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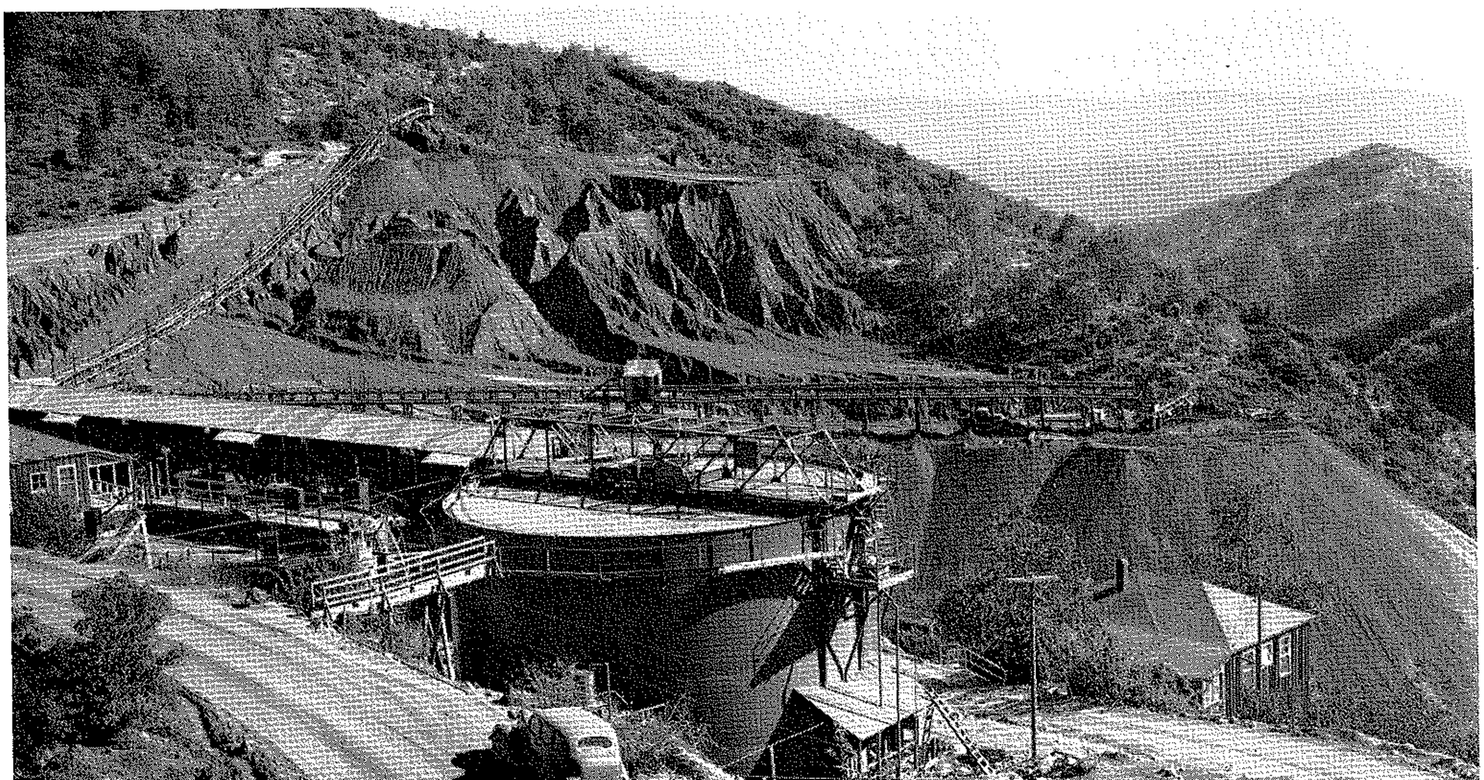

JANUARY 1940 ◆ ◆ ◆ VOLUME 30 No. 1

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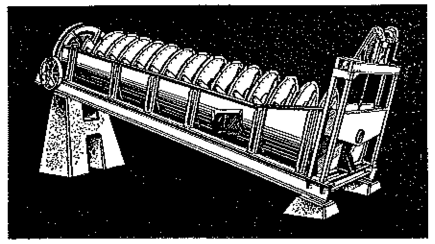

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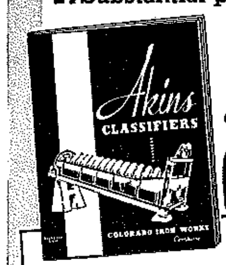

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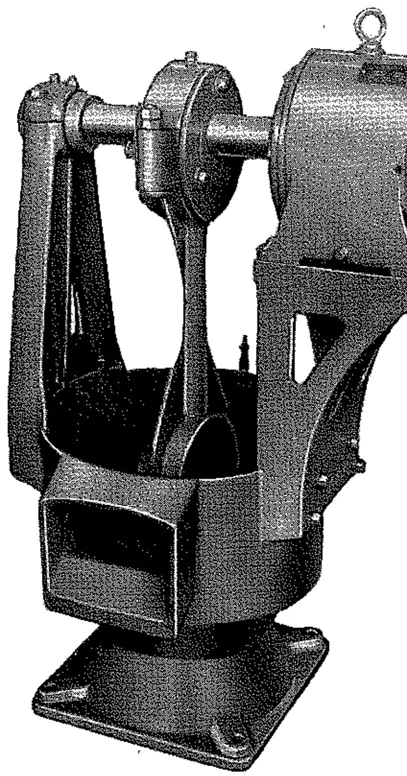

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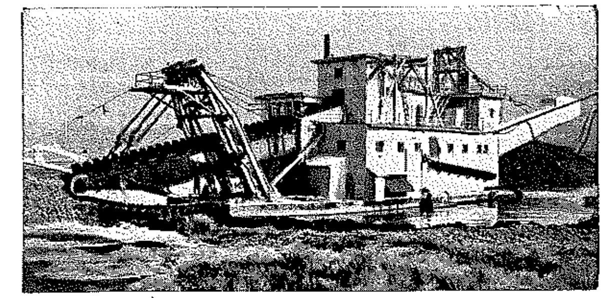

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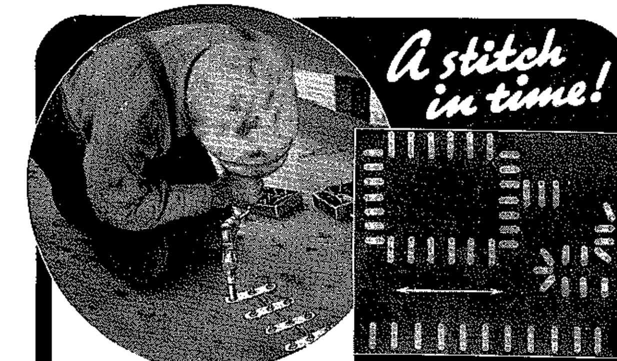

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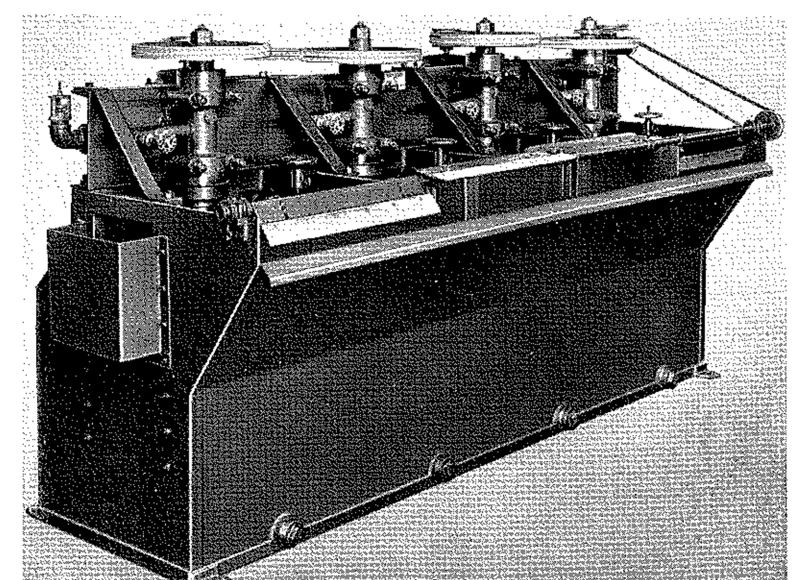

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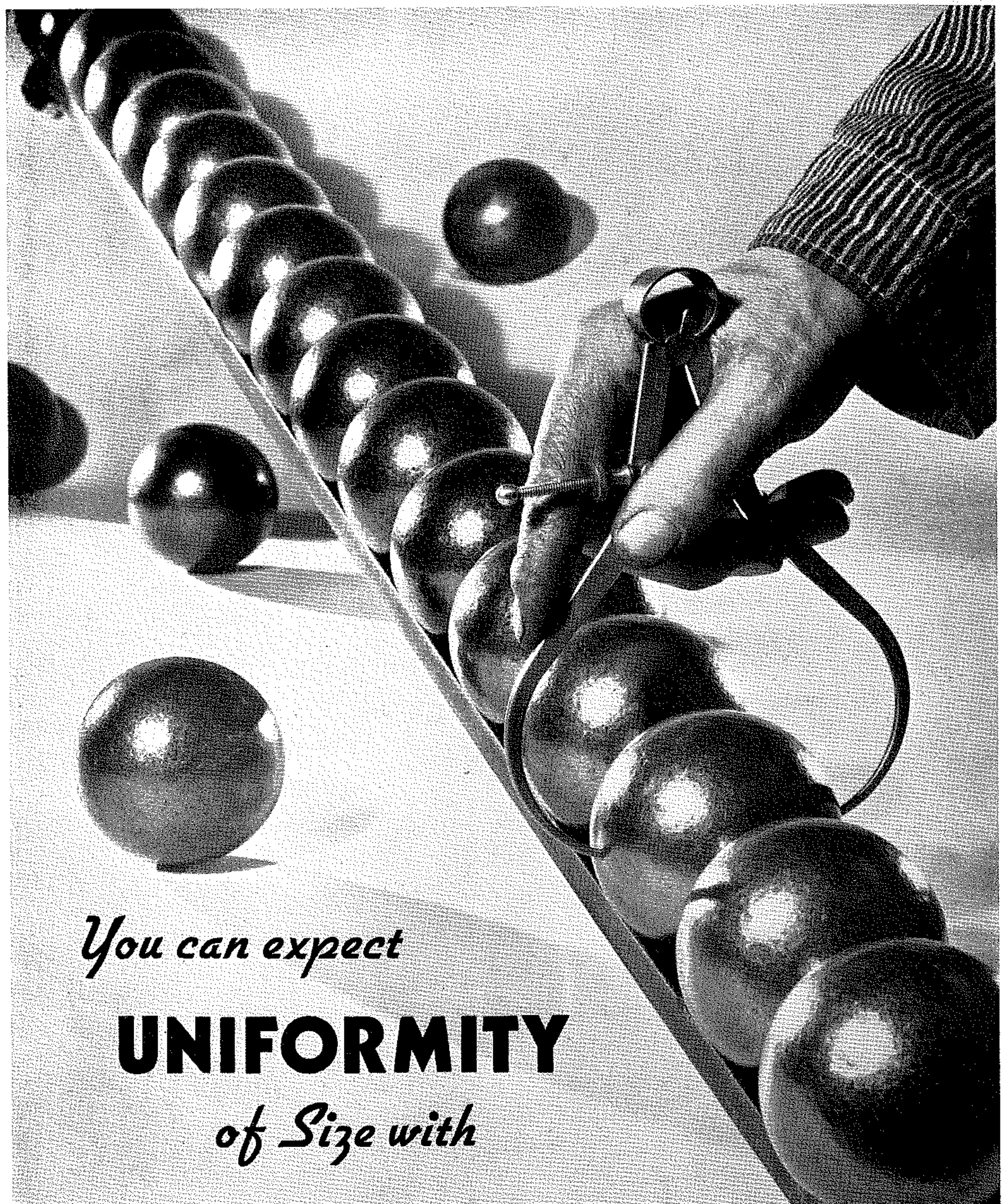

The Mines Magazine

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Vol. XXX — JANUARY, 1940 — No. 1

FRONT COVER ILLUSTRATION

Picture on front cover through courtesy of Caterpillar Tractor Company, Peoria, Ills. Cyanide plant of the Mountain Copper Co., Ltd., Matheson, Calif., 17 miles N. E. of Redding, Calif. "Caterpillar" Diesel D-8 Tractor and track-type wagon strip over-burden at quarry and haul to cyanide plant—one of the largest on the Coast used for gold production. In the foreground is a Dorr 4-compartment washing thickener 50 feet diameter and 36 feet deep.

CONTENTS

DEPARTMENTS

INDEX TO ADVERTISERS SEE PAGE 46

ENTERED AS SECOND CLASS MATTER AT THE POSTOFFICE AT DENVER, COLORADO, UNDER THE ACT OF CONGRESS OF MARCH 3, 1879. SUBSCRIPTION PRICE $3.00 A YEAR. SINGLE COPIES 50 CENTS. NO ADDITIONAL CHARGE FOR FOREIGN SUBSCRIPTION. PUBLISHED EVERY MONTH IN THE YEAR BY THE COLORADO SCHOOL OF MINES ALUMNI ASSOCIATION. ADDRESS ALL CORRESPONDENCE, INCLUDING CHECKS, DRAFTS AND MONEY ORDERS TO RUSSELL H. VOLK, 734 COOPER BLDG., DENVER, COLO. ADDRESS ALL CORRESPONDENCE RELATING TO MINES MAGAZINE TO FRANK C. BOWMAN, EDITOR, 734 COOPER BUILDING, DENVER, COLO.

Colorado School of Mines Alumni Association

NEW MEMBERS—DECEMBER, 1939

ALUMNI

E. Walter Adams, '32, Lead, So. *Dakota*
Wm. M. Baxter, III, '39, *Morenci, Ariz.*
John H. Bell, '30, *Chicago, Ills.*
M. F. Butler, '19, *Seminoe Dam, Wyo.*
Steve S. Dettman, '31, *Weimar, Calif.*
P. C. Gribben, '31, *Rodeo, Calif.*
R. Craig Hyslop, '39, *New Brunswick, Canada*
James W. Pearce, '14, *Chicago, Ills.*
G. W. Mitchell, '23, *Ontario, Canada*
Henry S. Sanderson, Jr., '30, *Denver, Colo.*
H. D. Squibb, '34, *Pittsburgh, Pa.*
R. O. Walker, '24, *Houma, La.*

ASSOCIATE

Wm. C. Aitkenhead, Faculty, *Golden, Colo.*
Charles H. Hull, Faculty, *Golden, Colo.*
Charles E. McGraw, Ex-'30, *Denver, Colo.*

• Personal Notes

Arthur C. Austin, '29, Seismologist for the Seismograph Service Company, is at present located at Chandler, Oklahoma, post office box number 205.

Edward C. Borrego, Ex-'27, has accepted a position with the Standard Oil Company of Venezuela at Pedernales, Venezuela.

Stephen W. Bradford, '39, is Mill Sampler for the Enterprise Mine at Weaverville, California.

Harold F. Browne, '28, Safety Inspector for the Sinclair Refining Company, has a new residence address, 4100 Hampshire Street, Fort Worth, Texas.

R. K. Burgess, '28, District Representative for Gates Rubber Company, is being addressed at 333 N. W. 5th Street, Portland, Oregon.

Edgar H. Clayton, '36, District Superintendent, Drilling and Exploration Co., Inc., is now located in Los Angeles, with address Box V, Station H.

Claude E. Fertig, Ex-'27, writes that he is out in the bush again, on the edge of the great cattle country which reminds him of Wyoming without the cold breezes. His address is in care of Mine Operations, Inc., Rio Guinobatan, Masbate, P. I.

Oscar A. Fischer, '14, Consulting Mining & Metallurgical Engineer, has moved his residence to 1080 Sherman Street, Denver.

E. H. Frenzell, '21, Equipment Engineer for the Grazing Service, Department of the Interior, has been transferred to Washington, D. C., where his address is The Roger Smith Hotel, Pennsylvania Avenue at 18th Street, N. W.

Harold L. Gardner, '27, is now in the Philippines as Engineer for North Camarines Mines, International Engineering Corp., Paracale, Camarines Norte.

R. L. Hallett, '05, Chief Chemist for the National Lead Company, has changed his business address to 111 Broadway, New York, N. Y.

C. D. Hier, '31, who has been doing seismograph work in the Netherland East Indies, writes that their exploration work has been suspended on account of the war. He is on his way back to the States via the Philippines where he will stop for a few days. Mail addressed to him at his home, Sedalia, Colorado, will reach him.

W. D. Jeffries, '37, Sales Engineer in the Minerals Separation Division, E. I. duPont de Nemours & Co., Inc., receives his mail at Room 3126, R. & H. Department of duPont Company, Wilmington, Delaware.

Neil O. Johnson, '33, recently joined the ranks of duPont Company as Technical Representative in their Explosives Department. His headquarters are at Birmingham, Alabama where his residence address is 2848 Fairview Drive.

Ralph Keeler, '31, has changed his Post Office Box in Manila to Number 297. He holds the positions of Mining Editor of the Manila Daily Bulletin; Editor and Publisher of the Philippine Mining Year Book; and Editor of Marsman Magazine.

William C. Klein, '31, is at Idaho Springs, Colorado where he is employed at the Gustafson mill, operated by the Gold Mines Consolidated and treating ore from the Donna-Juanita mine.

Charles E. Michaels, '36, has completed his contract with Braden Copper Company and returned to the States in time to spend Christmas at his home where he is now receiving mail, 339 No. Main Street, Lombard, Illinois.

Jimmy Mills, '39, who is employed by Caterpillar Tractor Company, has a new mailing address, 407 Wisconsin Avenue, Peoria, Ills.

Thompson H. Murch, '23, is associated with the Paramount Studio and resides at 329 So. Swall, Beverly Hills, Calif.

James F. O'Neill, '24, is at present in San Francisco where he receives mail at 263-17th Avenue.

Win Payne, '38, writes that as Student Computer for The Carter Oil Company, he is working with Computer *Jim Ord*, '35, the address of both being in care of the company, Box 1166, Warren, Ohio.

V. P. Pentegoff, '28, Geological Engineer for the Metropolitan Water District of Southern California, moved his residence recently to 1670 Edgecliffe Drive, Los Angeles, Calif.

William G. Polisson, '28, is with Cerro de Pasco Copper Corporation at Oroya, Peru, S. A.

Newton C. Pritchard, '38, is in the Metallurgical Laboratory of Carnegie-Illinois Steel Company and resides at 407 Madison Street, Gary, Indiana.

Clarence G. Purcell, '30, has been transferred by the Standard Oil Company of Indiana to their refinery at Greybull, Wyoming, and placed in charge of Technical Service. He and his family, wife and two-year old daughter, are now at home at Greybull where they receive mail thru Box 247.

E. J. Ristedt, '09, Safety Engineer for Cerro de Pasco Copper Corporation at La Oroya, Peru, has returned to his home in Berryville, Virginia, on vacation.

(Continued on page 33)

CONVENTION COLORADO MINING ASSOCIATION

(Colorado Chapter of the American Mining Congress)
January 26th and 27th, 1940

Mining men from all sections of the United States will convene in Denver on Friday and Saturday, January 26th and 27th, at the Shirley-Savoy Hotel for the Forty-third Annual Convention of the Colorado Mining Association, and the Twenty-sixth Annual Meeting of the Colorado Chapter of the American Mining Congress.

Local and State Committees are hard at work making plans for the greatest convention and the finest program possible. Committees are also at work on the Silver Banquet and dance to be held on the first evening of the Convention, and the Sowbelly Dinner, which is a stag banquet, on the second evening. The Committee has felt that the Sowbelly Dinner should be held on Saturday night to enable miners to attend from many of the mining districts, as, in the majority of instances, no work is required on the following Sunday morning.

A Ladies' Committee is making great plans for the Silver Banquet and a special treat is in store for visiting ladies from outside the city of Denver. All ladies, as well as men, must register at the Convention, no registration fee being charged, but membership in the Association is a prerequisite.

The program includes many outstanding speakers and authorities on numerous subjects. The Convention, itself, will convene at 10 A.M. Friday morning, January 26th, at which time Mayor Benjamin F. Stapleton will welcome the mining men to Denver; as will R. J. Osenbaugh, President of the Denver Chamber of Commerce. The President, Jesse F. McDonald, and the Secretary, Robert S. Palmer, will give their annual reports on the activities of the Association during the year.

The subjects to be discussed include the following:

"The Federal Policy of Withdrawing Mineral Lands, and Its Effect on the Future of Mining."

"Methods of Apprehending Thieves Who Steal Mining Machinery and Equipment from Mining Properties."

"The Crime of High-grading, and Federal Aid in Apprehending Criminals."

"Workmen's Compensation, and the Results Obtained by the Mining Industry Through the Adoption of Experience Rating."

"Manganese as a Non-ferrous Material."

"The Geological Survey and its Relation to the Development of Mining in Colorado." (new geologic maps of the Front Range will be placed on display).

"Western Industry and its Development."

"Things Detrimental to Mining."

"Mining Tax Titles."

"High Lights of National Legislation Effecting Mining."

"The Dust Problem in Mining and Milling."

"Occupational Disease Insurance."

"Safety Work and its Application to Mining."

"The Securities and Exchange Commission and the New Forms and Exemptions for Mining Registrations."

"Spectrographic Analysis of Ore, with Demonstration."

"Ground Movements and Subsidence."

"The Future of Gold and Silver."

New "Talkie" motion picture will be shown of Molybdenum in Iron and Steel, with particular reference to its application in the mining industry. A new Canadian film entitled, "Canadian Gravels", (first showing in the United States) a picture produced by the Ontario Mining Association, illustrating methods of preventing occupational diseases in mining. A new picture, in color, showing the operations of the Utah Copper Company is also scheduled to be shown.

The speakers include the following:

Robert M. Hardy, President, Sunshine Mining Company, Idaho.

Guy V. Bjorge, Homestake Mining Company, Lead, South Dakota.

Carl M. Loeb, Jr., Climax Molybdenum Company, New York.

A. H. Bebee, Cripple Creek.

D. D. Potter, Rocky Ford.

R. George Woods, Secretary-Treasurer, Colorado Sheriffs and Peace Officers Association, Denver.

Albert F. Knorp, Gold Producers of America, San Francisco, California.

Ray H. Brannaman, Chairman, Colorado Industrial Commission.

R. S. Dean, Chief Engineer, Metallurgical Division, United States Bureau of Mines.

Dr. G. F. Loughlin, Chief Geologist U. S. Geological Survey, Washington, D. C.

T. D. Benjovsky, President New Mexico Miners & Prospectors Association, Silver City, New Mexico.

Charles L. Willis, Editor Arizona Mining Journal and Secretary Arizona Small Mine Operators Association.

Stanley J. Stephenson, Manufacturers Association, Salt Lake City, Utah.

Bentley M. McMullen, Esq., Denver.

Julian D. Conover, Secretary American Mining Congress, Washington, D. C.

Donald E. Cummings, Associate Director of the Saranac Laboratory, Denver.

J. Dewey Dorsett, New York.

R. R. Knill, Union Pacific Coal Company, Wyoming.

Baldwin B. Bane, Registration Division Securities & Exchange Commission, Washington, D. C.

C. C. Nitchie, Bausch and Lomb Optical Company, Rochester, New York.

J. Burns Read, Colorado School of Mines, Golden.

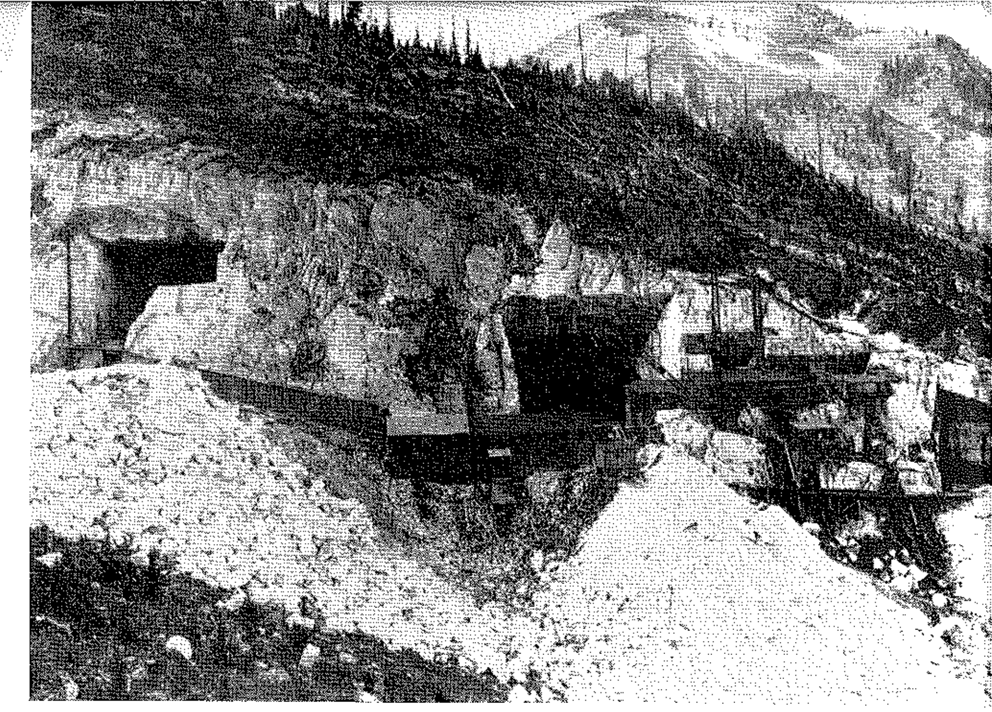
Dr. M. F. Coolbaugh, President, Colorado School of Mines; and lead-

(Continued on page 29)

Mitchell's MARBLE *Mountain*

B. BARTHOLOMEW

of the Vermont Marble Company
Marble, Colorado



● Fig. 1. View of front of Marble Quarry from Treasury Mountain. Shows three of the openings.

In the eighties, the state of Colorado was little more than a big mining camp. All roads led to Denver where hopeful prospectors unloaded their samples of ore. Living in the city at that time was a mining engineer named Alexander J. Mitchell, whose reputation as an assayer had been carried to the mountains.

Among the countless rocks submitted to him were specimens from the ledges above Yule Creek. They were far from rich in silver or gold, yet they interested him. In them he saw the building of a new industry, rising from a deposit of white marble. After questioning the prospector, Mitchell set out on the burro trail, which in those days was the only way to travel in Gunnison County. He had little difficulty in locating the gleaming cliffs, towering in grim majesty on the west side of Yule Creek. So impressive was the outlook that he gave up his business in Denver and began the long arduous task of bringing the property under his control. Much of it had been staked out as mining claims, and seemingly endless buying and trading was required to effect the desired change in ownership.

By 1892, however, Mitchell had acquired title both to the marble deposit and to certain timber lands, including a town-site and power rights on the river. Then was he confronted with two great needs—money and transportation. A passable wagon road had been pushed up thirty miles from Glenwood Springs to the old mining camp known as Marble City, which was three and a half miles away from his marble mountain. As an engineer, he could but see the handicap of such an outlet. He realized too that substantial funds must be forthcoming to transform the cliff into a quarry.

He was still seeking capital when the country slumped into the panic of 1893. And of all the states, none sank deeper than Colorado. It was a period of arrested development for all industry. Mitchell had all he could do to hang on to his property and keep his plan alive.

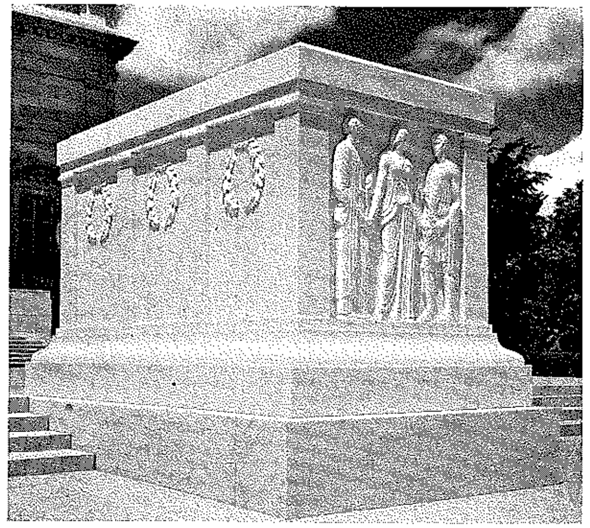
It was on the upward swing from the depression that he met Col. Channing F. Meek, railroad man and mine owner. It was a momentous meeting. Colonel Meek was converted to the cause and began forthwith to put his faith to the test. A quarry was opened on the mountainside, a road over which blocks could be hauled was graded down to Old Marble City, 2,000 feet below, where a shop and mill were reared to receive them. At the juncture of three rivers a mile away rose the power station which was to keep all the machinery in motion. Supplementing these activities, a railroad was built to connect the town with the line which prior to the panic had been extended as far as Carbondale. On this foundation was established in 1905 the Colorado-Yule Marble Company, with Colonel Meek as president and largest stockholder.

The years immediately following were marked by optimistic overpromotion. Vast amounts of stock were sold with the promise of accumulating dividends. Old Marble City, under the new name of Marble, grew up almost overnight, like a boom town of the mining regions.

It was comparatively easy to secure samples and through them to close contracts, for the marble was of superlative quality. But it was somewhat less easy to provide the stock in large quantities, for the quarry was still in the early stages of development. Of the blocks which were taken out only a part could be used. And while the old wagon road from quarry to mill had been replaced by an electric line, there was no telling when the snowslides would put it out of commission. In short, the investment was large and the cost of production high, a combination which in any competitive market makes it almost impossible to show a profit.

There was nothing wrong with Mitchell's mountain. It was a treasure-house of marble. But how to bring the material down from an altitude of 10,000 feet and adapt it to its many uses at reasonable cost, was a problem yet to be solved.

True, the Colorado-Yule Marble Company has many fine installations to its credit. The list is large and impressive, both in exterior and interior building work as well as in the field of cemetery memorials. No doubt the most important of these projects is the Lincoln Memorial in



● Fig. 2. Lincoln Memorial—Washington, D. C. Made of Colorado-Yule Marble.

Washington (Fig. 2). Here again they were handicapped by a lack of quarrying capacity. There were no extended tunnels to facilitate the selection of blocks. Even in large quarries much marble must be discarded in order to get the right harmony in color and veining. In an under-developed opening, the elimination is correspondingly greater.

Had it not been for the World War, possibly the Colorado Yule Marble Company would have had a longer history, but it was unable to weather that stormy period and passed into receiver's hands in 1916. Spasmodic attempts were made under different managements to revive the industry, but with disappointing results. In 1928, it was reorganized under the name of Yule Colorado Marble Company, and since that time it has been operated as a subsidiary of the Vermont Marble Company. A moderate amount of the product has been marketed each year, finished partly in Marble and partly in Vermont and the outside plants of the company.

When the Yule Colorado Marble Company was incorporated, Marble was a village of about 200 inhabitants, with a marble mill and two finishing shops and about 200 houses, most of which were vacant. Previously, the plants had been considerably larger, sections of each having been destroyed by fire. Electric power was ample for running all machinery and lighting the houses and streets.

As already stated, the quarry (Fig. 1) is about three and a half miles from the mills and is approximately 2,000 feet higher, or 10,000 feet above sea level. The quarry openings are slightly more than 200 feet above the trolley track. The thickness of the layer of white marble is from 100 to 125 feet. This pitches at a dip of 45 degrees W in to the mountain. Three openings have been made in the deposit but only one is being worked at the present time.

Tests show that this marble is a remarkably pure calcite. It ranges in color from statuary white to golden vein. A chemical analysis made under the direction of A. W. Smith of the Case School of Applied Science, is given below:

Chemical Analyses of Yule Colorado Marble
(Made under direction of A. W. Smith, Case School of Applied Science, Cleveland, Ohio, Oct. 22, 1907)

	Streak	Clear
Calcium carbonate ($CaCO_3$)	98.84	99.50
Magnesium carbonate ($MgCO_3$)	.25	.19
Iron carbonate ($FeCO_3$)	.02	.03
Manganese carbonate ($MnCO_3$)	.03	.02
Silica (SiO_2)	.27	.05
Alumina (Al_2O_3)	.05	.03
Iron Oxide (Fe_2O_3)	.28	Trace
Manganese oxide (MnO_2)	.06	None
Calcium sulphate ($CaSO_4$)	.08	.09
Undetermined	.12	.09
	100.00	100.00
Specific gravity	2.711	....

This table, as well as tests covering crushing strength and absorption, is given in United States Geological Survey Bulletin 884. The following description is quoted from that bulletin:

"Veining or marking, though irregular, is commonly subparallel to the bedding. Most of the statuary marble is sawed parallel to the bedding, but most of the golden vein is quarried and sawed in a vertical plane to give a diagonal pattern and stock thus obtained is called 'diagonal golden vein.' Some blocks are sawed in a horizontal plane, or parallel to the quarry floor, to produce an irregular, interfingering pattern, and stock from them is called 'top-of-the-quarry golden vein.' The brownish, or golden, vein is due to iron oxide."

To quote again from Bulletin 884, "The marble eventually acquires a light creamy tone, or patina, which is much sought by sculptors. The time required for this tone to develop is influenced by the kind of finish given."

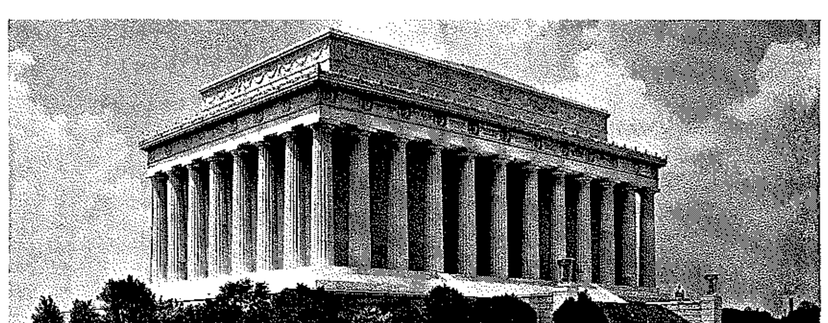
It has been determined that the durability of Yule marble is due in large measure to its interlocking crystals, which give it an extremely low rate of absorption. This has been brought out clearly by a series of photographs.

As to the future of the industry, no one is attempting to make any predictions. The present management is conservative and is striving persistently to work up to a paying basis. Marble quarrying at best is a battle with nature. In this case, nature gained a tactical advantage by barricading all the approaches with mountains.

Never was the matter of inaccessibility more apparent than in the quarrying of the marble for the Tomb of the Unknown Soldier (Fig. 3). The dimensions of the largest block were fourteen feet, by seventeen feet four inches, by six feet. In reporting the work, H. S. Hobart, who was manager of the quarries at the time, wrote as follows:

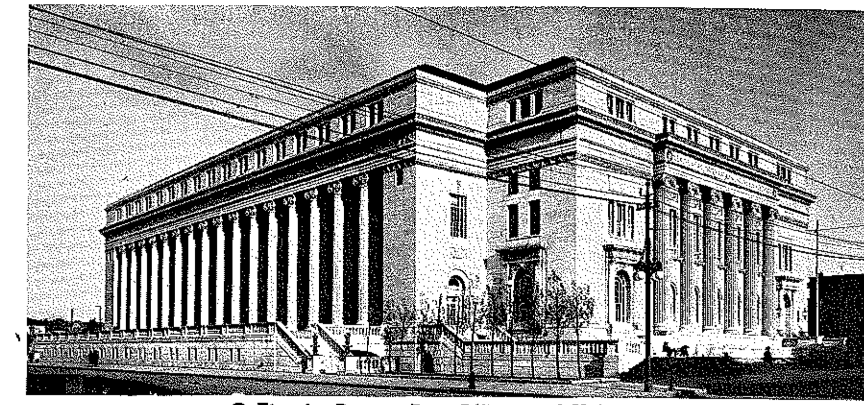
"To obtain a block of desired quality for the die of the monument required

● Fig. 3. Tomb of the Unknown Soldier. Made of Yule Marble.



more than a year. It was first necessary to quarry a mass that weighed more than 100 tons. A wire saw was then installed in the quarry to cut it approximately to the size required and to reduce its weight to an amount that could be safely handled with the equipment available and also to detect any defects. The block thus reduced weighed 56 tons. It was hoisted from the quarry by a specially reinforced derrick shipped from Vermont for the purpose. Before hoisting, the block was allowed to hang in the ropes for about 15 minutes to test their strength. The straight lift from the floor to the top or quarry bank was about 100 feet. Upon reaching the top the block was swung about 90° and landed on a "home-made" car which had two low wheels in front and none in back, the rear end dropping to assist in breaking the load. It was then removed for about 200 feet along a track that had approximately a 20° grade and a 20° curve where it passed out of the quarry opening. As the block was much too heavy for the 800-foot cableway from the quarry to the trolley line, it was necessary to build a track 600 feet long up the slope to connect with the 200-foot track leading from the quarry. As the trolley line to Marble had a minimum grade of 4 percent and grades of 10, 12, and even 17 percent at certain places, a regular block car could not be used, especially as the block had to be moved in January, when it would have been too cold to brake so heavy a load. The temporary track, therefore, was connected with the trolley track and the 'home-made' car made the trip of 3½ miles to Marble in 2 days. Two electric locomotives, one before and one behind the car, did the hauling. As the concentrated load on the "home-made" car could not cross the bridge over the Crystal River safely, a regular railroad flat car on which the block was to be shipped was pushed across the bridge, the trolley track disconnected and raised to the top of the flat car, and the marble block hauled onto the flat car with tackle blocks. The block was then shipped to West Rutland, Vt., for sawing, thence to Proctor, Vt., for cutting, and finally to Arlington Cemetery, Va., for erection and carving."

Despite the hazards and uncertainties, Yule marble is still coming into the shops and making its way out into buildings and cemeteries. The latest of the larger contracts is the new State Office Building in Denver. Listed below is a partial summary of what has been done in Yule Colorado marble:



● Fig. 4. Denver Post Office used Yule Marble.

Representative Buildings Containing Yule Colorado Marble

Locality	*Building*	*Use*	*Date of erection*
Pacific Coast Region:			
California:			
Compton	Angelus Abbey Mausoleum	Interior	
Huntington Park	Huntington Memorial		
Long Beach	Long Beach Auditorium	Interior	
Los Angeles	Bankers Building	do	
	Calvary Mausoleum	do	
	Chamber of Commerce	do	
	Charles A. Lindbergh Jr. High School	do	
	Examiner Building	do	
	Fidelity Building & Loan Assoc.	do	
	Kaufmann Memorial	Exterior	
	Los Angeles Theater	Interior	
	Merchants Nat'l Life Building		1915
	Merritt Building	Interior and exterior	
	Magnin Department Store	Exterior	1938
	Pan American Building	do	
	Senator Frank Flint Memorial	Exterior	
	Sun Realty Building	Interior	
	Sunnyside Mausoleum	do	
Pasadena	Kellow Mausoleum	Exterior	
Sacramento	St. Mary's Mausoleum	Interior	
San Diego	Catholic Mausoleum	do	
	Greenwood Mausoleum	do	
San Francisco	Benbough Mausoleum	do	
	Crocker First National Bank	do	
	Cypress Lawn Mausoleum	do	
	Municipal Building	do	
	Palmieri Mausoleum	Exterior	
	Santa Fe Building		
	Thorne Memorial		
	West Coast Life Building	Exterior	1916
Santa Monica	Community Mausoleum	Interior	
Oregon:			
Portland	First National Bank	Exterior	
	First National Bank Connecting Building		1916
	Bedell Building	Interior	1922
Washington:			
Seattle	New Infirmary Building, University of Washington	do	
Spokane	Zukor Store Building	Exterior	1935
Tacoma	Pacific Savings & Loan Building (remodeled with marble facing)	do	1931
Rocky Mountain Region:			
Colorado:			
Canon City	Post Office	Interior	
Denver	Capitol Life Insurance Building	Exterior	1923
	Colorado National Bank	do	1914
	Customs Building	Interior and exterior	1931, 1936
	Empire Building	do	1905
	Federal Reserve Building	Exterior	1925
	City and County Building	Interior	1929
	Union Station	do	1914
	Post Office Building	Exterior	1914

(Continued on page 29)

STRATEGIC MINERALS

Investigations Procedure Followed by the Bureau of Mines[1]

By JOHN W. FINCH, Hon. '38
Director, U. S. Bureau of Mines

What is Authorized

The Secretary of the Interior acting through the Bureau of Mines and the Geological Survey is authorized by the Strategic Materials Act (Public No. 117—76th Cong., Chapter 190, 1st Sess.) to make investigations concerning essential minerals of which the quantities or grades obtainable from known domestic sources are inadequate.

The Bureau of Mines, in carrying out its part of this program, may investigate deposits of such minerals in whatever manner may be necessary, in order to determine (1) the extent and quality of the ore, (2) the most suitable method of mining and beneficiating it, and (3) the cost at which it may be produced. The essential objective in doing these things is to determine where and how supplies of minerals and metals of which domestic production is usually inadequate might be obtained in a national emergency, even though at higher cost than usual.

The Geological Survey extends or renews its studies of mineralized areas, including those selected by the Bureau of Mines for investigation, recommends deposits of which it already has knowledge, and advises the Bureau of Mines with respect to all geological aspects of the investigations.

The Procurement Division of the Treasury Department, Washington, D. C., is the agency authorized to make all purchases of minerals, metals, and other strategic materials required by the Government. Those who desire to sell minerals or metals to the Government should therefore apply directly to the Procurement Division, not to the Bureau of Mines. The Bureau has nothing whatever to do with the part of the Act that authorizes purchase of minerals or metals to be warehoused or stockpiled as reserves for use only in a national emergency.

What is Not Authorized

The Bureau of Mines is not authorized to purchase mining properties, to operate them, or to render financial assistance to prospectors, owners, or operators of mines; and no compensation or gratuity is paid for information leading to the discovery of mineral deposits. The Bureau does not make assays or analyses of ores to save the public the expense of having them made by commercial assayers or chemists, or examine mines upon request to save their owners the cost of examination by mining engineers. Neither the Bureau nor any employee is authorized to make any request of owners or operators of properties to perform any work or incur any expense for the benefit of the Government in expectation of reimbursement or of recovery of damages therefor, unless the request is evidenced by a contract, signed by the Director and the other party concerned, specifying what is to be done and its cost.

Metals Sought

In its Strategic Minerals Investigations the Bureau of Mines is chiefly concerned at present with seven metals, all of which have been designated as of strategic importance by the Secretaries of War, the Navy, and the Interior upon advice of the Army and Navy Munitions Board. They are: Antimony, chromium, manganese (*ferro-grade*), mercury, nickel, tin and tungsten. Investigations of other metals and minerals whose strategic importance is less pronounced must be deferred to a later year of the Strategic Minerals Program.

Manganese

In explanation of the term "ferro-grade" applied to manganese, it should be stated that manganese ore comprises four very different raw materials, determined by grade and quality, as follows:

(1) Exceptionally high-grade manganese ore characterized by a high content of MnO_2 is used in making batteries. It commands the highest unit price and is known as battery ore.

(2) At the other extreme is manganiferous iron ore, usually containing 10 percent or less manganese; it is used for making manganiferous pig iron. The domestic supply of such ore is so abundant that the manganese it contains is usually paid for as if it were iron.

Between these two extremes are the ores, low in iron, that are suitable for making ferromanganese and those high in iron used for making spiegeleisen, although some of it also is used for making pig iron.

(3) For making ferromanganese the ore usually contains at least 45 percent manganese but averages 48 percent; and the ratio of manganese to iron is not less than 7 to 1, though it usually is 8 to 1, while there must be low silica (ranging from 7 to 10 percent) and very low phosphorus (ranging from 0.12 to 0.2 percent). Only manganese ore of this character has been designated as a strategic mineral because domestic production is inadequate.

(4) Ore in which the manganese-iron ratio is too low for making ferromanganese can be used for making spiegeleisen. Of such manganese ores, high in iron, there is no deficiency, and a relatively low price is paid for the manganese they contain. Although an excess of silica often can be remedied by pravity concentration, iron is difficult to remove by that means because the specific gravities of iron and manganese oxides are so nearly the same.

Chromium

Chromite ($Cr_2O_3 \cdot FeO$), the commercial source of chromium, has three major uses: (1) For making chromium-steel alloys, (2) for making refractories, and (3) for making chemicals. The first two account in nearly equal degree for over three-fourths of the consumption of chromium. Excess of iron is detrimental in both of these uses. A minimum chromium-iron ratio of about 3 to 1 is required for metallurgical uses and high iron renders refractories less resistant to heat and corrosion. The usual requirement as to grade is Cr_2O_3 48 percent, maximum sulfur 0.5 percent, and maximum phosphorus, 0.2 percent. Silica usually is limited to 5 percent. In the United States there is much chromite containing high iron, but there is a dearth of known deposits of high-grade chromite.

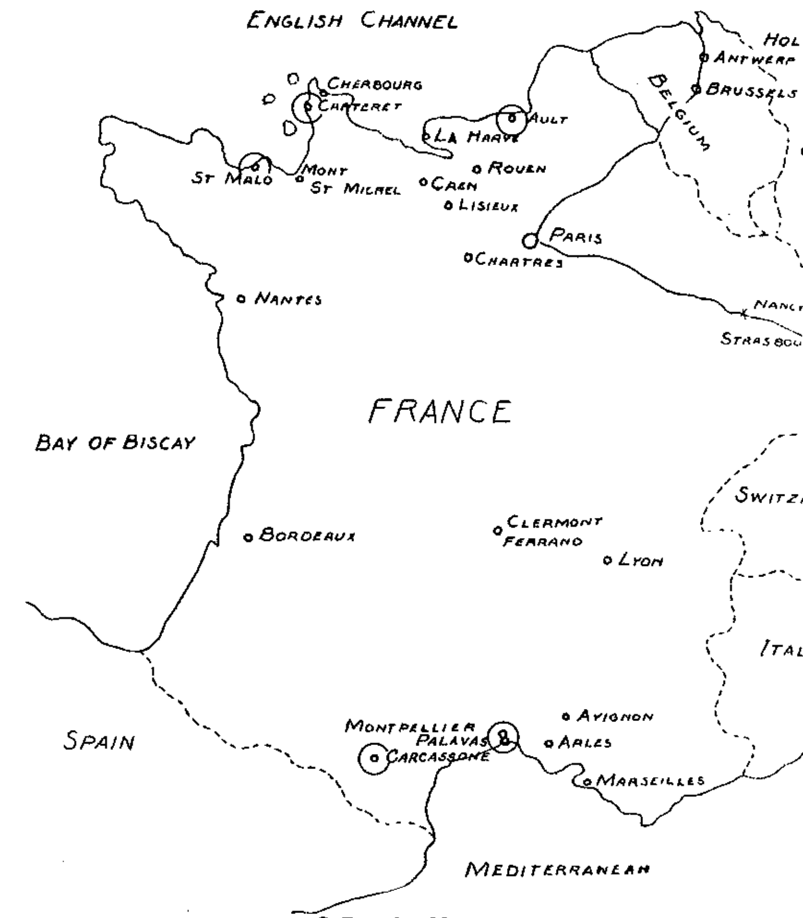
(Continued on page 45)

[1] Reprinted from Bureau of Mines Information Circular 7097.

Interesting FRANCE

IV. Mont Saint Michel Where Land and Water, Man and Nature Meet.

By J. HARLAN JOHNSON, '23
Associate Professor of Geology, Colorado School of Mines
and MERLE K. JOHNSON



● Fig. 1. Map of France showing the location of Mont Saint Michel on the northwest coast.

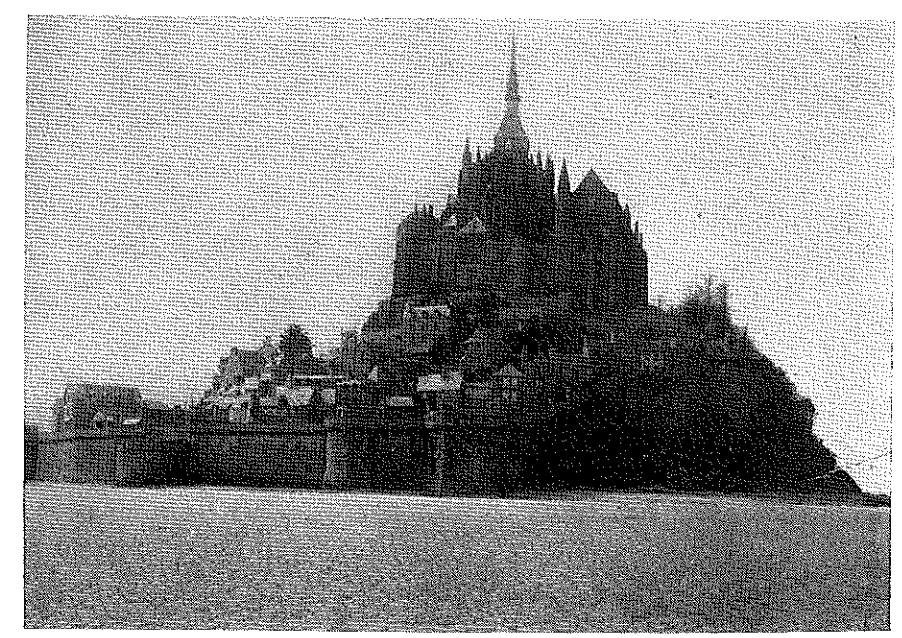
Mont St. Michel de la Mer del Peril is one of those places which once seen can never be forgotten. Whether the one who sees it is an architect, a soldier, a historian, a religious pilgrim, or a mere tourist it is still a place of beauty, strength, enchantment and wonder which one cannot forget and which one always wishes to see again.

The Mont is a rocky island off the French coast about 40 miles from St. Malo[1] and about 60 miles south of Carteret[2] close to the little road station of Pontorson (Fig. 1). The island is of granite, about 3000 feet in circumference and 165 feet high. It is in an estuary of the river Couesnon about half a mile from the shore. At high tide water completely surrounds it (Fig. 2) except for a narrow artificial causeway, while at low tide the Mont rises from bare sand flats which stretch for miles seaward.

A small monastery was built there in the eighth century, at the command of St. Michael himself, we are told. During the ninth and tenth centuries it was a famous shrine visited by numerous pilgrims from all parts of what are now France, Great Britain and Ireland. In 966 Duke Richard the First of Normandy replaced the earlier monks by members of the Benedictine order who enlarged the place and gave it a more militant atmosphere. The monastery was burned in 1203 and rebuilt on a grander scale. The building of that time is still known as La Merveille (The Wonder) and was probably the greatest architectural achievement of its day, as well as one of the most famous. St. Louis of France (Louis IX) made a pilgrimage to the Mont and fortified it strongly. It was repeatedly attacked by the English during the Hundred Years' War but was never taken. During the Wars of Religion also the place was unsuccessfully attacked many times. In the eighteenth century and up to 1863 the abbey was used as a prison for political prisoners. Now it is a national historical monument and a mecca for tourists and pilgrims.

All available portions of the island

● Fig. 2. Mont Saint Michel. General view. (Courtesy French Travel Bureau.)



[1] Mines Magazine, August, 1939, p. 419.
[2] Mines Magazine, May, 1939, p. 211.

have been built upon (Fig. 2). The monastery-fortress crowns the top of the hill which rises precipitously from the sea on the north and west sides. The south and east sides, which are more sloping, are covered by the town which is surrounded by massive walls finished in 1264. One single narrow street, High Street, winds from the seagate at the end of the causeway up and partially around the hill to the monastery. The houses of the town line this street and small terraces leading off from the street. The houses are small and closely packed together. They are usually three or four stories in height since ground space is at a premium. It was astonishing to find in so small a space not only homes and the new church, which is the one now used, but also a town hall, a public school with a tiny playground, and gardens with fig and lime trees, grapes, vegetables, and many kinds of flowers.

Only one road leads to the town, the highway from Pontorson. The Mont may be seen ahead for the last four or five miles of the journey, suggesting a fanciful picture etched against the sky. As one approaches the picture gradually enlarges, details develop, and by the time the causeway connecting it to the mainland is reached the Mont stands out clearly. We have always arrived while the tide was out and grey sand covered the bay, stretching from the land out to the Mont, and beyond as far as the eye could see. Crossing the dike the cars and busses park at the base of the city wall. As one leaves the car one unconsciously stops and gazes at the marvelous scene. It is breath-taking, unbelievable:—the massive wall with its low round towers; the houses of the town clinging to the base and slope of the steep hill like limpits to a rock; the monastery rising precipitously above, tall, great, massive, at once strong and beautiful, while crowning the summit is the splendid chapel, its spire seeming to reach the very sky, and above all at the very tip of the spire, a great statue of St. Michael himself with wings upspread and sword in hand, shining brightly as an angel always should.

Mont St. Michel is one of the few towns without a wagon or an automobile, therefore the visitor must perforce enter on foot.

As one passes through the gate in the massive walls the portcullis can be seen above, iron bound, still in position as it was when used to block the gate to hostile invaders five centuries ago. Just beyond, by the inner gateway, are primitive cannon left by the English when they attacked the village in 1434. Beyond for perhaps 60 feet the street is nearly level as it passes the famous Hotel Pollard and its open air restaurant and cafe on opposite sides of the narrow way. Then passing the inner gate the street starts to wind and climb up and around the hill. If one visits the Mont in winter the shops and most of the hotels will be closed and the street will be quiet and almost deserted. But how different in summer! The hotels, cafes, and shops are open, with tables, chairs, stands of tourist knicknacks, postcard racks, etc., spreading out into the already very narrow way and partially filling it so that the space for travel is so narrow that three people can scarcely walk abreast. The street is crowded with tourists, while on all sides touts, shopkeepers, and waitresses keep up a deafening clamor in an endeavor to persuade the visitor to stop at this or that hotel, to dine at this or that cafe because "no one else's meals are worth eating", to get postcards, charms, religious trinkets, pottery, brassware, guidebooks, or other souvenirs. The visitor has almost to fight his way through until at last fatigued, somewhat disheveled, and considerably annoyed he reaches the head of the street where the shops and their attendant hubbub end abruptly. One goes around a corner and the lower walls and gateway of the abbey appear. Continuing on, climbing steps and passing through gateways until above the lower walls the town with its modern noise, cheapness, and greed drops away and one is left among the centuries old walls and towers and feels something of the strength and peace and self-respect of the past.

On entering the abbey the visitor is ushered into a large room where admission tickets are obtained and where one may purchase postcards, etchings, photos, pamphlets while awaiting the time for the guide to take the party. At last he comes. The party is led up a long, steep flight of granite steps to the church above. It is a graceful Romanesque building with a late Gothic choir and a relatively recent facade. The facade looks somewhat out of place but the Gothic and Romanesque blend surprisingly well considering that they were four centuries apart in thought and execution. It is of this chapel that Henry Adams wrote in his classic book[3] "The quiet restrained strength of the Romanesque married to the graceful curves and vaulting imagination of the Gothic makes a union nearer the ideal than is often allowed in marriage. . . . If you look down the nave through the triumphal arches into the pointed choir four hundred years more modern—you can judge if there is any real discord, . . . there is none, the strength and grace join hands, the man and the woman love each other still."

If one wishes one may climb the tower or may go out on the broad platform before the church and look down the estuary to the sea, the same age old sea that the builders of the chapel looked down upon.

Leaving the church the party enters the great building beside it, the Merveille, or Wonder, as it has been called for centuries. By the church are the cloisters forming the upper story of the Merveille. One is amazed at their beauty, grace and lightness considering that they are made of granite. But the slender columns with the flowers and foliage are as fine and delicate as if they had been made of marble. Next the Refectory is entered, a magnificent vaulted hall with high Gothic windows. It has an air of grace and repose. The stone chair used by the reader during meals is still preserved on the wall to the right. Passing down to the next story the party visits the Salle des Hotes or great guest room where the abbot could have seated two hundred guests for dinner. It is beneath the Refectory, while beneath the Cloisters is the great Salle des Chevaliers or Hall of the Knights, a splendid thirteenth century hall with massive columns and vaulted aisles. In the story below are the great storerooms, while beneath and around them are crypts and other remnants of tenth and eleventh century structures, which in the course of the centuries have been used for many purposes including storerooms and dungeons. The party is shown the huge tread wheel used for hoisting food for the prisoners when the abbey was used as a prison.

The guide gives an interesting account of the history of the place, points out some of the unusual architectural features and intersperses his discourse with anecdotes and jokes. Usually he is a war veteran and well earns a generous tip from each member of the party.

Wandering through a maze of rooms and passages the guide at last stops before a small door, unlocks

(Continued on page 34)

[3] Henry Adams, Mont Saint Michel and Chartres, 1905.

SLUSHING AND SCRAPING
Economic Aspects

By CHARLES R. CUTLER, '39
Howe Sound Co., Holden, Washington

History

The introduction of mechanical slusher and scraper mucking is probably the greatest development in the mineral industry since the advent of chemical flotation. Like flotation, the principles of modern slushing and scraping, were used far back in the history of the world. Herodotus described a form of flotation, used to recover gold with pitch in 450 B.C., but the common hoe, which is the fore-runner of slusher and scraper mucking, was used by Neolithic man some 10,000 years B.C.

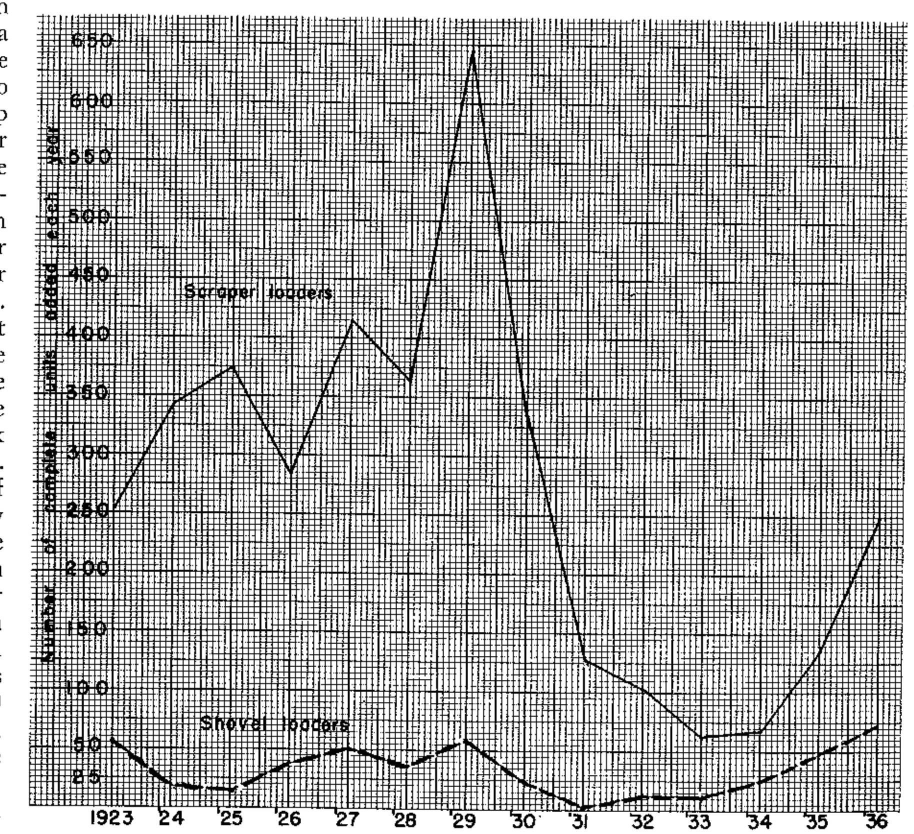
The mechanical scraping of muck underground is comparatively young. The earliest recorded use of the scraper was at the Bunker Hill and Sullivan mine at Kellogg, Idaho, in 1897 or 1898. In driving the Kellogg tunnel, a slip scraper was used to drag the broken rock from the face, and up an inclined slide, where the rock was discharged into a mine car. The loaded scraper was drawn by a single-drum hoist, mounted on a movable frame set over the track. The empty scraper was dragged back to the face by hand. In 1898, a slip scraper was designed at the Badger mine in Wisconsin to distribute waste filling in square-set stopes. This installation was similar to that used in the Kellogg tunnel, and a small air hoist, of the type then used for handling timber, supplied the power.

These early experiments were not particularly successful because of the light-weight equipment used, the small capacity of the scrapers, and the difficulty of pulling the scraper back to the loading position by hand. Although the mineral production of the United States increased rapidly during the next twenty years, there was little reason to experiment with mechanical aids to mining. Labor was plentiful; immigration, which has supplied a great part of the hand muckers to the mines, reached its peak during the decade 1900-1910 with over eight million immigrants, and over six million entered the United States from 1910 to 1920.

In 1915, the second milestone in the development of mechanical slushing and scraping was made by the Quincy Mining Company in Michigan when a double-drum hoisting engine was installed. One drum pulled the loaded scraper to the dumping position and the other, by means of a tail sheave, returned the scraper to the loading position. This arrangement made possible the use of heavier equipment and relieved the operators of the hard work necessary to drag the scraper back to the muck. Similar experiments were made at about this time at the Spruce mine in Minnesota. In the same year, Cadwallader Evans designed a scraper loading system for mining the thin, flat seams in the mines of the Hudson Coal Co. at Scranton. This system was used for loading coal in a semi-longwall method of mining and electrically operated double-drum hoists were used.

Under the stress of falling metal prices, the generally high wage scale, and a shortage of mining labor, the zinc-field hoe-type scraper was devised for use in the Tri-State zinc and lead district in 1919. These scrapers, too, were electrically operated double-drum hoists and the scrapers were equipped with tail ropes. Since the development of the double-drum method of scraping there has been no improvement in the principle of scraping, although it is true that individual units have been enlarged in power, size, and complexity.

During the 1920's there was a great increase in the number of scraper and slusher installations; metal prices were generally high, demand for increased production was of paramount importance, and due to restricted immigration and the prosperity in all other branches of industry, there was a shortage of labor for such arduous work as mucking. The depression of 1921 made it neces-



● Scraper and Shovel Loader added to equipment of underground metallic and non-metallic mineral mines 1923-1936.

sary for marginal mines to increase the tonnage per man and reduce the cost per ton. Previous experiments had proved the economy of scraper installations, and as the manufacturers of mining equipment began to turn their attention to scraping machinery, it was natural for mine producers to look upon this form of mechanization as an aid to cost reduction. With the great and constant growth of mineral production after the depression of 1921 and the general shortage of heavy labor for mucking due to restricted immigration and the prejudice of the second and third generations of foreign extraction against performing manual labor, the use of scraping equipment expanded rapidly. (See graph on page 15.)

As scraping came to be applied to dragging ore and rock over longer distances, larger scrapers were required, and higher rope speeds were employed to obtain the desired rate of output. The scraper thus emerged from the status of a loading machine to that of a combined loading and transporting machine in underground work and today it is widely employed in this dual capacity. As the need for more powerful machines grew, the use of electrically driven hoists increased rapidly because of their greater power and efficiency, and these hoists have largely replaced the air-driven units in many mines and districts.

Applicability

In underground metal mines, scrapers are used in connection with development work, stoping, filling, and transportation of ore.

In connection with underground development work, scrapers are used for the removal of ore and waste from tunnels, crosscuts and drifts. The broken material is usually scraped from the face and dragged up an inclined slide where it is dropped into mine cars. The development work necessary for sub-level caving, top-slicing, and block caving opens a large field to scraping as the broken material can be scraped a considerable distance from the face and dropped into a chute raise to the tramming level. Scrapers have also been used in connection with the sinking of inclined shafts and driving flat inclines.

The greatest opportunity for slushing and scraping probably lies in the stoping of ore. At present it is widely used in handling ore in open stopes in flat dipping beds and veins where the dip is less than the angle of repose of the broken ore; in cut-and-fill stoping; in top-slice, sub-level, and block caving stopes; and, to some extent in square-set stopes. Scrapers are used advantageously in connection with shrinkage stoping as the ore at the top of the stope can be quickly leveled off before the miners enter the stope, thus improving their footing on the broken ore. Where top-slicing, sub-level caving, or cut-and-fill stoping are the mining methods employed, the ore is usually scraped into raises and dropped to the haulage level. The use of scrapers in the block caving method of mining may eliminate a considerable amount of development work, as the ore can be scraped directly from the finger raises to the ore cars, and the use of grizzlies can be dispensed with entirely. (See figure below.)

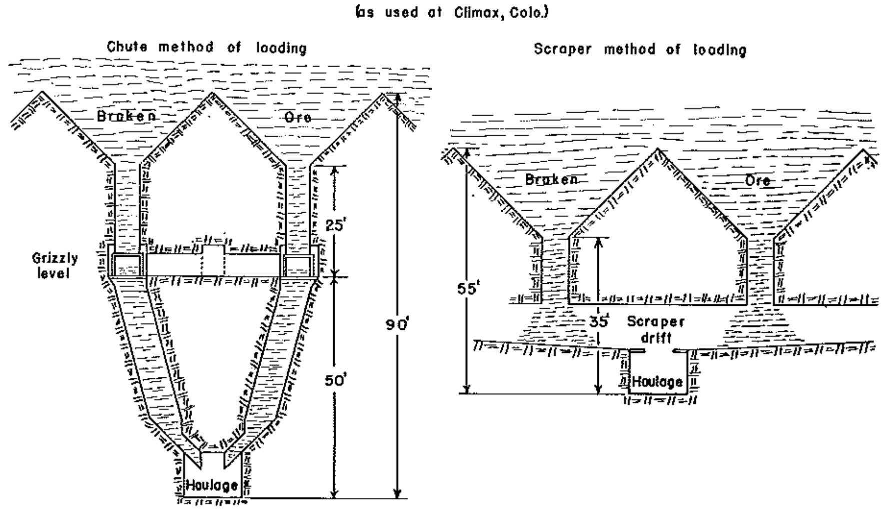
Scraping is used in connection with cut-and-fill stoping for spreading waste fill in the stopes. In this application the same scraper can be used for spreading the fill and moving the ore to the raises if the nature of the ore and the filling material do not differ too greatly. Scrapers may also be used for the delayed filling of stopes, such as the filling of shrinkage stopes that have been drawn empty.

Although slushers and scrapers were initially developed as loading machines, they are coming to be used more and more as transporting machines in the dual capacity of moving and loading the ore. In the iron mines of the Birmingham district, where tracks branching from the main haulage drift were formerly run to the face of each room, often on stiff grades directly up or diagonally across the dip, scrapers are now employed for dragging the ore from the faces of the rooms to cars on the main haulageway. In flat, thin beds it is often necessary to take up bottom rock or take down top rock to provide headroom for the cars. In such cases, scrapers can be used advantageously to drag the ore from the stope face to the main haulageway, thus eliminating the necessity of removing much waste rock as would be required if the cars were run directly to the breast.

In other instances scraping is employed for transferring ore on sub-levels from several stopes above the sub-level to a common chute. This practice often eliminates much costly development in the form of rock drifts and raises and at the same time eliminates track, cars, and tramming labor on the sub-levels or transfer levels. In yet other instances scraping is employed on the main haulage levels to transfer broken ore from a series of stope raises put up from a cross-cut through which the ore is dragged to cars in the haulage drift.

Scrapers have been found useful for removing ore from sections of stopes in which it would be extremely hazardous for men to work. The scraper hoist may be set up at a safe point at one end of the dangerous area, a tail sheave secured at the other end, and the scraper employed to remove the ore from the area in question without requiring men to go under the bad ground. Likewise, scrapers have been employed for dragging filling into unsafe stopes which are not provided with raises through which filling can be introduced from above. In other instances safety is promoted by the more rapid working made possible by scraping, thus reducing the time that backs are exposed and subjected to forces which result in weakening and caving.

(as used at Climax, Colo.)



In general, it may be said that scraping has a decided advantage over hand shoveling, especially where the tonnage is sufficient to keep the equipment busy throughout the working shift, where speed is desired, or where the mining system is such that efficiency is improved by shortening the mucking or filling period to permit a complete cycle of operations on each shift. Under favorable conditions scraping will show a saving in cost compared to handwork and other instances may merely increase speed of operation beyond that possible by handwork. Scraper loading has not only resulted in cost savings to the operating company but increased wages for the workers.

Selection of Equipment

In making the first application of scraping in a given mine the management is confronted with (a) selection of equipment adapted to the local conditions; and (b) adjustments in existing related operations, methods, and equipment to permit efficient use of the scraping equipment without impairing the efficiency of such related operations.

In adopting equipment suited to local conditions the principal considerations affecting the choice are (a) character of the materials to be handled, (b) method of digging, whether from the face of the pile or across the pile, (c) tonnage of material and rate of handling desired, (d) length of drag, (e) purpose for which the scraper is to be employed and method of disposal of the material handled, (f) inclination and nature of the floor over which the scraper will operate, and (g) size and shape of area and total tonnage to be handled from a single set-up of the hoist.

The character of the material handled; the size, weight, and shape of individual pieces; proportions of coarse and fine material; and consistency of the material (wet or dry, plastic or hard and friable) will influence the type, weight, digging angle, and general design of the scraper bucket or hoe. The method of digging, whether the scraper is to load across the muck pile or to pull down the face thereof, will influence the general design of the scraper.

The tonnage and rate of handling together with the length of drag will have an important influence upon the size (capacity) of bucket or hoe; the rope pull and rope speed of the hoist; the horsepower, drum capacity, and strength of hoist construction required; and the size and strength of pull ropes, tail ropes, sheaves, and snatch blocks. If these factors are not in proper balance unsatisfactory operation, frequent break-downs, and excessive repair and maintenance costs may be expected.

The purpose for which the scraper is to be employed should be considered carefully. Thus, if the scraper is to function as a transporting machine both the scraper and the hoist must be selected with this in view. A scraper designed for the best digging requirements in a given instance may not function well when employed for haulage purposes; it may dump much of its load along the way, may dig into the bottom or have a large fractional resistance during the haulage trip or on its return to the muck pile, or may tear up the bottom of the haulage way or the floor laid thereon. When the scraper spills its load along the haulage route this defect is often not serious, since when enough spill has accumulated the scraper will run in a rut with the spilled material on each side, effectually preventing any further loss of load. However, if the haulage way is wet the accumulation of spill may be undesirable because of the resultant damming back of the water.

A scraper designed for the best performance as a haulage machine may not function well as a digging machine. It sometimes becomes necessary therefore to select a design which is a compromise between maximum efficiency in digging and the best haulage performance. The nature of the floor over which the scraper is to operate is to be considered in this connection, and if the bottom is soft it may be necessary to provide a bottom of plank or rails for the scraper to slide on. The question of whether the scraper is to discharge into cars or into chute raises is another consideration. Thus, if the scraper is employed in a heading it must be of a width suited to the widths of the heading, the loading slide, and car and of a height accommodated to that of the heading and of the car and slide.

If the scraper is to be used for spreading filling in stopes, if it is to be operated in closely timbered stopes where obstructing timbers may call for special scraper design or mode of operation, if it will be required to scrape ore around sharp bends, or if it is to be employed in wide stopes for scraping ore to a central raise conditions must be taken into consideration.

The weight and dimensions of the scraper and hoist are important considerations, particularly if the equipment is to be moved frequently and if it must be taken up and down raises of limited clear sectional area.

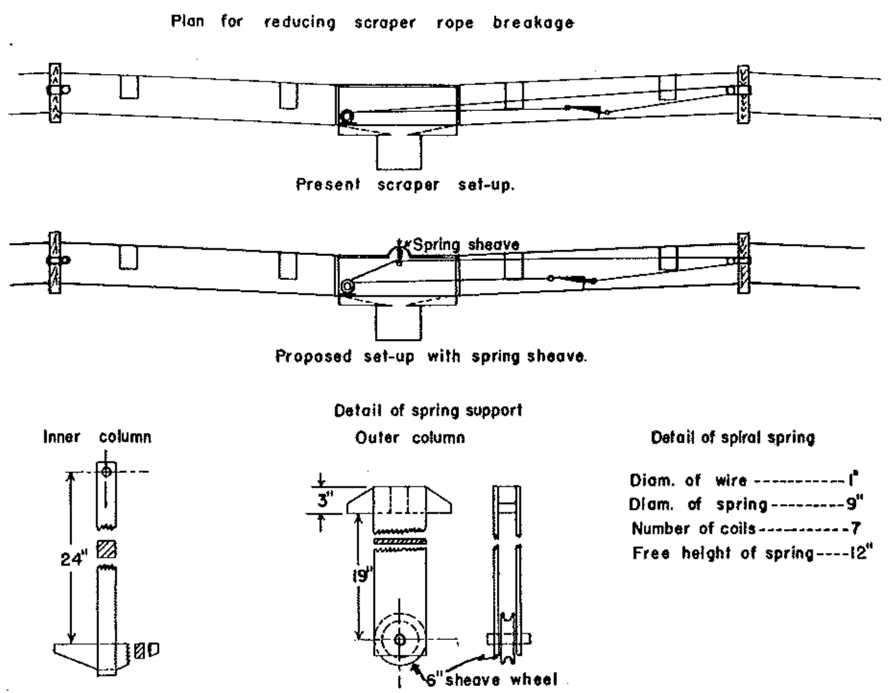
When making an initial scraper installation in a mine related operations and equipment seldom permit most efficient use of the scrapers without some changes. Radical changes in existing practices for the sole purpose of accommodating them to scraping should not be adapted too hastily. Such changes disrupt the routine, which from long use may have become highly efficient. With this in mind it is usually advisable so to design and install the first equipment that it will fit current practice and existing equipment, gradually adapting such changes in related operations and equipment as will increase the scraping efficiency and produce the best over-all results. More radical changes in practice may be warranted later as experience is gained with the scrapers and as the practicability and advantages of such changes become evident.

Frequently in metal mines the mine cars are too small to permit efficient scraping, and the time lost in changing small capacity cars may be several times actual loading time. Thus it may become advisable to install larger cars or provide switching facilities close behind the scraper for quickly changing cars or both. This condition often is the first factor limiting the capacity of a new mechanical loader installation, particularly when driving headings.

In other instances the ore loading chutes already installed may be too low to allow passage of a scraper slide under them without dismantling it, or the same condition may limit the height and capacity of car which can be employed.

Under other conditions it may be of advantage to vary existing mine practice. Thus, in some top-slicing stopes in the iron mines of the Lake Superior district radial slices driven from a central raise have replaced parallel or right-angle slices to facilitate dragging the ore from the faces directly to the chute and eliminate dragging around right-angle turns or loading first into cars and then tramming the cars to the chute.

In some instances it may be advisable upon installing scrapers in stopes to drill bigger rounds to provide larger muck piles for the scrapers to work on. In others, such changes in the cycle of operations as would result from providing two or more working places for each crew of drillers where one place formerly served



● **Sketch showing difference in height to pillar peak with chute vs. scraper loading.**

might result in greater efficiency. Certain changes in the plan of level or stope development, locations of ore and waste passes, or variations in timbering practice may prove desirable. Again changes in the organization of working crews, methods of payment—whether on a company account, contract, or bonus basis—may be advantageous.

Such adjustments in practices can frequently be made without impairing the efficiency of the practices affected thereby. Indeed, these changes can often be made with resultant improvement not only in the scraping performance but in the related operations as well.

Limitations

When considering the installation of scrapers in a mine it is well to bear in mind that an immediate capital charge for equipment is involved and the operation of mechanical equipment of any type entails charges not only for operating labor but for depreciation, inspection, maintenance and repairs, and power. The first cost of scraper installations, particularly those employing hoists up to fifteen or twenty horsepower capacity, is relatively small. Due to the simplicity of scraper equipment repair costs are small if the equipment is not too light for the work demanded of it and if regular inspection, oiling, and ordinary care are provided. Hoist ropes wear out rapidly and in most instances have to be replaced frequently, replacement of hoist ropes is often the most expensive single item in scraper operation. The original drawing above shows a method which the author believes would reduce the breakage of the ropes. Although the plans of the scraper layout is taken from operations at the Climax Molybdenum Co. mine, it is believed that similar improvements could be made on any scraper installations where rope breakage is excessive and due principally to excessive inertia in the hoist drums. (The author realizes that this addition to scraper installations may defeat one of the safety practices in use at Climax, i.e., one and one-quarter inch ropes are used instead of three-quarter inch rope because the larger rope, when it is snapped, will drop to the floor rather than snapping back toward the operator. This spring addition may cause the heavy rope to fly rather than falling dead.) Power costs for scraper operation are surprisingly small. Thus, while first cost, repairs and maintenance, and power costs are small they will total a sum which must be considered in making any scraper installation.

In driving small headings scraper loading has little, if any, advantage over hand loading, except in speed of driving, that is, where speed rather than costs is the prime consideration. In such work the small portable power shovel is a competitor of scraper loading. As the size of the heading is increased above a cross-section about 8 x 8 feet, both increased speed and reduced costs can often be obtained by mechanical loading. Here, too, the power shovel is a competitor of the scraper and is preferred by some operators. Conditions will determine the advantages and disadvantages of each type of equipment in specific instances.

When loading into cars it is imperative, to attain efficient operation, that the loaded cars be removed as they are filled and empty cars spotted in their places with a minimum loss of time. Some time is, of course, unavoidably lost in changing cars, and therefore greater efficiency in scraping is usually obtained when scraping into chutes than when scraping into cars. It is obvious that maximum efficiency from any machine is obtained only when the machine is working steadily.

The scraper is at a distinct disadvantage in handling ore from which considerable waste must be sorted during the loading, and under such conditions scrapers have in some instances been tried and discarded in favor of hand shoveling. The scraper will pick up waste and ore indiscriminately; and if a large proportion of waste must be sorted out intermittent operation of the scraper to allow intervals between each load for sorting so slows operation and reduces actual scraping time that the chief advantages of the scraper are lost. There is at least one instance recorded, however, where the scraper has been employed successfully for handling material from which an average of 40% is sorted in the stopes as waste.

Scraper Design

Two distinct types of scrapers are employed in underground scraping, the box-type and the hoe-type; both are bottomless. A third type is the slip scraper, previously mentioned, which while employed extensively at one time for slushing soft ore in the iron mines of the Lake Superior district, is now little used. This type required the services of a man to direct the slusher into the muck pile, and the empty slusher was pulled back to the pile by hand.

In some mines a type intermediate between the box and hoe types is used. This is usually a hoe scraper modified by side plates. Such scrapers may be termed semi-box or semi-hoe type scrapers, depending upon whether the characteristics approach more nearly the box or hoe type, the destinction being more or less arbitrary, however.

A choice between the two general types can usually be quickly made for any given installation. In general, it may be said that the box scraper is applicable to handling finely broken or granular material, whereas the hoe type is adapted to hard, chunky ore and rock. Unless the scraper is very heavy the sides of the box scraper ride up on the lumps and hinder penetration of the teeth or cutting edge into the pile. For digging in fine, friable material which offers little resistance to the sides of the scraper the box type is usually preferred because of its greater capacity in this class of materials. A hoe scraper will not retain fine, loose muck after it is pulled out of the pile because the material will run out the sides under the bail. Coarse material will not escape so readily because the bail will retain large chunks, which will in turn block the escape of other chunks and fine material in the center of the load. Furthermore, chunky material will often pile up above the top of the scraper and ride with the load. If there is no objection to an accumulation of muck along the path of the scraper this advantage of the box type scraper loses much of its importance. After a certain amount of spill has accumulated along the path of travel of the hoe scraper it will form a bank on both sides which will prevent appreciable spillage during subsequent trips. Such material as does escape at one point will be compensated for by the picking up of that previously dropped, and the scraper will then arrive at the dumping point with a full load. Spilled material must be removed eventually, however, and if the box type scraper can be used and will load itself quickly it is an advantage to be able to transfer the material with as little spillage as possible and thus maintain a clean drift or stope at all times. In clean-up work the box scraper has obvious advantages. In cleaning out corners, however, the hoe scraper has some advantage over the box scraper.

The proper size or capacity of scraper for a given installation will depend largely upon the quantity of material to be handled and the rate of handling desired and will be limited in certain instances by the width and height of the heading or the size of opening between obstructions, such as timbers, along the path of the scraper.

The proper weight of scraper for any particular condition is largely influenced by the size, weight, and other characteristics of the material handled. Many initial scraper installations have been faulty in this respect. In soft, dry, loose muck a light scraper usually will work satisfactorily, since in such material with the correct digging angle it will readily penetrate the pile and quickly fill itself. In handling hard, chunky ore, however, weight is an important factor in producing satisfactory penetration.

Good penetration of the muck pile depends upon properly adjusting the weight of the scraper, its digging angle, and its stability or balance to the character of the muck and to the direction of the line of pull, as pointed out by van Barneveld. Other investigators have shown that the resultant of the forces represented by the dead weight of the scraper and the rope pull determine theoretically the proper digging angle to obtain the best penetration of the scraper into the pile.

In practice it has been found that for scraping chunky ore enough weight is a prime requisite to good penetration and filling of the scraper. Operators have often started with scrapers which were too light to suit the character of the muck, and no amount of juggling the digging angle and other details of the design would produce satisfactory penetration and filling of the scraper. A light scraper in blocky ore will skim over the top of the pile and upon meeting obstructions in the form of heavy chunks or rough projections will jump about and spill any load already picked up. In some instances a decision to utilize a hoist already on hand, which not powerful enough to handle a heavy scraper, has led to the use of a scraper too light to dig chunky ore. Upon failure of the light scraper to perform satisfactorily a hasty conclusion was sometimes reached that scraping could not be employed for handling the ore in question. In the light of past experience it is therefore sound policy to start with a scraper of ample weight and with a scraper hoist powerful enough to handle it.

It is obviously poor practice, however, to use a scraper much heavier than is required for good penetration and strength of construction. Not only will such a scraper consume more power than necessary; but, more important, a heavy scraper is more difficult to handle, especially if it must be taken up raises into stopes or moved about frequently. The minimum weight for any particular installation can be determined only by trial. The weight may be varied to some extent by the use of removable dead weights on the back of the scraper. Too much weight on the back may overbalance the weight of the bail and for this reason it may be necessary to add weight to the bail, especially if the bail is short.

Scrapers employed in underground metal mines range in weight from about 250 or 300 to 3,600 pounds, the common range being 350 to 1,500 pounds. Other things being equal, large capacity scrapers obviously will be heavier than smaller capacity scrapers of similar design, due to the additional material required in their construction. Thus, a large capacity scraper may not require the addition of dead weights to secure good penetration, whereas a scraper of smaller capacity working in the same class of material may require weights to be added for this purpose.

The digging angle or angle of the cutting edge of the scraper has been the subject of much discussion and experimentation in scraper design. It may be defined as the angle the cutting edge makes with the surface of the pile when digging, that is, when the pull rope is in tension and the bail is lined out with the pull rope. Theoretically, the maximum digging effect should occur when the plane of the cutting edge lies in the resultant of the pull and the force of gravity.

In actual operation, although the weight of the scraper remains constant in magnitude and direction the force of the pull varies between rather wide limits as the scraper starts to dig into the pile and meets obstructions, finally secures its load and moves forward to the dumping point. Thus the angle the resultant makes with the horizontal may vary considerably during a complete digging cycle. Points on the top and face of the muck pile lie at varying angles with the horizontal, and still wider variations occur between the angle of pull and the slope of the pile as the scraper moves ahead. Furthermore, the location of the muck pile may vary from day to day in relation to location of the hoist, both as regards distance and elevation, introducing another factor which results in different relationships between the angle of the pull rope, the slope of the pile, and the resultant angle.

A commonly accepted principle in scraper design is that the length of the bail should be equal to or greater than the width of the cutting edge and that the height of the back should not be greater than half the width of the cutting edge. The length of the bail in hoe type scrapers may affect the capacity of the scraper, its balance or equilibrium, or both. In chunky muck the bail of the hoe scraper confines the load within the scraper, and obviously the shape and length of the bail will affect the amount of material which can be held between it and the scraper back. In the box scraper the sides correspond to the back part of the bail of the hoe scraper and serve a similar purpose.

Another generally accepted principle in scraper design is that the front or bail end should decidedly overbalance the back end; that is, when the pull rope is not in tension the front end of the bail should rest on the ground. If the back overbalances the front the cutting edge will not lie at the proper digging angle until the pull of the rope brings the front of the bail down and thus steepens the angle of the cutting edge so that it will force itself into the muck. If, on the other hand, the bail overbalances the back, the cutting edge will be already in digging position when tension is applied to the pull rope. Also, if the bail is too light it may be forced upward by the pressure of the load, and the digging will thus be flattened. Unless the bail overbalances the back it will flop about erratically in the air during the return trip of the empty scraper, especially if the bottom is uneven or is covered with chunks of ore, and it may foul timbers or other obstructions and overturn the scraper.

The nature of the work performed by scrapers precludes careful handling of the equipment, and rough usage must be expected. Strength of construction is therefore of prime importance, and materials should be selected with consideration of their strength and durability.

Either riveted, bolted or welded construction may be used, riveting being generally preferred for securing those members which require only occasional repair or replacement. Rivet heads should be countersunk where they are exposed to breakage or abrasion by striking against solid rock or grinding against broken material. The back of the blade or backplate and the outside of the sideplates and bail are most exposed in this respect. Although bolts are more quickly and easily replaced than rivets if they shear off, replacements are usually required more frequently. Nuts may loosen or be broken off, and the bolts will drop out if not watched; sometimes, before the loss of bolts is noticed, racking of the scraper will result in serious damage.

Because of the rough usage to which scrapers are subjected ample factors of safety should be employed in determining cross-sections of plates and bars, and the size, spacing, and number of bolts and rivets. Sudden shocks must be absorbed when the scraper bumps against obstructions, and reduction in strength must be expected as the scraper becomes worn through use. During work in hard ore, abrasion of certain parts of the scraper may be very rapid unless they are constructed of special wear resisting material.

Scrapers are usually made with a replaceable wearing lip riveted to the bottom of the backplate, due to rapid wear on the cutting edge. These lips may be of ordinary steel if the ore is soft, of high-carbon steel, or of alloy steel if the ore is abrasive and the wear on the lip is excessive. In some mines stellite has been welded to the edge of the cutting plate to delay abrasion wear. The rate of wear and the comparative costs of ordinary high carbon and of alloy steels will determine the most economical material to use in each particular instance. Ordinarily, however, it is desirable to employ special steels for parts most subjected to wear, as such steels will increase the life of the scraper several fold in most instances.

Horsepower of Hoists

The theoretical horsepower required to drag the scraper at a given rope speed is the rope speed in feet per minute, multiplied by the rope pull in pounds and divided by 33,000. When scraping on the level, the rope pull is the weight of the scraper plus its load times the coefficient of friction; if the load is being hauled upgrade the force required for raising the weight of the loaded scraper must be added to the frictional resistance. The pull required for dragging the loaded scraper, however, is usually less than that needed to force it into the muck pile and fill it. The factors entering into any theoretical calculation of power requirements are so variable during the digging and dragging cycle that the proper horsepower for any set of conditions can be better determined by experience than by mathematical formulas.

The maximum pull is usually required as the scraper is taking its load; it will vary greatly, depending upon the resistance offered to penetration and the obstructions met. Thus the scraper may secure a hold behind a large buried slab, throwing such a sudden strain on the hoist that its full power may be required to dislodge the slab and raise it out of the muck pile; the overload may even stall the hoist.

As previously mentioned, many of the early scraper installations were made with hoists of insufficient horsepower to handle the size of scraper required for satisfactory performance in the class of material to be scraped and to handle the muck at the desired rate. During the past several years the tendency has been to employ hoists of greater capacity. This has not been due entirely to the undertaking of more ambitious, wholesale scraping operations, which would obviously require more powerful equipment, but considerably larger hoists are now generally used for operating under the conditions where smaller hoists were formerly employed. Thus in many mines that formerly used 5 to 7½ h.p. and 150 feet per minute rope speeds, 15 h.p. hoists are now used with rope speeds of 200 to 280 feet per minute, although the size of the scrapers has not been materially increased.

Overpowered hoists cost more than lower-powered units, but they give greater service and increased operating efficiency, and their relatively small additional first cost is more than repaid by savings in repair, maintenance, and operating charges. The more powerful machines are desirable to meet sudden demands for excess power in pulling buried chunks out of the muck pile and in overcoming other obstructions and to withstand the general rough service to which scraper hoists are subjected.

Many of the earlier scraper installations employed air-driven hoists, and under certain conditions of operation some mines still use air-hoists. Air is available in all working places for the operation of rock drills, and it is simple to connect an air hoist to the air lines. On the other hand, the use of electric hoists may require installation of special power cables. In mines where electric trolley haulage is used direct current hoists often are driven by power from the trolley wire, requiring only short connecting wires.

Air hoists have certain advantages in poorly ventilated sections of hot

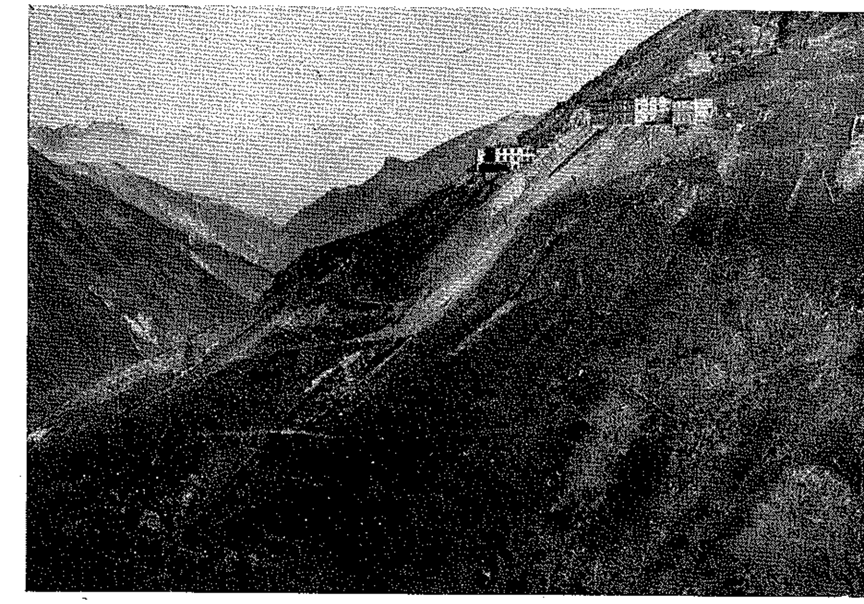
(Continued on page 34)

COGNE, ITALY
Europe's Highest Mine

By R. D. GRILLO

Former Italian Consul at Denver

Cogne, an Alpine village in the north of Italy, possesses the highest mines in the whole of Europe. Situated in the province of Aosta, at the far end of a green tableland surrounded by high mountains: Mount Grivolo (3,969 metres above sea-level) to the West, Mount Emilius (3,559 metres) to the North and the Grand Paradiso (4,061 metres) to the Southwest, Cogne is one of the most attractive tourist centres and climatic stations, besides being one of the most important Italian mining districts owing to its remarkable deposits of iron ore.



● The Mine—Cogne.

These deposits have been known and worked since ancient times. The qualities of great purity and richness of ore compensated the disadvantages accruing from the situation of the mine at such a high altitude and from the difficulties of transport. The Romans, conquerors of the Alpine passes and founders of Augustea Praetorium, or rather, Aosta, knew of the existence of the ore deposits at Cogne and greatly appreciated them on account of the degree of purity found in the metal extracted. These deposits were worked by primitive and rudimentary methods up to about the year 1300. Then followed centuries of interruption and abandonment, and only about the year 1855 was there a revival of their working. Other periods of pause followed which lasted in all for several decades.

In 1909 the working of the mines was resumed, this time on completely modern lines. A completely modern plant was provided in order to confer on the mines the same degree of potentiality as had the factories of the Val d'Aosta which had for many years been worked with extreme efficiency, both in regard to the output of the ore and to their organization.

The most important mineral deposits in the mining district of Cogne are in the mines known as Liconi, shown in Fig. 1, old mines which,

● The Mill—Cogne.

formerly abandoned, are now being worked on a large scale; and in the deposits appearing on the surface at Colonna and in the Larginaz mine.

These are open excavations in compact bodies of magnetite, having an average thickness of about fifty metres, yielding an average of fifty percent of iron, the main body of which appears on the surface in the upper spur which climbs up to Monte Croja above Cogne between the main valley of Grandeivie and the great valley of Grauson.

The surface area of these bodies of ore is enormous and reaches an altitude of from 1,500 to 2,500 metres above sea-level. The deposit is of magnetite with a high percentage of iron absolutely free from impurities such as phosphorus and sulphur and consequently suitable for use in the production of selected qualities of special kinds of steel and highly prized for use by the iron industry.

Recent magnetometric survey and drilling have shown the contents of the deposit to be around twelve million tons of iron ore. The greatest production per month so far attained is 24,500 tons with a forty percent iron output.

By means of a series of plants, such as shown in Fig. 2, for the crushing and magnetic sorting of the ore, using both the dry and the wet concentration system, two products are obtained, one of which contains thirty-one percent and the other fifty-six per cent of iron in quantities of respectively 12,800 and 4,500 tons per month.

Owing to the great altitude at which the ore is mined, its transport to the iron furnaces at Aosta proved to be a difficult problem owing to a drop of 2,000 metres. The problem has been solved by means of a cable tram which carries the ore from the deposit of Licani to the plant of Cogne, for crushing and classification, while an electric railway twelve kilometres long, of which eight run through a tunnel, carries the mineral to the station of Acque Fredde, at the starting point of another cable railway, four kilometres long, which finally brings the mineral to the plant at Aosta.

In order to provide adequately for continuous and regular supplies of the ore required to supply the blast furnaces of Aosta, enormous "silos" have been erected for use as reserves in case of an emergency due to interruption in the means of transport, thus providing a certain guarantee in order that the subsequent cycle of iron manufacture shall not be subject to any interruption, the consequences of which would seriously prejudice the work and the very life of this important mining organization.

The ore, borne over the above mentioned routes from the mines to the iron mills, is put into the silos ready to be loaded in the blast furnaces, so that its cycle of manufacture may then proceed. The two blast furnaces at Aosta are 20.7 metres in height and each produces from 200 to 250 tons of pig iron per day.

The specifications of the two blast furnaces are the following:

	Metres
Diameter of the crucible	3.200
Diameter at the body	6.000
Diameter at the opening	4.650
Height from the sole of the furnace to the opening	20.760
Capacity	Cubic Metres 350

They have to be loaded with about 2,600 tons of ore, 1,100 tons of coke and 900 tons limestone, besides which 6,000 tons of hot air is inserted.

In recent years, in order to reduce the use of coke as fuel for the running of the blast furnaces, systematic experiments have been carried on to ascertain the possibility of replacing, on a greater or lesser scale, the coke by anthracite from the coal district of La thuile, which belongs to the Cogne Company.

The position of the ore deposit and the severe climatic conditions, especially during the winter months, have rendered necessary numerous and widespread forms of work to be organized for the comfort of the workers and especially for those who are working in the mines. In the neighbourhood of the mine and connected with it by means of a tunnel, a number of buildings for the housing of the workers have been erected and equipped to provide the workers with the conveniences and comforts of a high standard of living. Large, light and airy rooms, huge refectories, spacious recreation rooms, modernly equipped hygienic and sanitary installations, reading rooms, cinemas, churches and all accessories such as the bakery, the general store, kitchens and so on, have been constructed.

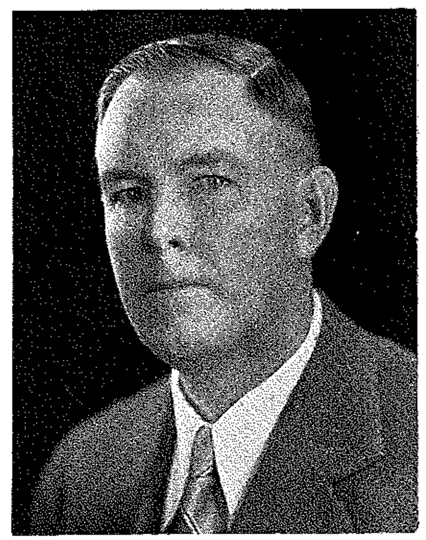
In its exceptional situation, the Cogne iron mine is the highest in Europe. In order to reach it, high mountains must be climbed, along beautiful Alpine roads covered with spotless snow. In the midst of these silent and solemn spaces, palpitates the fervent and active life of the great mining centre of Cogne.

• In Memoriam

Arlington P. Little

All Mines Men will regret to hear of the death of Arlington P. Little, professor of Electrical Engineering at *Mines,* which occurred in Golden on December 28, 1939. He was ill only a few days with pneumonia.

Professor Little was a native of Clarenceville, Quebec, and received his elementary education there. He then attended the University of Vermont, from which he received his bachelor of science degree in 1901; four years later he received his electrical engineer degree from the same institution.



Arlington P. Little

He taught for several years at the Oklahoma State College of Agriculture and Mechanical Arts and at Yale university as assistant professor of radio and advanced electro-physics. For four years he was associate physicist with the bureau of standards in Washington, D. C.

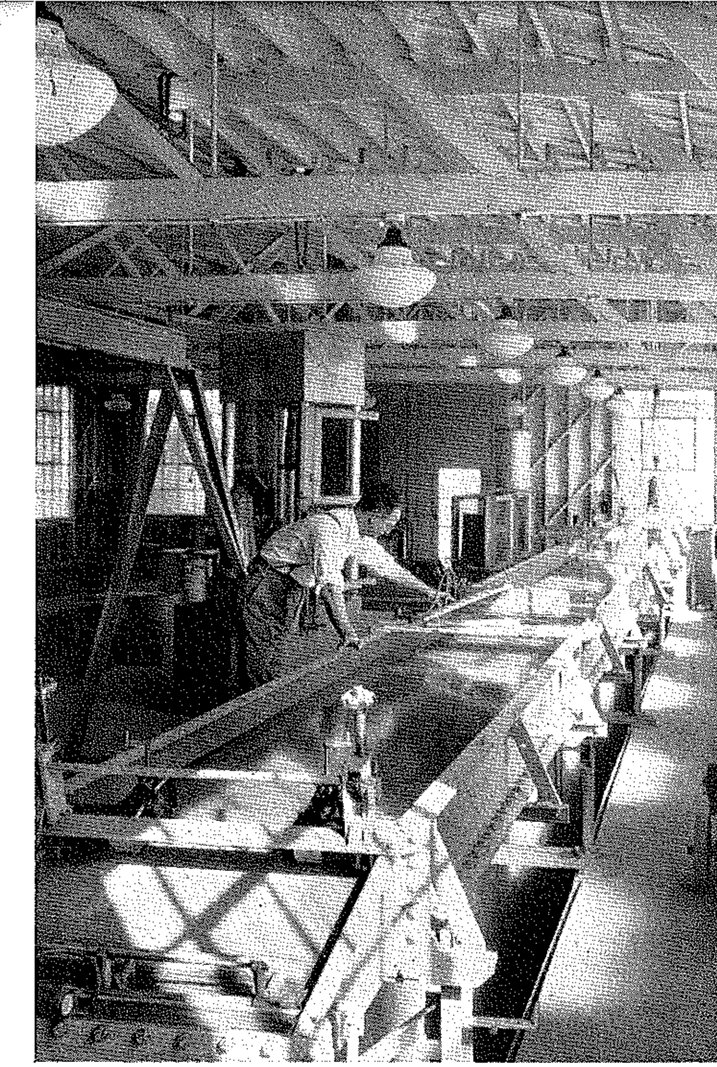
In 1915 he accepted position of professor on Mines faculty where he had since been. During summer vacations Professor Little traveled extensively in this country as well as Europe. He was interested in Indian life and customs and spent much time in the southwest in this study.

He was a member of the American Institute of Electrical Engineers, the Society for the Promotion of Engineering Education and honorary societies.

He is survived by his wife, Mrs. Mary Little, a son and a daughter.

The Place of Sedimentation Studies *in the* Soil Conservation Service

By JACK L. HOUGH
Assistant Geologist
Flood Control Surveys, Soil Conservation Service
Amarillo, Texas



• General view of suspended load flume in Soil Conservation Service Cooperative Laboratory, California Institute of Technology, Pasadena, Calif.

Recognition of the inherent relationship of present-day sedimentation problems to soil erosion led in 1934 to the inauguration of a series of sedimentation studies as part of the research program of the Soil Conservation Service. These studies were designed: (1) to furnish information on damages due to excessive sedimentation resulting from accelerated soil erosion, (2) to advance knowledge of the natural laws governing the erosion of soil by water, and the subsequent transportation and deposition of erosional debris, and (3) to discover and evaluate methods of lessening or eliminating damages due to sedimentation.

Accelerated soil erosion, that is, man-induced erosion as contrasted with normal or geological erosion, has resulted in the production of abnormal quantities of erosional debris. The resulting increased accumulations of such debris on valley lands, in stream channels, and in reservoirs, have resulted, in many cases, in serious damage to bottom-land agricultural activities and to water supply, water power, irrigation, drainage, flood control, and navigation developments.

The primary function of the Sedimentation Division is to provide sound basic data, not alone on present and future damage, but on processes and factors involved, and ultimately on methods of amelioration. Incidental to such studies the considerable volume of information collected will undoubtedly throw new light on many problems of wider scientific interest in the field of sedimentation.

The work of the Sedimentation Division is carried out by four sections:

(1) *The Reservoir Section* has as its immediate objective the appraisal of conditions of representative American reservoirs with respect to storage reduction resulting from sedimentation. This objective has entailed not only an analysis of available data on silting of reservoirs as collected by other agencies, but the institution of a nation-wide program of detailed engineering surveys of many reservoirs.

The ultimate objective of these studies are: (1) to establish information on the factors involved in reservoir silting, the rates of silting, the effects of different soils, slope and climatic conditions, and to correlate these results with land use in the drainage area, and (2) to develop new methods of sediment control supplemental to existing erosion-control practices.

The magnitude of the reservoir silting problem, particularly from an economic and engineering standpoint is worth noting here. Inventory files of the Section, as yet incomplete, list more than 10,000 reservoirs in the United States, representing an initial investment of more than $2,000,000,000. Storage capacities and values of these reservoirs are being greatly diminished by rapid silting, due largely to accelerated erosion.

To date, 70 detailed surveys, including not only volumetric determinations of sedimentation, but intensive studies of factors and processes involved, have been completed by the Section. These surveys are scattered over 20 states and represent a wide variety of climatic, physiographic, soils, and land use provinces.

(2) *The Stream and Valley Section* studies sedimentation in stream channels and on valley lands, particularly in its relation to accelerated soil erosion. The major objectives are: (1) to identify and evaluate damages due to excessive sedimentation, and to locate and delimit the principal areas in which such problems exist, (2) to study processes and factors involved, and (3) to investigate practicable methods of control or amelioration of such damages.

It is known that accelerated sedimentation in stream channels in many localities has impaired navigational facilities, diminished the channel capacity for flood waters, thus increasing flood menace, and, by obstructing natural or artificial drainage, has raised ground-water levels sufficiently to create swamp areas, with consequent damage to agricultural resources and hazards to public health. Accelerated sedimentation on valley lands, particularly where the sediment is of relatively infertile character, is known to impair or destroy agricultural productivity.

To date, detailed investigations have been carried out in four representative areas of the country. These studies have not only established factual data on damage due to accelerated sedimentation, but have made important contributions to the scientific knowledge of sedimentation. A new classification of valley bottom deposits and new criteria for the recognition of valley deposits have been developed.

(3) *The Stream Bedload Section* has as its major objectives: (1) the accurate measurement of amount and composition of total stream load, including both suspended load and bed load on especially selected natural streams, (2) the correlation of collected data with hydraulic functions of the streams and the topography conditions of the watersheds, (3) the development of empirical methods for measuring the bedload of any stream, and (4) the investigation and development of engineering methods of control of sediment.

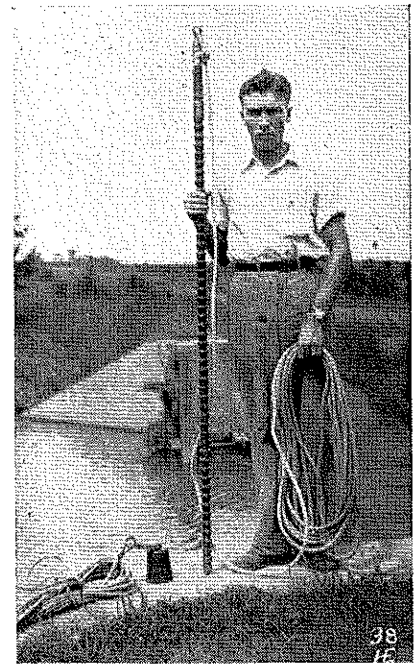
It is a common statement in the literature on transportation of sediment by streams that the volume of material moved along the bed is either roughly estimated or wholly unknown. Nevertheless, accurate knowledge of this factor is essential to the economic construction not only of major hydraulic engineering structures, but of the smaller developments involved in soil conservation work.

The method of measurement of bedload that has been developed by this Section depends primarily upon the principle of aliquot subdivision of bed-flowage from the entire stream cross-section into multiple flume flow. This is provided by a structure placed across the entire width of the stream. This structure is of a gilled weir type with units of equal width. The bedload material is removed hydraulicly from the weir units by pipe connections and power pump, and is discharged into a settling tank, from which it is later removed, weighed and analyzed for particle size.

(4) *The cooperative laboratory at the California Institute of Technology* is concerned with investigations of the fundamental mechanics governing the entrainment, transportation and deposition of erosional debris. In addition, model studies and allied investigations of hydraulic problems involved in specific structures used by the Soil Conservation Service are undertaken here.

A knowledge of the fundamental principles underlying the movement of soil material by water is urgently needed in order to design the most effective measures for the control of erosion. Little has been done on the problem in the past.

● General view of stream bed load. Outdoor laboratory located on Enoree River, near Greenville, S. C.



● Close-up view of 6 foot silt sampling spud and sounding pea.

In this laboratory the major lines of investigation have included a study of suspended load transportation, in which a 60-foot flume having closed circuit flow is used. The flume is adjustable to provide different degrees of slope, and the flow may be varied by means of pump control. The wear of sedimentary particles during transportation is studied in another flume. Density currents, involving underflow of sediment-laden water in a body of clear water, are investigated in a large glass-walled tank. The relation between turbulence and sediment concentration for various sizes of particles has been studied.

In addition to the part played in the research activities of the Soil Conservation Service, sedimentation studies constitute an important phase of the flood-control program now being undertaken by the Department of Agriculture. In the flood-control studies major emphasis is placed on, (1) evaluation of actual or probable physical and economic damage due to sedimentation, (2) evaluation of the relative importance of different source areas within the drainage basins studied, and (3) evaluation of possible measures for sediment control.

The program of sedimentation studies has involved, in some cases, the development of new and special methods and apparatus. In the study of valley sedimentation one of the most essential steps is the recognition

(Continued on page 29)

EARLY DAY GOLD MINING IN BRAZIL

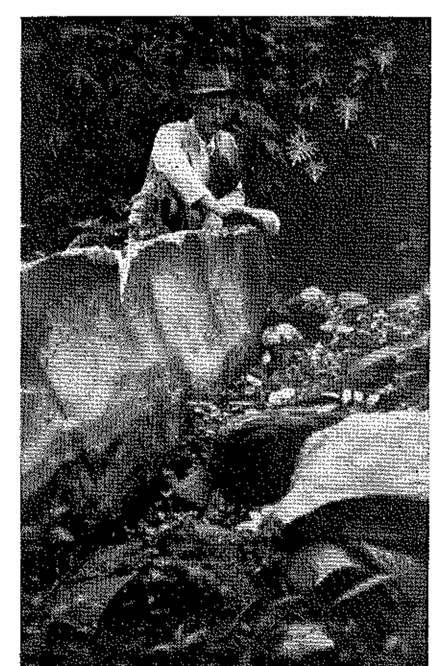
● Parts of Rock Walled Storage Tanks, Auro Preto, Minas Geraes, Brazil.

By ALLAN CAPLAN
Mineralogist and Gem Collector
New York, N. Y.

Far more gold was produced in Brazil during the seventeenth and eighteenth century than the yield of the present day, for thousands of African slaves toiled in the virgin streams for their greedy Portuguese masters. Ouro Preto, the first capitol of the state of Minas Geraes was established by the discovery of gold bearing rock scattered over the hills and in the small streams below. The small town is a ghost-like hangover of the past with its iron-barred stone prison (which was used for escaped slaves), the cobbled streets, the church-studded hills, and the picturesque rock-walled governor's place which is now used as the School of Mines.

The surrounding hills in a semi-arid climate have yielded much gold to the primitive black men. The small stream flowing through the elevated valley may yield to this day placer gold and even platinum when sufficient water is present. Most of the year, however, the stream bed is dry, and consequently, it is not worked.

● Slab of Schist, 4'x12'x5", Pitted by Hand Grinding, Auro Preto, Minas Geraes, Brazil.



The method of gold extraction by the Portuguese pioneers is revealed by exploring and studying the ruins of the vegetated rock-walled structures both in the valley and on the mountain slopes. A series of huge tanks resembling prison walls approximately forty by sixty feet each causes one to wonder about their purpose. Upon detailed investigation along the slopes, a system of thickly walled ditches, dams, and even tunnels comes to light. The ditches, which are five feet wide, can be traced far back on the distant mountains as they ascend towards the summit, appearing like a line on the face of a low rolling mountain. Some ruins of dwellings were discovered beneath bushes and ferns growing luxuriously during the present rainy season. Against the wall of one structure rested a huge slab of schist 4'x12'x5" in which pits were worn, evenly spaced, on both sides of the slab. Without a doubt, it was used by the toiling blacks to grind by hand the piles of rich oxidized ore of their master.

The ferruginous quartz, which averages an ounce of gold to the ton, lies scattered over the hills, and can be easily traced to its source. Veinlets and seams in schist exist over the entire vicinity. Because the material was easy to work by hand, a large production of ore was easily obtained by the combined efforts of the Africans. Long bat infested tunnels and drifts penetrate into the heart of the mountain. Not one of these exposed a strong vein such as is required by modern mining methods. For the slavers, it was an ideal situation, for they scattered the hundreds of slaves in the numerous rich out-crops and drifts.

The manner by which the gold was extracted from the easily crumbled ore was original and adopted to fulfill the demands of seasonal rainfall and natural occurrence of the gold. Without slave labor such a primitive method of operation could not be profitable.

The newly mined material was ground by hand upon slabs of rock similar to the one discovered. The coarsely ground ore was then dumped into one of the numerous rock-walled vats and accumulated. Water from the ditches was permitted to enter and was well mixed with auriferous material. Finally, the vat contents were then flushed by a flood from the ditch to be washed over sluice boxes or other means of gold separation. Each vat was worked in the same fashion; for when one was being filled, another was being mixed with water, and still another was going through the flushing procedure. Lack of water in the long ditches caused washing operations to cease until rains in the vicinity caused the ditches to fill once again. It was necessary, however, to catch the drainage of the mountain slopes for miles around, and to bring this accumulation through the ditches and tunnels to the tanks in the valley below.

Vast mounds of quartz, too hard for grinding, exist below the huge mixing vats. These piles range from one-half to an ounce in gold to a ton. Without a doubt these tremendous piles of "waste" expose the very low percentage of extraction, excluding the loss obtained by inefficient grinding. Yet the recovered gold built fortunes for the Portuguese land-barons, for the loss in extraction caused them no worry as long as quantity was easily mined.

The days of prosperity for slave holders came to an end about the time of our Civil War. Without the cheap and plentiful labor of the slaves, it was an impossibility to operate this property. Granted their liberty the hordes of blacks sought easier means of existence. Many of them continued gold mining independently, far from their original homes. Others turned to agriculture and other occupations to be absorbed throughout the generations with the white settlers and native Indians into a new and distinct race of people.

Today, there is very little gold mining existing in Brazil in comparison to the rich resources scattered throughout an immense interior. There are valleys ideal for dredges, and ore bodies remaining undiscovered. The lack of transportation facilities for the installation of modern equipment is a great hinderance in the development of the country, but the lack of Brazilian capital and the fear of foreign exploitation are the greatest factors which are retarding the prosperous future of Brazil.

• Outlook Bright for 1940

By

CHARLES E. WILSON

President General Electric Co.

We in the General Electric Company confidently expect that in both capital goods and consumer goods, business in the electrical industry will be better in 1940 than in 1939.

Late in 1939 the output of electricity reached new all-time high levels, clearly indicating the continuing need for more capital goods for the generation, transmission and distribution of electricity. These high levels also reflect increased industrial activity and the more urgent related need for capital goods for plant modernization and for low cost production by means of efficient electrically energized equipment.

Larger farm incomes and expanding payrolls in manufacturing and service industries should further stimulate the growing demand for consumer goods as represented by home appliances for better living. A greater appreciation of the relationship of good light to good sight, together with the application of new forms of lighting, broaden the outlook for this field. Through research and invention, new services—and new opportunities for more widespread employment—are constantly being made available.

In reaching these conclusions, due consideration has been given to the uncertainties arising from conditions abroad, as well as to our unsolved domestic problems, but in support of our confidence, we are increasing our expenditures and commitments not only in anticipation of, but as an aid to, better business in 1940.

•Norwegian Government Aids Gold Mining

By F. V. PATERNO

New York City

The Norwegian government has granted a loan of 65,000 kroner to a recently formed company for the purpose of purchasing motor-driven machinery to be used for gold washing in the Karasjok region of Finmark, a fylke (county) in the Arctic bordering on Finland. Experimental operations in the area, going on since 1931, have indicated a profit ratio of two to one in each cubic meter of gravel mined. The cost of operations have amounted to less than one kroner per cubic meter while a gold extraction of three kroner has been obtained.

A Norwegian kroner has the value of 0.40323 grams of fine gold.

Gudbrandsen Thesen of Oslo, who has been exploring the region for a small private organization, formed the company this year. It was to be capitalized at 100,000 kroner of which the government's 65,000 kroner formed the major contribution. It is Mr. Thesen's opinion that sufficient auriferous gravel exists in the area, which is connected by a direct road to the Arctic port of Hammerfest, to allow profitable operations to continue there over a long period of years.

Norway has obtained some gold from both cupriferous and non-cupriferous pyrites though not in large enough quantities to encourage large scale operations.

• Stygian River Ferryman Has Counterpart in Canada

By HALHED W. JOHNSON

Within the shadow of the new million dollar bridge over the broad and swift Kinojevis River sits a modern Charon. According to ancient mythology Charon was the ferryman who transported the souls of the dead across the Stygian River.

The modern Charon is personified by Alfred Vignault, a resourceful French Canadian and one of the first settlers in the area. When gold mining became active the ambitious pioneer seized the opportunity to earn a living by providing a transportation service via the river; thus saving many tortuous trips through the bush for prospectors and mining companies alike. With stout timbers hewn from the nearby forest he constructed a scow and then purchased an old motor-launch into which he fitted an abandoned automobile engine. The scow and launch are fastened together by ropes, and when "under way", make about 10 knots.

Making an average of two trips per day, fares are believed to be based on the "what the traffic will bear" system with nobody yet being known to claim he was overcharged. On a trip to Vallet Lake and return, a distance of some ten miles, the writer was charged the modest sum of two dollars.

The Kinojevis River is used to float millions of logs to the large paper mills downstream. In some of the lakes through which it flows, booms are placed to prevent loose logs from becoming a menace to what Ferryman Vignault calls "navigation". When the intrepid "navigator" comes to a boom his weatherbeaten face assumes a look of determination as he grimly steers, into its centre and "steps on the gas". Although often heavily loaded with freight the sturdy craft always survives. Passengers aboard at the time, however, hastily forego dinner as the "dreadnaught" crazily careens.

Serious and uncommunicative, the ferryman sits with battered steering wheel in hand, concerned only with negotiating the river currents and possibly wondering how much longer the motor will hold out. The motor is cracked from end to end, and, when running at full speed, jets of water flow in fountain-like manner from various places. Every known type of repair except sticking plaster has apparently been applied.

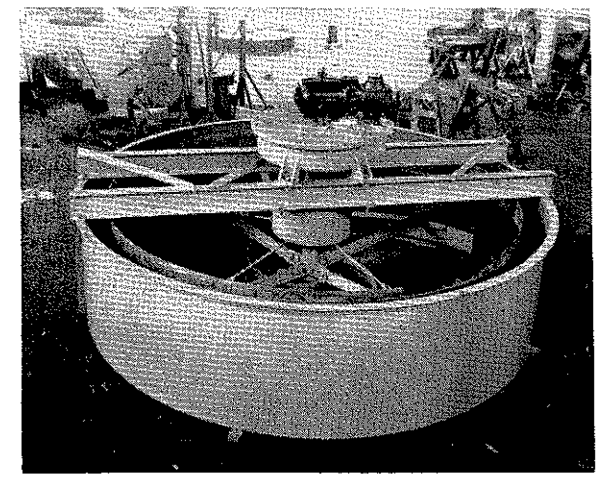
Whether from sheer love for his crude craft or for the sake of convenience was not ascertainable but the pioneer transportation magnate lives in a house built on stilts at the waters edge and within ten feet of what he solemnly calls "the ferry".

While it is doubtful if the modern Charon would acknowledge, as did his mythological prototype, speaking acquaintance with the souls of the dead . . . it is believed, however, that he would comment in no uncertain terms upon those of the living. The soul of a miner being propelled down river in the "Kinojevis liner" returning to the bush after a few wild days "in town" must be a sight to behold.

With the MANUFACTURERS

NEW EQUIPMENT

Improved Method of Classification



Important improvements in classification have been incorporated in the new Hardinge Hydro-Classifier, announced by Hardinge Company, Incorporated, of York, Pennsylvania.

The new design provides two outstanding advantages: improved performance and low operating cost.

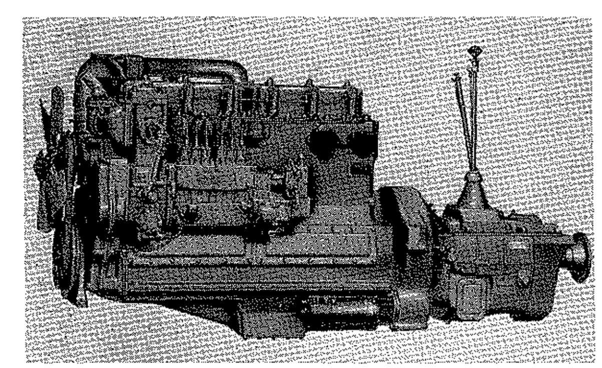
The first is achieved by design. The driving head embodies a geared head motor and the cast iron housing upon which it is mounted. A cut tooth gear rotates on ball bearings in oil within the housing. The use of a spur gear drive adds to the strength of the mechanism, and permits forcing the scraper through the heavy solids, which are liable to pack, in the bottom of the tank.

Sand, or oversize, in the classifier is delivered through a central opening, in the bottom of the tank, which is surrounded by a whirling vortex of water which assures proper desliming of settled solids, and a clean oversize.

A multi-speed motor is used in order that the scraping may be varied in speed to meet existing requirements, and to provide repulping in case it is desired.

This classifier is designed for metallurgical, chemical and industrial purposes and is made of standard steel, or acid-proof construction such as: special metals, rubber covered metal, or wood, where parts are exposed to corrosive action of the liquid in the pulp, as may be needed to assure best performance in individual operations. The entire unit is compact and accomplishes its purpose, most effectively. For example, where fine separations are demanded, the new classifier will deliver them at a new low level of capital cost.

"Caterpillar" 90-Horsepower Truck Engine



Caterpillar Tractor Co., world's largest manufacturer of Diesel engines, track-type tractors and road machinery, has announced its entry into the automotive field, with a 90-horsepower Diesel truck engine.

For replacement installations, "Caterpillar's" Model D468 engine is offered as a complete unit, equipped with a five-speed Spicer No. 5351 transmission, and clutch.

The engine is a six cylinder four-stroke, valve-in-head, water-cooled model with a bore of 4¼" and a 5½" stroke. Maximum horsepower is developed at 1800 RPM. Maximum torque is 305 pounds-feet at 900 RPM. Piston displacement is 468 cubic inches.

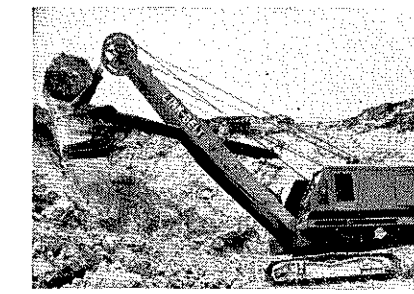
The engine fuel system features solid injection into precombustion chambers. All injection pumps and valves are set at the factory and require no adjustment in the field.

Pistons are of aluminum alloy. The cylinder head, the block and the crankcase unit are in cast alloy iron. Water circulation is by pump, with the operating temperature of the water controlled by thermostat. There is an air-cooled type lubricating oil cooler provided.

There are seven main crankshaft bearings, with a total surface of 118 square inches. Connecting rod bearings are of 2⅝" diameter and are 1⅞" in length. There is a crankshaft torsional vibration damper.

Lubrication is by pressure to all main and connecting rod bearings, piston pin bearings, camshaft bearings, valve operating mechanism and timing gears.

New Link-Belt Speeder Shovel Announced



● New Link-Belt Speeder Shovel

A newly-designed line of Crawler Shovels, 1½ to 2 cu. yd. capacity, Series "300", equipped with Speed-o-Matic hydraulic (oil) power control and Diesel, gasoline, oil or electric motor drive, is announced by Link-Belt Speeder Corporation, Chicago.

Among the salient features enumerated by the manufacturer, are these—

New design throughout, giving greater strength, life, stability and efficiency, without the burden of extravagant weight.

Greater speed and ease of operation, with the improved Speed-o-Matic control, resulting in 25% or more increase in output, over manual control.

Safe, fool-proof control of travel, steering and locking brakes entirely from operator's position in cab; incorporating an automatic locking arrangement against involuntary movement of machine when it is out of travel gear.

Increased ground clearance, 14½" to 18" clear, with travel, steering and locking machinery entirely enclosed; and with no protruding housings and parts to obstruct travel or become damaged or fouled.

Choice of crawler widths and lengths to suit any practical operating or ground condition.

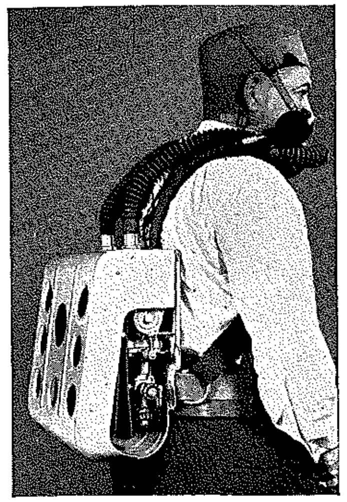
Extreme simplicity throughout, without sacrifice in versatility, including stress-relieved, unit-construction main frames of unusual depth and strength; large, rugged machinery with machine cut gears throughout, anti-friction bearings, and other money-saving features.

Ease of conversion to shovel, dragline, crane or other front-end equipment.

Particular attention is called to the fact that the new line is being announced only after over a year of field tests as a shovel, dragline and crane on tough digging and handling jobs.

Details of construction, working ranges, clearance dimensions, and safe loads at the various radii, are given in a new 12-page illustrated catalog which will be sent to any reader upon request addressed to Link-Belt Speeder Corporation, 301 W. Pershing Road, Chicago.

A New Product



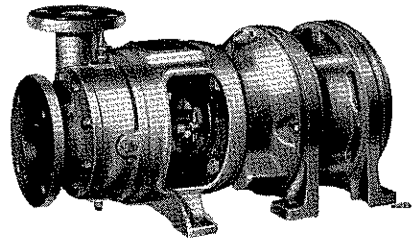
Announcement of the most recent development in M.S.A. Oxygen Breathing Apparatus—a new One-Hour *Back-Type* Model—is included in Mine Safety Appliances Company's Bulletin No. BM-2, copies of which are available on request.

Employing the same principles of operation as the well-known Front-Type One-Hour Oxygen Breathing Apparatus produced by this company, the new Back-Type model supplies protection for an equal period but differs in cover and harness arrangement, being carried on the wearer's back by comfortable wide-web straps and protected by a strongly-reinforced aluminum cover which effectively guards the working parts of the apparatus.

Furnished in either mouthpiece (approved by the U. S. Bureau of Mines) or full facepiece types, this new model of the M.S.A. One-Hour Oxygen Breathing Apparatus will find favor wherever use of the regular front-carry machine is hampered by special conditions requiring work in prone or stooping positions. The new Back-Type Apparatus weighs but 24 lbs. complete.

Write for your copy of M.S.A. Bulletin No. BM-2 to this publication or to Mine Safety Appliances Company, Braddock, Thomas & Meade Sts., Pittsburgh, Pa.

General Service Motorpump



● **The I-R Motorpump, built in sizes for delivery of from 5 to 1000 g.p.m. and heads up to 500 feet.**

A new illustrated broadside showing construction details of the Ingersoll-Rand Motorpump has just been published by the manufacturer.

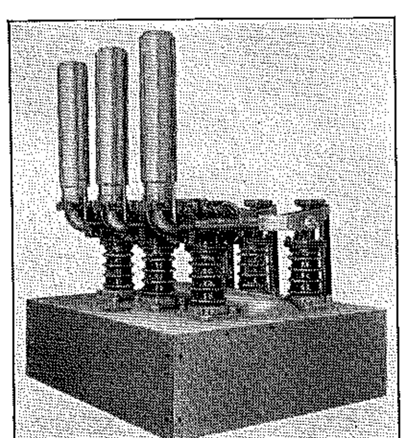
This pump, which is designed for all types of general service, is built in sizes for delivery of from 5 to 1000 gallons per minute and heads up to 500 feet. It embodies a unit construction with the pump impeller mounted directly on the shaft of the electric-motor drive. The entire unit is enclosed in a housing which requires no baseplate or foundation and may be bolted down for operation in any position.

Copies of the folder, Form 1917, are available from the Ingersoll-Rand Company, 11 Broadway, New York City, or any of their branch offices.

New Air Blast Circuit Breaker

A new oilless circuit breaker, which uses the prestored energy of compressed air for the two-fold function of breaker operation and arc interruption, has been announced by Allis-Chalmers Mfg. Company, Milwaukee, Wisconsin.

Designated as type AB-15-500, the new breaker consists essentially of an air storage tank containing compressed air, a main air blast valve, three interrupting chambers mounted upon hollow insulator supports, three exhaust mufflers or coolers integrally mounted with the interrupting chambers, and isolating contacts connected in series with the interrupting chambers, also mounted on insulator supports.



Each interrupting chamber has a hollow stationary contact forming a port or entrance to the muffler. The movable contact in making contact with the stationary contact closes the port and is normally held in this position by heavy springs.

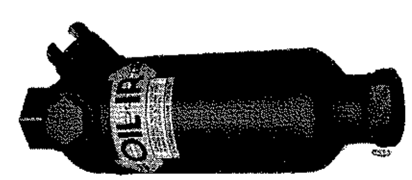
The interrupting process is initiated by admitting compressed air to the interrupting chamber through the air blast valve. The compressed air operating against a piston attached to the movable contact, causes the contacts to separate, thereby providing an outlet through which the compressed air escapes into the cooling chamber. As the contacts separate, an arc is drawn, which is immediately enveloped and centralized by the action of the air blast. Extension and centralization of the arc automatically connects a resistor in parallel with a portion of the arc, thereby eliminating high frequency transients and reducing the rate of rise of recovery voltage.

Due to the dynamic, dielectric and cooling effects of the air, coupled with the beneficial action of the resistor, a guillotine-like arc interruption characteristic is obtained, which is so efficient that arcing times of one half cycle or less are consistently produced.

The type AB-15-500 is rated 600 and 1200 amperes at 15 KV with 23 KV insulation and interrupting capacity rating of 500,000 Kva.

Special features claimed are as follows: Elimination of oil; short arcing time and fast closing with little or no contact burning and resultant low maintenance; extremely rapid dielectric recovery; power factor correction with elimination of high frequency transients and low rate of rise of recovery voltage; low air consumption; safe reliable operation; adaptable for panel, cell, cubicle, or metal-clad mounting.

Oil-Ir—Air-Line Lubricator



● **The Ingersoll-Rand Type F, OIL-IR, air line lubricator.**

Ingersoll-Rand announces a new airline lubricator—the OIL-IR—that will operate in any position. Designed primarily for rock drill lubrication it can be used on many kinds of air operated tools. Body construction consists of heavy steel tubing and forgings. Adjustment of the oil feed can be made without taking the pressure off the chamber and without interrupting the work. The lubricator will not "siphon back" or leak when the air pressure is released. It can be filled in either the vertical or horizontal position.

Detailed information on this new airline lubricator is contained in Form 2600. This folder also contains a discussion of what happens to air operated tools when they do not receive proper lubrication.

Copies are available from Ingersoll-Rand Company, 11 Broadway, New York City or from any of their branch offices.

Plant News

Allis-Chalmers Completes New Pittsburgh Plant

Completion of the most modern power transformer plant in the world has been announced by Mr. William Watson, vice president in charge of manufacturing of the Allis-Chalmers Mfg. Company, Milwaukee, Wis.

The new plant is an addition to the company's transformer factory at Pittsburgh, to be known as the River Plant of the Pittsburgh Works, and is the only transformer plant in the world that is laid out and set up for modern line-production operation throughout. Raw materials start at one end, and at the other end the transformer comes off the line not only completed, but fully tested and boxed, ready for shipment.

Complete equipment has been installed in the new plant for testing the transformers by means of artificial lightning up to a million volts in intensity, and only the latest types of machinery are used throughout the plant, including a large bonderizing unit for the protective treatment of transformer tanks, and a battery of automatic seam welders.

This extensive addition to the Allis-Chalmers Pittsburgh Works was designed by the Building Engineering Department of the company under its architect, Mr. Carl Meyer.

Convention-Colorado Mining Association —

(Continued from page 8)

ing operators throughout the state of Colorado.

The School of Mines Band will start off the Sowbelly Dinner as usual, and a real production similar to those best received in New York is to be staged. Splendid music, good food and an enjoyable time is assured. Novel features such as have never before been shown will be used at this Banquet. Price $1.50 per plate.

A party for the ladies is being arranged on this Saturday night, January 27th. Reservations must be made.

The Silver Banquet will be held on Friday evening, with the price of $2.50 per ticket being charged. This will include the dance, a special floor show, prizes, favors and all those things which make a Mining Convention better than any other Convention. Card tables will be provided for those who do not dance, but all will enjoy the special floor show and exceptional features being arranged.

The Convention should be the outstanding meeting of the Mining Association and of the mining men of this section. Plans will be completed for the ensuing year, and the policies of the Association will be announced to the public. All are invited to attend the sessions of the Convention and the Banquets.

Sedimentation Studies—

(Continued from page 24)

of modern sediment. Where sedimentation has been occurring at an advanced rate, as a result of accelerated erosion in the watershed, the deposits have not had time to develop a soil profile such as normally results from the processes of weathering soil formation. Buried dark soil horizons afford an accurate and practicable basis for identifying the contact between modern and underlying older alluvial deposits.

Distinctive "bleached" colors and hard ferruginous concretions are common in the pre-modern valley sediments, but have not been found in the modern sediments. Where present, they provide a reliable and practicable means of identifying the older or pre-modern sediments, even where no buried dark-soil horizon is present at the top of these older deposits. A pronounced color change, commonly from brownish to grayish, has usually occurred in the modern deposits where they are below the ground-water level, and in such places the contact between the brownish and grayish sediment marks the approximate level of the ground-water table, and not the contact between the modern and pre-modern deposits.

In measuring the volume of modern sediment in a valley bottom, ranges are established at approximate intervals, oriented at or near 90 degrees from the axis of the valley. These ranges are surveyed with a level to obtain the surface profile, and borings are made with a post-hole auger to determine the depth of sediment at several points on the range. Knowing the cross-sectional area of sediment on each range and the surface area of the segments between ranges, the volume of sediment present can be computed.

In the reservoir surveys two general methods are used. If an accurate contour map of the original basin floor is available, it is only necessary to construct a new map of the present configuration of the basin, on top of the sediment deposit, and measure the difference in volume shown by the two maps.

If no original map is available, it is necessary to determine the thickness of sediment by direct measurements. For deposits covered by water, a specially designed instrument called a "spud" is used. This is a steel rod with circular cups spaced one-tenth of a foot apart. The spud is attached to a line and plunged into the lake, where it will usually penetrate the lake deposit and extend a short distance into the pre-lake material. When the spud is withdrawn, it brings up a small sample in each

(Continued on page 45)

Marble Mountain —

(Continued from page 11)

West-central region:			
Iowa:			
Sioux City	Graceland Chapel		
Kansas:			
Wichita	Post Office	Interior	1932
Nebraska:			
Omaha	Forest Lawn Chapel	do	
East-central region:			
Illinois:			
Chicago	Michael Reese Hospital	do	
	New Field Building	do	
	Rosehill Mausoleum	do	
Ohio:			
Cleveland			
	Cuyahoga County Courthouse	do	
	Knollwood Mausoleum	do	
Middle Atlantic region:			
District of Columbia:			
Washington	Lincoln Memorial		1915
Pennsylvania:			
Philadelphia	Byberry Hospital	Interior	
New York:			
New York	Fidelity Bond & Mortgage Co.	do	
	Goelet Building (entrance)	Exterior	
	Municipal Building	Interior	
Virginia:			
Arlington Cemetery	Tomb of Unknown Soldier		
New England:			
New Hampshire:			
Manchester	Elliott Memorial		
Rhode Island:			
Providence	Providence County Courthouse	Interior	

CATALOG and TRADE PUBLICATIONS

(725) MACHINERY & INDUSTRIAL EQUIPMENT. Bulletin 1140 of Stearns-Roger Mfg. Co., Denver, Colo. contains 20 pages of illustrations showing the large variety of machinery and equipment manufactured by Stearns-Roger. You will be interested in the pages of illustrations from the shops showing equipment under construction, pages of castings, Gas & Gasoline Equipment, Mining Equipment, Oil Refinery Equipment, Sugar Factory Equipment and extraordinary difficult welded jobs, all of which impress one with the large field covered by this Denver manufacturer.

(726) COMPRESSORS. single-cylinder, single stage with feather valves are illustrated in Bulletin L-611-B8 of Worthington Pump & Mchy. Corp., Harrison, N. J. Construction and advantages are shown. Capacity tables are given. Denver office, 1725 California St., Denver.

(727) 1,000,000 PIPE LINE WELDS. This record made by H. C. Price Co., Bartlesville, Okla., who started in 1928 and in 1939 averaged five miles of welding per day. A tough job is shown in their reprint of Nov. 17th, 1939.

(728) ROD MILLS. Bulletin R-M 13 illustrates the construction and operation of the Ruth Rod Mill, giving dimension tables and operating data, specifications and flow sheets. The Ruth Company, Continental Oil Building, Denver will be glad to help you with your milling problems.

(729) ACID CENTRIFUGAL PUMPS. Bulletin E-1415 of A. R. Wilfley & Sons, Inc., Denver, Colo., illustrates and describes Model "AB" and Model "AC", motor and belt driven, giving dimension and capacity tables with other engineering data. Complete engineering service at your disposal.

(730) MANUFACTURE OF WRITING PAPER, the story is told with illustrations in Link-Belt News for December, also a story of Coal Dredging from the Susquehanna River, Pa., is found in this issue besides other items of interest in this 8-page newsy publication.

(731) AMALGAMATION, the principles and application for your engineering note book are told in "TREFOIL" January 1940 published by the Denver Equipment Co., Denver. Information and data is given on Denver Amalgamation Units of different sizes.

(732) SUCCESSFUL ROCK DRILLING. Gardner-Denver Company, Quincy, Illinois have published a ten page discussion of striking face failures of tappets and piston hammers and their relation to drill shanks and to general rock drill operation. Many drawings and illustrations are used to cover the points made in the discussion. Every mine operator using rock drills should have a copy of this valuable paper, it will help you decrease drill maintenance and increase drilling speed.

(733) ROLE OF NICKEL IN MACHINE TOOL INDUSTRY is a 14-page reprint showing the uses and advantages of Nickel in the machine tool industry, a paper published by The International Nickel Company, 67 Wall Street, New York.

(734) STEEL TENDONS OF MODERN INDUSTRY, is a 12-page publication showing the manufacture of Union Wire Rope and its many industrial uses. Published by the Union Wire Rope Corporation, Kansas City, Mo.

(735) REPLACEABLE DRILLING BIT BLADES are shown in Bulletin No. 398 of the Reed Roller Bit Co., Houston, Texas. These are shown in the 2-blade, 3-blade and 4-blade models using heat treated alloy steel.

(736) ALL WHEEL DRIVE FORDS. Form No. 391031 published by Marmon-Herrington Co., Indianapolis Ind., shows 16 pages of all models of All-Wheel-Drive Ford trucks and pleasure cars giving specifications for the different models. Many applications and uses are shown.

(737) ELECTRICAL EQUIPMENT FOR REFINERIES, is described and illustrated in a 48-page book GEA-1441 by General Electric Company, Schenectady, N. Y. This publication describes a wide variety of G-E Products —electric, steam, and mechanical—used extensively in Oil Refineries.

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 the index number.

(738) COMPRESSORS. Bulletin 726, Chicago Pneumatic Tool Co., 6 East 44th St., New York, shows the construction and operation of Class O-CE and O-DE horizontal-Duplex Motor-Driven Compressors of capacities from 350 to 10,000 c.f.p.m. Stearns-Roger Mfg. Co., Denver are Sales Representatives.

(739) VIBRATING PACKER. Bulletin No. 30 of Ajax Flexible Coupling Co., Westfield, N. Y. shows a machine especially designed for effective settling and compacting of materials in various containers. Urquhart Service, Wynkoop St., Denver are Sales Representatives.

(740) MERCURY ARC RECTIFIERS. Bulletin No. B-6064 of Allis-Chalmers Co., Milwaukee, Wisc., completely illustrates and describes the rectifiers, their uses and how they are built. Here are 40 pages of information useful and interesting to every electrical power user.

(741) AIR COOLED COMPRESSORS. Bulletin H-620-B16C of Worthington Pump & Machinery Corp., Harrison, N. J. shows this balanced angle 2-stage, stationary and Semi-portable air compressor with capacities of 83 to 445 c.f.m. for Electric Motor, Gasoline Engine, Diesel Engine, Gas Engine and Line Shaft drive. Denver office 1725 California St., Denver, Colo.

(742) GRAPHIC METHOD FOR SAG-TENSION Calculations in Transmission Lines of Aluminum Cable Steel Reinforced published by Aluminum Company of America contains 20 pages of formula and tables and ten curve charts for use in graphical solution of problems.

(743) DRILL STEEL CUTTER & SHANK GRINDER. Form 2611 Ingersoll-Rand, 11 Broadway, N. Y. shows illustrations of the Cutter & Shank Grinder and gives specifications.

(744) INDUSTRIAL & CONTRACTORS SUPPLIES. Section D General Cat. 150 gives 350 pages of tools and supplies that are continually in use by every mine and mill. This book will save you much time and money. By Hendrie & Bolthoff, Denver, Colo.

(745) RENEWABLE ELECTRIC FUSES. A circular by Pierce Renewable Fuses, Inc., shows the Air Condition Construction of the Pierce fuse and the ease with which new replacements may be made. Urquhart Service, 1501 Wynkoop St., Denver are Sales Representatives.

(746) GEAR LUBRICATION. "Crater Compound", a 30-page book by The Texas Company, 135 East 42nd Street, New York, showing the application of Crater Compound to gears and chain. 10 pages are given to recommendations of different grades of compound for various equipment.

(747) POWER FACTOR, ITS IMPROVEMENT. GEA-3225 book by General Electric Co., Schenectady, N. Y. contains 14 pages explaining the Power Factor and how it can be improved with G-E Pyranol Capacitors. Tables and curves are given with methods and examples of calculation. Every electric power user should have this book.

(748) CLASSIFICATION. Bulletin C5-B3 illustrates and describes simplex and duplex rake classifiers and the Hydro-classifier built by Denver Equipment Co., Denver.

(749) TAYLOR-ROCHESTER for 2nd quarter 1939 contains 26 pages of interesting topics seldom found in magazines, Nature's Hobby, Climate, Rains, Hail and Weather Records and the work of some important Weather Stations. The Foucault Pendulum. Published by Taylor Instrument Companies, Rochester, N. Y.

(750) ROTARY MACHINES. Bulletin 255 of the National Supply Co., Toledo, Ohio shows Rotary Machine FE-12-36 with capacity of 3500′ using 3½″ Drill Pipe. Specifications and general dimensions are given.

(751) CHROMIUM-MOLYBDENUM meets severe requirements. "MOLY matrix" for November 1939 by Climax Molybdenum Co., 500 5th Ave., New York, shows the advantages of using "Flame Hardened Cast Chromium-Molybdenum Steel" where wear resistance and toughness are required.

(752) MICRO-PROJECTOR, Polarizing Micro Accessories, Metallographic Research and other items of interest to the microscope user are given in "FOCUS" for Fall 1939 by Bausch & Lomb Optical Co., Rochester, N. Y.

(753) POWER PLANT IMPROVEMENTS at the Gardner-Richardson Co., Lockland, Ohio are described in a reprint from "Combustion" by Republic Flow Meters Co., Chicago, Ill. This will be of interest to large steam power plant operators. Mine & Smelter Supply Co., Denver are Sales Representatives.

(754) AIR-DRILL OILER. Form 2600 of Ingersoll-Rand, 11 Broadway, N. Y. illustrates and describes a new Air-Line Lubricator that will be of interest to users of rock drills.

(755) ELECTRIC SHOVEL & DRAGLINE. Bulletin D-1007 by Bucyrus-Erie Co., S. Milwaukee, Wis., contains 32 pages of information, illustrations and specifications showing the construction and operation of the improved 100-B, 4 yd. Electric Shovel and Dragline.

(756) TOUGH MINING JOBS. Nickel Steel Topics for December, by International Nickel Co., 67 Wall Street, N. Y. contains 12 pages of interesting applications of Nickel Steel, many of which will be of value to men of the Mineral Industries.

(757) HUNDREDS OF ITEMS, for Christmas are shown in H. & B. Bulletin Nov.-Dec. which contains 64 pages of useful articles not only for Christmas but for every day in the year. You will be interested in this magazine by Hendrie & Bolthoff, Denver, Colo.

(758) "AUTOMOBILE FACTS" for December by Automobile Mfg. Assoc., 366 Madison Ave., N. Y. contains much of interest to every car driver. An interesting factory flow sheet shows how a car is assembled in a few minutes ready for the road.

(759) BALL MILLS. Bulletin No. B2-B2, Denver Equipment Co., Denver, illustrates their quickly converted mill. Drawings and dimension tables, capacities, horsepower, ball loads and shipping weights are given.

(760) SPLICING WIRE ROPE, is the title of a 26 page book published by the Union Wire Rope Corporation, Kansas City, Mo., and shows you what tools to use and how to use them in making splices important to every user of wire rope.

(761) ELECTRICAL EQUIPMENT. General Electric Co., Schenectady, N. Y. have issued the following Bulletins; GES-2306, GE welding engineers offer helpful information; GEA-3339, 8 pages on the Automatic Time Switch; GEA-3250, New Smaller Magnetic Starter; GEA-1993F, 10 pages showing the construction and application of the enclosed indicating and drop-out fuse cutouts; GEA-3259, Magnetic Contactors for battery-vehicle control; GEA-3248 New D-C Magnetic Starter showing construction and application.

(762) ENGINEERING RESEARCH, its development at Lane-Wells. "Tomorrow's Tools-Today" Christmas Number tells some of the important work done by Lane-Wells for the Oil Industry.

(763) NICKEL ALLOYS. "INCO" a 40 page magazine published by International Nickel Co., 67 Wall Street, New York quarterly, devoted to the uses of Nickel and Nickel Alloys, contains many fine articles that will be of interest and value to you. Ask for Fall Edition 1939.

(Continued on page 37)

CAMPUS TOPICS

A. I. Levorsen

prominent petroleum geologist of Tulsa, Oklahoma, spoke to the student body last month and in an interesting and comprehensive manner reviewed the rise in importance of geologic study to the discovery of oil. He also discussed in detail the future importance of stratigraphic traps as a source of petroleum.

Going back into the early history of the petroleum industry, Mr. Levorsen traced the relative importance of oil exploration methods from 1900 to the present time. "In the beginning," he said, "all geologic study was necessarily confined to the inspection of surface features. This method had its greatest importance in the early nineteen twenties. It was followed by the methods of working out of sub-surface geology which forced its way to a position of greatest importance in 1925-6. In those two years geophysical methods first began to come into use and they reached a position of greatest ranking importance in exploration methods about 1930, an importance which geophysics has held to the present time. Study of microscope samples began to be used for oil work a few years after geophysics began to be used, and the use of samples has steadily risen. Now geophysics and microscope samples are by far the most successful and common methods, and they represent about two-thirds of the total exploration work."

Despite the great present importance of these two methods, Mr. Levorsen pointed out, they are not finding oil fast enough. "It seems to me we are approaching a time of new discovery methods", he stated. He suggested that the new field of soil analysis might prove to be one of the new discovery methods.

The consulting geologist spoke of the increasing emphasis on geology in the schools. He stated that there has been a forty percent increase in geology majors from '38-'39; he also noted that an average of one man per day applies for membership in the American Association of Petroleum Geologists, a fact which indicates that the need for geology is growing.

Continuing his talk on geologic methods of oil exploration, the geologist said that geophysic methods lose many discoveries located by subsurface methods. He explained this by saying that geophysics methods are based on locating a certain definite structure and the traps, that typical oil structures such as domes and anticlines are often condemned.

Cheaper drilling has also changed the picture of oil discovery work, Mr. Levorsen said, because with cheaper drilling and more holes drilled, the geologist has available a great deal more valuable information.

The revival of shallow drilling which has resulted from lower cost, has helped the increase of known reserves.

Mr. Levorsen discussed a type of petroleum trap which he named as wedge belts, a type of stratigraphic trap. The noted authority on this phase of geology explained these oil traps as being wedges of porosity or buried edges of porosity. He showed a several of slides showing the approximate location of these traps throughout North American fields.

He talked of a type of geology which he referred to as "layer cake" geology, a term used to describe the several layers of geologic systems. These different layers in the "layer cake" are due to unconformities in which all surface evidence of their presence is hidden. Sometimes as many as three or four unconformities will exist in one area, and there is undoubtedly much undiscovered oil in these unindicated layers. He said that the working out of geology in these areas was extremely difficult and the lower layers of these features are making geology a more complete study every year.

Mines Chemistry Department

was honored recently by the election of two of its members to offices in the American Chemical Society. Dr. William Howe was elected as chairman of Colorado Section and Dr. R. T. Phelps to the position of secretary. Dr. Howe served the society last year as vice-chairman and Dr. Phelps has held the position of secretary for the past three years.

The meeting was sponsored by both the American Chemical Society and the A. I. M. E. in honor of Dr. Gustav Egloff, Director of Research for Universal Oil Products of Chicago.

Dr. Egloff, one of the foremost authorities on hydrocarbons, particularly the cracking and refining of oil, spoke on "Motor Fuels of Today and Tomorrow." Dr. Egloff said there was a trend to few component motor fuels as the type of iso-octane. He emphasized the importance of high octane motor fuels as it effects the rate of climb and load carrying capacity of planes.

Professor John C. Reed

of the Mechanical Engineering department has announced a gift from the Gates Rubber Company of Denver, a Wicks continuous type blue print machine.

Professor Reed stated that they are very proud to have the machine, that it is being reconditioned and will be ready for class-room instruction the second semester.

The M. E. department has also received from Flexible Steel Lacing Company of Chicago, a number of mounted samples of aligator lacings and Felico H. D. Bolt fasteners and a supply of booklets, entitled "Short Cuts of Power Transmission" for distribution to students in the department.

"Technology and Technology Alone

is responsible for the great advances of recent years," was told to the student body recently by Dr. L. E. Young, consulting engineer for the Pittsburgh Coal Company and former head of the Mining department at *Mines.*

"Engineers today face three big jobs", he said. "First they must continue to improve the American standard of living by increasing production through better tools and better plants. Second, they must lift the national debt of forty-five billion dollars and re-establish the national credit. Third, they must keep the jump on the other countries in technical advance". He mentioned a recent study which showed that the American worker can secure as much of the necessities of life by working one hour as the English-man can by working two-and-a-half hours, the German four-and-a-half hours, the Italian seven, and the Russian seven-teen-and-a-half hours.

Dr. Young mentioned some of the qualifications that he would look for in hiring an engineer. They should know their jobs technically and be willing to give one-hundred percent loyalty and honesty to the organization. An engineer should be open minded or in the vernacular he should be able to "take it". He must fight mediocrity in himself and maintain an abiding faith in the profession.

Three hobbies were recommended for success: a zeal to do something in some particular line, a wholesome recreation, and a love for something beautiful and worthwhile of a cultural nature. This last point was illustrated with a humorous story of a peon boy who planted a garden in the desert and as the engineer must often do, carried a bit of beauty to a barren waste.

C. H. C. Braden,

Director of Publications at the School, has been granted a nine-months leave of absence in order that he may work for an advanced degree at Colorado University. He expects to return to Mines at the beginning of the regular session next Fall.

Professor Harry M. Crain of the English department has been appointed to take charge of Mines' publications during Mr. Braden's absence. He is especially qualified for this work having formerly been supervisor of publications at Texas Tech and head of publications at the New Mexico School of Mines besides having had a number of years of practical newspaper experience.

Sixteen Educational Broadcasts

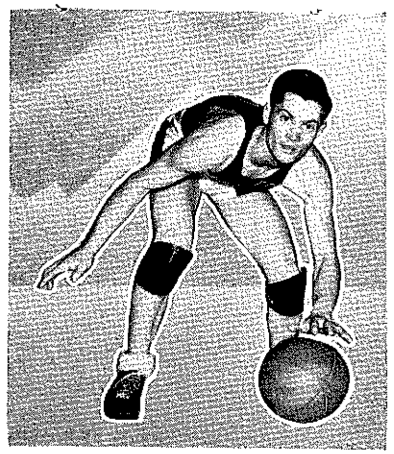
are being arranged by the Colorado School of Mines. The broadcasts, a part of a special program sponsored by the Rockefeller Foundation, will be 15 minutes in length. Dates have not yet been decided upon but they will be announced in the February issue of *Mines Magazine.*

Mines' part of the program will be prepared and organized by a faculty committee comprised of Dr. Adams, chairman; and Professors Barb, Baxter and Mason, petroleum section; Read and Dickinson, mining section; Waldschmidt and Heiland, geology; Wichman and Howe, metallurgy. Professor Crain will be secretary of the committee. Each option will be given an equal part of the Mines series. The committee has met twice to organize and discuss plans.

ATHLETICS AT MINES
Winter Sports Begin

By JOHN A. BAILEY, '40

As King Winter takes the stage and a great Mines football season is relegated to the past, the school starts a five sport winter athletic program. Basketball is already well underway with six starts already having been made by the team. Lack of proper ice and snow have given the hockey and ski teams a late start, but with recent weeks of cold weather both teams have been getting into shape for scheduled meets. Mines wrestlers are out to defend the title they won last year under coach Mason. The swimming team started serious practice after the Christmas holidays to prepare for what appears to be a successful season.



"SHORTY" HEGGLUND

Basketball

The basketball team is starting out with a new coach and a green bunch of players. Coach Neighbors has taken over the job of schooling the team following the resignation of Coach Romney last spring. He is giving the squad the valuable experience that they need by scheduling a number of practice games. During the Christmas holidays the team played the strong Wyoming team in a series of four exhibition games. The team dropped the first three games to Wyoming's Cowboys but came back in the final game to win by a satisfying margin of 38-27 on Wyoming's half-acre floor.

"Shorty" Hegglund, fast forward on the blaster squad, starred in the winning game. Hegglund was high score man in the game with sixteen points, and Rogers, a guard was second with eleven points.

With twelve regular games on its schedule, the team will have a loaded season which will take them well up into February. Neighbors hopes to win a good share of those games by building a team around his veteran material of three players. "Shorty" Hegglund, Lanny Lancaster, and Clay Creager are the mainstays for the veterans. Men now out for the team are Comstock, Talbott, Bousman, Davis, Hegglund, Lancaster, Thompson, Price, Retallack, Culp, Pierson, Hancock, Bernstien, Gilbert, Rogers, DeGoes, Creager, Richleski and Campbell.

It is expected that the team will improve rapidly as the basketball season grows, and they gain the improvement that comes with practice and experience. Football kept several of the team's most valuable players from the early practices.

The cage season includes games with Wyoming, C. U., Western State, Greeley, and Colorado College.

The complete schedule is as follows:

Colorado University, there, (two games) December 15-16.
Colorado College, there, (one game) January 5.
Colorado College, here, (one game) January 6.
Greeley State, there, (one game) January 12.
Greeley State, here, (one game) January 13.
Western State, there, (two games) January 19-20.
Greeley State, here, (one game) February 9.
Greeley State, there, (one game) February 10.
Colorado College, here, (one game) February 16.
Colorado College, there, (one game) February 17.
Western State here, (two games) February 23-24.

Frosh basketball is off to a smooth start with twenty men out for early practice sessions. Few of the men out have had previous experience and most of them will have to learn many of the game's fundamentals. Outstanding among the candidates for the team is John Keating who was an all-state high school selection in Nebraska last year.

Hockey

Mines still doesn't know whether to cheer or moan for its 1940 hockey team. Warm weather hasn't given them the ice they need to demonstrate what they can do, but if the number of men who have turned out for the sport is any criteria for judging, the team should have a good season.

Loss of several of last year's stars will hold back the team some, but with a few weeks of practice the team should be able to tackle an ambitious schedule. The team expects to play games with Colorado University, Western State, Colorado College, and they may also play games with traveling University of Michigan and University of Illinois.

Starting positions on the team are still tentative, but a rough prediction of the men and positions will find Jim Judge, Louis Falconer, and Art Wood on the forward lines. These men are all veterans, and Falconer, Canadian student, appears particularly strong. The defense posts will probably see Bob Lindsay and Ted Goudvis outstanding.

Joe Fusselman, last year's sensation, seems to be outstanding in the nets. Al Hoel, John Craig, and Maurice Lindsay are other veterans that are back again this year. Quite a number of frosh will be out this year to give the veterans a fight for first team berths.

Some of the new men that will be out are Harry Hallman, frosh football man from Pennsylvania, who has had previous experience at the game; Bill Shelton, Canadian player; and Bill Warren, who may make a strong bid for goalie against Fusselman.

Coach Bill Huleatt and Henry Newhall, team manager, have high hopes for a strong team which they expect will end the season with at least the success of last year's team which won about half of its games.

Wrestling

Having decisively beaten Colorado College and Greeley last season, the Mines wrestling team is hot after the second consecutive championship.

Although John Mason lost some of his most brilliant wrestlers, there are still several veterans coming back this season to assume the mat duties. In the 145 pound class the veterans returning are Nobby Tashiro, a thorn in any opponent's side; Bill Meyers, another iron man of the mat, and Addison Manning, one of Mason's chief veterans. Great things are expected this year of Everett Schmuck, Colorado State defending champion of the 145 pound class.

Next we have Joe Perlman, husky 165 pounder, upon whom coach Mason is depending to carry Mines hopes in this class.

In the heavyweight division Dave Gieskieng and Frantz Lupton are the two outstanding men returning. Dave who tips the scales at over 200 pounds is a regular bonecrusher, and Lupton, 180 pounds, knows as many tricks as any of them, and is a hard man to keep up with when he puts the pressure on his opponent.

One of the most likely candidates for the team, if he decides to come out, is Beda Arida, grand old man from Cleveland. He is undoubtedly a tough man to pin and he likes to mix things up with any man and better yet if his opponent is the bigger man.

Although the season is not fully planned as yet, the Orediggers will probably have three or four meets to make the season complete.

Skiing

Due to the unusually mild fall weather that has been prevailing in the region, skiing has not had the early start that it has had in recent years. Berthoud Pass, the most popular course for the ski team has not been covered with sufficient snow until the last few weeks to make skiing possible.

Dr. Phelps, coach of the ski team, has a number of last year's crew back again this year. Fred Nagel, a senior, and one of the finest skiers in the region, is back to do his specialties, the slalom and down hill race. Herb Treichler, Don Dowlin and Walt Heinrichs are also returning to help form the backbone of the team. Approximately thirty other men have turned out for the sport.

Although the schedule of the ski meets is still tentative the Miners will probably have several meets during the course of the winter with other schools, and with the wealth of ski enthusiasts now turning out, the season ought to be particularly successful.

Swimming

With one defeat at the hand of Boulder for the lone meet of the '38 and '39 season, the Miner swimming squad is beginning to whip itself into shape for the coming season which isn't very far away. The prospects look fairly bright this season. Coach Stevens has been able to schedule meets with four or five schools so that the season will be more well rounded than in the past.

Since several men are returning to the team this year, the coach is depending upon these veterans to form the backbone of the squad. The team this year will be captained by a truly great breast stroker, Marciano Natividad. Marsino is swimming his last year. Ed Bryan, ace swimmer from Hawaii, will probably head the field in the 50 and 100 yard free style events. Mac Duhme, another veteran, will be right behind Ed in this event. Frank Harris, football player, will be the top man in his event, the 220 yard free style. A man who will really figure in Mines scoring this year is Charley Vincent, rugged 50 yard sprint man. Charley is one of the best swimmers on the team and holds the conference record for the 50 yard event. In the 440 yard grind we have two veterans back this year, Everett Paris and John Botelho.

Dave Roberts, veteran 100 yard free style fan and team manager will be back swimming for his third year. Coach Stevens may place Dave in the backstroke event this year to give the team more uniform strength.

They will undoubtedly have meets with Colorado University, Denver University, Greeley State and Colorado College, their four traditional rivals.

Personal Notes—

(*Continued from page 7*)

Wayne G. Ritter, '36, in the Metallurgical Department of the Youngstown Sheet & Tube Company, resides at 229 East Ravenwood Avenue, Youngstown, Ohio.

Kenneth Rose, '39, Engineer Apprentice for Caterpillar Tractor Company, makes his home at 925 West Gift Street, Peoria, Ills.

Leo A. Scherrer, '24, Manufacturers Agent at Seattle, Washington, receives mail at his home, 2018 Condon Way.

Norman Sears, '24, in the Sales Department of Worthington Pump & Machinery Corp., has been transferred to Salt Lake City, where his address is 35 South 7th East Street.

P. W. Simmons, '29, has accepted a position with the U. S. Smelting, Refining and Mining Company in their Salt Lake City office.

Sidney S. Small, '27, changed his mailing address recently to a new home he has purchased at 9826 So. Harvard Boulevard, Los Angeles. He will enter his two children in the near-by George Washington high school in February. He writes that he is still busy showing his friends the merits of Worthington Pump & Machinery Company products.

(*Continued on page 37*)

Interesting France—

(Continued from page 14)

it, and the visitors enter the room from which they started and the tour of the famous building is ended.

As lunchtime approaches one is reminded of the necessity of eating and wonders where to do it. A number of cafes were passed on the way up the street, almost any one of which will serve a good meal, but naturally one thinks of the eating place, praised by travellers for decades and almost as famous in guidebooks as the Mont itself, Mme. Poulard's and its famous omelets. But one finds that now there are several poulards and the whole town seems to have developed an omelet complex. However, the original and best situated place is by the gate. One may look into the great kitchen and see chickens turning on spits and omelets being made over an open fire in skillets with handles three or four feet long. One may dine in the hotel dining room or the open air cafe on the opposite side of the narrow street. We chose the latter so as to be able to watch the passing crowd. It was interesting—people of all nationalities and classes, old and young, thin and fat, in all sorts of costumes. And their dogs, they were interesting also. The greatest variety of breeds I have ever seen: dalmatians, wolf hounds, police dogs, dachshunds, lag dogs aplenty, and hybrids in great number and startling combination.

An hour and a half passed quickly with an excellent meal, a bottle of fine wine, and the passing sights. Greatly refreshed, we set out on a tour of the city walls and the little side streets until we thoroughly agreed with an Englishwoman in the crowd who said to her companion "I never knew there was a place with so many steps".

As the afternoon passed the time for the turn of the tides drew near. Numerous notices posted around the causeway, the parking area, the gates, and in the hotels and cafes advise the visitor of the exact moment and warn him to be sure to be off the sands before that time. As the time approaches the tourists collect along the causeway, at the end of the Abbey garden, or on the great terrace in front of the chapel to see the tide come in. And it is a sight worth waiting to see because as the tide comes up the long narrow bay it piles up and comes to the Mont with a rush instead of raising gradually as along most seacoasts. It is nearly eight miles to the sea. In that direction as far as the eye can see there is only sand, gray or tan according to the light, empty, silent. Presently a distant murmur pervades the air. It does not seem to come from any direction but to be everywhere. Then in the distance appears a white line which draws nearer and nearer as the sound grows louder and louder. It approaches with astonishing speed until it reaches the Mont, a discolored, swirling mass of sand and water. Other waves follow behind and except for the narrow causeway the rock is again an island far from land. In the fall and winter when north winds blow strongly the tides pile up higher and are said to come in more swiftly than a galloping horse.

It is an interesting experience to go out on the sands when the tide is out and to walk around the Mont and see it from all angles. The idea at least is good and some beautiful views may be obtained; but there are drawbacks—the accounts one hears and reads about the quicksands make one a little nervous, one thinks of the rushing tides and unconsciously hurries a bit. Also, all the sewage, garbage, and waste from the town is dumped over the wall for the tide to remove but much of it is just swirled around with the sand and redeposited without improving the appearance and odor of the sandflats.

Gradually the day waned until the time came for us to depart but as our bus drove away we looked back as long as we could at the striking picture of the Mont against the sunset sky. We were grateful that in these times of devastating confusion and uncertainty we had an example of such steadfast patience and strength as St. Michael triumphantly guarding his Mount in Peril of the Sea.

Slushing and Scraping-

(Continued from page 20)

mines in that the exhaust air furnishes some measure of relief from uncomfortable working conditions. In remote sections of a mine where only one or two scrapers are to be used for only a short time, where air is already available, and where a long power line would have to be run solely for the purpose of scraper operation, the air-hoist has an advantage because of lower installation expense.

In operation the air hoist when overloaded will stall without damage to the air motor, but it will not give the momentary excess power that may be needed to dig a boulder out of a pile or to overcome other obstructions. Electric hoists may be damaged by too frequent and prolonged overloading, although this trouble will not be serious if the motors are properly protected against overloading.

In metal mines electric hoists are now generally preferred to air hoists; and many of the old air driven units have been replaced by electric ones. The preference for electric hoists is due in part to lower operating costs and in part to lower maintenance costs. As it requires, theoretically, about 4 h.p. at the compressor to deliver 1 h.p. of useful work at the air operated hoist, without allowances for leakage in the air lines, it is evident that the power required by electric hoists should be only about one-fourth that required by air hoists.

Future Scraping Practice

Although the trend in scraping practice has been toward larger scrapers and more powerful hoists, it is not likely that this tendency will increase except in rare instances. The Flin-Flon property of the Hudson Bay Mining & Smelting Co. in Manitoba and the Climax mine of the Climax Molybdenum Co. at Climax, Colorado use 150 h.p. hoists,

(Continued on page 44)

LOCAL SECTIONS

Scheduled Meetings

Birmingham Steel Empire

Tenney C. DeSollar, '04, President; W. C. Chase, Ex-'05, Vice-President; Hubert E. Risser, '37, Secretary, Flat Creek, Alabama.

Bay Cities, California

Four meetings per year, 2nd Monday, March, June, September and December. Frank Hayward, '32, President. William J. Rupnik, '29, Secretary-Treasurer, 714 Hillgirt Circle, Oakland, Calif.

Southern California

Four meetings during the year, 2nd Monday of month, January, April, July and October. E. J. Brook, '23, President; William Dugan, Ex-'12, Secretary, 315 West 9th St., Los Angeles, Calif.

Cleveland

Four meetings during year, 4th Friday, March, June, September and December. K. D. True, '35, President; R. J. Maloit, '37, Secretary-Treasurer, 9701 Lamont Ave., Cleveland, Ohio.

Colorado

Luncheon meeting, third Friday each month. Warren Prosser, Ex-'07, President; Frank J. Nagel, '03, Vice-President; Dent L. Lay, '35, Secretary, 1105 Zuni St., Denver, Colo.

Great Lakes

Meetings announced later. A. L. Lynne, '06, President; M. E. Frank, '06, Secretary, 4537 Drexel Blvd., Chicago.

Houston

Dinner meeting, second Friday of month. 6:00 P. M., Lamar Hotel, Houston, Texas. Clark W. Moore, '32, President; R. J. Schilthuis, '30, Secretary, 1410 Gustav, Houston, Texas.

Kansas

Meetings announced later. Thomas H. Allan, '18, President; John T. Paddleford, '33, Secretary-Treasurer, 429 First National Bank Building, Wichita, Kansas.

Montana

Meetings announced later. E. S. McGlone, President. H. M. Strock, '22, Secretary, 1309 Platinum St., Butte, Mont.

New York

Meetings announced later. C. L. French, '13, President; Ben W. Geddes, '37, Secretary, 1112 University Terrace, Linden, N. J.

Oklahoma

Meetings announced later. George Dunn, '20, President; R. N. Hastings, '30, Secretary, 1443 East 35th Place, Tulsa, Okla.

Pennsylvania-Ohio

Meetings announced later. S. L. Goodale, '04, President, 1156 Murrayhill Ave., Pittsburgh, Pa.

Utah

Meetings announced later. Otto Herres, '11, President. Kuno Doerr, Jr., '27, Secretary, 700 McCormick Bldg., Salt Lake City, Utah.

Baguio, P. I.

Dinner meeting, first Wednesday each month, Pines Hotel, Baguio. W. T. Graham, Ex-'26, President; C. W. Berry, '36, Secretary, Box 249, Baguio, P. I.

Manila, P. I.

Dinner meeting, first Friday each month. A. F. Duggleby, '15, President; Ralph Keeler, '31, Secretary, Box 297, Manila.

Birmingham Steel Empire

The Birmingham Steel Empire chapter held its first annual Christmas party at the Tutwiler Hotel in Birmingham on December 16, 1939. Twenty-two were present. All members present had their wives with the exception of Bob Blair who had as his guest Miss Townsend who became Mrs. Blair on December 29, 1939.

Mr. J. L. Robertson who was one time in Golden gave an illustrated talk on Japan which was thoroughly enjoyed by all.

Those present were:

Messrs. and Mesdames W. H. Coghill, '03; Tenney C. DeSollar, '04; W. C. Chase, Ex-'05; W. C. McKenzie, '23; Walter Hulsey, '26; J. W. Scott, '31; Neil O. Johnson, '33; E. D. Bristow, '37; H. E. Risser, '37; Bob Blair, '39 and Miss Townsend; Mr. and Mrs. A. J. Blair, the parents of Bob; and Mr. and Mrs. J. L. Robertson.

The ladies voted to have this an annual affair.

Plans were made to boost the 1940 Senior trip of the School to include Birmingham.

On the night of Homecoming at *Mines,* October 28, 1939, the chapter met and received the welcome telegram reporting the score of the Mines-C. C. game.

Election of officers was held when those in office were re-elected to serve for the year 1940.

Colorado

The regular monthly meeting of Colorado Section was held December 15, 1939 at the Oxford Hotel, Denver.

A fine representative group was present to obtain first-hand information on the Polish situation which Mr. M. P. Mehan gave so ably. Mr. Mehan went thoroughly into conditions in Poland, dealing particularly with the Lead-Zinc industry with which he was so closely connected while he was in Poland. High points were also touched on the political situation which ultimately brought the invasion of Poland. Particulars are not included here because of Mr. Mehan's article which will appear in *Mines Magazine.*

Colorado Section was pleased to have Coach Mason and Athletic Manager Dave Johnston present at this meeting. President Warren Prosser called upon Coach Mason to give the section information on the pending "Prune Bowl" game. Coach Mason stated that the team was very anxious to make the trip and were working out regularly, however financial problems were not settled so the game was not definite. All members present wished Coach Mason success should the game materialize.

President Prosser closed the meeting after appointing a nominating committee to recommend candidates for officers of the section for the ensuing year, election to be held at the next meeting. Those on the nominating committee are Frank Nagel, Frank Bowman and Charles Parker.

The following members were present:

A. L. Mueller, '35; R. J. McGlone, '27; Dent L. Lay, '35; C. O. Parker, '23; Dave Johnston; Coach John H. Mason; Russell H. Volk, '26; C. H. Reed, Ex-'13; Frank J. Nagel, '03; M. P. Mehan, '24; C. E. McGraw, Ex-'30; Frank C. Bowman, '01; Warren Prosser, Ex-'07; Bruce LaFollette, '22; Hugh M. Connors, '22; Scott H. Sherman, '04; W. H. Paul, '96; W. B. Patrick, '09; C. I. Dismant, '31; R. L. Stark, '31; R. S. Spalding, '33; George A. Kennedy, '95.

Houston

The regular monthly meeting of the Houston chapter was held Friday, December 8, 1939, at 6:30 P. M. in the cafeteria of the Lamar Hotel, Houston, Texas.

Those attending were:

D. M. Davis, '25; J. F. Dieckman, '39; V. W. Donohoo, '39; C. W. Maguire, '36; R. J. Schilthuis, '30; S. A. Wickstrom, '38; A. G. Wolf, '07.

R. P. Clark, Ex-'26, who is with the Phillips Petroleum Company happened to be in town and also attended.

Messrs. Donohoo and Wickstrom are new additions to our group, they recently having been stationed here by the Stanolind Oil and Gas Company, the former with a seismograph crew and the latter in the Production department at Alvin, Texas.

Manila, P. I.

A. F. Duggleby, '15, was elected president of the Manila Section at a dinner meeting held at the Bay View Hotel on Friday, December 22. He succeeds Q. A. Abadilla, '20. Ralph Keeler, '31, was reelected secretary-treasurer.

Feature of the evening was an informal talk by Dr. Grant Corby, chief geologist for the National Development Company (governmental organization), on the geological exploration of the Philippines with the object of determining possibilities of finding petroleum. Dr. Corby explained the work now being undertaken by the government, and stated that while there were many favorable indications in various parts of the Archipelago, not enough work had been done to make exact predictions possible.

A letter from Coach John Mason was passed around, and a discussion of the football situation took place. A committee, consisting of Roger Schade, '21, and Jack Newsom, '34, was appointed to investigate ways and means by which the alumni in the Philippines, members of both Baguio and Manila sections, could take part in the good work now going on. A resolution conveying congratulations to Coach Mason and his Orediggers for their most successful 1939 season was enthusiastically passed.

S. Douglas Hier, '31, who is stopping off in Manila for a short time en route to the United States, was present at the meeting. He has been in charge of a geophysical party in the Dutch East Indies for the past two years, and had many interesting experiences to relate.

It was decided to hold meetings quarterly instead of monthly, in view of the fact that most of the members of the Section are travelling so much of the time.

Special guests at the meeting, besides the speaker, were Judge John W. Haussermann, Hon. '38, V. V. Clark, Honorary member of the section, and George Miller. Alumni present were:

G. T. Geringer, '10; A. F. Duggleby, '15; Q. A. Abadilla, '20; Roger Schade, '21; E. C. Bengzon, '21; R. W. Wells, '29; S. D. Hier, '31; R. Keeler, '31; Jack Newsom, '34; Jones Castro, '39.

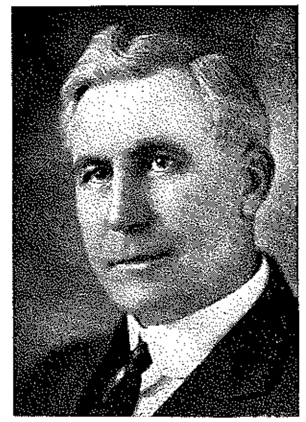
New York

In order to accommodate a number of the members of this section who commute from a long distance from New York and thus are only able to attend noon meetings, the regular meeting for December was a luncheon meeting held on December 12th at the Western Universities Club in New York City.

The turnout was rather disappointing, but those present had an enjoyable session. All were delighted about the good showing of the Mines football team this year, with much discussion about the favorable publicity in the New York newspapers and throughout the country.

Those present were:

Harry J. Wolf, '03; Alex. B. Carver, '25; Adolph Bregman, '14; F. C. Sealey, '17; J. A. Riley, '23; J. M. Frankel, '13; Geo. H. Roll, '19.



LESTER J. HARTZELL

Lester J. Hartzell, '95, Honored

On November 8, 1939, alumni and members of the faculty of the Montana School of Mines honored Lester J. Hartzell in celebration of his 35 years of continuous service at that institution. There were one hundred and twenty-five at the gathering and letters and telegrams came from as many more of that number of alumni scattered over the country. The communications expressed appreciation of Prof. Hartzell's work and nearly all contained some well-remembered anecdote of the classes under him.

Mr. August Grunert presided at the meeting which followed dinner and introduced Professor Adami, Professor Scott and President Thomson.

The guest of Honor was presented with an engraved pair of binoculars to commemorate the occasion.

Professor Hartzell, a native of Colorado, graduated from *Mines* in 1895 and from then until 1904, when he was appointed to the faculty of the Montana School of Mines, served as assayer and chemist at several properties in Colorado and Montana and in Monterrey, Mexico. He has the distinction of being the only member of the faculty of the Montana School of Mines who has served under all five presidents of which that institution boasts.

During his long residence in Montana, Professor Hartzell has worked with practically every kind of ore in the state, knowing, probably, more about them than any other one man in the profession. He is also regarded as an authority on ores found in all parts of the Rocky Mountain area.

While at *Mines* he earned a reputation as one of the greatest athletes in the annals of the state. He played five years on the football team, holding down every position, except that of center, and finally becoming known as an exceptional full back. He also made a name for himself in baseball.

IN APPRECIATION

Dr. Adams has asked that through *Mines Magazine* we express the appreciation of himself, the Glee Club and the Band to those alumni who wrote to KOA and to him regarding the School broadcast on December 16, 1939. KOA was especially pleased with the response from Mines Men.

Prize Winner—November 1939

Al Harding, '37, came out victor in the prize contest for finding the most errors in the November, 1939 issue of *Mines Magazine* and to him goes one year's free subscription.

"Believe It or Not" he listed 16 errors and the editorial staff had to admit they were all bona fide!

Personal Notes—

(Continued from page 33)

George B. Somers, D.Sc., '30, sailed from New York on November 25th, 1939, for Egypt where his address is now c/o Socony-Vacuum Oil Company, Sharia Ibrahim Pasha, Cairo.

Bill Sparr, '39, has been transferred by Ingersoll-Rand Company to Painted Post, N. Y., where he receives mail in care of the company.

Richard N. Spencer, '34, is Mill Shift Boss for Marsman & Company at their Suyoc Consolidated property. His mailing address is Box 18, Baguio, P. I.

Robert Swancutt, '37, is Mine Engineer for the M. & M. Mining Company at Radersburg, Montana.

John B. Traylor, '36, who has been in Breckenridge since his graduation, is now in Denver and residing at 1896 So. Corona Street.

Tom Trumbull, '38, Sales Engineer for duPont Company, is stationed in Denver and makes his home at 1537 Vine Street.

Charles N. Whitaker, '14, of the firm of Howes and Whitaker, Consulting Petroleum and Mining Engineers, has a new residence address, 3313 Union Pacific Avenue, Los Angeles, Calif.

Christmas Visitors

Visitors in the Alumni office during the past month included:

James L. Bruce, '01, General Manager, Cyprus Mines Corporation.

Tenney C. DeSollar, '04, Superintendent of Ore Mines, Woodward Iron Company, Bessemer, Alabama.

Glen E. Fassler, '29, Engineer, Walker Mine, Walkermine, Calif.

Ben W. Geddes, '37, on the Petroleum Research staff of the Standard Oil Development Co. of Elizabeth, N. J.

Wilbur G. Howard, '36, Rodman with the U. S. Bureau of Roads.

George Robert Johnson, '34, of Breckenridge, Colo.

Walter A. Kyelberg, '35, Engineer with the U. S. Bureau of Reclamation at Shelby, Montana.

C. J. Monahan, '39, who is doing Geological work for the U. S. Engineers office with headquarters at Little Rock, Arkansas.

Christmas Cards

The Alumni office had quite a festive air during the holidays with its display of Christmas cards received from the following:

Louis Bartholomees, '32, Baguio, P. I.; *Tom Bradley,* '37, Denver; *E. J. Brook,* '23, Glendale, Calif.; *Eugene Dawson,* '38, Los Angeles; *Evans Ferris,* '38, Lakewood, Colo.; *Ezell Flournoy,* '32, Copperhill, Tenn.; *Merle Gilbreath,* '33, Denver; *Herbert Heckt,* '36, Park City, Utah; *T. H. E. Jones,* '31, Pueblo, Colo.; *Heine Kenworthy,* '32, Baldy, New Mexico; *Wm. C. Klein,* '31, Idaho Springs, Colo.; *Wm. Pierce Morris,* '32, Chocaya, Bolivia; *Ben H. Parker,* '24, Buenos Aires, Argentina; *Robert W. Price,* '35, San Juancito, Honduras; *Donald M. Ray,* '25, Morochoca, Peru; *X. T. Stoddard,* '27, Boling, Texas; *Howard A. Storm,* '29, Skouriotissa, Cyprus; *Charles C. Tappero,* '35, Pueblo, Colorado; *Neal Bosco,* '35, Sao Paulo, Brazil.

• Weddings

Templeton-Daes

The marriage of Harold C. Templeton and Miss Marian Ramona Daes, daughter of Mr. and Mrs. Wallace E. Daes of Denver, took place in Kent, Ohio, on November 17, 1939.

Mr. Templeton who received his degree from *Mines* last May is Junior Engineer for the Youngstown Sheet & Tube Company. The couple are now residing at 319 W. Glenaven Avenue, Youngstown, Ohio.

Melzer-Brooks

Laurence S. Melzer, class of '39, and Miss Dorothy Brooks of Burden, Kansas, were united in marriage at the Methodist church in Burden the evening of December 9, 1939.

Until the time of his marriage Mr. Melzer was employed by the Frick-Reid Supply Corporation in Augusta, Kansas on construction work.

Detmar-Thompson

At a quiet wedding in Trinidad, Colorado at the home of her mother, Mrs. Thomas Thompson, Miss Rosamond Thompson was united in marriage to Arthur O. Detmar, Sunday evening, December 24, 1939.

The couple left immediately after the ceremony for Dallas, Texas, where Mr. Detmar, '39, is on a seismograph crew of the Magnolia Petroleum Company. Mailing address for Mr. and Mrs. Detmar is 721 Browder Street, Dallas.

• Births

J. C. Wilkerson, '31, recently sent in the following news item: On October 10, 1939, I became the proud father of a big baby boy and we have named him James Laurence."

Mr. Wilkerson is employed by the Wilson Supply Company as Sales Engineer in the Nixon Gas Lift department. The family is residing at 6321 Sewanee Street, Houston, Texas.

Mr. and Mrs. Lucien M. Masse welcomed a young son into their home the early part of December 1939. They have named him Joseph Robert.

Mr. Masse received his Master's degree in Geology from *Mines* in 1938 and is now studying for his Doctor's degree.

Catalogs—

(Continued from page 30)

(764) DEVELOPMENT OF THE MOTOR CAR. A 5-page Reprint from Nation's Business, November, is made available to you by Automobile Mfg'rs Assoc., 366 Madison Ave., N. Y., an interesting story starting with the old "Chug-buggy".

(765) ENGINEERING PROPERTIES OF MONEL "K" METAL. Bulletin T-9 gives 16 pages of engineering properties of "K" Monel and its application and also a long list of available Bulletins covering this important metal and its uses, published by International Nickel Co., 67 Wall St., New York, N. Y.

(766) LOW-VOLTAGE POWER CABLE. Bulletin GEA-3280, General Electric Co., Schenectady, N. Y., contains 18 pages of tables, curves, illustrations and information on the Tellurium Portable Cable and how to select a conductor size for your job.

(767) SAND-ACID-SLURRY, PUMPS. Catalog 14 of A. R. Wilfley & Sons, Inc., Denver, Colo., contains 36 pages of information on different types and sizes of Wilfley pumps and shows you why Wilfley centrifugal pumps give maximum efficiency and service and long life. This book will help with your pumping problems.

(768) V-BELT DRIVES. "Industrial News" for December brings new examples of the application of v-belt drives that may be used by many of our readers. An example of replacing gears on the Ball Mill is shown among others. Gates Rubber Co., Denver, will be glad to send you the "Industrial News".

(769) APPLICATION OF DRILLABLE MATERIALS for well completions. "Security Bulletin" by Security Engineering Co., Inc., Whittier, Calif. for December contains a very instructive article on this subject.

(770) DIAMOND CORE DRILLS. Bulletin 57 by E. J. Longyear Co., Minneapolis, Minn., contains complete information on UG Straightline diamond core drills with illustrations of standard models powered by gas, air, electric or Diesel motive units designed for capacities from 700 to 1750 feet in soft or hard rock. Mine & Smelter Supply Co., Denver & Salt Lake are Representatives.

(771) VIBRATING CONVEYORS & FEEDERS. Bulletin No. 29 of Ajax Flexible Coupling Co., Westfield, N. Y., shows a vibrating pan conveyor with flow control of from 10 to 70 feet per minute. It is adapted for handling unusual materials without damage to material or conveyor. Urquhart Service, Denver, Colo., are Representatives.

(772) WELDING HELMETS in new one piece or fabricated models are shown together with hand shields, wire screen helmets and other protective appliances are shown in Bulletin No. CE-10 of Mine Safety Appliance Co., Pittsburgh, Pa.

REVIEW of ARTICLES WORTH WHILE

Compiled by Departments of Mining, Metallurgy, and Petroleum, Colorado School of Mines

Completing Wells by Reverse Circulation in East Texas, by F. G. Beckman; Oil and Gas Journal, Mar. 10, 1938.

All oil operators are acquainted with the rotary process of drilling, wherein a bit is rotated at the bottom end of a drill stem while a fluid is pumped through the hollow drill stem, discharging at the bit and returning to the surface in the annular space between the wall of the hole, or casing, and the drill stem. All of the cuttings are eventually brought up to the surface in this manner. The reverse circulation is what its name implies. By the use of suitable equipment, a circulating fluid is pumped to the bottom of the well on the outside of the drill stem and is discharged to the surface through the drill stem.

In developing the reverse circulation method of drilling, advantage has been taken of using the column of fluid which has the highest velocity to carry out cuttings and debris from the bottom of the hole. To properly carry out cuttings, it is the velocity of the fluid that is of primary importance, rather than the volume. It was found by experimenting with low velocities that the cuttings are not carried out of the hole as they are cut, but often accumulate until they have been worn into small particles, or they have mixed with the drilling fluid to produce mud. They are floated out rather than carried. As the velocity is increased, the cuttings will tend to come out at approximately the same velocity as the fluid, and when that velocity is sufficiently high, there is no accumulation or wearing of the cutting. They are recovered at the surface in practically the same condition in which they were cut by the bit.

If velocity of the fluid carrying the cuttings is relatively low, the cuttings will be mixed; this can be explained as being caused by the difference of the specific gravity of the particles and their size and shape. If the velocity of the fluid stream carrying the cuttings is increased sufficiently, the cuttings will block off from one formation to the other as they are cut, and a mixture of the cuttings from the various formations does not result. The velocity of the fluid required varies with the size and specific gravity of the cuttings and also the specific gravity and viscosity of the circulating fluid. This rather interesting fact is the very thing that gives a more accurate log of the formations penetrated than any other method known at this time. It has been rather interesting to learn what takes place to cause the difference in results that are obtained with low-velocity and high-velocity fluids passing up through the drill stem.

The method of operation is essentially as follows:

As soon as the oil string of casing has been set and the cementing has been completed, the rotary is moved off the location, leaving only the derrick and the rig floor. A supply of crude oil which has been weathered is used as the circulating medium in drilling. A rock bit, which has generally been altered for the requirements, is put on the tubing and run to the proper depth. The casing test is made through the equipment either before or after the tubing has been run. This test having been completed, the operation is as follows:

Water is pumped down the casing to wash out all of the mud and debris which is found above the cement plug. Crude oil is then pumped in to follow the water and force the water out through the drill stem. It has been found that if the oil is available at the pump in sufficient volume, the oil will replace the water with very little admixture and will sometimes practically block off with not over a barrel of mixed fluid.

Catalytic Processing of Petroleum Hydrocarbons by the Houdry Process. Eugene Houdry, Wilbur F. Burt, A. E. Pew, Jr., and W. A. Peters, Jr. Ref. and Nat. Gas. Man., Nov. 1938, p. 574-82.

The general processes under the Houdry patents, 96 in number, may be stated as follows: 1. Catalytic cracking of a crude or distillate fraction thereof except gasoline to produce gasoline, gas oil, furnace oil, and with or without other heavy fluid products; 2. Catalytic viscosity breaking in liquid phase without appreciable gasoline production of tar or residues for use as furnace oils; 3. Catalytic treatment of gasoline from catalytic or thermalcracking including aviation gasoline; 4. Catalytic desulfurization of gases from topping or cracking operations; 5. Catalytic polymerization of butenes in liquid phase; 6. Production of light-gravity oils for furnace oil requirements or diesel oils by catalytic cracking of heavier-gravity gas oils or residuums.

The advantages of the Houdry process are: 1. High yield of high-octane gasoline in one pass. 2. Production of light-gravity low-boiling-point gas oil as cycle stock or as furnace oil in place of fuel oil. 3. Low gas yields. 4. High liquid recovery. 5. Flexibility in meeting seasonal variation in demand of furnace oil, fuel oil, and gasoline. 6. Availability of the process as a source of aviation gasoline with change in equipment. 7. In general, the authors desire to emphasize that: a. Heavy fuel oils are eliminated—the Houdry finished products consisting entirely of gas, gasoline, and gas oils. b. Type of crude has substantially no effect on yield or octane number of the gasoline produced by the catalytic cracking. c. On all crudes so far tested, sulfur content of the gasoline produced by the catalytic cracking is below 0.1 percent.

Houdry process has available either vapor phase treating of catalytic or thermal gasoline or liquid phase for aviation fuel. The vapor phase process gives a gasoline very low in gum and sulfur, high stability and excellent color and odor. The vapor phase may be used on thermally cracked gasolines at 2.5 to 4.5 cents per barrel with yield above 99% normally. The catalyst is oxides of manganese and nickel rejuvenated in place.

Catalytic desulfurization is available for complete removal of sulfur from crudes. For low concentration the sulfur is harder to remove. For high concentration or complete removal, the process is without equal in the opinion of the authors.

The process to summarize it briefly makes it possible for the industry to make high grade gasoline and maintain the economic ratio of various products of refinery. The process gives the industry valuable aid in the production of the distilled products.—P. H.

Use of Gas Lift in Handling Small Allowables, S. F. Shaw, The Oil Weekly, December 19, 1938, v. 92, No. 2.

Gas-lift has been regarded as a means for handling large production, since wells have been curtailed to small allowables it has been found that the use of gas-lifts may reduce lifting costs to a low point.

Conditions which are favorable to the use of this method are:

1. High flowing pressures, therefore, high fluid levels.
2. Gas-oil ratios obtain that are at least as high as those originally associated with the oil before the reservoir is tapped.
3. Small allowables, thereby requiring low cost equipment.
4. Use of centralized machinery installations, thus requiring minimum payroll expense.
5. Infrequency of pulling and other well jobs.

The East Texas field furnishes a good example of wells with small allowables being handled on gas-lift there being 500 wells on lifts in this field. The reservoir pressures are from 1000 to 1100 pounds, the gas consumption is 1340 cubic feet per barrel and since there are about 350 cubic feet per barrel of gas in the reservoir, only 1000 cubic feet need be added. This consumption of gas is not excessive for the conditions.

The Corpus Christi field which has been water flooded produces about 1% oil of the fluid lifted and it takes about 500 cubic ft. per barrel. Lifting costs are about 37½ cents per barrel which is high but not prohibitive.

Fluids may be lifted from depths up to 11,000 ft. at reasonable costs, if advantage of all favorable conditions is taken.
—C. R. B.

K. M. A. Combines Gasoline Extraction with Repressuring. J. C. Albright, Ref. and Nat. Gas. Man., Dec., 1938, p. 648-51.

In the K. M. A. oil field in north Texas, the present operators are becoming interested in repressuring. These operators are Deep Oil Development Company, Phillips Petroleum Company—Sunray Oil Company, and the Continental Oil Company. The units for compressing gas are for pressures up to 2000 pounds for injection.

The Continental Oil Company's installation is different from the usual scheme of a central extraction plant surrounded by the usual booster stations by making each plant a complete unit for extraction of the gasoline from the gas with a central stabilization plant as the raw gasoline from each of the surrounding plants comes to this central unit.

This method was decided upon because there was no greater expenditure of labor and fewer lines and also leads to greater flexibility in the central or any one plant may be shut off without disturbing the others.

The main plant is equipped with 2-400 Hp. angle type gas engine driven compressors rated at the given horsepower at 300 rpm. with 14x14 engines. The compressor cylinders are four in number —the first is 29x14, the second and third is 10½x14, and the fourth is 2¾x14. The first three boost the pressure to 300 pounds from atmospheric while the fourth boosts from 300 to 2000 pounds. The thruput is 250,000 cubic feet.

There are three surrounding plants; two of which are equipped with one engine and the third with two engines of the type described above.

The compressors and motors are jacket water-cooled circulated in a closed system by centrifugal pumps. The cooling towers have 614 sq. ft. of area and reduces the water to the required operating temperature for injection to the jackets. The compressor units occupy a floor space of 10½ x 12½ feet. The lubrication is by the application of oil cooling in the outside water cooled unit and then forced into the bearings by pumps. This lubrication leads to lower costs because of lessened piston, ring, and cylinder wall wear.

The main plant with its various units for stabilization works at a minimum pressure of 300 pounds in the fractionating tower. The stabilization unit is conventional with alternate scrubbing, compression and intercooling units.

Water is obtained from wells produced with a gas lift. The plant and dwellings are lighted by electricity obtained in the main plant with a 20 KVA 110 volt AC generator. The yard is lighted by search lights on towers. The gasoline is treated by a dry copper sweetener. The gasoline content of the gas is variable with a maximum content of 6 gals. per thousand cubic feet of gas.

The plants are becoming more complex and as time has advanced there will be more units built and from a conservation program, the operator will observe changes and study the effects of these changes.—P. H.

Well Completion Data. S. F. Bowley from Oil Weekly, March 27, 1939.

The improvements in drilling and completion technique during the last few years have placed at the disposal of the oil industry a set of tools which require appreciable correlation and accuracy in order to be of maximum use and profit.

Records may be of two kinds; the written record providing the historical background and including all minor details in the drilling of a well; the graphic record, of which the well logs and cross sections are examples. While the written record is necessary to provide all the details concerning a well, nevertheless it is of limited value for comparative study and coordination of data in undertaking difficult completions, and in this instance graphic records are indispensable.

When taking basic completion data, the necessity of accurately locating any subsurface point in a well must be stressed, while core analysis also plays a very important part in the essential information to be assembled.

With the growing use of core analysis in basic completion data, attention is being drawn to the physical constants in a core which may be analyzed with accuracy. Foremost among these are, permeability and porosity. Aside from these two main points in core analysis, the other major ones are: oil saturation, water saturation, chloride content, solubility in HCL, grain size and colloidal content. Several operators are attempting to make analysis upon fragmentary drill cuttings although such work appears to be inconclusive. Unless cores are subjected to some sort of analysis other than those of a superficial nature, an operator is not receiving the most for his money.

The electric log is now used in the majority of areas where exploitation or exploration is carried on. Rather recent developments in electric logging have increased its value appreciably so that its use not only made possible a considerable advance in completion technique, but in drilling practice itself through facilitating the adoption of "slim hole" drilling methods.

Once the basic completion data are in hand and have been set down graphically, as well as progressively, in the written record, the actual completion may be undertaken. Data pertaining to the actual completion are those which involve the mechanical details of completion itself, such as setting and cementing casing and testing thereof, the setting of screen and liners, production packer and so forth, as well as shooting and acidizing.

As far as completion data are concerned, it is only necessary to give the following information on the graphic record. (1) Initial oil production. (2) Initial water production. (3) Initial gas volume. (4) Choke size. (5) Completion date. All other data may be included on the written record, since it is assumed that more detailed data will be included in the symbols appearing upon the production map.—J. B.

KLAUS, H. *An Introduction to the Second Derivative Contour Method of Interpreting Torsion Balance Data.* Geophysics 3(3), 234-246, July 1938.

The writer points out that in the development of the application of the torsion balance, the emphasis on speed and for other reasons have caused the curvature quantity measured by the instrument to be neglected in interpretation and the emphasis placed on the gradient. The gradient was used to provide data which was integrated to obtain gravity values which were contoured, a regional value being subtracted either from the gradient before gravity was calculated or after as a gravity quantity. Interpretation proceeded from such a corrected picture. It is noted that Eoetvoes and other early workers considered the gradient and the curvature quantity of equal importance and interpreted results largely by constructing profiles of these quantities, gravity values being a by-product in this process.

The paper advocates first a return to the (original) gradient and curvature profile investigations for interpretation, and secondly the use of the "second derivative" contour method. This latter calls for a determination of the gradient and curvature as measured at each station by the torsion balance. The instrument yields the N-S and E-W component of the gradient which are plotted in usual practice on N-S E-W astronomic direction coordinates and similarly the two components of the curvature quantity. The procedure here proposed calls for the establishment of new axes parallel to (and at right angles to) the geological strike of the area, as determined by the field results themselves. Four maps are prepared showing the projections of the separate components on these new axes. Contours are drawn of equal value of these projected gravity and curvature components; the so-called second derivative contours.

These contours show characteristic patterns above anticlines, salt domes and faults, examples of which are given. The author notes that the method is not quantitative; It shows, however, quantitatively, the type of structural deformations and their position in relation to each other. Its use permits the recognition of such features as faulting and truncation of beds which latter fact would in many cases be a guide to the correct correlation of seismic records where changes in stratigraphic sequence might be missed.

The procedure is best applied in sorting acreage and gaining an understanding of an anomaly prior to detailed work and in guidance in the proper interpretation of the latter. Its proper use requires the scattering of good control torsion balance stations over an area and in general a high accuracy in field measurements. Profiles of gradient and curvature for interpretation are the backbone of the method, the contouring above referred to being an aid in the judicious selection of such profiles.—D. W.

MALAMPHY, MARK C. *Geophysical Prospecting for Petroleum Structures in Alagoas.* Mineracao e Metallurgia 1 (5), 193-202, Jan.-Feb. 1937.

The article compares geophysical surveys made by the Brazilian Government and a foreign geophysical consulting company. The company worked with magnetic electrical, seismic, and gas methods while the Government used magnetic, torsion balance, and seismic methods. Author criticizes the measurements of the consulting company as being unsatisfactory because of erroneous assumptions in regard to the position of the magnetic equator, errors in magnetic depth determination, of the data in terms of possible oil production.—C. A. H.

Book Reviews

Descriptive List of the New Minerals 1892-1938. George Letchworth English. 258 + VII pages. McGraw-Hill Book Co., Inc. New York, 1939. $3.00.

The author has brought together a descriptive list of over 2200 new English names that have appeared in the literature during the past forty-six years. The names with brief descriptions are arranged alphabetically and have been compiled from accounts that have appeared in the three Appendices of Dana's *System of Mineralogy,* Dana's *Textbook,* fourth edition, *The American Mineralogist, The Mineralogical Magazine, Mineral Abstracts* and *Chemical Abstracts.* A reference to the original description, and in many instances a number of references is given for each name. An Appendix summarizes the report of the Committee on Nomenclature which was adopted recently by the Mineralogical Society of America.

The author has performed a worthy service for mineralogical science in making available in a concise form information and data covering a long period of years and widely scattered throughout the literature.

—W.F.H. in Amer. Miner.

Earths Green Mantle. By Sydney Mangham.

In this story of plant science, Professor Mangham has not only treated the living plant as one of the most marvelous of all machines, in that it builds, runs, and repairs itself, but he has given glimpses of the wonder and beauty of plant form and architecture. He has outlined the story of man's persistent efforts to understand and utilize the almost illimitable wealth of plant life covering the earth; of the parts played by other branches of science in the development of our knowledge of plants; and of the use made and perhaps yet to be made of such knowledge.

You will find it fascinating to trace through these pages the constantly changing plant-covering of the earth; to reconstruct those plants which vanished a million years ago; to follow the evolution of new plants through the ages; to see how new models of plant life are forming before our very eyes.

The varied aspects of plants and their influence, which Dr. Mangham covers, seem limitless. He tells of the early explorations and discoveries when the search was for spices from the Orient; of the sixteenth century immigration of the potato from South America to the continent of Europe; of the detection and prevention of that fungus which attacks New England elms; of the Dutch use of marram grass to stabilize sand dunes and of cord grass to reclaim shallow lands from the ocean. Rubber for tires, paper for newspapers, tobacco, silk and celluloid—there are hundreds of plant products which contribute to our pleasure, comfort and convenience today. So the fascinating story of how man has attempted to discover and exploit the plant world goes on and will do so as long as there is life.

Petroleum Production Engineering—Oil Field Exploitation—New Second Edition. Published June, 1939. By Lester C. Uren, Professor of Petroleum Engineering, University of California. Second edition. 741 pages, 6x9, illustrated. $6.00.

This book spans the entire production phase of the petroleum industry, telling the story of petroleum production beginning with the completion of the field development phase and ending with transportation of the products to market. The chapters on principles of oil drainage, lifting methods, management of wells, secondary methods of recovery and surface handling of crude petroleum, constitute the most detailed and comprehensive treatment of these topics yet published.

Petroleum Development and Technology, 1939. By A.I.M.E. Petroleum Division. Review by Stanley C. Herold in A.A.P.G. Bulletin.

Petroleum Development and Technology, 1939, by the Petroleum Division, Trans. Amer. Inst. Min. Met. Eng., Vol. 132. 625 pp., illustrated. Published by the Institute, 29 West 39th Street, New York City. Cloth. Price, $5.00 net.

The annual volume for 1939, the fourteenth of the series, contains the papers and discussions presented before the Petroleum Division at meetings held in San Antonio, Texas, October 5-7, 1938; in Los Angeles, California, October 20-21, 1938; and in New York City, February 13-16, 1939. The papers appear in full, with exceptions first in the form of abstracts for those which have appeared in trade journals, and secondly in the form of titles for those not reprinted from the Division's quarterly publication Petroleum Technology. In both cases the appropriate references to publications are given. The usual high standard for the material and its presentation has been maintained.

Chapter I, "Production Engineering," 7 papers, 92 pages: "Mud Technique in Iran"; "Development and Production Problems in High-Pressure Distillate Pools"; "Core Analysis"; "Bottom-Hole Measurements in Pumping Wells"; "Exploring Drill Holes by Sample-Taking Bullets'; "Effect of Acid Treatment upon Ultimate Recovery of Oil from Some Limestone Fields of Kansas," abstract; and "Decline Curve Analysis," abstract. It is clear that most of these papers relate to specific engineering problems in drilling and production. Geologists will be interested particularly in core analysis and bullet samples.

Chapter II, "Engineering Research," 8 papers, 103 pages: "Significance of the Critical Phenomena in Oil and Gas Production"; "Gravitational Concentration Gradients in Static Columns of Hydrocarbon Fluids"; "Physical Properties of Hydrocarbons and Their Mixtures"; "Flow of Oil-Water Mixtures through Unconsolidated Sands"; "Effect of Pressure Reduction upon Core Saturation"; "Interfacial Tension between Water and Oil under Reservoir Conditions"; "Surface Chemistry of Clays and Shales"; and "Influence of Oil Flow on Water Content," abstract. Although these papers relate to subjects in petroleum physics and physical chemistry, the one on clays and shales has particular appeal to the geologist.

Chapter III, "Petroleum Economics," 3 papers, 34 pages: "A Design for More Effective Proration"; "Economic Equilibrium in Petroleum Refining Operations"; and "World Consumption of Petroleum and Related Fuels during 1938." The subjects of proration and consumption are indirectly of considerable interest to all petroleum geologists.

Chapter IV, "Production, Domestic and Foreign, and Reserves." This chapter contains 31 papers, 286 pages, on domestic production by states, or portions thereof, of 23 papers, 80 pages, on foreign production by countries, excluding Bolivia and Japan, including U.S.S.R. as Russia, and one paper, 4 pages on an "Estimate of World Oil Reserves." This section on production is continuous from year to year and has been found in many cases to be an indispensable source of information for geologists as well as engineers. The tabulation of estimated reserves constitutes a feature of importance to many geologists.

Chapter V, "Refining," one paper, 5 pages.

Year by year the volumes constituting Petroleum Development and Technology show an increasing differentiation between the specific interests of the geologist, the technologist, the physicist, the physical chemist, the economist, and the various types of engineers, who contribute to the advancement of the industry.

Annual Reviews of Petroleum Technology, Vol. 4 (covering 1938). "A collection of authoritative reviews of recent developments in every aspect of the technology of petroleum." 480 pp., 20 illustrations and diagrams. Cloth. The Institute of Petroleum, The Adelphi, London, W. C. 2 (1939). Price, 11 s. ($2.70).

An Introduction to Crystal Chemistry. R. C. Evans. vii plus 388 pp., 59 Tables, 113 Figs. Cambridge, at the University Press. (New York. The Macmillan Company.) 1939. Price $4.50.

This volume is designed primarily as a text for university students, but will be of interest to many others. No specialized crystallographic training is necessary for the reader. Very little attention is given to detailed structural or crystallographic features, nor is there any attempt to make a complete survey of all structures which have been analyzed. The main emphasis is on the correlation of typical structures with their chemical and physical properties. The various chapters consider interatomic binding forces, quantitative lattice theory, metallic elements, alloy systems, homopolar, ionic and molecular compounds. The material is clearly presented and well illustrated.

—L. S. Ramsdell in A. M.

Leaves and Stems from Fossil Forests. By Raymond E. Janssen. Illinois State Museum, $1.25.

This book, Volume I of the Popular Science Series, is more than "A Handbook of the Paleobotanical Collections in the Illinois State Museum." It is in fact the best popular account and guide to the fossil plants of the Pennsylvanian period that I have seen.

Although primarily based upon the exceedingly rich and well-preserved flora found in the Mazon Creek region of Illinois, nevertheless, the book includes species found in all the Coal Measures of the state. For each species there is a short description stressing those characters which distinguish it from closely related forms, and one or more specimens are illustrated. Special commendation should be given the 165 illustrations, especially the line figures clearly showing the differences between the various genera of the Cycadofilicales.

For the amateur and professional paleobotanists whose interests lie primarily in these late Paleozoic floras this book is highly recommended as the best popular work yet issued.

—H. E. Vokes in N. H.

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Recent Patents Relating to the Mineral Industries, edited by James Atkins, registered patent attorney, Munsey Building, Washington, D. C. Inquiries with reference to this subject or to any patents appearing in this department should be addressed to Mr. Atkins.

PUMPING APPARATUS. Patent No. 2,180,-366, issued Nov. 21, 1939, to Conrad Reichert, San Antonio, Tex., assignor to Petty Laboratories, Inc., San Antonio, Tex., a corporation of Texas.

MINING MACHINE. Patent No. 2,180,359, issued Nov. 21, 1939, to Joseph F. Joy, Claremont, N. H., assignor to Sullivan Machinery Company, a corporation of Mass.

VALVE MECHANISM FOR ROCK DRILLS. Patent No. 2,180,564, issued Nov. 21, 1939, to Edward F. Terry, Phillipsburg, N. J., assignor to Ingersoll-Rand Company, Jersey City, N. J., a corporation of New Jersey.

METHOD AND APPARATUS FOR CONTROLLING FLUID OPERATED PUMPS. Patent No. 2,180,400, issued Nov. 21, 1939, to Clarence J. Coberly, Los Angeles, Calif., assignor to Roko Corporation, Reno, Nev., a corporation of Nevada.

PUMP MECHANISM. Patent No. 2,180,451, issued Nov. 21, 1939, to Paul B. Barnett and Clarence C. Upton, Freer, Tex.; said Upton assignor to John P. Muller, Fort Worth, Texas.

UNDERREAMER. Patent No. 2,180,452, issued Nov. 21, 1939, to George M. Boulter, Bakersfield, Calif.

WELL DRILLING AND REAMING TOOL. Patent No. 2,180,589, issued Nov. 21, 1939, to Finers F. Jodges, Dallas, Tex.

METHOD OF TREATING NATURAL GAS. Patent No. 2,180,596, issued Nov. 21, 1939, to Bernard M. Laulhere, Walnut Park, Calif., assignor to The Fluor Corporation, Ltd., Los Angeles, Calif., a corporation of California.

WELL PLUG. Patent No. 2,180,605, issued Nov. 21, 1939, to Herbert C. Otis, Dallas, Tex.

CASING HEAD FOR PRESSURE DRILLING. Patent No. 2,180,680, issued Nov. 21, 1939, to Frederic W. Hild, Los Angeles, Calif.

PROCESS OF TREATING ORES. Patent No. 2,180,692, issued Nov. 21, 1939, to John S. Potter, Denver, Colo., assignor to The S. W. Shattuck Chemical Company, Denver, Colo., a corporation of Colo.

INSIDE PIPE CUTTER. Patent No. 2,180,-693, issued Nov. 21, 1939, to Dempson H. Reed, Houston, Tex.

ADJUSTABLE ROD GUIDE FOR PUMPS. Patent No. 2,180,719, issued Nov. 21, 1939, to Ernest W. Ostrom, Pasadena, Calif., assignor to Axelson Mfg. Co., Los Angeles, Calif., a corporation of Calif.

DEEP WELL PUMP. Patent No. 2,180,864, issued Nov. 21, 1939, to William L. Connor, Los Angeles, Calif., assignor to Fluid Packed Pump Company, Whittier, Calif., a corporation of Nevada.

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MEANS FOR ROTATING PUMP ROD IN A WELL. Patent No. 2,180,880, issued Nov. 21, 1939, to Alfred E. Poulsen, Los Angeles, Calif.

WELL BAILER. Patent No. 2,180,935, issued Nov. 21, 1939, to William H. Dumble, Bakersfield, Calif., assignor to Paul Cavins, Long Beach, Calif.

FEEDOVER DEVICE. Patent No. 2,180,949, issued Nov. 21, 1939, to Ludwig W. Balu, Whitman D. Mounce, and William M. Rust, Jr., Houston, Tex., assignors to Standard Oil Development Co., a corporation of Delaware.

GAS LIFT OR NATURAL FLOW WELL. Patent No. 2,181,099, issued Nov. 21, 1939, to Howard C. Pyle, Los Angeles, Calif., assignor to Union Oil Co. of California, Los Angeles, Calif., a corporation of Calif.

LOCKING MEANS FOR BUCKET PINS. Patent No. 2,181,125, issued Nov. 28, 1939, to Harry George Leonard Eckart, Sydney, New South Wales, Australia, assignor to Alluvial Mining Equipment Limited, Sydney, Australia, a company of New South Wales, Australia.

EARTH DRILL BIT HEAD. Patent No. 2,181,394, issued Nov. 28, 1939, to Charles A. Dean, Compton, Calif.

ROTARY BIT. Patent No. 2,181,395, issued Nov. 28, 1939, to Charles A. Dean, Compton, Calif.

LOCKING MEANS FOR BUCKET PINS. Patent No. 2,181,675, issued Nov. 28, 1939, to George Herbert Watson, Sydney, New South Wales, Australia, assignor to Alluvial Mining Equipment Limited, Sydney, New South Wales, Australia, a company of New South Wales, Australia.

WELL FISHING TOOL. Patent No. 2,181,-187, issued Nov. 28, 1939, to Paul F. Jennings, Alhambra, Calif.

WELL RIG TRANSMISSION SYSTEM. Patent No. 2,181,193, issued Nov. 28, 1939, to Ralph, Lillich, Houston, Tex.

SPUDDING BIT. Patent No. 2,181,284, issued Nov. 28, 1939, to Ernest L. Potts, Houston, Tex., assignor to Eastmen Oil Well Survey Company, Dallas, Tex., a corporation.

METHOD AND APPARATUS FOR CONTINUOUS EXPLORATION OF BORE HOLES. Patent No. 2,181,601, issued Nov. 28, 1939, to John Jay Jakosky, Los Angeles, Calif.

ROTARY DRILLING MACHINE AND PIPE TONGS. Patent No. 2,181,641, issued Nov. 28, 1939, to Harold C. Hicks, Taft, Calif.

PLUNGER. Patent No. 2,181,748, issued Nov. 28, 1939, to Feri A. Thaheld, Dallas, Tex., assignor to The Guiberson Corporation, Dallas, Tex., a corporation of Delaware.

OIL WELL PUMP. Patent No. 2,181,775, issued Nov. 28, 1939, to Roy C. Williams, Wayne, Ohio.

DEVICE FOR OBTAINING CORE SAMPLES. Patent No. 2,181,980, issued Dec. 5, 1939, to Roy Q. Seale, Corpus Christi, Texas.

DETACHABLE BLADE CORE BIT. Patent No. 2,182,035, issued Dec. 5, 1939, to Guy Purnell, Angleton, Tex.

PUMP. Patent No. 2,182,062, issued Dec. 5, 1939, to Charles W. Sproull, Houston, Tex.

PLUGGING TOOL. Patent No. 2,182,196, issued Dec. 5, 1939, to Cicero C. Brown, Houston, Tex.

MECHANICAL RAM. Patent No. 2,182,245, issued Dec. 5, 1939, to George W. Bowen, Houston, Tex.

METHOD OF AND APPARATUS FOR MINING. Patent No. 2,182,127, issued Dec. 5, 1939, to Joseph F. Joy, Claremont, N. H., assignor to Sullivan Machinery Co., a corporation of Mass.

PACKING GLAND MOUNTING. Patent No. 2,182,246, issued Dec. 5, 1939, to Tanner E. Boyer, Bell, and Lester P. Stockman, Los Angeles, Calif.

WELL BIT CONSTRUCTION. Patent No. 2,182,247, issued Dec. 5, 1939, to Alfred C. Catland, Alhambra, Calif., assignor to Globe Oil Tools Company, Los Nietos, Calif., a corporation of California.

PACKING MATERIAL. Patent No. 2,182,-251, issued Dec. 5, 1939, to Charles S. Crickmer and Roy A. Lamb, Dallas, Tex., assignors to Merla Tool Company, Dallas, Tex., a firm.

COMBINATION BORING BAR GUIDE AND SEALING MEANS. Patent No. 2,182,263, issued Dec. 5, 1939, to George G. Probert, Walnut Park, Calif., assignor to Emsco Derrick and Equipment Company, Los Angeles, Calif., a corporation of California.

VALVE LOCKING DEVICE. Patent No. 2,182,278, issued Dec. 5, 1939, to Walter Brauer, Oklahoma City, Okla.

TOOL SPINNER FOR WELL DRILLING. Patent No. 2,182,374, issued Dec. 5, 1939, to William H. Dumble, Bakersfield, Calif.

PLUG. Patent No. 2,182,483, issued Dec. 5, 1939, to Laurence B. MacGregor, Long Beach, Calif.

PUMP PLUNGER. Patent No. 2,182,527, issued Dec. 5, 1939, to Sumner B. Sargent, Jr., Los Angeles, Calif., assignor to Sargent Engineering Co., a corporation of Calif.

OIL WELL APPARATUS. Patent No. 2,182,-545, issued Dec. 5, 1939, to Jefferson D. Pace, Shreveport, La.

PACKER. Patent No. 2,182,549, issued Dec. 5, 1939, to Joseph O. Brumbly, Los Angeles, Calif., assignor to R. E. Kline.

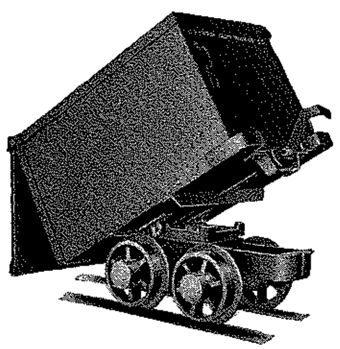
AUTOMATIC DRILLING MACHINE. Patent No. 2,182,624, issued Dec. 5, 1939, to William C. Dreyer, Dallas, Tex., assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., a corporation of Pa.

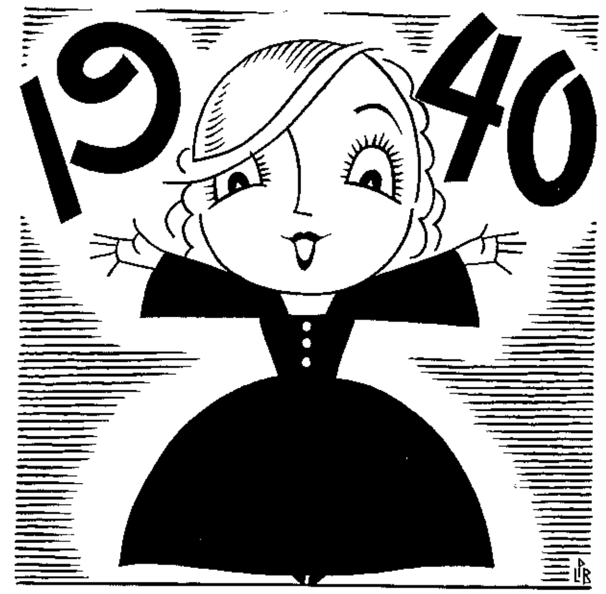
SEALING STRUCTURE FOR DEEP WELL PUMPS. Patent No. 2,182,730, issued Dec. 5, 1939, to Charles R. McDaniel, Oklahoma City, Okla.

DEPTH RECORDER FOR A WELL DRILL. Patent No. 21,297, reissued Dec. 12, 1939, to George P. Mizell, Dayton, Tex.

ORE DRESSING. Patent No. 2,182,845, issued Dec. 12, 1939, to Benjamin R. Harris, Chicago, Ill.

OPEN HOLE FORMATION TESTER. Patent No. 2,182,888, issued Dec. 12, 1939, to Harvey Whitaker, San Antonio, Tex.





Slushing and Scraping—

(Continued from page 34)

but these are comparatively rare installations.

Robert C. Matson has presented figures showing actual comparative costs of scraping for electric and air-operated hoists. In the example given, 604,005 tons were scraped by the air hoists and 91,124 tons by the electric hoists. The power costs were $0.034634 per ton for the air hoists and $0.004165 per ton for the electric hoists, a ratio of about 8 to 1. The cost per hour for power was given at $0.45866 for the air hoists and $0.057229 for the electric hoists.

As scrapers have been employed and are being employed in every type of mining method at present, it seems that the use of mechanical scrapers will continue to expand as improvements are made upon them, both mechanically and economically.

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Strategic Minerals—

(Continued from page 12)

Bureau of Mines Invites Information

The Bureau of Mines welcomes statements of fact as to the nature and situation of deposits containing any of these seven metals. Especially welcome are facts that are specific as to deposits believed to contain the strategic metals in substantial amounts. Merely small showings of ore, however rich, are of less interest than large deposits appearing to contain considerable tonnage of metal, even though the ore may be so relatively low in grade that it would not usually be mined at a profit.

To assist in obtaining facts that will be most helpful to the Bureau a simple, brief form is available for the use of any who request it.

Examination of Properties

Properties indicated by data available to the Bureau as of possible interest will be visited by its examining engineers to confirm and extend information in regard to them. As there are thousands of properties that should be seen eventually, it is necessary to route these engineers systematically to conserve time and minimize expense. Therefore it will not be practicable to make special examinations in response to solicitation. Neither will the examining engineers conduct regional searches to discover unknown deposits or to investigate formations as such, the latter being a function of the Geological Survey. They will be concerned chiefly with individual properties upon or within which, as shown by outcrops, mine workings, trenching or drill exploration, substantial deposits or ore are presumed to exist.

Selection of Properties for Exploratory Projects

Selection of properties for the conduct of exploratory projects upon them will be made from those that appear from preliminary examination to promise most with respect to the national objective, without regard to their geographical situation. No allotments will be determined by State or other geographical boundaries, as this would defeat the purpose of the Act.

In general, properties likely to yield only small, rich ore bodies will not be selected, as the cost of exploration would be excessive in proportion to the tonnage of metal that might be derived from them. Preference will be given to properties whose ores appear to be subject to concentration into an acceptable product of which a large tonnage might be disclosed by systematic exploration, especially by drilling. With respect to such deposits there is no presumption that they should prove to be commercial in ordinary times. It is the scarcity of commercial deposits of these minerals that has caused them to be declared strategic. The hope is to find marginal and moderately submarginal properties that may nevertheless yield substantial tonnages under circumstances in which the cost of production would not be of major importance.

Conduct of Projects

Available funds are only adequate to permit the conduct of about eight projects at a time. The consent of owners of the properties selected must be obtained before work upon them is begun. No stipulation as to the work to be done is made, and no work is undertaken by request or for the purpose of benefiting the owner. Neither will any report be supplied for use in promotion. The only undertaking by the Bureau of Mines is that of providing a copy of any assay charts made in order that the owner may be informed as to values and widths of ore disclosed by the investigations.

All sampling on projects is done with extreme care, large samples being shipped to a metallurgical laboratory of the Bureau for reduction, analysis, and the conduct of beneficiation tests. If commercial ore is found it is the privilege of the owner to mine it, as no reservations are made to retain any control of property by the Government. Neither is the owner of a property investigated subject to any charge for any benefit he may happen to receive, although he is expected to grant free access to all parts of the property for purposes of sampling and to permit the use by the Bureau during the conduct of its investigations of any equipment he may have available on the property, not essential to his own operations.

Objective of Investigations

The objective of these investigations is unusual, in that they are not concerned primarily with the commercial possibilities of the deposits; a reorientation from the normal approach to mineral exploration is thus required. It is not to be supposed that large deposits of commercial promise have been overlooked by private enterprise; but private industry has no incentive to develop submarginal or even marginal ores. It is known that some large deposits of this character have been explored only superficially, and it is probable that there are many others. Deliberate investigation of these deposits, while time permits thorough exploration and the development of methods best suited to their beneficiation and processing, will save much confusion, inefficiency, and waste of time and money in the actual event of a national emergency.

In some circumstances even negative results of investigations would prove of great value because definite proof that specific deposits could not be relied upon as sources of supply at any price would aid in determining what should be stocked in advance of an emergency and also to show what research for the development of substitutes is necessary. Insistence of owners that certain deposits contain large resources, in spite of virtual proof to the contrary, has created in some minds a false sense of security regarding emergency protection. Some properties of this kind will doubtless require investigation now in order that in an actual emergency the facts in regard to them may be well understood.

In effect, the Government desires to know definitely its natural resources of the several strategic minerals—the tonnage, grade, quality and rate at which production can be maintained—as well as the cost of mining and beneficiating the minerals to provide a usable product. Such information is obviously necessary for intelligent planning of national defense and meeting industrial needs if our usual supplies of imported minerals should be cut off through interruption of sea-borne trade.

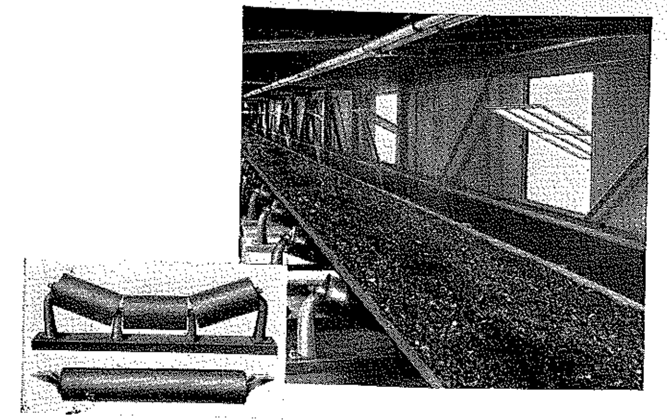
Sedimentation Studies—

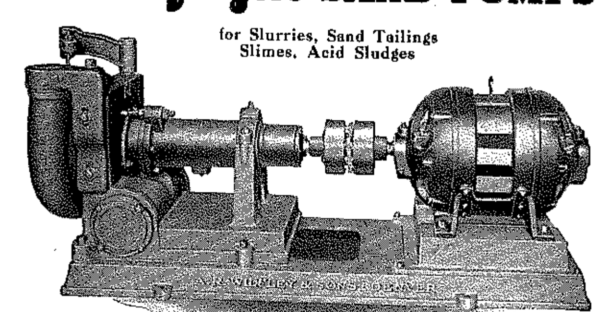
(Continued from page 29)

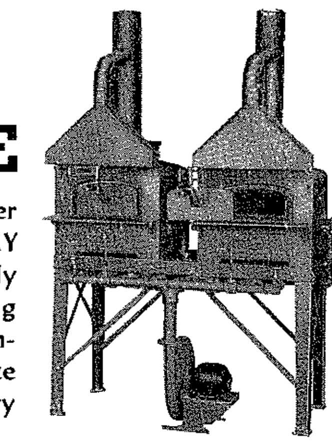
cup. It is merely necessary to count the number of cups bearing lake sediment to obtain a measurement of the thickness. Distinction between old soil and lake deposits generally depends upon comparative softness and lack of grit in the deposits. Often there is a marked difference in color.

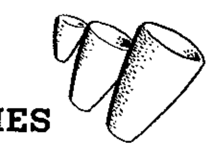
In a reservoir survey, as in a valley survey, the thickness determinations are made along range lines and the surface profile of the deposit is obtained by sounding. If no base map is available, an accurate triangulation net is established and the shore line is mapped. The ranges are tied into this map. All measurements of water depth, sediment depth, and surface areas are made with a high degree of accuracy.

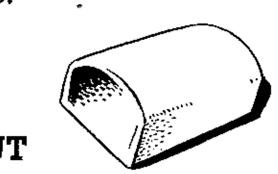
INDEX TO ADVERTISERS

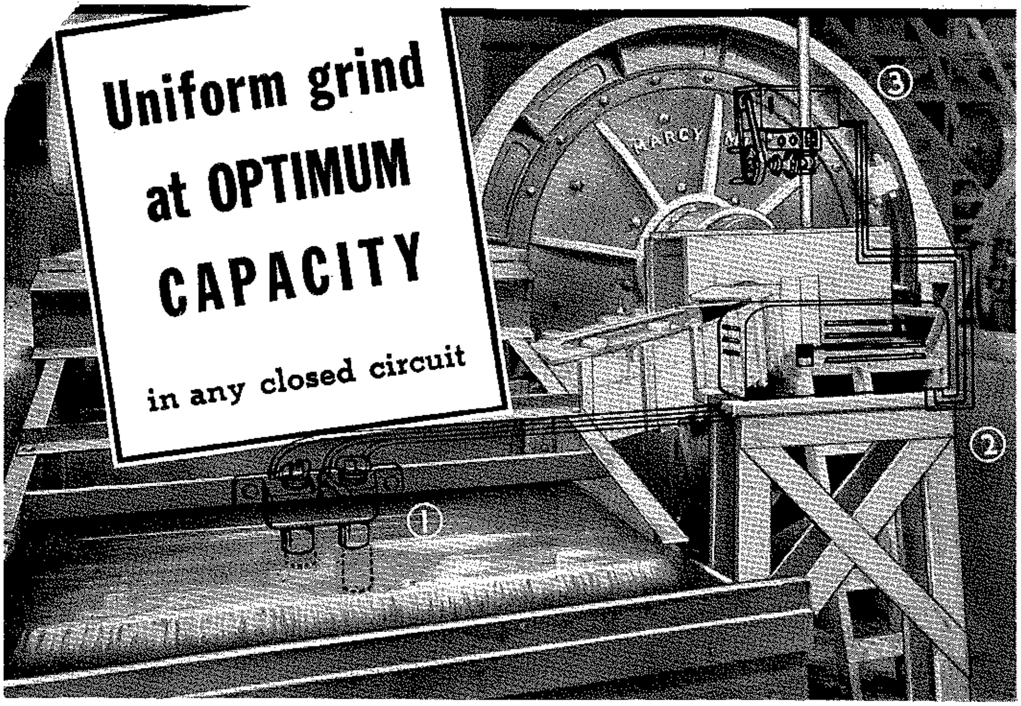


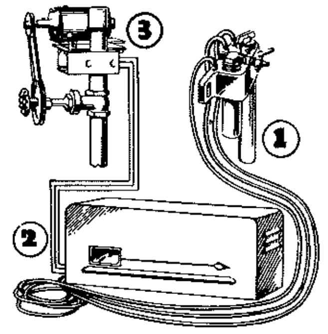












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3. Dilution controller with motor, which opens and closes water valve.

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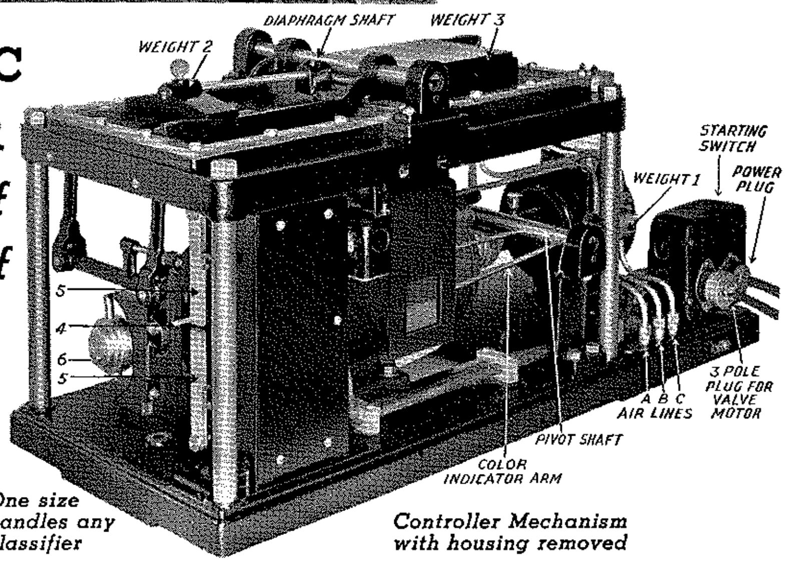

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