

THE MINES MAGAZINE

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MINERAL ENGINEERING

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- ★ Metallurgical Engineering
- ★ Fuel Engineering
- ★ Petroleum Engineering
- ★ Geological Engineering
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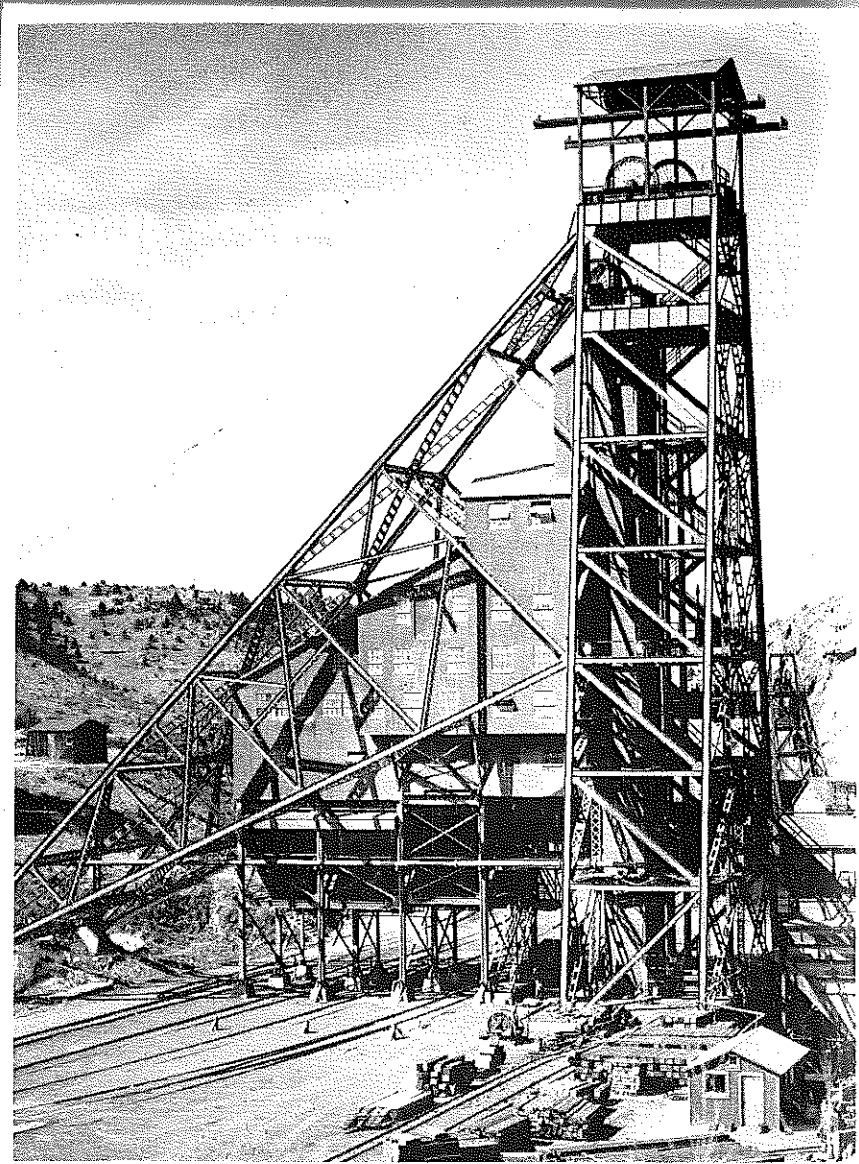
**SAN JUAN BASIN GEOLOGY
FIELD CONFERENCE**

DECEMBER

◆ **1950**

VOLUME XL

NUMBER 12



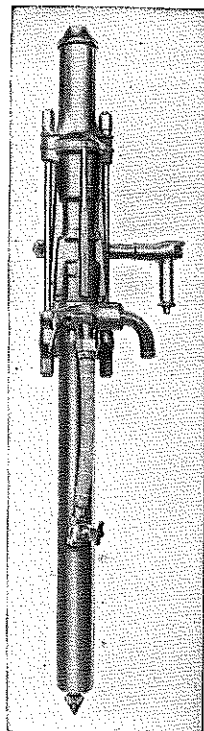
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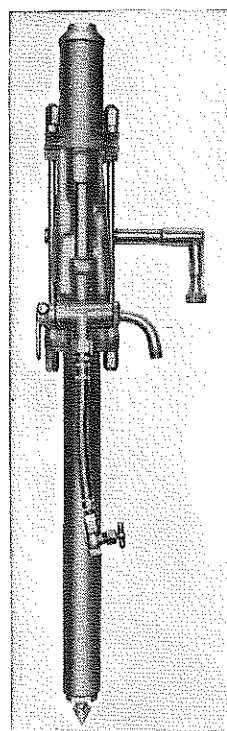
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PERSONAL NOTES

John H. Newsom, '34, has a change of address to Operation Division, Okinawa Engr. District, A.P.O. 331, c/o Postmaster, San Francisco, Calif.

George E. Norris, '27, resigned his position with Gardner-Denver Company to take over partnership in Moore-Norris Company. His new address is 114 North Beacon Street, Brighton Station, Boston, Mass.

Earl H. Ramsey, '50, who is associated with Sohio Petroleum Company at Casper, Wyoming, was in Denver and Golden for Homecoming.

E. S. Rugg, '43, has a change of address from Calpet, Wyoming to Box 595, Sundown, Texas. He is serving as Engineer for The Texas Company.

George R. Rogers, '48, Geophysical Engineer for Phelps-Dodge Corporation, has been transferred from Tyrone, New Mexico, to Douglas, Arizona, where he is addressed 1510-9th Street.

M. H. Salsbury, '26, resigned his position with the Golden Cycle Corporation to accept that of Mining Engineer with the U. S. Bureau of Mines. His first assignment is at the Leadville Drainage Tunnel, his business address being Box 602, Leadville, Colorado.

Alvin Shames, '49, completed his graduate work at Pennsylvania State College, and has accepted a position with Battelle Memorial Institute. He is now addressed in their care, 505 King Avenue, Columbus 1, Ohio.

David Singer, '50, has a change of address to 1316-9th Street Wichita Falls, Texas. He is Geologist for Arkansas Fuel Oil Company.

Arthur C. Smith, '37, was on vacation in the States this summer and called at the Alumni office last month. He is Production Supervisor for Creole Petroleum Corporation, with address Apartado 172, Maracaibo, Venezuela.

S. A. Spencer, '47, Party Chief for Phillips Petroleum Company, is now being addressed Box 447, Abbeville, Louisiana.

Arthur N. Sweet, '11, Consulting Engineer, has moved from Los Angeles to Denver, where he is addressed 1045 Sherman Street, Apt. 210.

Kimball M. Williams, '50, has accepted a position with the Chile Exploration Company and is addressed in their care, Chuquicamata, Chile, S. A. (Via. Antofagasta).

William Allen, Jr., '47, is Geophysical Engineer for Phelps Dodge Corporation, receiving mail through Box 505, Douglas, Arizona.

E. Robin Anderson, '43, is employed by Shell Oil Company as a Sub-surface Geologist. His mailing address is 820-12th Avenue West, Calgary, Alberta, Canada.

Lewis D. Anderson, '39, has a change of address to Box 556, Rico, Colorado, where he is employed by the Rico Argentine Mining Company.

Joseph Berta, '41, is being addressed 1104 McKinley Avenue, Rock Springs, Wyoming. He is serving as Research & Planning Engineer for the Union Pacific Coal Company.

Bill L. Bessinger, '50, is Engineer Swamper, Phelps Dodge Corporation, Copper Queen Branch, his mailing address being Box 696, Warren, Arizona.

Peter B. Bike, '50, has a new mailing address, c/o Petty Geophysical Engineering Co., General Delivery, Clarendon, Texas.

(Continued on page 18)

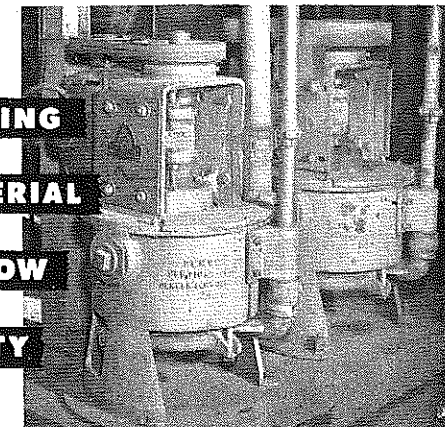
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Ralph D. Curtis, '26
Production Manager
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Manager, Foreign Operations
Brown Drilling Company
Long Beach California

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

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

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

Letters . . .

MESSAGE FROM A MINER'S WIFE

From MRS. CHARLES E. BUCK, 1409 West 13th Street, Amarillo, Texas
Please note change of address from Jackson, Mississippi.
Mr. Buck, '39, is the district geologist for the Panhandle Area of Oklahoma and Texas and northeast counties of New Mexico, Skelly Oil Company.
We now have three sons: Joe, age 9; Craig, age 6; and Brant, age 14 months.

ENJOYED VACATION IN THE STATES

From JOHN E. BOWENKAMP, '32, Timmins Mining Enterprises, Apartado 86, Popayan, Colombia, S. A.
Please find enclosed my check in payment of membership dues in the Association for the year 1950. Certainly I should have remitted this long before now. I have failed to do so through only inexcusable neglect and oversight. I trust, however, that I may be more prompt a few months from now when dues for the year 1951 become payable.
I have only just returned to Colombia after a pleasant four months of vacation in the United States, during which I had the pleasure of visiting *Mines* campus for the first time since my graduation in 1932. I particularly enjoyed, while on the campus, a visit with Dr. Coolbaugh who has always befriended and inspired me and who personally showed Mrs. Bremkamp and me and our two sons, John, Jr. and Robert, through Berthoud Hall.
I was proud to see how *Mines* has grown and I am prouder still to be a *Mines* alumnus.

NEWS OF MEN IN KENTUCKY

From HERMAN E. KNIGHT, '49, R. F. D. No. 5, Madisonville, Ky.
Enclosed is check in payment of dues for the current year and I wish to thank you for not stopping my magazine even though I am late in remitting.
Our young daughter is walking now I wish to announce that she was born 2 December 1949. Her name is Sally Jane.
Other *Miners* here in western Kentucky are Russell Badgett, '40, and Bill Robinson, '48. George Featherstone, '43, was here until a few weeks ago when he was transferred to Pennsylvania. Cam Hales, '48, visited me from Florida a few months ago. He had run into Floyd Clawson, '49, and Fred Deuel, '49, there.
I now have a new job as chief engineer, West Kentucky Division, Bell and Zoller Coal and Mining Company. I was mining engineer with the same company until 1 June this year.

FROM A NON-MINES MAN

From CHARLES P. MILLER, Miller Engineering & Geological Co., 905 No. Dalmont, Hobbs, New Mexico.
Enclosed find check for renewal subscription to *The Mines Magazine*. I have been out of the office for two weeks, hence the delay. My wife and I enjoy the magazine and would dislike to miss any of the issues.
Many of my friends read the magazine and say they think it is the most outstanding publication of its kind.

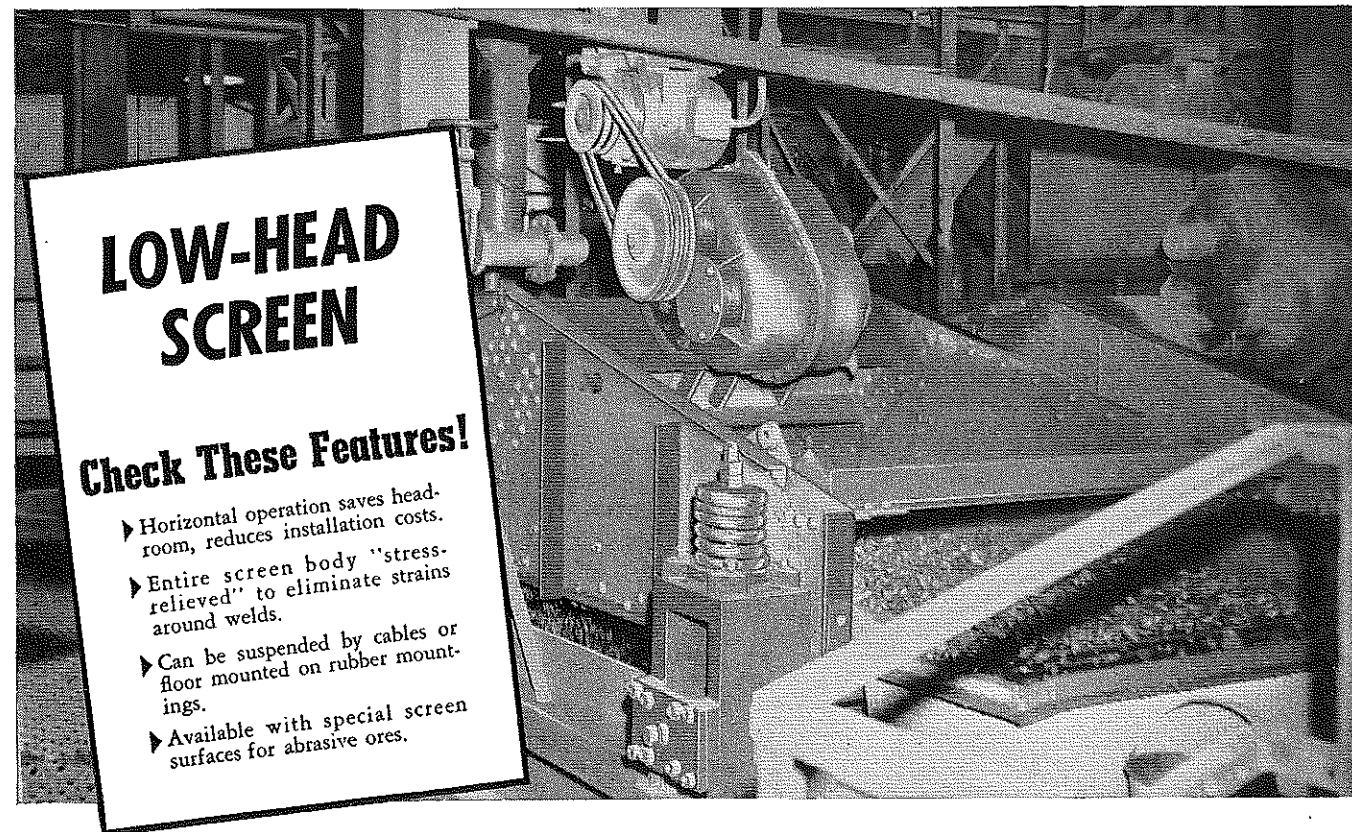
HAS SETTLED IN CALIFORNIA

From GEORGE P. ROBINSON, '04, 3849 Elm Avenue, Long Beach 7, Calif.
Just a line to let you know that after 44 years in Mexico, I have returned to the United States and have taken up my residence here in Long Beach. We have purchased a home and I expect to spend the rest of my days here. Will you, therefore, change my address to that given above and send my copies of the magazine here.
We like Long Beach and California very much and when I receive the next copy of *Mines Magazine* and learn the meeting place and date of the Alumni chapter nearest here, I hope to be able to attend some of their meetings.
I had an attractive offer to go to Turkey as consulting lead metallurgist, but it is a long way off, the doctor advised against it, and I have grown lazy and accustomed to loafing since I retired, so passed up the job.
I expect to return to Denver for a visit next summer and will certainly call at the Alumni office.

ANNOUNCES SON'S ARRIVAL

From GLENN E. WORDEN, '48, Box 428, Midwest, Wyoming.
This is to advise you of new address which is given above.
My new position is with the U. S. Geological Survey as Petroleum Engineer in the Conservation Division, Oil and Gas Leasing Branch. I find my work very interesting and pleasant in that I contact many *Mines* grads on my field trips and have the opportunity of watching all the oil and gas development in the Rocky Mountain area, due to the intricacies of my job.
I also would like to announce the arrival of my first candidate for the 1968 class. Michael Eddy made his presence known August 30, 1950, and has been rapidly developing the *Miners'* yell ever since.
Best regards to everyone.

HERE'S PROOF—
Why Allis-Chalmers Sink-Float Screens
are Accepted as Standard on Iron Range



FOR THE TOUGH job of handling iron ore in sink-float, operators have chosen *Low-Head* vibrating screens. In fact, every sink-float plant on the iron range uses these Allis-Chalmers screens for this job!
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The *Low-Head* screen shown above is a typical heavy media screen installation. One of eight *Low-Head*

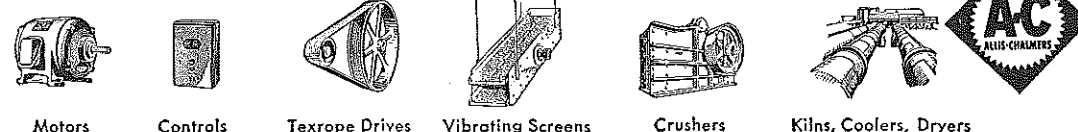
screens installed in the sink-float plant at Holman mines, Taconite, Minn., this 6x16 ft single deck screen is used in the wash and drain process here. It washes media from iron ore concentrate . . . recovers expensive ferro-silicon for re-use.
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TECHNICAL MEN WANTED

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

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

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

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

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

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

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

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

(1216) MILL SUPERINTENDENT. A well known mining company in South America has position open for Mill Superintendent with several years experience in milling operation. Latin American background is essential. Three year contract with housing provided. Approximate starting salary, \$6000 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.

(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.

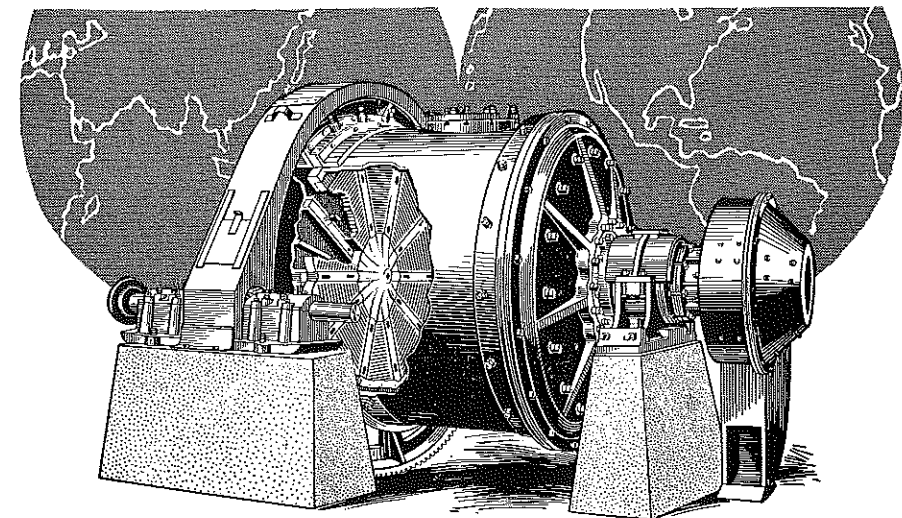
(1261) JUNIOR MINING ENGINEER. A western mining company has a position open for Junior Mining Engineer who is qualified to handle surveying, mapping and drafting. Salary open.

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

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

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

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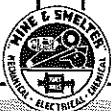
584 OUTSIDE U. S. A.

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Cuba	9
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Philippines	37

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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 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 train-

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Permit us to present field records which substantiate these statements.

TECHNICAL MEN WANTED

(Continued from page 6)

Jr. Metallurgist in research work. Must be well trained in fundamental principles of Metallurgy, alert and industrious. Probable salary, \$275 per month based on 40-hour week.

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

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

(1316) MINING ENGINEER. An eastern coal mining company has position open for Mining Engineer with experience in surface and underground surveying and also in plant design and construction. Salary open.

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

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

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

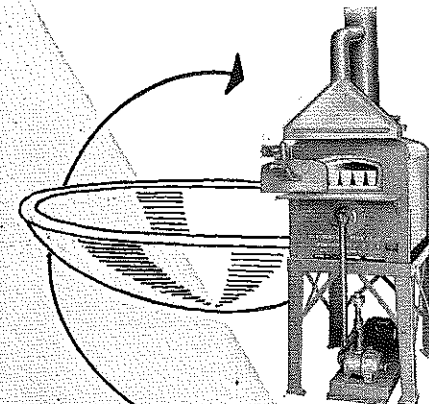
(1324) PETROLEUM ENGINEER. One of the large research and development companies has position open for petroleum engineer who has had experience in research and reservoir engineering. Man with good background in reservoir engineering studies and few years field experience required. Salary depends upon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

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

(1326) JR. CHEMIST. A mining company well established in the western country has position open for Jr. chemist for employment in their

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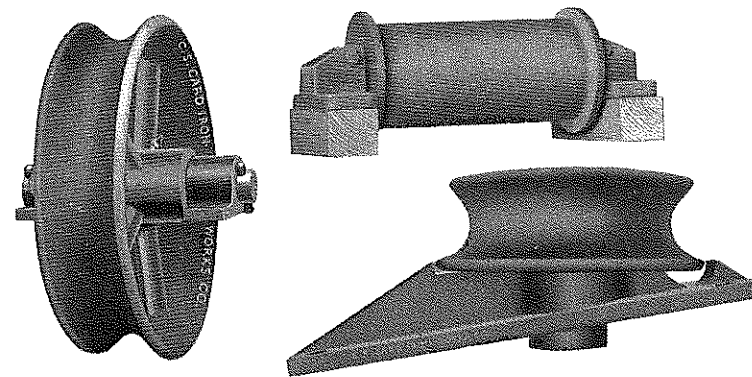
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assay laboratory. Applicant should have good knowledge of assaying and chemical laboratory methods. Salary open.

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

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

(1330) DRAFTSMAN AND DESIGNER. A position is open with a well known mining company planning extensive operations in the Rocky Mountain region. Applicant should have five to ten years experience, including plant design, using heavy crusher equipment running as high as 1000 tons per hour. Probable starting salary, \$450 to \$500 per month.

(1331) JR. PETROLEUM ENGINEER. A well established service company has position open for petroleum engineer as oilfield service man. Should have some experience in connection with oilfield operations and preferably in the operation of diamond drill equipment. Starting salary, \$260 per month plus car and expenses.

(1333) MINING ENGINEER. A South American mining company has position open for engineer in one of their base metal mines. A recent graduate will be considered. Should have some knowledge of Spanish. Standard three-year contract with travelling expenses both ways. Salary depending upon experience and ability of applicant.

(1335) ASSISTANT GEOLOGIST. Position is open with mining company located in the middle west and carrying out extensive exploration work. Work will consist of open pit mine maps and sections together with field supervision of ore drilling and sampling program as well as examination and reports. Probable starting salary, about \$300 per month.

(1336) JR. MINING ENGINEER. An industrial company located in Texas has position open for jr. mining engineer with experience in mine, land and road surveying together with mapping

(Continued on page 34)

Professional...
CARDS

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Jean McCallum, '10
Mining & Metallurgical Engineer
Consulting
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Bartlesville Oklahoma

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Joseph J. Sanna, '41
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1975 South 2nd West, Salt Lake City 13, Utah

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

Elmer R. Wilfley, '14
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John H. Wilson, '23
Independent Exploration Company
1411 Electric Building
Ft. Worth, Texas

John H. Winchell, '17
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Harry J. Wolf, '03
Mining and Consulting Engineer
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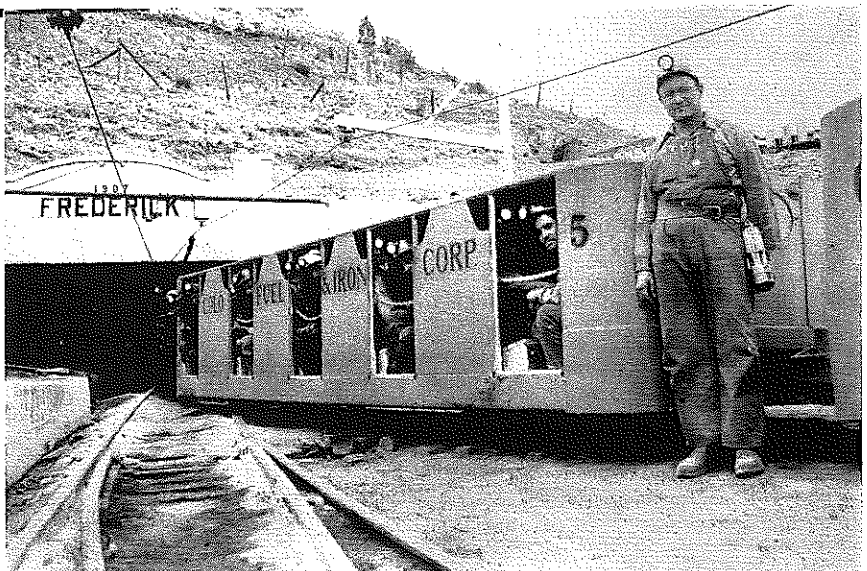
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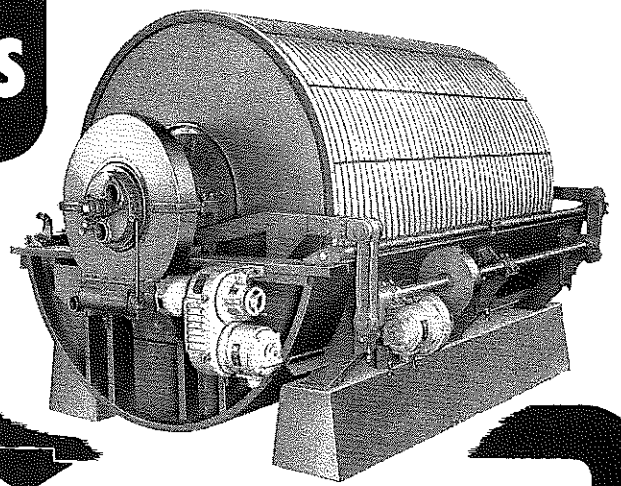
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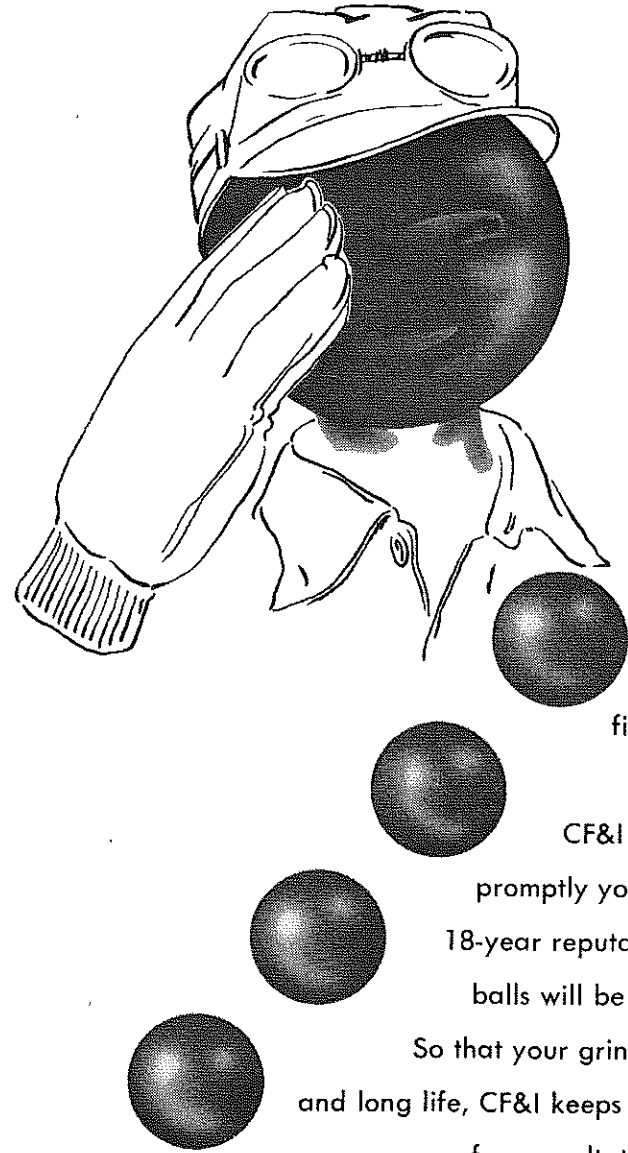
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The Mines Magazine

VOLUME XL DECEMBER, 1950 No. 12

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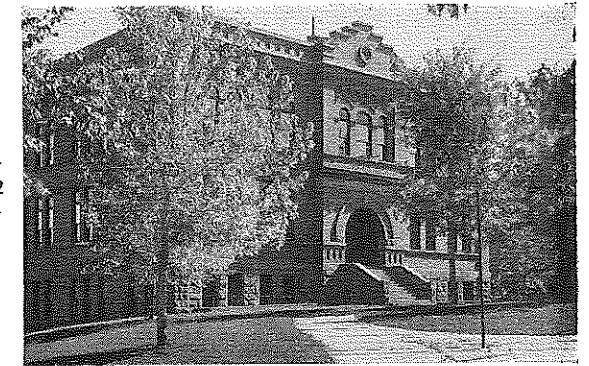
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Wright Head Frame, Colorado Fuel & Iron Company's Sunrise Mine, Sunrise, Wyoming. Height equal to a ten-story building.

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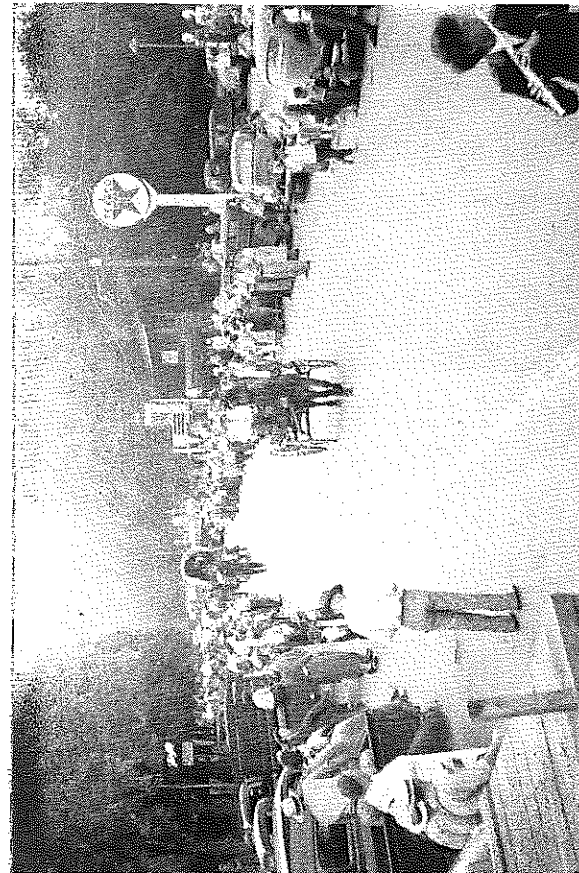
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▼ Right—Close-up of parade on the left.

▼ Left—In front, left to right: Lee K. Worth, '17, and H. C. Price, '13.



▼ All Noel sees "Mines" parade.



▼ Above—Mayor Mott of Noel and Cleve Moss, '02, with Prexie Vanderwilt and S. C. Sandusky, '08 in the back seat, take a chance behind a Missouri mule.

▼ Below—An Oxen drawn "Prairie Schooner," portrays early transportation methods. Mrs. Floyd Belleau between two hard-rock "Miners" enjoys the ride.



TWO-DAY CELEBRATION OF "MINES" ALUMNI

NOEL, MISSOURI
September 15-16, 1950

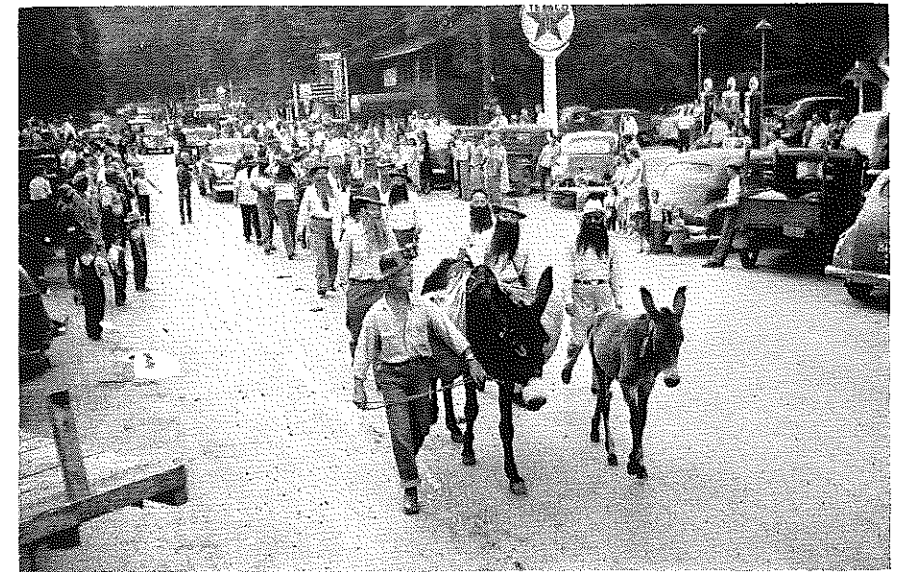
Early in August, Karl Koelker of the class of 1914, former Joplin engineer now living in Noel, Missouri, had the ambitious idea that enough "Mines" men within a six-hour drive of Noel could be attracted to this town for a reunion.

He set about the task single-handed, planning and announcing a program which attracted Alumni of twenty-six classes and their families for a celebration which turned out to be one grand success. Harold C. Price, '13, of Bartlesville, Oklahoma, and Lee Worth, '17, of Tulsa, joined Koelker in getting the program under way.

The festivities began Friday with a registration of the visitors although there was no formal program. Two of the local taverns decorated their places with signs of familiar favorite retreats in Golden when the graduates were students. Here the old timers and young graduates recited many of the old and exciting days at "Mines" and traded experiences since graduation.

Saturday was the big day which started off with a parade through the main street of Noel headed by a mule-drawn wagon. In the front seat were Mayor R. C. Mott of Noel, and C. D. Moss, '02, of Tulsa. In the rear seat was John W. Vanderwilt, President of the Colorado School of Mines and S. C. Sandusky, '08, of Baxter Springs, Kansas. Sandusky and Moss were decorated with long whiskers for the occasion.

Music was provided by the 35-piece Anderson High School Band lead by Miss Martha Berry, band majorette and a group of baton twirlers. Included in the parade was an ox-drawn covered wagon. Riding in the wagon were Jack Turner, '14, Black Hawk, Colorado, Mrs. Floyd Belleau, Webster Grove, Missouri, and F. W.



▼ Here come the "Miners."



▼ The paraders enjoy real hospitality from Mr. and Mrs. Koelker.

▼ Martha Berry and her group of baton twirlers perform for the "Miners."



(Mike) Evans of Joplin, Missouri.

Among others who took part in the parade were Harold C. Price, '13, George H. Wigton, '13, Burwell Kilbourn, '13, Karl L. Koelker, '14, Neil M. MacNeill, '14, Lee K. Worth, '17, Norbert W. Hyland, '22, Floyd M. Belleau, '23, Harry L. Baldwin, '25, Albert P. Buell, '26, M. Park Huntington, '26, Edwin H. Crabtree, Jr., '27, Clement A. Weintz, '27, William H. Courtier, '28, Thomas A. Manhart, '30, John F. Purdum, '30, Harrison L. Hays, '31, Alma J. Hintze, '31, Arthur B. Austin, '32, Lester B. Spencer, '34, Thomas F. Kenney, '36, Robert C. Earlougher, '36, Carl L. Morris, '36, James E. O'Keefe, '37, Carl R. Holmgren, '38, Harold L. Mendenhall, '38, Charles K. Buell, '39, Allen S. Crowley, '39, P. K. Hurlbut, Jr., '40, Jephthae C. Stipe, '40, Walter L. Patty, '41, Fred D. Waltman, '42, Richard F. Moe, '43, John V. Hill, '44, Marshall L. Bailey, '47, and Dave Johnston, business manager of "Mines" Athletic Association.

The parade ended at the Koelker home where there were plenty of cold refreshments waiting for the hot and thirsty paraders.

Saturday afternoon, a tea was given by Mrs. Koelker at the Koelker home and among the guests were Mrs. Lee Worth of Tulsa, Mrs. John Vanderwilt of Golden, Colorado, Mrs. S. C. Sandusky of Baxter Springs, Kansas, and Mrs. Harold Price of Bartlesville, Oklahoma.

The grand event of the two-day program was the banquet served Saturday night in the McDonald dance hall, a 40 x 80 foot floor with a tent over it built especially for the occasion. After the banquet, the tables and chairs were cleared to make room for the dance.

All those who were fortunate to be present at these festivities declared

Scholarships in the School of Mines Columbia University

Several Henry Krumb scholarships are awarded annually to students who are candidates for the B.S., E.M., or M.S. degrees in Mining, Metallurgy and Mineral Engineering from Columbia. The value of each scholarship is \$1,000 together with the cost of transportation from the student's home or port of entry within the United States to New York City.

Write to the Office of University Admissions, Columbia University, New York 27, N. Y. requesting application blanks and announcements.

Applications must be completed before April 1, 1951.



▼ Fun for all.



▼ Baton twirlers do their stunts in front of C.S.M. Banquet Pavilion.

that it was a great success and that they were delighted that they had travelled the distance necessary to be present.

As host and hostess and top enter-

Engineering Undergraduate Award And Scholarship Program

Cleveland, Ohio: The fourth competition in the Annual Engineering Undergraduate Award and Scholarship Program has been announced by The James F. Lincoln Arc Welding Foundation, Cleveland 1, Ohio. The dates for the competition have been extended this year to include one entire year, June 1, 1950 to May 31, 1951.

All resident engineering undergraduates registered in any college offering a degree in any branch of engineering (including agricultural and architectural) are eligible to participate. Awards totaling \$6750 will be made for the best papers on arc welding design, maintenance, fabrication or research. Awards range from \$1000 to \$25 for students and duplicate awards in scholarship funds will be made to the schools in which the main award winners are enrolled.

The Foundation states that it is not necessary to know how to weld or to be en-

tertainers, Mr. and Mrs. Koelker have won the hearty approval of a large group of "Mines" people—they are looking forward to a much larger gathering on the same spot in 1951.

rolled in a course studying some phase of welding. The purpose of the program is to stimulate independent study and investigation by engineering undergraduates into the science of arc welding and its possible application in industry and agriculture.

Rules for the program are available in an illustrated booklet giving suggestions for paper subjects, bibliography, and showing examples of award winning papers. Write:

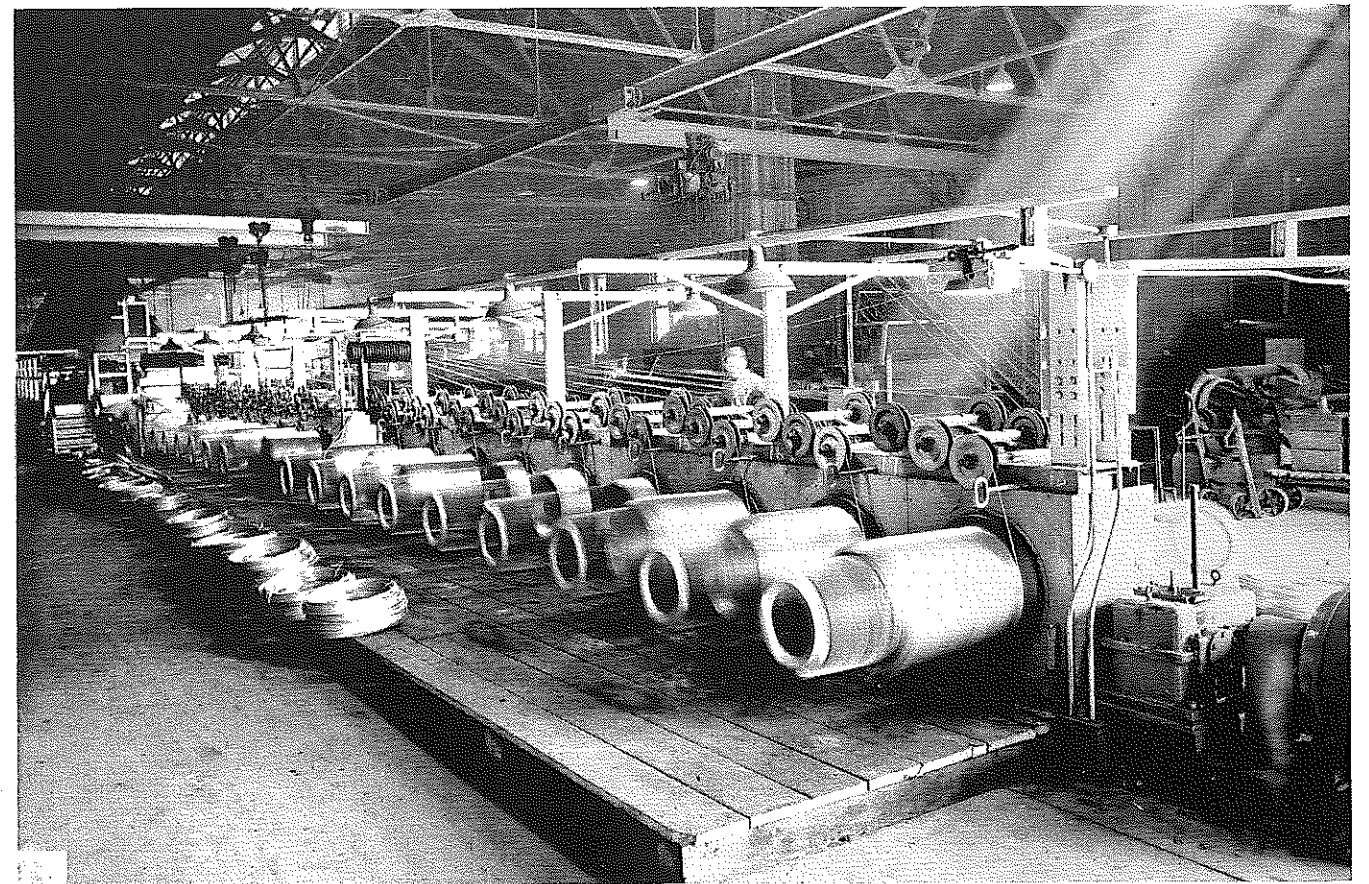
A. F. Davis, Secretary, James F. Lincoln Arc Welding Foundation, Cleveland 1, Ohio.

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▼ Hot galvanizing unit which serves needs of galvanized wire products, C.F.&I. Steel Works, Pueblo, Colorado.

STEEL FOR WESTERN NEEDS[☆]

By

JOHN R. ZADRA, '35

Assistant Chief Metallurgist,
The Colorado Fuel and Iron
Corporation

Pueblo, Colorado

Introduction

We are all more or less familiar with the steels currently produced in the West. However, it is always of interest to explore the origin of the western steel industry and its development through the years to meet the needs of expanding industries. The early history of steelmaking has been linked inseparably with the progress of western railroads, mines, farms and ranches, and other basic industries, and during the past 50 years great strides have been made in building the economic importance of the western empire. Its continued growth in the next half century seems clearly defined, and this subject has been chosen to help provide historical background for the new industrial west.

[☆] Paper presented at San Francisco regional meeting, November 1950.

The growth of the steel industry has made possible the growth of our nation. In 1810 steel production in the United States totaled less than 1,000 tons, and by 1950 total steel capacity had reached over 100 million

tons, more than the production of all the rest of the world. Just as steel has helped build America into the greatest country in the world, it has also

helped to build the West into a vital segment of the nation's economy and strength.

The basic industries of the West have grown in importance throughout the years and today its copper, lead, zinc, and other minerals; its oil and gas production; its wheat, corn, sugar, and other farm products; its sheep and cattle; and, since the end of World War II, the expanding volume and variety of its manufacture and fabrication have all contributed in great measure to the progress of the entire nation. Steel has played a vital role in this great development and will continue to do so in future years as the vast resources of western states are brought into greater production and expanded usefulness.

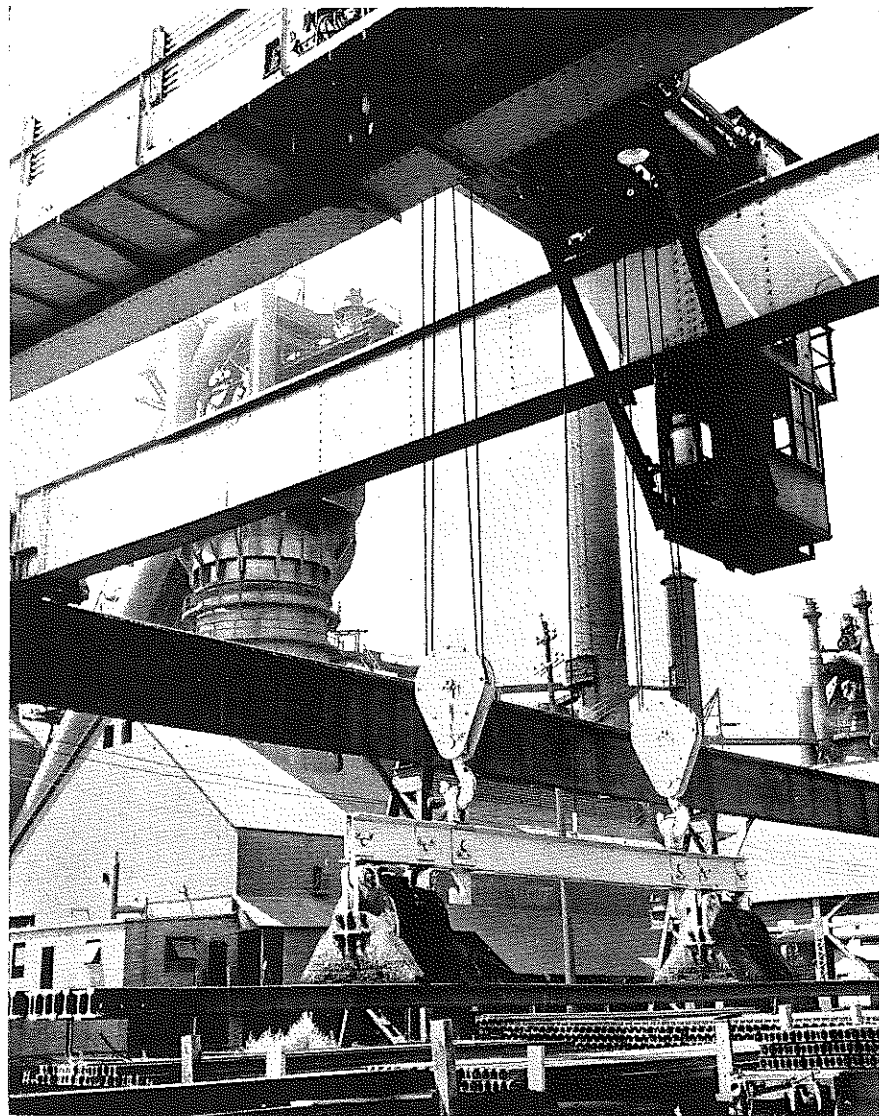
Historical

Copper was probably the first metal to be utilized, due to its being found free in the earth. Later, iron came into use because of its greater toughness, strength, and hardness. Its use in India and China is recorded as far back as 2,000-3,000 B.C. Iron was first discovered in the United States in North Carolina in 1585, and construction of the first iron works was



JOHN R. ZADRA

tons, more than the production of all the rest of the world. Just as steel has helped build America into the greatest country in the world, it has also



▼ Loading C.F. & I. rails at rail dock showing powerful magnets loading rails on railway flat cars.

begun in 1619 near the present city of Richmond, Virginia. This works was destroyed in an Indian raid on the day the furnace was first lighted. The first iron works to be operated successfully over a period of years was built at Saugus, Mass., near Lynn, about 1645. The earliest known iron furnaces west of the Missouri River were a furnace near the present community of Cedar City, Utah, in 1851, another in Missouri in 1879, and one that was built in Pueblo, Colorado, in 1881.

At the end of the nineteenth century iron was classified by the International Committee of 1896, affiliated with the American Institute of Mining Engineers, as nonmalleable iron and malleable iron. The former melted suddenly upon heating, and the latter softened upon heating before melting. From 1784 up to about 1856, the first form of refined iron was

wrought iron, made possible through the development of the puddling process. This was followed in 1856 by the bessemer process for making steel, which was the first kind of steel to be used extensively for rails at the time when railroads were being built in various parts of the nation. In 1868 open hearth steels were beginning to be produced which was a refinement over the bessemer grades. By 1898, 74 per cent of the steel was produced by the bessemer process, 24 per cent by the open hearth process, and one per cent by the crucible process. The production in the year 1898 in the United States was about 12 million tons of pig iron and 9 million tons of steel or about one month's production, based on today's producing capacity, of which 90 per cent is produced by the open hearth process.

The bessemer steel grades which were being produced at the turn of

the Twentieth Century were for wire rods, wire nails, cut nails, bridge material, beams, angles, and rails. The open hearth steel grades produced were for boiler plates, both fire box and flange quality, bridge and building materials, such as rivets, tension and compression members, sheets and machinery forgings. It is interesting to note that no reference was made, insofar as the open hearth steels were concerned, to the types of steels that are known today; that is, rimmed, capped, semi-killed, or killed. Today, open hearth steel production has some 70 standard carbon steel grades specifying various chemical ranges and limits, and includes all four types. In addition, many grades are made whereby the mechanical property requirements dictate the chemical composition and type.

Iron and Steel Developments

The expansion in metal and coal mining, railroads, agriculture, machine and metal manufacturing shops, as well as the increasing demand for structural shapes in the industrial operations of the Trans-Mississippi territories, and the availability of deposits of iron ore and coal, led to the organization of The Colorado Coal and Iron Company in 1880. In 1892, The Colorado Coal and Iron Company was merged with The Colorado Fuel Company and became The Colorado Fuel and Iron Company.

The Colorado Coal and Iron Company in 1881 had erected a blast furnace and foundry at Pueblo, Colorado, and in 1882 a bessemer converter, blooming and rail mill, a puddle mill, plate mill for cut nails, a spike and bolt mill, and a 20-in. bar mill. The iron production from the blast furnace was 80 tons per day. The bar mill rolled puddled iron into muck bars which in turn were piled into "box piles" or "fagots," heated to a temperature at which the mass would weld together and subsequently rolled to the desired shape, such as angle iron, iron bars, flats, and rounds. Among the finished products made were iron horse shoe nails, spikes, and bolts.

On April 12, 1882 the first bessemer steel ever produced west of the Missouri River was rolled at the Pueblo plant rail mill into 30-pound rails for The Denver and Rio Grande Railroad. Total steel rail production for that year was 16,000 tons, or about the equivalent of two weeks' production at the Pueblo rail mill today. By 1892 the annual steel production had increased to 26,000 tons of rails and 12,000 tons of other finished products. The growing West and increased

agricultural, ranching, mining, petroleum, and building activities stimulated further steel mill expansion and improvements to supply a greater volume and variety of steel products. During the years between 1892 and 1904, The Colorado Fuel and Iron Company constructed additional blast furnaces, new open hearth furnaces to meet the demand for open hearth steel and products, a new blooming mill and rail mill, a new bar mill, a new rod and wire mill, a new nail mill, and a new structural mill. Other finishing units were added in later years to produce a full complement of finished rail and accessory products for western railroads as well as other finished products for diversified use by other western industries.

On the West Coast, rolling mill operations were pioneered by the Pacific Rolling Mill Company in 1868. It produced rails, angle iron, iron bars, bolts, spikes, railroad and ship forg-



▼ Drilling for placement of C.F. & I. Roof Bolts, Coal Mine, Trinidad, Colorado

ings from puddled iron. Also, in 1884 this company started the earliest steel production, but discontinued operation in 1897. Other steel producers, such as the Union Iron Works in 1899 and the Pacific Jupiter Steel Company in 1907, both located in San Francisco, started producing steel for castings and crucible steel respectively. The Columbia Steel Company, located at Pittsburg, California, and the Pacific Coast Steel Company, located at South San Francisco, both organized in 1909, began steel production for castings in 1910. In the ensuing two decades of the Twentieth Century, expansion in steel production continued on the West Coast for the production of steel castings, steel ingots, billets, bars, structurals, wire products, sheets and tin plate, to meet the steel demands of western needs. In recent

years the growth in the demand for flat rolled steel products in the form of sheet and tin plate prompted the installation of the first cold reduction sheet and tin plate mill west of the Mississippi River at the Pittsburg works of the Columbia Steel Company. Also, since World War II, the Geneva Steel Company at Geneva, Utah, has converted its plate mill to produce both plate and hot rolled coils; other western steel producers have added capacity to produce pipe and a variety of other products to round out their product lines.

Early Building of the West

America has been settled mainly by enterprising immigrants seeking economic opportunities and economic freedom. In 1800, 5 million Americans were scattered over an enormous country that reached from the St. Lawrence Valley to the border of Spanish Florida, from the seacoast to the Mississippi. Not one in ten among them lived in a town of a thousand inhabitants, and all but few outside these towns were farmers.

Roads were few and in very bad condition. Turnpikes and canals were just beginning to be built. There were no railroads, telegraphs, or telephones. Natural waterways provided well for internal and coastal trade in America. To the East was the Atlantic, to the North the Great Lakes, to the South the Gulf of Mexico, to the West the Ohio and Mississippi, all traversing long distances and deep enough for navigation.

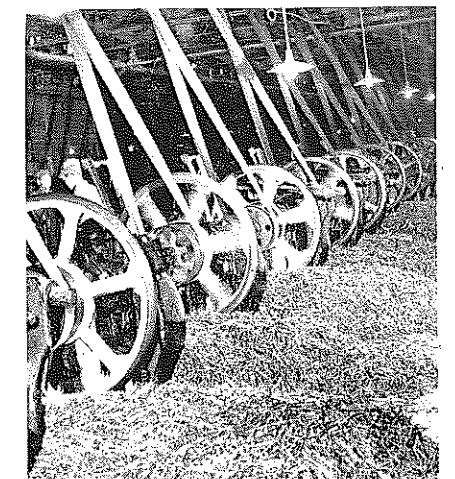
Settlers moving inland and outward beyond the river valleys, however, were soon past the reach of steamboats plying natural waterways. To send their produce to market and to get manufactured goods from Eastern ports and factories, these settlers required overland connections. Travel over turnpikes was slow and expensive. Water transportation was much cheaper, but during winter months the northern routes were frozen. It remained for the steam railroad, therefore, to free industries from horse and wagon travel and open the West for new industry development.

While textile and other factories in New England and the Middle States were absorbing new groups of factory employees, the agricultural West was being transformed by immigrants from Europe and farmers from the East. By 1840 the West was becoming permanently settled by farmers, merchants, and a few manufacturers.

Railroad Construction—Had the United States been content to depend upon animal power and hand manu-

facturing processes, it would have made slow progress. Also, the factories of the East, without railroads, would not have been able to ship their goods to market, and the large wheat crops of the early West would have rotted in the fields had there been no machines to harvest it.

In 1851 the Erie Railroad pointed the first trunk line railroad toward the West. By 1860 the New York Central, the Pennsylvania, the Baltimore and Ohio, and the Erie had direct rail connections to Chicago. By 1869 the Union Pacific had completed its Northern transcontinental route linking the East with the West. The development of the Southern Pacific, the Santa Fe, the Burlington, and other roads through western states



▼ Battery of nail machines, essential part of C.F. & I. Plant

stimulated commerce, agriculture, and other industry.

Thus, the development of the railroad industry in the West gave western steel mills an opportunity to provide such steel products as rails, track spikes, track bolts, tie plates, and joint bars. The Colorado Fuel and Iron Corporation is today the largest and only western producer of rails, and, in combination with other western producers, supplies track accessories for western railroad needs.

Mining—The mining industry, stemming from the California gold rush of 1849 and the discoveries of gold, silver, lead, and zinc in the two decades that followed in the other western states, found an urgent need for superior mining machinery and equipment over the early hand methods employed in mining operations with primitive tools and equipment. To accomplish this, companies were organized in Colorado and the West for the manufacture of mining machinery, including steam boilers, steam engines, smelter machinery, rock

drills, mines cars, hoists, and tube, ball and rod mills. Iron and steel in the form of castings, rolled shapes, bars and plates for fabricating this machinery and auxiliary equipment came from foundries connected with the fabricator and opened new markets to western steel mills. Besides the iron and steel products used in fabricating machinery, other specialty steel products, such as grinding balls, grinding rods, mine rails, roof bolts, and other products for mining and milling operations, have been developed for western mining needs.

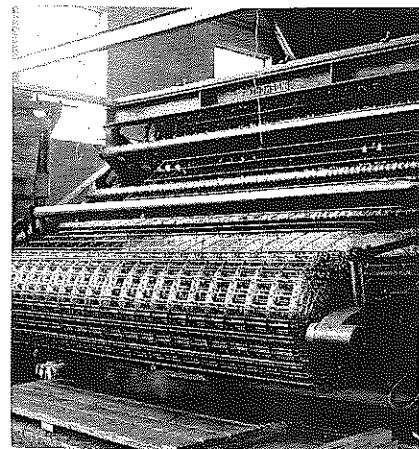
Agriculture and Livestock — Early mining in the West served as an inducement for settlers to enter the various territories, and the establishment of mines and farms also stimulated transportation development. Pioneers to the West founded principal cities which in turn provided real incentive for agricultural development. Total revenues from cattle ranches, fruit farms, wheat farms, and other farmed fields have grown tremendously through the years. The agricultural and livestock industry brought new product needs to western steel mills in the form of baling wire, various types of field and farm fence, fence posts, poultry netting and barbed wire, welded wire fabric, and other wire items. Rolled steel products, such as small structural shapes, angles, bars, sheets and tin plate, and grader blades, have also been needed in the manufacture of various farm implements, wind mills, pumps, tin cans and other equipment by this great industry which serves the West and the nation.

Construction—About 1890 the construction of foundations, retaining walls, and similar structures changed to a greater use of cement concrete. Through research and improvements in technique, the cement industry grew rapidly. The development of reinforced concrete in which steel is embedded in the mass of concrete, brought greatly improved conditions in the use of concrete for foundations of structures. Thus, another new market was opened to western steel plants in the rolling of reinforcing bars.

The lumber and building industries have played a vital part in the development of the West. Railroads provided transportation of forest products to cities and towns for the building of homes, churches, schools, hospitals, and industrial buildings, and this in turn stimulated the demand for common nails, staples, stucco netting, bars, small shapes, and other products of western steel mills.

Petroleum — The petroleum industry in the United States dates back to

1859. This industry places California as the second largest oil producing area in the United States, producing 20 per cent of the nation's output. Thus, another great western industry has provided western steel mills with a large market for rolled structural shapes and bars for steel fabrication and erection of oil derricks, towers, pumps, sucker rods, and other machinery and equipment vital to oil and gas production. The Bethlehem Pacific Coast Steel Corporation is the largest fabricator of oil well equipment for western petroleum needs.



▼ Clinton Welded Fabric a C.F. & I. product used in highway building construction work for reinforcing concrete.

Distribution

The distribution of steel and other related products has been another important part of western development. Jobbers, dealers, and distributors have supplied the diversified needs of expanding industries in a most efficient manner.

Manufacturing and Research

For many years western states lagged behind other sections of the country in the field of manufacturing. In recent periods, however, great progress has been made in the West, both in expanding present plants and in attracting new manufacturing industries. This is helping materially to balance the former agricultural and mining economy, and is providing new market and production opportunities.

Research has been the keynote of western progress. The science of geology, chemistry, and metallurgy, combined with many years of experience in the manufacture of steel and the forming of finished steel products has helped basic western industries to make a vital contribution to both peacetime growth and wartime production. The West of today is still a huge research laboratory for both private and governmental explorations, including oil and gas development, new steel and wire products,

the hydrogenation of coal, oil shale investigations, atomic energy research, reclamation projects, new refining processes for minerals, diversification and improved quality of steel products, new uses for farm products, as well as broad programs of research by railroads to provide safe, high speed transportation.

Conclusion

To supply the steel requirements of the United States and to maintain its position of world leadership in steel production, the steel industry has spent over one and one-half billion dollars since January 1, 1947, for expansion and improvement of facilities.

American Iron and Steel Institute reports that the most significant expansion has taken place in western states. California has become one of the first ten steel producers in the country; Colorado has maintained high production and continued to diversify its line of products; and Utah has become an important factor in steel production. Western steelmaking capacity has increased from about 2 million tons in 1940 to over 5½ million tons in 1950.

The West has made great progress in the past 50 years and its people look to the next half century with full confidence that its record of achievement can be maintained. The steel industry of western states will do everything possible to aid in the development of other industries; it will continue its efforts to broaden its economic position in the overall economy of this nation; and above all, it can be depended upon to give full support to the defense of our country and the perpetuation of our American way of life.

PERSONALS

(Continued from page 3)

Robert J. Black, '49, joined the staff of the Humble Oil Company last month, his work being with a seismograph field party. His present address is 3006—25th Street, Lubbock, Texas.

A. F. Boyd, '26, is being addressed 2124 No. 6th Street, Grand Junction, Colorado.

Robert D. Brace, '49, is Geologist for Standard Oil Company of California, his mailing address being Box 2605, Salt Lake City, Utah.

Lt. Col. Robert W. Brown, '39, has been transferred to Wright-Patterson A. F. B. at Dayton, Ohio, where he is addressed Hq. Air Material Command, Box 965.

John J. Chapman, '41, who has been in Venezuela for several years as Geologist for Creole Petroleum Corporation, is at present, in the States with address Route 2, Clyde, North Carolina.

Major James S. Cogswell, Ex-'38, has been transferred from Fort Warren A. F. Base, Wyoming, to Tyndall A. F. Base, Florida, P. O. Box 203.

(Continued on page 24)

POST-WAR REHABILITATION AND MECHANIZATION OF A PHILIPPINE CHROMITE MINE

By A. P. DAVIDSON, '26*

The Coto Mine is located twenty-seven kilometers inland from the China Sea, on the west coast of the Island of Luzon of the Philippine Islands, at fifteen degrees thirty minutes north and one hundred and twenty degrees east of Greenwich. By road the Coto Mine is roughly two hundred and seventy-five kilometers north and west of Manila, or two hundred and fifty kilometers south and west of Baguio, traveling time in either case being about six hours.

The claims comprising the Coto Mine were staked early in the 1930's. This was a period, in the Philippine Islands, when venture capital was very interested in mining. The Consolidated Mines Incorporated was formed with a book capitalization of 5,000,000.00 (five million pesos) in one centavo shares. Much of the money raised through the sale of shares was used for the construction of a road from tide water to the Coto Mine.

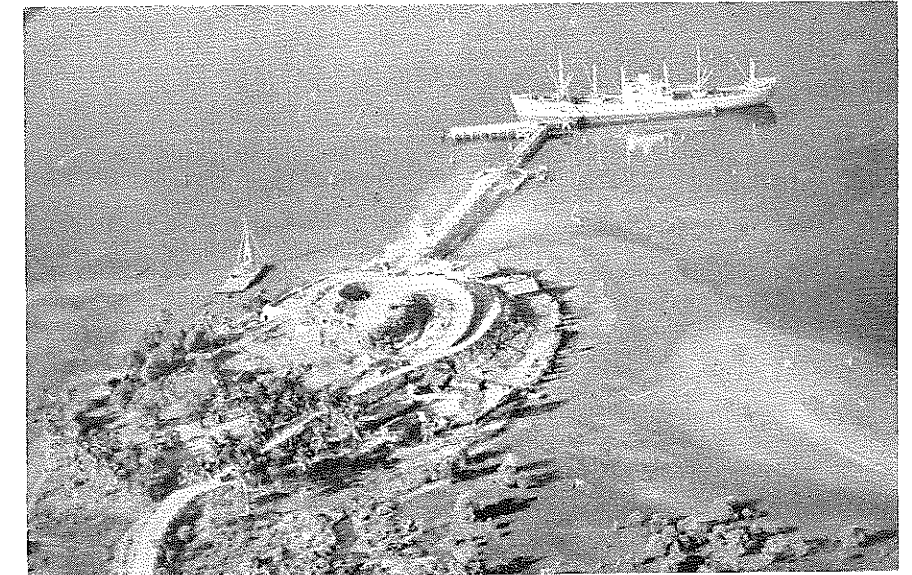
In 1934 the market for Refractory Chromite was at best both limited, and uncertain. However, Benguet Consolidated Mining Company, under the direction of Judge John W. Haussermann its President, realizing the potential value of the deposit, entered into a financing and management contract with the Consolidated Mines Incorporated.



▼ Staff House — Coto Consolidated Mines Contract Benguet Cons. Mining Co., Masinloc, Zambales, P. I.

Zambales, the Province in which the Coto Mine is located, is for the most part a mountainous province. Along the coast the coastal plain is, at points, non-existent and seldom reaches a width exceeding ten miles

* General Superintendent, Chrome Mines Benguet Consolidated Mining Co. Masinloc, Zambales, Luzon, P. I.



▼ M. S. Bahome loading at Masinloc. Swede and a good one. Ore bins in lower left.

at any point. The mountains are steep and covered with jungle or hardwood forests. The higher mountains of the region exceed six thousand feet elevation.

The temperatures throughout the year will vary from a low of sixty-five degrees to a high of less than one hundred degrees. The humidity is high. Rainfall is heavy but occurs largely between the months of May and October. Typhoons are a hazard during the last six months of a year but can occur during any month.

The climate is not particularly unhealthy. Malaria has in the past been prevalent during the drier months of the year, occurring in one of its more malignant forms, but supervised use of the recently developed Aralen has brought it under control during the past two years.

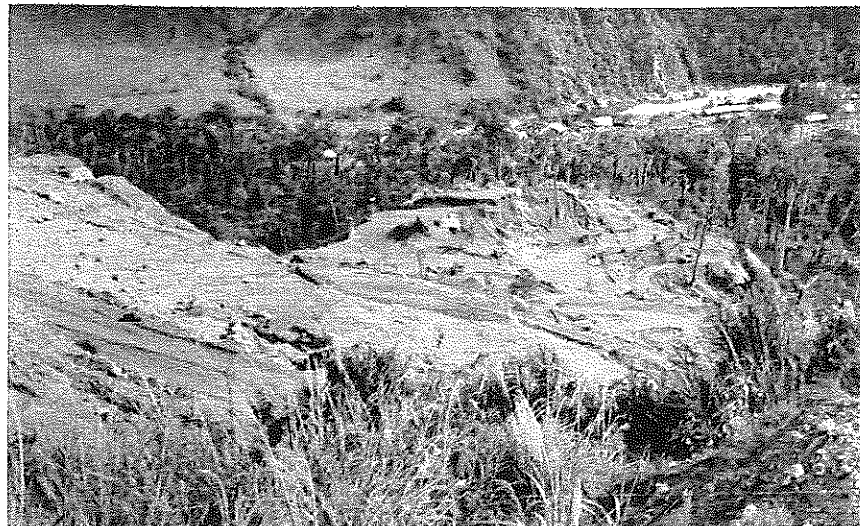
While the management contract between Consolidated Mines Incorporated and Benguet Consolidated Mining Company was entered into in 1934, the first shipment of ore was not made until 1936 as a construction program had to be completed and a market developed for the ore. Intermittent shipments continued through the years 1937, 1938 and 1939 but it was not until 1940 and 1941 that the market accepted any considerable tonnage.

The initial Pre-War production was of the so called "float ore" found scattered over the lower slopes of the mountain containing the ore body, and then expanded to mining ore in place. Ore in place was then, as it is now, mined from working benches cut along the slope of the ore body.

Records of the Pre-War operation are not intact and will not be referred to. Sufficient to state that at the time War broke out, the Company had a good concrete pier at tide water, bin capacity at the dock exceeding twenty-five thousand tons, scales for weighing ore, a small-scale ore washing plant near the mine, a camp near the mine with the usual facilities, and a road from the mine to the pier which was in good repair and which did not exceed a maximum of a five percent grade except on the ore body itself.

December 1941, on orders from the United States Army, the pier at tide water was dynamited. The spans behind the pierhead were completely destroyed and the pierhead itself was shattered.

During the War all rolling stock was taken over by the United States Army and all mechanical equipment, supplies, and buildings were lost during the occupation to either the invader or to the local people. A small



▼ From ore body looking down over working faces towards the Mine Camp and the Luis River.

amount of ore on the pier was evidently shipped to Japan but apparently the Japanese technique could not handle this ore.

By 1945 the only physical assets were remnants of the pier which had been poorly repaired by the Japanese, the ore bins of concrete construction only as the timbered ore bins had fallen into ruin, a roadbed overgrown with tropical vegetation, and thirty-two bridge sites. The bridges had either been removed for the lumber in them or had rotted away during the period of no maintenance.

The Pre-War sales efforts of the Benguet Consolidated Mining Company had created a demand for Refractory Chromite from the Coto Mine. Once hostilities ceased, consumers requested shipments of ore to supply what is apparently at least a 240,000 ton yearly market. The Refractory Chromite from the Coto Mine is now accepted as the best ore of this type on the market, not only because of its very consistent grade and texture, but also because the quantity of ore available is sufficient for many years to come. This assured supply creates the confidence needed to development and expand the present market.

Refractory Chromite's greatest use is in the manufacture of fire brick used by the steel industry. Refractory Chromite is also used in the manufacture of refractory cement. Undoubtedly other uses will be found or developed.

Immediately following suspension of hostilities, Benguet Consolidated Mining Company started to bring the Coto Mine back into production. As soon as members of the staff recuperated partially from the effects of internment by the Japanese, crews of workmen were employed and rehabilitation commenced.

Tropical vegetation was cleared from the road surface and the road was reconditioned for heavy traffic. All bridges were rebuilt. Several months were required for this work as lumber for bridge construction could only be obtained from the adjoining forests where logs were hewn by hand.

Fortunately War Surplus became available. From this source Benguet Consolidated Mining Company purchased Bull-dozers, compressors, trucks, a sawmill, tents, foodstuff and many other critical supplies. Consumer goods were not available shortly after the War and deliveries from the United States were slow, so it was only because War Surplus was available that immediate progress could be made.

Temporary offices and staff quarters were established in the town of Masinloc. Tents were pitched at the camp site. The sawmill was put into operation. As rapidly as even limited shelter became available, labor was recruited from neighboring provinces as insufficient labor was available in the locality.

Credit should be given to Mr. J. S. Peterson, Assistant General Manager and Vice President of Benguet Consolidated Mining Company for the

	Cr ₂ O ₃	SiO ₂	Fe ₂ O ₃	Al ₂ O ₃
Consumer Requirements	+ 32.00%	- 5.00%	- 11.00%	+ 25.00%
Pre-War Averages	33.67%	4.19%	10.18%	29.84%
1947 Shipments	32.48%	5.09%	10.99%	28.85%
1948 Shipments (First Half)	32.39%	5.24%	11.13%	28.71%
1948 Shipments (Second Half)	32.47%	5.16%	10.26%	29.32%
1949 Shipments	32.87%	4.66%	10.26%	29.72%

effort which made Consolidated Mines Contract the first mine to enter production after the War. Credit should also be given to the first General Superintendent after the War as he did not return to the United States

until ill health resulting from internment forced him to do so. From 1947 until June of 1948 the operation was under an Acting General Superintendent at which time the writer came to the Philippines to become General Superintendent of the Consolidated Mines Contract of Benguet Consolidated Mining Company.

The Post-War production record has been as follows:

April 1946 through the year 1946
17 ships loaded with 55,000 long tons.
Year of 1947
57 ships loaded with 148,000 long tons.
Year of 1948
73 ships loaded with 231,600 long tons.
Year of 1949
52 ships loaded with 164,980 long tons
Year of 1950 through September
45 ships loaded with 138,140 long tons.

During the third quarter of 1949 operations were curtailed and then suspended during the fourth quarter, but resumed on a minor scale during the first quarter of 1950 followed by increased production with greatly increased production anticipated for some time in the future.

At the time ore deliveries were resumed the consumers held very little if any stocks of Refractory Chromite. As shipments increased the quality demanded by the consumers gradually stiffened until the consumers required that only lump ore be shipped. The term "lump ore" has never been well defined but it is generally accepted as meaning more than ninety percent plus one quarter inch. Much of the ore is friable and tends to create fines when handled with heavy equipment during the loading and unloading of the ships as well as the handling in trucks and in the ore bins. Even when ore shipped from the mine is all plus two inches, there is an appreciable amount of fines at the time of delivery. The presence of silica in the ore is very undesirable. Consumers believe that the fines carry higher percentages of silica than the lump ore but this is not necessarily true. A high combined percentage of chromite and alumina is desired by some consumers. The following is a tabulation of ore deliveries:

The comparatively high Pre-War chrome content was obtained from the so-called "float ore," which as the result of weathering had lost some of the associated minerals. The improvement of the grade of ore delivered

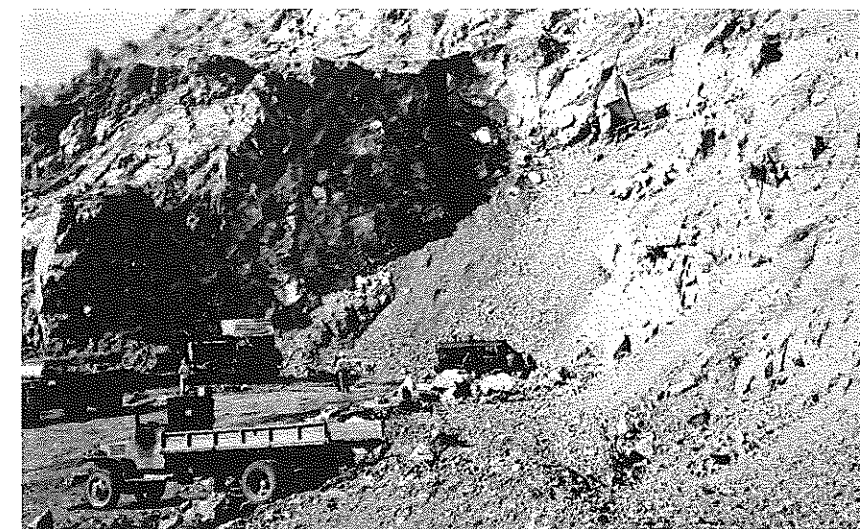
during the last year and a half is the result of cleaner mining and use of the new Washing Plant.

The mineral chromite as found in the Coto Mine in its purest state is probably about 36% Cr₂O₃, 1% SiO₂, 10% Fe₂O₃, 33% Al₂O₃, 18% MgO, 2% CaO and other fractions. The ore occurs in lenses ranging in width from narrow seams up to forty or fifty feet which are separated by dikes with a similar variation in width. Generally the lenses dip at about sixty degrees and have a strike running north east, but there seems to be no true pattern. Lenses at the limits of the ore body may have a strike and dip differing from adjoining lenses. Each lense in itself is reasonably consistent in grade and texture but adjoining lenses may have different characteristics. Some lenses within the major ore body have such a high percentage of serpentine associated with the chromite that the ore is worthless at present. It is possible to grind the ore and free the chromite but the market for fine chromite is limited.

Following the War the first shipments were made from ore remaining on the ore bins from the Pre-War production. With equipment purchased from War Surplus the Pre-War mining benches were uncovered and worked. As the consumer requirements made the finer sizes undesirable those finer sizes together with the waste material from dikes separating the lenses were by necessity shoved over the edges of the benches and accumulated into dumps. As these dumps grew and faces expanded a great amount of interference developed. However, this practice was justified and necessary in order to meet the rapidly increasing consumer demands. Until the summer of 1948 mining was carried on only at the locations of greatest ease of access and



▼ Shovel loading chromite from old dump.



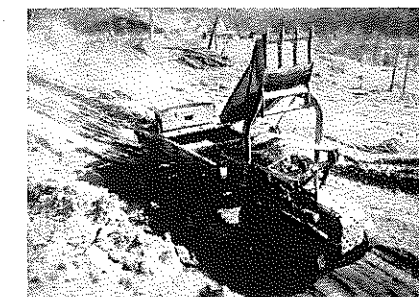
▼ A working face on the ore body.

where the overburden was of the least depth. In June 1948 a working bench was developed at the top of the ore body which was also the highest part of the mountain. From this location a series of benches have been developed and systematic stripping undertaken.

Late in 1948 three Carry-alls were purchased from Surplus. These units are pulled by D-7 Caterpillar Tractors. Stripping is done almost entirely with these Caterpillar Carry-all units. The labor cost of this stripping is about Po.05 per cubic yard when the carry is not over three hundred yards, but the equipment maintenance and operation charge is considerably higher.

In September 1948 the first of three units of Athey Loaders was placed in operation. The Athey Mobile Loader is a unit similar to the Eimco Loader but is installed on a D-4 Caterpillar Tractor and powered by a hydraulic system. This has proved to be a very satisfactory unit being much more mobile than the 1/2 cubic yard

Bucyrus-Erie shovels purchased recently, but the operating and maintenance cost is high. The shovel is more economical whenever the broken ore or dump to be loaded exceeds one thousand tons. However, the Athey Loader will load up to one thousand tons in an eight hour shift but five

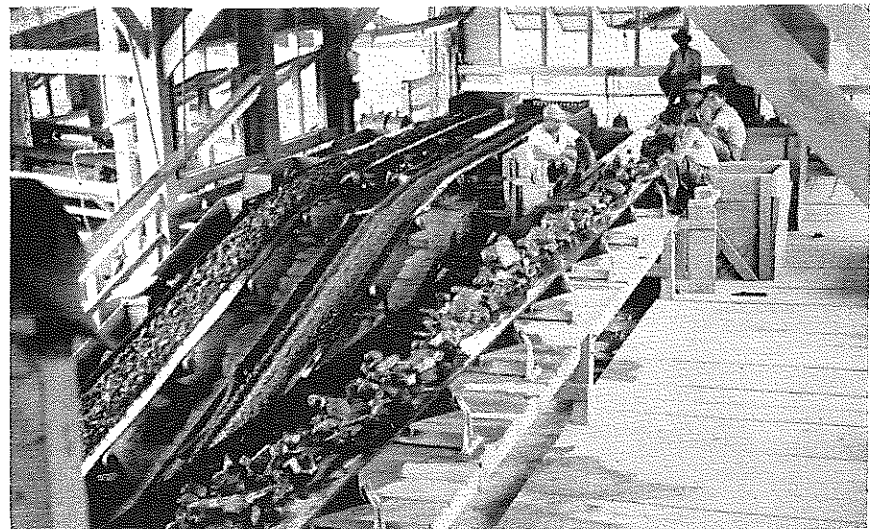


▼ Athey Loader discharging ore into truck.

hundred tons is much nearer to the daily duty. The labor charge on Athey Loader loading is four centavos per ton.

Before the Washing Plant went into operation ore was broken at the working bench and loaded onto trucks which delivered the ore directly to the wharf ore bins. Usually most of this ore was obtained by barring the face with a point bar and blasting only the toe of the face. Stone forks were used in place of shovels, but even so a high percentage of fines were loaded.

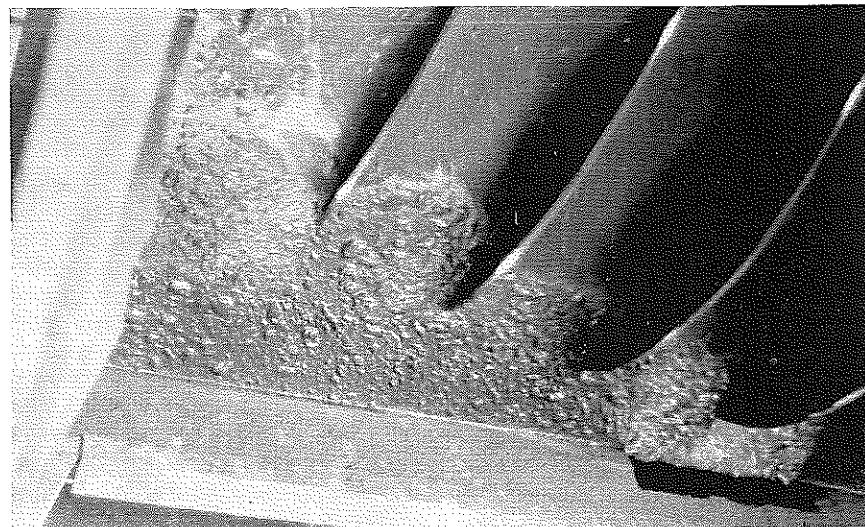
With the operation of the Washing Plant loading of ore into trucks to be sent directly to the wharf ore bins has been limited to ore picked up with the bare hands, thus eliminating most of the fine sizes as ore loaded in this manner is plus four inches. This practice will continue while the Washing Plant and Heavy Media Separation Plant are being fed material from the accumulated dumps, but once freshly broken ore is sent to those plants their



▼ Picking waste in Washing Plant. The other two belts deliver ore to the Heavy Media Separation.

capacity will increase and lump loading will be a thing of the past.

Current practice is to load lump ore onto trucks entirely with men employed by contractors, these men not being on the Company payroll. The ore being sent to the Washing Plant is hand loaded by Company employees who, aside from the shift bosses and road crews, are all on piece work contract. Cost of labor for these contracts is roughly P0.20 per ton for drilling and blasting and a similar amount for the operation of all heavy equipment which includes Bull-dozers, Carry-all units, Athey Loaders, half yard shovels, rooters, rollers, and road grader. This practice coupled with the operation of the Washing Plant and Heavy Media Separation Plant has allowed the maintenance of production equal to market demands with a great reduction in number of men employed.



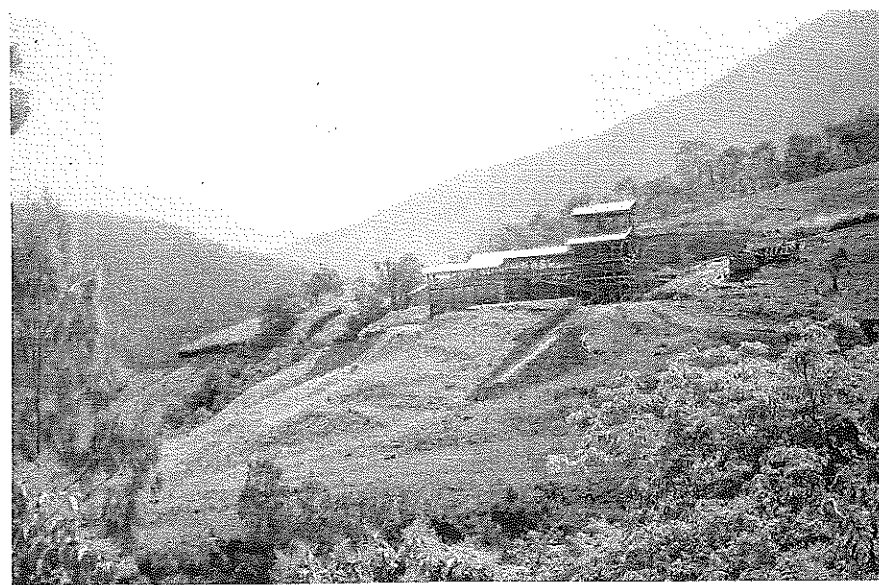
▼ Float in separator of Heavy Media Separation.

Immediately following the War trucks were purchased from Surplus and placed in the hands of Company

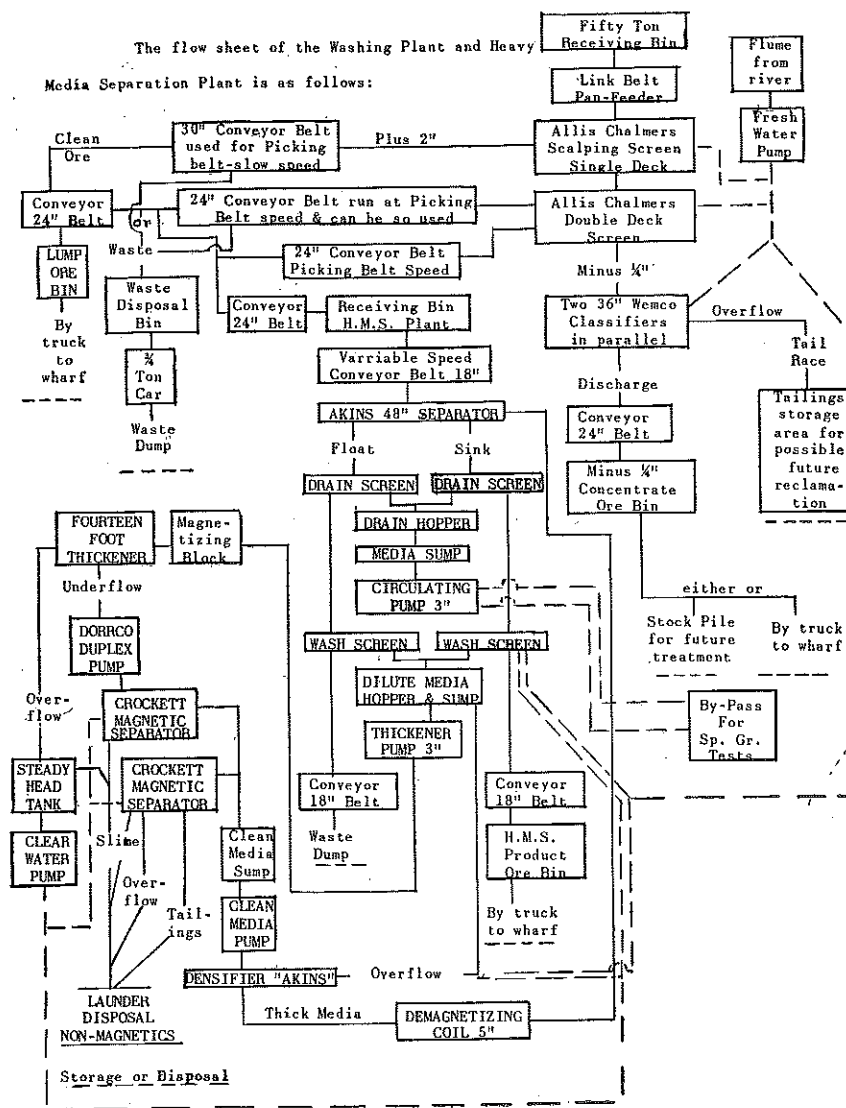
employees. This operation was costly and far from satisfactory. However, as individual Filipinos received payments from War Damage they purchased trucks from War Surplus. These independent Philippine contractors have been given contracts to haul the ore from the mine to the Washing Plant or to the wharf from either the mine or the Washing Plant. At present forty such contractors using one hundred and forty trucks have contracts. This condition, while satisfactory, can not continue indefinitely, as unfortunately, few of these contractors will put money aside to purchase new trucks to replace trucks wearing out. With the realization that a transportation problem is developing, surveys are now being made for a rail line from mine to Washing Plant and from Washing Plant to wharf.

The hauling contract now in force provides for ore deliveries to wharf from the mine for P3.50 per long ton (2240 pounds) or if the ore is loaded by the hauler the price is P4.00 per long ton. Ore hauled from the Washing Plant bins to the wharf is at P2.75 per long ton which is based on P0.105 per ton mile. Dump trucks bringing ore from the mine to the Washing Plant are paid P0.30, P0.40, or P0.50 depending upon the elevation on the ore body at which the ore was loaded. All trucks are weighed immediately before and after discharging their load and payment is made on difference of those two weights as registered on the hauling card.

Early in 1948 the construction of a Washing Plant was decided upon. Mr. L. W. Lennox, class of 1906, Metallurgist and Board of Directors for Benguet Consolidated Mining Company designed the Washing Plant. Construction was started during the summer, the building was



▼ Masinloc Washing Plant for Chrome Ore under construction.



completed in November, but as machinery in some cases did not arrive until early in 1949, operation was not possible until late February of 1949.

The Washing Plant accepted a material which had previously been placed on dumps. A good clean lump was produced but the sizes of minus one inch could not be handled successfully. The fraction of plus 1/4" minus 1" which comprised a large percentage of the total feed was stock piled after washing and will now be treated in the Heavy Media Separation Plant. The minus 1/4" sizes sent through a 36" Wemco Classifier cleaned up into a very good product with an average analysis, when the better cleaner ore was being used, of approximately 35% Cr₂O₃, SiO₂ down to 2.5% and other fractions about the same as the mine ore. The total tonnage produced exceeded expectations. It was necessary to install a second Wemco Classifier in parallel in October 1949. The first shipment of this -1/4" concentrate

was shipped in May of 1949. The consumer tested the material for several months and in January 1950 started purchases at the rate of from 2,000 to 2,500 tons per month.

American Cyanamid completed tests on the plus 1/4" fraction with satisfactory results. A package plant rated at fifty tons an hour was purchased from Southwestern Engineering in Los Angeles.

The first trial operation with the Heavy Media Separation Plant was in mid May with consistent operation being attained in late August. Several changes in the installation were made but on the whole the installation has been very satisfactory.

The greatest difficulty in the Heavy Media Separation operation was in training employees in the operation of the plant, this being the first Heavy Media Separation Plant in the Orient. Mr. Malcom Glen of American Cyanamid was present during the

initial stages of the operation and was a great help.

Media losses have been high but the operation has been in effect for only two months. Operating technique is improving and a second Crockett Magnetic Separator has been ordered. Reasonable media losses are anticipated with the installation of the second Crockett Separator.

The ore is sold "Free On and Free Off" which means that stevedoring is a part of the operation. The ore in the Wharf Ore Bins is drawn off through chutes located below ore bins into tubs mounted on trucks. The tubs are rectangular in cross section with a slight taper on the side to insure a clean discharge when dumped. The track gauge is eighteen inches. The track is thirty pound rail. The distance from the ore bins to the pierhead is approximately one thousand feet. Previously tubs were hand trammed to the pierhead but hand trammers have been replaced with a small Brookville diesel powered locomotive.

The stevedoring operation consist of spotting a full tub under the boom of the ship where a spider chain with four hooks can be hooked onto the four corners. It is then hoisted vertically with the winch corresponding to the boom over the pier until it is above deck level at which point the cable from the second boom rigged on the opposite side of the hatch pulls the tub to a point over the hatch where a trip chain is hooked into a ring in the bottom of the tub. As the tub is lowered into the hold the trip chain inverts the tub and dumps the contents into the hold. The maximum number of tons loaded by this method in twenty-four hours has been slightly better than two thousand long tons but normal operation is approximately twelve hundred long tons a day.

In 1947 as many as three hundred men were employed at the dock, but this number was slowly reduced to one hundred and sixty in the fall of 1949, at which time operations were suspended for three months. Starting again in 1950 the entire wharf operation, with the exception of ten men on the Company payroll, was placed on contract. The stevedoring contract employs only sixty men and these men work only when a ship is in port.

A tentative plan for belt loading of the ships is now on the drawing board and will probably become an accomplished fact if world conditions do not prohibit such construction and investment.

During the occupation the Japanese placed wooden sections over the spans

of the pier which were dynamited. This repaired pier, although unsafe, was used after the War until replaced by a permanent pier. In the spring of 1948 rebuilding of the section which had been dynamited and the construction of a "T" pierhead 215 feet long was undertaken. This work had to be done without interfering with ship loadings. The design and preliminary construction was undertaken on contract by a well known engineer, but poor health resulting from internment forced him to abandon the contract. It was then necessary for the Mine Staff to supervise the completion of the pier construction. The pier as it now stands is entirely of reinforced concrete with concrete piles driven to solid ground through coral. Some of the piles weigh eighteen tons each. The total expenditure on this project was approximately one quarter million pesos.

Shortly after resumption of operations it had become the practice to drop the payroll by either Piper Cub or L-5. The point at which the drop was made was out on the coastal plain. In January 1949 an unsuccessful attempt to take the payroll resulted in the wounding of a Staff member, and thereby brought about the construction of a two thousand foot air strip near the mine. Since the construction

of the air strip the Company has purchased a Helicopter which makes the air strip unnecessary.

In November 1949 a Radio-telephone was installed. This radio-telephone gives direct communication with the Telephone Company in Manila who in turn completes a connection with any desired telephone.

Since resumption of operations following the War a continuous construction program has been in progress. Income from ore sales has carried all construction costs. However, even with the very considerable return of operating profits to construction and expansion, it has been possible for Consolidated Mines Incorporated to pay several dividends from their share of the earnings.

Labor relations shortly after operations were resumed became strained. Several strikes occurred. Two general wage increases, one of ten percent granted by Judge John W. Hassuerman in the spring of 1948, and the other on order of the Court of Industrial Relations in June of 1949 have brought the minimum wage to two pesos a day. In addition to the daily wage one liter of rice is issued to each employee after each days work. Employees may purchase from the Company one half ganta (one and a half liters) of rice each day at a price

which will not exceed fifty centavos. Houses, lights, fuel, and water are furnished. Medical and Dental attention are available at the Company Hospital. Either a fifteen day vacation with pay or a Christmas Bonus equal to fifteen days wages is given to the employees. Sick leave with pay up to fifteen days each year is allowed.

Store and Restaurant concessions are granted to private individuals but the Company runs its own store selling staples at the lowest possible price. The school in the camp was built by the Company and all expenses including the salaries of the teachers is carried by the Company. A Recreation Hall has been built. Movies are shown twice each week at a very reasonable price.

It is anticipated that construction and improvements will continue, that production per man shift will continue to increase, and that the cost of production will continue to decrease. At this time surveys are being made with the thought of replacing truck hauling with rail haulage using diesel locomotives.

The Filipino employee has shown himself to be capable of learning new methods as well as a willing worthwhile employee. The prospects for the future are bright.

ECONOMIC SIGNIFICANCE OF SECONDARY OPERATIONS AND RESERVES IN THE EASTERN STATES*

By
HONORABLE PAUL D. TORREY
Chairman, Secondary Recovery
Advisory Committee

The business of producing oil is such an important factor in the economic life of the nation that the efficient operation of oil fields has direct bearing on maintaining and extending prosperity in every state so fortunate to have been endowed with oil resources. All measures that may be taken to maintain profitable production of oil, therefore, are deserving of considerate support by the governments and by the people of the oil-producing states. Such measures may be designed to secure from older fields the recovery of oil that will not be obtained by the methods of production that have been employed, or they may serve to assure the maximum economic recovery of oil from recently discovered fields and from fields yet to be discovered.

Methods for increasing the recovery of oil were first developed and applied extensively in the Eastern States. Although well known and outstanding results have been obtained, significant and imposing opportunities still exist in this region for obtaining more oil from presently known and developed fields. Proper utilization of these opportunities, very conceivably, can have a profound influence on the future economic life of communities as well as of commonwealths. As a matter of fact, the future of many communities is so closely associated with the preservation of the oil industry that for all practical purposes they may be considered to be inseparable.

The development and application of secondary techniques in the Penn Grade area have been described ably and adequately at previous meetings of the Interstate Oil Compact Commission, particularly by Don T. Andrus (1) at the 1946 Summer Meeting, held at Grand Rapids, Michigan, and, similarly but more recently by J. P. Jones (2) in testimony before the Armed Services Subcommittee of

the House of Representatives of the United States. The details of these discussions have received wide and highly deserved publicity, and need not be repeated. For that reason, principal attention can be devoted without extensive preamble to important recent events in the history of the oil industry in the interior states of the Eastern area, and particularly to recent developments in Illinois.

Oil was first discovered in Illinois in 1889, and by 1904 and in immediately succeeding years the fields of southeastern Illinois became one of the important oil-producing regions of the United States. Illinois ranked third in the nation's production in 1908, 1909, and 1910. Thereafter, oil production declined continuously until the discovery and rapid development of new fields in southern Illinois, beginning in 1937, served to focus attention again on the oil possibilities of the State.

The more recent oil activity in Illinois was preceded by the notable discovery in 1928 of the Mt. Pleasant field, located in the central part of the Michigan basin. Finding substantial new oil reserves in an area covered by a thick mantle of glacial drift, which prevents surface exploration for geologic conditions favorable for the accumulation of oil and gas, served to renew the attention of the oil industry to the production possibilities of similar areas in other eastern states that formerly had been sparingly explored. The Illinois basin, covered in large part, as it is, by glacial drift, immediately offered promising possibilities for the application of geophysical methods of exploration which contemporaneously were in process of development and refinement. The initial results of geophysical exploration, combined with subsurface studies of the Illinois Geological Survey, were conspicuously successful. During the early part of 1937 the Patoka, Clay City, and Cisne fields were discovered in rapid succession. Later in 1937 the very important Loudon field was discovered, and in the following year the Salem field was brought into production. Thereafter, development of

the Illinois fields proceeded at an almost unprecedented rate, as a result of the relatively shallow depth of the producing formations and because of the easy drilling conditions. The all-time peak of oil production in Illinois was reached in 1940 with a total of 147,647,000 barrels, which amounted to 10.8 per cent of the total production of the United States, and which advanced Illinois to fourth ranking place among the oil-producing states, it being exceeded only by Texas, California, and Oklahoma. These figures compare impressively with the production during 1937 which amounted to only 7,326,000 barrels of oil, and which represented only 0.57 per cent of the total United States production. Such a phenomenal increase in production has rarely been equalled in the history of the American oil industry. It resulted, as many people will recollect, in a severe dislocation of previously established markets for the crude oil produced from certain of the other states.

Some salient facts regarding the statistical position of the Illinois oil industry and how it has compared with the oil industry in the other eastern states, are presented in Table No. 1. From Table No. 1, the dominating position of Illinois can be ascertained. Illinois has produced more oil than any of the other eastern states (Column 5); during the past 10 years Illinois has produced more oil than the combined production of all of the other eastern states (Column 9); this superiority was maintained in 1949 (Column 10); and the API proven reserves for Illinois are greater than the combined reserves of all of the other eastern states (Column 11). In 1949 Illinois was the sixth ranking oil-producing state of the nation, being exceeded only by Texas, California, Louisiana, Oklahoma, and Kansas. For these pertinent and compelling reasons, much of the following discussion will be restricted to the opportunities and to the incentives which exist for increasing the recovery of oil from Illinois fields.

Referring again to Table No. 1, it will be immediately apparent that production of oil during the past 10

SAN JUAN BASIN FIELD CONFERENCE

The New Mexico Geological Society held its first Field Conference November 3 to 5, 1950, by conducting a trip through the Upper San Juan Basin in New Mexico and Colorado. Approximately 200 geologists from the west and midwest in a caravan of about 70 automobiles were present for parts of the excursion.

The group included representatives of all the major oil companies, many consulting geologists and members of the United States Geological Survey.

The trip commenced in Albuquerque the morning of November 3rd and ended about 42 miles north of Durango the afternoon of November 5th.

Among *Mines Men* present were: Ben H. Parker, '24; T. S. Harrison, '08; L. W. Storm, '02; Hugh Wallis, '28; C. P. Butcher, '24; R. C. McCain, '49; D. S. Galbraith, '49; Robert McMillan, '41; J. A. (Pete) Mullinax, '47; Frank A. Morgan, Jr., Ex-'45; Allan Loleit, '50; B. M. Bench, '30; H. N. Goodell, '42.

The trip was saddened the second day by the death of Cary Butcher, '24,

consulting geologist and engineer of Midland, Texas, who suffered a heart attack.

The first day the conference inspected the entire eastern margin of the San Juan Basin and the stratigraphy and structure of the basin rim. The drive traversed the Rio Grande valley, the Sierra Nacumiento, the Chama Basin, and the Archuleta Anticlinorium, and ended that evening in Pagosa Springs, Colorado.

On the second day the party reviewed cretaceous stratigraphy along the north side of the San Juan Basin. The conference drove northward from Pagosa Springs to examine upper cretaceous exposures and then westward to view other cretaceous and early tertiary sequences. The second night was spent in Durango.

The final day of the conference allowed the group to study the stratigraphy and structure of cretaceous to pre-cambrian rocks between Durango and Molas Lake in the San Juan mountains.

An excellent guide book was furnished each participant. This fine

publication, complete with road logs, many papers, maps and photographs, and the well-prepared talks at each stop were made possible through contributions of the University of New Mexico, New Mexico School of Mines, U. S. Geological Survey, U. S. Soil Conservation Service, and geologists of several oil companies.

PERSONALS

(Continued from page 18)

John H. Cone, '37, resigned from Geneva Steel Company at Dragerton, Utah, to accept position of Engineer with Combined Metals Reduction Company, Panacalite Division. His new mailing address is 2127 So. 19th East, Salt Lake City, Utah.

George E. Crosby, '40, resigned as Petroleum Engineer with Stanolind Oil & Gas Company, to take a similar position with Continental Oil Company in Hobbs, New Mexico. His mailing address there is Box 111.

James R. Cross, '49, has moved his residence to 1495 East 18th Street, Cleveland 6, Ohio. He is Junior Engineer for Standard Oil Company (Ohio).

Joseph T. Darde, '49, has a change of address to Box 108, Alvin, Texas. He is
(Continued on page 42)

* Reprinted from paper presented at Interstate Oil Compact Commission, French Lick, Indiana, August 3-5, 1950.

TABLE NO. 1—PERTINENT OIL STATISTICS FOR THE EASTERN STATES

All Production Figures in Thousands of Barrels

1	2	3	4	5	6	7	8	9	10	11
State	Year of Oil Discovery	Year of Peak Production	Production During Peak Year	Total Production to end of 1949	Extensions and Revisions 1940-1949	New Discoveries 1940-1949	Total of Columns 6 and 7	Total Production 1940-1949	Production 1949	Proven Reserves at end of 1949
Illinois	1889	1940	147,647	1,444,300	848,167	129,779	977,946	891,444	63,952	468,138
Indiana	1889	1904	11,339	189,565	78,889	21,841	100,730	64,685	9,472	50,209
Kentucky	1883	1946	10,578	241,433	74,925	17,906	92,831	80,749	9,456	56,168
Michigan	1925	1939	23,462	306,281	126,198	70,415	196,613	181,195	16,547	66,496
New York	1864	1882	6,685	172,828	75,788*	0	75,788	48,280	4,216	62,900
Ohio	1876	1896	23,941	617,259	21,407	8,272	29,679	33,668	3,485	27,703
Penn.	1859	1891	31,424	1,113,167	64,813*	0	64,813	144,580	11,450	103,356
West V.	1876	1900	16,196	438,138	20,800	2,225	23,025	30,921	2,830	37,992
Total				4,522,971	1,310,987	250,438	1,561,425	1,475,522	121,408	872,962

(2), (3), (4), and (5) from IPAA "The Oil Producing Industry in Your State."

(6), (7), (9), (10), and (11) from API Reserve Committee 1949 Report

(*) All from secondary recovery operations

years in the four states of the Penn Grade Crude area—New York, Pennsylvania, Ohio, and West Virginia—has far exceeded the discovery and development of new reserves. For the Eastern Interior states of Michigan, Indiana, Illinois, and Kentucky, slightly more oil has been found during this period than has been produced, the ratio of discovery to production being 1.12 to 1. However, it should be noted that the favorable position indicated by this ratio is due principally to the spectacular production developed during this period in southern Illinois and south-western Indiana, and to the fact that in 1949 large secondary reserves were recognized for the first time in Illinois by the API reserve committee. Otherwise, the discovery-production ratio for the Eastern Interior states from 1940 to 1949 inclusive, and for the year 1949 individually, would definitely be below "1", as it has been in the Penn Grade Crude area states for several decades.

At the 1948 Summer Meeting of the Interstate Oil Compact Commission, the writer (3) explained to Chairman Beauford Jester and to the Executive Committee that discovery-production ratios provide a useful and valuable measurement of the future productive possibilities of the various oil states. It was emphasized in the special report presented at this meeting that in states where production almost equals or is in excess of discoveries over a period of several years, the preservation of the oil industry and its important contributions to the economic and social life of the state and its people will be dependent on the adoption of measures for increasing the recovery of oil from existing fields. The data presented in this report indicated clearly that the oil industry in the four Eastern Interior states was rapidly approaching a deficient position. The more recent

and more complete data presented in Table No. 1 shows that the indicated trend that was emphasized at New York almost two years ago has not been arrested. As a matter of fact, the prospects in these states for discovering large new reserves of oil in deeper and older formations remain just as uncertain or even more so at the present time as they were at the end of 1947. Such being the case, it seems appropriate again to urge emphatically that the adoption of measures for maintaining or even increasing the production of oil from discovered reserves, as the occasion many demand for emergency requirements, should certainly be receiving attention by the governments of the respective states, by landowners, and by labor organizations, as well as by the oil industry alone.

The statistical data presented in Table No. 1 show conclusively the increasing difficulty that is being experienced in finding new oil reserves in the eastern states. They do not show, however, the greatly increased expenditures that are being required to find new oil reserves. At the time when the Loudon and the Salem fields were found and were being developed, expert economists estimated that 19.2 per cent of the revenue derived from oil production was required for exploration purposes to maintain the discovery of oil in balance with the production of oil. Today that figure has increased to about 35 per cent, and there is no indication that continued increase will not take place in coming years. The incentive, therefore, to obtain additional recovery from known reserves of oil rather than to try to find new reserves becomes more and more attractive.

Since Illinois has no law for the proration of oil production, which would help to insure that development and production practice will

conform best with specific reservoir conditions for each field, a large part of the oil that has been produced since the discovery of the Patoka field in 1937 has been at withdrawal rates which have equalled or closely approached the maximum productivity of the fields. Much unfavorable publicity resulted from the operating conditions which have prevailed in certain Illinois oil fields. An excessive number of wells were drilled in parts of the Salem field and in town-lot areas of the Centralia and Patoka fields, and there was a flagrant waste of gas, with accompanying dissipation of reservoir energy, in the Centralia, Salem, Clay City, Storms and other areas. Even a cursory observation of production conditions which prevailed during the early life of these fields could not have helped but have created an impression of general overproduction and waste. Fortunately, uncontrolled methods of production were not employed in every field, and there are several outstanding examples in Illinois where rigid conservation practices have been enforced by the voluntary action of the operators, among which may be cited operations in the Loudon Cypress sand and Bethel sand reservoirs, the Loudon Devonian Lime reservoir, the Dix Bethel sand reservoir, and the Mount Vernon Waltersburg sand reservoir. In these fields development and production practice have been designed with the objective of obtaining the maximum economic recovery of oil rather than the most rapid daily production and depletion. In Illinois, therefore, there are contrasting examples of deplorable waste and poor management of oil resources and of highly efficient and most commendable conservation of oil resources.

It is not within the scope of this paper to devote consideration to complex problems of oil reservoir me-

chanics and behavior. However, it must be stated, in order to justify some of the following conclusions, that various fields in Illinois, undoubtedly, would have benefited from superior natural water-drive recovery performance, if production had been curtailed to a rate which would have approximated the encroachment of water into the reservoir as oil was withdrawn. Since the production of such fields was not regulated to conform to the influx of water into their reservoirs, they have yielded oil largely by the action of dissolved gas-drive, the most inefficient natural production mechanism known. In fields where this wasteful mechanism had a predominate part in the primary recovery of oil, large quantities of oil remain which can now be obtained only by the application of secondary methods.

Squires, Luckhardt, and Bell, (4) in their outstanding contribution to the Second Edition of the API Book on "Secondary Recovery of Oil in the United States", state that the oil-productive area of Illinois covers 371,000 acres of which only 25,400 acres, or 7 per cent of the total area, have been affected, in varying degree of intensity, by secondary recovery operations. They report that air and gas drive was first attempted in 1921 and has been applied subsequently on some 18,000 acres with an average recovery to date of 260 barrels of oil per acre. Much higher recoveries have been obtained from some of the better designed and more systematic operations, such as the secondary operations in the Colmar-Plymouth field of Hancock and McDonough counties, from which a recovery of some 870 barrels of oil per acre has been obtained over a period of 11 years.

Results obtained from more recently commenced water-flooding operations are much more impressive. Accidental and haphazard water-floods were in operation in various fields of southern Illinois as far back as 1924, but more systematic fields of New York and Pennsylvania, were not commenced until 1943 when a pilot flood in the Patoka field was placed in operation. This project later was expanded to cover an area of over 500 acres from which a secondary recovery of over 10,000 barrels of oil per acre already has been obtained in comparison to a previous unaided primary recovery of about 5,000 barrels of oil per acre.

Information taken from a recent paper by Vincent and Huffman (5) on eleven Illinois water-flooding projects, where estimations of secondary

recovery have been made, indicates that an average secondary recovery of about 5,200 barrels of oil per acre can be expected, in comparison to an average primary recovery of slightly over 3,100 barrels of oil per acre. Secondary recovery operations in Illinois, therefore, which are expected to more than double the primary recovery of oil, cannot be regarded as new and untried experiments. The outstanding results speak for themselves.

If the application of secondary

To Operators—Gross Income	equals	\$848,312,500
350,000,000 x 2.77 x 0.875		
To Landowners—Royalty Income	equals	\$121,187,500
350,000,000 x 2.77 x 0.125		
Total		\$969,500,000

methods in Illinois should result in an average increase in oil recovery of only 1,000 barrels per acre for the entire productive area of the state, which certainly does not appear to be an unreasonable presumption if consideration is given to the results obtained from existing secondary operations, the ultimate primary recovery of the state will be increased by some 371,000,000 barrels. The proven reserve of Illinois at the end of 1949, as estimated by the American Petroleum Institute, amounts to 468,138,000 barrels, of which it is known that 134,000,000 barrels are attributed to secondary recovery projects now in operation. In consequence, the primary reserve of the state actually amounts to 334,138,000 barrels of oil. From these figures it is easy to determine that the minimum secondary reserve, as estimated in this paper, after liberal allowance for all previous secondary production, is in the range of 350,000,000 barrels of oil and, therefore, exceeds the proven primary reserve. This figure, undoubtedly, is conservative, for it is well known that effective secondary water-flooding operations usually can be anticipated to double the primary recovery obtained from dissolved gas-drive reservoirs. With a total production of 1,444,300,000 barrels of oil to the end of 1949 and taking in consideration the impressive performance of present secondary recovery operations, it certainly does not seem to be unrealistic to suggest that the total reserve of oil which may be recovered by application of secondary methods in Illinois fields can amount to as much as twice the figure herein estimated. At least, the imposing figure of some 700,000,000 barrels of oil may be considered to be a promising prospect, which can stimulate belief in the possibility for profitable continuation of the oil industry in

Illinois for many future years. The availability of additional oil, so near to centers of large consumption of petroleum products, might assist in a most material way to meet the demand for expanded production which might be required for the defense of the United States.

The gross revenue that should accrue to Illinois operators and landowners from the production of the minimum secondary reserve, using the 1949 average price of \$2.77 per barrel, is calculated as follows:

The notable results that have been obtained by the maintenance or restoration of pressure in various Illinois oil reservoirs provides convincing evidence that:

a. The current production from Illinois fields undoubtedly could be substantially greater than it is if conservation measures had been enforced in every new field from the very time that the Patoka field was discovered.

b. The application of conservation measures to recently discovered fields in the Illinois basin not only would have benefited substantially the ultimate recovery of oil, but also it would have lessened the impact of a major oil discovery on the economy of other oil-producing states.

c. Partial and sometimes almost complete correction of past mistakes in the production of oil fields can be made by the application of secondary methods, but almost always at much greater cost. It is generally recognized that maintenance of reservoir pressure and a fairly uniform production rate is preferable and is more effective than pressure restoration at or near to the end of the primary production phase.

It must be appreciated that the application of secondary methods is limited, just as primary production is limited, by the ability to produce oil at a profit. Profitable secondary recovery can be assured in many fields only by means of unit or cooperative operations. For this reason, the action taken by the Interstate Oil Compact Commission in encouraging its member states to revise laws or to enact new laws which will permit the application of the most efficient oil recovery techniques by means of unit operations is commended highly. This outstanding contribution by the Com-

fact can have an important bearing on the future success of many secondary recovery projects.

The possibilities for the more efficient and more economic recovery of oil by the operation of fields as units have been recognized for many years. The basis for this recognition originally was founded on the impressive record of effective and low-cost recovery that has been obtained from various foreign fields and from some domestic fields which have been developed and operated by one company. In most foreign countries, where private ownership of mineral rights is not allowed, frequently one lease or concession will encompass the entire productive area of an oil field. The location of wells and the production of oil, therefore, may be designed expressly to conform best to existing reservoir conditions, and without any consideration of variable fee or lease ownership.

Excepting reservoirs that possess uniformly low or very irregular permeability, the maximum recovery of oil may not be obtained necessarily by production from densely spaced wells located on every property within the defined limits of a field. More frequently, operating experience has indicated, the maximum economic recovery can be obtained by operations in which the movement of fluids through the reservoir is forced to wells that have been selected as producers without regard to their location with reference to established property lines. The selection of the most suitable wells for production purposes is based on extensive study of the original occurrence of fluids in the reservoir, and on studies of readjustments that may take place in the reservoir as oil is withdrawn, or which may be caused by gas or water injection into the reservoir. As a consequence, increased ultimate recovery may be obtained by purposely forcing an underground migration of fluids from one property to another, and by restricting or denying the right to produce oil on one property to the determinable advantage of adjoining properties. Obviously, the only fair and equitable manner by which such operations can be conducted is for the operators and the landowners, with the approval of the state regulatory authority, to agree on a plan for the exploitation of a field which will insure each party his proportionate share of all of the oil produced. The unitization of the field is a method whereby such an agreement can be effected. For that reason, if for no other, it should be emphasized that unit agreements and unit

operations provide a method whereby both the operator and the land-owner can protect and enjoy their proportionate participation in a field, and at the same time promote the adoption of measures designed to insure the maximum economic recovery of oil, which will further enhance the value of their respective equity interests.

The frequent misunderstanding that unit agreements are to be imposed by law or regulation so as to deprive a minority operator or royalty-owner of his equity requires affirmative correction. Every effort should be made to show the legislatures and executives of the various states, as well as the parties directly interested in the production of oil from a specific field, that a unit agreement is not a means to deprive any individual of his right to an equitable share of the produced oil. Rather, a unit agreement provides an effective method whereby each party can safeguard and preserve that which belongs to him. Furthermore, the contention that unit operations constitute restraint of trade and, thereby, violate antitrust laws is nonsense, and can only be based upon fallacious reasoning that independent operators and landowners do not possess the right to profit to the maximum extent from the resources belonging to them, while at the same time they serve, unquestionably, the public interest by the more prudent and effective exploitation of their property.

It should be evident that substantial economies in development and operating cost may result from unit operations. These economies are important both to the operator and to the royalty-owner for they can enable the exploitation of deep or inferior reservoirs, and they can permit a continuation of oil production down to a very low level. However, the primary advantage of unit operations result from increased ultimate recovery and this fact should not be confused with other less relevant arguments.

Shortly after oil was discovered in Pennsylvania in 1859, it was recognized that the removal of fluids from underground reservoirs created differentials in pressure which would cause movement of oil, gas, or water from one point to another in the reservoir. The injection of fluids into reservoirs creates similar pressure differentials which will cause both the reservoir fluid and the injected fluid to move through the permeable rock. The ability to control such movement of fluids and to use the same to the maximum advantage will determine, in many

cases, the success or failure of a secondary project. Failure can easily result if the fluid injection program is not planned to conform to lack of homogeneity in the permeability profile, to any existing discontinuity in the reservoir, and to changes in the relative permeability of the reservoir rock to various fluids that takes place as fluids are removed. It should be obvious that one operator or several operators cannot restore pressure effectively in a common permeable reservoir as long as another operator may persist in the destruction of pressure effects as rapidly as they are created. Furthermore, no method is known whereby underground barriers can be created to prevent the destruction of pressure effects by an uncooperative neighbor. Consequently, almost every reason that can be advanced for the unit operation of oil fields for primary production are applicable to secondary production.

The question very properly might be asked why secondary water-flooding operations have been so signally successful in the oil fields of New York and northwestern Pennsylvania without widespread unitization of the fields? The answer to this question is not difficult to give. The reason why unit operations have not been employed extensively in these fields is because of the general low permeability of the producing formations which prevents very effectively rapid movement of fluids through the reservoirs even under high pressure differentials. In this important respect these reservoirs differ from many of the much more prolific reservoirs of the Illinois basin, where, very conceivably, a minor number of wells could drain effectively an entire field of moderate size. Nevertheless, it is notable that there are many successful cooperative projects in the Allegheny and Bradford fields, where common sources of water supply have been developed and operators have shared the cost of drilling and operating injection wells located along or adjacent to property lines. Elsewhere in the Penn Grade Crude area, there are examples of highly successful unitized secondary recovery operations, among which may be cited the Hamilton Corners field, in Venango County, Pennsylvania, where air and gas drive was commenced by one operator in 1916, and the large Sistersville project, in Tyler County, West Virginia, which has been operated as a unit since 1933.

The right of a state to regulate the production of oil and gas is based on well defined and adjudicated principles which acknowledge the common ownership of reservoir energy in a

(Continued on page 38)

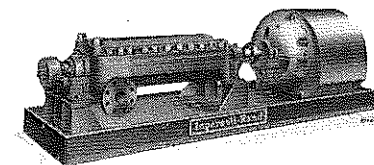
WITH THE *Manufacturers*

New Multi-stage Centrifugal Pumps (789)

Ingersoll-Rand Company has announced a line of completely new multi-stage centrifugal pumps for high-pressure applications to 1200 psi and capacities to 1600 gpm. Known as the Class HMTA, they are built in 3-, 4-, 5- and 6-inch sizes with from 3 to 9 stages. These pumps are exceptionally efficient, easy to maintain, and dependable. Applications cover a wide range of boiler-feed, pipeline pumping, and refinery as well as other general high-pressure industrial services.

The features of this distinctively new design are its cylindrical-bore, horizontally-split casing and compact, Unit-Type rotor assembly. The rotor assembly is composed of the shaft, impellers, and channel rings. These channel ring sections contain the multiple volutes and fluid passages, as well as the renewable wearing parts for each stage. The entire rotor assembly is quickly and easily removed from and installed in the smooth-bore casing, since there are no mating ring fits or delicate alignment problems.

The pressure differential between successive stages in the HMTA pump is sealed by corrosion-resistant cast-iron or alloy-steel piston rings around the outer diameter of the channel rings. These hydraulic-type, step-seal rings have a metal-to-metal fit with the casing.



A completely balanced rotor is assured with multiple-volute design, which eliminates radial thrust at all conditions of operation. Axial thrust, developed by in-line staging of the single-suction impellers, is effectively counteracted by a hydraulic balancing drum.

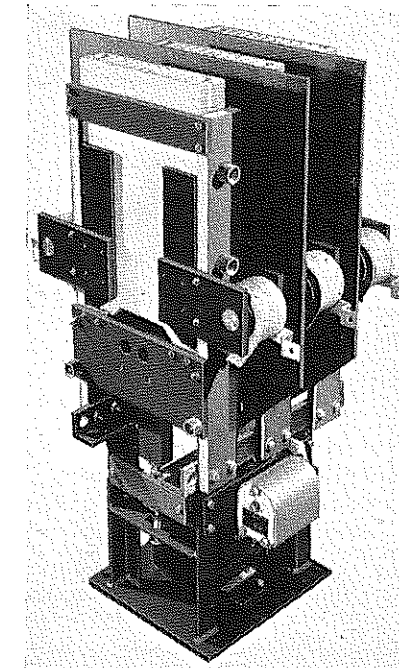
A catalog fully describing these new pumps may be obtained by writing to the company at 11 Broadway, New York 4, N. Y.

New 50,000-KVA Air Contractor (790)

Allis-Chalmers has announced extension of ratings of its high voltage air contractor line (Type 256) for general alternating current motor control applications up to 2500 hp at 5,000 volts or 3,000 hp at unity power factor.

The new 25,000 ampere for 30 cycle through current rating now makes it possible to use air contractors in conjunction with back-up breakers rated up to 25,000 amperes interruption capacity or 150,000 kva at 4160 volts and 100,000 kva at 2300 volts.

Since the new contactors can safely pass 54,000 peak amperes, it can be used with non-current limiting fuses rated at 250,000 kva at 4160 volts. This contactor can



also be used without back-up protection where system faults cannot exceed 50,000 kva.

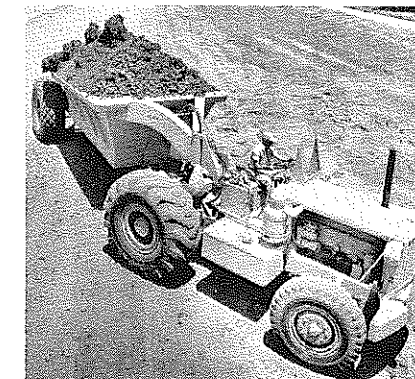
The Allis-Chalmers high voltage air contactor line (Type 256) now consists of 200 and 400 ampere sizes for 2500 or 5,000 volts with 25,000 or 50,000 kva interruption capacity.

Write to Allis-Chalmers for descriptive bulletin.

The DW20 Four-Wheel Tractor & W20 Wagon (791)

The DW20 has five forward and one reverse travel speeds. Forward travel speeds range from 2.88 m.p.h. in first gear to 26.60 m.p.h. in fifth gear. Reverse speed is 3.72 m.p.h.

The four-wheel tractor has a wheel-



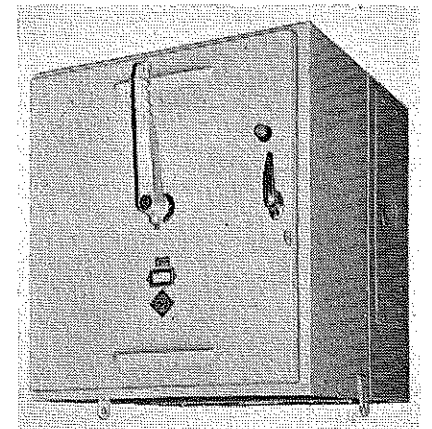
base of 128 in. with the front tread at 88 in. and the rear tread at 84 in. Overall length of the tractor with matched wagon is 45 ft., 8 in., height is 10 ft., 2 in.

The bottom dump W20 Wagon has a struck capacity of 17.0 cu. yds. and a heaped capacity of 25 cu. yds. Doors are hydraulically controlled with a positive mechanical lock. High strength steel and all-welded construction are features of the wagon body.

The wagon body is designed higher at the front with a downward slope toward the rear. This shifts the center of gravity of the load farther forward and combined with the split-type gooseneck, that permits shorter tractor and wagon coupling, results in equal weight distribution between the tractor and wagon tires. Length of the hopper measured from the top inside is 15 ft. Width is variable with an average of 8 ft., 5 in. The large bowl presents an easy target for loading by shovel or dragline.

Individually Mounted, Steel Enclosed Breakers (792)

Allis-Chalmers Manufacturing Company, 982 S. 70th St., Milwaukee, Wisconsin, has announced that its Types G-25 and G-50 low voltage air circuit breakers, previously available only as bare breakers or in metal-enclosed switchgear, can now be had for individual mounting.



The individual, stationary mounted breaker has a sheet steel enclosure formed and welded into a housing that completely encloses the circuit breaker and cable connections.

The rear portion or cable entrance box can be separated from the breaker housing and includes removable cover plates at the top, bottom and sides for easy connection, and cover plates with 3-, 3½-, 4½-, and 4¾-inch diameter knockouts for incoming and outgoing cables.

The breakers can be used wherever

Referring to Equipment News, please send as checked:

MINES MAGAZINE, No. _____	Prices <input type="checkbox"/> Bulletins <input type="checkbox"/> No. _____	Prices <input type="checkbox"/> Bulletins <input type="checkbox"/> No. _____
734 Cooper Building, No. _____	Prices <input type="checkbox"/> Bulletins <input type="checkbox"/> No. _____	Prices <input type="checkbox"/> Bulletins <input type="checkbox"/> No. _____
Denver, Colorado	Name _____	Position _____
Please have copies mailed to:	Company _____	Street _____

Special Crawler Crane (793)

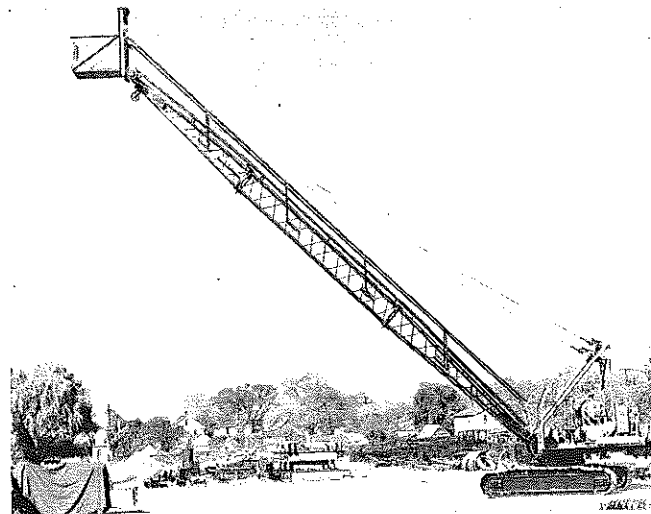
The General Excavator Company, Marion Ohio, recently delivered to the Pittsburgh Plate Glass Company, Columbia Chemical Division, at Barberton, Ohio, a specially built Model 310 crawler mounted Crane-type machine, designed for use in their underground limestone mine, approximately two miles from Barberton, and almost one-half mile straight down.

The General Model 310 is powered with a General Electric motor; all motions are controlled by air, with the use of Air-Cushion clutches to operate the swing mechanism. On the end of the lattice type boom there is mounted a "basket" or platform attached to the boom by a pantograph Type mounting, which keeps the platform level, designed to support one or two "scaler-men," whose job it is to remove loose rock and debris from the roofs and sides of the mine chambers after a blast has been made.

The machine travels from one location to another with the 52 foot boom in a horizontal position. The independent swing and travel provide the maneuverability required to negotiate the turns through the 30 foot openings created by the stone pillars, which must be left in the mine for safety. A dolly is mounted under the point of the boom for easy maneuvering on the floor of the mine.

The boom is raised and lowered by two separate boomhoist units, the second one being provided as an additional safety measure. The speeds of the units are synchronized, and they are operated by two levers at the operator's position. Two posts, with dollies, extend upward from the basket, to prevent injury to the scalers and the boom point.

The only service entrance to the mine is a shaft 7' x 8'. The



General Model 310 was dismantled and lowered into the mine by elevator, where it was re-assembled and put to work.

Complete information covering General Model 310, write to Manufacturers.

there is a low voltage circuit—in industries, utilities, educational and public institutions, outdoor and indoor theatres, stadiums and athletic parks and fields.

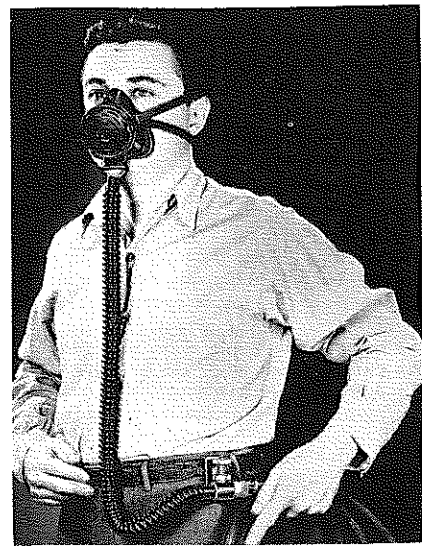
Write to the manufacturer for complete details.

Air Line Respirator (794)

A new addition to their fast growing line of respirators, the No. 2099 Air Line Respirator, is announced by American Optical Company, Southbridge, Mass.

Recommended for such operations as paint spraying, welding, cleaning tank cars, abrasive blasting, and protection against dusts, fumes, vapors, mists, smokes, and gases. No filters or cartridges are needed because a continuous flow of fresh air is directed through the hose.

Features include the use of AO's popular R2000 respirator facepiece, a 2½ foot flexible, non-kinking, rubber breathing tube plus a 12½ to 50 foot length of 5/16

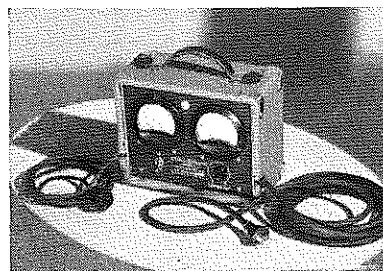


inch diameter air hose. Air flow to the facepiece of the No. 2099 is regulated by an adjustable valve clipped to the worker's belt or clothing. Valve locks in position and cannot be accidentally changed.

Write to the Manufacturer for complete details.

Thermocouple Vacuum Gages for Industrial and Laboratory Use (795)

A redesigned line of thermocouple vacuum gages for industrial, laboratory and other applications where vacuum must be accurately measured has been announced by General Electric's Meter and Instrument Divisions.



Included in the line are a 115-volt, a-c, portable thermocouple vacuum gage, and types for both rack and panel mounting. All but the rack-mounted type have been designed to operate either from 115-volt a-c or from No. 2 flashlight batteries.

Usable on either glass or metal vacuum systems, the gages give a continuous indication of pressure and respond almost instantly to pressure changes. Pressure can be read directly from a scale calibrated from 0-200 microns.

In the 1-100 micron range, the instruments are accurate within 10 per cent of the reading or 1 micron, whichever is greater.

The gage is connected to the gage tube electrically; hence it may be disconnected from the tube without disturbing the vacuum system. The gage tube may be interchanged without the need for recalibrating the indicating instruments.

The vacuum-gage tube is built to withstand damage if accidentally operated at atmospheric pressure.

PLANT NEWS

Death Takes Arthur C. Green, Vice President Goodman Manufacturing Company

Arthur C. Green, director and vice president in charge of sales Goodman

Manufacturing Company, Chicago, died on October 31, as the result of a heart attack.

A graduate of the University of Michigan, his entire business life was devoted to interests associated with the mining industries. Starting with Goodman in 1911 with a well rounded out experience in design, construction and production engineering, he was assigned to sales work in the midwest. His territory and responsibilities grew with the years.

In 1930 he was appointed Central District Manager, in 1936 he was given charge of Western Sales and elected director of this Company. In 1937 he became General Sales Manager and in 1939 Vice President and Sales Manager.

In mining circles throughout the country he was recognized as an authority on mining practices. His influence was particularly felt in the mechanization of underground operations with resulting



ARTHUR C. GREEN

benefits to mine operators, workers and ultimately the consumer.

He was a member of the American Institute of Mining Engineers and Lake Superior Mining Institute.

(Continued on page 40)

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.

(5859) CENTRIFUGAL PUMPS. Form 7233 by Ingersoll-Rand Company, 11 Broadway, New York 4, New York, contains 16 pages illustrating and describing a new multi-stage centrifugal pump, Class HMTA for pressures up to 1200 psi. This bulletin shows the internal construction of this multi-stage pump through a sectional photograph, and illustrations showing special features. Tables of data is included giving general dimensions of pumps and motors.

(5860) WORM GEAR DRIVES. Book No. 2324 by Link-Belt Company, 307 North Michigan Avenue, Chicago 1, Illinois, contains 80 pages giving complete information and engineering data covering speed ratios of 3% to 1 up to 8000 to 1. Special features include compact design, anti-friction bearings, automatic splash lubrication, high ratios in small space, operation at high input speeds, quiet performance, and their availability for vertical or horizontal driving.

(5861) V-BELT DRIVE. Industrial News, by Gates Rubber Company, 999 South Broadway, Denver, Colorado, contains 4 pages illustrating and describing new applications for V-Belt Drive. Ideas may be found here that will assist you in using V-Belts in connection with some of your difficult transmission problems.

(5862) CENTRIFUGAL PUMP. Bulletin No. 1001 by De Laval Steam Turbine Company, Trenton, New Jersey, contains 8 pages illustrating the advantages of the De Laval pump and the services offered for the exchange of parts which guarantees low maintenance cost. General dimensions are given and also capacity and head range for different size pumps.

(5863) "LIQUID RHEOSTAT." Bulletin 148-7544 by Allis-Chalmers Manufacturing Company, Milwaukee 1, Wisconsin, illustrates Type 257 liquid rheostat, describing its construction and operation and principal advantages.

(5864) "FLUOR-O-SCOPE." November, 1950, by Fluor Corporation, Ltd., 2500 South Atlantic Boulevard, Los Angeles 22, California, contains 24 pages featuring 60 years of progress of the Fluor Corporation. Included in this issue are highlights of the 30th Annual American Petroleum Institute in Los Angeles. Many photographs are included in this issue, showing personnel of the Fluor Corporation.

(5865) CLASSIFICATION. Bulletin No. 2341 by the Dorr Company, Barry Place, Stamford, Connecticut, contains 4 pages describing the Fahrwald Sizer, its principals of operation and applications.

(5866) "CAPACITORS." Bulletin GEC-595 by General Electric Company, Schenectady, New York, contains 4 pages illustrating and describing capacitors for economy in 460-volt power distribution systems. Information contained in this bulletin shows the advantages of the capacitors for reducing power costs. Information included shows how to select sizes of equipment.

(5867) "U. S. STEEL QUARTERLY." November, 1950, contains 8 pages including news letter from Irving S. Olds, and information in regard to increased capacities of U. S. Steel production. Included is consolidated statement of U. S. Steel Corporation and Subsidiaries statement of income.

(5868) "MECHANICAL TOPICS." Volume 12, Number 4, by International Nickel Company, Inc., 67 Wall Street, New York 5, New York, contains 12 pages of short, illustrated articles showing many new uses and the advantages of using nickel alloys for increasing wear resistant properties.

(5869) HOSE REPORTER. November, 1950, by Gates Rubber Company, 999 South Broadway, Denver, Colorado, contains 4 pages showing important uses of Gates Rubber Hose, and listing warehouse stocks carried by dealers in the Rocky Mountain Region.

(5870) "RARIN-TO-GO." November, 1950, by Frontier Refining Company, Cheyenne, Wyoming, is largely devoted to the personnel of this organization. In this issue Frontier announces their new motor oil under the trade name of Ultra-Lube.

(5871) SHUTTLE CARS. Bulletin CL/TS-502 by Goodman Manufacturing Company, Halsted Street at 48th, Chicago 9, Illinois, contains 4 pages illustrating and describing Goodman cable reel shuttle cars with hydraulically controlled elevating discharge. Tables of capacity and speed are included as well as distinctive features. An outline drawing shows general dimensions and space needed for operation.

(5872) VIBRATING SCREENS. Book No. 2354 by Link-Belt Company, 307 North Michigan Avenue, Chicago 1, Illinois, contains 12 pages illustrating and describing Link-Belt "CA" Concentric Action Vibrating Screens for medium and heavy duty service, made in sizes ranging from 3 feet wide by 8 feet long to six feet wide by 16 feet long. This book contains illustrations showing the construction and operation of the

equipment and also tables of dimensions and other data.

(5873) "MINERAL INFORMATION SERVICE." November 1, 1950, by California Division of Mines, Ferry Building, San Francisco 11, California, contains 8 pages of information containing notes on gold dredging, new tungsten discovery, mercury, and lists the new publications and index map to California quadrangles.

(5874) "HARDINGE HIGHLIGHTS." November, 1950, contains 6 pages of descriptive information covering Hardinge's rod mill, 11½ feet diameter and 12 feet long. Information is included covering Hardinge's counter-current classifier, which solves the washing problem.

(5875) PULSE-FREE PIPING. Bulletin No. PDS-8501, by Fluor Corporation, Ltd., 2500 South Atlantic Blvd., Los Angeles 22, California, contains 4 pages illustrating and describing the Fluor pulsation dampening piping systems, comparative costs of installation, and maintenance.

(5876) CONCRETE. News letter, October, 1950, by American Concrete Institute, 18263 West McNichols Road, Detroit 19, Michigan, contains 26 pages of news items and discussions of interest to members of the association and those associated with concrete problems.

(5877) "LINK-BELT NEWS." By Link-Belt Company, 307 North Michigan Avenue, Chicago, Illinois, contains 8 pages of short illustrated articles pertaining to conveying installations and equipment. In this issue we have an interesting article descriptive of the St. Joseph Lead Company's zinc smelter at Josephtown, Pennsylvania. Included is a flow sheet of the plant.

(5878) "THE GRAPEVINE." October, 1950, by United Geophysical Company, Inc., 596 East Colorado Street, Pasadena 1, California, contains 8 pages of illustrated news letters from various geophysical parties of this company operating in the United States and foreign countries.

(5879) MOTOR GENERATORS. Bulletin GEA-5506, by General Electric Company, Schenectady 5, New York, contains 8 pages illustrating and describing synchronous motor-generator sets, 30 to 8000 KW. Well illustrated, the booklet shows four typical installations and describes the construction features of the synchronous motors and d-c generators.

(5880) "H & B BULLETIN." September and October, 1950, by Hendrie and Bolthoff Company, 1639 17th Street, Denver, Colorado, contains 32 pages illustrating and describing a large number of new tools and equipment items, which will be of interest to all branches of the mineral industry as well as contractors.

(5881) CORE DRILL. Bulletin D-28, by Joy Manufacturing Company, Oliver Building, Pittsburgh, Pennsylvania, describes the Joy 22 HD heavy-duty Diamond Core Drill, a 2000-foot-capacity drill driven by gasoline, electricity, or compressed air, mounted on truck, steel skids, or underground column.

(5882) "THE BEACON." October, 1950, by Ohio Oil Company, Findlay, Ohio, contains 44 pages largely devoted to the personnel of this company and its activities in various oil fields.

(5883) "FLUOR." Recent 8 page illustrated catalog by Fluor Corporation, Ltd., 2500 South Atlantic Boulevard, Los Angeles 22, California, entitled "Fluor since 1890," gives a general idea of the type of engineering services and construction which this company has to offer, especially in regard to cooling equipment.

(5884) "PROGRESS NEWS." November, 1950, by Gates Rubber Company, 999 South Broadway, Denver, Colorado, contains 24 pages devoted to the activities of the personnel of this organization. (5885) "TEXACO STAR." Fall, 1950, by Texas Company, 135 East 42nd Street, New York 17,

New York, contains 28 pages illustrating and describing the activities of the Texas Company. In this issue considerable space is given to information pertaining to Scurry County and West Texas development. Here is shown a portable drilling rig which may be moved completely intact with drilling equipment.

(5886) NICKEL. "INCO." Volume 24, Number 2, by International Nickel Company, Inc., 67 Wall Street, New York 5, New York, contains 36 pages of short illustrated articles showing many important uses for nickel. Among the articles included in this issue is one on pipe conveyors, one on a new pump for many services, and another on pipeline assembling made easier.

(5887) NEW LOADER. Bulletin CLT-501, by Goodman Manufacturing Company, Halsted Street at 48th, Chicago 9, Illinois, contains 4 pages illustrating and describing the Goodman 665 tractor tread loader. A diagram of general dimensions is included.

(5888) HOISTS. Bulletin 76-X, by Joy Manufacturing Company, Oliver Building, Pittsburgh, Pennsylvania, contains 16 pages illustrating and describing the complete line of Joy single-drum, multi-purpose hoists for mines, construction jobs, oil fields, and industrial plants, driven by Turbinair, Pistonair, electric, or gasoline engines.

(5889) "ON TOUR." October-November, 1950, by Union Oil Company, Union Oil Building, Los Angeles 17, California, contains 24 pages illustrating and describing the activities of the Union Oil Company. In this issue is an interesting article on the Blackfoot Nation and their reservation. Also included is information covering the refining installation of Union Oil Company and three pages of information with tables included showing the benefits from Federal old age pension.

(5890) "THE CONVEYOR." Volume 195, by Stephens-Adamson Manufacturing Co., Aurora, Illinois, contains 20 pages illustrating and describing a large number of conveyor installations. Among these is included an installation where a zipper closes the belt. Another article illustrates the operation of a large gravel plant with minimum amount of labor. Many good ideas are included in this issue which will be valuable to anyone with conveyor problems.

(5891) HYDRAULIC BULLDOZERS. Form No. 30045, by Caterpillar Tractor Company, Peoria, Illinois, is an illustrated folder illustrating various types of hydraulic bulldozers manufactured by this company, and including full specifications covering each type of equipment.

(5892) "PACKERS." Price List effective November 1, 1950, by Lane Wells Company, 5610 South Soto Street, Los Angeles 58, California, contains 16 pages of tables giving data and prices, as well as information for selection of packers and service offered by this company.

(5893) "COMPACT COMMENTS." November, 1950, by Interstate Oil Compact Commission, Post Office Box 3127, Oklahoma City 5, Oklahoma, contains 10 pages covering the activities of the Compact Commission, as well as news from various oil producing states. Four pages of statistical information cover drill activities, production, and geophysical activities in various oil-producing states.

(5894) MINE-AIR COMPRESSORS. Bulletin A-53, by Joy Manufacturing Company, Henry W. Oliver Building, Pittsburgh 22, Pennsylvania, describes and illustrates portable air compressors, two stage, single acting, air cooled, 130 or 175 CFM. General specifications and dimensions are included.

(5895) ALUMINUM. Aluminum News - Letter, October, 1950, by Aluminum Company of America, Pittsburgh 19, Pennsylvania, contains 8 pages illustrating and describing new important uses for aluminum. Among other items included in this issue is a Colt's automatic pistol weighing only 26½ ounces.

(5896) "BAROID DISTRIBUTORS." September, 1950, by National Lead Company, Los Angeles 12, California, contains 12 pages giving a complete listing of distributors and sub-distributors of Baroid products in the oil fields of the United States and Canada.

(5897) "NICKEL TOPICS." October, 1950, by International Nickel Company, 67 Wall Street, New York 5, New York, contains 12 pages of short illustrated articles showing many new uses for nickel and alloys. Among articles included in this issue are the rocker shovel as an earth mover, nickel steel in the electromagnet, and 25,000 G.P.M. condenser circulating water pump.

(5898) TARIFF TOPICS. October, 1950, by American Tariff League, 19 West 44th Street, New York 18, New York, contains 4 pages of important tariff information, and especially per-

(Continued on page 43)

MINES MAGAZINE I am interested in the following publications:
734 Cooper Building No. _____
Denver, Colorado _____
Please Name _____
have Street _____
copies _____
I mailed City _____ State _____
to: _____

Alumni Business

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MARVIN ESTES, '49

MEETINGS

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

EXECUTIVE COMMITTEE MEETING

The regular meeting of the Execu-
tive Committee, Colorado School of
Mines Alumni Association, was held
in the Alumni office on Monday, No-
vember 20, 1950.

The meeting was called to order at
7:50 P. M. by President Colasanti.

Roll Call

Members present: James Colasanti,
President; Robert W. Evans, Secretary;
Malcolm E. Collier, Treasurer;
Harvey Mathews, Robert J. Mc-
Glone. Committee chairmen: Addi-
son Manning, Roger Schade, Harry
McMichael, Lynn Storm. Executive
Manager, Frank C. Bowman.

Members absent: George Setter,
Vice President; Carl I. Dismant,
Committee chairmen: Charles O.
Parker, Edwin White, Harry Mc-
Neill, Herbert Heckt, John Winchell.
Minutes of the meeting of October
16, 1950, were read and approved as
read.

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

Treasurer's Report

Mr. Collier reported that finan-
cially the situation is about the same as
it was in 1949. Operations for the
year should show a profit, however it
will be very close. The Petroleum
issue of the magazine should show a
profit; the Yearbook will be published
close enough to the end of the year
to allow the earnings to be shown in
1950. The Association showed an op-
erating loss during October but
showed a profit for the first 9 months
of 1950. Mr. Bowman stated that
the Association should show a profit
for the year.

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

Alumni Endowment Committee

Mr. Schade reported receipts of
\$148.36 during October 1950, making
a cash balance of \$2580.09.

The Placement Service receipts dur-
ing October 1950 were \$339.13 and
disbursements \$270.30, leaving a bal-
ance of \$1208.79.

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

Athletic Committee

Mr. Manning reported that during
October 1950, \$23.92 was received
from bank interest. There were no
contributions nor payments on notes
received during the month.

The Savings account was trans-
ferred during October to the Midland
Federal Savings and Loan Associa-
tion.

As of October 31, 1950, the check-
ing account showed a balance of
\$971.24; the savings account \$5000.-
00; and \$268.00 remained outstand-
ing on loans.

Moved by Mr. McMichael that
the committee report be accepted;
seconded by Mr. Schade; passed.

Budget and Finance Committee

No report.

Capability Exchange Committee

Mr. McMichael reported the Place-
ment Service should end the year in
the black.

During October there were 26 calls
for men; 12 recommendations made;
2 placements reported; 426 letters
mailed; 569 men remain on the active
list; and 149 calls for men remain
unfilled.

The first Airmail Bulletin was
mailed on November 15, 1950.

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

Instruction Committee

No report.

Legislation Committee

No report.

Membership Committee

Mr. Bowman reported that during
October 1950, 51 memberships were
paid, making a total of 2277 members
as of October 31, 1950; this is 65%
of total living graduates.

Moved by Mr. McGlone the re-
port be accepted; seconded by Mr.
Schade; passed.

Nominations Committee

No report.

Public Relations Committee

No report.

Publications Committee

Mr. Bowman reported that for the
83 1/3% budget period, 68.5% of
the budgeted income has been earned
and 68.3% of the allowed expendi-
tures has been spent.

The Special Petroleum Number is
off the press and will be mailed within
a few days.

The November magazine should be
ready for mailing about the 25th.

The December magazine should be
mailed by December 15, 1950.

With the above issues in such good
shape, the Yearbook should be ready
for printing soon after the first of
January 1951.

(Continued on page 41)

FROM THE Local Sections

ARIZONA

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

BAGUIO

Frank E. Delahunty, '25, President; Luther
W. Lennox, '05, Secretary-Treasurer, Ben-
gett 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. Brad-
ley, '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 Play-
ter, '30, Vice President; Clyde Osborn, '33,
Secretary; James N. Peros, '38, Treasurer.
Visiting Miners contact Secretary, c/o
Western Machinery Co., 762 Folsom Street,
San Francisco, Calif., Exbrook 2-4167.
Meetings, last Friday of October, Novem-
ber, January, February, March and April at
the Bellevue Hotel, Geary and Taylor Streets,
San Francisco, Calif. Time: 6:30 P. M.

BIRMINGHAM

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

CENTRAL OHIO

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

CENTRAL WYOMING SECTION

Herbert Schlundt, '43, President; Lynn D.
Ervin, '40, Secretary-Treasurer, c/o Stan-
olind Oil & Gas Co., Casper, Wyoming.
Meetings, first Saturday, March, June, Sep-
tember, 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; Ar-
thur C. Most, Jr., '38, Vice-President, Sec-
retary-Treasurer, 91-7th Street, Fullerton,
Penna. Meetings upon call of Secretary.

GREAT LAKES

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

HOUSTON

Albert L. Ladner, '27, President; McKay G.
Donkin, '29, Vice President; W. Bruce Bar-
bour, '37, Secretary, c/o The Second Nat-
ional 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, Sec-
retary, 646 Galena, Butte, Montana. Meet-
ings upon call of Secretary.

NEW YORK

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

The New York Section of the
Colorado School of Mines Alumni
Association held its monthly meeting
at the Mining Club, 33 Broadway,
New York, on November 3, 1950, at
6:30 P. M.

Following the customary prelimin-
aries and a dinner of appropriate pro-
portions, the group of nine in atten-
dance was regaled by a discourse on
the subject of City Zoning by none
other than L. C. Squire, '22, an ac-
knowledgeed authority, expert, and
specialist on this modern branch of
municipal technique. That the speak-
er had the knack of making a presum-
ably dry subject interesting was con-
firmed by the fact that a considerable
discussion developed during the ques-
tion period.

The following men were present:
Domingo Moreno, '23; L. C. Squire, '22;
M. A. Lagergren, '33; H. Goodman, '48;
J. M. Baggs, '39; D. L. Rainey, '42; D.
B. Mazer, '47; R. E. Buell, '41; Harry J.
Wolf, '03.

As the meeting adjourned it was
noted that each member silently prom-
ised himself that he would try to
induce some local or visiting alumnus
to come to the next meeting to in-
crease the attendance.

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, Feb-
ruary, 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 Cor-
poration, 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. Lun-
cheon 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 Ter-
race, New Kensington, Pa. Meetings upon
call of officers.

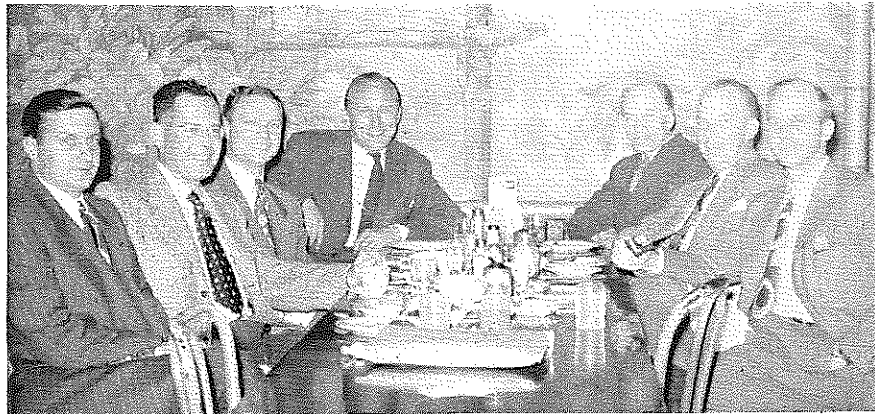
PERMIAN BASIN

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

SOUTHERN CALIFORNIA

John Biegel, '39, President; A. J. Heiser, '43,
Vice President; C. J. Cerf, '41, Treasurer;
Franklin S. Crane, '43, Secretary, c/o Oilwell
Supply Co., 934 North Alameda St., Los
Angeles. Telephone: Mutual 7311.
Scheduled meetings second Monday of Janu-
ary, April, July and October, at Officers'
Club, 2626 Wilshire Blvd., Los Angeles, 6:30
P.M. Phone Secretary for reservations.

On Monday, October 9, 1950,
members of the Southern California
Section, Mines Alumni Association,
met at the Officers' Club to hear Dr.
James Boyd speak but who could not



Executive Board Meeting of CSM Alumni Association, Southern California Section. Meeting was held at Clifton's Cafeteria, Feb. 28, 1950. Reading from left to right: Treasurer Charley Cerf; Program Chairman Joe Hathaway; CSM Foundation Chairman Jordan Nathanson; President John Biegel; Employment Chairman Norman Whitmore; Reception Chairman Rufus Smith; Secretary Frank Crane.

make this meeting due to a pressing schedule on his nation-wide tour.

Frank Crane introduced Mr. W. J. Hamilton who presented to the group an excellent color movie of his film, "Safari," with commentary. This unusual and interesting film was well received and appreciated by the members lucky enough to attend the meeting.

Those present were:

Bill Bancroft, '36; Bill Prigge, '42; Russ Harris, '40; H. B. Starbird, '97; Jordan Nathanson, '36; R. M. Fullaway, '16; J. L. Bruce, '01; H. L. Young, '39; J. E. Warnecke, '97; H. C. Armington, '07; Gower Waters, Ex-'09; Sid French, '08; E. D. French, '21; Bob Brummett, '26; J. L. Soske, '29; Rufus Smith, '29; Don Schlummer, '38; Stanley Jackson, '38; Bob Reigel, '34; J. P. Williams, '34; R. B. Paul, '02; Norman Whitmore, '26; George Middleton, '31; Wally Pentegoff, '28; Jim Kavenaugh, '38; E. L. Larson, '23; L. R. Wolff, Ex-; W. H. Everett, '08; Charles Beyrle, Ex-; H. C. Eddy, '09; R. H. Ganong, '47; R. H. Shanley, '42; C. B. Neiswender, '12; F. S. Crane, '40; C. J. Cerf, '40; Bill Boyle, '12; John Hicks, '48; Walter Levey, '48; Dick Moody, '36; Bob Obrecht, '34; N. M. Nichols, '40; Bill Beggs, '38.

ST. LOUIS

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

The St. Louis Section, C. S. M. Alumni Association, met at the home of Mr. and Mrs. George C. Bartholomees in Bonne Terre, Missouri, the evening of October 14. Co-hosts and hostesses were Messrs. & Mesdames Ed Haugh, E. L. Bilheimer, Martin Honke, G. G. Grigsby, E. L. Lewis, and Art Meyer.

After dinner, served out of doors, a business meeting was held in which President J. E. Morrison stated that arrangements had been made to have good old *Miner's* Beer Bust for the

Alumni and their friends the evening of February 19, 1951, at the York Hotel, St. Louis. This is to be in conjunction with the A.I.M.E. convention which will be held in St. Louis at the same time.

It was suggested that the Beer Bust committee be enlarged and include Jim O'Keefe and H. Markwardt, besides the original two of Morrison and Harvey Pings. O'Keefe was appointed chairman.

Interesting accounts were given by the O'Keefes and Belleaus of the Alumni meeting in S. W. Missouri, at Noel.

The next regular meeting is to be at the home of Colonel and Mrs. Morrison, Saturday, May 5, 1951, at Jefferson Barracks.

A get-well letter was signed by all those present to be sent to Art Meyer, '50, who was confined to his bed at the hospital.

Those present at the meeting were: Messrs. and Mesdames Floyd Belleau, '23; E. L. Lewis, '42; E. L. Bilheimer, '22; H. Markwardt; Ed. Haug, '32; George Bartholomees, '29; Heine Kenworthy, '32; Martin Honke, '47; Jim O'Keefe, '37; H. A. Wolf, '32; James Phebus, '42; H. A. Dumont, '29; G. G. Grigsby, '14; J. E. Morrison, '26; and Mrs. Art Meyer; Dave Coolbaugh, '43; L. P. Pressler, '05.

UTAH

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

WASHINGTON, D. C.

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

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

TECHNICAL MEN WANTED

(Continued from page 7)

and calculation of ore reserves. Probable salary, \$325 per month to start.

(1837) COAL MINING ENGINEER. One of the large coal companies operating in the Rocky Mountain region has position open for young mining engineer who has had some practical experience in coal mining, a knowledge of state coal mining safety laws and the ventilation of coal mines. This man will be trained in coal mining operation. Salary depends upon previous experience and ability of applicant.

(1838) SALES ENGINEER. One of the leading manufacturers of milling equipment has a position open for sales engineer between the ages of 40 and 50 years who has had considerable experience in the sale of mining and milling equipment and understands its construction and operation. Salary will depend upon ability of applicant to produce.

(1839) ADVERTISING ASSISTANT. A well established machinery manufacturing company with a well organized advertising department has position open for advertising assistant who is well acquainted with mine and mill equipment and able to write fluently. Salary open.

(1841) MINING ENGINEER. A mining company with extensive operations in South America has position open for assistant superintendent of mines. Should be able to handle all phases of mining operation and have a good speaking knowledge of the Spanish language. Substantial mine experience in Latin-America preferred. Salary open.

(1842) METALLURGICAL ENGINEER. A South American company has position open for a man with at least five years experience in the operation of concentration plants using both flotation and gravity methods. Preference will be given to single man with good knowledge of Spanish language. Three-year contract. Transportation both ways. Three months vacation. Salary open.

(1843) RESEARCH ENGINEER. One of the large research organizations has position open for geophysical trainee. Applicant must have B.S. degree in either Physics, Geophysics, electrical engineering or Geology, and have a good background in mathematics and physics with high academic standing. Position includes training in technical phases of instrument construction, operation and maintenance, interpretation and mapping of geophysical data and in field operation procedures.

(1844) PHYSICIST. A position is open with an eastern research organization for a physicist, who has at least an M.S. degree in Physics or Mechanical Engineering with a good working knowledge of electronics. His duties will be the design and development of electronic and geophysical instruments and mechanical equipment related to oilfield production, drilling and transportation. Salary open.

(1846) JR. REFINING ENGINEER. One of the major oil companies operating gasoline plant producing gasoline butane and propane from gas has position open for trainee willing to start as a roustabout and progress as experience justifies. Probable starting salary between \$250 and \$275 per month.

(1847) TOPOGRAPHICAL ENGINEERS. One of the Federal Bureaus has positions open for Topographical Engineers. Work consists of field surveys and topographical mapping. Applicants must be graduate engineers with degree in Mining or Civil engineering. Starting salary, around \$3100 per year.

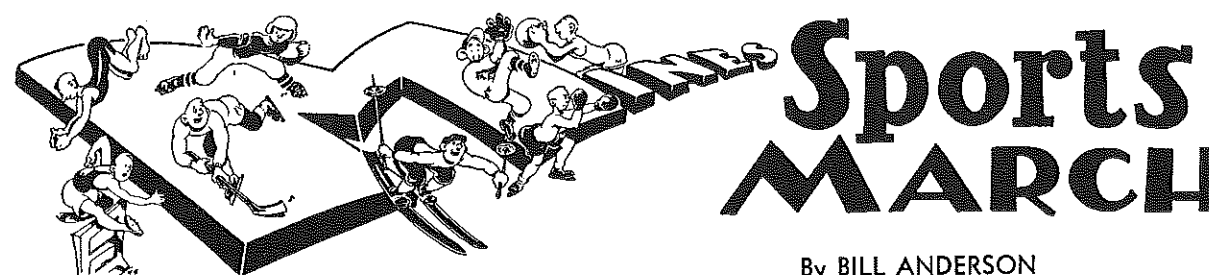
(1848) MINING GEOLOGIST. A large mining company with operations in South America has position open for Mining Geologist who has at least three years experience in connection with geological work and surveying in hard rock mining. Applicant must be either unmarried or willing to be employed single status for at least two years. Probable starting salary will run from \$350 to \$450 per month plus subsistence expenses and other benefits.

(1849) MINING ENGINEER. A large eastern mining company has position open for Mining Engineer who has had at least ten years mining experience, including the use of mechanical loading equipment as applied to room and pillar methods of mining. Salary open, depending upon the experience and ability of applicant.

(1851) JR. MINING ENGINEER. A position is open for a Jr. Mining Engineer who desires to enter training with one of the principal mining companies of the western states. Good opportunity for training and advancement. Probable starting salary, \$275 to \$300 per month.

(1852) METALLURGICAL ENGINEER. One of the large producers of non-ferrous metals has position open for Production Metallurgist who has had at least two years experience in connection with control and development work involving standard fabricating procedures. Preference will be given to man with experience in aluminum production, although other applicants will be

(Continued on page 43)



By BILL ANDERSON

1950-51 BASKETBALL SCHEDULE

1950
Fri. Dec. 8 Adams State College at Golden.
Sat. Dec. 9 Adams State College at Golden.
Fri. Dec. 15 Strait Lumber Company at Golden.
Sat. Dec. 16 Continental Air Lines at Golden.
Tue. Dec. 19 Idaho State College at Pocatello.
Wed. Dec. 20 Idaho State College at Pocatello.
Fri. Dec. 22 Montana State College at Bozeman.
Sat. Dec. 23 Montana State College at Bozeman.
Fri. Dec. 29 Denver Chevrolet at Golden.
Sat. Dec. 30 1951
Fri. Jan 5 Lowry Field at Golden.
Sat. Jan. 6 Mines at Lowry Field.
Fri. Jan. 12
Sat. Jan. 13 Strait Lumber Company at Aurora.
Fri. Jan. 19 Western State College at Golden.
Sat. Jan. 20 Western State College at Golden.
Fri. Jan. 26 Regis College at Lowry Field.
Sat. Jan. 27
Fri. Feb. 2 Colorado College at Colorado Springs.
Fri. Feb. 9 Colorado State College at Golden.
Sat. Feb. 10 Regis College at Golden.
Thu. Feb. 15 Continental Air Lines at Denver Auditorium.
Wed. Feb. 21 Colorado College at Golden.
Sat. Feb. 24 Colorado State College at Greeley.

The Orediggers' football fortunes took a decided upswing at the end of the season as the Miners won three of their last four games. The spirit and hustle of the entire squad has never been better as the Blasters came from behind deficits of 0-26 and 0-13 to win two of their victories. The year's tally was four victories against six defeats.

Colorado A & M 26—Mines 0

A highly regarded Colorado A & M team came to Golden on Nov. 4 and lived up to its reputation, winning 26-0.

The Aggies opening kick-off struck a Mines' player and was recovered by the Rams on their own 47-yard line. Jack Christiansen ran 39 yards to the Orediggers' 13-yard line in the open-

ing play from scrimmage. Seven plays later with fourth down on the Mines' 6-yard line, Christiansen cut back over tackle to give the Aggies their initial six points.

An alert, hard-charging Mines line kept the A & M crew bogged down for the remainder of the first half. The Aggies fumbled eight times during the game, regaining possession of the ball only once on their miscues.

The Orediggers drove for three consecutive first downs in the second quarter from their own 18-yard line to the Ram's 36 before being held for downs. Bill Johnston then punted out on the Aggies six-yard line.

The turning point of the game came late in the third quarter as the Aggies' Hoelzer punted 70 yards and out of bounds on the Mines' one-yard line. Johnston's third down punt was returned by Rice to the Mines nine. Don Straub passed to Jim David in the end zone on the first scrimmage play after the return. A Straub to Mikkelsen touchdown pass, and Mikkelsen's nine-yard touchdown jaunt in the fourth quarter ended the scoring.

Mines 22—Lowry Field 7

A hard-charging Mines team ended a Lowry Field two-game winning streak on Oct. 28 at Lowry Field by beating the host team 22-7. The Orediggers trapped fullback Otis Robinson behind the double stripes for a safety in the first quarter to lead by a 2-0 score at half-time.

In the third quarter, Mines received and drove 51 yards for a touchdown without losing possession of the ball.

Fullback Ed Ziolkowski drove over from the one-yard line for the score. The running of Ziolkowski and Tailback Carl Piercy highlighted the drive. An 11-yard pass from Piercy to End Bill Johnston placed the ball on the one.

The Oredigger scored again in the fourth quarter on a sustained 45-yard march. A 26-yard heave from Ray Govett to Johnston set the stage for Govett's two-yard plunge to pay dirt.

A 33-yard scoring pass from Govett to End Bill Watts ended the tallying.

Watts made a sensational falling catch of the ball in the end zone between two defenders.

Mines 33—Adams State 26

The Blasters played their best game of the season at Alamosa on Nov. 11, when they roared back from a 0-26 deficit score to win 33-26. The win resulted in the United Press naming Coach Fritz Brennecke as "Coach of the Week."

The Indians started fast to score within two minutes after the opening kick-off with a 10-yard pass from John Sheeley to Eddie Salazer capping a 49-yard drive.

Minutes later, speedster Lucius Dailey electrified the crowd with a brilliant 93-yard touchdown gallop.

The Miners' drive with the next kick-off came to an abrupt halt as Tackle Tom Smith picked an Oredigger fumble out of the air and ran to the Mines' 15-yard line before being brought down from behind. Sheeley hit End Tom Urbin with a scoring pass on the succeeding play.

The second period was barely under way when Lucius Dailey scored on a 41-yard dash to place the Indians in a seemingly insurmountable 26-0 lead with only 17 minutes of football played.

Mines' second period score on a Bob Jacobsen to Claude Jenkins pass good for 22 yards, did not dampen the partisan crowds spirits as the Orediggers trailed 7-26 at halftime.

The Blasters took command in the second half holding the Indians to a total gain of five yards for the entire half while scoring twice in each of the third and fourth periods for the victory.

A 44-yard aerial from Ray Govett to Dave Brown put the ball in the Adams State four early in the third period. Govett smacked over tackle on the first play from scrimmage to add six points.

Upon gaining possession of the ball after the ensuing kick-off, the Miners again went to work. A 33-yard scoring pass from Govett to End John Volosin made the score 26-20. Volosin went high in the air to make a spectacular grab in the end zone. Tackle Dick Barnes converted.

Mines again drove from their own 46 on the next series of downs, scoring on an eight yard aerial from Govett to Jenkins. Barnes' placement was wide leaving the figure knotted at 26 all.

With less than a minute remaining and the Orediggers again on the march, Wingback Bob Einarsen threw to Ziolkowski for 29 yards and the win. Big Ed side stepped one tackle and ran over another to score standing up. Barnes added the point for good measure. The final: Miners 33, Indians 26.

Govett's passing was the best of the year as he hit receivers on 12 out of 19 tosses, two for touchdowns, good for a total of 185 yards. End Claude Jenkins caught seven passes good for 85 yards and two touchdowns. Adams State passed and ran for 335 yards during the first half only to have the tables completely reversed in the second, being held to a minus 26 yards rushing and 31 yards gained passing.

Mines 14—New Mexico A & M 13

The Orediggers journeyed to Las Cruces as Homecoming guests of New Mexico A & M on Nov. 18 where they again spotted an opponent 13 points before winning 14-13. An intercepted pass set up the initial score for the Aggies who rosted six points before the game was a minute old. The conversion attempt was wide.

The New Mexico team drove 58 yards after getting the ball for another score in the first stanza. The conversion was good.

Then neither team threatened until late in the second quarter. When Dick Bench intercepted a New Mexico pass on the Aggies' 30-yard line. On third down, Bob Einarsen threw to Ed Ziolkowski for 28 yards and a touchdown. Ziolkowski was alone in the end zone. Dick Barnes' conversion was good.

In the third period, New Mexico was held for downs on its own 13-yard line. Herb Torpey broke through from his end position to block the punt and Tackle Bill Cooke fell on the ball in the end zone for the touchdown. Dick Barnes split the up-rights for the winning margin.

New Mexico men drove from their own 20 to the Mines' 19 in the third quarter where they lost the ball on downs in their only other scoring threat of the game.

Linebacker Ed Turner recovered an Aggie fumble on the New Mexico 12-yard line, but the Mines threat ended inches short of the two-yard line where the Aggies took over.

This year's Orediggers made up a team that was never beaten until the

final gun. They were light, the offensive unit averaging 168 pounds and the defensive unit a robust 173 pounds, but although out weighed they were never out fought. In three of their wins they came from behind to earn the victory.

Tailback Ray Govett was the leading offensive back gaining 602 yards in 160 plays. Ray intercepted six passes as defensive safety to lead in that department. Ed Ziolkowski was the leading scorer with 31 points, the top rusher with 241 yards. He was also on the touchdown pass receiving end most, taking three for scores. End Claude Jenkins led all pass receivers with 25 catches good for 406 yards and two touchdowns. Bill Johnston punted 56 times and averaged a creditable 39.4 yards.

Mines Yearlings

An underrated Mines' freshman team traveled to Fort Collins on Oct. 28 and played a bruising 0-0 tie with the highly regarded Colorado A & M yearlings.

Tackle Jim Phelp's attempted field goal from the 22-yard line in the third quarter was wide to end one Mines' scoring threat.

The Baby Blasters lost the ball on downs on the Aggies eight-yard line in the fourth quarter.

Highlights of the game were Fullback Alan Fulton's smashing runs into the Aggie line and "Skip" Stenseth's quick kicking to keep the Aggies deep in their own territory. Outstanding defensive linemen were Tackles Burley Scales and Ken Miller, Center LeRoy Little and Guard Bill "Mother" McGreevy, who played stand-out roles in holding the Aggies for four straight downs on their one-yard line, stopping the only Aggie scoring threat.

The Mines' Frosh inability to hold on to the ball lead to a 2-12 defeat at the hand of the Colorado College Frosh at Colorado Springs.

C. C. took advantage of a Mines' fumble on the Orediggers' 12-yard line to score their first touchdown in the second quarter.

Late in the second period the Blasters marched 61 yards to the Tigers' two-yard line where a fumble halted the drive. On the first scrimmage play a C. C. back was tackled in the end zone by Guard Jack Fowler, to make the score 6-2 at the end of the half.

In the second half two Mines' fumbles within the C. C. 10-yard stripe and an intercepted pass returned 43 yards for a touchdown led to the Miners' ultimate defeat.

Basketball Prospects

Head Coach John Karamigios issued the call to all hardwood players on Nov. 16.

Six lettermen have reported for drills with a host of sophomores from last year's Frosh team.

The main problem facing Karamigios will be the replacement of such stalwarts as Clyde Kerns, Jack Earl, Herb Waterman and Lou Landers.

Outstanding lettermen returning are: Doug Waterman, All-Conference guard, and Tom Johnson who received All-Conference mention at center. Other lettermen who bolster Mines' chances considerably are: Bill Ruehle, small jump-shot artist; Jim Ault, husky rebound man; and Bob Einarsen, left-handed hook-shot specialist.

Newcomers to the squad who will help are John Lockridge, 6' 2" Frosh star of two years ago, out last season with an injured knee; Tom Wyman, 6' 1" steady performer from last year's Frosh team and Tony Dempster, 6' 5" pivot man, who should develop into an outstanding cager with more experience and polish.

Mines Soccer Team Defeats Boulder 4-0

Colorado School of Mines soccer team continued undefeated by clipping the Colorado university team 4-0 at Brooks field Sunday. (Nov. 19).

The team from Boulder played without a full squad, and Mines held men out of the game to even the contest. Mines scored two goals in the first half and two goals in the second half. Scoring for Mines were Rod Thomas, captain of the team, Victor Perez, and Rafael Romero.

Mines Freshmen - Colo. State Freshmen

The Mines freshman team lost a thriller to the Colorado State frosh at Golden as the Greeley team broke a 13-13 tie on Buzz Speckner's fourth down end run good for a score from seven yards out in the last ten seconds of play.

The Bears' yearlings scored the first time they got the ball, driving from their own 33 with Stewart sweeping his own right end from the six to score.

Again late in the first quarter, Colorado State started a drive from its own 42. A Stewart to Abbott pass, good for 32 yards, and Stewart's 13-yard jaunt set the stages for Porter's pass to Speckner from the three-yard line and a touchdown early in the second quarter.

(Continued on page 39)

Book Reviews

Classical Mechanics

By Herbert Goldstein, Ph. D. Harvard University. Addison-Wesley Press, Inc., Cambridge 42, Mass. 1950. 6x9. 400 pages. Illustrated. \$7.00.

The traditional treatment of the subject is no longer adequate and this book is an attempt at an exposition of classical mechanics that fulfills present requirements. The author starts off with a survey of the elementary principles.

Included are those formulations of importance to modern physics and mathematical techniques associated with quantum mechanics. Considerable space has been devoted to Canonical Transformations, Poisson Bracket Formulations, Hamilton-Jacobi Theory and Action-Angle Variables.

Euler's Theorem on motion of the rigid body is thoroughly discussed. Considerable space has been given to the development of more mathematical tools needed in connection with the subject. Exercises are appended to each chapter illustrating some particular point or proving variant theorems. References have been listed at the end of each chapter which will be a great assistance for use in elaborating upon the material discussed or for obtaining additional information in regard to the subject. Additional references are included at the end of the book.

A very useful index of symbols is also included listing the initial appearance of each meaning of the important symbols. A well arranged index provides easy reference to any subject contained in the book. To anyone interested in the subject of classical mechanics, this will be found to be a valuable reference as it contains a complete coverage of the principles underlying the subject and mathematical treatment.

Semimicro Qualitative Analysis

By William C. Oelke, D. C. Heath Co., 1950. IX+377 pages. 1 phot. plate, 11 tables, 35 figs. \$3.75.

"Written to emphasize 'the laws of chemical equilibrium as the logical basis for any system of analysis', this book for college sophomores not only gives the general theory of the subject but applies the theory to actual laboratory separations, which comprise Part II. Descriptive material is included so that the student will learn much additional inorganic chemistry. Balanced equations are given for all important inorganic reactions." *American Scientist*, July 1950.

California Oil Fields, Vol. 35, No. 2

By Division of Oil and Gas, Ferry Bldg., San Francisco, California. July-Dec. 1949.

This Number contains information pertaining to the Placerita Oil Field, San Ardo Oil Field, Resume of Oil Field Operations in 1949, Production Statistics of California Oil Fields, July 1 to December 31, 1949, Wildcat Wells Abandoned in 1949, Proved Acreage by Counties, December 31, 1949, Directory of California Oil Operators, Index to Annual Reports and maps are included covering the fields under discussion.

A large amount of statistical information is also included in this Number.

Chemical Engineering Costs

By O. T. Zimmerman, Ph. D. and Irvin Lavine, Ph. D. Industrial Research Service, Dover, New Hampshire. 400 pages 6 x 9. 350 illustrations. 200 cost charts. 100 tables. \$6.50.

This book is an encyclopedia of information covering very completely equipment used in connection with the chemical industry. The illustrations used throughout the book are well selected and give one a good idea of the equipment at a glance. Tables and charts furnishing information pertaining to different forms of equipment together with their performance enable one to make estimates in the minimum time pertaining to various chemical processes for plants under consideration.

Illustrative problems used seem to be well selected. Chapter on industrial materials for use in connection with chemical industrial plants and operation together with a large number of tables supply a great deal of valuable information in a condensed form.

This book should prove valuable and instructive as a reference for anybody making estimates of cost in connection with chemical engineering.

Mineral Commodities of California—Geologic Occurrence, Economic Development and Utilization of the State's Mineral Resources

By the staff of the Division of Mines directed by Olaf P. Jenkins. Cloth-bound with map showing mineral distribution. \$2.00.

This volume reviews, by means of separate technical papers, the entire mineral industry of California. More than 80 different kinds of raw materials are discussed, nearly all of which, under favorable economic conditions, are capable of profitable development and use in industry. Also included is a map showing the general distribution of mineral deposits, on the back of which is a description, accompanied by a map, of the geomorphic provinces of the State. The latest statistical data has been supplied through cooperative agreement by the U. S. Bureau of Mines; the earlier production figures were drawn largely from the Division's own records, and recast in the form of graphs.

As a handbook of useful knowledge concerning the mineral resources and industry of California, Bulletin 156 serves a very broad field of interest; producer, explorer, and use of mineral materials, as well as the general public seeking authoritative information, will find this volume invaluable. It is very suitable for a college text on economic geology.

The Canadian Mineral Industry in 1948

Department of Mines and Technical Surveys, Ottawa, Canada. No. 829. \$25. 126 pages.

This publication contains a review of the production of metals, industrial minerals and fuels in Canada during the year 1948. In many cases, exports are shown and the country of destination. Production, consumption and value are shown under each metal or mineral.

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

Ruxton of the Rockies

Collected by Clyde and Mae Reed Porter. Edited by LeRoy R. Hafen. University of Oklahoma Press, Norman, Okla. 325 pages. \$5.00.

Largely in his own words and crammed with closeup views of life amid the Rockies a full century ago, here's the true story of a genuine mid-'80s adventurer.

He's George Frederick Augustus Ruxton. Born to the purple in Britain, he managed to be expelled from the Royal Military Academy of Sandhurst at the age of 15. Whereupon he went to war in Spain, which was what he wanted—action instead of textbooks.

At 17 he wore the Cross of San Fernando with the warrior title of knight. He went on from there across most of the world, riding a horse, carrying a gun in case he ran across some big game, and jotting down notes which have been converted into this book.

His story, carries him northward through all of Mexico in 1846 and on alone through then turbulent New Mexico into what now is Colorado.

In the company of one horse and a brace of mules, with scalp-hunting Indians as numerous as the grouse, he spent the next winter camped amid game herds occupying the area which now includes the cities of Colorado Springs, Pueblo and Manitou.

Ruxton rode on from there to more adventure and early death.

The authors include Clyde Porter of Kansas City and his wife, noted students of western lore, and the volume was edited by LeRoy Hafen, executive director of the Colorado Historical society.

They named a creek near Pike's peak for Ruxton and Thomas Hornsby Ferrel wrote a poem about it. That's in the book, too, along with every fact about Ruxton the authors could glean in months of research and on a pilgrimage to his birthplace. Denver Post

The Orange Free State Gold Mines

By Paul Klemmner. Pinners Hall, Austin Friars, London, E. C. 2, England. 107 pages. 21 shillings.

This book contains a general survey of the gold mines of the Orange Free State including factors governing state production. General information under mining operations includes prospecting, exploration, development, exploitation and metallurgical treatment. Geological features are discussed together with sampling. Valuation of operating mines contain detailed information furnished by the several operating companies.

List of references are included and also a map of the Orange Free State Gold Field showing the present mines, lease areas and possible extensions.

The Minnesota Geologist

Official Bulletin of the Geological Society of Minnesota, Vol. VII. Third Quarter 1950.

This is a mimeographed publication containing 6 pages dealing principally with the activities of this organization. A report by the President gives a good idea of what the Society has accomplished and also includes a financial statement.

SECONDARY OPERATIONS AND RESERVES

(Continued from page 28)

field and the necessity for the prevention of waste in the public interest. Having shown in extensive detail how operators and landowners can share great benefits from the application of improved recovery methods, attention can now be given to the benefits which will accrue to the state and to its people by the proper exercise of this right to control the production of oil by the enactment and enforcement of adequate conservation laws. The State of Illinois can provide an excellent example.

The value of the estimated minimum secondary reserve of 350,000,000 barrels of oil to the government of Illinois and to the people of Illinois under existing price and tax schedules can be determined approximately as follows:

Revenue from Severance Tax at 3 per cent at \$2.77/bbl. 350,000,000 x 2.77 x 0.03	equals—\$ 29,085,000
Revenue from Gasoline Tax assuming that entire secondary reserve is refined in Illinois, that half of the crude is made into gasoline, and that all of the gasoline is consumed intrastate. Tax at 0.03/gal. 350,000,000 x .5 x 42 x 0.03	equals— 220,500,000
Estimated Production Payroll at 0.309/bbl.	equals— 108,150,000
Estimated Pipe Line Payroll at 0.0675/bbl.	equals— 23,625,000
Estimated Refinery Payroll at 0.30/bbl.	equals— 105,000,000
Estimated Marketing Payroll at 0.608/bbl.	equals— 212,800,000
Total	\$699,160,000

The following are basic assumptions used for the preceding tabulations:

For refining: 8,140 employees with an average wage of \$3,700 per year and with average runs of 100,000,000 barrels per year.

For marketing: 13,305 service stations with an average of 2 employees each receiving an average wage of \$2,000 per year, and with average sales of 45,000,000 barrels of motor fuel per year.

Impressive as these figures are, it will be readily understood that they do not begin to represent the entire returns that will come to the government and people of Illinois from the anticipated production, transportation, processing, and marketing of the state's secondary oil reserve. If it were possible to estimate ad valorem taxes, the vast sums of money that will be spent in the drilling and equipping of new wells for injection and production purposes, and the cost of constructing expensive water or gas injection systems, it could probably be stated with reasonable certainty that the state government and the people of Illinois can expect to benefit from the production of its secondary reserve in the amount of about 1 billion dollars. This amount is approximately equivalent to the gross income which the oil producers and royalty-owners can expect to receive from the sale of the secondary oil from which must be deducted, of course, taxes, and development and operating expenses.

With such a large source of tax and payroll revenue in prospect, it would seem obviously to the advantage of Il-

linois to encourage in every possible way the extensive application of methods for increasing the recovery from all of its oil fields. Some of the secondary reserve, unquestionably, can and will be produced under existing conditions and laws. However, the enactment of a conservation statute, which will enable the unit operation of fields, will go a long way to insure the maximum application of secondary methods with substantial and far-reaching benefits to landowners, to operators, and to the government of Illinois and its people.

This consideration of the possibilities for more widespread application of secondary methods in certain of the eastern states should not be concluded without giving some attention to the profound effect the same may have on the ability of the United States to defend itself in the event our country should be separated from foreign

sources of oil supply. Members of the distinguished Railroad Commission of Texas have stated that Texas' tremendous contribution of liquid fuels to the recent victory of the United States and its Allies came from fields that had been discovered and developed prior to the commencement of hostilities, and in which large reserve productive capacity existed by reason of wise administration of the State's conservation laws. New discoveries during the War years, although of great importance as an assurance of

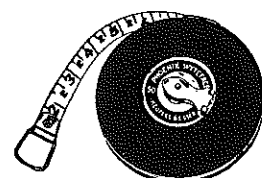
future oil supply, nevertheless made only a minor contribution to war-time demands for oil products. Similarly, the writer believes confidently that it will be much easier to supply possible present or future emergency requirements for liquid fuels from oil that has already been found rather than from oil which remains to be discovered. We certainly can consider it to be a patriotic obligation to dedicate a great deal of thought and attention to the enactment of appropriate laws and to essential technical studies for the purpose of making large secondary reserves of oil available at the time they may be needed most. Likewise, the writer believes firmly that a great part of the known oil reserve of the United States can be produced more profitably and more expeditiously, and with greater overall benefit to the people of this nation than the immediately foreseeable production of substitute synthetic liquid fuels.

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- (1) Don T. Andrus, "Secondary Recovery Research—An Adventure in Conservation," *Interstate Oil Compact Quarterly Bulletin*, Volume V, Number 2, August, 1946, pp. 16-26.
- (2) J. P. Jones, "Conservation and Secondary Recovery," presented as testimony before the House of Representatives Armed Services Subcommittee, February 6, 1948, and reprinted in the February, 1948, issue of *Producers Monthly*, Volume 12, No. 4, pp. 18-23.
- (3) Paul D. Torrey, "A Preliminary Statement on Secondary Recovery Prospects and Possibilities in Various Parts of the United States," *Interstate Oil Compact Quarterly Bulletin*, Volume VII, No. 2, September, 1948, pp. 60-65.
- (4) Frederick Squires, Paul G. Luckhardt, and Alfred H. Bell, "Secondary Recovery in Illinois," Chapter 42 Second Edition of API, "Secondary Recovery of Oil in the United States," 1950, pp. 505-521.
- (5) R. R. Vincent and K. P. Huffman, "Resume of Water Flood Operations in Illinois, Indiana, Kentucky, Ohio, Michigan, and West Virginia," Paper presented at API Eastern District, Division of Production, Cleveland, Ohio, April 28, 1950, Paper 826-21-F.

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IN MEMORIAM

John R. Shanley

of the class of 1915 died at his home in Long Beach, California, February 12, 1950. He had been a resident there since 1923 when he became engaged in the gasoline manufacturing business which he continued until his death.



JOHN R. SHANLEY

Mr. Shanley was born and reared in Denver. He was graduated from West-Denver high school, then enrolled at *Mines*. During the four years there he was active in campus affairs. He was a member of Beta Theta Pi and Theta Tau fraternities. He played baseball and football and was chosen as all Rocky Mountain end in 1913 and 1914.

Upon his graduation from *Mines* Mr. Shanley accepted position of safety engineer with the Arizona Copper Company at Morenci, Arizona. Two years later he resigned this position to enter the service in World War I where he was with the Field Artillery in France until 1919 with

SPORTS MARCH

(Continued from page 36)

After the half-time intermission, the Orediggers' offense came to life, with intercepted passes stopping two *Mines*' drives in the third quarter. Milton Stenseth southpawed a long pass to end Chuck Andrews, good for 37 yards and wingback Loren Whitescarver rambled 42 yards on a reverse late in the third quarter.

Greeley took over on downs at their own 29-yard line and, after three running plays, ended up on their own 15-yard line on consecutive losses.

the rank of 1st Lieutenant. After his discharge and until he moved to Long Beach he was County Engineer for Hot Springs County, Wyoming.

Mr. Shanley and Miss Kathryn Hudson were married in Long Beach in 1919. Besides his wife he is survived by a son, Robert, *Mines* '42, and two daughters, Mrs. Patricia Bittel and Miss Jeanne Shanley, all of Long Beach.

William K. Kirby

former member of the faculty at *Mines* passed away October 4 in New York City. His home, however, was 1964 Glen View Terrace, Altadena, California.

A native of Salt Lake City, Utah, Mr. Kirby came to *Mines* in 1921 as the first professor in the department of Petroleum Engineering. He left the school to take up private practice as consulting petroleum and mechanical engineer and, later, became president of Compania de Petroleo Ganso Azul, Ltd., of Lima, Peru.

He was a member of the Petroleum Engineers Institute and the New York Mining & Metallurgical Society.

He had made his home in Altadena for the past fourteen years, where his wife now resides. Besides her he is also survived by two brothers, C. W. Kirby of San Francisco and Robert Kirby of Tombstone, Arizona; a niece, Mrs. Bonnie Kelly of Monrovia, and a nephew, Ernest Kirby of Montana.

Joseph W. Vota

Chief Engineer for Shenandoah-Dives Mining Company at Silverton, Colorado, passed away October 18 in an ambulance as he was being rushed to a clinic in Albuquerque, New Mexico. His condition had been seri-

ous for over a week when it was decided to take him to Albuquerque for special treatment.

Mr. Vota had spent his entire life in Silverton. He was the son of Mr. and Mrs. Ludwig Vota, pioneer residents. Upon completing his high



JOSEPH W. VOTA

school work, he entered *Mines* from where he was graduated in 1932.

He then obtained mining employment at Silverton, gaining experience at several of the mines before becoming associated with the Shenandoah-Dives company in 1941.

Shortly after his graduation from *Mines* he was married to Miss Nona Willy of Silverton who survives him. He is also survived by his mother of Grand Junction, Colorado, and a daughter, Jo Ann, who is attending Wasatch Academy at Mt. Pleasant, Utah.

Mr. Vota took an active part in the affairs of the community, having served on the school board and in various capacities during mining conventions. He was a member of San Juan Lodge No. 33, A. F. & A. M., and the Order of the Eastern Star, having served in all the chairs of both orders.

Porter's first down pass, setting the stage for *Mines*' second TD. After Stenseth and fullback Fulton had made a first down on carries of five and eight yards respectively to *Mines*' 43-yard line, Stenseth hit Fulton with a pass in right flat, and the 185 pound fullback legged it the remaining 45 yards for the touchdown. Jim Phelps added the point, knotting the count at 13-13.

Stenseth's fumble while trying to pass from his own 15-yard line set the stages for Greeley's whirlwind finish.

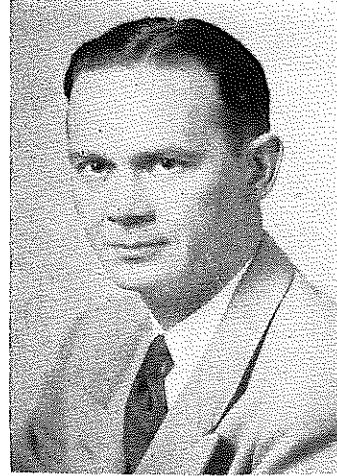
PLANT NEWS

(Continued from page 30)

Remington Rand Makes Appointment

Appointment of George Bastianello as assistant sales manager of its Business Services Department was announced recently by Remington Rand Inc.

Mr. Bastianello joined the Company recently to aid in coordinating the expansion of its management method and service operations. With over 20 years' ex-



GEORGE BASTIANELLO

perience in the business field, at home and abroad, he has specialized in tabulating card services, as well as industrial and consumer research, cost accounting, and methods engineering.

Before coming to Remington Rand, Mr. Bastianello was connected with the New York office of Statistical Tabulating Company. In Europe from 1927 to 1934, he served with International Harvester Corporation, Western Electric Company, and Studebaker Pierce Arrow Corporation.

ALCOA Will Increase Production

Two major ALCOA programs that together will boost America's production of defense aluminum by more than 25 per cent annually have been announced in Washington by I. W. Wilson, senior vice president of Aluminum Company of America.

The first, a "quick action" plan will be started immediately, and shortly will be producing added supplies of the vital light metal for the national defense stockpile at the rate of approximately 158,000,000 pounds a year, using stand-by facilities owned by the company which require the use of higher-cost electric power than is economical for peacetime smelting of aluminum.

The second phase is an expansion plan that involves the erection of permanent new capacity by ALCOA, capable of producing approximately 240,000,000 pounds of aluminum a year. This new capacity will be achieved by enlarging the smelting facilities at ALCOA's Point Comfort, Texas, plant, plus the construction of a new plant utilizing electric power generated from gas or coal fuels.

Mr. Wilson emphasized that the "quick action" plan is not an expansion program, but is an emergency measure separate and distinct from the other ALCOA plan for the addition of permanent smelting facilities.

Mr. Wilson called attention to the fact that heretofore the only major aluminum

production facility erected since World War II in this country was ALCOA's reduction plant at Point Comfort, Texas, capable of producing 114,000,000 pounds of aluminum a year. Operations began there early in 1950, and the aluminum produced by the plant has already made an important contribution to the defense effort.

Gardner-Denver Company Establishes Canadian Plant

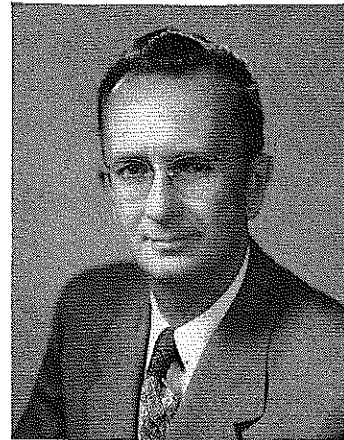
To provide increased service for its expanding Canadian business, Gardner-Denver Company, manufacturer of rock drills, air compressors, pumps and equipment for mining, contracting, oil field and industrial purposes, is establishing a Canadian plant, officials of the company announce.

The new plant will be located at Brantford, Ontario, and will be operated by Gardner-Denver Company (Canada) Limited. Key production men will be temporarily transferred from the parent plant, Quincy, Illinois, to provide the necessary initial supervision, but both skilled and unskilled labor will be obtained in Canada.

Production of the new plant will be handled through the seven branch offices which the Gardner-Denver Company maintain in Canada.

Link-Belt Appoints B. V. Jones Advertising Manager

Link-Belt Company, manufacturer of materials handling and power transmission equipment, has appointed Bertram V. Jones Advertising Manager, to succeed Julius S. Holl, deceased. Mr. John F. Kelly will continue in the capacity of asst. advertising manager.



B. V. JONES

Mr. Jones joined the Link-Belt advertising department in Chicago in January, 1923, after having done advertising work for several other companies.

He has since then handled production, creative direct mail and catalog work, and for a period of seven years served as advertising manager for Link-Belt Speeder Corporation, a subsidiary company building shovel-cranes.

He was appointed asst. advertising manager of Link-Belt Company in 1949 and became executive asst. advertising manager on July 1, 1950.

Goodyear Dividends

Regular quarterly dividends of \$1.00 per share on common and \$1.25 per share

on five dollar preferred, have been declared by the board of directors of the Goodyear Tire & Rubber Company. The dividends are payable December 15 to stockholders of record November 15.

Kenneth R. Geist Named Director of Purchases at Allis-Chalmers

Retirement of Fred E. Haker as director of purchases for Allis-Chalmers Manufacturing Company, effective October 28th, after 50 years of service with the firm, has been announced by Walter Geist, president.

Haker is succeeded by Kenneth R. Geist, who has served as assistant to the director of purchases for the past two years. Haker's retirement date also marks his 70th birthday. According to Walter Geist, Haker has agreed to remain until January 1, as a special representative reporting to the president.

In his new post, Geist will supervise the expenditure of more than \$190,000,000 annually in dealing with approximately 8,000 suppliers around the world.

Allis-Chalmers Rumley Ltd. Acquires Erie Iron Works

Allis-Chalmers Rumley Ltd., a Canadian subsidiary of Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin has announced the purchase of the plant of the Erie Iron Works at St. Thomas, Ontario, and also the purchase from the city of an additional seven acres of land.

Allis-Chalmers Names Dr. H. K. Ihrig Vice President in Charge of Research

Walter Geist, president of the Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin, has announced the election of Dr. H. K. Ihrig as vice-president in charge of research effective November 15.

Simultaneous with this announcement, W. C. Buchanan, president of the Globe Steel Tubes Company, Milwaukee, Wisconsin, and a director of Allis-Chalmers, announced that the resignation of Dr. Ihrig as vice-president and director of laboratories of the Globe Steel Tubes Company was accepted at a meeting of the company's board of directors this week.

Buchanan said, "After 17 years of loyal service, naturally we are reluctant to lose the services of so valuable a man as Dr. Ihrig. However, as a director of Allis-Chalmers and cognizant of that firm's expanding program of research, I know that Dr. Ihrig can make a great contribution. We are extremely pleased that he is going to have this splendid opportunity."

G. C. Quinn Becomes Allis-Chalmers Industrial Press Supervisor

Gerald C. Quinn, editor since 1945 of the Allis-Chalmers Electrical Review, has been appointed supervisor of industrial press relations, according to A. R. Tofte, manager of the Allis-Chalmers advertising and industrial press department. He succeeds N. H. Jacobson, who has joined the Atomic Energy Commission in the newly created position of technological information officer.

Hewitt-Robins Increases Dividends

Directors of Hewitt-Robins Incorporated has increased their regular quarterly disbursement on its common stock from

25¢ to 40¢ per share, and, in addition, declared a year-end extra dividend of \$1.00 per share, bringing the total amount of dividends for 1950 to \$2.15 per share.

Both the fourth quarter dividend and the year-end extra are payable December 15, 1950, to Stockholders of record November 20, 1950.

DuPont Announces Personnel Changes

James S. Denham, general manager of the Du Pont Company's Photo Products Department, retired on December 1 after a long career in three of that company's industrial departments. He will be replaced by Samuel G. Baker, now general manager of the Electrochemicals Department. The vacancy left by this transfer will be filled by Donald O. Notman, assistant general manager under Mr. Baker.

DuPont to Build New Plant at Memphis

Plans for the construction of a chemical plant at Memphis, Tenn., at an estimated cost of \$7,500,000, have been announced by E. I. du Pont de Nemours & Company.

The new plant will be built about 10 miles north of the business district on a 225-acre site purchased last May and will be operated by the company's Electrochemicals Department.

James J. McIntyre, who will be manager of the new plant, already has reported to Memphis. He has been assistant manager of Du Pont's Niagara Falls, N. Y., plant.

Plant construction will be under the direction of Du Pont's own Engineering Department and approximately 700 local workmen will be on the job during peak building operations.

DuPont Stockholders Increase

E. I. du Pont de Nemours & Company, Inc., was owned by 122,386 stockholders as of September 30, 1950, an increase of 3,654 over the number of holders recorded at the close of the first half-year, June 30, 1950, and an increase of 17,938 over the number as of September 30, 1949.

There were 105,485 holders of common stock, and 23,586 holders of preferred stock as the third-quarter period of 1950 ended. These figures include 6,685 holders of more than one kind of stock. Every state in the union continued to be represented among the owners of the company.

G-E Equipment Aids in Construction of 24 Mile Tunnel for N.Y.C. Water Supply

Electrified equipment is helping to bore 25 miles through the Catskill Mountains to add 300 million gallons of water to New York City's water supply. The extension of the Delaware Aqueduct is being built by the Walsh Construction Company and B. Perini and Sons, with electrical equipment co-ordinated and engineered by the General Electric Company.

New Corrosion Testing Station to Open in North Carolina

Representatives of more than 100 industrial companies and government officials have been invited to attend the formal opening on November 15 and 16 of the new Harbor Island addition to the Kure Beach corrosion testing project near Wilmington, N. C., has been announced by F. L. LaQue, in charge of the corrosion engineering section of The International Nickel Company, Inc., under whose direc-

tion the project is operated.

With the new laboratory and marine exposure racks which have been added at Harbor Island, the Kure Beach project now has increased facilities for the study of over 20,000 specimens of all types of materials in sea water and sea air. It is believed to be one of the largest projects of its type in the world.

Stanolind Transfers Personnel

Stanolind Oil and Gas Company has announced the transfer of four engineers in the company's Central Division.

Junior D. Armour, field engineer, has been transferred to Gorham, Kansas, from the company's West Edmond Area office in Oklahoma City.

Wallace A. Borgeson, Jr., formerly petroleum engineer in the Kansas District Office, Ellinwood, Kansas, has been named field engineer at Ulysses, Kansas.

Murray D. McCormick, who was field engineer at Gorham, Kansas, has been named petroleum engineer in the Kansas District Office, Ellinwood.

Rexford E. Cheek, field engineer, has been transferred from Ulysses, Kansas, to the company's West Edmond Area office in Oklahoma City.

McCormick has been with Stanolind since 1940. Armour and Cheek joined Stanolind as engineers in 1943. Borgeson has been with the company since 1945.

Cheek received his degree in Petroleum Engineering from Colorado School of Mines in 1943.

International Minerals Announces New Financing

A special meeting of the stockholders of International Minerals & Chemical Corporation will be held on November 27 in New York to consider a proposed plan of new financing which has been approved by the board of directors, according to Louis Ware, president of the corporation.

It will be proposed to increase the number of authorized shares of the corporation's common stock from 800,000 to 2 million shares. This would enable the board of directors to carry out a plan of financing which would contemplate the sale, to underwriters for distribution to the public, of 200,470 shares of common stock. This would be followed by the payment of a common stock dividend on the basis of one share of common stock for each share of common stock then outstanding.

International Minerals Show Substantial Increased Earnings

Net sales of International Minerals & Chemical Corporation for the three months ended September 30, 1950, totaled \$11,500,292 as compared with \$10,208,702 for the same period last year, an increase of 13 per cent.

Net earnings for the three-month period were \$943,366 as compared with \$805,627 for the corresponding period a year before, an increase of 17 per cent.

Earnings per common share for the three-month period were \$1.07 per share as compared with 89 cents per share for the same period a year ago, with 792,030 common shares outstanding.

La.-Miss. Distributors for Owens-Illinois Glass Company

The Kaylo Division, Owens-Illinois Glass Company, Toledo, Ohio, has announced the appointment of Reilly-Benton Company, Incorporated, New Orleans, Louisiana, as distributors of their Kaylo heat insulation for the area of Louisiana and Mississippi.

The Reilly-Benton Company, Incorporated, are solely wholesale distributors of insulation materials and accessories engaging in no application work. They maintain sales representatives at New Orleans, for the State of Louisiana, and Jackson, for the State of Mississippi.

Ford Aircraft Engine Division Honors Engineer

William F. Pioch, veteran Ford Motor Company production engineer, has been appointed manager of manufacturing engineering of the newly-formed Aircraft Engine division, it has been announced by Maynard T. Murray, general manager of the division.

The division will produce Pratt and Whitney 28-cylinder engines for B-36 bombers under a contract agreement with the U. S. Air Force. The engines will be manufactured at the Ford Aircraft Engine plant in Chicago.

Mr. Pioch, an employe of Ford for 33 years, was chief engineer of the giant Willow Run bomber plant from which Ford delivered 8,685 B-24 Liberator bombers to the Air Force during World War II.

ALUMNI BUSINESS

(Continued from page 32)

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

Research and Investigation Committee

Mr. Storm reported the committee is continuing the analysis of the job investigation and a report will be completed by the middle of December 1950.

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

General Report

Mr. Bowman reported that accounts receivable carried over from last year will show about \$75.00 that seem to be uncollectable.

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

Special Business

An application for Associate membership, submitted by Mr. William H. Williams of Denver, Colorado, was read by President Colasanti. Mr. Williams met all requirements and had remitted the proper fees. Moved by Mr. McGlone the application be accepted; seconded by Mr. Collier; passed.

President Colasanti reported the committee authorized by the Executive Committee at the last meeting to investigate the possibility of additional money and help for Frank Bowman would be as follows: Carl Dismant, Chairman, Lynn Storm, Harvey Mathews, Malcolm Collier, George Setter.

Adjournment

No other business appearing, the meeting was adjourned at 8:45 P. M.

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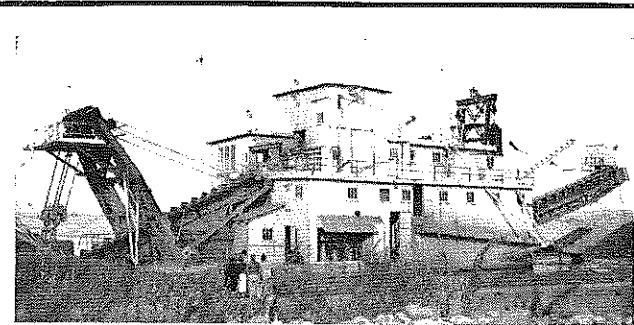
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TECHNICAL SOCIETIES AND ASSOCIATIONS MEETINGS

35th Annual Meeting of Colorado Society of Engineers Jan. 18, 19, 20, 1951

The 35th Annual Convention of the Colorado Society of Engineers will be held January 18, 19, and 20, 1951 at the Shirley-Savoy Hotel, Denver, Colorado.

Mr. J. R. Casey, Manager Gas Turbine Sales for the General Electric Company is to be one of the featured speakers. Mr. Casey will bring us an up-to-date report on these fast moving developments.

As in past years, the Annual Convention will feature exhibits by many local and national firms, a program of speakers which will be of interest to Engineers of all branches, Friday night dance, and the usual Saturday night banquet and floor show.

53rd Annual Meeting of the Colorado Mining Association February 1, 2, 3, 1951

The Colorado Mining Association will hold its 53rd Annual Meeting in celebration of the Diamond Jubilee of the State of Colorado, February 1, 2, and 3, 1951.

As usual, this convention will be attended by important men of the mineral industries. Both national and international speakers are always attracted.

As in past years, it will be climaxed by the Gold and Silver Banquet and the Famous Sowbelly Dinner.

Western Metal Congress and Exposition, Mar. 19-23, 1951— Oakland, California

Seventh Western Metal Congress and Exposition, March 19-23, Civic Auditorium and Exposition Hall, Oakland, Calif. This double event is sponsored by American Society for Metals in cooperation with 20 other national technical societies.

William H. Eisenman, national secretary said the ASM technical program, which will be but one of several sponsored by various societies, is being worked out by a committee headed by Earl R. Parker, University of California, Berkeley and a Colorado School of Mines graduate.

Parker plans that morning and afternoon ASM sessions include three to four papers by eminent authorities, who will present complete perspectives of what

mechanical and other engineers need to know concerning frequently encountered metallurgical problems.

With more than 100 speakers to be programmed for the Congress, Parker said each ASM session will be devoted to an industry, such as aircraft, oil, large machinery, small equipment and shipbuilding. Other societies' programs—and the exhibits—in addition will be devoted to mining, chemical, manufacturing and other industries.

PERSONALS

(Continued from page 24)

in the Producing Department, Hastings Gasoline Plant, Stanolind Oil & Gas Company.

Eugene E. Dawson, '38, is now associated with the Will I. Lewis Drilling Company in whose care he is addressed, Mt. Vernon, Illinois.

T. L. Donovan, Ex-'26, is back on his job again after vacationing at his home in New Cumberland, West Virginia. He is Chief Engineer for Sinclair Petroleum Company, with address Box 51, Dire Dawa, Ethiopia.

Henry P. Ehrlinger, III, '50, has accepted a position with Lead Carbonate Mines, Inc., at Silverton, Colorado, as Student Metallurgist.

W. E. Elser, '48, Petroleum Engineer for Denton-Spencer Company, Ltd., has a new mailing address, 8035-102 Street, Edmonton, Alberta, Canada.

Frank M. Estes, '02, is in Indonesia, making investigations of mineral deposits and studying the economic situation there.

(Continued on page 43)

TECHNICAL MEN WANTED

(Continued from page 34)

given consideration. Salary open, depending upon the experience and ability of applicant.

(1353) ASSISTANT GENERAL SUPERINTENDENT. Position is open for young Mining Engineer who has had some experience in mining and milling operations of sulphide ores in the Rocky Mountain Region. Probable starting salary, \$350 to \$400 per month participating bonus, depending, of course, upon the experience and ability of the applicant.

(1355) METALLURGICAL ENGINEER. A manufacturing chemical company located in Ohio has position open for Jr. Metallurgist to train in the manufacture of chemical products who is willing to consider a training period of about three years, starting on a salary of \$275 per month and eventually building up to position as Operating Head. This position offers real opportunities for the right man.

(1356) JR. MINING ENGINEER. A company located in the Great Lakes Section has position open for Jr. Mining Engineer in their transportation department. Applicant must be willing to combat severe climatic conditions and be interested in transportation and the maintenance of equipment used in connection with such work. Salary open, depending upon the experience and ability of applicant.

(1357) MINING GEOLOGIST. One of the principal mining companies operating in the Midwest has position open for young Mining Geologist with two to three years experience who is willing to enter training program that offers excellent opportunities for advancement. Probable starting salary, \$350 per month.

(1359) CHIEF ENGINEER. A company with extensive operations in South America has position open for young Mining Engineer with some experience and a speaking knowledge of Spanish who has a good background in mining and mining methods. Probable salary, \$400 per month to start on.

(1360) ELECTRICAL ENGINEER. A company with Metallurgical operations in South America has position open for Electrical Engineer who has good operating experience and experience in maintenance of electrical equipment. Probable starting salary, \$400 per month, plus transportation for himself and family. Applicant should be willing to go single status for four to six months.

(1361) SURVEYOR. A service company with headquarters in the principal Rocky Mountain oil producing areas has position open for surveyor capable of making accurate surveys by standard methods. At least three months will be required for training in this work. Starting salary, \$275 per month, plus expenses when away from headquarters.

(1363) METALLURGICAL ENGINEER. A position is open for Metallurgical Engineer to work on research work in connection with large milling operation. Location will be in California. Probable starting salary, from \$325 to \$350 per month, depending upon experience and ability.

CATALOG REVIEWS

(Continued from page 31)

taining to the Torquay, England, Parley. A chart of United States exports and imports for 1949 and 1950 is included, and also a table showing United States' balance of payments.

(5899) "PAY DIRT." November 17, 1950, by Charles F. Willis, 523 Title and Trust Building, Phoenix, Arizona, contains 16 pages covering important information pertaining to the mining industry. Tentative outline is given by the Bureau of Mines showing information required for mine loans.

(5900) "NEW MEXICO MINER & PROSPECTOR." By Don Lusk, Albuquerque, New Mexico, for October, 1950, contains 12 pages largely devoted to information pertaining to mining activities in New Mexico. Considerable space is devoted to information on uranium ores. Two pages are devoted to valuable aid to prospectors.

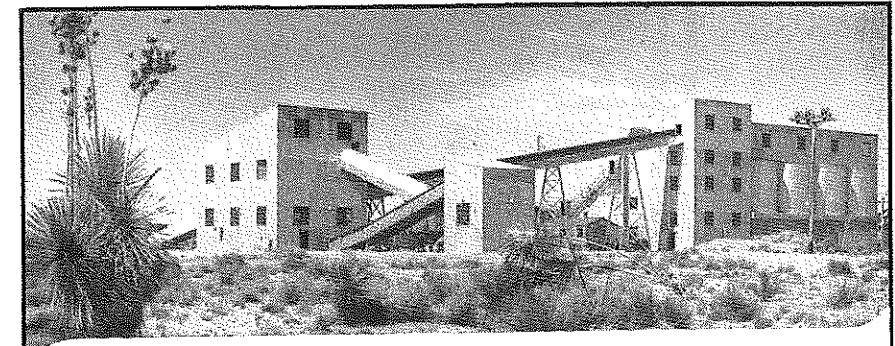
PERSONALS

(Continued from page 42)

His home address is 208 East Cherry Circle, Memphis 11, Tenn.

Gerald E. Fox, Ex-'51, who is associated with the Exploration Service Company, resides at 26 Bercaw Lane, Los Gatos, California.

Thomas E. Gaynor, Jr., '48, was in Denver the latter part of October and called at the Alumni office. He is Engineer for Idaho-Maryland Mines Corporation, his mailing address being Box 60, Grass Valley, California.



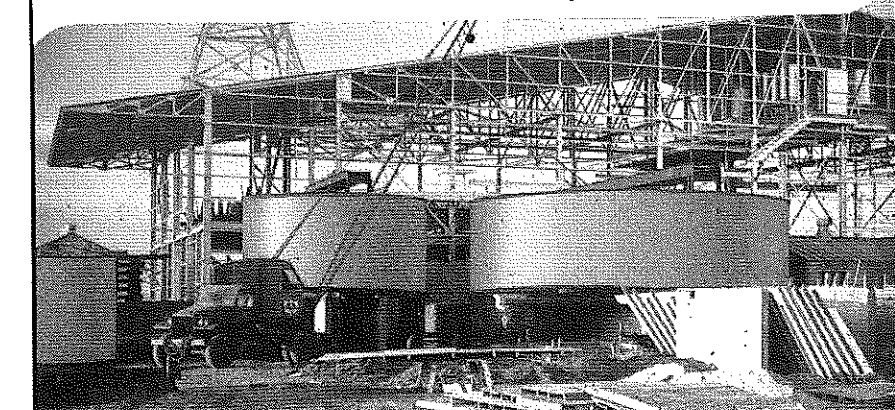
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Construction view of the flotation building with 30'x20' thickeners in the foreground



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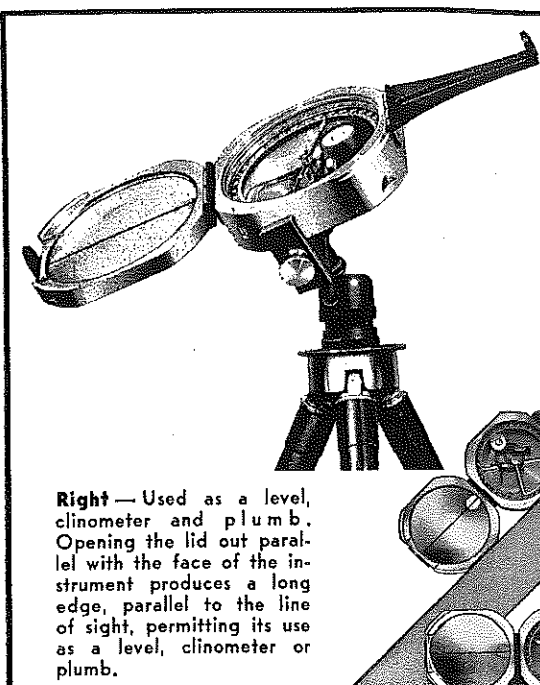
(Continued from page 8)

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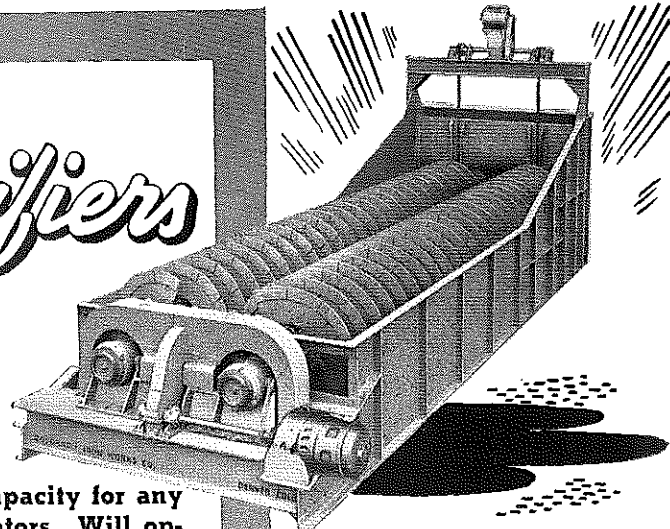
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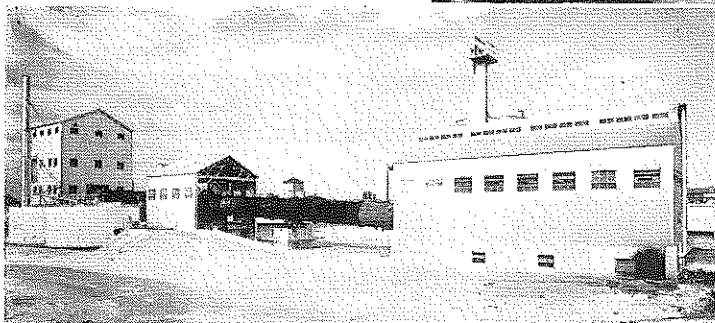
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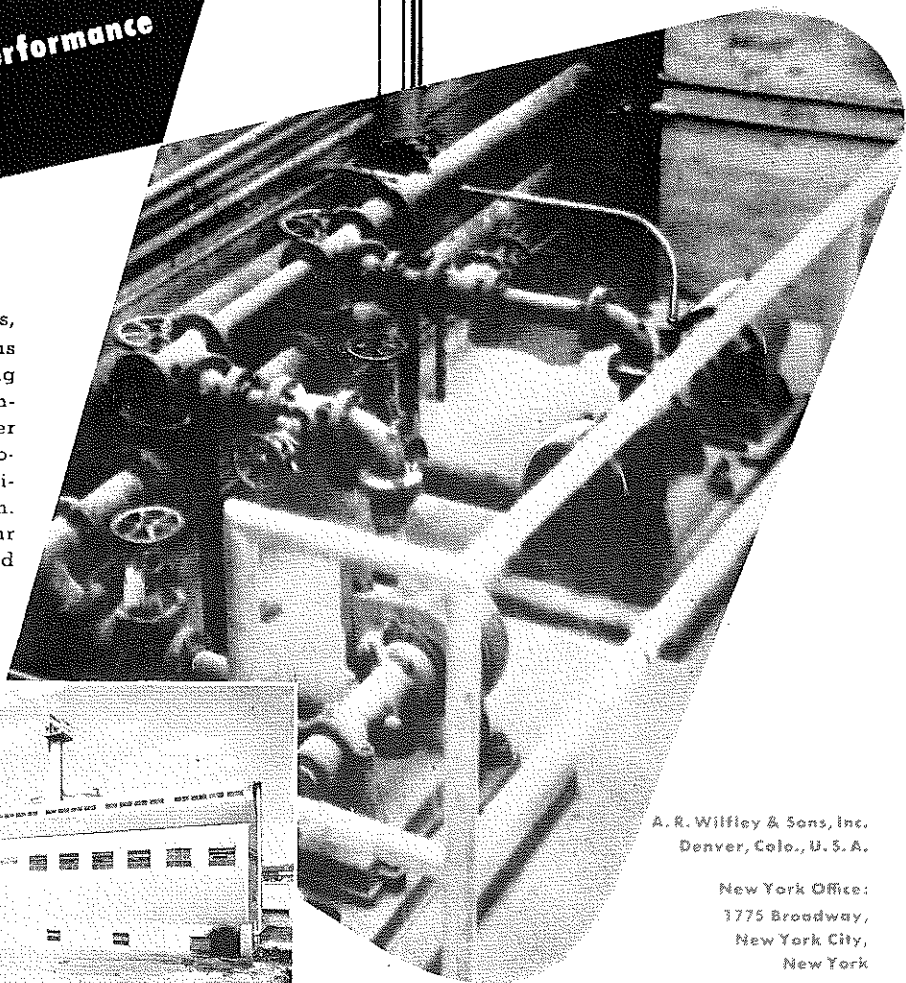
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