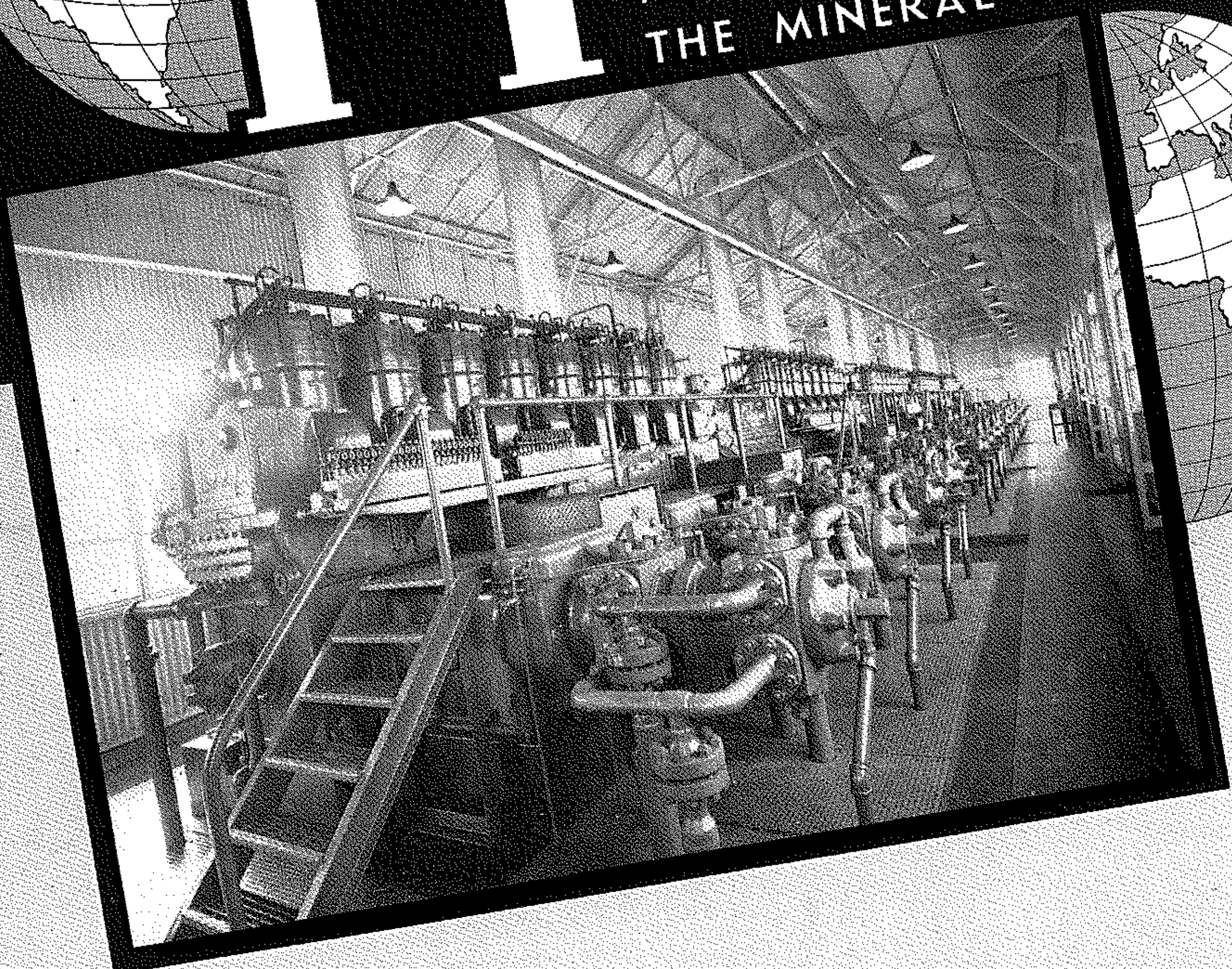
THE MINES MAGAZINE

AROUND THE WORLD WITH THE MINERAL INDUSTRIES



JUNE · 1940

VOLUME XXX NO. 6

Letters

*Your letters are welcomed for publication in this column every issue. Send along your bouquets, your suggestions, your news, your problems, your criticisms. You like to read them and so do others. These are a good start, let's hear from others.—*ED.

FAVORABLE COMMENTS

From W. M. HART

Copy of May just came. It's a beauty! You've stepped up the tempo, and I'll be amazed if everyone doesn't go for the new format 100%! The copy is certainly interesting to me, and should appeal to all . . .
Manufacturers Building, York, Pennsylvania.

A RECORD FOR OUR READERS

From F. B. GARRAHAN

On April 15th the Carlton Tunnel was advanced 74 feet in 24 hours which is undoubtedly also a world's record . . . As of April 21st the tunnel has been advanced 13,600 feet in approximately nine months . . . The enclosed photograph shows a Model 21 Eimco-Finlay Loader operating in this tunnel, with which 8 foot rounds (10'x11' section) are mucked out in 50 to 60 minutes.

We would appreciate your giving this remarkable achievement adequate mention in your editorial columns . . .
EIMCO Corporation, Salt Lake City, Utah.

VALUE NEW EQUIPMENT AND CATALOG NEWS

From DORR COMPANY

We are enclosing, for your review, copies of the following two recent bulletins of ours, in case you care to mention them in that section of your publication which relates to new equipment and manufacturers . . .
570 Lexington Ave., New York.

MANY ARTICLES OF INTEREST

From CLARK GROVE

I wish to compliment you on the fine job you are doing with Mines Magazine. Even though my work confines me largely to the Eastern Seaboard, I find many articles of real interest, and through the magazine I have been able to keep posted on the activities of many old friends and acquaintances.
Mining & Industrial Equipment, 330 West 42nd Street, New York.

O. K. MINERS

From F. F. (BUD) SEEBURGER IV

I know I should have belonged all these years, five of them. Did for a year in San Francisco. The answer, of course, is "No excuse, sirs!"

Saw Major F. M. S. Johnson in Boston last month. He is still, as he always has been, one of the best Miners *Mines* ever had. He's a very busy man, with his duties as 1st Corps area

(Continued on page 290)

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(Continued on page 290)

PERSONAL NOTES

George Adams, '36, engineer for the Riverside Cement Company, resides at 5668 Grand Avenue, Riverside, Calif.

Warren Adams, '25, is now residing in Washington, D. C., in the Lindberg Apartments, 200 Massachusetts Ave., N. W.

Frank D. Aller, '92, and Mrs. Aller have returned to their home in Golden to reside where their new address is 1218-16th Street.

A. A. Bakewell, Jr., '38, is associated with the Standard Cyaniding Company at Lovelock, Nevada.

Bradford E. Bailey, '37, who is in the Process Laboratory of the Standard Oil Development Company, moved his residence recently to 43 Bellwood Place, Elizabeth, N. J.

B. M. Bench, '30, is being addressed temporarily in care of U. G. Bench, 6935 Crandon Avenue, Chicago, Ills.

Gary Block, '08, mining engineer of Prescott, Arizona, has gone to Venezuela to take charge of a gold mine at Gausipatti for the Goldfield Consolidated Company.

James A. Bowler, '39, is metallurgical accountant for Phelps Dodge Corporation with address Box 1033, Morenci, Arizona.

M. E. Bunger, '09, senior engineer with the U. S. Bureau of Reclamation, is at present in Phoenix, Arizona, receiving mail thru General Delivery.

John J. Christmann, Jr., '36, resigned his position as petroleum engineer with the state of Michigan and is establishing himself as a consulting geologist and petroleum engineer in Lubbock, Texas. His temporary address there is 2416-16th Street.

Harry E. Coppin, '37, who has been leasing in Victor, Colorado, is at present in Denver, 1727 West 34th Avenue.

Allen S. Crowley, '39, sales engineer for Gardner-Denver Company, has been transferred to Atlanta, Georgia, where he is addressed in care of the company, 332 Whitehall St., S. W.

C. W. Desgrey, '26, has been transferred by the U. S. Gypsum Company to their Jacksonville plant as Works Manager. His new address is Box 3197, Jacksonville, Florida.

Van W. Donohoo, Jr., '39, is now being addressed in care of Phillips Petroleum Company, Box 801, Station A, New Orleans, La.

C. T. Draney, '32, engineer for Bechtel-McCone-Parsons Corp., Consulting and Contracting Engineers, is back in Los Angeles from a trip to the Northwest, where he is being addressed at 601 West 5th Street.

Melvin Evans, '37, has been transferred to the Research department of Phillips Petroleum Company and is residing at 1017 Keeler Street, Bartlesville, Okla.

Kirk Forcade, '36, geologist for Phillips Petroleum Company, is receiving mail at present thru Box 315, Auburn, Nebraska.

V. G. Gabriel, D.Sc., '33, consulting geologist and geophysicist has as his permanent address 290 So. Michigan Ave., Pasadena, Calif.

H. A. Goddard, '25, superintendent, Industrial Sales, Pittsburgh Division, Gulf Oil Corporation, has a change of residence to 125 E. Marlin Drive, Pittsburgh, 16, Pa.

Edward T. Hager, '12, mining engineer for The Carborundum Company resides at 627 Fourth Street, Niagara Falls, N. Y.

John E. Hatch, '36, is in the metallurgical department of the Youngstown Sheet & Tube Company and receives mail R. D. 4, Mathews Road, Youngstown, Ohio.

F. E. Heatley, '15, consulting geologist and geophysicist, is addressed at the Elks Club, San Antonio, Texas.

W. I. Ingham, M.Sc., '34, has moved his headquarters as consulting geologist from Greenville, Kentucky to Tulsa, Oklahoma. His address there is 1501 So. Jamestown Avenue.

Robert B. Kennedy, '38, process engineer for the Magnolia Petroleum Company, has a new address, 1980 Wall Street, Beaumont, Texas.

A. S. MacArthur, '27, recently accepted position with the Continental Mining Corporation with headquarters in Denver. He is being addressed at 1565 Lafayette Street, Apt. 10.

Harley J. McDonald, '39, in the metallurgical department of the Carnegie-Illinois Steel Corporation, resides at 1208 Milton Avenue, Regent Square, Pittsburgh, Pa.

Harry J. McMichael, '39, recently accepted position as junior metallurgical engineer with the Chile Exploration Company at Chuquicamata, Chile, S. A.

C. R. Madebach, '39, is employed as assistant metallurgist in the research laboratory of the Phosphate Recovery Corporation, Mulberry, Florida. His address there is Box 463.

R. E. Metzger, '34, has been transferred by The New Jersey Zinc Company to the Personnel department of their manufacturing plant at Palmerton, Penna. He is being addressed at Horse Head Inn, Palmerton.

James S. Miller, '37, is engineer for the Black Hawk Consolidated Mining Company at Mogollon, New Mexico.

H. L. Minister, '16, representative for the Rocky Mountain region for McGraw-Hill publications, recently moved into a new home, 1188 Hudson Street, Denver.

Donald M. Morrison, '35, is assistant to the assistant superintendent of Blast Furnace department, Carnegie-Illinois Steel Corporation and resides at 1741 E. 73rd Place, Chicago, Ills.

Maurice Naftaly, '38, writes that since his return to the Philippines in January 1939 he has been mill shift foreman for the San Mauricio Mining Company at Jose Panganiban, Camarines Norte.

E. R. Pedersen, '39, is in British East Africa as mining engineer for the New Saza Mine at Chunya, Tanganyika.

Edmund F. Peterson, Jr., '37, has completed his contract with Braden Copper Company and sailed the early part of this month for the States. Mail sent to his home, 721 South 11th Street, Muskogee, Okla., will reach him.

G. R. Plumb, '29, is engaged in mining in British Columbia where he receives mail in care of Walter W. Johnson Co., Atlin, B. C., Canada.

Charles E. Prior, '13, who recently returned to North America from Australia has a new address, 4725 Connaught Drive, Vancouver, B. C., Canada.

Karl W. (Porky) Reynolds, '20, has recovered from the automobile accident of last September in which he lost his left arm just above the elbow. He has returned to his office at 1038 Kennedy Building, Tulsa, Okla.

Oscar Reynolds, Ex-'04, Consulting Engineer, is being addressed at present at Box 1565, Bakersfield, Calif.

M. J. Rosenthal, '34, is now in Casper as Chief Engineer for the Liquid Gas, Inc.

(Continued on page 328)

PRIZE OFFER

Check the errors found in Mines Magazine as you read it. The reader reporting the most errors receives FREE one year's subscription to the magazine. The winner will be announced in the magazine the second month after publication. Send list of errors to Mines Magazine, 734 Cooper Building, Denver, Colorado.

(Continued from page 287)

engineer. As busy as he is he still had time to talk to a Miner for a few hours.

A little case of history for your records to show that regardless of a man's ability, if he has enough to graduate from the Colorado School of Mines, he can get places in this old world—

Three years I was at the Selby Plant of the American Smelting and Refining Company; hard work, but fun.

To the Air Corps Training Center in October 1938. Five months on "A Stage" as a Dodo (a bird with wings that doesn't fly); a Dodo, in fact, until soloing on the 23rd of November, 1938. Three months on "B Stage" flying B T 9s. From Randolph to Kelly, the advance flying school, for three more months, flying B C 1s and B T 2s. Graduated from Kelly, August 26, 1939 and commissioned as a second lieutenant in the Air Corps Reserve. Stationed at Langley Field, September 12, 1939. Co-pilot on B 18s, B 19as, B 17s and B 17 Bs. Pilot on all single engined ships of the 2nd Bomb Group, G H Q Air Force.

The first opportunity to take a competitive exam for a commission in the regular Army came in February of this year. The results were published in April. Because of the School I went to, the best in the world, and a few other minor reasons, I made the grade. I am now Lt. F. F. Seeburger, IV, Air Corps, U. S. Army. Going to *Mines* has helped me all along the line but most here, I believe. Not only in making it easier to pass the exams in Engines and Navigation but also in that forms submitted for application to take the exams include a photostat of college degree. The Board members say, "Hmm, good school!" when they see that.

If I behave myself, I'll be in the Army as long as the legs kick or have enough strength left to push right rudder on take-off. It's a good life. Any of the fellows just getting out of School that haven't something good lined up should look into it.

One more bit for the records—Major Mileau's daughter, Marie Louise, will be Mrs. F. F. the IV on the 20th of June, this year.

I haven't given up the profession, flying is less than half of being in the Air Corps. I'm assistant engineering officer of my squadron, the 20th. Some day I hope to be stationed at Wright Field, the Air Corps experimental, research and testing department. There's real engineering going on up there, metallurgy a big part of it, so maybe you can send that good Magazine to me there in the future.

If Ronald K. DeFord or Dean Morgan had to dig thru this grammar, they'd recall my degree! My regards to the Dean, anyway, Doc Howe too.

If you like it, there are few things better than being allowed to fly.

Langley Field, Virginia, May 15, 1940.

BOOK SERVICE USEFUL

The extracts from letters listed below indicate that many find our book service useful. Letters are widely distributed. If you want a book covering a special subject, let us get it for you. ED.

From WASHINGTON

. . . I note that "Technical Methods of Ore Analysis" by Weinig and Schorder is now available, so will you kindly mail me a copy. Enclosed find check for $4.00 . . .

From COLORADO

. . . Please ship us one book "Geology of Petroleum"—Emmons, one book, "Geologic Structures"—Willis, total $10.00 . . .

From OREGON

. . . send me one copy "Examination of Placer Deposits" by Graves, $3.00, also one copy of "Peele's Mining Engineers Handbook" in one volume, $10.00 . . .

From ARKANSAS

. . . Enclosed please find $2.00 for which please send me, "Minerals and How to Study Them," Dana . . .

From IDAHO

. . . find my check for $4.00. Please send me a copy of, "Mine Accounting and Costs Principles," McGrath.

From CALIFORNIA

. . . send C. O. D. to the above address your selection of the best book and latest on Blowpipe Analysis, not more than $4.00 . . .

From NEW ORLEANS, LA.

. . . enclosed U. S. Postal order for $5.00 for which send a copy of "The Electric Furnace," Stansfield . . .

From OHIO

. . . send me the following: "Butler's Crystallography, Minerals, and Analysis," Emmon's "Geology of Petroleum," check for $10.00 enclosed . . .

From MEXICO

. . . send me the following two books, "Mineral Deposits"—Lindgren, "Mineralogy," Kraus & Hunt, enclosed my check for $11.50 to cover . . .

From WYOMING

. . . can you recommend anything as additive or progressive on Quantum Mechanics, further than Lewis and Randall? You may send collect treatise on Laplaces equation—Vector Quantities and the work of Gibbs (1839-1903 Yale) . . .

The Mines Magazine

VOLUME XXX | JUNE, 1940 | NO. 6

Contents

Departments

Front Cover

4000 H.P. Compressor Installation of The Coastal Recycling Corporation project in the Agua Dulce field, Nueces County, Texas, the world's largest high pressure Condensate Recovery and Pressure Maintenance Plant. This Plant was designed to process 128,000,000 cu. ft. of gas per day from 12,000 acres, gathering gas at 2000 lb. pressure, recovering gasoline at 1500 lb. pressure and returning the stripped gas to the underground formation at 2500 lb. pressure. The Stearns-Roger Manufacturing Company, Denver, Colorado, designed, fabricated, furnished and installed all material for the entire project on a turn key basis.

INDEX TO ADVERTISERS SEE PAGE 330

Official Organ of the Colorado School of Mines Alumni Association. Copyright 1940. 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 Frank J. Nagel, Secretary, 734 Cooper Bldg., Denver, Colo. Address all correspondence relating to Mines Magazine to Frank C. Bowman, Editor, 734 Cooper Building, Denver, Colo.

THERE IS PLENTY OF ROOM AT THE TOP

By
CHARLES ARTHUR BANKS
Vancouver, British Columbia

I look upon it as a very great honour to be selected to give this, the 66th Commencement Address, particularly as this institution, which came into being over 60 years ago, is one of the best equipped and, in many ways, the finest mining college in the world today. Little wonder is it that the Colorado School of Mines is so well known, for its students have found their way into high positions in all the important mining fields throughout the world. Wherever I travel, I seem to run into American mining engineers, and this is particularly so throughout the British Empire which is so closely connected with the United States in its ideals and love of freedom for the individual, and where the American engineer has always been welcome.

Not only do the American engineers take their place with British engineers in the development and management of mines in South Africa, Canada, Australia and in other parts of our Empire, but they quite rightly interest themselves in the Mining Societies of the Empire—I might say that, several years ago, an American mining engineer residing in London was President of the Institution of Mining & Metallurgy while, at the present time, an American is the President of the Australian Institute of Mining Engineers. Your ex-President, Mr. Herbert Hoover, as you must be well aware, spent a great part of his mining life in the British Empire, first going as a young engineer to Western Australia, and later settling in London, where he became extensively interested in British Mining Companies operating within the Empire, and in other parts of the world. So many American mining engineers have worked in the British Empire that one wonders what we should have done without them and, conversely, how they would have fared without the British mines.

*Commencement address, Colorado School of Mines, May 24th, 1940.

CHARLES ARTHUR BANKS

Of course, there are important mining fields outside the United States and the Empire, but it is a fact that the great majority of your engineers who have gone abroad, have gone to British countries, or else to British companies, and I sincerely hope that it will remain this way, for your sakes as well as ours, for it serves to create an accord and understanding between our countries, the benefit of which can hardly be over-estimated.

Just now, with the British Empire and, indeed the greater part of the world, at war, we all do some wondering as to what our future will be, and how our living and work may be affected by the momentous events that are taking place today. One thing, however, seems certain — whatever happens—the requirements for metals and minerals will not decrease. During the past 40 years, that is from the commencement of this century, the world has used more of its mineral resources than in the whole of its previous history and, as the production curve throughout these 40 years has risen more or less steadily, everything points to there being a continued and increasing demand for the trained mining engineer.

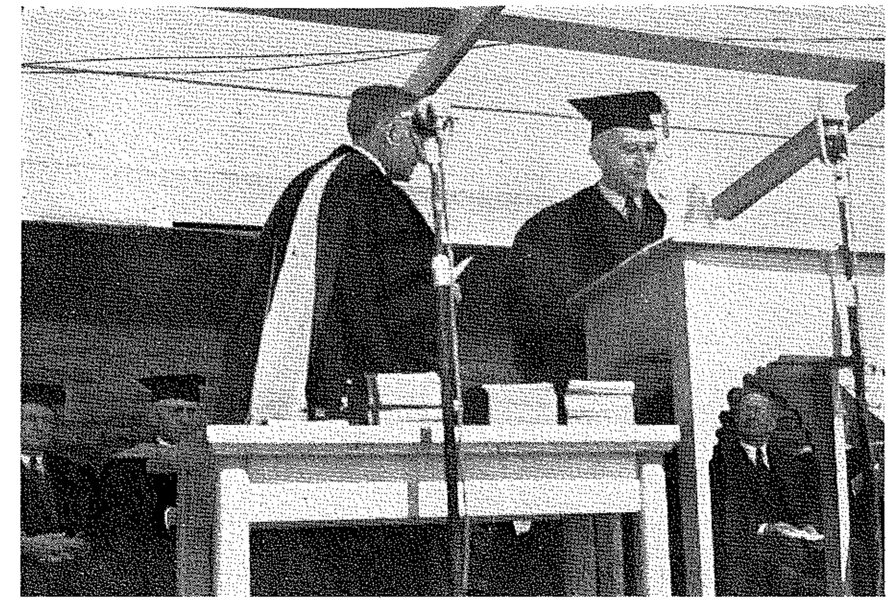
You, therefore, seem to have chosen a profession which appears to have lots of scope for your efforts and, furthermore, I can think of no finer career for a man who likes engineering, who has character, ability and ambition, who wishes to see the world, likes a sense of adventure in his work, and is prepared to sacrifice some of the security which he might have in certain other professions, for the many advantages that the mining profession has to offer.

From my experience to date, I find it comparatively easy to obtain engineers for the minor and middle positions, but often extremely difficult to find the right type of experienced broad-gauge engineer for the higher positions which are constantly becoming open and, in view of this, my message to you today, if I may put it that way, is *There is Plenty of Room at the Top.*

Men are not equal by any means, and no matter how some may work and plod, they are able to get only so far, while others will continue up the ladder and reach the top. The field of the mining engineer is so wide and varied that there is no set formula for reaching this goal, but I will try and give you a few of my ideas that I hope may help you along the road.

It is possible that some of you may drop out of mining at an early date, because something has cropped up which seems to offer better prospects, for one reason or another, and in this case, the education which you have received here will, I am sure, stand you in good stead in whatever field of endeavour you should happen to follow. However, the majority of you will follow the mining profession, and many of you will come to the top and hold important positions throughout the world.

You will have to decide sooner or later whether you wish to become a specialist in some particular branch of the industry, but I think it would be wise for you to leave this decision for awhile, and even for some years, until you have had some general experience, which will stand you in good stead in any event, and you are in a better position to make this important decision. In a general way, I would say that the



▾ President M. F. Coolbaugh, Charles A. Banks

progress of the specialist is more rapid to start with; however, there is a ceiling to his advancement, whereas the engineer who follows the profession in a general and wider way is more likely to reach the higher positions.

Let me first impress upon you that, in leaving college, you have not in any way finished with your studies; it is essential that you keep your technical knowledge fully up-to-date by studying mining magazines, discussing mining matters with your associates, and following the papers of the mining institutions, or societies, to which you may belong. This, however, is not in itself enough. It is extremely important that you build up your knowledge of affairs in general, by reading, by associating with people outside your own line of business, and by taking a lively interest in the work of others. I would say that a good general knowledge, such as this, is essential to the mining engineer and will be found to be of increasing value, as he progresses in his calling—without it, your friends outside your particular line of business and who you will have to meet in a business and social way, may think that you are possibly a very fine engineer, but are a first class bore. This general knowledge of people and affairs develops your personality, which is so helpful to the successful man in all lines of endeavour.

I would also advise that you take up one or two foreign languages in your spare time, for in traveling and working in foreign countries, as a successful mining engineer does to a great extent, you may be at a great disadvantage if you have to rely entirely on English. I should think Spanish and French would be the most helpful to you.

There is another important matter which I should mention. If you have a flair for business, you should follow it up in a general way, as a good business knowledge is likely to be increasingly useful to you later on; in fact, it is an asset to the broad-gauge engineer, the value of which can hardly be over-estimated. If I were asked to recommend a man to take charge of a large mine, or mining organization, I would endeavour to select a thoroughly capable engineer, who also has a good sound knowledge of business—should such a person not be available, however, I would most certainly choose a business man of the right type, rather than a mining engineer with no knowledge of business. I am speaking now of a manager for a large mining operation—for the small property, or mine, of course, it does not matter so much. Again, more and more mining engineers are finding their way to the Boards of mining companies, which seems to me to be a very good thing, both for the mining profession and the investing public. The engineer most suitable for such positions is, again, of course, the one with business ability.

The successful mining engineer must be a good judge of men, as on this will depend the quality of his staff and, to a large extent, the success of his operations. In the higher positions which you will occupy, as you advance in your profession, it will pay you to see that all work which can be suitably handled by members of your staff, be taken care of in that way, so that you, yourself, are left as free as possible to tackle the larger problems that will arise from time to time, and which are apart from the general routine. The good executive engineer is usually a man who keeps his desk more or less clear, who gets to know his staff, and who is always ready and willing to give time to important visitors as they come along.

We have all heard the expression, "an engineer cannot be too conservative." I am afraid I disagree with this idea; an engineer should be conservative up to a point, but I know of cases where valuable properties have been lost because the engineer, in his report, put insufficient weight on the development possibilities of the property—in other words, he lacked vision. In a particular case which I have in mind, the engineer's report quite unfairly limited the possibilities of the property to the developed ore, or at least put little weight on development possibilities. The property was considered to be too small by the engineer's principles, who decided against acquiring it. It was subsequently purchased by other interests, and became an important mining operation which has yielded handsome profits for the past thirty years, or thereabouts, and I might say that it is still giving a good account of itself. An engineer's report should state the facts, as far as he can judge them, regarding the ore in sight, its metal content, profit value and so on, and views as to the development of additional ore; and, also, where it would be a factor, the possibility of acquiring additional nearby property to add to the development possibilities of the undertaking.

Sometimes a mining property is turned down because there is no known method of treating the ore—sooner or later, however, and, if the orebody should prove to be of sufficient size and value to warrant the necessary metallurgical research, a method of treatment will almost certainly be found; in such cases and, dependent upon the requirements of the company considering the business, the property might be worth purchasing (provided the terms are suitable) in expectation of a method of treatment being worked out later.

When writing reports, my suggestion is that you make them as brief as possible, so long as all the essential points are covered—executive engineers tire of reading long winded reports, especially when they are of a negative nature which, unfortunately, they usually are.

I must impress upon you that a high ethical standard is required in all your work; situations arise when you will wonder just what is the right thing to do. For instance, you may be asked for information regarding a property on which you have reported for other people. The information contained in that report would ordinarily belong to your former employer and, without his authority, you have no right to pass it on to others; however, your former employer may have passed away, or the company for which you reported may have become non-existent, and you are unable to get permission to use the data. In a case of this kind, and on other occasions when you are doubtful as to how you should act, you might discuss matters with a senior engineer, or perhaps refer the question to your mining institution or society. In most cases, however, you will not go very far wrong if you take the advice of Gemmini Cricket—"Let your conscience be your guide." Mining engineering is a great test of character. You must be prepared to face and overcome difficulties, and to accept disappointments which are bound to come from time to time; also, it is just as important that you keep your head when success comes your way. A good thing to bear in mind is that things are seldom quite as bad, or quite as good, as they may at first seem.

Opportunity and luck may play an important part in your future. You must watch out for the former and recognize and grasp it when it comes along. There will be times when you are at a division of the road and when each seems to offer equally good opportunities. You then have a difficult decision to make—not so much in your earlier years perhaps, when you can look upon everything you tackle as a widening of your experience, but most important later on, when each step that you take should, as far as possible, be in the right direction and up the ladder. One road leads to success and the other perhaps to failure—one may lead you to the management of a small mine, or one that, with great difficulty, and only the best possible management can be made to show a profit, while the other may take you to the management of a mine making record dividends, and one that will enhance your reputation, at least with the outside world. This is the luck of the game, of course, and if good fortune should tap you on the shoulder and lead you to the management of a rich property, do not sit smugly in your position and be satisfied with the large profits being won; but rather see to it that you are operating your property without waste and to the best possible advantage; you will otherwise be a bad manager, in spite of the dividends and outside opinions. I call to mind a case of this kind—I was visiting a property which was making record profits and, when I pointed out to the manager that the mill tailings seemed to be unnecessarily high, he replied "Well, after all, look at the huge profits we are making; we probably are losing in the tailings some recoverable values, but that doesn't matter very much." Actually, it takes a good engineer to operate the poor, or marginal, mine, while an indifferent manager can hardly fail to make a success of the good one.

While your profession is an intensely interesting one, it also offers lots of excitement and often a good deal of romance. I can think of few greater thrills than the striking of a rich orebody underground after months, and perhaps years, of disappointment; or the bringing in of an oil well. These are thrills which some of you will experience, and which will be an offset against the disappointments which you are bound to have at times.

In addition to the thrills there is the romantic side of your profession but, before I speak of this, let me say a few words regarding romance of a more personal character, and of which most of you have, no doubt, already had thoughts. One of the most important decisions of every man's life is, of course, his choice of a life partner. To the mining engineer, however, this is a particularly important matter for, in his younger days, he will probably be living in small mining towns, while later, and if he is successful, he will most likely reside in some of the large cities. In the small mining community, the right type of wife can be of very great assistance to her engineer husband, in helping to promote harmony and good relations between the employees in the camp; while the wrong kind might stir up trouble that would jeopardize her husband's position—this latter statement is no exaggeration whatever. In later years, your partner, if she is the right one, will be a great help to you and will assist in maintaining contacts, which may be of considerable importance to you in your wider field of engineering endeavour. So, you see, this question of selecting a partner is, as I stated above, going to be a very important decision on your part—good luck to you all in making it, and may you be as fortunate in your choice as I have been.

Now there is the romance which comes to you in your engineering work and, in this connection, I can hardly do better than tell you of a few of my own experiences.

Some years ago, I became associated in a small way with an American mining engineer who had obtained a gold mining concession in Arabia, from King Saudi. If you proceed about half way up the Red Sea from Aden and then get off the boat, on the Arabian side, and travel 200 miles inland from the coast, you will reach the concession by a recently built road which skirts the sacred City of Mecca. On the area is a pile of tailings of several hundred thousand tons, resulting from the operation several thousand years ago of a gold quartz lode. In the vicinity are a number of stone grinding discs which were used perhaps by the slaves of King Solomon, for grinding the quartz which was obtained by underhand stoping from a nearby orebody. The gold was recovered by some method of crude concentration which left substantial value in the tailings. The orebody has now been developed, and today a modern mill handling several hundred tons daily, of ore and tailings, is in operation. To be associated with a discovery, or operation, of this kind is full of interest, as you can imagine.

I am directly associated with gold dredging on a large scale in Colombia, South America, in districts where the Spaniards mined alluvial gold, to shallow depths, some hundreds of years ago. On these areas we find, not only gold ornaments which were buried with the people in those days but, if you please, fish hooks made of gold. The latter were probably made and used thousands of years ago by the natives who, at that time, had no other metal from which to make their hooks; these hooks, I might say, are precisely the same shape as the fish hooks in use today, excepting that there is no barb. The fineness of the gold is about 700, and the base in the metal is sufficient to give the required hardness.

Then there is the development during the past 10 or 11 years of the Bulolo Gold Dredging area, in the Mandated Territory of New Guinea, and with which I have been so closely connected from the outset. The interior of New Guinea is inhabited almost entirely by cannibals who, I am glad to say, have changed their diet of recent years, at least so far as our native employees are concerned. However, further inland, the natives are still living in the stone age, and still practicing cannibalism. Gold to these people had no special value, their medium of exchange being shell money with which they could purchase a wife, or even a pig. They live in tribes and when the tribal chief dies certain words of their language die with him and, for this reason, the language of each tribe is constantly changing. Inter-tribally they speak pidgeon English, which consists largely of words picked up by the coastal tribes from the early British traders —a bicycle, for instance, is a "machine walkabout," while a motor car becomes "steam-boat belong bush." A piano would be described as a "bid fella bockus, you fight him teeth, he cry," and so on. Many of their words

(Continued on page 325)

THE DIAMONDS OF BRAZIL

By
ALLAN CAPLAN, EX-'41
Mineralogist and Gem Broker, New York, N. Y.

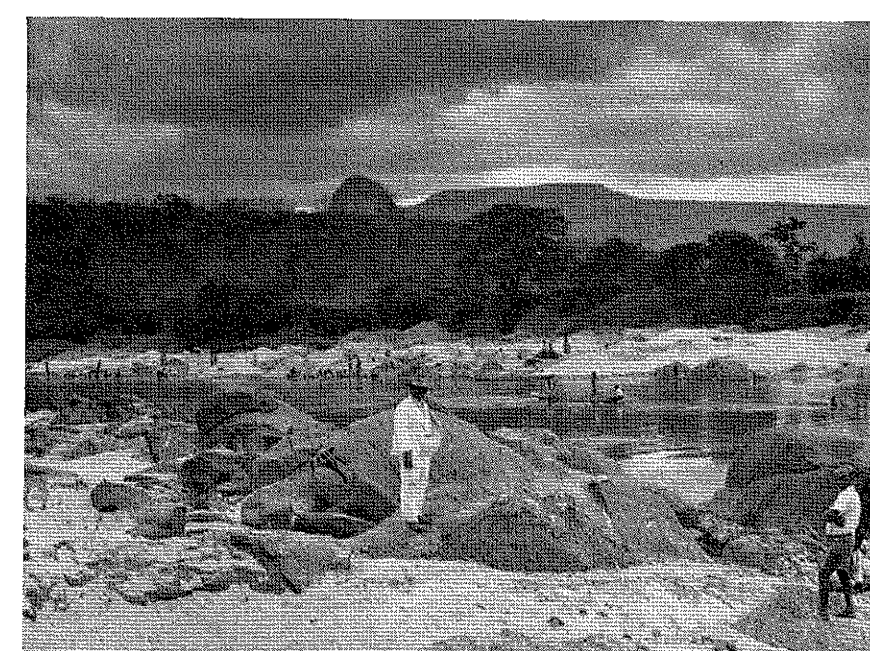
Since the discovery of diamonds by native gold hunters of 1725 in the central elevated regions of Brazil over 15,000,000 carats of stones have been acquired from the river gravels. Before this discovery, the ancient mines of India were worked for centuries; and for this reason, the properties of the Maharajahs were gradually producing less. The discovery of the Brazilian fields was a boon to the industry, even in those days, as the gems found their way into the regal European treasures. In 1870, however, the great fields of South Africa were opened to the world; and the diamonds began to pour upon the market. The production outdid the consumption and the value of the stones took a sharp drop.

The South African mines are concentrated in comparatively small areas; and because of this, the organization of a syndicate to monopolize the production to stabilize the value of the diamond was possible. As a result, the diamond-producing properties are now owned by the British syndicate. The group of financiers operate the primary deposits, but the secondary deposits or placers are generally leased to private parties or small companies and the entire output is purchased by agents of the syndicate. In contrast, the Brazilian fields are spotted over an area of five states, one of which is easily greater than New England. The production in this country depends upon thousands of native panners known as garimpeiros who work the rivers without cooperation or system, making the yield from Brazil much smaller than it actually should be. At the present time, approximately $6,000,000 worth of rough diamonds are found each year. This is only 3 per cent of the world production which is a great contrast to the 90 per cent produced by South Africa.

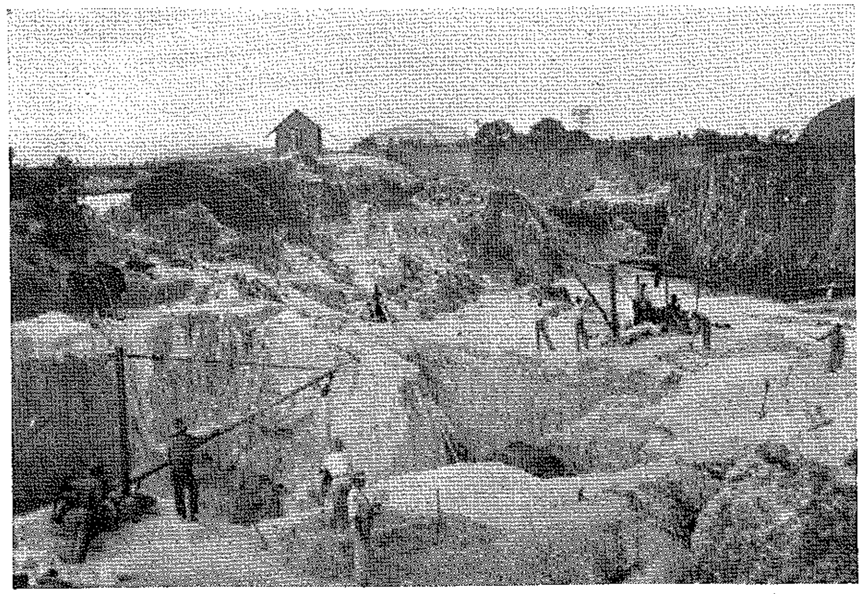
Brazilian diamonds are desirable both in the gem business and the commercial industries. They are generally harder than stones from other parts of the world; and therefore, the gems have a more brilliant lustre when polished. On the other hand, the borts are much more durable and withstand more abuse than other diamonds. Numerous stones of great size have been discovered in the northwestern part of Minas Geraes which is at the present time an active producing region. Last year the "President Getulio Vargas" stone, the third largest rough diamond in existence was found with a weight of 725.60 carats, slightly larger than the famous Jonker diamond.

In general, the diamond-mining regions of Brazil are in an ancient rolling country often sparsely covered with vegetation. The larger rivers which drain considerable area cut through hills and flow through rich agricultural valleys. In the rainy seasons from October to April, they are fast and deep in contrast to the shallow streams which exist in the dry periods of the year. (Fig. 1) The climate is healthful and dry during the rainless months; but during the rains, the regions become sultry and occasionally infested with malaria. The natives are easy-going and independent but persistent workers. They are a mixed strain of white, negro and Indian blood, and for the most part are very good-natured.

The method of mining for diamonds somewhat resembles the gold washing of our own West. The diamonds are found in a conglomerate deposit which rests upon bed rock. The technique is to work in the river bed during the dry season, digging through the sand to the diamond-bearing layer, which may range from an inch to a foot in thickness. This material which is well-cemented with sand and limonite is known as "canga". The material is broken with a hammer and passed through a series of screens and later washed. The diamonds, if present, are found with a beanlike concentrate of rutile magnetite, hemetite and other heavy minerals including gold. To find the



▼ Fig. 1. Rio Santo Antonio during dry season.



▼Fig. 2. Diamond Mining on pipe formation near Diamontina.

canga formation does not guarantee the presence of diamonds, nor do the diamonds necessarily have to be found in the conglomerate. In most instances, however, the canga is the actual diamondiferous material. The garimpeiro works with his shovel and bateau and digs a pit in a likely spot, trusting to luck that the place will reward his efforts.

The types of diamond gravels are known as river, valley, and plateau deposits. The river deposits are the most profitable of the three to work since the diamonds are more abundant. Giant potholes and old channels cut in the river bed sometimes yield thousands of carats. In a small hollow of the junction between the Rio Ribeiro do Inferno and the Rio Jequetinhona near Diamantina 8,000 to 10,000 carats were revealed in a short time; yet, the neighboring section of the river was very poor and did not yield much in diamonds. It is in larger operations when the entire course of a stream is diverted that greater quantities are procured from the river beds. The river diamonds are generally well water worn, and decrease in size and number as the stream flows away from the plateau areas.

The valley gravels are not as rich as the river deposits, although the diamonds are less water worn. The beds are nothing but remnants of an old stream bed which have been preserved as terraces, resulting from stream rejuvenation. Because of the infrequent presence of diamonds, the valley beds are not worked with great success.

Most interesting yet least of all in importance are the plateau deposits. In some respects the topography resembles a dissected penaplain, causing the plateaus to be ancient terraces. Here, diamonds are larger and well crystallized, being embedded in a broken conglomerated mass strongly cemented with hard limonite. Although the deposit is definitely secondary, the diamonds show slight evidence of river action. The deposits, which are variable in thickness, rest upon bedrock. Erosion has been active on the elevated beds for ages, causing the formation to be extremely spotted. Without any doubt, the diamonds of both the valley and stream deposits have originated from the erosion of the much older elevated plateau deposits. To account for the origin, the source rocks of this oldest deposit constitute a problem far from being solved.

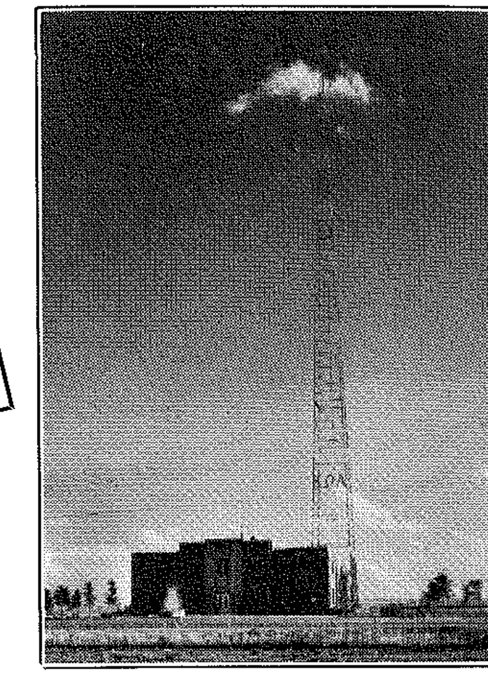
A strange deposit exists in the region of Grao Mogol, 180 miles north of Diamantina. Diamonds occur in a white laminated sandstone of the Itocolume formation interbedded with Silurian limestone. The lamination is caused by scales of mica, sometimes so constructed as to cause flexible sandstone known as "Itocolumite". This sandstone, which is more like a quartzite in texture, varies considerably and often resembles a fine conglomerate. Because of the age of the beds, early geologists believed that it was the source of diamonds, but the evidence of well water-worn diamonds in the sandstone is proof enough that they were laid down with the grains of sand. Rarely are the diamonds large or of fine quality; they are more often small borts. The manner of extracting the stones is simply to shatter the sandstone by a blast and to seek the prize. The amount of diamonds secured in this manner is very slight; the greater supply is obtained by working the near-by stream for eroded stones.

Some evidence as to the origin of the river-diamonds has been found, but it is not definitely convincing. In some localities in the vicinity of Diamantina, diamonds are found in variously colored clays, with other minerals interbedded with the quartzite. These strata are cut with veinlets of quartz which contain small crystals of titanite, tourmaline, magnetite and other minerals. The minerals, which are found with the diamonds, are the same as found in the canga of the river deposits. Sometimes, the diamond crystals show impressions of other crystallized minerals; even inclusions, such as magnetite and titanite or ilmenite are present. The diamonds of the soft clays may have had their origin in the quartz veinlets, although an actual diamond in the quartz matrix has not yet been obtained.

In another region near Diamantina, a definite pipe formation is being worked with success. It is an oval-shaped deposit roughly 600 x 2,000 feet completely surrounded by white sandstone and exposed at the surface on the elevated plateau. (Fig. 2) The pipe material is a mass of vertically oriented boulders of the white sandstone cemented with a greenish sericite called "masse" descending to unknown depths. American capital has recently installed a strong hydraulic jet to wash the masse through flumes to a mill below. A series of screens, a small ball mill and finally a test jig-table concentrates the diamonds to where they can be removed by hand from a small concentrate of hematite pebbles. The production ranges about a thousand carats per month of diamonds averaging less than a carat but of the finest quality. The amount of gems per cubic yard is not great; and for this reason, the property will not be an outstanding small-scale enterprise.

Without a doubt, stones from these same primary deposits have found their way into the streams; yet, the formations are far too small to account for the production and scattered nature of the diamonds. Pipes, either large or small, must exist somewhere in these regions. In the unexplored states of Goyas, and Matto Grosso, new fields are being revealed in the river beds. Unfortunately, the lack of trained men and the ignorance of the natives has hindered the discovery of the original diamond-bearing rocks. An immensely rich interior with vast unexplored regions may have a pipe equal to any of the African mines hidden beneath its surface. There is no telling what will be discovered in Brazil in the years to come.

NBC PRESENTS MINES MEN IN "MAN and MINERALS"



Over the Air — KOA — March 24, 1940

GEOPHYSICAL EXPLORATION

PART I. Locating Minerals

Announcer: The Colorado School of Mines presents "Man and Minerals."

Announcer: The scene is a faculty office at the Colorado School of Mines in Golden, Colorado, where we find Dr. A. S. Adams and Coach Mason in conversation.

Mason: Well, Doc, every time I come over here you seem to be buried in a pile of papers.

Adams: That's no lie!

Mason: What are all those letters—fan mail?

Adams: Give us time, John, give us time. Fan mail or no—we do get some interesting letters once in a while.

Mason: For instance?

Adams: Well, here's one I'd like to have you look over.

Mason: (Reads)—

Adams: Well, John, what do you make of it?

Mason: Not bad. You know, Doc, if we could do all the things this fellow thinks we can do—

Adams: We would be nothing short of magicians.

Mason: You said it.

Adams: You know, I can see why people think nothing is impossible in science—what with the seeming miracles performed almost every day in medicine, chemistry and physics—

Mason: The fellow that wrote that letter is looking for a miracle all right. You ought to show it to Doc Heiland.

Adams: I should say so.

Mason: Say, isn't he about due here?

Adams: There he is now.

Heiland: Hello, Doctor Adams. Hello, Coach Mason.

Adams: Hello, Doc, glad to see you. We were just talking about you. Here is something I want you to read.

Heiland: What is it?

Adams: An inquiry addressed to the school,—right down your alley. Let me read it.

Mason: Go ahead!

Adams: (reads) Colorado School of Mines, Gentlemen: I have heard that you have perfected what I believe is called a geophysical device —one that will find iron, gold, copper, dollar bills and oil. Please send me further details. Also, please inclose a blue print as I want to make one of these machines myself. Very truly yours. . . .

Heiland: The dollar bills sure are a new wrinkle. Otherwise, this sounds a lot like some other inquiries the Geophysical Department is getting almost every week.

Mason: Come, now—is that all the comment we're going to get out of you?

Adams: You ought to invent a gadget like that—

Mason: And tell me about it; I promise not to tell anyone else and we'd both be rich.

Adams: Now wait a minute. I see something here in this letter that ought to be possible.

Heiland: You mean, finding iron?

Adams: That's it. I should imagine anything that is magnetic ought not be too hard to pick up.

Heiland: That's right. You know, magnetic prospecting for iron ore was used in Sweden as much as 300 years ago.

Adams: I certainly didn't know Geophysics started as early as that!

Mason: Did they have any luck with it?

Heiland: Yes, quite a few large ore-bodies were found in this way.

Mason: What do you do, just go over the ground with a compass?

Heiland: That's about the size of it—except that a special variety of compass was built for this particular purpose.

Mason: Did every miner or prospector have one?

Heiland: At first, yes, until they found out that these instruments did more good in the hands of geologically trained persons.

Adams: You mean that not every magnetic attraction means iron ore?

Heiland: No, it really doesn't. A close correlation of magnetic data with geologic information is necessary to separate ore indications from stray attractions due to certain types of barren rock.

Adams: Wait a minute—didn't you tell me a yarn once about an ore-body being found quite accidentally by a prospector's wife?

Heiland: Yes. The girl in the story was the wife of one of the leaders of a prospecting campaign organized by the Swedish government.

Adams: Yes, it certainly was an unusual story.

Mason: Tell me: when, and where, and how did all this happen?

Heiland: Well, it was in Sweden, toward the end of the war, when iron ore was at a premium.

Adams: And weren't they prospecting for new ore around some of the previously known orebodies?

Heiland: Quite so. *This* prospecting party was working in Norbotten, near the large Kiruna iron orebody.

Adams: That's in northern Sweden, isn't it, Doc?

Heiland: Yes, it's in Lapland, near the Arctic Circle. Well, anyway, they'd been prospecting around in that area for several weeks without getting any worthwhile indications . . . But one day, two of the engineers sure had the surprise of their lives. As I heard the story, it happened like this —

Olaf: Well, Erik, here goes—another station, another reading.

Erik: Probably will be the same thing all over again, Olaf.

Olaf: Hold this compass for me, Erik, while I drive this marker stake.

Erik: Here's your compass, Olaf.

Olaf: Well, let's see what we've got here. It registers exactly nothing (disgustedly). The thing acts as if we were miles from any iron.

Erik: That needle doesn't show the slightest dip.

Olaf: It sure acts as if it were glued to that glass case.

Erik: That's it. It begins to look as if the big Kiruna Mine over there on the hill took in all the iron in the country and left nothing for the rest of it.

Olaf: Wouldn't be surprised. You know, they ran a magnetic survey over that thing not so long ago and estimated some two thousand million tons of ore in it.

Erik: I can well believe that.

Olaf: (disgustedly) Well, let's quit and have something to eat. Hand me that food basket over there.

Erik: There won't be much in it, I'm afraid. Back home we'd be on ration cards now!

Olaf: On this job you've got to live off the country, if you can.

Erik: Right. Wish we had some of those berries I've seen around here. Didn't your wife say she'd pick some and bring them over?

Olaf: Look over there!

Erik: Where?

Olaf: Here she comes!

Erik: Oh yes, she's running, too!

Erik: She must have guessed we were hungry.

Christina: (arrives) Olaf! !

Olaf: Hello, Christina, sure glad you've come.

Christina: Olaf, you wouldn't believe what happened!—

Olaf: Must have found a lot of berries—I'll sure be glad to get my hands on them—

Christina: Look, Olaf, it's not about berries—it's much more important than that—listen!—

Olaf: (disgustedly) Well, honey, it was nice of you to bring another compass, but we really don't need one.

Christina: But that's where you are mistaken, Olaf—you know I always carry my compass with me—

Olaf: Yes?—

Christina: See that patch of trees over there near the lake?

Erik: Yes—

Christina: That's where I went berry picking—and all of a sudden the needle started jumping around—

Erik: It did? ! !

Olaf: That's the best news yet—

Erik: Come on, Olaf, that sounds worth looking into—

Mason: I'll bet they went to work on that all right.

Heiland: Yes, Sir! They worked late into the night mapping that indication. In this way the large Vieto orebody was discovered.

Mason: Well, I guess the Swedes have it. Any work been done over here like that?

Heiland: Yes, in New York and New Jersey, rather early too, in the Seventeen Hundreds.

Mason: That's convincing enough as far as iron goes. You really have me sold on that.

Adams: But let's get back to our letter. Can you produce a gold-finder for us?

Heiland: Sometimes we can find gold, too.

Mason: I don't quite see how. Gold usually doesn't occur in big chunks like an iron orebody.

Heiland: That's quite correct, and yet there is a way to find it sometimes—Do you remember Dr. Boyd talking about placers last week?

Adams: Yes, I do. They're river gravel deposits.

Heiland: Yes, that's right, and the gold is usually found at the bottom of these, near bedrock.

Adams: And at places where the speed of the river slackened.

Heiland: And at the same places other heavy minerals are usually deposited too.

Adams: Iron minerals, such as magnetite?

Heiland: Quite so. Therefore, by picking up these magnetite concentrations, we can trace the gold associated with them.

Mason: I don't quite see how that could be done with an ordinary compass.

Heiland: No, it isn't done that way. We use a very delicate magnetic instrument for that, which we call a magnetometer.

Adams: Have they found any gold with magnetometers?

Heiland: Yes, some companies have been quite successful in British Columbia, Alaska, and elsewhere.

Adams: Well, we are getting along fine with our letter. The next thing our letter-writer wanted us to invent was a device for finding copper.

Mason: Now don't anybody tell me that can be found by a magnetometer too.

Heiland: Strange to say, just that has been done. In the Lake Superior District, for instance.

Mason: How's that?

Heiland: You probably remember Dr. Boyd saying a few weeks ago that a lot of minerals came from molten rock?

Mason: I believe I do.

Heiland: Well, often a number of minerals are crystallized together and they frequently include magnetic iron.

Mason: Then you could locate the copper indirectly by noticing the presence of magnetic iron minerals just the way the Swedish Engineers found the iron ore?

Heiland: Yes, but more often a copper formation will have some known geologic relation to a magnetic rock.

Adams: Then you map the magnetic formation and from your geologic studies, you know that the copper-bearing formation is, say 100, or 200 feet away from the magnetic indication?

Heiland: That's it exactly.

Mason: I always think of copper as carrying electricity. Would it do the same thing underground?

Heiland: You mean offer little resistance to a current passed?

Mason: That's what I mean. What about that?

Heiland: That's true, particularly when copper, iron or lead occur in sulphide form. Then they can be detected by electrical means.

Mason: You mean that these sulphides occur in big chunks, veins, or something like that?

Heiland: They do, and are usually very good electrical conductors.

Mason: Don't the rocks around them conduct electricity too?

Heiland: Yes they do, but not very well.

Adams: Well, then, if you pass an electric current through the ground, it would be sort of concentrated by a sulphide orebody, wouldn't it?

Heiland: Yes.

Mason: Wait a minute, there's something I don't quite see. How do you get current into the ground? Do you use batteries?

Heiland: No. We take a little gas engine along and generate our own power.

Adams: I suppose when you pass current through the ground an orebody acts as if it were a wire, carrying current?

Heiland: Precisely, and produces a magnetic field around it.

Mason: And you pick that up with a compass, uh?

Heiland: You've got alternating current in your orebody and the compass won't work with it. Try again.

Adams: How about picking it up like you would the hum of a power line?

Heiland: That's what we do, in a way. We go over the ground with a detection coil wound with many turns of wire, hooked to a pair of headphones.

Adams: Then the observer gets the loudest buzz, we'll say, right over the orebody?

Heiland: If you held your coil vertical, you would. Actually, the field procedure is quite a little more involved than that—

Mason: That's complicated enough for me. Seems to me you could do that a lot simpler.

Heiland: How, coach?

Mason: Well, if I was doin' it, and had all that current floatin' around in the ground, I sure'd tap it at several places to find out where most of it was.

Adams: You mean by sort of putting a pair of spikes in the ground and hooking them up with a—some headphones?

Heiland: Very good, very good. We'll make geophysicists out of you fellows yet—

Mason: No fooling—is that method any good?

Heiland: Yes, and to be more precise, they hook their power plant to two long bare copper wires that they tack to the ground.

Mason: How far apart are these wires?

Heiland: Oh, about half a mile, so arranged that the supposed orebody would come between them.

Adams: Then you supply power to the grounded copper wires—

Mason: And pick up the current between them, with two stakes or something like that?

Heiland: Yes and no. You hold one stake stationary and move the other about until you hear nothing in the headphones connected to the spikes.

Mason: Don't tell me you can find an orebody by looking for nothing!

Heiland: Well, it's so, nevertheless; and if you don't hear anything in the headphones between two points, it means that no current flows between them.

Mason: What does that mean?

Heiland: That means if you tie up all these points and put them on a map, you would get straight lines that are parallel with the bare copper wires I spoke about—

Adams: When no orebody is present?

Heiland: Right.

Adams: And these lines are distorted when there is an orebody that concentrates the current?

Heiland: Yes, they sort of wind around the orebody and avoid it, as it were.

Mason: Seems to me that's a rather slow procedure.

Adams: Has it had any success?

Heiland: Its been rather successful in prospecting for shallow ore in Sweden and Canada.

Adams: Just one other thing, while we have you here and are asking a lot of questions.

Heiland: What's that?

Adams: Well, it would seem to me that from what I remember about ore, it is a lot heavier than all the barren rock around it.

Heiland: That's quite true.

Adams: Can't you make use of that fact somehow?

Heiland: We do, and that brings us to one of the most recent geophysical methods applied in mining.

Adams: You mean you can actually weigh an orebody?

Heiland: Precisely.

Mason: By George! If that is so, why can't I just go get myself a balance and see if I can't find a little gold in them thar hills!

Heiland: You need a very sensitive balance, I'm afraid.

Mason: How sensitive?

Heiland: Oh, one that would weigh one pound accurate to one-millionth of an ounce.

Mason: I can't visualize that.

Heiland: Well, let's explain it some other way. See this piece of paper?

Mason: Yes, it's ordinary typewriter size.

Adams: Yes, and I think ten sheets of it weigh about one ounce.

Heiland: All right. Now take each sheet and divide it up into a great many little squares, each being one-hundredth of an inch on the side.

Mason: How many squares do you get then out of your ten sheets of paper?

Heiland: About ten million squares.

Adams: I see it now. That balance has to be sensitive enough so that when you're weighing ten sheets of paper, you could tell whether there was one of those little squares put on or taken off.

Heiland: That's entirely correct.

Adams: Don't they call an instrument of that sort a—I don't know how to pronounce it, but isn't it a g-r-a-v-i—meter?

Mason: A gravy-meter, eh?

Heiland: All right, have it your own way, but we call it a "gravimeter."

Mason: How does one of these things work?

Adams: Yes, how do you weigh an orebody with that?

Heiland: Well, visualize a weight hung from a coiled spring, and provided with some sort of a magnifying device, so that very small displacements of the weight can be detected.

Adams: Then the weight goes down where the pull of gravity is greater, and goes up where it is less?

Heiland: Precisely. And as you cross a heavy orebody, the force of gravity usually increases. Hence, the name gravity-meter, or gravimeter for short.

Adams: Seems to me I've read somewhere that the gravimeter was first developed for geophysical oil exploration.

Heiland: Yes, it was.

Adams: Oh, that reminds me—our letter-writer wanted to know whether you had some gadget for finding oil.

Heiland: I sure would like to tell him some more about that.

Adams: Suppose we do that, but I'm afraid we won't have time for it now.

Mason: Well, between now and next week, I'm going to figure me out that gadget for finding "dollar bills"—and some good tackles, too.

Announcer: You have just listened to another program prepared and presented in cooperation with the Rocky Mountain Radio Council by the faculty members and students of the Colorado School of Mines, an institution devoted exclusively to the advancement of the mineral industries. Heard on this program were: Dr. C. A. Heiland, head of the Geophysics Department; Dr. A. S. Adams, Coach Mason, Mrs. Ed. Sawitzke, Herb. Treichler, and Ralph Trentham. Tune in next week at the same time and listen to another discussion of Geophysical Exploration. Address any question you may have about this program to the station to which you are listening.

Announcer: The Colorado School of Mines.

MINERALS IN THE PEACE SETTLEMENT

By
C. K. LEITH
Professor of Geology
University of Wisconsin

The demand for free access to mineral resources by Germany was one of the important underlying causes of the Great War. It was declared by Italy as one of the chief reasons for taking Abyssinia; by Germany in occupying Austria, Czechoslovakia, and part of Poland; and by Japan in its expansion in Eastern Asia. The need for raw materials is now specifically stated by Hitler as Germany's primary grievance in the present war, and the control of raw materials by the Allies seems likely to be the principal factor determining its outcome.

Ever since the last world war, international controversies of growing intensity and scope have been waged about mineral supplies in the commercial field. On the one hand, expanding industry and the advance of technology have made individual nations relatively less self-sustaining and have required a larger flow of minerals across national borders. On the other hand, this international movement has been handicapped, and in some cases stopped, by nationalistic efforts toward autarchy, by blocking of exchanges, and by the closing of doors in many different ways to foreign exploitation and development. Some nations are now so cut off from necessary foreign supplies that the only way out has seemed to them to be invasion of foreign territories. The present war is only one of the symptoms of the collision of these two opposing forces, and it is not likely to settle the problem of access to the world's mineral supplies.

Press release from Geological Society of America.

In preparation for the Peace Conference in Paris in 1919, Mr. Bernard M. Baruch, who headed the Economic Section of the American Commission to Negotiate Peace, had it very much in mind that something should be done in the way of equalizing access to raw materials. The French and English representatives to the Economic Section of the Peace Conference submitted similar proposals, but the subject was given little or no consideration by the Peace Conference. The problem was raised again in a resolution of the Miners Congress held in Geneva in 1920; in the International Chamber of Commerce in 1921; in the Economic and Financial Committee of the League of Nations in 1922; the World Economic Conference in 1927; by the Diplomatic Conference of the League of Nations in 1927; and by many other individuals and groups.

An insistent call is now coming from many quarters for a clear definition of the purposes of the war. Many individuals and groups are working on the subject, but, so far as I know, the question of raw materials has not yet been included in the public statements of war objectives by the Allied governments. In view of the fact that the question of equality of access to raw materials has been steadily forging to the front for so long, the consideration of this subject can hardly be omitted from any adequate program of peace settlement. Unless something is done about it, the raw material problem will surely make trouble again. The steady advance of industrialization and of technology means growing need for international flow of raw materials and therefore intensification of the problem for the future.

No one can now pretend to know specifically what should be done about improving access of the have-not nations to raw materials. The various proposals which have come forward from so many sources since the past war are still in very general terms and lack the detail and focus necessary for any real planning. A vast amount of detailed work needs to be done to develop a really practicable plan. There seem to be three general methods of procedure or, preferably, some combination of them—namely: (1) To continue to defend the status quo by force; (2) to attempt modification of the status quo in the way of appeasement; (3) to use affirmatively the power inherent in the dominant possession of raw materials by a few nations to maintain a certain amount of law and order in the world by force; (4) a combination of (1), (2), and (3)—that is, to make reasonable concessions, defend the main position, and in addition apply mineral sanctions to keep the peace. These are briefly discussed in the following sections.

(1) *Maintenance of the status quo*

The salient feature of the status quo is control of about three-fourths of the world's mineral business by the United States and the British Empire in about equal proportions, including commercial control of minerals outside their own domains. Also, the United States and the British Empire completely control the seas over which the mineral supplies of the world move—not only their own but also those controlled by other nations. France, with her colonies, is also to be ranked with the "have" nations, though relatively her supplies are limited. Russia's mineral supplies, with few exceptions, are scarcely sufficient for her own growing needs, notwithstanding the optimistic estimates which have been broadcast by Soviet officials. No country is entirely self-sufficient. The United States, which is most nearly so, finds it necessary to import substantial quantities of 15 industrial minerals. Many countries, notably Germany, Italy, and Japan, are conspicuously short of many essential minerals. Efforts to achieve self-sufficiency or autarchy by "have-not" nations have not materially changed the picture. The intensive development of domestic supplies, new applications of technology, and substitutions have met only a small percentage of the requirements, and this at a cost which would be prohibitive under normal commercial conditions of free exchange between countries.

From the point of view of the nations in control of minerals, the argument is sometimes advanced that the status quo is satisfactory. We sell the products freely to anybody who can pay for them, and the supply is such that there is enough for all. We point to the acquiescence of peaceful nations such as the Scandinavian countries, Belgium, the Netherlands, Switzerland, and others as a pattern of a proper attitude. Why should anybody complain? The answer on the part of the more aggressive "have-not" nations is that we have too much advantage in case of commercial emergencies; that we will not accept enough of their products in exchange; that we have occasionally held up the rest of the world without sufficient consideration of the consumers' position; that in case of war we can and do cut off access to raw material sources; that they want a share in the control both for peace and war and intend to get it, by force if necessary. Back of all these demands is the ambition for power. However unfair this attitude may seem to us, it is strong and persistent, and to go back to the pre-war economy of minerals without change will simply mean the necessity for future protection of the status quo by force, as it has been maintained from time to time in the past.

(2) *Possible changes in the status quo*

We may study more carefully than we have the grievances of the "have-not" nations to see how far they may be ameliorated and how far self-interest invites this procedure as a desirable alternative to the maintenance of the status quo by force. It may be cheaper to make certain concessions than to fight new wars. I do not pretend to know what can or should be done in the way of concessions. I merely emphasize the need of more careful consideration than we have yet given this problem.

(1) It has been suggested, for instance, that the cartel system of distribution has been solely controlled by producers and that representation in the cartels of consumers and governments might lead to a more equitable distribution of products. It has been further suggested that there be an international reviewing authority such as a Permanent Cartel Commission.

(2) It has been suggested that there should be more public control of price fixing and production quotas both within and without the mineral industries covered by the cartels.

(3) It has been proposed that there be a review of the entire field of mineral import and export tariffs and of quotas, and particularly preferential colonial and imperial tariffs. This would include the valuation of actual effects of reciprocal trade treaties of multilateral scope and their comparison with bilateral and barter agreements. The breakdown of multilateral arrangements has been followed by the introduction of barter arrangements in increasing number and scope. We do not yet know fully the possibilities in either procedure.

(4) The crux of the problem lies probably in the impaired purchasing power of the "have-not" nations. We will not accept enough of their manufactured products in exchange, they do not have gold, and their currencies have been depreciated by turning their economic effort so largely into the building of armaments and by expensive efforts to achieve autarchy. While much of the difficulty is caused by their own actions, the exchange problem cannot be solved without international cooperation.

(5) There has been much discussion of the redistribution of colonies or of putting colonies under mandates with equality of access. Even if this were politically possible, the mineral reserves of the colonies are much too small to solve the problem.

(6) It has been proposed that we consider the practicability of some sort of collective guaranty to mineral supplies, both in war and peace.

(7) It has even been proposed that the world would be better off if the "have" nations should help the "have-not" nations to accumulate stockpiles of needed materials for use in emergency to obviate the possibility that these nations may feel impelled to go out and acquire raw materials by the acquisition of new territory.

No one of these possibilities has been adequately explored, nor have they been reviewed as a whole. The problem needs extensive study from the standpoint of each of the raw material industries and from the standpoint of each country. We do not yet know enough about the possibilities to say how important a contribution to world peace could be made by any changes that may prove practicable.

(3) *Mineral sanctions*

A third alternative is to use the power now inherent in the control of mineral resources by a few countries as a sanction in peace time as well as during war. This would mean perfecting some sort of collective control by the few fortunate nations; the exercise of this control to lessen the building of armaments, to make clear that sanctions could and would be used to preserve peace, in the hope that recalcitrant nations might be deterred from precipitating a war, just as crime is to some extent deterred by the existence of a police force capable of decisive action. In other words, it would mean a more constructive use of sanctions in the direction of not only winning wars but of preventing them. Possession of minerals means the power to control the production of guns, ships, and transportational facilities by land, air, and water. The use of such power may not prevent all war but may well limit its incidence.

Before the Peace Conference of 1919 in Paris, the British War Commission suggested to the American Government that consideration be given to a proposal that the exportable surplus of raw materials controlled by the Allies be allocated after the war by mutual agreement, substantially in continuance of the war procedure, for the purpose of making the Central Powers dependent on the Allies during the fulfillment of the peace terms. Lists and estimates of key raw materials were drawn up by the British and American delegations. Nothing came of the proposal; in fact, it was almost entirely ignored, even in the public records of the Peace Conference.

The procedure for mineral sanctions was provided in Article 16 of the Covenant of the League of Nations. The only attempt to apply raw material sanctions—to Italy in the Abyssinian War—failed because they were badly planned and only partially enforced. The effort constituted no real test of the power of mineral sanctions.

(4) *Combination of (1), (2), and (3)—the most promising*

The use of all three of these methods seems a not unlikely outcome of any serious effort to meet the international problem inherent in the inequality of mineral supplies among the nations. While the "have" nations may well make some concessions which will help, it seems unlikely that they will ever be willing to give up any large part of their control, particularly in view of the fact that the ambition for power plays so large a part in the changes being asked. We cannot but feel that dominance, not equality, may be the ultimate objective of the "have-not" nations. After making such concessions as seem reasonable, or seem cheaper than the cost of war, we may well use the power inherent in the control of raw materials to maintain law and order. This procedure seems to promise something better than the welter of world troubles which will result from a purely defensive effort to maintain the status quo without the introduction of constructive measures to lessen the impact of raw material problems on world affairs.

Evolution of International Control of Minerals and its Possible Use for World Peace

Whatever is done or not done along the lines mentioned, one outcome of

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NON-METALLIC MINERALS

By
KENNETH E. HICKOK, '26

Instructor, Department of Metallurgy
Colorado School of Mines

Part III—Sand and Gravel

Sand and gravel are probably the most familiar of all the non-metallic minerals. It is doubtful that a single adult person could be found in these United States who is not familiar with sand and gravel. In fact, these extremely essential materials are so common that we are prone to look upon them as being in the same classification as air or water because they are plentiful and cheap.

However, the fact that these materials are low in price and plentiful in quantity probably has had more to do with their widespread use than any other factor except their eminent suitability to their many applications. The widespread use of sand and gravel has resulted in a far-flung industry which has a yearly tonnage production of almost unbelievable proportions.

Specifications on sand and gravel vary over such wide limits, depending on the application, that it is almost impossible to state a clear definition that will hold for various localities and applications.

Mr. J. R. Thoenen of the U. S. Bureau of Mines suggests the following definitions: "Sand is the unconsolidated, granular material, coarser than 200 mesh and finer than ¼ inch, resulting from the natural disintegration of rocks. Gravel is the similar unconsolidated granular material, coarser than ¼ inch but finer than 3½ inches, resulting from the same causes."

As will be noted from the above definition, unlimited leeway is allowed as to mineralogical make up as well as shape of the individual grains comprising the sand or gravel. Thus, the individual grains may result from the disintegration of any kind of rock, sedimentary, metamorphic or igneous, and the shape of the grains may vary from angular to spherical.

This is not to be interpreted that all sand or gravel is equally suitable for every different application because such is not the case. Many users have specifications that relate to grain shape as well as mineralogical characteristics.

Production

The wide occurrences of sand and gravel in commercial deposits are so variable that each deposit requires individual consideration as to the most suitable means of exploitation.

A broad classification of types of deposits would include, benches, pits and bars. These would be further classified as to depth of overburden, whether wet or dry, stratification or segregation of different sizes, and many other features.

Depending on the type of deposit, mining could be done with shovels, draglines, bulldozers, carryalls, slackline cableways, dredges, or hydraulic monitors. Each particular type of equipment would be suited to some individual deposit while being useless for another type. One thing common to all deposits is that the mining and transportation method used must be low in cost. A few cents a ton may spell the difference between a nice profit or financial ruin.

Transportation of the mined gravel to the washing-screening plant may be by means of trucks, locomotives, conveyor belts, or even pipe lines. The type of transportation system used will depend on tonnage to be produced, distance from the plant, depreciation of equipment, whether the material is wet or dry, and many other factors which will vary from deposit to deposit.

The grand total of the sand and gravel produced in the United States during 1938, as reported by the U. S. Bureau of Mines in the Minerals Yearbook for 1939, amounted to the huge sum of almost $86,000,000 which represented over 181,000,000 tons. Thus, the value of the sand and gravel produced domestically was some $10,000,000 over the combined value of the primary lead and zinc production for the same period.

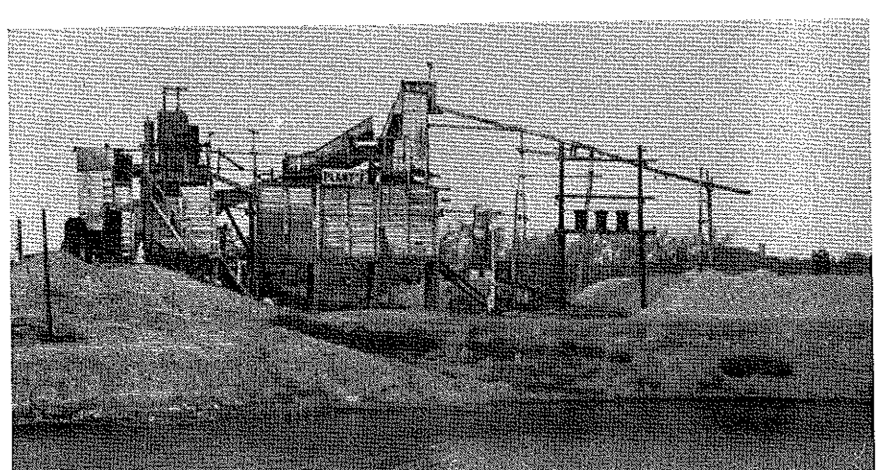
Beneficiation

Beneficiation of sand and gravel must of necessity be very simple and low cost. In many cases screening to commercial sizes is the only treatment necessary. In other cases, clay must be washed from the sand grains and the clean, washed sand is then screened to size and dewatered. Some plants crush the oversize material and route the crushed product through the regular sizing equipment.

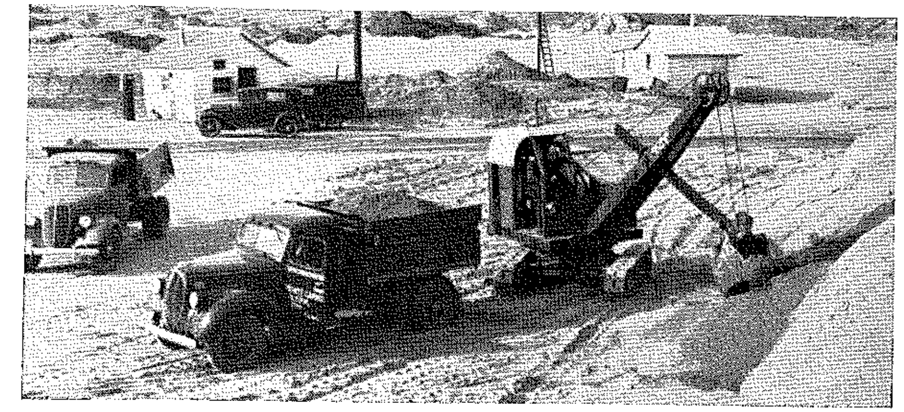
It is obvious that little beneficiation can be practiced on a product that averages only 47 cents per ton in value.

Geographical Distribution and Political Control

Sand and gravel deposits of commercial value are widely distributed throughout the world. It is probable that every state in the Union has some usable sand and gravel deposits. Every civilized country has ample supplies of these materials so that it is impossible for any nation to attempt political control of these very necessary non-metallics.



▼ Wet Pit sand and gravel plant near Denver.

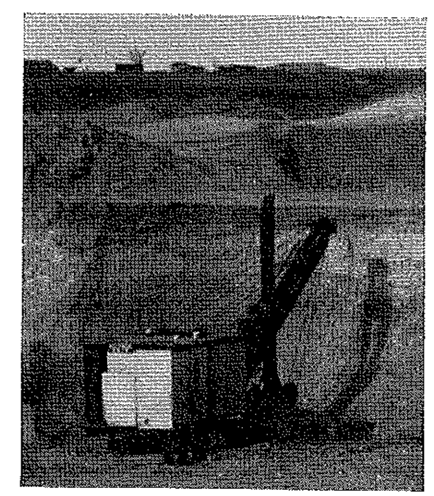


▼ Loading trucks from sand and gravel stockpile near Denver.

Uses and Market

The major use for sand and gravel is in construction work of all kinds. As an aggregate for concrete work and as highway surfacing we find most of this material is used.

After building and paving we find that the next biggest use for sand and gravel is as Railroad ballast. This use has fallen off the past few years because of the economic situation of the railroads. With the return of prosperity this use should increase to



▼ Dry Pit sand and gravel deposit near Denver.

tremendous proportions because much of their normal track maintenance which has been slighted the past few years, must be done eventually.

In addition to these major uses, sand and gravel are also used for making glass, foundry moulding, grinding and polishing, in filter beds, and as engine sand to prevent slippage of engine wheels.

The market for sand and gravel follows the construction trend and as a consequence it suffers or booms with construction. Seasonal demands also add to the uncertainty of the otherwise normal market because little construction work is in progress during the winter months, except in the southern states.

The big increase in non-commercial production, that is, sand and gravel produced by cities, counties, state or federal governments, has caused a very definite trend toward portable plants which are set up as near the job as the gravel deposit will permit. When the job is finished, the plant is moved to a new location for the next job, and so on. This cuts down transportation costs between the plant and the work and tends to decentralize the industry.

Low cost and availability have thus made our cheapest non-metallic product into one of the biggest industries in the United States. Because sand and gravel are low in cost and easily available, everybody can afford to use them in large quantities. This is the basis of a huge industry that employs millions of men and which operates in all parts of the country.

Minerals in the Peace Settlement

(Continued from page 301)

the war seems to be pretty certain, and that is an increase in public control of mineral resources, both national and international. The last war gave a great impetus to such control. After the war public control lessened for a short time, but very soon nearly all the governments of the world began to interest themselves in the problem of securing better control of natural resources in the interest of national defense, or self-sufficiency, or conservation, or whatever it may be called. The growth of barter has involved international understandings. The present war has seen a tightening of public controls, not only of the nations at war, but by many of the neutrals. In fact, control measures are coming along with such rapidity that the international mineral business is already conducted in large part by or with the approval of governments, and much of the domestic business, even in countries like ours, has to accommodate itself to these conditions. It is an interesting fact that for 20 years the trend toward public control of natural resources has been growing generally all over the world, regardless of forms of government, political ideology, or conditions of war and peace. A wave of nationalization of mineral deposits, in one form or another, has swept the world. Whatever it means, whether the trend is right or wrong, this is a fact which should not be ignored.

Cartels, or international committees, or world monopolies have from time to time controlled the world distribution of aluminum, coal and coke, copper, diamonds, lead, mercury, molybdenum, nickel, nitrates, petroleum, platinum, potash, silver, steel sulphur, tin, tungsten, and zinc.

If one looks forward to the future, it seems to be reasonably certain that an ever-growing part of the international trade in minerals will be under some sort of international control, both public and private, through cartels, trade agreements, quotas, exchange controls, barter, nationalization of resources, and by other methods. The control will presumably not be lodged in any single supernational or international political organization but will come gradually into being through the growth of a plexus of agreements, public and private, which will progressively narrow the field of private initiative.

The growth of international control of this kind may supply crude machinery for accomplishing any of the ends which may be sought in any post-war attempts to solve the international control problem. In fact, the spread of international control to date is largely in response to the varied problems which have come up. Whatever the merits or demerits of international control, whether we like it or not, the fact is that in the sense above indicated it seems to be in the process of evolution. The problem now is to find out how intelligently we may direct that control in the interest of world peace.

Part to be Played by the United States in the Solution of the World Mineral Problem

The United States is the world's largest producer, largest processor, and largest consumer of the world's minerals. It commercially controls important mineral supplies in many other parts of the world. It is dependent on foreign sources for many needed minerals. It has built up foreign

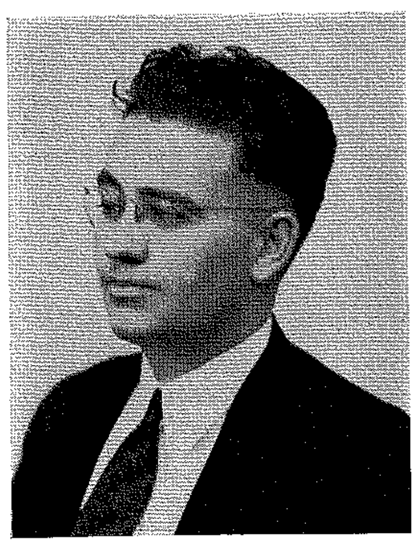
(Continued on page 320)

UP THE LADDER

E. R. Harrington, Ex-'24 Receives Doctor's Degree

Eldred Ray Harrington, head of the science department at the Albuquerque High School, received a Doctor of Philosophy degree from the department of chemistry in the University of Southern California's graduate school on June 8 in Los Angeles.

Harrington took graduate work at the California university from 1931 to 1935. He was admitted to its school of research in 1936. His work has been in the division of physical chemistry, the special division of colloid chemistry. His thesis was a study of colloidal properties of several New Mexico clays, among them adobe, ball, fire, kaolin and pottery.



E. R. HARRINGTON

He was graduated from the Albuquerque High School in 1920. After spending two years at the Colorado School of Mines and two years at the University of New Mexico, Harrington received a degree in civil engineering, majoring in geology. He later received a master of arts degree in geology from the University of New Mexico, adding majors in chemistry, physics and mathematics.

Harrington is a good example of what "Mines persistence" and determination will do.

Here We Have a Mining Man

By A. C. HARDING, '37

The first time I met Murch, I was working at a nearby gold property. The accountant and I were sitting in the office holding a bull-session when Murch opened the door and instinctively ducked his head as he entered. The accountant jumped to his feet, introduced us, and with the air of an expert on the topic, proclaimed, "We were just discussing mine management." Murch snorted and dismissed the subject with, "The longer I'm at it, the less I know about it."

We two novices laughed politely, accepting this gross understatement as an expression of modesty. We knew better, and so, evidently, did the National Lead Company. For twenty-one years he has been superintendent of properties for National Lead subsidiaries, for the past twelve years, superintendent of its El Portal, California, barytes operation, now has supervisory capacity over a bentonite property at Hector, and as an examining engineer, has inspected hundreds of properties in western states for the same company.

A couple of months after that first meeting, I went to work for him as engineer and office man, later adding responsibility of foremanship over the smaller of the two mines at El Portal. The first thing he told me when I showed up at his office to go to work was, "If you see anything around here that you don't think is right, go ahead and change it. We don't profess to know much about office work."

I decided not to accept this invitation too literally, and it wasn't long before I realized that Murch had evolved a Utopian clerical system from his years of production experience. His formula consisted simply in eliminating all figures that were not absolutely necessary to efficient operation, and in reducing to a minimum the routine work of compiling figures that were necessary. This characteristic of simplifying procedures and reducing complex problems to their fundamentals is inherent in everything he tackles. A paramount example of the direct way he deals with a subject resulted when I proudly announced one day that the two Hardings would soon be three. He asked only two questions, but of all the possible questions he had from which to choose, I marvelled that he quickly selected the two that were

E. H. MURCHISON, E.M., '12

undoubtedly the most important. "Do you both want it?"; and, "Have you got a good doctor?" I don't believe the answers should be considered significant to this character study, but to ease the minds of the curious, I happily could and did say "Yes" to both.

Although he is quite receptive to new ideas, presented on a basis of practicality, he is equally quick to puncture a glittering theory with a pointed remark. His foremen find him an easy boss, personifying, for me, the expression I once heard, "If you want an easy job, work for a man who knows his business," but they do well to have an answer prepared for his almost inevitable "Why?." Glib tongued salesmen have been stymied by a practical "What good is it?" and their failure to properly distinguish between a grunt and a snort.

Murch doesn't like his first name, and the only person I ever heard call him "Earl" was his father, a former Colorado State senator from Arvada, when he visited the property last summer. To everyone who knows him

(Continued on page 320)

GEOLOGICAL ASPECTS OF THE COLORADO-BIG THOMPSON PROJECT

By ROSS L. HEATON
Geologist Bureau of Reclamation

(Continued from May Issue)

GRANBY DAM SITE

Granby reservoir is to be the largest of the project and is located between Granby and Grand Lake. It will be more than eight miles long and will have a capacity of 482,000 acre-feet. Granby dam, therefore, although it is not the highest on the project, will impound the most water. Its height is 223 feet above river level plus 63 feet to bedrock (Fig. 12).

The site has been investigated for both a concrete arch and an earth and rock-fill dam. The axis of the latter, if shown on the Location Map, Figure 13, would pass through Pit No. 13 and cross the river at the location of the bridge.

The site is in an area of pre-Cambrian rocks with scattered occurrences of Jurassic and Cretaceous rocks though none of the sedimentaries are involved in the dam site. The area is marked further by the wide-spread occurrence of consolidated tufaceous clays and basalt flows with some sand and gravel streaks which are believed to be the equivalent of the North Park formation of Miocene age. These beds show in very few places at the surface but are present in nearly all excavations such as road cuts, test pits, etc., in the area surrounding the dam site. Blanketing all of the older formations in many parts of the area are glacial moraines of considerable magnitude.

The rocks at the main dam site are entirely pre-Cambrian granite, pegmatite, gneiss and schist. In the unaltered state they are strong rocks except for the schists which are sometimes composed largely of biotite and are very soft. They do not occur in abundance on the outcrop but core drilling indicates that they are wide-spread under the overburden.

Structure:

Faulting, shearing or any process which may weaken the rocks of the foundation are very important, especially in the case of a concrete arch dam. The engineer is interested in the strength and elasticity of the rocks much more than in their names or mineral composition.

The dam site was carefully mapped on a scale of 50 feet to the inch. The various kinds of rock were shown and every visible evidence of movement was recorded. Others were discovered by core drilling. These, together with the outcrop areas are shown on the Location Map, Figure 13. The large scale map showing kinds of rock and classification of overburden cannot be reproduced here on account of its size.

The great majority of the faults consists of only one plane of movement and affect the rock for not more than an inch or two. They are sometimes discontinuous and not traceable across covered areas to adjacent outcrops. Others resolve themselves into a zone of movement one or two feet wide. Only one appears to have affected a zone of any considerable width and it was discovered by pit digging and core drilling on the left (east) abutment. Here the rock is badly altered and is very unsound for a width of 20 feet or more (See Section C-C, Fig. 13). The feldspars are altered to clay and the micas disintegrate readily so that practically no core was recovered in the diamond drill holes. It is possible that other similar zones may occur in the river bottom. The faults strike in two directions approximately at right angles to each other.

Overburden:

The overburden at Granby dam site consists of slide rock, glacial outwash gravels and slope wash, the latter consisting of a mixture of soil, sandy clay and rock fragments which range in size from pebbles up to large boulders. The slope wash is five to ten feet deep on the covered areas of the upper slopes and thickens toward the river. In the lower slopes it varies from 15 to 23 feet except in the lowest portion where it is 29 to 45 feet deep. The river gravels in the vicinity of the axis and upstream from that point are 50 to 62 feet deep and reach a depth of 76 feet just above the axis of the proposed earth and rock-fill dam.

Materials:

It is proposed to secure materials for the embankment from an area just east of the dam site and designated as Borrow Area No. 1 on Figure 14. It is morainal material similar to that at Green Mountain but with less rock flour and, therefore, somewhat inferior compaction properties. Screening will be necessary to remove the boulders. On a bench at the north edge of the borrow area the material has been reworked by river action and it will probably be utilized in the semi-pervious zone of the dam. Other areas in the vicinity were tested but were found unsatisfactory mainly on account of the intermixture of decomposition products from the North Park clays.

Materials for the pervious zone may be obtained from required excavation to bedrock in the river bottom. Rock for rock-fill and riprap will come from required excavation for the spillway and outlet tunnel and from screening operations in the borrow area.

Dikes:

Four dikes will be required to span saddles in the reservoir rim (Fig. 14). Only three of these are of major importance. As may be seen from the cross sections, Dikes Nos. 1 and 2 are in an area of thin, sandy clays overlying the North Park formation. The latter is doubtless excellent for cutoff purposes and is believed to have plenty of bearing strength for this type of dam. Dike No. 1 will have a length of 2000 feet and a maximum height of 70 feet. No. 2 will be 1200 feet long and 45 feet high. The materials will probably come from Borrow Area No. 4 (Fig. 14). They consist of outwash gravels and residual clays which will be mixed in the shovel operations.

Dike No. 3 will span a gap which, in pre-glacial times, probably formed the channel of the Colorado River[2].

[2] Ronald L. Ives. "Glacial Geology of the Monarch Valley, Grand County, Colorado". Bull. Geol. Soc. Amer., Vol. 49, 1938, p. 1056.

▼ Fig. 9. View along line of cross section of Figure 8. M—Morrison shale: D—Dakota formation: P—upper porphyry sill.

It is now filled with outwash sand and gravel, with some till, to an unknown depth. One of the test pits went to 80 feet as shown in the cross section without striking bedrock.

The nature of the foundation for this dike might lead to the suspicion that it would be a source of serious leakage but the percentage of till, together with the long percolation distance, is reassuring. However, precautions will be taken to blanket the upstream toe of the embankment over a considerable area with impervious, clayed material.

Dike No. 3 is to be 1900 feet long and 55 feet high. The materials will be derived from Borrow Area No. 3-A (Fig. 14) which is morainal material similar to Borrow Area No. 1.

Dike No. 4 is small and comparatively unimportant. It will have a foundation similar to that at Dikes Nos. 1 and 2.

Investigations:

Much the same routine was followed as in the investigations at Green Mountain dam site except that at Granby, a total of six sites for earthen dikes was examined, two of which were abandoned. These, if utilized, would have eliminated Dikes Nos. 1 and 2 and would have involved the use of a natural spillway on the west side of the river a mile below the main dam. Quite extensive investigations were carried on at this spillway, involving numerous test pits, trenches and core drill holes. These explorations disclosed a very interesting example of alternating basalt flows and volcanic tuffs filling a huge "valley" in the ancient pre-Cambrian complex. On each side of this "valley", which apparently came in from the west, granites form the rim of the present canyon of the Colorado River. In the center of the "valley," alternating basalt and scoriaceous clays were penetrated to a depth of 355 feet by a diamond drill before reaching granite at a point 110 feet below the river level.

On the main dam and on the dikes and natural spillway, 127 pits, trenches and drifts were dug. Thirty-eight core holes were drilled, some of which were inclined, the two deepest ones being approximately 550 feet in depth (See Fig. 13). In addition to the above, six-inch diameter cores were obtained from four places on the abutments, sent to the laboratory and tested for modulus of elasticity.

NORTH FORK DIVERSION DAM SITE

The location of the proposed North Fork Diversion dam is on the Colorado River three-fourths mile below the confluence of the North Fork and Grand Lake Outlet. A 47 foot dam at this point will form what is to be known as Shadow Mountain Lake and will raise the water level to the same elevation as Grand Lake. The dam is to be an earth and rock-fill structure with the spillway on the right abutment. It will serve to divert a part of the water from the North Fork into Grand Lake by way of Grand Lake Outlet and thence to the west portal of the Continental Divide Tunnel.

The site of North Fork Diversion dam is entirely in glacial material, some of which has been reworked by stream waters. The site was formed by the Colorado River cutting through a terminal moraine which was left as a dam across the valley when the glacial ice receded. A lake was undoubtedly present for a time and it is proposed to restore this lake, but to a higher level than it was originally.

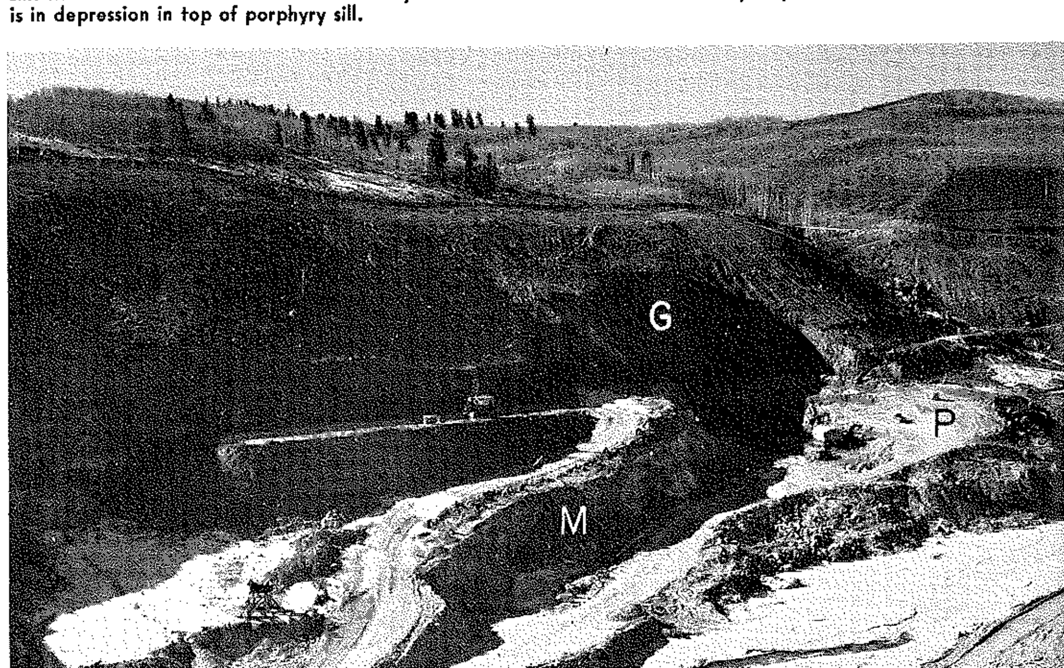
The abutments consist of practically impervious glacial till down to 10 feet below river level and extending across the river. Below this is a layer of sand, gravel and boulders, with some clay, 27 to 33 feet deep (See cross sections, Fig. 15). Water was encountered in the pits when they penetrated this layer but it came into the pits slowly. Below this is the North Park formation consisting of impervious consolidated volcanic clays with streaks of sand and gravel.

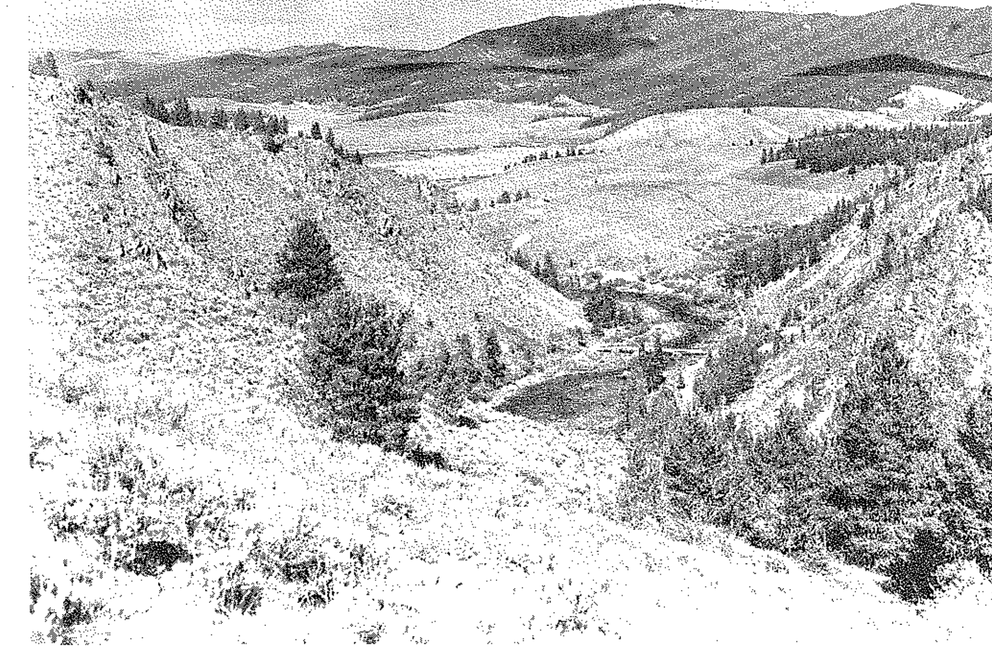
A low dike 2250 feet long will extend from the right abutment along the top of the terminal moraine (See Section B-B, Fig. 15).

The ground water table slopes from 10 feet above river level at the outer end of the dike to 10 feet below river level in the pits near the stream. Water stands 8 to 10 feet below river level in these pits and a fluorescein dye test failed to show any water movement between Pits 4 and 5 in 24 days. They are 110 feet apart.

Materials for the impervious and semipervious zones of the dam will be found in abundance 1000 feet above the dam site. Rock for rock-fill and riprap will probably be derived from screenings in the same area. Concrete aggregate may be obtained from a deposit less than a mile from the dam site.

▼ Fig. 10. Stripping operations, left abutment. G—glacial drift: P—top of lower porphyry sill: M—bench of Morrison shale crossed by coffer dam cut-off wall at left on dip slope. Shovel is in depression in top of porphyry sill.





▼ Fig. 12. Granby dam site. View looking upstream into reservoir site.

EASTERN SLOPE DAM SITES

The General Layout Map, Fig. 1, shows the locations of Horsetooth, Arkins and Carter Lake reservoirs. All of the dams to be built at these reservoir sites are in the sedimentary rocks of the eastern foothills of the Rocky Mountains. These formations consist of alternations of hard sandstones and softer shales. They have been tilted against the mass of the ancient igneous and metamorphic rocks of the mountains and erosion has left the harder rocks as parallel ridges separated by valleys in the softer beds. The latter form the reservoir sites. Dams must be built wherever the bounding ridges on the low side of the reservoirs have been cut through by erosion.

Horsetooth reservoir will require four dams which are to be known as Horsetooth, Soldier Canyon, Dixon Canyon and Spring Canyon. The latter three are in erosion notches in the ridge or hog-back formed by the hard sandstones of the Dakota formation. Horsetooth dam will span the reservoir valley at the north end.

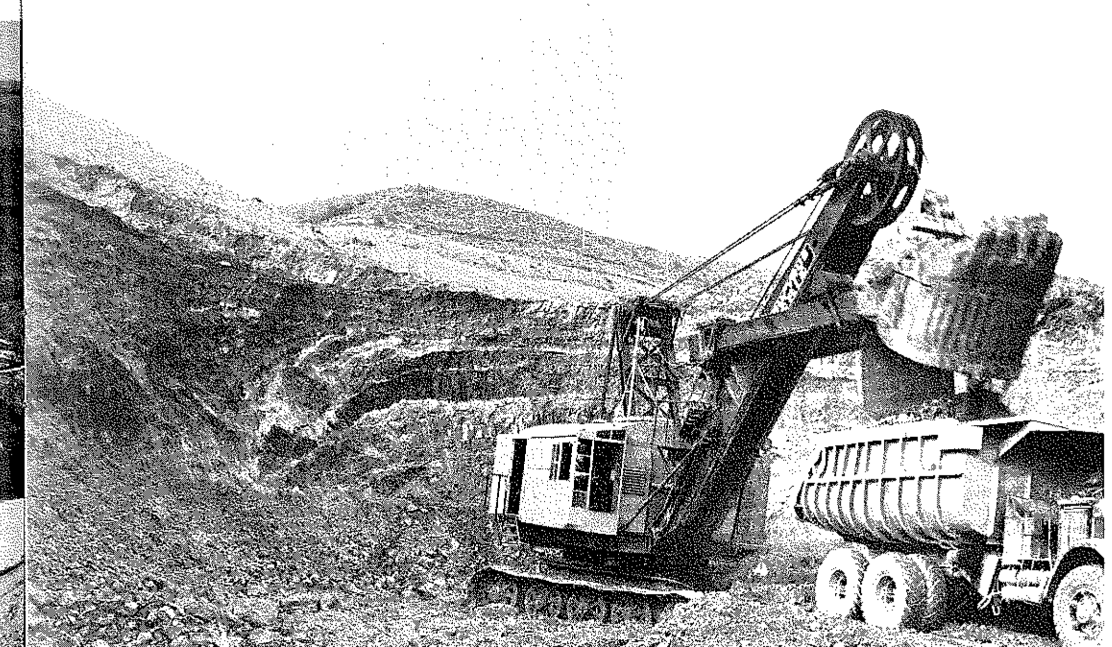
Arkins dam as well as the main dam at Carter Lake will also be in erosion notches in the Dakota hog-back. Since the same formations will be involved in all five of these dam sites only one of them, Soldier Canyon, will be described. Slight, significant differences in the sites will be mentioned.

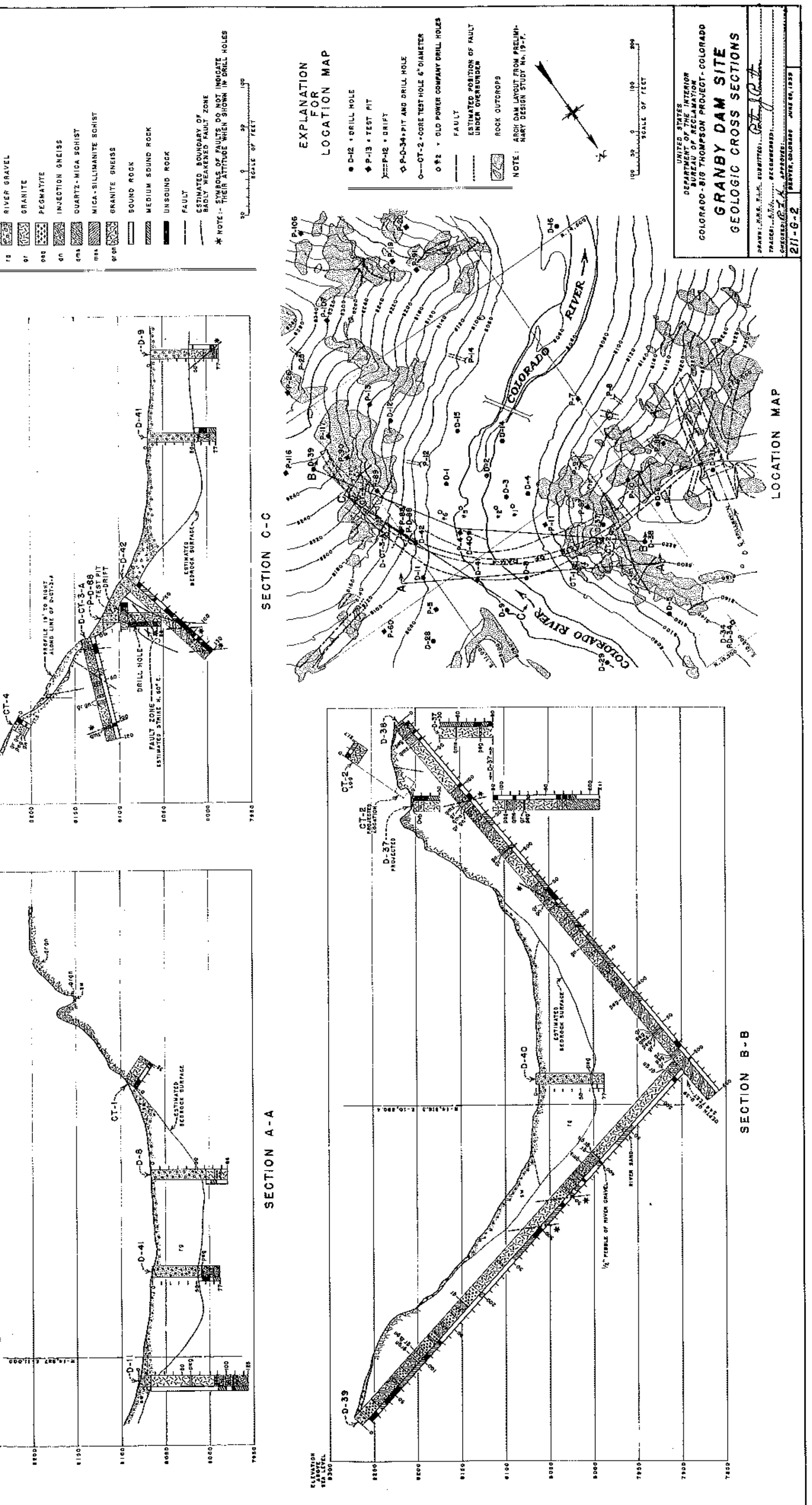
The formations involved in the eastern slope reservoirs are shown in the table on the second following page.

Some of the formation names in the table are a departure from orthodox usage and are descriptive of lithologic units for convenience in descriptions for engineering design. Thus the term "Sundance" is applied to a sandstone unit which includes the Entrada and the Jelm (?) formation of Wyoming. True Sundance marine beds are absent in this locality. The term "Lyons" is applied to the upper cross bedded member of the type Lyons, the lower part of which here contains a large proportion of red shale. To that portion is given the name "Satanka", although it is equivalent to only the lower Satanka of Wyoming.

The Lykins formation consists of red shales and sandy shales with two or three thin limestone members in the lower part. The Lyons is a hard, buff colored, slabby, cross bedded sandstone. The Satanka is an alternation of red shales and sandy shales with thin beds of light colored sandstone. The Ingleside is a massive, light red sandstone and the Fountain consists of arkosic sandstone and conglomerate with some red shale and a few thin nodular limestones. The nature of the Dakota, Morrison and Sundance formations may be seen in the geologic column and cross sections, Figure 16.

▼ Fig. 11. Excavating in elongated depression in top of porphyry sill, left abutment. Shows Morrison shale slumped into depression.





▼ Fig. 13. Outcrop map and geologic cross sections, Granby dam site.

SOLDIER CANYON DAM SITE

Soldier Canyon is the northernmost dam site in the Dakota hogback ridge on the east side of Horsetooth reservoir. The dam is to be an earth and rock-fill structure with a height of 190 feet above bedrock and an up and downstream length of 1060 feet. The crest length will be 1050 feet. The embankment will have an upstream slope of 3 to 1 and a downstream slope of 2¼ to 1, changing to a 6 to 1 slope near the toe. No spillway or outlet tunnel will be involved since the reservoir outlet is to be at Horsetooth dam.

Geology:

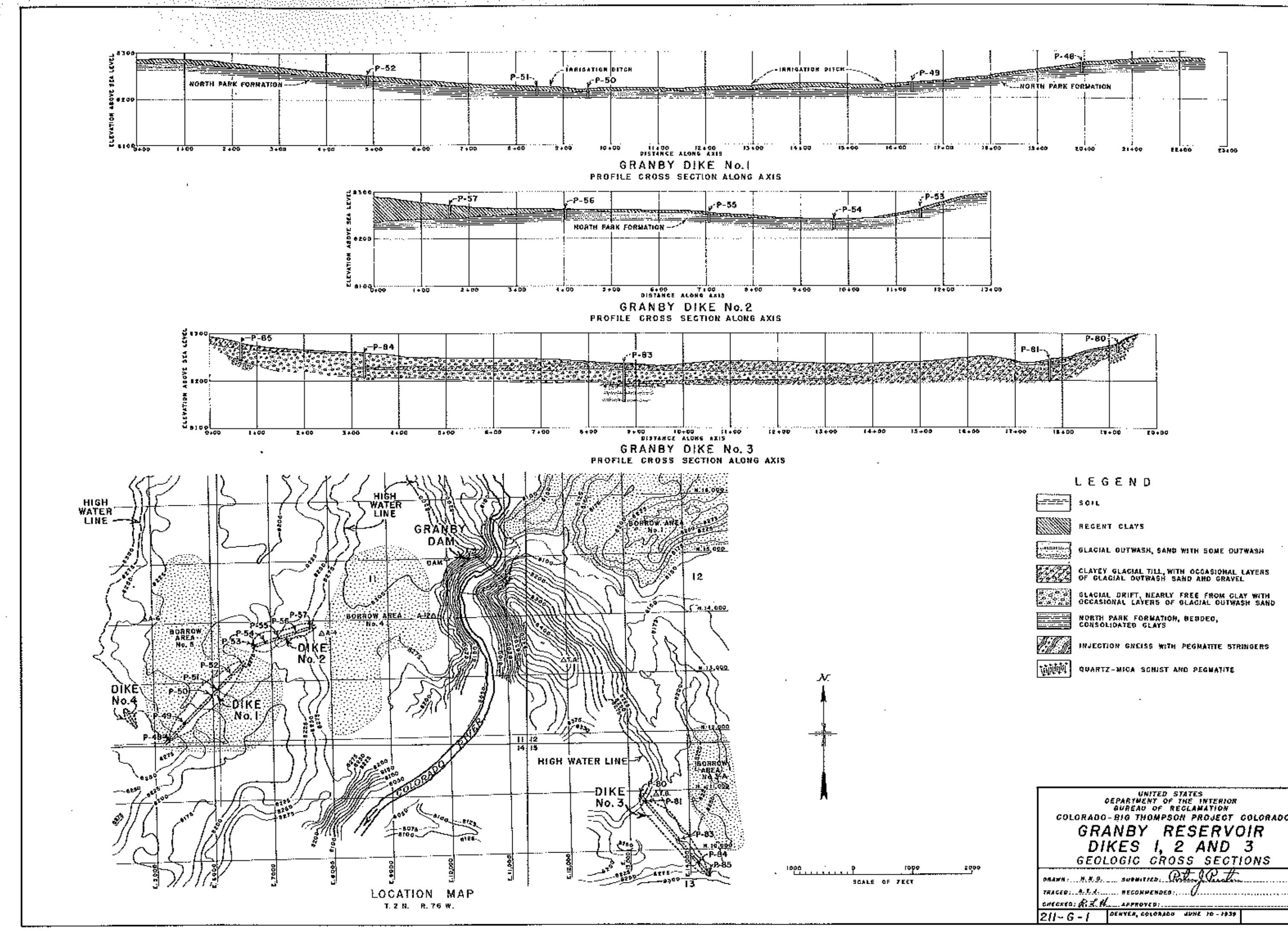
The only formations directly involved in the Soldier Canyon site are the Dakota and the upper part of the underlying Morrison. The Dakota is 315 feet thick and consists of three massive sandstones separated by shales. The upper 160 feet of the Morrison is shale which is limy in places. The thicknesses, normal to the bedding planes, of all the strata involved in and near the site, are shown on the geologic column (Fig. 16).

Structure:

The dip of all of the strata is downstream but decreases in amount from 30 degrees at the upstream toe to 23 degrees at the downstream toe. This change in dip is shown in Section C-C of Figure 16 which also shows the succession of strata present under the dam embankment along line C-C on the Location Map. Cross Section A-A, on the axis of the dam, is practically along the strike of the beds and they are, therefore, shown as nearly horizontal. Their thickness is shown as being greater than in the geologic column because the cross section is vertical and the strata are inclined. Cross-section B-B is a developed section along the proposed cut-off trench and the strata are therefore shown as nearly horizontal in the center and inclined at the ends. The dip of the beds is also shown on the Location Map by means of structural contours drawn on the top of the upper sandstone of the Dakota group. There are no faults cutting across the rocks of the dam site although some slipping has occurred between the layers of sandstone during the tilting process, resulting in numerous slickensided surfaces.

Overburden:

The depth of overburden ranges from 1 to 30 feet and is, as a rule, thinner on the upper slopes and thicker on the lower slopes and in the stream bottom. The thickness of overburden is shown on Figure 16.



▼ Fig. 14. Geologic cross sections at Granby dikes with map showing location of dikes, borrow areas and earth and rock-fill layout for main dam.

As will be seen on the logs of test pits on the same drawing, the overburden on the slopes usually consists of sandy clay with scattered boulders and fragments of sandstone. The clay content is such that the material is usually sticky when wet and holds up well in the pits without cribbing. The overburden in the stream bottom consists of sand and gravel with rounded boulders of quartz schist from the mountains to the westward.

Percolation Tests:

Since all of the strata dip downstream, possible seepage loss through porous beds is a matter of some concern. The formation which is thought to present the greatest possibility for seepage is the Sundance sandstone. It is 200 feet thick as shown by the log of drill hole No. 201, although none of it is exposed at the surface at the dam site and only a few feet in other parts of the reservoir.

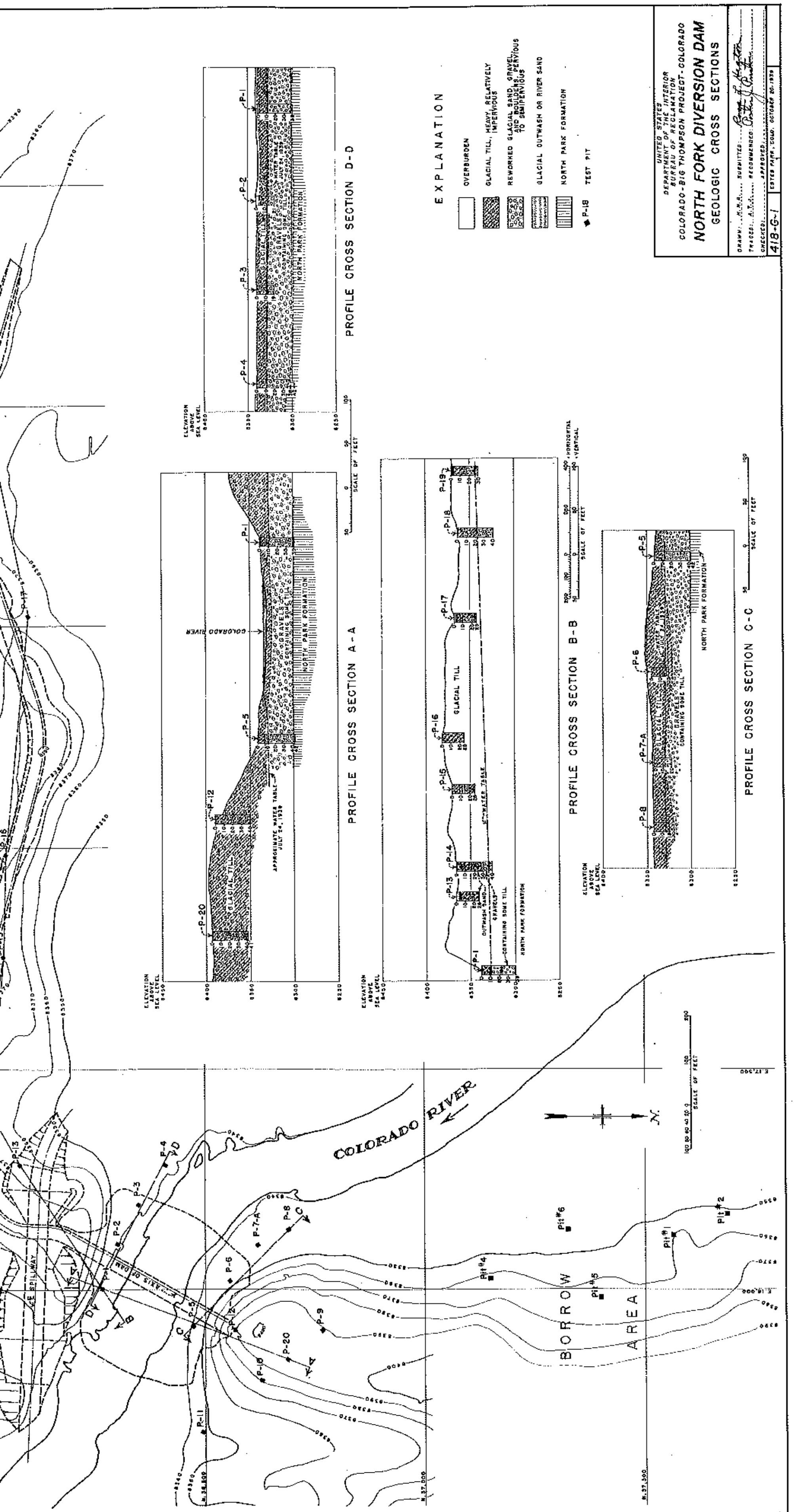
Percolation tests were taken for every five feet of the sandstone in drill hole No. 201. The losses in the upper part of the hole were very slight, but in the lower part they ranged from 9.75 to 21 gallons per minute under a pressure of 85 pounds per square inch in a three inch diameter hole. These losses are, of course, not excessive. Laboratory tests on blocks from an outcrop of the upper part of the sandstone showed a percolation rate of .23 foot per year, under unit conditions, parallel to the bedding planes and .04 foot per year across the bedding planes. The conclusion was reached that there will be some loss while filling the pores of the sandstone in the dry zone near the surface but that it will then be considerably less than the loss by evaporation. The sandstone is well blanketed throughout the length of the reservoir.

Formations Involved in Eastern Slope Reservoirs

AGE	FORMATION		THICKNESS (Feet)
Upper Cretaceous	DAKOTA	Upper sandstone	25-40
		Upper shale	155-200
Lower Cretaceous		Middle Sandstone	35-75
		Lower Shale	6-55
		Lower Sandstone	35-75
Upper Jurassic	MORRISON		255-340
	SUNDANCE		115-200
Triassic (?) and Permian	LYKINS		550-850
Permian	LYONS		46-65
	SATANKA		170-210
Pennsylvanian	INGLESIDE		90-125
	FOUNTAIN		900-1-50

GEOLOGIC FEATURES OF OTHER EASTERN SLOPE DAM SITES

Dixon Canyon and Spring Canyon dam sites are almost identical with Soldier Canyon except that at Spring Canyon the overburden is heavier and, due to peculiarities of erosion, the



▼ Fig. 15. Geologic cross sections and layout for North Fork diversion dam.

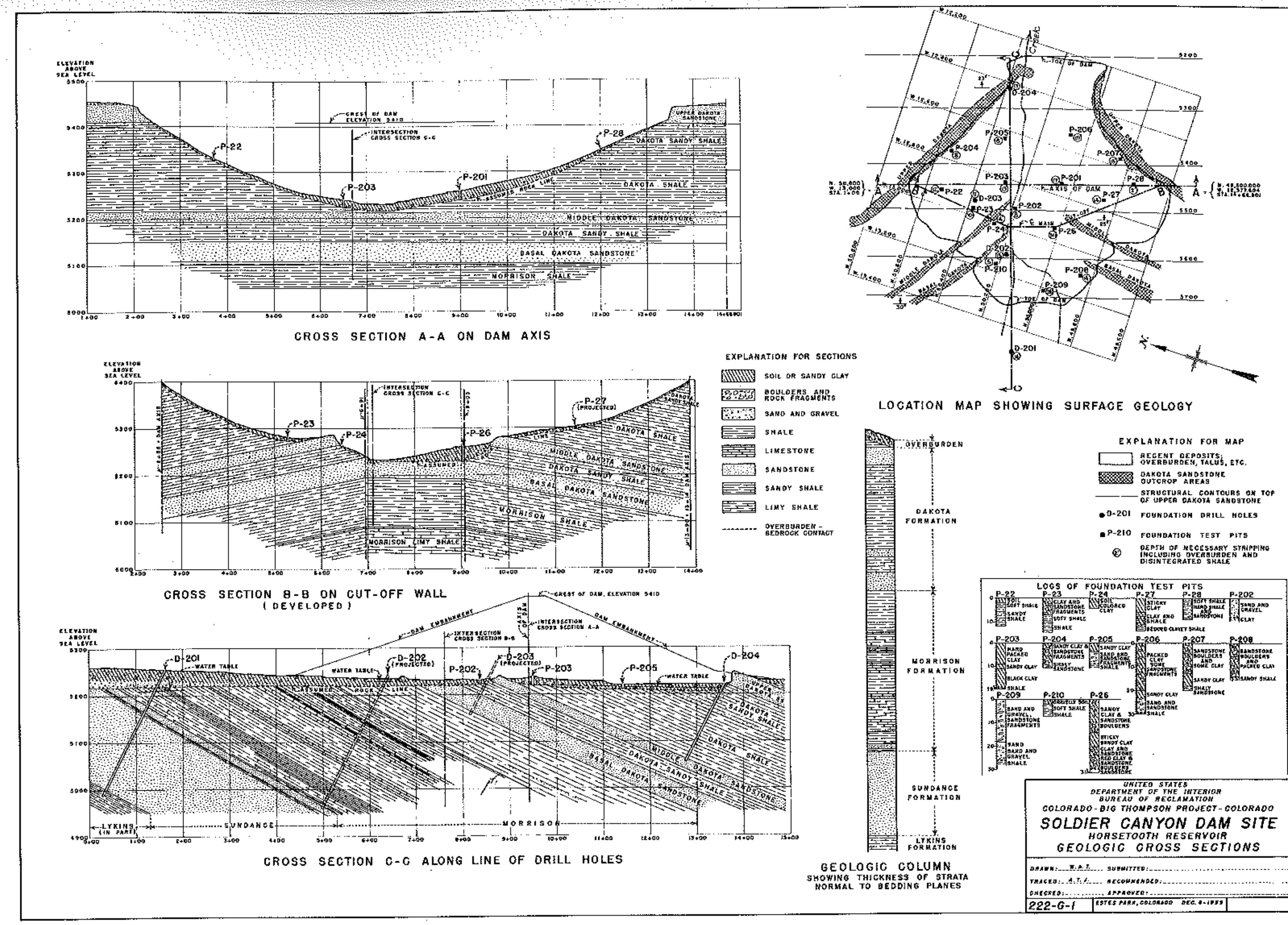
axis of the dam is to extend between outcrops of the middle Dakota sandstone instead of the upper Dakota as at the other two sites. Horsetooth dam will be 1460 feet long and 90 feet high and will extend across the upturned edges of the strata instead of parallel to the strike. One end will rest on the Lyons sandstone and the other on the shales and limestones of the lower Morrison formation. The Sundance and Lykins will underlie the main body of the dam and an outlet tunnel will be built near the center, under the embankment.

The crest of Arkins dam will extend from the lower Dakota sandstone on the south side to the middle Dakota on the north. The crest of the main dam at Carter Lake will connect middle Dakota outcrops on each side of the canyon. The beds dip at angles of only 13 or 14 degrees. Of the other two smaller dams at Carter Lake, one will extend across upturned beds between the Lyons and Morrison formations as at Horsetooth dam. The beds dip more steeply at Carter Lake, however, and the dam will, therefore, be much shorter, having a crest length of only 1060 feet. Its height will be 65 feet. The other dam or dike will be built at the north end of Carter Lake and span a wide, shallow depression in the reservoir rim which is a structural as well as a topographic saddle. The foundation rock will be the Lyons sandstone with practically no overburden. This dike will be 1150 feet long and 36 feet high.

CONDUIT TUNNELS

There will be many tunnels along the canal lines varying in length from a few hundred feet to more than two miles. The location of these tunnels is shown on the layout map (Fig. 1). The first one below the east portal of the Continental Divide tunnel is the Giant Track tunnel. It will be 6500 feet long and nearly all in granite. Below Estes Park on the north side of Big Thompson River there will be several short tunnels in granite and quartz schist on the conduit to the power plant at the forks of the Big Thompson, although this canal is not included as a part of the present construction program.

The first tunnel north of Big Thompson River on the Poudre Supply Canal will be the Green Ridge tunnel, one-half mile long which will be driven in a mixture of granite and schist, quite seriously affected by faulting. Its west portal is near the Big Thompson fault, the latter being associated with a large echelon fold. Farther north, at the south end of

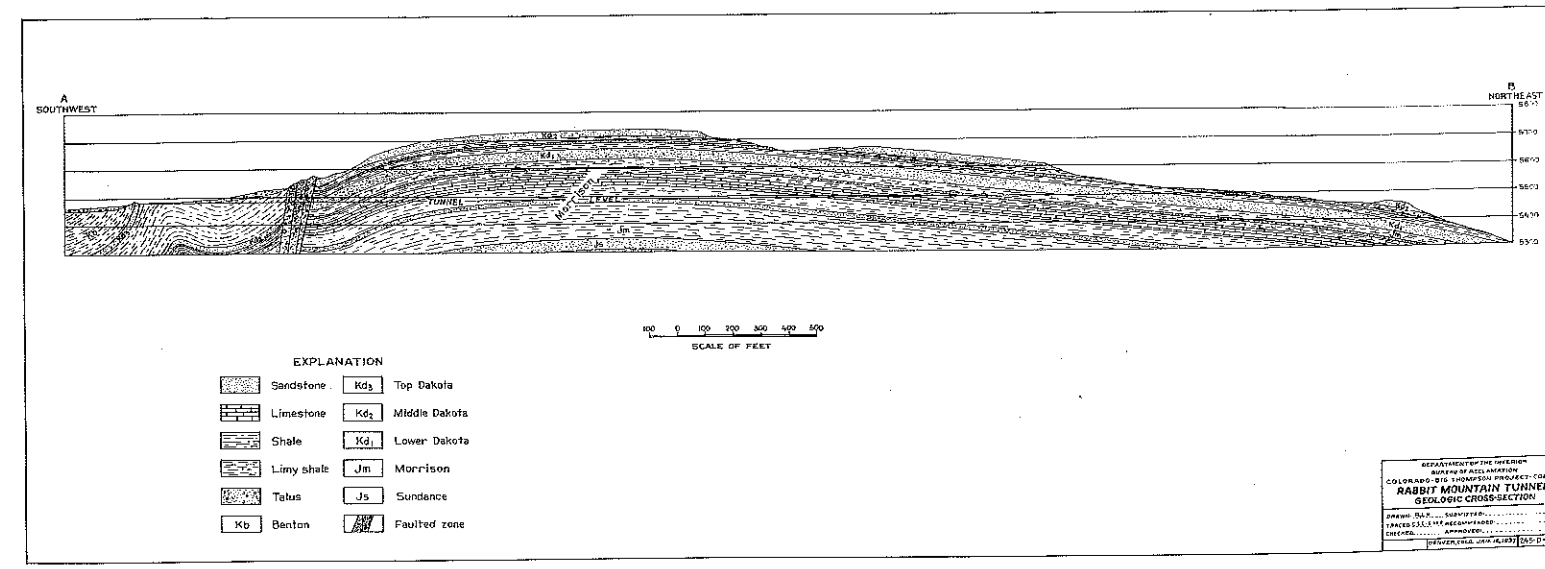


▼ Fig. 16. Soldier Canyon dam site. Geologic cross sections with map showing surface geology.

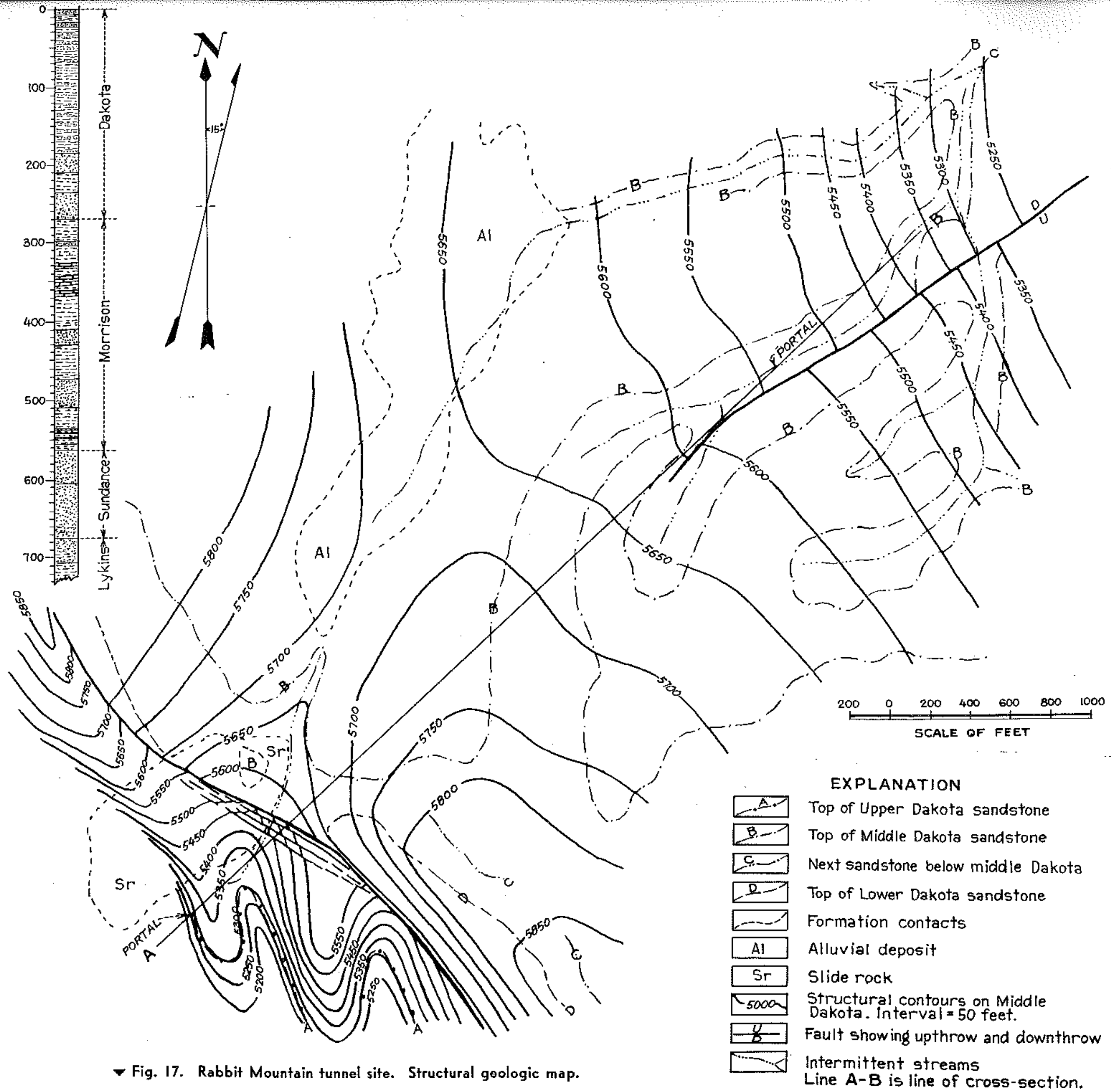
Horsetooth reservoir, is the Horsetooth tunnel, the longest on the canal system. It has a length of 11,600 feet and is to be driven across a large eroded anticline. Steeply dipping beds of the Fountain formation flank the fold on each side while the center portion of the tunnel will be driven in granite and lesser amounts of schist. At least three faults and two dikes will be encountered.

South of the Big Thompson River the Carter Lake inlet tunnel will be driven through the Fountain arkosic sandstones for 1600 feet, the Ingleside sandstone for 350 feet, and the Satanka shales and sandstones for 650 feet. The tunnel direction will be directly with the dip of the beds which is uniformly fifteen degrees.

Rabbit Mountain tunnel is on the



▼ Fig. 18. Rabbit Mountain tunnel site. Geologic cross section.



▼ **Fig. 17. Rabbit Mountain tunnel site. Structural geologic map.**

St. Vrain Supply Canal just south of Little Thompson River. It will penetrate an echelon fold but, unlike Horsetooth tunnel, it will be entirely in sedimentary rocks. The arch is asymmetrical with six degree dips on the northeast and thirty degree dips on the southwest. The formations involved are the upper Morrison and the lower and middle Dakota (Figs. 17 and 18). The tunnel will be approximately 4000 feet long of which 1400 feet will be in the Dakota and 1600 feet in the Morrison formation. There is a zone near the southwest end of the tunnel which has been badly shattered by faulting for 100 feet. There is a downthrow on the southwest of 130 feet. On the downthrow side the upper Dakota sandstone and shales are folded into a series of small anticlines and synclines plunging steeply to the southwest. On the northeastern side of the anticline there is another fault trending in the direction of the dip. At one point it is close to the line of the proposed tunnel and no doubt the rocks will be noticeably disturbed for a distance of 200 feet or more.

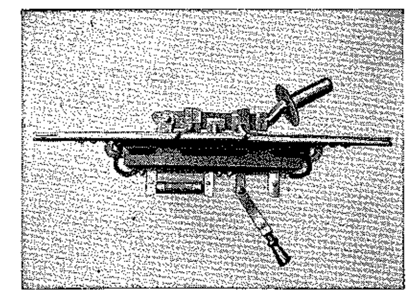
In the geological work connected with the project the writer was assisted throughout the investigations by Chas. S. Content, Assistant Geologist. The geological work during foundation testing at Green Mountain dam site was directed by Mr. Content and that for Granby and North Fork Diversion Dam sites was supervised by Horace N. Goodell, who also mapped the geology of Granby dam site. W. A. Thompson gathered geological data at Green Mountain dam during the driving of the outlet tunnel and assisted in preparing maps and cross sections of the eastern slope dam sites after completion of the field work. Porter J. Preston is the Supervising Engineer of the Colorado-Big Thompson Project, the fourth largest reclamation project in the country. The Bureau of Reclamation is in the Department of the Interior, Harold L. Ickes, Secretary. All Bureau work is under the direction of John C. Page, Commissioner; R. F. Walter is the Chief Engineer of the Bureau; S. O. Harper is the Assistant Chief Engineer, and J. L. Savage, is Chief Designing Engineer.

WITH THE *Manufacturers*

EQUIPMENT NEWS

New Switch

A new Auxiliary Section Insulator Switch, designed to minimize electrical fire hazards and to protect electrical equipment in mines, has recently been placed on the market by the Mosebach Electric & Supply Co., 1173 Arlington Ave., Pittsburgh, Pa. Really two switches in one, the new unit consists of a standard type Mesco Insulator Switch combined with a smaller switch which can be fused for any desired load.



When ordinary switches are employed, the full load, capable of operating machinery such as loaders, cutters, etc., is of course carried through the switch. In such cases, where it is necessary to operate small pumps, fans, etc., at the face during shutdown periods, the small load also is carried through the large switch. Thus, when the ampere load is suddenly increased, as often happens, the switch does not cut it out, and the higher amperage burns out the motors, resulting in ruined equipment and often in mine fires.

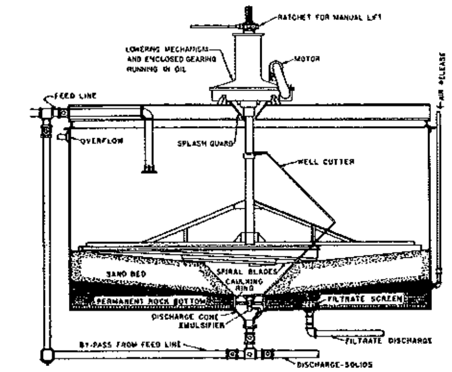
Chief advantage of the new Mesco Switch over ordinary switches is that, although high amperage load can be routed through the larger switch during working periods, this switch can be opened and the smaller one closed during shutdown periods. The small switch passes sufficient ampere load to operate fans, small pumps, etc., but if the amperage is suddenly increased the fuse burns out, stopping all current and protecting the equipment at the face.

The manufacturer will be pleased to supply additional information and prices upon request.

Improved Design of Sand Filter Clarifier

The Hardinge Company, Incorporated, York, Pennsylvania, announces a new design, heavy duty sand filter, which is used for filtering boiler feed water, gold cyanide solutions, brine, gasoline and the like. It incorporates two new types of drives, one for intermittent operation, using standard open type worm gearing and the other for continuous operation with completely enclosed drive on ball bearings in an oil filled housing.

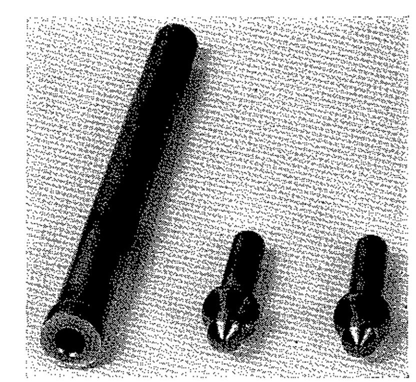
This sand filter, unlike others, requires no washback, with attendant loss of liquor. In principle, the liquid to be clarified is introduced in the tank, on the bottom of which is a sand filter bed and spiral scraping mechanism. The liquid is drawn through the filter bed by a vacuum pump or by hydraulic pressure of the liquid in the tank. As the bed becomes impervious from the sludge de-



posited thereon, the scraper removes this sludge to the center, where it is discharged. At the same time, a very light cut is taken off the top of the sand bed by slightly lowering the scraper. This cut removes the sludge that tends to collect between the particles of sand over long periods of time.

The sand bed need be renewed only once every two to five years as a rule. The filtrate is crystal clear. The operation is extremely economical, a sand cut being required only periodically and is made with a simple movement of a new type ratchet wrench on top of the driving mechanism, which accurately controls the amount of the cut required. The units are made in sizes from 6' to 100' in diameter, with capacities ranging from a few gallons up to 5,000 gallons per minute.

New High Corrosion Resistance Valve



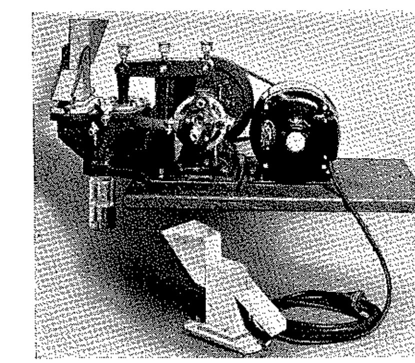
Shown in the illustration is the latest type of Kennametal valve developed by McKenna Metals Co., 323 Lloyd Ave., Latrobe, Pa. Known as a "slow up valve," it has a small ring of Kennametal inserted in the valve seat, with a cone shaped piece of Kennametal, ground and lapped to the same angle of chamfer, tipped on the valve stem. Both seat and stem are lapped so accurately they will hold a vacuum.

As in the case of Kennametal ball valves and other valves equipped with this hard carbide material, the new Kennametal slow up valves are extremely resistant to both erosive and corrosive action. For this reason, Kennametal valves have wide applications in the oil industry, where oil containing sand in suspension soon wears out ordinary valves; in the gas industry, where corrosive gases are encountered; in the chemical industry, where its high corrosion resistance favors its use in acid proof pumps and similar equipment; and in other industries where resistance to abrasion and corrosion is important.

Despite its extreme hardness, which is about 78 Rockwell C or 91 Rockwell A for grade KH, Kennametal is unusually strong, enabling valves on which it is used to resist breakage while in service. Kennametal balls, for example, have been placed on an anvil and struck with the full force of a 12 lb. sledge without breaking.

Kennametal can be supplied in preformed shapes of almost any design for tipping valves and valve seats. Complete information will be supplied by the manufacturer upon request.

Denver Laboratory Mineral Jig

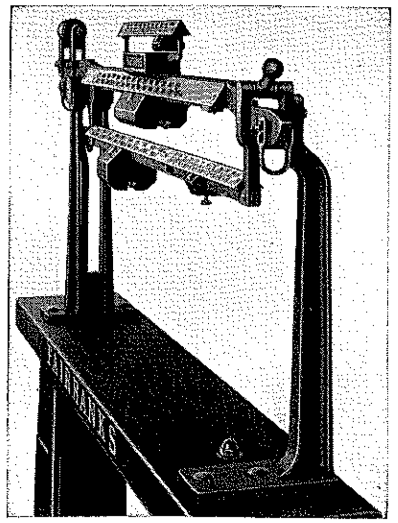


Denver Equipment Company, 1400 Seventeenth St., Denver, Colorado, has incorporated into a laboratory mineral jig all the features of the well-known commercial units. Laboratory usage has demonstrated that results obtained can be used as an accurate index to results which can be expected in plant practice. Mine laboratories contemplating operating jigs find this unit an excellent guide and Universities use them for instruction and experimental work.

The Denver Laboratory Mineral Jig must not be confused with the older types of laboratory jigs used prior to the development of this new machine. The Denver Mineral Jig has proven applicable primarily to those problems paralleling ball mill-classifier conditions wherein the unit treats an unclassified feed, the size of feed ranging from minus ¼ inch downward, recovery being secured as a hutch product. Special units are available for problems involving coarser feeds.

The Denver Laboratory Mineral Jig is designed with one hutch compartment and includes several refinements to assist in laboratory technique. It may be used for batch tests or continuous operation, and will handle up to 200 pounds per hour. The unit is furnished with assorted sizes of jig shot and two screen boxes with lower screens of different sizes. One of the most important points in operating this laboratory unit is to have a constant feed . . . in order to maintain a steady feed rate the Denver Jig Feeder has been designed and is recommended for use with jig. Complete detailed information on the construction and operation of Denver Laboratory mineral jig will be gladly furnished.

Accurate Weighing Made Easier For Motor Truck Scales

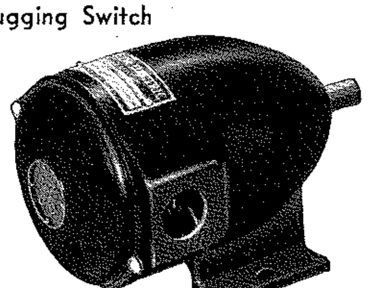


The full capacity beam recently announced by Fairbanks-Morse makes accurate weighing of motor trucks much faster and easier than ever before. All graduated face plates are set at an angle of 45 degrees which eliminates "hunch-back" weighing and permits a tall or short person to read from a natural standing position. These plates are made of aluminum and have large, black, etched in figures.

The main poise and main tare poise are both equipped with positive seating stainless steel poise dogs located in the center of the poises and operating in a vertical plane from convenient finger-form side handles. The poise dogs engage in 90 degree notches which are accurately machined on the underside of the beams. Definite location of poise dogs in center of notches is assured—wear on the notches is reduced and over-all accuracy of the beam is prolonged. By locating the notches on the bottom of the bars dirt cannot accumulate in them and affect the accuracy of the poise setting. The poises respond to feather-weight touch. When the beam is balanced, it is read easily because the decimal reading face plates on the new Fairbanks Beam reduce mental calculation to a minimum.

The new beam is available with or without tare-bar. All working parts are scientifically heat treated to insure precision fit and continued accuracy. Complete information may be obtained from Fairbanks Morse & Co., 600 S. Michigan Ave., Chicago.

G. E. Introduces New Plugging Switch



In a new plugging switch for controlling motor stopping, recently introduced by the General Electric Company, the use of an Alnico magnet as its fundamental part eliminates frictional parts or clutches and contributes to low maintenance costs and long operating life. Compact design, low operating torque, and immunity to heat are other features of this switch.

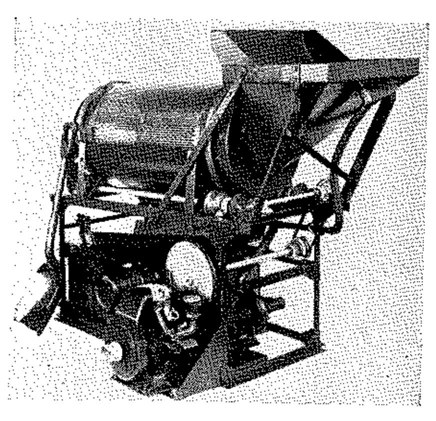
In stopping a motor it is often desirable to reverse the power connection and so bring the motor to rest quickly by its tendency to run in the reverse direction. This is plugging. However, if the motor is to stop, it is necessary that the plugging power be removed at the correct moment, to keep the motor from re-accelerating in the reverse direction. This is accomplished by a plugging switch.

In the operation of this new switch, a driven Alnico rotor produces a rotating magnetic field which induces eddy currents in the walls of the aluminum cup. The magnetic reaction produced by the eddy currents turns the cup through its limited rotation, and the contacts are operated by the Textolite rod which connects the cup and the movable contact strip.

Centering springs tend to keep the contacts in the normal position but since the magnetic operating force on the aluminum cup is dependent on speed, contacts operate at and above a definite speed. As the speed decreases, a definite point will be reached where the spring force will overcome the magnetic force. This is the tripping point. Changing the spring tension provides a simple means of adjusting the tripping speed over a definite range. A different tripping range can be obtained by changing the springs.

Portable Placer Machine

The Universal Portable Placer Machine, manufactured by the Universal Dredge Manufacturing Company, Denver, Colorado, was designed for the purpose of providing the operator in the mining field with a practical and inexpensive placer machine which is suitable for operation on bank run gravel as well as providing an ideal clean-up machine to be used in connection with testing placer property from either churn drillings or pits.



The structural steel frame work is welded into sections and securely bolted together at assembly, thus facilitating aeroplane or muleback transportation. The trommel screen is designed to withstand the severe abrasion and shock, is provided with four longitudinal lifting angles forming the main section members of the screen. The feed hopper is constructed of steel plate with an enclosed spout which extends well into the screen. A reciprocating sluice mounted on V-shaped rollers prevents packing of the material within the riffles. Rubber riffles are molded in one piece. The water supply pump is coupled to the gasoline drive engine by means of a flexible coupling and connects with a water storage tank, located directly under the riffle sluice. A de-watering sand wheel is recommended where the machine is operated any appreciable distance from the water. Power is furnished by a 1½ h.p. air cooled gasoline engine and is directly coupled to the water supply pump. The normal capacity is said to be from two to two and a half yards per hour of bank run material.

"Very Encouraging" Business Outlook Reported by Westinghouse President

George H. Bucher, President of the Westinghouse Electric & Manufacturing Company, told stockholders at the annual meeting of the company that the outlook for business was "very encouraging."

Orders for the first three months of 1940 were more than 30% higher than the same period during the last year, $65,250,000 compared with $50,121,000 in orders for the two quarters.

The backlog of unfilled orders was approximately $83,000,000 on March 31, 1940, a peak figure in the company's history. At present rates the payroll may reach $95,000,000 for the year. "Though complete figures are not yet available," Mr. Bucher said, "preliminary figures indicate that net earnings will be appreciably higher than in the first quarter of 1939."

Foreign business was about 33 per cent higher than in the same period last year; virtually none of it was with belligerent nations.

Mr. Bucher described research on high-temperature, high-pressure steam turbines, being carried on by Westinghouse in co-operation with the Philadelphia Electric Company. An experimental full-sized high-pressure steam turbine, equipped with an optical system that permits engineers literally to see what is going on inside the machine, has been installed in the Schuylkill Plant at Philadelphia, Pa., where it can be operated under full load and actual field conditions.

Improvements in air conditioning equipment were described; particularly for a 100-horsepower compressor, which is only twice as large as an automobile engine. During an average season this compressor operates about four times as long as the average automobile engine and always runs under full load.

CATALOGS AND TRADE PUBLICATIONS

FOR YOUR CONVENIENCE

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

(945) SCREENING MOIST MATERIALS. Bulletin B-6088 by Allis-Chalmers Mfg. Co., Milwaukee, Wisconsin. Illustrates and describes the Sta-Kleen Low-Head horizontal screen with the "ball deck" that gives a secondary vibration to prevent blinding.

(946) MOTOR TRUCK SCALES. Publication ASB 610.4 by Fairbanks, Morse & Co., Chicago, Ill. Describes and illustrates a new full capacity beam for motor truck scales. Capacities are from 10 to 40 tons and employ the decimal reading principle.

(947) FLOTATION SHORTHAND. June 1940 Deco Trefoil by the Denver Equipment Co., Denver, Colo. Contains an on "Flotation Shorthand" by Arthur F. Taggert, well known professor of Mineral Dressing. This inovation is well described and you are asked to vote on its practicability. This number also contains a pamphlet on the operation of La Chiripa. y- Anexas, S. A. and a pamphlet on laboratory float machines.

(948) MOLYBDENUM IRON CASTINGS. The Moly Matrix by Climax Molybdenum Co., 500 Fifth Ave., New York, N. Y. Description and illustrations of a molybdenum iron cast cat line hoist housing and high pressure pipe line valves of molybdenum cast iron.

(949) BALL MILLS. Bulletin No. 200 by the Eimco Corporation, Salt Lake City, Utah. Description and illustrations of the Eimco grate-discharge ball mill, V-belt driven with construction details and tables of sizes and capacities.

(950) DIRECT-CURRENT GENERATORS. Bulletin GEA-1607C by General Electric Co., Schenectady, N. Y. Information on construction features, modifications and available ratings on type B generators and exciters. These are two or four pole, 125 or 250 volt shunt or compound 40 C continuous generators.

(951) AIR HOISTS. Bulletin H1—Second Edition by Gardner-Denver Co., Quincy, Ill. Illustrations and construction details of various sizes of air hoists and air motors with specification tables.

(952) SYNCHRONOUS MOTORS. Bulletin GEA-3345 by General Electric Co., Schenectady, N. Y. Description and advantages of using the part-winding method for part-winding starting of synchronous motors with illustrations of the equipment necessary.

(953) JAW CRUSHERS. Bulletin No. B-6034 by Allis-Chalmers Mfg. Co., Milwaukee, Wisconsin. Descriptions, illustrations and construction details of the fine reduction, Dodge, Blake and Superior jaw crushers. Tables of dimensions and capacities, 27 pages.

(954) WAGON DRILLS. Bulletin WD—Second Edition by Gardner-Denver Co., Quincy, Ill. 6 pages describing and illustrating wagon drills and their mountings with tables of dimensions and specifications.

(955) GRINDING MILL LINERS. Super-Molychrome Liners by the Eimco Corporation, Salt Lake City, Utah. Descriptions of super-molychrome liners and how they are made to specifications. Also what users says about these liners.

(956) CONVEYING EQUIPMENT. Link-Belt News, May, 1940 by the Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill. News articles such as an 8500 ton ship unloading itself, a new low-priced stoker for the home and the company's balance sheet for the last year.

(957) SUMP PUMP MOTOR. Bulletin GEA-3352 by General Electric Co., Schenectady, N. Y. Description of a fractional horsepower, split-phase, constant speed motor with a built-in float switch and overload protection.

(958) DIESEL ENGINES FOR OIL DRILLING. Bulletins Nos. 261, 263, and 264 by the National Supply Co., Pittsburgh, Penn. Specifications and torque speed graphs for 255, 310 and 350 horsepower engines.

(959) ELECTRICAL EQUIPMENT. Quick Selector Catalog 30-000, April 1940 by Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. A 64 page catalog to facilitate the user of electrical equipment in selecting the correct apparatus for any motor, lighting or feeder circuit and installation data.

(960) DEVELOPMENT AND MANUFACTURE OF OPTICAL GLASS IN AMERICA. Reprint of an article in the Scientific Monthly, April 1940 by M. Herbert Eisenhart and Everett W. Melson Bausch and Lomb Optical Co., Rochester, N. Y. 12 pages describing developments in manufacture such as mechanical stirring, measuring refractive index, properties sought in new glass.

(961) NICKEL CAST IRON. Nickel Cast Iron News, May, 1940 by International Nickel Company, Inc., 67 Wall St., New York, N. Y. Articles on steam locomotive castings, prevention of galling in gear hobbing machines and nickel iron alkaline storage batteries.

(962) PORTABLE COMPRESSORS. Form 3364 by Ingersoll-Rand Company, 11 Broadway, New York, N. Y. 31 pages of illustrations, descriptions and construction details of two-stage portable air cooled compressors. Illustrations of other compressed air equipment.

(963) VERTICAL INDUCTION MOTORS. Bulletins GEA-1412B, 1368D, 3223 by General Electric Company, Schenectady, N. Y. Illustrations and construction details of a vertical solid-shaft open or closed induction motor, a vertical hollow-shaft shielded induction motor, and single-phase one to five horsepower vertical motors.

(964) MACHINE LATHE PERFORMANCE DATA. Data Sheets Nos. 38 to 45 by Gisholt Machine Company, 1265 East Washington Avenue, Madison, Wis. Data and illustrations of how to best machine, with turret lathes, steel forged driving hubs, fan bearings, miscellaneous parts, airplane parts and others.

(965) ALL-WHEEL-DRIVE FORDS. Catalog by Marmon-Herrington Company, Inc., Indianapolis, Indiana. 15 pages describing and illustrating standard Ford trucks, passenger and commercial cars that have been changed to four and six wheel drives with or without dual wheels. If your road conditions are bad, this should be of interest to you.

(966) DRIFTING DRILLS. Bulletin DD—Fifth Edition by Gardner-Denver Co., Quincy, Ill. 23 page catalog describing and illustrating all sizes of drifters used in mining, quarrying, etc., with accessories and other compressed air tools.

(967) GENERAL ELECTRIC ANNUAL REPORT. Annual report for 1939 by General Electric Co., Schenectady, N. Y. 24 page booklet gives company balance sheet, financial condition, organization changes, directors and officers.

(968) METAL MINE LOCOMOTIVES. Bulletin No. H-3611 by Goodman Mfg. Co., Halsted St. at Forty-eighth, Chicago, Ill. Descriptions, illustrations and construction details of storage battery and trolley locomotives from trammers to 25 ton machines.

(969) ELECTRICAL APPARATUS. Bulletins GEA-2902B, 3198A and GES-2285 by the General Electric Co., Schenectady, N. Y. Descriptions and illustrations of a vacuum tube time delay relay, glyptal welding aid to prevent adhesion of weld spatter and Airs type voltage regulators.

(970) OIL FIELD EQUIPMENT. Bulletins Nos. 243, 267, 269, 262, and 258 by the National Supply Co., Pittsburgh, Penn. Illustrations and descriptions with construction details of a rotary hook for moderate depth drilling, a unit pumper, tubing heads, and a 300-ton traveling block with independently mounted sheaves.

(971) LONGWALL COAL CUTTING MACHINES. Bulletin M-369 by Goodman Mfg. Co., Halstead Street at Forty-eighth, Chicago, Ill. Description and illustrations of the L-10 and L-11 longwall coal cutters that can be arranged for over and bottom cutting, will work on pitches, have twin drums and two speeds.

(972) NICKEL ALLOYS. Nickelworth, Second Quarter 1940 by the International Nickel Co., Inc., 67 Wall St., New York, N. Y. News items on new uses of nickel alloys such as corrosive resistant vessels and a strong bond between nickel and steel.

(973) JAW CRUSHERS. Bulletin No. 305 by the Eimco Corporation, Salt Lake City, Utah. Description and illustrations of a jaw crusher with forced feed lubrication, heat treated steel castings and regulator for adjusting size of product when in motion.

(974) TRAVELING CRANES. Folder by Shaw-Box Crane & Hoist Division, Manning, Maxwell & Moore, Inc., 800 Broadway, Muskegon, Michigan. Descriptions and illustrations of light and heavy duty hand and motor operated traveling cranes.

(975) SHAKER CONVEYORS. Compressed Air Shaker Conveyors by the Meco Works, U. S. A. Agent, The Goodman Mfg. Co., Halsted Street and 48th Place, Chicago, Ill. Description, illustrations and construction features of an air shaker conveyor with tables of dimensions and air consumption.

(976) HIGHWAY USERS MORE THAN PAY THEIR WAY. Automobile Facts, May 1940 by Automobile Mfg. Association, New Center Building, Detroit, Mich. Articles on motor transport's share of highway charges, training of men in service work and gains to the consumer by advances in production techniques.

(977) CYANIDE MACHINERY. Bulletin C-40 by Morse Bros. Machinery Co., Denver, Colo. Descriptions and illustrations of machinery used in cyanidation such as thickeners, pumps, filters, and precipitation equipment.

(978) INSULATING MATERIAL. Insulator, April 1940 by Armstrong Cork Co., Lancaster, Pa. Articles about equipment using insulating material such as packing plant refrigerators, gasoline extraction equipment and storage of prison supplies.

(979) PLACER MACHINES. Portable Placer Machine pamphlet by the Universal Dredge Mfg. Co., Central Savings Bank Building, Denver, Colo. Description of a portable placer machine, its advantages and other equipment manufactured by this company.

(980) ASBESTOS PROTECTED STEEL. Felt-Cote pamphlet by American Steel Band Co., 200 Bowman Building, Pittsburgh, Pa. Illustrations and descriptions of asbestos protected steel roofing installations and their advantages.

(981) DRILL SHARPENERS, INSTALLING AND OPERATING. A 28-page book published by Gardner-Denver Company, Quincy, Ill., giving full instructions for using the Gardner-Denver Drill Sharpener, with drawings and illustrations showing how to operate this equipment to the best advantage.

(982) VIBRATING SCREEN. Catalog No. 1762 of Link-Belt Company, 300 W. Pershing Rd., Chicago, Ill., contains 20 pages of illustrations showing many installations of Vibrating Screens for a large variety of materials. Drawings of several types of screens and dimension tables are given. This book gives you a good idea of the screen and what it will do for you.

(983) LARGE SYNCHRONOUS MOTORS. Bulletin B-6063 by Allis-Chalmers Mfg. Co., Milwaukee, Wis., contains 27 pages showing the detailed construction of large coupled engine Type Synchronous Motors and many applications. The bulletin also shows types of starting equipment and metal clad switch gear.

(984) ELECTRIC HOIST WITH PUSH TYPE BALL BEARING. TROLLEY: Catalog No. 337-A of Shaw-Box Crane & Hoist Division, Manning, Maxwell & Moore, Muskegan, Michigan, contains 24 pages showing the construction and application with capacity tables from 250 lbs. to 40,000 lbs.

(985) SUCKER RODS. Bulletin 272, National Supply Company, Toledo, Ohio, contains 24 pages showing the manufacture and construction of National Supply Company Sucker Rods and Couplings.

(986) DENVER MINERAL JIGS. Bulletin No. 12-B, Denver Equipment Company, Denver, contains 18 pages, illustrating the principle, construction, operation and many installations of the Denver Mineral jig. Actual Flow sheets of operation plants shown will help you in adapting the jig to your mill circuit. Specifications and dimensions are given showing capacities, water and power requirements. You will want a copy of this bulletin.

Alumni Business

MEETINGS

Executive Committee Meetings

3rd Monday of each month, Alumni Office, 7:00 P.M.

Alumni Council Meetings

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

Publication Committee Meetings

2nd Tuesday of each month, Alumni Office, 7:00 P.M.

Magazine Staff Meetings, Alumni Office on call.

NEW ASSOCIATION MEMBERS MAY, 1940

Alumni

Michael Ivanoff, '25 - Norman, Okla.
Don Peaker, '32 - - - - Tulsa, Okla.
F. F. Seeburger, IV, '35
Langley Field, Va.
Glenn R. Stephens, '27 - Golden, Colo.
Norman Whitmore, '26
Los Angeles, Calif.

Associate

Erland E. Anderson, Ex-'42
Denver, Colo.
Harold Busler, Ex-'41 - - Cody, Wyo.
Oscar W. Carlson, Ex-'29
Los Angeles, Calif.
Clark B. Carpenter, Prof.
Golden, Colo.
Albert J. Dexter, Ex-'05 - Denver, Colo.
Byron P. Edmonds, Ex-'37 - Houston, Tex.
Fred Jones, Jr., Ex-'39 - Grand Lake, Colo.
Robert M. Meyer, Ex-'37 - Greeley, Colo.
Hubert A. Stringer, Ex-'34
Gadsden, Ala.
Claude W. Thomas, Ex-'40
Casper, Wyo.

REPORTS

Executive Committee Meeting

The regular monthly meeting of the Executive Committee was held in the Alumni Office on Monday, May 20, 1940.

Members present: E. J. Brook, President; Frank C. Bowman, Vice-President; George W. Thomas, Treasurer; Frank J. Nagel, Secretary; Charles O. Parker. Committee Chairmen: Bruce B. LaFollette, Publications; James W. Dudgeon, Athletics; Russell H. Volk, Membership; T. C. Doolittle, Budget; Donald Dyrenforth, Public Relations; C. Lorimer Colburn, Alumni Association Endowment; Allen Craig, Capability Exchange. Guests: Dent Lay and A. E. Perkins.

Financial

Treasurer Thomas reported that the treasury was in a healthy condition, that this year in common with other years a surplus is being built up in the early months of the year to carry over the later months when collections will not be so large.

Athletics

Chairman Dudgeon reported that Donald Eden and Gene Volpi had submitted their credentials and scholarship records which had been found acceptable and they had been awarded Alumni scholarships.

Messrs. Ted Gerber and Monty Jones had been previously accepted. There are five applications for the remaining Alumni Scholarship and a committee of three members was appointed to decide who was best qualified.

Ways and means for raising additional funds for the Alumni Loan Fund were discussed. Mr. Brook told of the methods originated by the Southern California section.

Capability Exchange

Chairman Craig stated that the usual number of positions available had been received, some of which had been filled, others were pending. Alumni are earnestly requested to keep their ears to the ground for all jobs which Miners can fill and report same promptly.

Membership

Chairman Volk reported on the activities of the Membership Committee. The application of eleven men for Associate Membership were voted on and accepted. The names of these new members appear elsewhere in this issue.

Alumni Association Endowment

Chairman C. Lorimer Colburn spoke of the activities of this committee and all alumni were asked to keep this in mind for active participation at the proper time.

Publications

Chairman Bruce LaFollette advised that the Special Alumni Number was late getting off the press but that it had been well received by all subscribers and unanimously pronounced a success. It was moved and carried that Messrs. Frank C. Bowman, Bruce LaFollette and all the members of the Publications Committee be given a vote of thanks for their work on getting out the Special Alumni Number.

Annual Banquet

Chairman Donald Dyrenforth of the Public Relations Committee told of the preparations for the Annual Banquet.

Dr. Arthur Adams had consented to act as Toastmaster, Mr. L. Ward Bannister, a prominent Denver attorney, was to be the principal speaker.

Entertainment by the Glee Club and professional entertainers.

Useful and desirable prizes had been obtained for the designated winners.

General

Letters from Mr. Simon Guggenheim, Mr. John W. Hausserman and Mr. Charles W. Comstock regarding their attendance at the Annual Banquet were read. Meeting adjourned.

President's Message

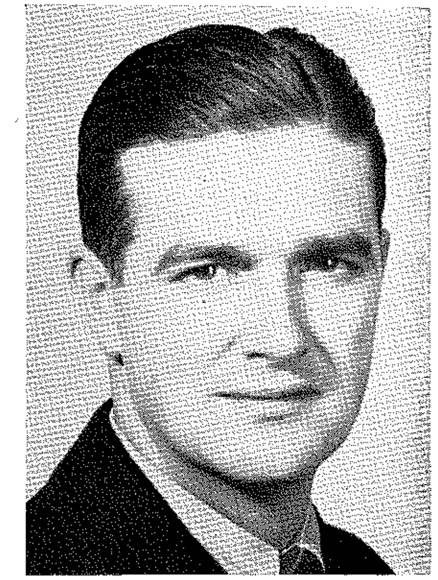
Your President recently had the good fortune to spend several days in Denver during commencement week upon Association business. This furnished the opportunity of meeting with our Executive Committee, the Alumni Council, and the Colorado Section officers in official meetings to receive first hand information on the progress of our program. Unofficial discussions with committee chairmen, alumni, the president of the school, faculty members, and students presented additional valuable sources of worthwhile counsel and a cross section of varied viewpoints toward association business.

From all these discussions an unanimity of opinion exists that certain phases of our activities emerge as paramount in importance to all interested groups. A membership which has full knowledge of these problems considered as most important can furnish needed help toward their solutions.

The policy of concentrating upon strengthening our internal organization has been adhered to as our outstanding task. It is the opinion of your officers that this policy has been successful up to the present time, but that the success of all future phases must be shouldered by local sections. Those phases are (1) a reorganization and revitalizing of "dead" local sections and (2) personal contact work to put our membership drive "over the top."

Many of our local sections are considered to possess an organization capable of assuming these assignments, others are undergoing a process of reorganization and will soon join in the organized efforts. Still others must enter the active groups before their efforts can materially assist the Association in solving the paramount problem with which we are confronted. We feel certain that the officers and members of these sections will assume this responsibility without further delay.

The Association is showing the greatest progress in history this year because of the effective work of your executive committee and the fine support of our members. Whether this pace can be maintained during the last half of the year is dependent upon the local sections. In making this statement full cognizance has been taken of probable unfavorable economic conditions created by World War II. We in America must maintain those institutions that promote "the American way of life," in spite of economic storms. Your Association has a definite place among those institutions. It must not only be maintained but must grow and prosper.



E. J. BROOK

Your official publication "Mines Magazine" with a new attractive format and a change in editorial material to contain more personals, campus, sports, association and news of "Mines Men" in addition to technical articles is deemed suitable. In this manner, members living in regions remote from Colorado have access to news unavailable in the local press.

Every effort will, of course, be made to improve the quality of articles accepted for publication. Letters from our members stating their preference in articles are earnestly solicited by the publication committee to act as a guide for editorial policies.

Our capability exchange should be the outstanding service to members maintained by the Association. Functioning properly this service can place Mines Men in responsible jobs, rather than in "bread and butter" jobs which tide them over a temporary emergency. It is important that all members keep an up to date service record on file at the Association office for reference by the Capability Exchange Committee when "positions to be filled" are brought to our attention. This committee has a plan under advisement and in process of perfection to extend our contacts to sources which will make it possible to secure worthwhile jobs for Mines Men as a regular procedure.

Members of the committee who have sponsored and acted as Trustees for the Student Loan Fund for the past three years believe, and rightly so, that a more generous response should be shown by our members. Mr. Dudgeon stated, "If every Mines Man could only be brought to realize that 'a dollar a year' from each man would be ample to carry on this work, and then act accordingly, constant appeals for funds would be unnecessary." Our results compare quite unfavorably with similar efforts by Alumni groups of schools no larger than our own. Several large sums are promised our fund by alumni who will willingly give when "a large number of small contributors show that they are interested in the welfare of alumni sponsored students at Mines to the extent of financial backing."

These are a few matters which I believe should be brought before our members for their consideration. Our problem was concisely stated by our vice-president Frank Bowman,—"If the Association can be sold to Mines Men as it has been sold to others, if, in selling the Association our members can catch a vision of the possibilities we possess—we can write out our own ticket."

Your officers and committee chairmen, without exception, have an extremely optimistic outlook toward the future of this year's program of the Association. We are working as a team and "not sparing the horses." We are, however, confronted with some major problems. The solution to those problems lies in the support, the interest, and the action of our members.

MINES ANNUAL ALUMNI BANQUET

By FRANK J. NAGEL, Secretary

On Thursday evening, May 23, at 6:30 P. M. there assembled in the University Club in Denver, from far and near, Mines Men for their annual evening of fellowship eats and welcome to the new brethren of the Class of 1940. And it was a happy crowd, as they stood around the lounge, greeting old friends with the usual methods, warm words between cool sips. And everyone within a day's ride who could get there was there.

Shortly after 7:00 P. M. the dining room doors were opened and the happy and orderly crowd promptly took their places. "The Mining Engineer" was sung before sitting down. No time was lost by the waiters in tramming the food. And the Wandering Minstrel thumming his guitar promptly got the crowd into a singing mood. Between bites all the popular songs were rendered, harmony filled the air. After the excellent meal had been disposed of the "Mines" Glee Club gave a selection in their usual excellent manner.

President Brook then took the floor and extended a welcome to all present. He welcomed the class of 1940 into the ranks of the Alumni Association and reminded them that from now on into the future they would have responsibilities to fulfil, not the least of which is their responsibility to the Alumni Association and to their Alma Mater.

He then stated that acting upon a petition from the membership of the Alumni Association the Executive Committee had unanimously voted to confer an Honorary Membership in the Association upon Simon Guggenheim. Mr. Guggenheim had been invited to be present at this banquet but was unable to accept. President Brook presented the certificate of Honorary Membership to the secretary, asking that he read the qualifications embodied thereon and, after the meeting to mail the certificate to Mr. Guggenheim. The qualifications were as follows:

"Simon Guggenheim has been a benefactor of the Colorado School of Mines by donating to this institution Guggenheim Hall which is now its Administration Building. He has shown an unusual interest in education and in everything relating to the betterment of mankind. Mr. and Mrs. Guggenheim established the John Simon Guggenheim Memorial Foundation in memory of their son, John Simon Guggenheim, who died in 1922. This Foundation provides scholarships for advanced studies abroad. For many years the name of Simon Guggenheim has been closely associated with the mining and metallurgical developments of Colorado. In 1907 he was chosen United States Senator from Colorado and during his term as senator devoted his entire time to the service of his state and constituents.

"From early manhood Senator Guggenheim has been active in promoting the best interests of Colorado and of the Colorado School of Mines. His confidence in and respect for the School has been further shown by the selection of Mines' graduates to serve in important assignments on his staff.

"Senator Guggenheim has gained distinction as a statesman, as a captain of industry and as a mining man."

President Brook then presented the toastmaster, Dr. Arthur S. Adams, who introduced the distinguished guests, many of whom said a few words.

Mr. Max Schott, President of the Climax Molybdenum Company, told in a few words how luck smiled on him and brought him to Colorado.

Dr. Coolbaugh spoke briefly.

Mr. Charles A. Banks of the Bulolo Gold Dredging Company, Ltd., told of his experiences and assured the Class of 1940 they had made no mistake in choosing the mining profession.

Mr. William Shepherd, Managing Editor of the Denver Post, was called upon but when it was found that he was not present his name was applauded as a friend of Miners.

Mr. Barney Whatley explained how Mrs. Whatley and he had decided to present the Murals to the Colorado School of Mines.

Ex-Governor Jesse McDonald, W. J. Coulter and John T. Barnett were introduced by the toastmaster.

The speaker of the evening, Mr. L. Ward Bannister, was then introduced. From his first words it was easy to see that a happy choice had been made for the speaker. He spoke a language understood by Miners. Mr. Bannister's subject was "My Country 'Tis of Thee" and pointed out what American Democracy means to the citizens of this country and the reasons why we enjoy the many advantages we have.

He analyzed in a very fair and dispassionate manner the advantages and disadvantages of the New Deal, giving full credit for what was progressive and worthy of being retained and pointing out those ideas which had failed and gave his well thought out remedies for an orderly return to normal conditions. Mr. Bannister closed with the plea that everyone should assume his full responsibility as a citizen and that all should rededicate themselves to the principles of democracy.

After hearty applause for the talk of the speaker, Toastmaster Adams introduced Chairman Don Dyrenforth of the Public Relations Committee. Don awarded the prizes of the evening. The prize for mileage was a close one between Monterrey, Mexico and Los Angeles, California, but it was decided that Los Angeles was the greater distance from Denver and Edward J. Brook received the prize for distance.

Frank D. Aller of the Class of 1892 received the award for the oldest graduate present.

The prize for the absent member went to W. W. Currens of Little Falls, New Jersey, while the lucky ticket holder among those present was F. J. Bucher, Class of 1940.

Dr. Arthur L. Adams and Mr. L. Ward Bannister were also presented with remembrances of the evening.

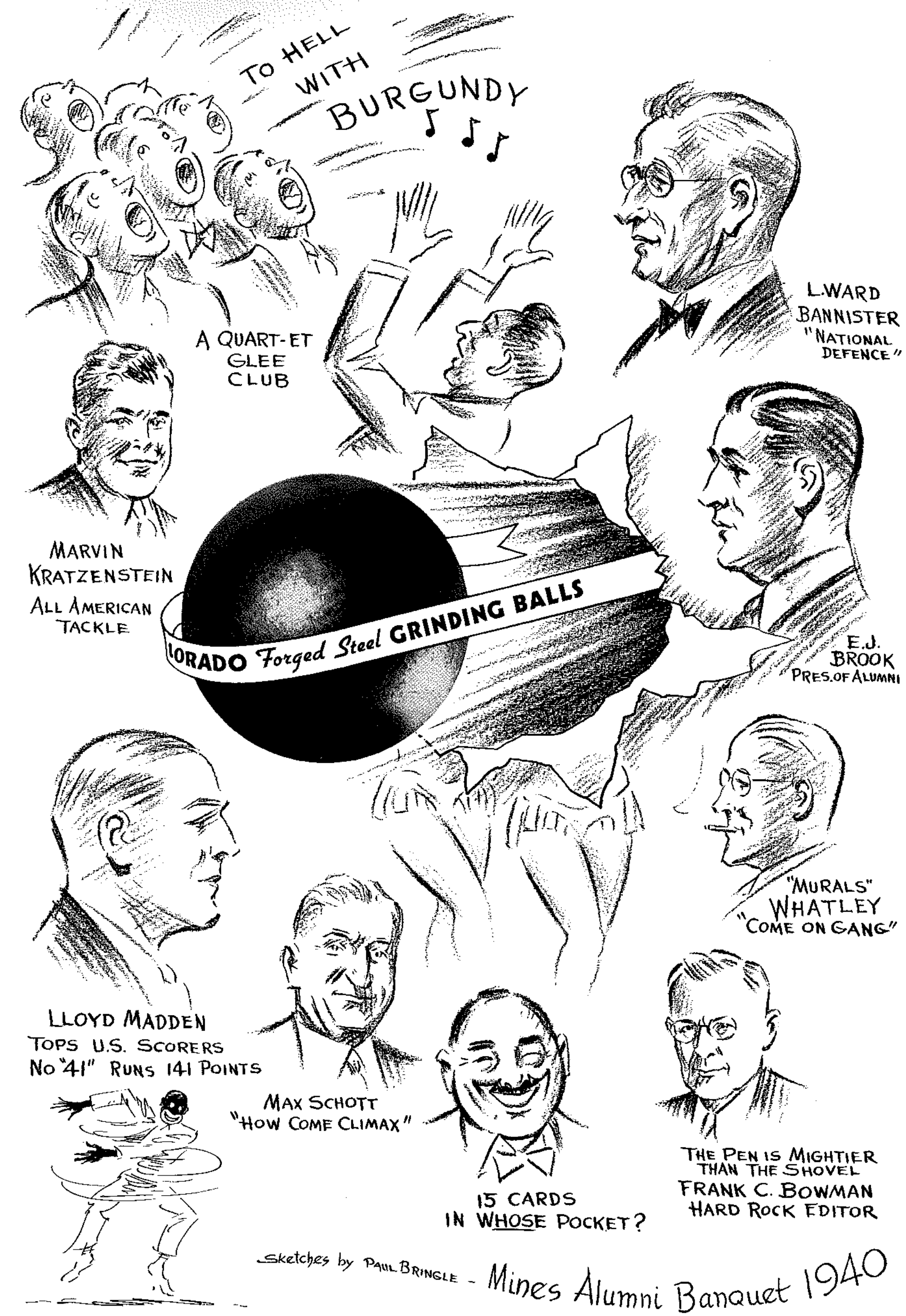
Mr. James W. Dudgeon, Chairman of the Athletic Committee, was then introduced and presented Messrs. Katzenstein and Madden with framed cartoons of themselves in football suits.

Coach John Mason was then presented with a fine gold Waltham wrist watch in recognition of his producing a championship football team. The assistant football coaches were lauded by Coach Mason and introduced in the course of his remarks.

Toastmaster Adams returned to the mike and extended greetings to the Class of 1915, five members of which were present in celebration of their Silver Anniversary. Ben Essig made the response and in his talk assured Court Doolittle of the usual silver contribution to the C. S. M. Foundation. The other four members in attendance were, A. H. Bebee, A. C. Daman, H. W. Kaanta and W. S. Stringham, the latter from Mt. Pleasant, Tenn.

There followed an entertainment of

(Continued on page 320)



Alumni Banquet—

(*Continued from page 318*)

various stunts from the Three Range Riders to Professor LeMont, magician, after which Mines Glee Club rendered several selections and the meeting came to an end.

Old friends were met again, new friends were made, we had a good feed, heard cheering and instructive talks, and everyone was home by midnight. A perfect evening.

Among the honored guests were Dr. Coolbaugh, Charles A. Banks, Max Schott, Wm. J. Coulter, Barney Whatley, Ex-Governor Jesse McDonald, L. Ward Bannister, John T. Barnett, Fred Steinhauer, Edward C. Hanley, T. S. Harrison, F. H. Parsons, Trustees. And of the old timers there were Frank Aller, '92; O. R. Whitaker, '98; Jim Steele, '00; Walter Burlingame, '01; Ed Arthur, '95; C. Q. Schlereth, '06. And the rest of us, headed by President E. J. Brook, were: Wm. H. Paul, '96; P. H. Bertschy, '98; Frank C. Bowman, '01; Frank J. Nagel, '03; M. C. Allen, '06; Charles N. Bell, '06; C. L. Colburn, '07; Warren Prosser, Ex-'07; A. E. Perkins, '10; Karl V. Geib, '11; S. M. Walker, Ex-'11; Don Dyrenforth, '12; H. M. Cronin, '13; J. W. Dudgeon, '13; Harvey Mathews, '13; A. F. Carper, '14; A. E. Craig, '14; Carl Blaurock, '16; F. E. Briber, '16; J. N. Adamson, '21; Joseph P. Ruth, Ex-'21; G. W. Salzer, '21; H. H. Christy, '22; M. E. Collier, '22; H. M. Connors, '22; Bruce B. LaFollette, '22; J. H. Johnson, '23; C. O. Parker, '23; Bud Robineau, '23; K. E. Hickok, '26; J. T. Stubbs, '26; George W. Thomas, '26; R. H. Volk, '26; Nick Watts, Ex-'26; A. S. Adams, '27; T. C. Doolittle, Hon. '27; R. J. McGlone, '27; John M. Coke, '28; T. F. Adams, '29; C. K. Viland, '29; C. R. Walbridge, '29; E. J. Garbella, '30; John L. Robison, '31; R. L. Stark, '31; James Boyd, M.Sc. '32; R. J. Dalton, '32; Sam Gustavson, '32; A. G. Setter, '32; R. S. Spalding, '33; G. E. Woodward, '33; Ray Asel, '34; J. A. Bowsher, '34; Bob Sayre, '34; R. P. Obrecht, '34; R. F. Barney, '35; F. N. Bosco, '35; D. C. McDonald, Ex-'35; Tony Mueller, '35; J. M. Demmer, '36; Earl L. Durbin, '36; D. Wantland, M.Sc. '36; Harry Coppin, '37; C. J. Setter, Ex-'37; E. W. Ferris, '38; T. J. Trumbull, '38; George B. Whitaker, '38; Edmund Phillips, Ex-'40; Class of 1940: R. R. Allen, R. E. Armstrong, Rusty Badgett, John A. Bailey, R. W. Bennett, J. G. Blythe, Karl Brueggeman, F. J. Bucher, Wm. Chase, Douglas Clark, R. F. Connor, John M. Cook, Jos. Crompton, Eugene L. Current, Milton E. Danitschek, Gerrit DeVries, D. H. Dowlin, R. M. Duhme, Ernest Dissler, C. Mac Dye, Lincoln Elkins, Paul Fillo, Frank Geib, T. L. Goudvis, Chas. Grimes, Jim Hawkins, W. E. Heinrichs, Jr., Perry K. Hurlbut, S. J. Hussey, M. C. Javellana, J. Q. Jones, C. R. Kasch, Marvin Katzenstein, Art Kesling, Robert Knapp, Addison B. Manning, H. L. Muench, F. A. Nagel, M. M. Nichols, Jos. L. Oberle, Edward F. Porter, Earl Y. Palmer, Dave Roberts, Wm. J. Ryan, D. E. Salsbury, Henry Schoellhorn, W. I. Sedgley, L. A. Shannon, W. E. Sherbondy, Nick Shiftar, T. Sinclair, I. C. Sleight, J. C. Stipe, R. J. Sullivan, H. Tanaka, Herbert Thornton, I. J. Vaughan, E. M. Villareal, Jr., A. W. Warren, G. R. Wynne, George G. Yeager, Marvin Yoches; Faculty: C. B. Carpenter, Adam Esslinger, Dave Johnston, J. R. Morgan, Doy Neighbors, R. T. Phelps, M. I. Signer, J. W. Vanderwilt, F. M. Van Tuyl, W. A. Waldschmidt, A. P. Wichman; Guests: F. W. Bosco, H. B. Blythe, Thos. M. Devlin, Lloyd Madden, David B. Mazer, G. Warren Parker, Arthur Veeder, E. L. White, Paul Pringle, Jerry Sabin, Jack Stringham, Edward Thornton, E. M. Villareal, Sr., Dan Yeager, and one lovely but lone lady, the accompanist of the Glee Club, Miss Johanna Lyon.

Minerals—

(*Continued from page 303*)

markets for mineral products. It is deeply involved in the international transportation of minerals. It has been a large factor in the many cartels and agreements which have developed in the past. No new collective plan for equalizing access to minerals among the nations of the world can succeed without participation by the United States. If the United States stays out, its mineral industries will be affected in one way or another by any collective effort made by foreign nations.

Under these circumstances, a policy of economic isolation in minerals seems to be impossible. Our share in the world mineral business is so large that any world mineral problem is necessarily in considerable part our own. Whether we take affirmative action or merely defend our position, there is much to be done in bringing together the basic data for planning.

I am not urging that the United States start out on any particular program of internationalization of resources. We do not yet know how far this may be desirable and, if desirable, how it shall be done. My purpose is rather to urge the recognition of the simple fact that the problem of administration of mineral resources either from the standpoint of self-interest or of world peace is worldwide in its scope. Enlightened self-interest calls for recognition of the progressive internationalization of resources now actually under way and a broader and more systematic approach to the problem of mineral administration than in the past. As the situation now stands, the consideration of the problem is petty and piecemeal—from the standpoint of immediate rather than long-range considerations. Surely, as a basis for deciding what to do about it, we should at least begin an effort to see the problem in its broader outlines.

Up the Ladder—

(*Continued from page 304*)

better than "Mr.," including all the property employees, he is just "Murch," a name which fits him eminently.

His 230 pounds are spread over a six foot three inch frame which belies his 52 years in both appearance and capacity for scaling hills and ladders and in being able to perform any manual job on the property. And he does just that. Visitors are just as likely to find him on the railroad siding, helping to load or unload a box-car, as they are to find him cutting through red-tape in the office. The latter pastime is both his particular aversion and delight. His letters to the home-office include bits of practical wisdom and philosophy like the following sample with which he concluded a missive to his production manager. "So, let's go ahead with it and stop all this bellyaching."

His only complaint against the march of progress is the invention of that contraption, the typewriter. His principal aggravation is that it has forced him to synchronize his mind with the relatively slow action of his two index fingers, and he would rather change the liners in a ball mill than mess with a new typewriter ribbon. He insists he can't fix anything that weighs less than a ton.

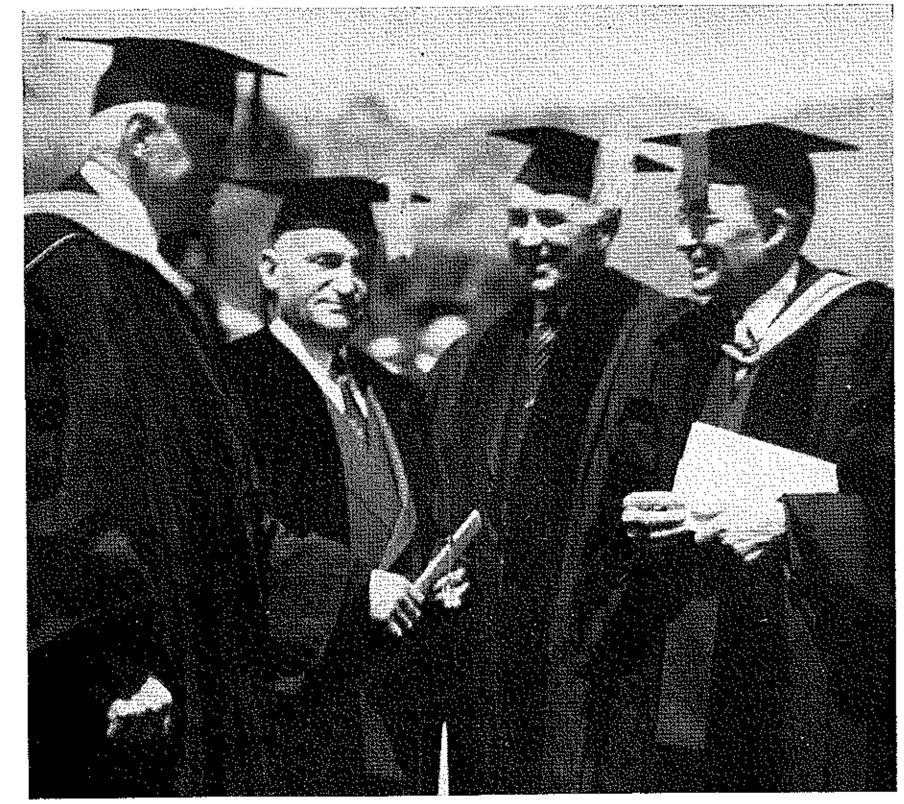
With a shock of snow white hair and a most pugnacious jaw, he presents a formidable appearance to strangers. His gruffness, however, is mostly superficial. I have never heard him utter a cross word to an employee, but I have heard him speak in pretty level sentences to a railroad president. Every man on the job counts him as a friend, and I've heard the story of his riding five miles at midnight to relay a sorrowful message with tears streaming down his granite cheeks.

Murch received his E.M. from Mines in 1912, which happened to be the year I was born, and some twenty-five years before I received mine.

It's difficult to visualize what may lie ahead, and this may be particularly true for a young engineer. But, I have a fairly good hunch that I'll not be sorry I had an opportunity to serve my apprenticeship under a master of his trade.

COMMENCEMENT AT MINES

MAY 24, 1940



▼ Dr. John C. Barnett, Max Schott, Charles A. Banks, Dr. M. F. Coolbaugh.

"As you leave here and go out into the mining world you go forth with the best possible training; a grounding from the Colorado School of Mines. The future will find you scattered throughout the mining world, largely, I hope, within your own country and territory and the British Empire. The products of mining, which have been such a large factor in building our civilization, can be used for the comfort and the benefit of mankind, or for his destruction and enslavement. My hope is for your success and that the products of your efforts may be used for the maintenance of peace and freedom of men, and the continued development and progress of the civilized world," Charles Arthur Banks, noted British mining engineer, told the graduating class of the Colorado School of Mines in the commencement address. Seven advanced degrees were granted: three doctor of geophysical engineering, two master of mining engineering, and two master of metallurgical engineering.

Mr. Banks stressed the fact that American mining engineers receive the best possible training and that they were met with throughout the world and especially in the British Empire.

"It is a fact that a great majority of your engineers who have gone abroad have gone to British countries or else to British companies, and I sincerely hope that it will remain this way, for it serves to create an accord and understanding between our countries the benefit of which can hardly be overestimated," he told the audience of 1500, friends and guests of the school, at the 66th annual commencement, the first in the history of the school to be held outdoors.

The largest graduating class in the history of the Colorado School of Mines received degrees, 144 besides the advanced degrees above referred to. Of these 46 received the degree engineer of mines; 44 the degree geological engineer; 36 the degree metallurgical engineer; and 28 petroleum engineer.

The honorary degree of doctor of engineering was conferred upon Mr. Banks and upon Max Schott of New York City, president of the Climax Molybdenum Company. Medals and awards for high attainments in scholarship and leadership were awarded by Dean Jesse R. Morgan as follows:

The Harry J. Wolf Gold Medal for scholastic attainments, to Addison Berry Manning, Jr., Denver.

The D. W. Brunton award of a Brunton transit for meritorious work in mining engineering, to George Glenn Yeager, Denver.

The Thomas S. Harrison award, for meritorious work in petroleum engineering, to Herbert D. Thornton, Summitville, Colorado.

The Colorado Engineering Council medal, for excellence in scholarship, high integrity, and general engineering ability, to George G. Yeager.

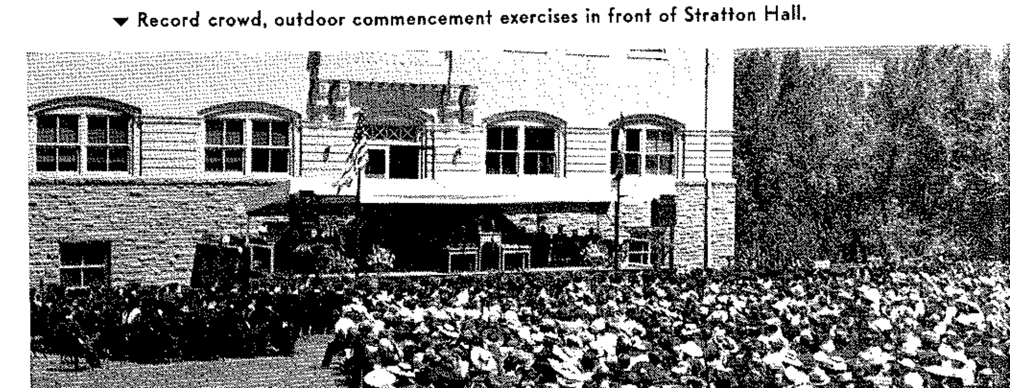
The William D. Waltman award to the "graduating senior whose conduct and scholarship have been most nearly perfect and who has most nearly approached the recognized characteristics of an American gentleman during his entire time in school," to William C. Mueller, Denver.

The E. J. Ristedt award of an officer's model saber to the Battalion Commander of the R. O. T. C., to Marvin L. Katzenstein, Council Bluffs.

The James Underhill award to the cadet officer of the R. O. T. C. who

(*Continued on page 326*)

▼ Record crowd, outdoor commencement exercises in front of Stratton Hall.



Dr. F. M. Van Tuyl

head of the Geology department, was appointed to the Proration Practices committee of the Gas Conservation Commission at meeting of the Interstate Oil Compact Commission held in Oklahoma City recently.

The Gas Conservation Commission performs the same service with natural gas arising from oil fields as the original Oil Conservation Commission did with the oil itself. It is intended, primarily, to allow the accumulation of a suitable reserve of oil and gas, and to prevent the wasteful exploitation of the fields now in operation.

Mines Glee Club

next year will be headed by Dr. Leon S. Ward who takes the place of Dr. A. S. Adams who is leaving *Mines* to join the faculty of Cornell University.

Dr. Ward is well qualified for the position as he organized the glee club at the Michigan School of Mines when he was associated with that school.

Mining and Metallurgy

official publication of the A. I. M. E. again pays tribute to *Mines* student body by reason of the school again leading all Mining and Metallurgical schools on the continent in number of student associates. This makes the seventh time in succession since statistics on the rankings were first filed.

Mines lists 241 members which was followed by a close second of the A. & M. College of Texas with 240. The latter, however, is composed of many affiliated student societies, not student chapters as at *Mines*. Nevertheless it will be a nip-and-tuck race for the lead this coming year.

Baseball Field

is to be improved during the summer months. The plan is to cut the field back and make a rectangle out of it. It will then be sodded and rock seats will be built on the sides for spectators. Two drives will be built for cars.

Wild Horse Park

will have its largest enrollment this summer of its eight years of operation. From present indications there will be approximately one hundred men in camp for three to six weeks. In addition there will be nearly sixty mining option juniors who are slated to spend three days there.

In the past there has been a problem of furnishing enough water for the men. As a result, the development of the camp has been somewhat retarded. Last summer, however, the petroleum engineering students completed a new well which promises to furnish two thousand gallons per day, an adequate supply for one hundred men.

The equipment from the old Mineralogy lab in Guggenheim basement has been taken to the park. The tables are being reassembled for dining and drafting tables. Additional tents and cots have been obtained this year and also a limited number of new instruments have been made available for the large number of students expected. The old policy of assigning squads to kitchen police by rotation has been abandoned to be replaced by a regular crew.

The work done at the Park by the students is of an extremely practical nature. Five squads work together to make a complete geological map of the entire area, approximately thirty square miles. This includes a structural contour map, a surface topographic map and an isochore or driller's map. There will also be magnetometer chart sections across areas unsuited for plane table measurements, tracing of contacts by micro-paleontology, and the measurement of the entire geologic column from the Timpas Limes to the igneous intrusion of the front range.

The microscope work will be under Professor Waldschmidt. The paleontology and section measurements will be under Professor Johnson.

New Officers

for campus organizations include: Woody Todd, president of Blue Key. He was also re-elected as president of the Stray Greeks. Donald Dunn was chosen for the office of treasurer and Bob Moyer as secretary.

Joe Berta heads the Student Council as president while Art Wood was chosen as Athletic Council representative.

Jim Peeso was elected president of Sigma Gamma Epsilon, honorary engineering fraternity; Don Roberts, vice-president; John Luggenbill, secretary-treasurer; Jack Hyer, corresponding secretary.

The class of 1941 will be headed its senior year by Randy Taylor; Owen Kingman will be vice-president; Clint Edwards, secretary; and Bob Moore, treasurer.

The junior class officers are Lee Talbott, president; George Kiersch, vice-president; Jim Leonard, secretary; and Paul Davis, treasurer.

Ben Parker

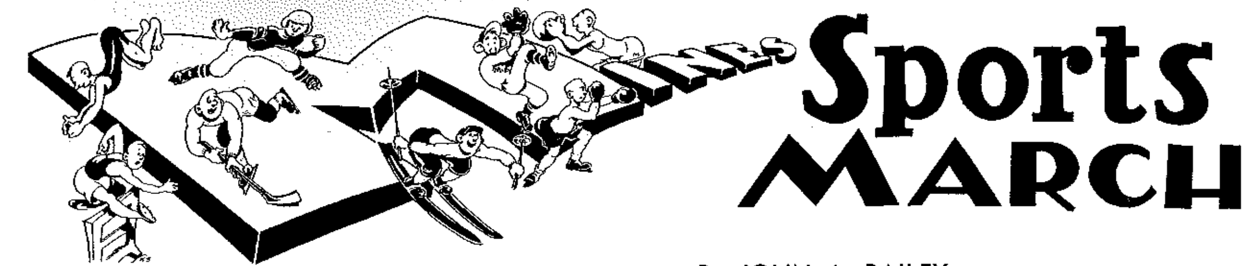
on leave of absence from the Geology department, has notified Dr. Van Tuyl that he will return to Golden in September to resume his teaching duties. He has been connected with the Argentine government the past year and located in Buenos Aires. He will teach Petroleum, Geology and Non-Metallics.

Dr. John Haff will be given complete charge of Petrology and will be assisted by Professors Stevens and Levings. Stevens will take over the Structural Geology department with Levings taking charge of the laboratory.

An effort is being made to continue Dr. Vanderwildt's connection with the school by obtaining him as a special lecturer in Mining Geology. Due to his connection with Climax Molybdenum Company, he feels that he cannot give full time to the school.

Books Recommended for One Working in Petrology and Geology

Petrology for Students, 6th ed., 1923, Cambridge University Press. By A. Harker.
Nomenclature of Petrology, 2nd ed., 1928, Thos. Murby & Co., London. By A. Holmes.
Principles of Petrology, 2nd ed., 1929, Dutton & Co., N. Y. By G. W. Tyrrell.
Metamorphism, 1932, Methuen & Co., London. By A. Harker.
Petrography, vols. 1 to 4, University of Chicago Press. By A. Johannsen.
Manual of Petrographic Methods, 2nd ed., McGraw-Hill, N. Y., 1918. By A. Johannsen.
Structural Behavior of Igneous Rocks, Memoir 5, Geol. Soc. Amer., 1937. By R. Balk.
Elements of Optical Mineralogy, Parts 1 to 3, John Wiley & Sons. By A. N. Winchell.
Determination of the Feldspars in Thin Section (Translated by W. Q. Kennedy), 1933, Thomas Murby & Co., London. By K. Chudoba.
Sedimentary Petrography. Thomas Murby, London. By A. Milner.
Sedimentary Petrography, Appleton-Century, N. Y. By Krumbein & Pettijohn.
Igneous Rocks and the Depths of the Earth. By R. A. Daly.
Textbook of Mineralogy, 4th ed., John Wiley & Sons. By J. D. Dana.
Mineral Deposits, 4th ed., McGraw-Hill, N. Y. By W. Lindgren.
Ore Deposits of the Western States; Lindgren volume, A. I. M. E., N. Y., 1933.
Industrial Minerals and Rocks; Mudd memorial volume, A. I. M. E., N. Y., 1937.
Field Geology. By Lahee.
Geology Structures. By B. Willis.
Interpretation of Topographic and Geologic Maps, McGraw-Hill, N. Y., 1925. By Dake and Brown.
Treatise on Sedimentation, 2nd ed., Williams & Wilkins, Baltimore. By W. H. Twenhofel.
Geology and Engineering. By Leggett.
Geology and Petroleum. By Emmons.
General Geophysics.
Bibliography of North American Geology, U. S. G. S.
U. S. G. S. Bull. 825, 348.
Petroleum Geology. By Ver Vebes.
General "Geology-Principles and Processes" Emmons. McGraw-Hill, 1929. By Thiel, Stauffer, Allison.
Historical—Text book of Geology, Part II—Historical Geology, John Wiley & Sons. By Schuchert I. Dunbar.
Petrography and Petrology. By Grout.
Invertebrate Paleontology. By Twenhofel & Shrock.
Data of Geochemistry, U. S. G. S. Bull. (latest edition). By Clarke.

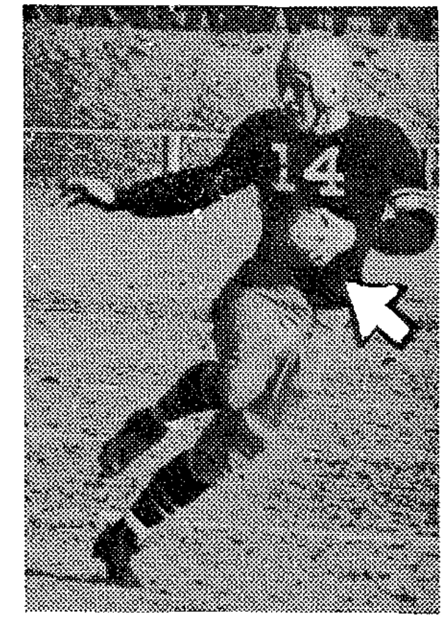


By JOHN A. BAILEY

The School's successes in football and basketball could not find a parallel in major spring sports. Despite a fine spirit and hard work, the baseball and track teams finished an indifferent season and were left with only the hopes of more and better victories in 1941. Those hopes may have a real foundation, as a number of lettermen will return and prospects for the development of freshman and sophomore men into place winners seem to be more than just something to talk about.

Only one man will be lost to the baseball team, and he is John English, a senior metallurgy student, who has played in the infield as a first-string man. The rest of the team will return next spring with more experience and confidence to win back some of the lost glories in baseball. The team wound up its season in May with a two-game match with Colorado College. Both games were lost in respective scores of 8-4 and 11-2, but they weren't without flashes of brilliance by some of the Blaster players who pulled the games out of doldrums several times. Shorty Hegglund was the leading slugger for the Miners with a double and a single. Randy Taylor pounded out a long double to knock in one of the Miners' runs. Eddie Dolega, the school's star center fielder and high bidder for an All-Conference post, batted in the other Mines runs in the first game with a single in the fifth.

The second game of the double bill was very well played and well-filled with excitement. But it had too


Lloyd Madden Joins Chicago Cardinal Professionals

many errors in the field to give the Miners a victory. C. C. scored four unearned runs from Mines' bobbles. This laxity on the part of the Blasters was greatly overshadowed by the fine hurling of long, Joel Moss. He struck out nine men and allowed but eight hits. These hits were bunched in two innings so that they counted in the score column to a greater effect. Except for these two innings Moss had the Tigers completely tamed for seven innings. The fielding gem of the day went to Randy Taylor on a smashing grounder. Taylor ran over, speared the ball just as it was about to go into the outfield, and while still running fired the ball to first base.

Moss and Bill Roberts, junior transfer student from Amherst College, have handled the pitching assignments for the year and have turned in fairly consistent performances.

Mines was host at three separate athletic meets during the month. Two were track meets and the other was the conference tennis meet. One of the invitational track meets was for the benefit of class "B" high schools and the other was the Rocky Mountain Conference Track Meet, the first to be held in part in the new field house.

Greeley won the Conference meet with a total of 72 points, and Colorado College and Mines were second and third respectively with scores of 56 and 35 points. The only record breaking performance of the meet was C. C.'s Chuck Spoor who made a 15 second gallup over the 120-yard high hurdles. Lloyd Madden won firsts in the 100-yard dash and the 220-yard dash. His time was 10.3 seconds in the 100, and 22.5 seconds in the 220-yard dash. Two other firsts were also garnered by Mines; DeLaittre won the shotput in junior college competition and Gieskieng won the javelin throw. DeLaittre's heave was 40′ 2″, and Gieskieng hurled the javelin 159.9 feet. Other places were won by Jameson, mile run; Hutchinson, fourth in 440; Shaw, third in 100; Moore, third in javelin throw; Gieskieng, third in shotput; Moore, 120 yard high hurdles, third; Roberts, tie for third in the pole vault. DePolo, Stommel, and Vaughan also won places.

FROM THE *Local Sections*

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

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

A dinner meeting of the Birmingham Section was held on Saturday evening, April 20, 1940. Each member was requested to bring guests with him and alumni of seven different schools were present. The alumni of the Michigan School of Mines were the special guests of the evening, they having a large group in attendance. Thirty-four men were present, including the members of the Section and the evening proved very instructive and interesting.

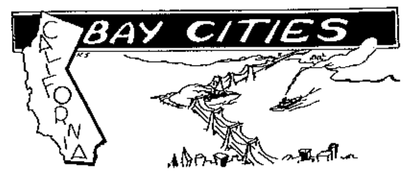
Mr. C. E. Abbott, Vice-President of the Tennessee Coal Iron and Railroad Company, presented several reels of colored movies which he took while on a European tour in 1939. This was of particular interest because it showed sections of the continent included in war areas at the present time.

President T. C. DeSollar sent regrets that he was unable to be present at the meeting. He is recuperating in the hospital from injuries received in the mine some weeks ago.

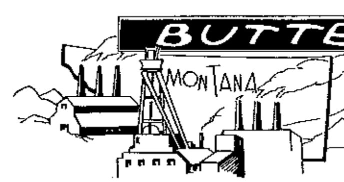
It was voted unanimously that the movies of the Mines Championship Football Team be obtained and shown at the next meeting.

Besides the guests present, the following alumni attended:

Will Coghill, '03; W. C. Chase, Ex-'05; W. C. McKenzie, '22; A. W. Beck, '23; Walter J. Hulsey, '27; J. W. Scott, '31; Neil O. Johnson, '33; E. D. Bristow, '37; Robert J. Blair, '39; Hubert E. Risser, '37.



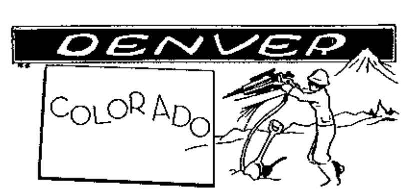
Frank Hayward, '32, President; William J. Rupnik, '29, Secretary-Treasurer, 714 Hillgirt Circle, Oakland, Calif. Four meetings per year, 2nd Monday, March, June, September and December.



E. S. McGlone, President; H. M. Strock, '22, Secretary, 1309 Platinum St., Butte, Mont. Meetings upon call of Secretary.

A. L. Lynne, '06, President; M. E. Frank, '06, Secretary, 4537 Drexel Blvd., Chicago. Meetings upon call of secretary.

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



Dent L. Lay, '35, President; R. J. McGlone, '27, Vice-President; A. L. Mueller, '35, Secretary, 430 E. 11th Ave., Denver, Colo. Luncheon meeting, third Friday each month.

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

The Houston section held its regular monthly meeting on Friday, May 10, at 6:00 P. M., in the cafeteria of the Lamar Hotel. Those attending were:

W. G. Blackwell, '39; Charles Buck, '39; J. F. Dieckman, Ex-'39; K. P. Hurley, '22; C. W. Maguire, '36; W. E. Mitchell, '35; C. W. Moore, '32; R. J. Schilthuis, '30; C. H. Stewart, '25; A. G. Wolf, '07.

The feature of the meeting was the showing of the moving pictures of last season's Mines-CC game which was enjoyed most thoroughly.

The senior class of Petroleum Engineers visited Houston and vicinity May 11-15 and were entertained by the Houston chapter at an "eat as long as you can" dinner at Jack Saunder's Pier 21 on Saturday evening, May 11. Members of the chapter enjoyed the visit very much and from all indications the boys did too. Refreshments for the dinner were provided by Ingersoll-Rand through the courtesy of our newly discovered K. P. Hurley, '22.

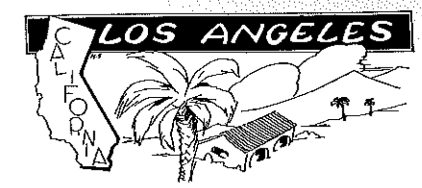
There were 30 men in the senior class party, including Professors Ball and Reed and 16 of our group attended the function, listed as follows:

A. B. Bennett, 32; B. B. Boatright, '22; G. W. Carr, 25; D. M. Davis, '25; P. C. Dixon, 31; C. D. Hier, '31; K. P. Hurley, '22; C. W. Maguire, '36; J. D. Marr, '31; C. W. Moore, '32; F. M. Nelson, '25; Ralph J. Schilthuis, '30; E. A. Slade, '34; C. H. Stewart, '25; P. A. Washer, '26; A. G. Wolf, '07. Mr. E. P. Hayes of The Texas Company was a guest, making the total attendance 47.

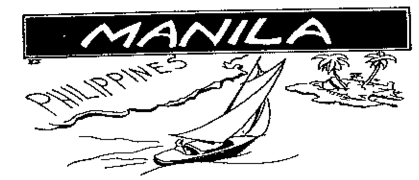
CINCINNATI

An informal meeting of Mines Alumni was held in Cincinnati Wednesday noon, May 1, on the occasion of the annual Coal Show sponsored by the American Mining Congress. Among those present were:

Gilbert H. Smith, '24; Cedric McWhorter, '24; Morris Cunningham, '24; Theodore Marvin, '22; Hugh Finley, Ex-'22; Fred Kirby, '22; W. R. Chedsey, '08; George Phillips Mahood, '24; Maxwell Pellish, '25; W. Ross Wilson, 31; John McGhee, '26; John Bell, 30; M. R. Budd, '24.



R. S. Brummett, 26, President; William Dugan, Ex-'12, Secretary, 315 West 9th St., Los Angeles, Calif. Four meetings during the year, 2nd Monday of month, January, April, July and October.

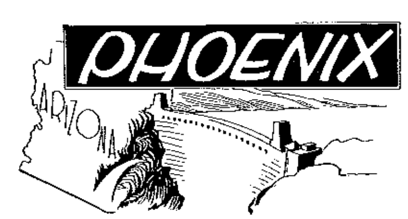


A. F. Duggleby, '15, President; Ralph Keeler, '31, Secretary, Box 297, Manila. Dinner meeting, first Friday each month.

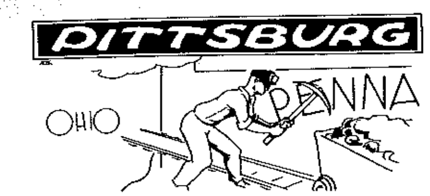
C. L. French, '13, President; Ben W. Geddes, '37, Secretary, 1112 University Terrace, Linden, N. J. Meetings upon call of secretary.

Otto Herres, '11, President; Kuno Doerr, Jr., '27, Secretary, 700 McCormick Bldg., Salt Lake City, Utah. Meetings upon call of secretary.

Officers to be elected.

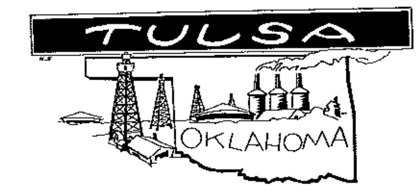


Two meetings in year, second Saturday in April and October. T. E. Giggey, '34, President; A. F. Hallett, '09; Percy Jones, Jr., '08, Vice-Presidents; E. M. J. Alenius, '23, Secretary-Treasurer, Box 2751, Phoenix, Ariz.



S. L. Goodale, '04, President; A. M. Keenan, '35, Secretary, Box 146, Pittsburgh, Pa. Meetings upon call of secretary.

(Continued on page 274)



John R. Evans, '23, President; D. H. Peaker, '32, Secy.-Treas., c/o The Carter Oil Co., Tulsa, Okla. Meetings upon call of secretary.

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

Room at the Top—

(Continued from page 294)

are our swear words, a fact which at first proves embarrassing to visitors.

The Bulolo property lies about 50 miles inland from the coast, over a range of mountains about 6,000 feet high, and the dredging area is 2,500 feet above sea-level. No road to the interior existed, or has since been built.

The construction of two dredges was commenced about the middle of 1930, after 40 million yards of gravel had been proved. Two large specially built freight planes carried the sectionalized dredge parts and the hydro-electric equipment from the coastal Port of Lae over the mountains to an aerodrome which had been constructed on the property in the midst of the dense tropical jungle. The first dredge was completed early in 1932, and the second about eight months later. From then on, the gravel reserves were steadily increased and further dredges were added so that today eight large steel dredges are in operation, handling approximately 20 million cubic yards annually which, I might say, is equivalent to roughly 85,000 tons daily. Two additional hydro-electric plants were installed so that today approximately 10,000 h.p. is available.

At the outset 40 million yards of gravel only were proved, while to date we have dredged approximately 85 million yards, and over 160 million yards still remain—over one million ounces of fine gold have been recovered to date. The total amount of machinery, supplies and equipment flown in to the property to date somewhat exceeds 35,000 tons and this has been accomplished without loss of life, equipment, or serious accident. The capital expenditure involved in air transportation was far less than in the building and upkeep of a long tropical road and in road haulage; but this was not the only advantage. The property was brought into production perhaps two years earlier than would otherwise have been possible, so that the recovery of the whole of the anticipated profit (about $60,000,000) was advanced to that extent, and this really meant an interest benefit to the shareholders of several million dollars.

Immediately the property came into production, a comprehensive housing scheme for the white employees was proceeded with. The houses were well planned, with all modern conveniences, and today they are surrounded by fine tropical flower gardens. The native employees, of which there are about 1,500, are well cared for, and they seem to be quite happy —after their two years engagment is up, they are usually quite anxious to renew their contract, or to "make paper" again, as they call it.

In spite of the fact that the property is within 10° of the equator, living conditions are excellent, and I look upon Bulolo as one of the happiest of mining communities.

I think you will agree that the development of this field, in which a number of American engineers have played a very important part, has been a mining romance in every sense of the word.

Well, so much for that side of the picture. As you leave here and go out into the mining world, you go forth with the best possible technical training; a grounding from the Colorado School of Mines, and all that its instructors can give you. The future will find you scattered throughout the mining world, largely, I hope within your own country and territory, and the British Empire.

The products of mining, which have been such a large factor in building our civilization, can be used for the comfort and benefit of mankind, or for his destruction and enslavement. My hope is for your success, and that the products of your efforts be used for the maintenance of peace and freedom of men, and the continued development and progress of the civilized world.

Commencement—

(Continued from page 321)

displays the greatest military efficiency in his grade, to J. Gardner Blythe, Philadelphia.

The R. A. Baxter award for meritorious work in chemistry to Robert Knight Johnston, Olney Springs, Colorado.

The C. A. Heiland award for meritorious work in geophysics to Addison Berry Manning, Jr., Denver.

The A. S. Adams award to the senior who has given the greatest contribution to the glee club, Logan V. Caldwell, Wheatridge, Colorado.

Book Reviews

The March of Fascism. By Stephen Raushenbush. Yale University Press, 1939, $3.00.

Why did kindly, well-educated people like the Germans put Hitler in power? Why did Italy, which was among the victors in the World War and had a strong left-wing movement, follow an ex-Socialist to and after the March on Rome? Not because of propaganda, since propaganda was largely in the hands of the other side. Not because of "big money", since most industrialists distrust a Leader. Not to create an empire, because no people in Europe has wanted to go to war. The causes of Fascism, as Mr. Raushenbush shows, are very clear, and they exist in this country as they existed in Germany and Italy and appear now in other parts of Europe. Mr. Raushenbush reconstructs the story of why Fascism came where it has already conquered, why it appeals to thousands of people in the countries that once responded to words such as "Liberty" and "Equality".

Where unemployment is widespread, where millions have little hope of a decent life, where talk of "liberty" can no longer be connected with a steady job and some sort of future, where the liberal parties have only words and the appeal to history—there is the soil of Fascism.

In Jersey City, Budapest, and pre-Hitler Munich there are curious parallels, for all the difference in geography and history. THE MARCH OF FASCISM is not only a story of what has happened and what can happen; it also indicates the lines we must follow to make sure that it doesn't happen here.

Stephen Raushenbush brings to this story of Fascism a wide range of experience, and knowledge of the daily problems faced by industry, labor, and government. He was chief investigator for two legislative commissions in Pennsylvania, and for three years he was director of industrial relations of that state. He was secretary and chief investigator for the Senate Munitions Committee. He has taught at Dartmouth College. He has worked as manager in the clothing and oil industries, and as a laborer in the coal industry. Recently he has been discussing Fascist strategy with men of all sorts, not only in Germany and Italy, but in the former Czechoslovakia and the other nations of Eastern Europe.

—Publishers' Review.

The Examination of Fragmental Rocks. By Frederick G. Tickell. Stanford University Press, Stanford University, Calif., 1939, 154 pages, $4.00.

First published in 1931, this book has been revised to present descriptions of new technique and apparatus for the determination of porosity and permeability. Excepting the chapter in which these physical properties are discussed, the second edition is similar to the first edition.

Chapter 1 is a short introduction. Chapter 2 discusses size analysis and the making of thin sections. It is disappointing to find that this chapter was not revised. During recent years considerable research has been done on methods for the determination of the shape and the size distribution of particles in an aggregate. The references in this chapter and in the bibliography should lead the reader to most of the literature that describes the results of this work, but it seems probable that the usefulness of the book would have been increased by at least a brief discussion of these developments.

Chapter 3 (Porosity and Permeability) has been rewritten. It contains a comprehensive and up-to-date discussion of methods for the determination of total and "effective" porosity, and permeability. Discussion of the problem and the methods of determining the percentages of water and oil ("saturation") would be a worth-while addition to this chapter.

No significant changes appear in Chapter 4 (Preparation of Specimens), Chapter 5 (Identification of Minerals), or Chapter 6 (Description of Minerals found in Sedimentary Rocks). However, those familiar with the fundamentals of optical mineralogy should have no difficulty in understanding and in using this part of the book. Descriptive tables for minerals found in sedimentary rocks are given in Chapter 6; they should be helpful.

The number of titles in the bibliography has been increased from 105 to 137, 67 of which are new, having been written since the first edition was published. Some of the titles in the first edition that did not directly concern laboratory technique have been omitted in the revision.

There is a definite need for a book of this type in both pure and applied geological work. The present edition of Tickell's book almost satisfies this need.

Patent Service

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.

SUCTION GOLD DREDGE. Patent No. 2,195,541, issued April 2, 1940, to William Schierding, Metaline Falls, Wash.

PROCESS OF ORE CONCENTRATION. Patent No. 2,195,724, issued April 2, 1940, to Antoine M. Gaudin, Butte, Mont., and John Dixon Vincent, Whittier, Calif.

WELL DRILLING MUD CONDITIONER AND METHOD. Patent No. 2,195,752, issued April 2, 1940, to Jolly W. O'Brien, Houston, Tex., assignor to National Lead Co., St. Louis, Mo., a corporation of New Jersey.

DRILLING FLUID. Patent No. 2,195,798, issued April 2, 1940, to Philip H. Jones, Redondo Beach, and Arthur L. Blount, Palos Verdes Estates, Calif., assignors to Union Oil Co. of California, Los Angeles, Calif., a corporation of California.

RECOVERY OF SULPHUR. Patent No. 2,195,870, issued April 2, 1940, to Raphael Rosen, Elizabeth, N. J., assignor to Standard Oil Development Co., a corporation of Delaware.

TOOL GUIDE. Patent No. 2,195,871, issued April 2, 1940, to Vivian Edward Kuster, Long Beach, Calif., assignor to The Hewitt-Kuster Co., Long Beach, Calif., a copartnership.

APPARATUS FOR DEGASSING ROTARY MUDS. Patent No. 2,195,898, issued April 2, 1940, to Daniel O. Newton, Huntington Park, Calif., assignor to Socony-Vacuum Oil Co., Inc., New York, N. Y., a corporation of New York.

METHOD OF PREVENTING CORROSION IN PIPE LINES. Patent No. 2,195,989, issued April 2, 1940, to Edward L. Hoffman, New York, N. Y., assignor to Socony-Vacuum Oil Co., Inc., New York, N. Y., a corporation of New York.

METHOD OF TREATING ORES. Patent No. 2,196,233, issued April 9, 1940, to Joseph T. Terry, South Pasadena, Calif., assignor of one-half to Harland F. Beardslee, Los Angeles, Calif.

BORING TOOL. Patent No. 2,196,311, issued April 9, 1940, to Clyde Kilmer, Bakersfield, Calif.

METHOD OF MEASURING THE INHERENT TERRESTRIAL MAGNETISM OF THE EARTH'S CRUST. Patent No. 2,196,314, issued April 9, 1940, to Robert E. Lee, Coleman, Tex., assignor of fifty per cent to Joseph H. Reynolds, Cisco, Tex.

METHOD OF DEWAXING MINERAL OIL. Patent No. 2,196,374, issued April 9, 1940, to Jones I. Wasson, Townley, and Anthony H. Gleason, Elizabeth, N. J., assignors to Standard Oil Development Company, a corporation of Delaware.

WELL CLEANER. Patent No. 2,196,439, issued April 9, 1940, to Charles K. Holt, Bakersfield, Calif.

PROCESS FOR SEPARATING AND CONCENTRATING MINERALS. Patent No. 2,196,457, issued April 9, 1940, to Maurice Constant, Scobey, Mont.

SEMISUBMERSIBLE MOTOR PUMP. Patent No. 2,196,462, issued April 9, 1940, to Aladar Hollander, Los Angeles, Calif., assignor to Byron Jackson Co., Huntington Park, Calif., a corporation of Del.

WINGED WHIPSTOCK. Patent No. 2,196,517, issued April 9, 1940, to Ray F. Bolton, Dallas, Tex., assignor of one-half to Eastman Oil Well Survey Corporation of California and one-half to Eastman Oil Well Survey Company of Delaware.

KNUCKLE ANCHOR FOR WHIPSTOCKS. Patent No. 2,196,528, issued April 9, 1940, to James D. Hughes, Dallas, Tex., assignor of one-half to Eastman Oil Well Survey Corporation of California and one-half to Eastman Oil Well Survey Company of Delaware.

WELL DEVICE. Patent No. 2,196,535, issued April 9, 1940, to Herbert C. Otis, Dallas, Tex.

APPARATUS FOR CEMENTING WELLS. Patent No. 2,196,538, issued April 9, 1940, to Ferdinand J. Spang, Butler, Pa.

BORE HOLE EXPLORING APPARATUS. Patent No. 2,196,571, issued April 16, 1940, to John W. Millington and William T. Evans, Beaumont, Tex., assignors, by mesne assignments, to Sperry-Sun Well Surveying Co., Philadelphia, Pa., a corporation of Delaware.

ROCK DRILL BIT. Patent No. 2,196,598, issued April 9, 1940, to Benjamin Franklin Shepherd and Robert D. Zimmerman, Phillipsburg, N. J., assignors to Ingersoll-Rand Co., Jersey City, N. J., a corporation of New Jersey.

APPARATUS FOR CEMENTING WELL BORES. Patent No. 2,196,652, issued April 9, 1940, to Reuben C. Baker, Coalinga, Calif., assignor to Baker Oil Tools, Inc., Huntington Park, Calif., a corporation of California.

CEMENTING, WASHING, AND ACIDIZING RETAINER FOR PERFORATED WELL CASINGS. Patent No. 2,196,653, issued April 9, 1940, to Reuben C. Baker, Coalinga, and Clarence E. Burt, Los Angeles, Calif., assignors to Baker Oil Tools, Inc., Huntington Park, Calif., a corporation of California.

WELL CEMENTING APPARATUS. Patent No. 2,196,656, issued April 9, 1940, to Clarence E. Burt, Los Angeles, Calif., assignor to Baker Oil Tools, Inc., Huntington Park, Calif., a corporation of California.

WELL CEMENTING APPARATUS. Patent No. 2,196,657, issued April 9, 1940, to Clarence E. Burt, Los Angeles, Calif., assignor to Baker Oil Tools, Inc., Huntington Park, Calif., a corporation of California.

CEMENTING, WASHING, AND ACIDIZING RETAINER FOR OIL WELLS. Patent No. 2,196,658, issued April 9, 1940, to Clarence E. Burt, Los Angeles, Calif., assignor to Baker Oil Tools, Inc., Huntington Park, Calif., a corporation of California.

CIRCULATING WELL PACKER. Patent No. 2,196,661, issued April 9, 1940, to John H. Grubb, Shreveport, La., assignor to Baker Oil Tools, Inc., Huntington Park, Calif., a corporation of Calif.

CONTROL VALVE. Patent No. 2,196,664, issued April 9, 1940, to Jacob L. Kofahl, Taft, Calif., assignor to Baker Oil Tools, Inc., Huntington Park, Calif., a corporation of California.

PACKING FOR WELL DEVICES. Patent No. 2,196,668, issued April 9, 1940, to Thomas M. Ragan, Downey, Calif., assignor to Baker Oil Tools, Inc., Huntington Park, Calif., a corporation of California.

WINDBREAK FOR OIL DERRICKS. Patent No. 2,196,704, issued April 9, 1940, to William C. Markle, Hutchinson, Kans.

DREDGE FOR MINING. Patent No. 2,196,-859, issued April 9, 1940, to Bert O. Godfrey, Brooklyn, N. Y.

DEFLECTING BIT. Patent No. 2,196,940, issued April 9, 1940, to Ernest L. Potts, Houston, Tex., assignor to Sharp Deflecting Tool Co., Houston, Tex., a corporation of Texas.

DEFLECTING TOOL. Patent No. 2,196,944, issued April 9, 1940, to Frank W. Sharp, Houston, Tex., assignor, by mesne assignments, to Sharp Deflecting Tool Co., a corporation of Texas.

WELL PIPE JOINT. Patent No. 2,196,966, issued April 9, 1940, to Otto Hammer, Whittier, Calif., assignor to Security Engineering Co., Inc., Whittier, Calif., a corporation of California.

EXPANSION WELL PUMP. Patent No. 2,196,993, issued April 16, 1940, to Joe H. Kidder, Los Angeles, Calif.

DRILL GUIDE FOR ROTARY RIGS. Patent No. 2,197,019, issued April 16, 1940, to Daniel B. Monroe, Denver, Colo.

ORIENTING CORE BARREL. Patent No. 2,197,062, issued April 16, 1940, to Cecil Howard Sweet, Huntington Park, and Lawrence Shiner Chambers, Los Angeles, Calif.

DUAL CONTROL LIFT MECHANISM. Patent No. 2,197,064, issued April 16, 1940, to Riley A. Aucoin, Overton, Tex.

FORMATION TESTER. Patent No. 2,197,078, issued April 16, 1940, to Boyd R. McKinley, Los Angeles, Calif.

ORE TREATMENT. Patent No. 2,197,146, issued April 16, 1940, to Hendrik W. V. de W. Erasmus, Lewiston, and Clarence E. Cormack, Buffalo, N. Y., assignors to Electro Metallurgical Co., a corporation of West Virginia.

BORING TOOL. Patent No. 2,197,162, issued April 16, 1940, to Lucian S. Smith, Los Angeles, Calif.

BUBBLE TOWER. Patent No. 2,197,199, issued April 16, 1940, to William M. Welch, Austin, Texas.

PLUG FOR WELLS AND THE LIKE. Patent No. 2,197,222, issued April 16, 1940, to Walter A. Norman, Longview, and Thomas M. Norman, Gladewater, Tex.

DIRECTIONAL WELL DRILLING TOOL. Patent No. 2,197,227, issued April 16, 1940, to Thomas C. Strength, Long Beach, Calif.

METHOD OF TREATING VANADIUM ORES. Patent No. 2,197,241, issued April 16, to George A. Hatherell, Roscoe, Calif., assignor to Frank A. Garbutt, Los Angeles, Calif.

PROCESS FOR EXTRACTING SILVER FROM ORES, CONCENTRATES, OR OTHER MATERIALS. Patent No. 2,197,272, issued April 16, 1940, to Harold Eugene Lee and Barton Robert Muir, Kellogg, Idaho, assignors to Bunker Hill & Sullivan Mining & Concentrating Co., Kellogg, Idaho, a corporation.

SETTING TOOL. Patent No. 2,197,344, issued April 16, 1940, to Percy F. Matlock, Houston, Texas.

DRILL STEM SECTION. Patent No. 2,197,392, issued April 16, 1940, to David G. Hawthorn, Tulsa, Okla., assignor to Geophysical Research Corporation, New York, N. Y., a corporation of New Jersey.

OIL WELL CEMENTING PLUG. Patent No. 2,197,396, issued April 16, 1940, to Fred Maines, Long Beach, Calif.

BOTTOM CONNECTION SCREW THROUGH SETTING TOOL. Patent No. 2,197,403, issued April 16, 1940, to Harold C. Block and Leslie A. Layne, Houston, Tex.; said Block assignor to said Layne.

METHOD OF UNDERGROUND EXPLORATION. Patent No. 2,197,453, issued April 16, 1940, to Gerald L. Hassler, Berkeley, Calif., assignor to Shell Development Co., San Francisco, Calif., a corporation of Delaware.

DRILL BIT. Patent No. 2,197,541, issued April 16, 1940, to Thomas H. Stancliff, Houston, Tex., assignor to Reed Roller Bit Co., Houston, Tex., a corporation of Texas.

MEANS FOR CONTROLLING WELL FLOW. Patent No. 2,197,685, issued April 16, 1940, to Samuel F. Cunningham, Oklahoma City, Okla., assignor of one-half to Brauer Machine & Supply Co., Oklahoma City, Okla., a corporation of Okla.

PERSONAL NOTES

(*Continued from page 289*)

His home address is 438 East 12th Street.

Wm. J. Rupnik, '29, chemist for the Shell Oil Company, has a new residence address, 2011 Pine Avenue, Long Beach, Calif.

L. E. Sausa, '38, is employed by the U. S. Vanadium Corporation at Laws, California in the capacity of chief chemist.

Kenneth Six, '28, engineer for the Sinclair Refining Company, resides at 4055 Mattison Street, Fort Worth, Texas.

Latham C. Squire, '22, is general manager of the Agzlo Chemical Corporation, 110 East 125th Street, New York City. His residence address is 155 East 96th Street, New York City.

Harold L. Teffts, Ex-'32, has moved his residence to 1618 East 13th Avenue, Denver. He is in the Mail Separation department of the Denver post office.

Charles S. Thomas, '34, assistant metallurgist for the Jeffrey Manufacturing Company, resides at 3128 Indianola Ave., Columbus, Ohio.

L. R. Van Burgh, '17, attorney-at-law, has moved from Los Angeles to Houston, Texas, where his address is 1316 Houston Cotton Exchange Building.

Visitors at the Alumni office recently included: *Edwin E. Bussey*, '97 from Seattle; *J. M. Feeley*, '38, engineer for the Consolidated Coppermines Corporation at Kimberly, Nevada; *H. L. Jacques*, '08, Construction Engineer of Los Angeles; *Roxy Root*, '35, who has been with Phelps Dodge Corporation in Jerome, Arizona, for the past few years; he recently accepted a position with Gates Rubber Company and will now reside in Denver; *A. S. Walter*, '15, Dean of Mining and Metallurgy of the New Mexico School of Mines, Socorro, N. M.; *William Zohn*, '35, engineer for the Gilt Edge Mines, Inc., Deadwood, So. Dakota.

WEDDINGS

Smith-Shaneck

The marriage of Delbert F. Smith, '38 and Miss Naomi M. Shaneck of Oblong, Illinois, took place at St. Louis, Mo. on April 20th. The couple are making their home at Robinson, Illinois at present but should receive mail in care of the Seismograph Service Corporation, 709 Kennedy Building, Tulsa, Okla., by whom Mr. Smith is employed.

Morrison-Enzenroth

Roland E. Morrison, '41 and Miss Margaret J. Enzenroth of Gilman, Colorado were married at the Episcopal Church in Golden on May 18, the Rev. Robert I. Parke officiating. They were attended by Mr. and Mrs. Tom Shepherd, also '41. They will make their home in Golden until Mr. Morrison completes his course next year.

BIRTHS

From far away Chile comes the news of the birth of Susan Catherine Fernald to Mr. and Mrs. Russell D. Fernald on February 4, 1940. The young lady tipped the scales at 4½ pounds. Her father is junior metallurgist for the Chile Exploration Company at Chuquicamata.

Mr. and Mrs. W. E. Burleson, Ex-'36, announce the arrival of a son, Robert Estes, on May 5, at the Red Cross hospital, Salida, Colorado. Mr. Burleson is mine foreman of Burleson Mines, Inc., Ohio, Colorado.

IN MEMORIAM

Irvine A. Purdy

I. A. Purdy of the class of 1910 died on April 18, 1940, in Butte, Montana, where he had spent the thirty years since his graduation from *Mines*.

He was born in Ontario, Canada, but when an infant his parents returned to the States and settled near Detroit, Michigan. He attended elementary and high schools in Detroit and entered the Colorado School of Mines in 1906.

Mr. Purdy's first employment in Butte was with the Butte & Superior Mining Company and later with the Butte and Duluth. In 1915 he went to work for the Timber Butte Milling Company as metallurgical engineer. He also served as ore purchaser, statistician and cost accountant until 1930 when the mill was closed on account of the depression. Until 1934 he was employed by the Montana State Highway department as inspector, then returning to work for the Anaconda Copper Mining Company who had acquired the property of the Timber Butte Milling Company in 1928. Since then he had been employed in the office of the Washoe Sampler.

Mr. Purdy was a first Lieutenant of Engineers in the World War, having enlisted from Butte, received his appointment and was honorably discharged in December 1918.

He was married to Miss Beatrice Ann Bray of Butte in July 1920. He is survived by his wife, two sons, John Gilbert and Irvine Austin, two sisters and a brother.

He was a member of Mt. Moriah Lodge No. 24, A. F. & A. M. of Butte which conducted the burial services, assisted by the Rev. Thomas Ashworth, rector of St. John's Episcopal church.

Philippine Mining Year Book for 1940

This edition of the Philippine Mining Year Book contains many new features which make it of value to everyone interested in the Philippines.

This book contains 242 pages of data, statistics, descriptions and illustrations covering the mining industry of the Philippines, also the personnel of these companies.

The editor, Ralph Keeler, is to be congratulated on the wonderful job he has done—you can only appreciate this book by seeing it. You may obtain a copy post paid by sending $1.00 to Mining Year Book, Incorporated, P. O. Box 297, Manila, Philippines.

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