and describing lubrication and Sun filters. The operations and advantages of this equipment are brought out. Specifications are included as well as table of dimensions.

(5710) HARDINGE PRODUCTS. A recent bulletin by Hardinge Co., York, Pa., contains a very convenient and useful industrial map of the city of New York with a listing and location of important companies. Included in this bulletin will be found a short description of Hardinge products together with a map showing their location and sales outlets.

(5711) "THE BEACON," July 1950, by Ohio Oil Co., Findlay, Ohio, contains 36 pages largely devoted to personnel activities of this company, including service awards. A description of the Billings Gas Co. Operations Service is also included in this issue.

(5712) DIAPHRAGM PUMPS. Bulletin P8-B7 by Denver Equipment Co., 1400-17th St., Denver, Colo., contains 8 pages illustrating and describing the construction and use of the Denver diaphragm pump and its many advantageous features. Outline drawings giving general dimensions and also tables giving operating data are included.

(5713) DIESEL TRACTOR. Form No. 12676 by Caterpillar Tractor Co., Peoria 8, Ill., contains 29 pages illustrating and describing Caterpillar D8 Diesel Tractor showing its construction, operating advantages and use in connection with various industrial operations. Description of special attachments and specifications are included. Photographs show actual performance.

(5714) "PROGRESS NEWS," August 1950, by Gates Rubber Co., 999 South Broadway, Denver, Colo., contains 24 pages including items on the operation of the company and also personnel activities among employees.

(Continued on page 42)

MINES MAGAZINE
734 Cooper Building
Denver, Colorado

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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, Colorado School of Mines Alumni Association, was held in the Alumni office on Monday, August 21, 1950.

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

Roll Call

Members present. James Colasanti, President; Robert Evans, Secretary; Malcom E. Collier, Treasurer; Robert McGlone. Committee chairmen: Addison Manning, Harry McMichael, Lynn W. Storm. Executive Manager, Frank C. Bowman.

Members absent: George Setter, Vice President; Harvey Mathews, Carl Dismant. Committee chairmen: Roger Schade, Charles Parker, Edwin White, Harry McNeill, Herbert Heckt, John Winchell.

Minutes of the previous meeting, July 17, 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. Collier reported that financially the picture is about the same as the same period last year. The Association showed an operating loss in July 1950, however for the first seven months of 1950 it shows a net profit.

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

Alumni Endowment Committee

Mr. Bowman reported for Mr. Schade. The Alumni Endowment fund showed receipts during July 1950 of $93.10, leaving a balance of $2398.73.

The Placement Service showed receipts of $199.50 during July 1950 and disbursements of $330.06, leaving a balance of $999.67.

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

Athletic Committee

Mr. Manning reported that some payments are coming in on notes to the Loan Fund.

As of July 31, 1950, the savings account showed a balance of $4784.17; the checking account $929.15; and $493.00 remained outstanding on loans.

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

Capability Exchange Committee

Mr. McMichael reported that during July 1950 there were 18 calls for men; 23 recommendations made; 5 placements reported; 1147 letters mailed; 459 men were on the active list; and 98 calls remained unfilled.

A sample bulletin listing the jobs and men available has been mailed to men on the active list, with some interest shown and some checks coming in. Letters will be sent to prospective employers next. Considerable interest has been shown by employers and the general opinion is that this is a step in the right direction.

The Placement Service is to be complimented on the excellent work they are doing. This is a very good committee.

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

Budget and Finance Committee

No report.

Instruction Committee

No report.

Legislation Committee

No report.

Membership Committee

Mr. Bowman reported for Mr. Setter. During July 1950 there was a gain of 62 members in good standing, a poor month. 58 of this number are alumni and 4 Associate members. The total of 2116 is over 60% of the possible membership.

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

Nominations Committee

Mr. Bowman said that the ballots have been printed and should be mailed by September 1, 1950.

Public Relations Committee

Mr. Bowman announced that the Salt Lake City chapter will have a breakfast for *Mines Men* during the American Mining Congress convention. The breakfast will be held at the Elks Club.

Publication Committee

Mr. Bowman reported for Mr. Heckt. For the 58 1/3% budget period, 51.5% of the budgeted income has been earned and 47.1% of the alloted expenditures has been spent.

The July issue was mailed 10 days behind schedule; the August magazine was mailed on schedule. The September issue should be off the press on time.

For the Special Petroleum issue in October, 22 articles have been promised. If this number comes out on time, the Directory will be published right after Christmas during the slack season.

(Continued on page 35)

"MINES TODAY"

Dr. Paul F. Bartunek,

instructor of graduate and undergraduate physics at Lehigh university, Bethlehem, Pa., joined *Mines* faculty this month at the opening of the fall term.

He will hold the rank of associate professor in the school's enlarged physics department, President John W. Vanderwilt said in announcing the appointment. This fall, for the first time in its history, *Mines* is offering graduate courses in physics. Head of the department is Dr. V. Allan Long.

Bartunek's teaching experience extends over a number of years at prominent institutions including the Rensselaer Polytechnic Institute at Troy, New York.

Married and a native of Nebraska, he received his doctor's degree from the University of Michigan and for two and one-half years during World War II was employed by the U. S. Bureau of Standards. He is the author of a number of technical publications and a member of the Lehigh university Inquisitors' club.

In addition to helping develop graduate offerings in physics, Dr. Bartunek will serve as instructor for a portion of the 250 students who each year take general physics at the Colorado School of Mines.

A Thousand Students

were expected on *Mines* campus by the close of registration the 12th of this month. William V. Burger, registrar and director of admissions, said the Korean war is believed to account for a drop in enrollment. A number of *Mines* army and navy reservists have been called to active duty and several young men have notified the school they are reporting for service with the armed forces and will not carry out enrollment plans.

Enrollment last year was 1134 for the fall term and 1060 for the second semester, Burger stated.

Of those on campus this coming year, approximately a third will be veterans of World War II. The foreign student population is expected to total 90 compared with 105 last fall. Dollar troubles of South American countries has resulted in a fewer number from there enrolling at *Mines*.

This year, for the first full school period, students will be invited to seek an option in geophysics—a branch of study formerly contained in the geology department.

Enrollment the past summer was as follows: 622 attending two separate six-weeks class sessions; 462, nine-weeks term. A total of 137 studied geology in a practical field camp at Wildhorse park near Pueblo, while 38 were at Rangely and 101 were at Idaho Springs, the two remaining field camps.

Ten foreign students studied intensive English courses and did graduate thesis work.

Three Freshmen

and two transferred students are enrolled at *Mines* this semester as recipients of Alumni scholarships.

They were selected by recommendation of alumni and by being in the upper half of their graduating class.

They are: Ted Bergstrom, Chicago, Ills.; Burley Scales, Boonville, Ind.; Jack Fowler, Bartlesville, Okla.; Kent Miller, Midland, Texas; and John A. Masek, Casper, Wyoming.

ALUMNI BUSINESS

(Continued from page 34)

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

Research and Investigation Committee

Mr. Storm reported that the classes of '00, '10, '20, '30 and '40 have been classified as to present jobs. An analysis of this information must be made. A report should be made before the end of the year, covering the results of this investigation.

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

General Report

Everything has been covered by previous reports.

Special Business

An application for a local chapter of the Colorado School of Mines Alumni Association was presented from a group of alumni in Midland, Texas. The application was in proper form and all those signing are in good standing. The chapter is to be known as the Permian Basin Section.

Mr. Evans moved the application be accepted and a charter granted; seconded by Mr. Collier; passed.

Adjournment

The meeting adjourned at 8:40 P. M.

PERSONAL NOTES

(Continued from page 16)

William H. Fraser, Jr., '49, has moved his residence in Bakersfield, Calif., to 132-B Godey Road, Apt. 1. He is Petroleum Engineer for the Superior Oil Company.

Arnold C. Frederick, '43, called at the Alumni office the latter part of July while on vacation from his duties as Engineer for Pan American Southern Corporation at Eldorado, Arkansas.

Martin S. French, '50, is with Shell Oil Company as Junior Exploitation Engineer Trainee. His mailing address is Route 1, Box 318, New Iberia, Louisiana.

William H. Friedhoff, '07, who has been ranching at Yerington, Nevada, since his retirement six years ago, has sold the ranch and moved to 455 Arroyo Street, Reno, Nevada.

David H. Gieskieng, '41, has a new residence address, 78 Jackson Street, Denver 6. He is Sales Representative for Allis-Chalmers Manufacturing Company.

T. E. Giggey, '34, Vice President of The Pryer-Giggey Company of Whittier, California, resides at 734 East Beverly Blvd., Whittier.

Joseph R. Gilbert, '42, moved his residence recently to 1764 Drexel, N. W., Warren, Ohio. He is Metallurgical Engineer for American Welding and Manufacturing Co.

Thomas A. Hoy, '49, is Technical Service Representative, Explosives department, duPont Company, and resides at 2550 Birch Street, Denver 7.

Amado Jimenez, '38, is Sales Superintendent for Texaco Petroleum Company, with address Apartado 1739, San Jose, Costa Rica, C. A.

J. A. Kavenaugh, '38, Technical Advisor for Revere Copper and Brass, Inc., is addressed at his home, 17 Cabrillo Road, Arcadia, California.

Robert D. Kesler, '48, Research Engineer, Battelle Memorial Institute, was vacationing in Denver last month. His mail-

(Continued on page 40)

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. I, 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 I.

HOUSTON

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

KANSAS

All activities suspended.

MANILA

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

MONTANA

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

NEW YORK

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

NORTH CENTRAL TEXAS

E. J. Brook, '23, President; J. W. Peters, '38, Vice President; H. D. Thornton, '40, 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.

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.

PERMIAN BASIN

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

On August 4, 1950, the following *Mines Men* in Midland, Texas, met together and signed a petition to the parent organization of *Mines Alumni Association* for a charter to be granted to a section at Midland, Texas, under the name of the Permian Basin section. It is our intention to conduct meetings and function as a unit of the Association and in accordance with its Constitution and By-Laws:

Norman E. Maxwell, '17; Perry A. Gill, '36; M. S. Patton, Jr., '40; W. T. Schneider, '36; Milward Miller, '26; C. Newton Page, '42; R. W. Snyder, '37; Thomas H. Cole, '43; Glenn J. Poulter, '50; Herbert Waterman, '50.

In the election of officers, Norman E. Maxwell was chosen as President; Perry A. Gill, Vice President; and M. S. Patton, Jr., Secretary.

Preceding the above meeting a very enjoyable evening was spent with a picnic on July 24, with the following in attendance:

Dr. and Mrs. W. A. Waldschmidt, Former Faculty; Messrs. and Mesdames T. H. Cole, '43; W. T. Schneider, '36; L. H. Johnson, '37; C. N. Page, '42; C. W. Payne, '38; L. S. Melzer, '39; Milward Miller, '26; Perry A. Gill, '36; M. S. Patton, Jr., '40; R. W. Snyder, '37; H. M. Goodman, '39; E. J. Johnson, '49; Sam Geffen, Ex-'42; E. C. Philby, '49; Norman E. Maxwell, '17; Norman E. Maxwell, Jr., '41, (Waterproof, La.); and S. B. Shaeffer, '41.

SOUTHERN CALIFORNIA

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

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

On Saturday, July 29, members of the Southern California Alumni Section gathered at Union Oil Company's LaBrea picnic grounds for their annual stag beer party and get-together.

Those who wanted exercise played softball and horseshoes. One casualty was suffered by Stan Jackson during the ball game who, while catching a fast ball, lacerated a finger.

Bill Kilgore, Ex-'10, donated the beer served at this meeting and his contribution was surely appreciated by the group.

Joe Hatheway, '41, outdid himself in buying and arranging a dinner of turkey and ham with all the trimmings, a feed which was thoroughly enjoyed by the *Miners*.

Members present were:

Art Heiser, '43; Frank Crane, '43; Charles Cerf, '41; E. M. Howell, '30; Walt Tulch; R. M. Fullaway, '16; C. E. Calvert, '12; Ben Wells, '04; Kent Fullaway; J. L. Soske, '29; C. B. Neiswender, '12; M. H. Salsbury, '26; John Biegel, '29; Tom Bancroft; F. S. Jacobson, '33; Steve Bradford, '39; E. S. Larson, '23; Bill Dugan, Ex-'12; Bill Beggs, '37; Bob Hartman, '42; Norman Whitmore, '26; Sid French, '08; George Middleton, '31; Bob Obrecht, '34; Lawrence Wolfely; Bert Rehtmeyer, '42; Bob Shanley, '42; R. S. Powell, '21; Bob Riegel, '34; Norman Nichols, '40; Bob Brummett, '25; Stan Jackson, '36; Art Brown, '21; and W. C. Prigge, '42.

Guests were: Ed Riegel, father of Bob Riegel, and Jack Peet, son of V. C. Peet. Norman Whitmore introduced two guests from Alaska, Mr. Warren Stewart and son, Gregg Stewart. Mr. Stewart was the second man to stake claims on the famous Bonanza Creek in the gold rush of 1898.

ST. LOUIS

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

A thoroughly enjoyable spring meeting of the Colorado School of Mines Alumni Association, St. Louis section, was held the evening of May 6, 1950, at the home of Mr. and Mrs. F. M. Belleau, Webster Groves, Missouri.

Following an excellent pot luck dinner a short business meeting was held and the coming A.I.M.E. convention in St. Louis was discussed. It was decided that the local section would entertain their fellow *Miners* and friends with a good old fashioned beer bust with genuine Coor's beer, providing it could be arranged. J. E. Morrison and Harvey Pings were appointed to make arrangements.

An election was held and Colonel J. E. Morrison was elected chairman to succeed Jack O'Keefe and Geo. C. Bartholomees as Secretary-Treasurer to succeed F. M. Belleau.

The next meeting was set for July 15 for the annual picnic at Washington State Park.

Those present were:

Messrs. and Mesdames F. M. Belleau, '23; J. E. Morrison, '26; H. E. Kenworthy, '32; E. L. Bilheimer, '22; E. W. Markwardt; G. C. Bartholomees, '29; H. F. Pings, '43; M. E. Honke, '47; G. G. Grigsby, '14; J. E. O'Keefe, '37; R. A. Woolford, '28; H. A. A. Wolf, '32; H. A. Dumont, '29.

The third annual picnic of the C. S. M. Alumni Association, St. Louis section, was held at Washington State Park, July 15, 1950. While the attendance was not as large as usual, due to vacations and illness, it was very successful. There were moments, however, when there were doubts expressed as to whether the game was horseshoes or bowling. The championship remains usdecided.

At the brief business meeting, J. E. Morrison, chairman, reported on the findings of the entertainment committee for the coming A.I.M.E. convention in St. Louis. It was voted to go ahead and arrange for one evening at the Statler Hotel. Coor's beer will be served if possible.

It was decided to hold the October meeting on the 14th, at the home of Mr. and Mrs. George Bartholomees, 330 Church Street, Bonne Terre, Mo. It will be a pot luck dinner.

Those present were:

Messrs. and Mesdames F. M. Belleau, '23; J. E. Morrison, '26, and family; H. A. Dumont, '29; E. J. Haug, '32, and family; M. T. Honke, '47, and family; E. W. Markwardt and family; A. P. Meyer, Jr., '50, and family; H. A. A. Wolf, '32, and family; R. A. Woolford, '28; George Bartholomees, '29.

UTAH

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

The annual summer picnic of the Utah section, C. S. M. Alumni Association, was held in the garden of the C. C. Parson's residence in Salt Lake City on August 5, 1950.

Those attending were:

George H. Allen, '37; with wife and daughters, Betty and Pat; Mr. and Mrs. James Cassano, '31; B. C. Clark, '48; Mr. and Mrs. C. R. Cutler, '39; Mr. and Mrs. John Dismant, '39; H. W. Evans, 49; Mr. and Mrs. D. C. Frobes, 24; Mr. and Mrs. F. B. Hall; Mr. and Mrs. George S. Krueger, '07; K. H. Matheson, Jr., '48; Mr. and Mrs. W. J. McKenna, '21; Mr. and Mrs. P. A. Pelton, '35; Mr. and Mrs. N. Nordby, '49; Mr. and Mrs. H. B. Overstreet, '49; W. W. Sabin, '49; Mr. and Mrs. Blair Sackett, '09; Mr. and Mrs. M. J. Sayers, '29; Mr. and Mrs. H. J. Van der Veer, '30; Mr. and Mrs. N. F. Whetzel, '34; John Weeks, '49; Mr. and Mrs. Phil Simmons, '29; Mr. and Mrs. Dave Squibb, '34. Guests: Mr. and Mrs. G. E. Roberts, Mr. and Mrs. Carl Westerberg, Mr. and Mrs. William Krueger, Miss Barbara Brewster, and Lt. Col. and Mrs. Ebb.

WASHINGTON, D. C.

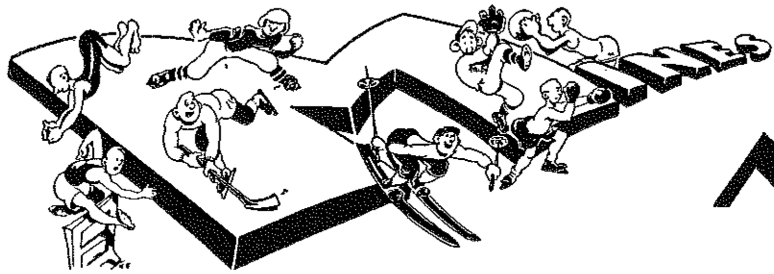
Marcus G. Geiger, '37, President; Frank E. Johnson, '22, Vice President; Leroy M. Otis, '14, Secretary-Treasurer, Muirkirk, Maryland.

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

AMERICAN MINING CONGRESS SALT LAKE CITY

(Continued from page 5)

Reed, Pasadena, Calif., 1937; James V. Thompson, Denver, Colo., 1940; Frank E. Briber, Denver, Colo., 1916; Armistead F. Carper, Bishop, Calif., 1914; Frank B. Harris, Los Angeles, Calif., 1941; Frank B. Harris, Salt Lake City, Utah, 1913; George A. Golson, Lisbon, Portugal, 1942; David H. Gieskieng, Denver, Colo., 1941; Henry S. Newhall, Pittsburgh, Pa., 1940; Melden E. Volin, Albany, Ore., 1933; William E. Ellwanger, Salt Lake City, Utah, 1943; J. C. Stipe, Baxter Springs, Kansas, 1940; Max W. Bowen, Colo. Springs, Colo., 1924; Kuno Doerr, Jr., East Helena Mont., 1927; Ruglas K. Burgess Portland, Ore., 1928; Howard J. Van der Veer, Salt Lake City, Utah, 1930; Donald Dyrenforth, Stamford, Conn., 1912; Harry L. McNeill, Denver, Colo., 1924; John H. East, Jr., Denver, Colo., 1910; Daniel Harrington, Arlington, Virginia, 1900; Philip J. McGuire, Oakland, Calif., 1915; Charles S. Beech, Denver, Colo., 1926; S. Power Warren, Washington, D. C., 1913; James Colasanti, Denver, Colo., 1935; George O. Argall, Jr., San Francisco, Calif., 1935; Theron E. Giggey, New York City, N. Y., 1934; Clyde E. Osborn, San Francisco, Calif., 1933; Donald R. Siljestrom, Butte, Mont., 1949; Kenneth W. Carlson, Dallas, Tex., 1942; Richard H. Shaw, Denver, Colo., 1942; Richard L. Scott, Denver, Colo., 1942; Cecil R. Walbridge, Denver, Colo., 1929; Marshall J. Sayers, Salt Lake City, Utah, 1929.



Sports March

By BILL ANDERSON

> **1950**
> **COLORADO MINES**
> **FOOTBALL SCHEDULE**
>
> Sept. 16 at Nebraska State Teachers — Night Game.
> Sept. 22—Idaho State at Golden — Night Game.
> Sept. 29 at Colorado State College — Night Game.
> Oct. 7—Colorado College at Golden.
> Oct. 14 at Western State.
> Oct. 20—University of Omaha at Golden — Night Game.
> Nov. 4—Colorado A. & M. at Golden.
> Nov. 11 at Adams State.
> Nov. 18—New Mexico A. & M. at Golden.

"It won't be long now," are the by words for Football enthusiasts throughout the land, and Head Coach Fritz Brennecke and staff are well aware of the time limitation. The Blasters will open against the Nebraska State Teachers at Chadron, Nebraska, on September 16. Fifty-seven candidates were "invited" to report for drills starting September 1. Twenty-one lettermen were expected to return from the 1949 Mines team that was runner-up to Colorado College in the final standings of the Rocky Mountain Conference. Four lettermen from the 1948 squad were again to be ready for duty in 1950. Last weeks' activities changed the lettermen outlook, as eight lettermen have indicated that they will not be available this Fall. Little help is expected from a Freshman Team that failed to win in 1949.

Tackle and center replacements are top priority items on Coach Brennecke's worry sheet. Two tackles were lost by graduation and two via the scholastic route. Both the offensive center, Glenn Poulter, and the defensive center, Pat Mercer, have graduated. Ends and guards are plentiful and should be adequate. The Backfield which was expected to shape up above average has been hurt considerably with the loss of Jack Earl, All Conference Halfback, and Roy Essary, a two-hundred pound blocking back, who were recently called to active duty with a Colorado National Guard unit. The fullback chores are in good hands with Dick Bench returning at this spot.

POSITION COMMENTS —

Ends—Leading the parade of ends is Claude Jenkins, All Conference selection as a Sophomore in 1949. Three other lettermen are also available for end duty this Fall. They include Bill Johnston, 190 pound undefeated heavyweight boxer, John Volosin, 176, and Herb Torpey, 175, from the 1948 team. Ed Turner, 177, a Junior College transfer from California will make a strong bid for a starting assignment. Bill Watts, 178, a squadman last year will also return. Up from the Freshman Squad are Ken Dunn, 175, Carl Krueger, 170, Guffie Menogan, 187, Arnold Siltanen, 176, and Tom Wyman, 175. Max Settlemyre will not return from the 1949 team.

Tackles—Bob Johnson, 195, and Paul Hamilton, 186, are returning letter winners at the Tackle position. Squadman Jim Ault, 190, will again be available. Dick Barnes, 200, a place kicking specialist will help. Up from the Freshman team are Bill Cooke, 186, and Joe Rebeck, 184. Loss of four lettermen and two others by the scholastic route make the tackle position the hardest hit.

Guards—The Guard position is almost as well staffed as the end spot with four lettermen returning; namely, Don Adams, 160, All Conference Guard as a Sophomore, Wally Arnold, 175, Dick Arnold's younger brother, John Miley, 185, and Bill Treader, 175. Bob Howard, 185, is the brightest prospect up from the Freshman Squad and will make a strong bid for a starting berth. Other Sophomroes are Andy Jurasin, 160, Roger Peck, 160. Jimmy Huff, 165, who made rapid progress toward the end of last season, will be in contention. Other Squadmen are Gerald Jefferies, 150, and Bob Peters, 175.

Centers—Adam Thomas, 165, is the only letter winner among the centers. Lloyd Best, 173, a Squadman last year and Bob Critchlow, 179, a Junior College transfer are in a three-way battle with Thomas for the starting assignment. Also returning are Joe Taylor, 180, squadman last year, and Sophomore Wayne Siltanen, 160.

Wingbacks—Dave Brown, 175, and Drexel Lee, 160, are letter returnees for wingback service. Carl Piercy, 175, a Junior College transfer, should see lots of action. Bob Einarson and Ed Gaulke, will help here.

Blockers—No lettermen will return at the blocking back spot. Jason Johnson, 185, a transfer and Wally McGregor, 165, a Squadman last year are the top candidates.

Fullbacks—Dick Bench, 180, a Second Team All Conference Selection for the past two seasons, leads as a top candidate for Fullback duties. Ed Ziolokowski, 182 pound letterman and a line backer deluxe, may see offensive duty this year. Chuck Young, 179, a letter winner in 1948 gives added strength to this position. Bob Mendonca, 190, is up from the Freshman Team and Squadman Bob Fitch, 160, will also return.

Tailbacks—Letter winners Bob Jacobson, 160, and Bob Pozzo, 155, are in a three way battle with Ray Govett, 155, with the starting tailback assignmnet. Howard Kaylor, 170, also a letter winner and Bill Morgan from the Freshman Squad are also making a bid for the starting assignment.

AMONG THE MISSING —

Jack Earl, All Conference Tailback last season; called to the Colorado National Guard.

Ron Bethurum, Wingback and Safety man who had a 97 yard punt return against Idaho State last year.

Darell Beckley, 205 pound defensive tackle.

Roy Essary, 200 pound blocking back called to the National Guard.

John Connors, 196 pound 1948 letter winner.

Max Settlemyre, starting defensive end in 1949.

Bob Garland, 200 pound guard, and Ed Hunter, a 202 pound tackle.

All of these men were letter winners.

Book Reviews

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

International Petroleum Register, 28th Edition

Mona Palmer, Publisher. 412 West Sixth St., Los Angeles, California. 1950. 8" x 11½". 606 pages. $15.00.

This Directory, published annually, contains the active oil companies of the world. The book is well arranged for quick reference giving the history, capital structure, personnel, location and capacity of refineries and manufacturing plants. It also gives the production, capacity and location of marketing facilities and areas of distribution. Wholesale distributors in the United States are given by states. Drilling contractors are also listed by states. One section is devoted to foreign companies.

The book is well arranged and completely indexed for time-saving reference.

California Journal of Mines and Geology

Vol. 46, No. 2, April 1950. By Department of Natural Resources, Division of Mines, Ferry Building, San Francisco, Calif. 285 pages with 14 maps in a folder.

This issue contains "Geology and Oil Prospects of Western San Jose Hills, Los Angeles County, California," by Franklin H. Olmsted, which gives the reader an idea of the stratigraphy, structure, and oil prospects of the Miocene and Pliocene sediments which rise above the Quaternary alluvium of the San Gabriel River Valley. Dr. K. O. Emery's paper on "Ironstone Concretions and Beach Ridges of San Diego County, California," is an interesting account of the spherical concretions found on the Linda Vista terrace in San Diego County. A description is given of these concretions, their geological environment and distribution, and their possible economic value.

"Geology of the Red Mountain Magnesite District, Santa Clara and Stanislaus Counties, California," by Alfred J. Bodenlos, is a discussion of the geology and mineral deposits of the Red Mountain area. It includes sections on sedimentary rocks, mineralogy, paragenesis, reserves, and descriptions of several of the mines. The mineral deposits and the methods used to mine them, as well as a description of the topography and geology of Alameda County is described in "Mines and Mineral Resources of Alameda County, California," by Fenelon F. Davis. The paper also includes a tabulated list of the principal mines and mineral deposits.

Also included in this issue of the Journal as a supplement is a reprint of "Manner of Locating and Holding Mineral Claims in California," by A. H. Ricketts, revised by C. A. Logan and Charles V. Averill.

Manganese Deposits of California (Bulletin 152)

By Dr. Parker D. Trask, and other well-known geologists. Division of Mines, Ferry Bldg., San Francisco, Calif. 1950. 378 pages, 6 x 9. Cloth bound. Illustrated. 20 Geological maps in folder. $2.75.

This book contains detailed descriptions of many manganese deposits omitted from previous publications. It is really a supplement to Bulletin 125. This bulletin, together with Bulletin 125 contains a detailed record of all the state's known resources of manganese.

Bulletin 152 reports the results of a cooperative undertaking by the U. S. Geological Survey and California State Division of Mines. This book should be of inestimable value to those interested in manganese mining and in the search for new deposits.

Included is a very complete index covering 30 pages.

Silver Town

By John W. Horner, Native of Colorado. Caxton Printers, Ltd., Caldwell, Idaho. 1950. 318 pages illustrated. $4.50.

Silver Town is a historical sketch covering the Georgetown-Idaho Springs, Central City mining and social activities from 1867 through 1880.

The author covers the early activities in these camps touching mostly upon social life, and a great deal of the personal characteristics of the leaders during this time are brought out in such a way that one gets a good idea of life in these early day mining camps.

The book is not only amusing and interesting but contains a great deal of material of historical value. For those who are interested in building up information covering early western life, this will be a valuable addition to their library. Others will receive a great deal of enjoyment from the various humorous sketches included throughout the volume. Included on the cover page is a sketch showing early day mining roads and trails in the area covered.

Minerals Yearbook 1948

Prepared under the direction of E. W. Pehrson, Chief, Economics and Statistics Division and edited by Allan F. Matthews. Published by the Bureau of Mines, James Boyd, Director. For Sale by Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. 1652 pages. $4.25 (Buckram).

Minerals Yearbook, authoritative publication on the production, distribution and consumption of mineral commodities, presents in detail basic data of the mineral industry, including metals, non-metals, fuels and petroleum, including statistics covering raw materials and finished products.

The book is divided into three parts. Part One covers a review of the mineral industries for the year 1948. Part Two, which is the major part of the book, covers a review on commodities and Part Three covers a review on the production by states.

One of the most important parts of the book is a 23-page index by Mabel E. Winslow.

Accident Prevention

The Prevention of Accidents Committee of the Transvaal Chamber of Mines, Johannesburg, South Africa, has published two reports in 1950.

"Report on Electric Blasting in Sinking Shafts" lists the advantages of electric blasting and the equipment used. A sketch shows the electric blasting control circuit. A sketch also shows the methods of minimizing the risk of electric shocks produced by lightning storms in the vicinity of hoisting shafts.

"Report on Truck and Tramway Accidents on the Gold Mines of the Witwatersrand and Extensions" contains charts covering statistics on accidents as well as tabulation over a period of 20 years. Safety devices and precautions are discussed and illustrated, covering underground transport.

Handbook of Liquid Metals Research

Dr. R. N. Lyon, Oak Ridge National Laboratory, Editor-in-Chief. Published by joint AEC - Navy Committee, Dr. Allen T. Waterman, Chief Scientist, Office Naval Research, Chairman. Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 194 pages. $1.25.

Information is compiled in the *Handbook* on metals having low melting points so that they become liquid at room temperature or within a few hundred degrees of room temperature.

Since their boiling points are considerably higher than that of water, liquid metals can be used at higher temperatures without a pressurized system. For this reason liquid metals have an advantage over water as heat transfer agents.

The metals discussed in the *Handbook* include the following: aluminum, antimony, bismuth, cadmium, cesium, gallium, indium, lead, lithium, magnesium, mercury, potassium, rubidium, sodium, thallium, tin, zinc and several alloys.

The subject matter covered by the *Liquid Metals Handbook* is shown by the list of chapter titles, authors and research agencies listed below:

I. Physical Properties of Some Liquid Metals, by R. R. Miller, Naval Research Laboratory, Washington, D. C.
II. Chemical Properties and Laboratory Techniques, by C. B. Jackson, Mine Safety Appliance Co., Pittsburgh, Pa.
III. Resistance of Materials to Attack by Liquid Metals, by L. R. Kelman, Argonne National Laboratory, Chicago, Ill.
IV. Availability, by I. R. Kramer, Office of Naval Research, with the assistance of the U. S. Bureau of Mines.
V. Heat Transfer, by R. N. Lyon, Oak Ridge National Laboratory, Oak Ridge, Tenn.
VI. Large Scale Handling, by K. D. McMahan, Knolls Atomic Power Laboratory, Schenectady, N. Y.
VII. Industrial Utilization, by D. L. Katz, Department of Metallurgy and Chemical Engineering, University of Michigan, Ann Arbor, Michigan.

Geology of the Macdoel Quadrangle California (Bulletin 151)

By Dr. Howel Williams, Professor of Geology, University of California. Division of Mines, Ferry Bldg., San Francisco, Calif. November 1949. 78 pages. Illustrated. 4 geological, topographical maps. Cloth bound. $1.75.

(Continued on page 40)

BOOK REVIEWS

(Continued from page 39)

This book contains information concerning the geology and mineral deposits of North Central California adjacent to the Oregon border, the area designated as the Macdoel Quadrangle. This report includes part of Shasta and Butte Valleys and the Cascade Range as well as a portion of the Klamath River Valley. It covers both the areal and structural geology as well as mineral deposits.

Included in this publication is "Circular Soil Structures in Northeastern California" by Peter K. Masson, Geologist, Humble Oil Co. This article contains the origin of a number of interesting rock and soil structures.

FLOTATION & CYANIDATION

(Continued from page 28)

gold was extracted with consumption of 33 pounds of cyanide and 17.6 pounds of lime per ton of ore. Another test was made on tailings from selective flotation of copper, in which the pulp was agitated for 72 hours, resulting in extraction of additional gold and silver to make totals in both flotation concentrates and cyanide solution of 95.3 percent of the gold and 80.1 percent of the silver. Cyanide consumption was 5.4 pounds per ton of original ore, and 18.3 pounds of lime were used in addition to the amount used in flotation. The cyanide residue contained 0.02 ounce gold and 0.26 ounce silver per ton. The flotation tailings used in this latter test were not from the selective flotation test described in (2) but from a similar test in which concentrates carrying only 9.88 percent copper were made with higher recovery of copper and about the same recovery of gold. The flotation tailings used in this test contained only 0.11 percent copper, as against 0.27 percent copper in the tailings when flotation concentrates carrying 17.00 percent copper were made.

(To Be Continued)

PERSONAL NOTES

(Continued from page 35)

ing address is 505 King Avenue, Columbus, Ohio.

Louis L. Landers, '50, is in the employ of the Federated Metals Division of the American Smelting & Refining Company in Whiting, Indiana. His residence address where he receives mail is 6806 Magoun Avenue, Hammond, Indiana.

C. E. Lundin, '49, has a change of residence address to 5043 Drexel Boulevard, Chicago 15, Illinois. He is serving as Assistant Metallurgist for Armour Research Foundation.

M. M. MacFarquhar, '48, has a change of address to Apt. BB2, 1510 No. Broad Street, Hillside, N. J. He is employed by the Esso Standard Oil Company at Bayway, N. J.

R. S. Mahannah, '47, Seismologist Party Chief, Shell Oil Company, is now receiving mail through P. O. Box 807, Dodge City, Kansas.

Robert L. Marsh, '50, is settled in his work in the Geological department of Gulf Oil Company in Houston. However, since the arrival of Mrs. Marsh and their two daughters, he has been experiencing anxiety in regard to the children. Kaaren, five years old, was stricken with polio and is in a Houston hospital; Nancy was bitten by a dog and six stitches were required to be taken in her face. The family home in 7262 Patricia Lane, Houston, Texas.

Burt C. Mariacher, '41, Application Engineer for Allis-Chalmers Manufacturing Company, has moved his residence from West Allis to 7806 West North Avenue, Wautatosa 13, Wisconsin.

Richard G. Martin, '50, is Trainee Computer for Petroleum Consultants, Inc., in whose care he is addressed, Box 312, Thermopolis, Wyoming.

Jack L. Mataya, '41, is being addressed 117 Mt. Vernon, Big Spring, Texas, where he is at present located as Field Seismograph Superintendent for Stanolind Oil & Gas Company.

George N. Meade, '41, has a change of address from Casper, Wyoming to Box 496, Roswell, New Mexico. He is Field Seismograph Supervisor, Stanolind Oil & Gas Company.

Norman S. Morrisey, '42, called at the Alumni office recently when in Denver for a few days. He is doing Geological Research work for Stanolind Oil & Gas Company, with residence address 1530 E. 14th Street, Tulsa, Okla.

A. C. Most, Jr., '38, was vacationing in Denver last month from his duties as Sales Engineer for The Traylor Engineering & Manufacturing Co., Crushing and Mining department. He receives mail at his home, 91-7th Street, Fullerton, Penna.

James M. Murphy, Jr., '50, is employed as Technical Trainee for Phillips Petroleum Company and is addressed Box 246, Big Spring, Texas.

H. B. Parfet, Jr., '49, has accepted a position as Junior Engineer with the Potash Company of America. His new address is Box 31, Carlsbad, New Mexico.

Ben H. Parker, Jr., '49, Junior Geologist, Union Oil Company of California, is, at present, in the Denver office of the company and is receiving mail through Box 508, Golden, Colorado.

Raymond W. Parker, '49, Petroleum Engineer for Ohio Oil Company, has a change of address from McFadden to Cody, Wyoming, Box 530.

Franklin H. Persse, '48, Sales-Service Engineer for Hercules Powder Company, has been transferred from their home office at Wilmington, Delaware, to Salt Lake City, Utah, with address in their care, 136 So. Main Street.

Harvey F. Pings, Jr., '43, of 18 Greenridge Heights, Route 5, East St. Louis, Ills., was on vacation in Denver recently. He is Production Engineer for Aluminum Ore Company at East St. Louis.

J. Ross Reed, '37, has been advanced by the National Electric Coil Company of Columbus, Ohio, to Division Manager. His office address is 1751 New York Drive, Altadena, California.

Robert G. Riegel, '34, resigned his position with Republic Steel Corporation at Youngstown, Ohio, to accept one as Superintendent, Electric Weld Pipe Mill, Kaiser Steel Corporation, Upland, California.

Major Donald W. Roberts, '41, has moved his residence from Hyattsville, Maryland, to 401 Cedar Lane, Falls Church, Va. He is with the Munitions Board Petroleum Committee in Washington.

WEDDINGS

Hasbrouck - Jones

Wilfred P. Hasbrouck and Miss Barbara Jones, daughter of Mr. and Mrs. Leroy W. Jones of Denver, were married July 9 at the Sixth Avenue Community church, Denver. A reception followed at Alpha Chi Omega sorority house at the University of Denver, from which college the bride was graduated.

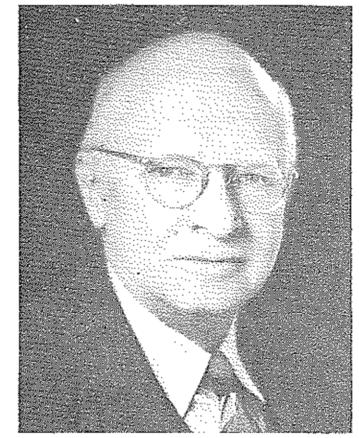
Mr. Hasbrouck received his degree from *Mines* in May, after which he assumed duties as junior geophysicist for Stanolind Oil & Gas Company. At present his address is General Delivery, Ardmore, Oklahoma.

(Continued on page 42)

IN MEMORIAM

Walter E. Burlingame

for many years a prominent assayer, chemist and consulting mining engineer of Denver, died the evening of August 10. He had been in failing health for the past year.



WALTER E. BURLINGAME

He was a native of Denver and spent his entire life in Colorado. Upon his graduation from *Mines* in 1901 he became associated with his father, E. E. Burlingame, Assayer and Chemist of Denver, and, after his father's death he continued the business until 1923 when, desiring field and practical mining and milling experience, he accepted position of superintendent for the New Life Mining & Milling Corporation at Rollinsville, Colorado, later serving as general manager. He returned to Denver in 1933 and again took up the laboratory work, also doing consulting engineering.

Mr. Burlingame was twice married, his first wife being Miss Margaret Freeman of Memphis, Tenn., who died in 1942. Two years later he married Mrs. Sadie Cross who survives him. He is also survived by a daughter, Mrs. Jean Wunderlich of Los Angeles, California, who, with her husband and children, is now in Germany; two grand children, Walter E. and Margaret Wunderlich; and a sister, Mrs. Robert G. Morrison of Denver.

Edmond C. van Diest

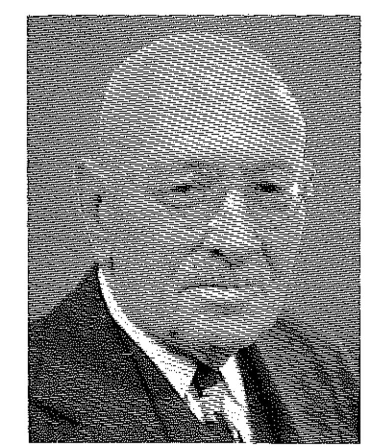
passed away at his home in Colorado Springs on August 1, lacking twelve days of being eighty-six years of age. He had been in failing health for some time.

Mr. van Diest was born in Buitenzorg, Java, Dutch East Indies, but brought to the United States by his parents in 1871. He received his elementary education by a private tutor and in high school in Denver. He was graduated from *Mines* in 1886, the only full-course graduate that year and the third full-course graduate of the school.

Going to Colorado Springs in 1904 as consulting engineer for General William Palmer, the city's founder, he made that his permanent home.

After the death of Winfield Scott Stratton, early day mining man, Mr. van Diest was named consulting engineer for the Stratton estate and the Eureka Exploration company; he also engaged in general engineering practice. He founded the Associated Engineers company, the General Construction company and the Intermountain Railway, Light and Power company. The latter developed into the Western Public Service company, Mr. van Diest continuing as its president until 1925 when he disposed of all of his utility interests.

Among his other business activities he was president of the Plomo Mining company; the Rito Seco Gold Mines company; Metals Exploration company; Utah Ice and Storage Company of Salt Lake City; Mountain Ice and Coal Co. of Pueblo; Buena Vista Power company, Buena Vista; Hygiene Service Co., Boulder; Fairbury Service Co., Fairbury, Neb.; Doyle Ice and Storage Co., Salida, Colo.; Mountain Service corporation, Butte, Mont.; and Wasatch Service Co., Salt Lake City.



EDMOND C. van DIEST

He had served as director and vice president of the United States Chamber of Commerce, member of the advisory council of the United States department of Commerce, governor of the Rocky Mountain district of Kiwanis International, director of Kiwanis International and president of the Intermountain economic conference, held in March 1945.

As a trustee of Colorado college for 24 years, Mr. van Diest was developer of the athletic field, and for his interest in and development of Peterson flying field, he was named an admiral in the flagship fleet by the American Air Lines two weeks before his death. He had also served on the Board of Trustees at *Mines*. He was awarded the distinguished achievement medal by the school at commencement exercises last year.

He was a member of the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, Alpha Kappa Psi fraternity, the Elks lodge, the El Paso Club of Colorado Springs, the Denver Athletic club, and Grace Episcopal church of Colorado Springs.

Mr. van Diest was married in May 1890 to Miss Anna Louise Meyer of New Mexico who survives him. Also surviving are three daughters, Alice of Colorado Springs; Mrs. Ralph Weldie of Houston, Texas; and Mrs. David M. Skillin, Jr., St. Louis, Mo.; three grandchildren and one great grandchild.

Kent P. Campbell

of the class of 1910, passed away in El Paso, Texas, last December 7, following a few days illness. He was to have retired from his work with the American Smelting & Refining Company on January 1, this year, and planned on returning to Boulder, Colorado, which had been his home since he was a young boy.

Several months after his graduation from *Mines*, Mr. Campbell became associated with the American Smelting & Refining Company and his services were continuous up to the time of his death. His first employment was as draftsman at one of the mining units in Mexico. Later on, he transferred his activities to the smelting department as assistant assayer. From the laboratory he went out in the plant and occupied various positions. He served as manager of the three smelting plants, his last position being manager at the Chihuahua, Mexico, plant.

Mr. Campbell was a very efficient and loyal member of the company's staff and he made a host of friends during his long career with the company. He had the happy faculty of being able to get along with the Mexican workmen and they, as well as the other employees, grieved his passing.

Born in Carson, Iowa, Mr. Campbell was brought to Colorado by his parents in 1904, where his father died eight years later. His mother, Mrs. Scott Campbell of 700 Arapahoe Street, Boulder, survives, as do two brothers, Loyd A. of Glenview, Illinois, and Claude M. of Cheyenne, Wyoming. He never married.

A. E. C. PROGRESS NEWS URANIUM POLICIES

(Continued from page 27)

Price Assured to March 31, 1958. The Commission has approved the price policy I have just outlined. It will remain in effect until March 31, 1958, subject only to changes or modifications which will not be less favorable to the producers. This means an assured market for uranium ore at minimum prices for approximately eight years. Circular No. 5, which applies to carnotite ores of the Colorado Plateau, now effective until June 30, 1954, also will be extended to March 31, 1958.

Let me say in closing that the expanded national defense program carries increased requirements for uranium. Thus far we have been able to meet requirements for all existing operations and new programs. Given ample notice, and the necessary men and materials, almost any requirement can be met—at a price. In this country there are vast deposits of shales containing small amounts of uranium which could be recovered if cost was no object. Cost, however, has been a factor, and cost in terms of manpower, materials, and time, always will be a factor. We must get what we need but the price we—the taxpayers—pay should not be in excess of what is necessary to fulfill our needs.

ATOMIC ENERGY REPORTS AVAILABLE

Depositories for complete sets of reports Atomic Energy Commission.

Colorado School of Mines library, Golden, Colorado, and other libraries listed. Mines Magazine, August 1950, page 25.

CARIBOU MINE, BOULDER COUNTY, COLO. TO BE EXPLORED FOR URANIUM

The Atomic Energy Commission has signed a $17,000 contract with Consolidated Caribou Silver Mines, Inc. of Beverly Hills, Calif., for a limited amount of underground exploration work in the company's Caribou Mine in the Colorado Front Range near Nederland, Colorado. Underground exploration under the contract is to be completed by November 30.

The AEC contracted for the work primarily to assure itself of obtaining data of geologic value for use in studying the Front Range, which has long shown evidences of uranium mineralization, and also to gain more conclusive information on the potentialities of the Caribou Mine itself. After having spent substantial sums in exploration work in the mine since uranium was discovered there in 1948, the company had notified the Commission that it was about to suspend its own operations on uranium.

The AEC, assisted by the U. S. Geological Survey, has been studying the Front Range area through spot examinations and other means for several years. The current accessibility of the Caribou Mine offers an opportunity to observe and map uranium-bearing veins and thus to gain information useful in determining whether additional intensive studies of the Front Range should be undertaken. The Caribou Mine is the deepest exposure in the district and is the only mine in which there is a considerable section of uranium-bearing vein material exposed.

CATALOG REVIEWS

(Continued from page 33)

(5715) AIRSLUSHERS. Bulletin AS-3 by Gardner-Denver Co., Quincy, Ill., contains 20 pages illustrating and describing the construction and use of Gardner-Denver new HEE Airslushers. Included in this bulletin are notes and illustrations showing the outstanding design advantages included in this equipment. Also specifications and tables of general dimensions are included. Diagrams show typical airslusher hookups.

(5716) "MECHANICAL TOPICS," Vol. 12, No. 3, by International Nickel Co., 67 Wall St., N. Y. 5, N. Y., contains 12 pages of short illustrated articles showing many uses for nickel and nickel alloys.

(5717) FAST PULSE AMPLIFIER by Hewlett-Packard Co., 395 Page Mill Road, Palo Alto, Calif. Included in their journal, July 1950, is 4 pages illustrating and describing the new 125-volt Fast Pulse Amplifier capable of amplifying pulses as short as 0.01 microsecond.

(5718) "S-A CONVEYOR." Vol. 194 by Stephens-Adamson Co., Aurora, Ill., contains 20 pages illustrating and describing many applications of the use of conveyors in connection with various industrial operations. In this issue is shown the operation of the new conveyor layout of the Granite Rock Co., Logan, Calif.

(5719) CONSTRUCTION NEWS. "Mountain Constructor," R. G. (Bob) Stebbins, General Mgr., published at 1138 Welton St., Denver, Colo., contains 36 pages covering construction news items throughout the Rocky Mountain Region. Included in this issue is an article on Pole Hill Tunnel and another on Tucson's million dollar disposal plant.

(5720) CRUSHER. Bulletin 07B7145A by Allis Chalmers Co., Milwaukee, Wisc., illustrates and describes the type R Hydrocone Crusher which has a wide range of sizes for fine crushing as well as large capacity. Included in this bulletin is a general drawing of crusher installation and dimensions, also table of capacity for various sized crushers and horse power consumption.

(5721) SAND PLANTS. Bulletin No. 7291 by The Dorr Co., Barry Place, Stamford, Conn., illustrates and describes the scope of the Dorr Company service in connection with sand plants and also typical sand preparation flow sheets.

(5722) "INDUSTRIAL NEWS," July 1950, by Gates Rubber Co., 999 So. Broadway, Denver, Colo., contains 4 pages illustrating and describing new uses for Gates Vulco-Ropes. Included in this issue is shown the conversion of a large compressor to motor drive at the Hegeler Zinc Co., Danville, Ill.

(5723) "SOUND BUSINESS," July-August, 1950, by United States Gypsum Co., 300 W. Adams St., Chicago, Ill., contains 8 pages illustrating and describing methods for soundproofing of buildings and rooms.

(5724) "AMERICAN BRAKE SHOE COMPANY REPORT," by W. B. Givens, Jr., President, for Quarter ending June 30, 1950, contains 8 pages of information showing the products and earnings of this company.

(5725) "COMPACT COMMENTS," July 1950, by Interstate Compact Commission, P. O. Box 3127, Oklahoma City, Okla., contains 12 pages of news items from various states and information in regard to future meetings. Four pages of statistical data are included, showing oil field operations and production, also geophysical and core drilling activities.

(5726) WIRE ROPE. A 4 page folder by Union Wire Rope Co., 2160 Manchester Ave., Kansas City 3, Mo., illustrates use of testing equipment in the research laboratory of this company.

(5727) "DU PONT MAGAZINE," August-September, 1950, contains 34 pages with short illustrated articles discussing new products of the Du Pont Company and how they are used to advantage in connection with almost every industrial operation. Many excellent up-to-date ideas can be obtained from this magazine.

(5728) CLEANING METHODS. "Oakite News Service," July-August 1950, contains 24 pages of short illustrated articles showing the advantages of cleaning materials and equipment. Among other articles included is "Excerpts from a Talk on Preparing Metal Surfaces for Painting."

(5729) "FARMING" for Summer 1950, by the United States Gypsum Co., 300 W. Adams St., Chicago, Ill., contains 16 pages of short articles pertaining to farm buildings, their design and construction. In this issue details are shown for an egg cooler and a feed bin for a poultry house. Also ideas in regard to plans for houses and furnishings are included.

(5730) "PAY DIRT," July 21, 1950, by Charles F. Willis, 528 Title & Trust Bldg., Phoenix, Arizona, contains 16 pages of articles pertaining to the metals industry such as "New Attack is Made on Silver," "Sales Tax Study is Made" and a discussion on mining law changes and other legal acts effecting the minerals industry.

(5731) KONESHOT PERFORATING. A recent 4 page bulletin by Lane-Wells Co., Los Angeles, Calif., pictures the new super powered open hole "Koneshot Gun" and its effective use.

(5732) CATERPILLAR DIESELS. Form No. 12932 by the Caterpillar Tractor Company, Peoria 8, Ill., contains 8 pages illustrating and describing why Caterpillar engines are best for your mining job. Many illustrations are included showing equipment in actual operation.

(5733) GASOLINE. A recent 4 page bulletin from the Union Oil Co. of Calif., Union Oil Bldg., Los Angeles 17, Calif., shows the what, why, how and when of the new "76" gasoline balanced performance. Illustrations and arguments are convincing.

(5734) BAROID FIELD SERVICE. The June 1950 Baroid Distributors Magazine by Baroid Sales Division, National Lead Co., Los Angeles 12, Calif., contains 12 pages giving the distributors and sub-distributors of Baroid products.

(5735) ALUMINUM. The Alcoa Aluminum News-Letter, July 1950, Robert A. Neary, Editor, Pittsburgh 19, Pa., contains many short illustrated items showing everyday uses for aluminum in connection with building, construction and various types of equipment. A discussion is included covering the use of aluminum pipe and fittings, especially in connection with electrical installation.

(5736) ROOF BOLTS. Booklet No. 293 by the Bethlehem Steel Co., Bethlehem, Pa., contains 8 pages illustrating methods or application of mine roof bolts and supplies necessary for application. This new method of mine roof supports is becoming extensively used.

(5737) CONTRACTORS EQUIPMENT. The July 1950 Number of "The Look Around" by Moore Equipment Co., 6th & Acoma, Denver, Colo., contains 24 pages illustrating and describing the use of many types of contractors equipment and also contains short timely articles.

(Continued on page 44)

WEDDINGS *(Continued from page 40)*

Briber - Willey

In a ceremony which was performed in the garden of the home of Mr. and Mrs. Warren Hardaway of Denver the evening of August 2, Alex Briber and Miss Carol Willey were united in marriage.

The bride, daughter of Mr. and Mrs. Gilbert S. Willey of Lincoln, Nebraska, is a graduate of the University of Denver where she was a member of Pi Beta Pi sorority.

Following a wedding trip to Canada the couple are making their home in Seattle, Washington, where Mr. Briber will study at the University of Washington the coming year under a fellowship in mining engineering. He received his Engineer of Mines degree from *Mines* in 1948 and since then has served as junior engineer for the Commercial Testing and Engineering Company of Charleston, West Virginia. He is the son of Frank E. Briber, '16.

Nutter - Johnson

John F. Nutter, '49, and Miss Ruth Alice Johnson, daughter of Mr. and Mrs. John Arvid Johnson of Palmer, Alaska, were married August 19 at St. John's Lutheran church in Palmer.

Mr. Nutter is petroleum engineer for the U. S. Geological Survey and is stationed at Fort Richardson, Alaska, where the couple are now at home. His mother went to Alaska for the wedding.

BIRTHS

When John Pratt, '39, was in the alumni office last month while on vacation in Denver, he announced the arrival of a son, John Thomas, on April 11, 1949. His wife and the young son accompanied him on this trip.

Mr. Pratt is metallurgist for Hughes Tool Company at Houston, Texas. His home address there is 7742 Dixie Drive.

Mr. and Mrs. Hermann A. Hofmann have announced the birth of a daughter on June 23, her weight being 6 pounds, 10 ounces.

Mr. Hofmann received his degree in geology from *Mines* this year. His present address is 1120½ Washington Avenue, Golden, Colo.

Mr. and Mrs. Paul Fillo, '40, are the parents of a third son, Frank Dunn, who arrived at their home on July 16.

Mr. Fillo is salesman for K-C Construction Company and receives mail at his home, 3615 East Iliff, Denver 10.

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 1822. Metal mining in Oregon, 1949—preliminary annual figures. 2 pp.

MMS 1823. Metal mining in Idaho, 1949—preliminary annual figures. 5 pp.

MMS 1824. Metal mining in California, 1949—preliminary annual figures. 4 pp.

MMS 1825. Iron ore in 1949—preliminary. 4 pp.

MMS 1826. Mineral production in Alaska, 1949—preliminary figures. 4 pp.

MMS 1827. Mine production of copper in the United States in 1949—preliminary annual figures. 5 pp.

MMS 1828. Mine production of gold in the United States in 1949—preliminary annual figures. 5 pp.

MMS 1829. Mine production of silver in the United States in 1949—preliminary annual figures. 4 pp.

MMS 1830. Metal mining in the States east of the Mississippi River, 1949—preliminary annual figures. 4 pp.

MMS 1831. Mine production of zinc in the United States in 1949—preliminary annual figures. 5 pp.

MMS 1832. Mine production of lead in the United States in 1949—preliminary annual figures. 5 pp.

MMS 1833. Copper in 1949—preliminary report. 5 pp.

MMS 1834. Lead and zinc pigments and zinc salts in 1949—preliminary annual report. 4 pp.

MMS 1835. Lead industry in 1949—preliminary. 5 pp.

MMS 1836. Zinc industry in 1949—preliminary. 6 pp.

MMS 1837. Molybdenum in 1949. 3 pp.

MMS 1838. Preliminary 1949 totals for recovery of copper from copper-base scrap. 2 pp.

MMS 1839. Production of coke and coal chemicals from coal-gas retorts in 1949. 4 pp.

MMS 1840. Fluorspar industry in the United States in 1949—final annual figures. 7 pp.

MMS 1841. Directory of peat producers in the United States who reported production or sales in 1949. 4 pp.

MMS 1842. Peat in the United States in 1949. 3 pp.

MMS 1843. Platinum-group metals in 1949. 5 pp.

MMS 1844. Fuller's earth shows a moderate decrease in 1949. 1 p.

MMS 1845. Metal mining in Washington, 1949—final annual figures. 4 pp.

MMS 1846. Bentonite sales off in 1949. 1 p.

MMS 1847. Metal mining in Texas, 1949—final annual figures. 2 pp.

MMS 1850. Carbon-black production and sales decline again in 1949. 2 pp.

MMS 1851. Metal mining in Missouri, Oklahoma, Kansas, and Arkansas, 1949—final annual figures. 4 pp.

MMS 1853. Metal mining in Utah, 1949—final annual figures. 5 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.

7547. Underground transportation in the Ruhr coal-mining district of Germany, by R. W. Stahl, H. E. Sanford, and J. B. Benson. 9 pp. 9 figs. Includes descriptions of various haulage conditions, such as hoisting, loading, tipples, roadways, tracks, switches, conveyors, and locomotives and cars, with photographs of certain typical equipment.

7548. Safety practices in churn drilling at Morenci Branch, Phelps Dodge Corp., Morenci, Ariz., by Alan A. Sharp and Allen D. Look. 22 pp. 2 figs.

7549. Conditions and practices at coal mines in the Ruhr district of western Germany, by J. B. Benson, H. E. Sanford, and R. W. Stahl. 48 pp. 47 figs. Presents a complete survey of safety conditions and practices at coal mines in the Ruhr area.

7550. Economic importance of pegmatites, by Paul M. Tyler. 57 pp. Includes discussions on geographic location of granitic pegmatites, general geology, mineralization, prospecting, mining and milling methods and costs, and general economic considerations.

7551. Report of Petroleum and Natural-Gas Branch, fiscal year 1949, by R. A. Cattell and others. 50 pp. 20 figs. Reviews work done by Petroleum and Natural-Gas Branch during fiscal year.

7552. Drilling and blasting, open-cut iron-ore mines, Lake Superior district, by John A. Johnson, Floyd G. Anderson, and Roy G. Stott. 37 pp. 18 figs. One of a series describing iron-ore mining practices in the Lake Superior district to aid in preventing accidents in that industry, discusses drilling and blasting in open-cut iron-ore mines.

7553. Thallium: Properties, sources, recovery, and uses of the element and its compounds, by William H. Waggaman, Gladys G. Heffner, and Edwin A. Gee. 50 pp. Discusses properties, history, sources, extraction, preparation, and uses of thallium. Includes bibliography.

7554. Reconnaissance of metal mining in the San Juan region, Ouray, San Juan, and San Miguel Counties, Colo., by William H. King and Paul T. Allsman. 109 pp. 23 figs. Describes mineral deposits and discusses mining and milling methods of various companies in the San Juan region.

7555. Mining, milling, and manufacturing methods at the Blue Diamond Corp.'s gypsum property, Clark County, Nev., by George H. Holmes, Jr. 21 pp. 14 figs.

7556. Historical resume of mine and tunnel ventilation studies, Bureau of Mines, 1910-49, by G. E. McElroy. 16 pp. Summarizes mine and tunnel ventilation studies made by the Bureau between 1910 and 1949. Includes bibliography.

7557. Fuel-burning equipment dimensions required by smoke-abatement ordinances, by J. F. Barkley and R. E. Morgan. 19 pp. 9 figs.

7558. Carbide insert bit drilling at the Cleveland-Cliffs Iron Co. mines, Ishpeming, Mich., by Walter E. Lewis. 16 pp. 10 figs.

7559. Coal for coke production, by Arno C. Fieldner. 21 pp. 5 figs. Reviews briefly our fuel reserves, with special reference to coking coal.

7560. Mining methods and costs at the Highland Surprise mine, Shoshone County, Idaho, by D. W. Butner. 11 pp. 7 figs.

7561. The use of dust respirators in coal mines, by S. J. Pearce. 6 pp. Describes various types of respiratory dust-filtering equipment in general use.

7562. Report of the Health and Safety Division, fiscal year 1949, by J. J. Forbes and W. J. Fene. 52 pp. 5 figs. Outlines the activities and major accomplishments during the 12-month period.

7563. Extinguishing fire with carbon dioxide in the Valier mine, Valier Coal Co., Valier, Franklin County, Ill., by James Westfield, H. C. Brumbaugh, and R. W. Whittaker. 10 pp. 3 figs.

7564. Fighting a fire in No. 59 mine, Peabody Coal Co., Springfield, Sangamon County, Ill., by J. A. O'Connor, J. S. Malesky, and T. C. Higgins. 19 pp. 3 figs. Describes a stubborn mine fire of electrical origin that started on the main haulage road.

REPORTS OF INVESTIGATIONS U. S. Bureau of Mines

4524. Concentration of oxide manganese ores from Payday No. 1 and Newcomb properties, Weber and Rich Counties, Utah, by J. A. McAllister and Walter J. Long, Jr. 9 pp.

4525. Investigation of the New Idria mercury deposit, San Benito County, Calif., by Russell R. Trengove. 24 pp. 7 figs.

4526. Coal carbonization: Ammonium sulfate yields from coals of various regions of the United States, by D. A. Reynolds and D. E. Wolfson. 15 pp. 6 figs.

4527. Recovery of alumina from submarginal bauxites. Part 1. Electric-furnace production of calcium aluminate and ferro-alloy, by Charles E. McCarthy, Richard S. Cole, Earl F. Nichols, Hewitt Wilson, and John A. Ruppert. 93 pp. 28 figs.

4528. Recovery of alumina from submarginal bauxites. Part 2. Extraction of alumina from electric-furnace slags of calcium aluminate, by Maurice R. Thompson, Henry M. McLeod, Jr., and Milford L. Skow. 91 pp. 42 figs. Deals with leaching of electric-furnace calcium aluminate slag to produce solutions from which metallurgical-grade alumina can be recovered.

4529. Survey of commercial aviation-gasoline characteristics, January 1949 production, by W. C. Holliman, M. G. Barker, and Nancy Bobrowski. 17 pp. 11 figs. Gives results of a semiannual survey of aircraft motor fuels.

4530. Investigation of the Benjamin Franklin graphite mine (Government-owned) and the Just graphite mine, Chester County, Pa., by Robert S. Sanford and Frank D. Lamb. 17 pp. 3 figs.

4531. Sampling and determination of aldehydes in Diesel-engine exhaust gas and in mine air, by Henry W. Busch and L. B. Berger. 9 pp. 2 figs.

4532. Investigation of the Great Gossan Lead, Carroll County, Va., by M. H. Kline and T. J. Ballard. 39 pp. 25 figs. The Great Gossan Lead in Carroll County, Va., is one of the largest undeveloped sulfide ore bodies known in the eastern United States. It extends for 16.7 miles along the western slope of the Blue Ridge Mountains.

4533. Investigation of Lone Elm zinc-lead deposit, Jasper County, Mo., by Louis C. Brichta. 29 pp. 2 figs.

4534. Guide for making cost estimates for chemical-type operations, by C. W. Van Noy, T. C. Dunville, R. G. Dressler, and C. C. Chaffee. 64 pp.

4535. Recovery of aluminum from crude aluminum-silicon alloy by extraction with molten zinc, by Hillary W. St. Clair and D. D. Blue. 24 pp. 6 figs.

4536. Investigation of manganese deposits, Little Florida Mountains mining district, Luna County, N. Mex., by A. M. Evans. 11 pp. 11 figs.

4537. A study of stray electric currents in Airdox systems in coal mines, by C. L. Brown, F. J. Gallagher, and John Hyvarinen. 13 pp. 11 figs.

4538. Investigation of the Andersonville bauxite district, Sumter, Macon, and Schley Counties, Ga., by William A. Beck. 150 pp. 22 figs.

4539. Investigations of the Cartersville manganese district, Bartow County, Ga., by A. L. Peyton and Walter T. Leweicki. 32 pp. 18 figs.

4540. Investigation of Snowball fluorite deposit, Maricopa County, Ariz., by Thomas C. Denton and Chas. A. Kumke. 15 pp. 3 figs.

4541. Investigation of Comet Coalition lead-zinc deposit, Lincoln County, Nev., by Russell R. Trengove. 6 pp. 8 figs.

4542. Investigation of Oat Hill mercury mine, Napa County, Calif., by Fremont T. Johnson and Spangler Ricker. 23 pp. 5 figs.

4543. Investigation of the Strawberry tungsten deposit, Madera County, Calif., by Russell R. Trengove. 19 pp. 14 figs.

4544. Diamond drilling at the Rambler copper mine, Albany County, Wyo., by John I. Kasteler and Eugene Frey. 6 pp. 7 figs.

4545. Concentration of oxide manganese ores from the Tintic district, Eureka, Juab County, Utah, by A. O. Ipsen, H. D. Snedden, and H. L. Gibbs. 18 pp.

4546. Studies of the kinetics of coal hydrogenation, by M. G. Pelipetz, E. M. Kuhn, S. Friedman, and H. H. Storch. 9 pp. 9 figs.

4547. The determination of low concentrations of hydrogen sulfide in gas by the methylene blue method, by A. E. Sands, M. A. Grafius, H. W. Wainwright, and M. W. Wilson. 19 pp. 3 figs. An ultrasensitive method for rapidly detecting the presence of small quantities of hydrogen sulfide in gas is being used successfully in research at the Bureau of Mines Synthesis Gas Production Laboratory at Morgantown, W. Va.

4548. A Bureau of Mines method for determining porosity: A list of porosities of oil sands, by Cleo Griffith Rall and D. B. Taliaferro. 28 pp. 4 figs.

4549. Investigation of the Prairie Creek diamond area, Pike County, Ark., by J. R. Thoenen, Robert S. Hill, E. G. Howe, and S. M. Runke. 24 pp. 28 figs.

4550. Investigation of Hamilton County bauxite district, Tennessee, by Frank K. McIntosh. 31 pp. 7 figs.

4551. Concentration of manganese ores from Piute and Kane Counties, southern Utah, by Richard Havens and W. W. Agey. 9 pp.

4552. Coal carbonization: Effects of blending Pocahontas No. 3 coal with 12 high-volatile A coals, by D. A. Reynolds. 8 pp. 3 figs. During the past few years, 12 high-volatile A coals were blended with Pocahontas No. 3 coal from Kimball, McDowell County, W. Va. Compares the physical properties of the cokes from these high-volatile coals and their blends.

4553. Liquidus temperatures and liquid densities of zinc-aluminum alloys, by I. S. Solet and Hillary W. St. Clair. 6 pp. 2 figs. This study describes measurement of liquidus temperatures and measurement of the density of molten alloys.

4554. Investigation of Colorado Minerals Co. calcite deposits, Archuleta and Hinsdale Counties, Colo., by Ernest V. Deshayes and S. R. Wilson. 7 pp. 4 figs.

4555. Investigation of the Springvale bauxite district, Randolph County, Ga., by William A. Beck. 20 pp. 11 figs.

4556. Investigation of the Young America lead-zinc deposit, Stevens County, Wash., by Robert J. Hundhausen. 18 pp. 8 figs.

4557. Effect of high pressures on the flammability of natural gas-air-nitrogen mixtures, by G. W. Jones, R. E. Kennedy, and I. Spolan. 16 pp. 6 figs. Describes the procedure followed and the results obtained relative to the effect of pressure up to 3,000 pounds per square inch upon the limits of flammability of natural gas-air and natural gas-air-nitrogen mixtures.

4558. Investigation of the Abbott quicksilver mine, Lake County, Calif., by Frank J. Wiebelt. 11 pp. 3 figs.

4559. Grouting diamond-drill holes at the Christmas mine, Gila County, Ariz., with notes on the setting properties of cements and the use of liquid carbon dioxide as a pressuring agent in grouting, by Stanton L. Tainter. 10 pp. 5 figs.
4560. Investigation of the Buckeye manganese deposits, Stanislaus County, Calif., by M. E. Volin and E. J. Matson. 7 pp. 9 figs.
4561. Investigation of the Dayton iron deposit, Lyon and Storey Counties, Nev., by Robert W. Geehan. 34 pp. 12 figs.
4562. Lead smelting in the ore hearth. 1. Problems involved in smelting rich charges, by G. L. Oldright. 18 pp. Describes a lead blast-furnace investigation on smelting richer lead products and gives problems involved.
4563. Lead smelting in the ore hearth. II. The development of the ore hearth: Its smelting column, by G. L. Oldright. 43 pp.
4564. Estimated plant and operating costs for producing gasoline by coal hydrogenation, by L. L. Hirst, J. A. Markovits, L. C. Skinner, R. W. Dougherty, and E. E. Donath. 83 pp. 23 figs.
4565. Investigation of the Whitechuck travertine deposit near Darrington, Snohomish County, Wash., by Constantine C. Popoff. 4 pp. 1 fig.
4566. Sulfur in petroleum. III. Selected physical properties of some sulfur compounds, by R. Vernon Helm, William E. Haines, and John S. Ball. 44 pp. As part of a cooperative research program designed to increase the utilization of high-sulfur crude oils and thus conserve better-grade crudes, this report lists data on the physical properties of sulfur compounds most likely to be found in petroleum and its products and provides information useful in devising methods for removing these objectionable impurities.
4567. National motor-gasoline survey, winter 1948-49, by O. C. Blade. 33 pp. 3 figs. Survey includes service-station gasolines of 130 major and minor companies and contains analytical data for 3,811 samples of gasolines from 17 marketing areas of the country.
4568. Relation between and precision of dust counts (light- and dark-field) from simultaneous impinger, midget-impinger, electric-precipitator, and filter-paper samples, by Carlton E. Brown and H. H. Schrenk. 35 pp.
4569. Relative reducibility of some iron oxide materials, by E. P. Barrett and C. E. Wood. 17 pp. 6 figs.
4570. Flotation of gray iron ores from the Talladega area, Alabama: Laboratory Studies, by H. G. Iverson. 18 pp. Laboratory studies on beneficiating gray iron ores from Talladega County, Ala., show that acceptable blast-furnace feed may be recovered from low-grade ores by flotation.
4571. Investigation of the Del Rio and Stackhouse barite deposit, Cocke County, Tenn., and Madison County, N. C., by Laurence A. Dahners. 26 pp. 13 figs.
4572. Diamond-drill and auger sampling of vanadiferous shale, Mercur Dome mine, Tooele County, Utah, by William H. King and Stephen R. Wilson. 8 pp. 2 figs.

PLANT NEWS

(Continued from page 32)

for information concerning facilities, personnel, possible production schedules and other matters of material procurement planning for national defense."

G.E. Prepared for All-out Mobilization

In the event of all-out mobilization, the General Electric Company is in a position to produce substantially double what it produced during World War II, Charles E. Wilson, G-E president, declared recently.

He said that with its postwar expansion program completed and production currently at record-breaking levels, the company is far better prepared than at any other time in its peacetime history to meet demands made upon it by the Armed Services.

G.E. Starts Large-Scale Production of Gas Turbine Power Plants

Large-scale production of gas turbines, latest type of power plants for land, railroad, and marine use, has been started by the General Electric Company in Schenectady, N. Y. plant facilities now being equipped at a cost in excess of $4,000,000.

Steel Mill to Install Scherbius Frequency Changer Set

One of the largest Scherbius frequency changer sets ever built by the General Electric Co. will be installed at the Aliquippa, Pa., works of Jones and Laughlin Steel Corporation. The 25,000-kw induction-synchronous set will be used to replace 25-cycle power which will be lost from the existing boilers due to the increased need for process steam.

Single Cylinder Turbine Propulsion Unit to Repower Great Lakes Bulk Carrier

The latest single cylinder turbine designed especially for low powered vessels and for modernizing ore carriers on the Great Lakes is being built by General Electric for the S. S. Homer Williams. The equipment is scheduled for delivery to allow installation during the winter months so the vessel can be in regular service for the 1951 season.

Link-Belt at the Iron and Steel Exposition, Cleveland, September 26-27-28-29

The exhibit which will occupy spaces 17-18-19, will feature Link-Belt conveyors for handling everything from raw materials to finished product, and the company's very complete line of power transmission equipment.

An extra-special feature will be the showing of a Kodachrome motion picture depicting the mechanical handling of raw materials, coils of steel strip, etc.

The power transmission displayed will include large worm gear and P.I.V. variable speed drives; a large roller bearing pillow block, with cutaway section, on a revolving turntable; and an operating unit of herringbone-gear drive (with transparent plastic top) connected to one of the new Link-Belt Electrofluid drives.

CATALOG REVIEWS

(Continued from page 42)

(5738) PHOTOMETRY. Folder 1003 by Baldwin Instrument Co., Ltd., Brooklands Wks., Dartford, Kent, England, describes scientific measuring instruments for photometry such as Cinema screen photometer, integrating light counter and Vacuum-cell Photometer.
(5739) LABORATORY EQUIPMENT. Bulletin No. 648 by Precision Scientific Company, Mine & Smelter Supply Co., Distributors, Denver, Colo., illustrates and describes aluminum Desiccators. Important features are included with data for ordering and price.
(5740) MONEL METAL. Technical Bulletin T-9 by International Nickel Co., 67 Wall St., New York 5, N. Y., contains 24 pages illustrating and describing engineering properties of "K" Monel and "KR" Monel metals, tables showing physical properties and also many charts are included. Much valuable information is to be found in this bulletin for those who are interested in this type of metal.
(5741) FLOTATION INDEX. The 12th Annual Addition to the Flotation Index for the year 1949 has been published by the Great Western Division, The Dow Chemical Co., San Francisco, Calif., furnishing an index covering Flotation, Mineral Dressing—General, Heavy Media Separation and Milling Operations for the year 1949.
(5742) BROMINE CONTAINERS. A recent booklet entitled "Materials for Bromine Containers" has been reprinted from the December 1949 issue of "Industrial and Engineering Chemistry" by the International Nickel Co., 67 Wall St., N. Y., N. Y., and includes reports on studies of various groups of materials and data on the methods of testing as well as the results obtained.
(5743) BITUMINOUS PLANT. Form No. 620 by Pioneer Engineering Wks., Minn., Minn., contains 8 pages illustrating and describing Pioneer Model 101, Bituminous plant for 110 to 135 tons per hour production. A cutaway photograph included pictures the operation of the whole plant. Important features of this equipment are illustrated and described.
(5744) AIR-COOLED COMPRESSOR. Form 1048 by Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y., contains 8 pages, illustrating and describing the "T" Series, Type "30" Air-Cooled Compressor for heavy-duty service made in sizes 7½ - 10 - 15 horse power. This bulletin illustrates and describes the various sizes of these compressors and sectional illustrations showing internal construction. Features are described and tables of engineering data with general dimensions are included.
(5745) CIRCULAR BIN DISCHARGER. Bulletin 250 by Stephens-Adamson Mfg. Co., Aurora, Ill., contains 4 pages illustrating and describing the S-A Circular Bin Discharger. Sectional drawings and cutaway photographs fully describe this apparatus. Examples are included showing its capacity. This Bin Discharger is designed for handling pulverized, granular, glutenous and soft lump materials that may arch and refuse to discharge by gravity or surge through openings too rapidly. These Dischargers also handle fine ores, cement, zinc oxide, soda ash and other materials. It is not recommended for large lumps or materials which cement into solid mass in the bin.
(5746) "THE GRAPEVINE," August 1950, by United Geophysical Co., Inc. 595 East Colorado St., Pasadena, Calif., contains 8 pages of letters and illustrations from Parties working in various parts of the world. Many letters of great interest are included in this publication.

TECHNICAL MEN WANTED

(Continued from page 9)

(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.

(1269) GEOPHYSICISTS. A well known geophysical corporation has positions open for party chiefs, computers, osbervers, 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.

(1270) JUNIOR SALES ENGINEER. A national corporation with offices in Denver has position open for graduate Metallurgical Engineer familiar with non-ferrous metals for training in their sales department. Salary open.

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

(1275) JUNIOR MINING ENGINEER OR GEOLOGIST. One of the larger copper companies has position open for Junior Mining Engineer or Geologist as trainee. Work would start underground and man would be gradually advanced as his training justified it. Applicant must be able to pass physical examination. Starting salary will be on day wage basis. Employment will probably be in the southwestern part of the United States.

(1276) JUNIOR MINING ENGINEER. A well known mining company with operations in Colorado has position open for young mining engineer, preferably with one or two years experience. Duties will consist of mine sampling and helping with mine surveying and mapping. Salary open.

(1277) PROCESS ENGINEER. A large chemical manufacturing company extending their plant facilities has position open for Process Engineer with at least five years experience in designing, construction, estimating and plant operation. Starting salary $350 to $450 per month, depending upon experience and ability of applicant. Excellent opportunity for advancement. Location in Rocky Mountain Region.

(Continued on page 45)

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(Continued from page 44)

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

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

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

(1295) MINING GEOPHYSICIST. A mining company with international operations has a position open in their exploration department for a young graduate engineer with University training in Physics and Electronics, who is interested in geophysical field work in connection with mining exploration. Applicant should be between the ages of 25 and 30 years and willing to travel in any part of the world. Salary open.

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Parker & Company, Charles O. ★ 3
Denver, Colo., 2114 Curtis Street

Price Company, H. C. ★ ......
Bartlesville, Okla.
Los Angeles, Calif.
San Francisco, Calif.

Professional Cards 4, 8

Public Service Company of Colo. ★ ......
Denver, Colo., Gas & Electric Bldg.

Roebling's Sons Company, John A. ★ ......
Trenton, New Jersey
Denver 16, Colo., 4801 Jackson St.

Seismic Explorations, Inc. ......

Seismograph Service Corporation ......
Tulsa, Oklahoma

Sinclair, Harry (Hard Rock) ★ ......
Denver, Colo., 2224 Welton St.

Spang & Company ......
Butler, Pennsylvania

Stearns-Roger Mfg. Company ★ ......
Denver, Colo., 1720 California St.

Stephan Corporation, The ......
Sacramento, Calif.,
Rt. 8, Box 1782, Freeport Blvd.

Stephens-Adamson Mfg. Co. ......
Aurora, Illinois
Los Angeles, Calif.
Belleville, Ontario, Canada

Stonehouse Signs, Inc. ★ ......
Denver, Colo., 842 Larimer St.

Strawn's Book Store ......
Golden, Colo., 1205 Washington Ave.

Thomas-Hickerson Motor Co. ......
Denver, Colo., 1000 E. 18th Ave.

Topside Oil Company ......
Denver, Colorado, Symes Bldg.

Union Supply Co. ......
Denver, Colo., 1920 Market St.

United Geophysical Company, Inc. ......
Tulsa 3, Okla., 822 Thompson Bldg.
Pasadena 1, Calif., 595 E. Colorado St.

Vulcan Iron Works Co. ......
Denver, Colo., 1423 Stout St.

Western Machinery Co. ★ ......
San Francisco 7, Calif., 760 Folsom St.

Western Oil Tool & Mfg. Co. ......
Casper, Wyo., Box 260

Wilfley & Sons, A. R. ★ ......Back cover
Denver, Colo., Denham Bldg.
New York City, 1775 Broadway

Yuba Manufacturing Company ★ 2
San Francisco, Calif., 351 California St.