The COLORADO SCHOOL OF MINES MAGAZINE

Volume 20 No. 10 • October 1930

Homecoming Number

The Cross of Gold

Mid-summer 1896 saw sweating delegates to the Democratic National Convention in Chicago fiercely split into two camps: Gold (currency based on gold only) and Silver (Bi-metalism, currency based on both silver and gold) .... The financial crisis of 1893 had forced the government to stop buying and minting silver. Thus money was growing scarce, particularly for Western and Southern farmers. They, burdened with mortgages and debts contracted during the post-Civil War boom when currency was plentiful, now demanded free and unlimited silver coinage with which to pay these debts. The Republicans weaseled, declared for a gold standard until international bi-metalism was possible. Eastern Democrats led by Senator Hill of New York also stood for gold.... In the stifling convention hall, the debate dragged on. As TIME, had it been published July 13, 1896, would have reported subsequent events:

. . . Last scheduled speaker was Nebraska's young onetime congressman, William Jennings Bryan, No. 1 Orator of the Silver Democrats. His sonorous voice easily filled the hall as he sketched the history of the currency conflict, then defiantly faced the Gold delegates:

"You tell us that we are about to disturb your business interests . . . . You have disturbed our business interests by your course. . . . The man who is employed . . . attorney in a country town . . . merchant . . . farmer . . . miners . . . are as much business men as the few financial magnates who, in a back room, corner the money of the world. We speak for this broader class of business men . . . . (Cheers) Our petitions . . . scorned . . . We beg no longer. We petition no more. We defy them. (Loud applause) The holders of fixed investments have declared for the gold standard, but not . . . the masses. . . .

"There are two ideas of government: There are those who believe that if you . . . make the well-to-do prosperous, their prosperity will leak through on those below. The Democratic idea has been, however, that if you legislate to make the masses prosperous, their prosperity will find its way up through every class which rests upon them. (Cheers)

"You tell us that the great cities are in favor of the gold standard. We reply that the great cities rest upon our broad and fertile prairies . . . . Destroy our farms and the grass will grow in the streets of every city in the country. . . .

"Having behind us the producing masses of this nation and the world . . . we will answer their demand for a gold standard by saying to them: *You shall not press down upon the brow of labor this crown of thorns; you shall not crucify mankind upon a cross of gold.*"

A moment's silence, then a frenzied roar that announced the coming to glory of a new leader. Yelling, weeping, hundreds of delegates struggled to the platform. Eight huskies lifted Orator Bryan to their shoulders, and the parade began . . . . Later the Convention rejected the gold plank, adopted one demanding "free and unlimited coinage of both silver and gold at the present legal ratio of 16 to 1." That night a huge crowd gathered in front of Bryan's hotel, forced him to repeat his speech. . . . Next day another crowd rushed to the barber shop where No. 1 Orator Bryan was being shaved, to tell him that he was Democratic Candidate for U. S. President, to run on a strictly Bryan platform . . . .

Welcome Home, Miners!

Saturday
October
25

Homecoming Program

1. Registration, Integral Club, Saturday morning.
2. Luncheon, Integral Club at 12:00 o'clock.
3. Parade to Field at 1:15 o'clock.
4. Special events at Brooks Field.
5. Mines vs. Teachers, 2:00 o'clock.
6. Open house and Dinner at Fraternities, following game.
7. "M" Club dance at Guggenheim Hall, 9:00 o'clock.

Saturday
October
25

The COLORADO SCHOOL OF MINES MAGAZINE

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CONTENTS

Editorial Comment

A Prosperous Year

THE man who is looking for the agreeable usually finds it. The opposite is also true. The opening of a new semester always presents its problems and at the same time hopeful situations. In reviewing conditions at the Colorado School of Mines this fall there are many things which foretell a profitable year.

We have at the present time the largest enrollment since the fall of 1924. This large number obtains in spite of the fact that more than a hundred students have been refused during the year because of deficient high school credits.

The strict standard of selection of students at Mines indicates a sound condition. Men choosing the Colorado School of Mines do so only after consideration of the requirements for their future profession. At the same time they evaluate very carefully the reputation of the school and other conditions necessary to make an ideal choice.

With these conditions prevailing, we are confident that the School of Mines is beginning one of the most prosperous years of its history.

Contact

"CONTACT!" Thus shouts the airplane pilot. The propeller whirls, the engine roars, the plane moves, and he is off. The plane responded to the pilot because the magneto made *contact* and worked properly.

In our daily life we are always making contacts—Contacts with our fellow-men, with things, and with events. During our school days in Golden, our main contacts were with the faculty, our fellow-students, our course of study, and last, but not least, with *Mines Spirit*. When our school days were over we continued making contacts, then with the outside world, with the public, our employers, employees, or clients. Do we still contact *Mines Spirit?*

In regard to kinds of human contacts, there are three: friendly, neutral, or inimical contacts. The last of these are often painful. The neutral contact is neither friendly nor inimical, but may become either. The less said about it, the better. The friendly contact is the kind that Mines men should always make with each other. It is the only kind that pays well in the end.

Friendship is a matter of give and take. If it demands all giving without any receiving, it does not last long as friendship.

Bills, bills, bills. Not the government kind, either, but those calling contact with your pocketbook. Do you cheerfully meet them? And to top the climax, here is a letter in the mail from the Alumni Association wanting you to contribute to the C. S. M. Athletic Fund to help lift the School's Athletic Debt. Ye Gods!

Contact is made, but does the magneto respond? Perhaps it needs a little injection of that old *Mines Spirit*. (Yes, but the baby may need new shoes.) Try to make it if you can, Miners. Let's go. Contact! We're off for better football seasons with the ballast of debt cast overboard.

—*R. P. FitzGerald, '10.*

Corporations and Fellowships

THE Mine and Smelter Supply company has established a thousand dollar fellowship in metallurgy at the Colorado School of Mines. This fellowship will stimulate greater effort on the part of young men following the metallurgical option.

It should result in research which will be of vital interest to Colorado, and other mining sections throughout the world.

This fellowship and the results of the research which it makes possible should prove a mutual benefit to the donor and the School. It will bring more highly trained men into the Mine and Smelter organization; and it will provide an opportunity for students to take greater advantage of the facilities for research at the Colorado School of Mines.

The alumni and everyone connected with Mines appreciates the progressive spirit of the Mine and Smelter Supply Company.

Solve the Problems

THERE has been no time in the history of western mining when the problems confronting it were of greater importance. Silver is at its lowest ebb; gold is in little better shape; copper prices are below normal; lead and zinc are faced with many problems; curtailed production is the rule of the day.

Colorado's mines are "dreams of a by-gone day" unless something is done to better the situation. Utah, a silver state, finds her revenue from the mines diminishing; Nevada, New Mexico, California, the Coeur d'Alene—all—can stand a little more prosperity in their mineral production.

The mining industry, like all other industry, is confronted with the necessity to meet changing fundamental conditions; is obliged to meet new and different competition; must find new uses for its minerals; and must find ways and means to develop and utilize its great bodies of low-grade materials.

—*Mining Congress Journal.*

Commend or Condemn

COMMENDATIONS and condemnations are equally gratefully received by your Secretary because either proves that the various appeals sent out from the Alumni office are not ignored.

Got a scorching letter the other day from Lester Grant—I had addressed him giving him the title of "Doctor". You see he was formerly Dean at the School of Mines and a little prejudiced about these engineers who run around calling themselves "Doctor". In most of my former letters I had addressed him bluntly as "Dear Grant"; that has been my custom to call a man by his surname when I have a thousand or more letters to get out in a day.

This title of "Doctor" was so unusual for our former Dean that he read the letter carefully and discovered that I wanted him to donate a bond to the Athletic Association. He must have liked the title because he donated the bond.

I had occasion recently to take a vacation and used the period in trying to assist Billy Milliken in cleaning up the $10,000 of bonds issued by the Athletic Association against the grandstand at Brooks Field.

The first place I tried was Los Angeles. This beautiful Southern California metropolis is noted everywhere for its millionaires so what a natural place to go to raise money. The Local Chapter there staged a great banquet at the University Club, but had only arranged seats for 30 or 40. The Mines Men kept coming in so more tables had to be placed to accommodate the crowd. And I was counting the noses for donations of $100.00 to $1,000 each. Finally it came time to call on the Secretary of the Parent Association and just then Bill Dugan handed me a copy of the announcement of the meeting which stated that there would be no solicitation for funds. My whole trip knocked into a cocked hat by one false move on the part of the Chapter management! ! ! Well, we got a few donations around the edges which goes to prove that we would have had a very successful trip if it had not been for the little slip in the announcement.

Those boys in Los Angeles are all right—They have started the Southern California Fund for the Foundation. Now, if we don't watch out they will be annexing Golden to Los Angeles.

Then I visited San Francisco and C. M. Eye staged a luncheon for me there at the Engineers Club. There were not so many present because he had not announced that there would be no solicitation of funds. It is funny how shy a fellow can be when he wants to. Some of the fellows who attended the meeting made liberal donations to the Athletic Fund.

The trip to California was enjoyable, but we haven't raised enough money yet to clean up the Athletic bonds. Gee! I would like to see a couple of $1,000 checks come in, a few $500 donations and a whole flock of $100 remittances. But times seem to be hard for such liberality, so come on fellows, swamp the Alumni office with $1.00, $5.00 and $10.00 bills and we will get the Athletic Association on its feet and turn out a winning team yet.

—C. LORIMER COLBURN, *Sec.*

Sticking to the Job

THE Summer is over—The "Vacation Spirit" is in the slow process of giving way to the "steady grind." In spite of the hot summer your Alumni organization was on the job all the time. There was work to be done that could not be postponed. Your Alumni Magazine came out regularly each month; the Alumni Directory was published in September; your Capability Exchange kept up a continuous campaign to find jobs for those who needed them.

The duties of the Alumni staff are expanding all the time. One not in close touch with this work cannot fully appreciate the importance of a well organized Alumni to the graduates of an institution. Almost every man who has attended the School of Mines gets, sooner or later, some direct value from the Alumni Association. This service in many instances is given without his knowledge.

There is no way of assessing this service according to its service. An Alumni Association must be supported by the patriotism of the graduates and the friends of the college. It is a privilege to become a member of an Alumni Association. Every man who is eligible owes it to himself and to his college to join and assist in its work. The greater the percentage of members the greater will be the value of the Association.

According to the Alumni records during the past year every dollar paid into the Alumni treasury by members of the Association has been worth three dollars in Alumni work. This is one organization that you can support during dull times as well as prosperous times, knowing full well that your loyalty is paying big dividends to yourself and to your college associates.

Your Alumni organization is sticking to the job all the time.

—C. LORIMER COLBURN, *Sec.*

"One for All, All for One"

THE Capability Exchange is sponsored by the Alumni. Its purpose is to provide an employment exchange personally interested in Mines men. It offers two services: first to the Mines men out of work, and second, to the Mines men who are capable of holding better positions than they now hold.

The Capability Exchange is now perfecting its organization. That which is needed most is the record of every Mines man who wishes to contact better positions. But a complete record file will avail nothing, if the Exchange does not learn of openings for its registrants.

In this, the Alumni everywhere can cooperate with the Capability committee by informing the Denver office of openings which occur in their particular localities. Wire the information if necessary; it may mean a promotion for a fellow member of the Mines family.

COLORADO SCHOOL OF MINES
GOLDEN, COLORADO

October 14, 1930

OFFICE OF THE PRESIDENT

Mines Alumni,
Throughout The World

Dear Alumnus:

The Colorado School of Mines, your Alma Mater, extends a cordial invitation to you to attend the seventh homecoming day celebration, October 25.

A prosperous year for Mines seems evident. With over 500 students registered, we have the second largest enrollment in the history of the School. We may take this as an indication of faith in the School of Mines to train engineers. Come home October 25 and see for yourself what a splendid group of young men we have on the campus.

Mines athletic teams are steadily improving. Now that the Alumni have taken an active part in assisting the athletic department in overcoming one of its greatest obstacles, the debt on Brooks Field, more rapid progress may be expected in the next year or two. The time is not far ahead when Mines will win the majority of its conference football games.

Hoping that I shall see you in Golden October 25, I remain,

Cordially yours,

M. F. Coolbaugh

MFC/FH

Sig Gam and Theta Tau Polo Teams Ready for Annual Battle, 1929, Staged on Homecoming Day.

Homecoming Set for Miners

October 25 set for Miners' return to ▪▪▪ Golden ▪▪▪

Orediggers will play grudge ▪▪ game with Teachers ▪▪

Homecoming day will be October 25 this year. It will be the first time that the Mines' homecoming has fallen on an October date. The custom in the past has always called for an early Saturday in November. Thus homecoming day has often preceded the *Magazine* date of issue, making it necessary to rush the homecoming number in order that it might reach the Alumni before the "big game" had been played.

Plans are already under way, and an interesting program is promised. Some pros and cons in regard to the elimination of the banquet following the game have been voiced by those in charge of arrangements. At the time of this writing, no decision had been reached. There are well founded arguments on both sides.

The various social organizations on the campus are anxious to entertain in honor of their Alumni who return for the homecoming occasion, but they have been influenced to curtail their plans in the past in order to avoid any conflict with the Alumni dinner. These organizations are more in a position to entertain because of their splendid club houses with everything always in order for social activity.

Some objection has been raised to the plan of letting the several fraternities take care of the evening's entertainment. Many of the Old Grads went through school before fraternities were established on the Mines campus, and they are not affiliated with any group. A plan has been proposed whereby all nonfraternity men will be invited to attend the evening's merry making at some one of the clubhouses, following the football game. It seems likely to be adopted.

In view of the fact that the Colorado section on the nineteenth of September held its annual banquet at Golden, at which time over a half hundred juniors and seniors met with the Alumni and were initiated into the fold, another banquet on October 25 would be superfluous, according to the committee's report. It was also stated that the Homecoming banquet last year was not so successful because of other activities planned for the same evening. The recommendation is that something must be eliminated from the program of the day, and that the logical event to eliminate is the dinner, providing the fraternities are willing to take over the responsibility for the evening's merry making.

Whatever conclusion is reached, the results will be printed in the program distributed at the School on the morning of October 25. The program appearing in this issue will leave this event optional.

Events of the Day

The homecoming committee will consist of Frank C. Bowman, '01; Frank E. Briber, '16; Carl Blaurock, '16; Robt. Higgins, '17; Donald Dyrenforth, '12; Fred C. Steinhauer, '99; W. M. Traver, Jr., '16; and several members representing the School and student body. Plans worked out up-to-date include the following: Alumni will gather, as usual, in the Integral Club, first floor of Gymnasium, Saturday morning. The register will be open there, and every returning Grad is urged to sign it.

Tickets will be on sale Saturday morning at the place of registration. A section in the stadium is being reserved for Mines men and their guests. In order to make sure of getting seats in this reserved section all Alumni should secure tickets before going to the gate at Brooks Field.

An informal luncheon, no toast master, no speeches, will be in order at the Integral Club. Visitors will go to the Club room without tickets and have luncheon, meet their friends, members of the faculty and others. This will be a "Dutch" affair.

Following luncheon, a parade will form behind the band on Washington Ave. at 1:15 o'clock. Students, Alumni and Mines fans will march to the field. Pregame events will start immediately following the arrival of the parade at the stadium.

Game Promptly at 2:00

Several events will be staged before the kick-off in the game with Colorado Teachers College. First will be the annual interfraternity burro race. This has created much merriment in years past. Following the grand race will come the parade of college bands. A special event is planned, the details of which are being held as a surprise, by the Blue Key fraternity, Mines' booster organization. Following this will be the flag raising ceremony, just before the teams dash onto the field.

Promptly at 2:00 o'clock, the referee will blow his whistle and the game will be on.

Mines out for Revenge

When the Miners went to Greeley last year they took the game too lightly. Although they had the Teachers subdued until the last quarter, the Greeleyites came from behind to tie the score. Then, as many will remember, the referee pulled that famous "final gun decision," giving Teachers one more play after the game was supposedly ended. On this play the Pedagogs dropped a kick over the goal from their 30-yard line, winning the game by a 16 to 13 score.

The Miners have not forgotten this fluke, and they are seeking vengeance this year in the homecoming battle. It will be a grudge fight, with plenty of rivalry to inject more than enough excitement for one afternoon.

The "M" Club dance is scheduled for 9:00 in Guggenheim hall. This dance, sponsored by the lettermen, has always proved a fitting close to the hectic homecoming program. Alumni are cordially invited to attend.

The traditional Polo battle between the Sigma Gamma's and the Theta Tau's will be staged between the halves. This Polo contest has provoked much humor in the past, and this year's contest will be no exception.

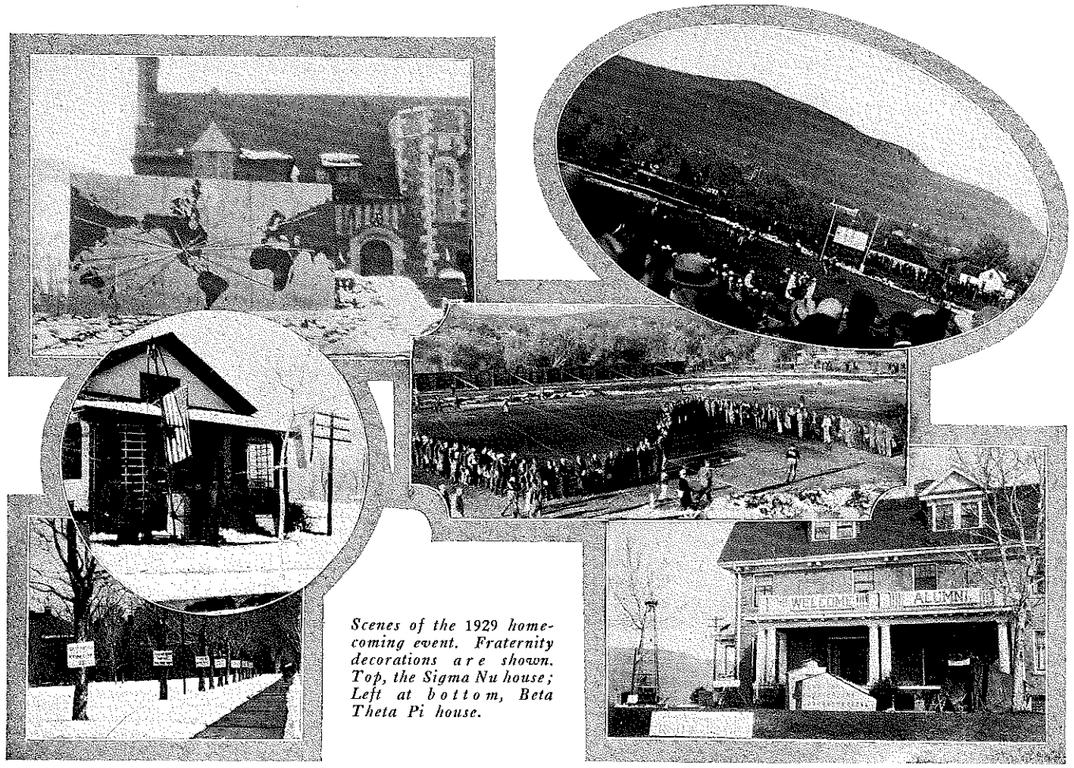
Frats Will Decorate Houses

It is customary to dress up the campus for homecoming day. The fraternities compete for a cup in decorating their houses and lawns. The prize went to Kappa Sigma last year. The competition was keen, with the Beta's, Sig Alph's and Sigma Nu's all tied for second honors. All fraternities will hold open house before the game, and the campus visitors are invited to drop in and visit at every house.

Oredigger to Put Out Extra

The *Oredigger,* student weekly paper, will publish a special edition to be distributed at the field. Stories of the various players will be featured along with pictures of the team and the individual players. The line-up will be printed in large type on the front page, so that the spectators can use this paper as a program. No official program other than this special extra of the *Oredigger* will be distributed at the game.

(Continued on page 38)



Scenes of the 1929 homecoming event. Fraternity decorations are shown. Top, the Sigma Nu house; Left at bottom, Beta Theta Pi house.

Colorado School of Mines' Curriculum Changes

By J. R. Morgan*

THE educational institution which meets the demands of modern education and modern industry must constantly keep in mind modifications of its courses of study. Many basic courses, of necessity, must remain practically the same; but methods of presentation, even in these courses, change from time to time.

Coordination of the practical and theoretical must be constantly under consideration in order to maintain basically sound relationships between the class room and the mining camp, the petroleum field and the metallurgical plant.

During the past five years, two complete revisions of curricula at the Colorado School of Mines have been made. In October of 1929, the curriculum committee began a thorough investigation toward the constructive revision of all courses given. Regular meetings were held each week until the latter part of April at which time the major part of the work was completed.

Changes were made only after frequent conferences with the departments concerned. The courses at other technical schools were studied carefully and compared with those given at the School of Mines. Throughout its consideration, the committee has attempted to evaluate all factors necessary to the coordination of courses in planning a well balanced curriculum.

Some of the major changes are, briefly, as follows:

The faculty has felt for sometime past that the amount of work in the freshman year was too heavy. While the number of failures were comparatively no greater than those at other institutions of similar character yet the basic work was so important that the committee felt that more time should be given for the assimilation of basic principles, consequently the amount of work in the freshman year was reduced. This was accomplished by a re-arrangement of the courses in chemistry, geology, and English. The work in none of these courses was weakened but thru the cooperation of the departments concerned the work was so arranged that the same results were obtained in a minimum amount of time.

The old course in quantitative analysis had been outlined especially for mining and metallurgical students. Certain basic factors were adaptable to all options but for specific applications it did not meet the detailed requirements of the petroleum students. A new course has been arranged for petroleum men combining with the general principles given, certain specific adaptations to the petroleum industry. The short course in physical chemistry has been expanded into a two semester course and is required of all options except the Non Ferrous Metallurgy and petroleum refining. Those who choose these options are required to take a more extensive course.

The subject of physics begins in the sophomore year and continues for three semesters instead of two. This third semester of physics is followed immediately by a course in the electrical engineering department covering the fundamentals of electrical engineering. Two semesters of electrical engineering are required of all options with the exception of geology.

*Dean, Colorado School of Mines.

The course in calculus has been extended to a four hour course instead of a three. While the results obtained in calculus have always been excellent yet the department has been handicapped in the amount of time allotted to this work. This difficulty is obviated by the new arrangement.

Following the suggestion of President Coolbaugh the committee approved the organization of a department of mechanics, in which is included theoretical mechanics, thermodynamics, hydraulics, vector analysis, and potential functions. The courses in applied mechanics are now a part of the civil engineering department and include graphic statics, resistance of materials, structural design and reinforced concrete. Courses in applied thermodynamics such as steam engineering and engineering thermodynamics are now a part of the mechanical engineering department.

A sequence of courses has been agreed upon which establishes a coordination and relationship heretofore impossible. Graphic statics and analytical mechanics are now given in the second semester of the sophomore year and resistance of materials is given prior to the course in machine design. Thermodynamics is now required for graduation in all options and is offered during the junior year.

The value of economics as applied to all fields in the mineral industry can not be overestimated. Recognizing this fact the committee introduced an additional course in industrial organization which is introductory to the two courses in principles of economics required in the senior year.

The courses in mining and petroleum have been revised, new courses added, and some combinations of old courses made.

Illustrative of the close coordination between departments is the fact that two courses in the mining department, mine gas and ventilation and Mining Operations, are given by two professors in different departments. The strictly mechanical engineering phases of the work are given by the mechanical engineering department and the mining department is responsible for those pertaining solely to mining.

The same condition obtains in the petroleum engineering option where a course in fluid transfer is given in conjunction with the mechanical engineering department.

A knowledge of the methods used in the smelting of lead, zinc, and copper being necessary for the miner as well as for the metallurgist, the mining department requested that the course in pyrometallurgy be required for students taking the mining option.

The work now given in the English department is favorably comparable to that given in any of the standard technical schools. Two semesters of composition work is required for freshman, one semester of general types of literature for sophomores, technical exposition for one semester in the junior year and one semester of engineering English in the senior year.

While courses in French, Spanish, and German are offered, only the German is required. This course is a prerequisite for some of the courses in geophysics. In addition to the beginning course in German a year of scientific German has been added to the curriculum.

The courses in geophysics have been enlarged upon and new courses added. Much new apparatus has been added to the department and both theoretical and practical work is being given in magnetic, electrical, and radioactive prospecting as well as courses in torsion balance, seismograph and geothermo investigations.

Alumni are invited to send for the new catalog and to examine carefully the changes made in the curriculum.

Juniors Take Short Trips

In accordance with the change in the curriculum last year, calling for the annual inspection trip in the senior year rather than in the junior year, the members of the junior class in the mining and metallurgical options are scheduled to take several short trips this semester. These trips are planned for week ends, and will be excursions to plants near Golden. The long inspection trip for the mining and met students will come in the Spring as usual, and only seniors will take it.

This year the trips will be three in number: September 27, Climax Molybdenum company; October 18, the Eries coal district; and the latter part of November, the Colorado Fuel and Iron works at Pueblo.

At Climax, the juniors made a study of one of the most interesting methods of mining in the world. They were shown the vast amount of work being done to develop the 12,000 foot level which includes an entirely new plant with the next to the largest ball mill in the world; crushers able to handle from 300 to 500 tons of ore per hour as compared with the present 1200 tons of ore per day, and the new flotation unit which is to begin operation soon. They also visited the old plant.

The Professors in charge of this trip made careful plans for the instruction of the men. While in class during the week previous to the trip, the men were given lectures on the peculiar method of mining, the flotation process and the geological structure of the Climax region.

The new method of grouping the students under instructors and guides at the mines gave them a better opportunity to grasp the details of the operations at Climax.

The men were grouped according to their option. The Miners under Prof. J. Burns Read and M. I. Signer; the Metallurgists under Prof. Irving A. Palmer and W. B. Jacobson. Some of the Senior Geologists and Metallurgists were grouped under Prof. W. P. Huleatt. Eighty students and professors made the trip.

New Crushing Plant

A new crushing plant and additional development work are the new features of the mine and mill which were observed by the inspection group. The detailed description of this work which follows is taken from the E. and M. J. of recent date:

"Construction of the new crushing plant has been practically completed. The 750-ton concrete coarse-ore bin is finished, and the 60-48-in., all-steel Buchanan jaw crusher has been erected and is ready to run. Both the 7-ft. Symons cone crusher and the 5½-ft. Symons cone crusher have also been installed, and all that remains to be done before putting the crushing plant into operation is the installation of a Ross feeder ahead of the jaw crusher and the completion of the conveyors and screens. The plant will be ready for operation by Oct. 1. It will reduce ore passing through 30-in. grizzlies to a 3-8 inch ball mill feed, and is expected to have a capacity of 2,500 tons per shift.

Phillipson tunnel, which is being driven 450 ft. below the old workings, is now advanced to 2,750 ft. yet to go to meet the immediate objective, which is the bottom of a transfer raise from the upper tunnel. The top of this raise is located near the portal of the upper White level. The Mosquito fault was encountered in the tunnel at 2,230 ft. and the broken zone extended to 2,290 ft. This fault is striking almost north and south and is dipping to the west at 75 deg. West of the fault, between 6 and 8 ft. of gouge was encountered. It appeared to be composed of ground-up shales. After passing through the fault and between 2,300 ft. and 2,600 ft., water was encountered. The flow from this area is approximately 700 g.p.m., as indicated by weir readings. At present, the face of the tunnel is in highly altered silicified granite and though the tunnel is not far enough advanced to be into the commercial ore zone, the rock is well fractured and mineralized with molybdenum.

Refiners Inspect Florence Unit

Juniors in the petroleum refining option made their first inspection trip of the year, September 26 and 27. They visited the Continental Oil Company refinery at Florence, Colorado.

This refinery, though one of the company's smallest and oldest units, furnished an excellent opportunity to study the general methods of the oil refining industry.

At the pump house the crude oil is pumped from storage tanks into 500 barrel-capacity shell stills, where it is heated and the lighter portions vaporized. The hot vapors are piped through a series of fractionating columns and condensed where the separate fractions of straight run gasoline, kerosene and gas oil are obtained in liquid form. Vapors from the tops of the fractionating columns are passed thru heat exchanges where part of their heat is transferred to the incoming crude from the storage tanks.

The residue remaining in the crude stills is piped into a battery of 1000 barrel coking stills where under high temperatures it is reduced to a porous coke. During this coking process more gas oil and some heavier oils are obtained.

All the gas oils are piped to the Burton cracking stills near-by which are owned and operated by the Standard Oil Company of Indiana. The product of these cracking stills which is known as pressure distillate, is again returned to the refinery proper where gasoline is extracted from it. This cracked gasoline is washed and blended with the straight run gasoline to form the commercial motor fuel.

Other units of interest were the boiler room, the control laboratory, the ethyl treating plant, and the compound building where heavy lubricants such as summer black oil and cylinder oils are made.

The inspecting juniors reported that they were greatly impressed with the high degree of neatness and cleanliness in evidence around the plant and also by the courtesy and ability of the guides who conducted the tour.

Geology Department Receives Fossils for Collection

During September the Geology Department of the School received the following gifts to add to its collection:

A small collection of marine fossils from the Belnap limestone of Young county Texas. Collected and donated by John H. Wilson, '23.

T. A. Manhart, '30, presented a small collection of Cretaceous fossils from Perry Park, Colorado.

Lobo Guerrero, who attended Mines last year, gave the department his collection of ten specimens of Tertiary fossil fish and oysters from California.

Mr. H. A. King presented nine specimens of fossils from Oregon. These were from the Oligocene and Jurassic ages.

Prof (in biology class): But how can one check the ravages of the potato bug without destroying the crop?

Frosh: Can't you dynamite them?—*State Lion.*

Alumni Association ▪▪ Initiates ▪▪ Junior Members

Mines Band Plays at Dinner ▪▪ Max Ball Toastmaster ▪▪ Colorado Section Meeting ▪ Annual Night ▪

Movement is Started to Clear Athletic Debt

Sixty-three students of the two upper classes of the Colorado School of Mines were initiated as junior members into the Alumni Association September 19. The initiation ceremonies were held in conjunction with the regular annual meeting of the Colorado local section.

Immediately following the initiation rites a banquet was held in the Armory dining room for the new members. Music for the occasion was furnished by the Mines' band under the direction of Professor A. E. Bellis.

The feature of the night's program was the presentation to the athletic department of ten one-hundred-dollar bonds held against Brooks Field. The holders of these bonds voluntarily cancelled them in response to a drive initiated by the Alumni Association to liquidate the outstanding debt against Mines' athletics.

The bonds cancelled at this time were turned in by the following: President M. F. Coolbaugh, two; William Woods of Golden, one; J. E. Dennis of Golden, one; E. J. Yetter, of Denver, one; Kistler Stationery company of Denver, two; D. F. Blackmer company of Denver, two; and Daniels and Fisher of Denver, one.

Since the presentation of these bonds at the Alumni dinner, Professor William P. Huleatt, Professor Irving A. Palmer, Doctor F. M. Van Tuyl, Director Dave C. Johnston, and the O. P. Bauer Confectionery company of Denver, have turned their bonds back into the athletic association, making a total of fifteen hundred dollars that has been retired from the ten thousand dollar debt.

Entrance to Armory Hall where the Initiation and Banquet were staged.

Billy Milliken, '93, chairman of the athletic committee, announced at the Alumni dinner that on homecoming day a large part of the debt now hanging over the athletic department, would be lifted. Mr. Milliken and his committee have enlisted the aid of all the Mines Alumni members in this drive to remove the millstone which has hung so long round the neck of athletics at the School of Mines. Many of the Alumni are responding to the call sent out by the athletic committee, and it is estimated that over $2,000 will have been raised by homecoming day.

The remainder of the program of the Colorado local section banquet called for several short talks. Charlie Parker, '23, president of the section, introduced Max W. Ball, '06, as toastmaster of the evening. Max made the shortest speech given, "Bring on the food."

Hugh Stewart, '12, president of the parent organization, described the work being done by the Capability Exchange and the Foundation committee. President Coolbaugh spoke briefly upon the relation of the Alumni to the School. Colonel Pettis commander of Fort Logan, guest of the evening, told the banqueteers "What the Army Thinks of Mines' Men."

The football situation was outlined by Coach George Allen. The Coach was not optimistic but he ventured to say that the 1930 team would be a better balanced one than the team which represented Mines in 1929.

Secretary C. L. Colburn, '07, after presenting the cancelled bonds to Dave Johnston, expressed his appreciation for the cooperation of the various committees in making this meeting a success. He explained that the initiation of undergraduate students into the Alumni Association as junior members fostered a better understanding.

Mine and Smelter Fellowship

The Mine and Smelter Supply Company has provided a $1,000 fellowship at the Colorado School of Mines. This fellowship is to be awarded each year to some Mines graduate to enable him to pursue research in the field of metallurgy. The recipient will be a candidate for the master of science degree.

If the fellow performs satisfactory work during his year of graduate study, he will be offered a position with the Mine and Smelter company. The agreement providing for this fellowship is as follows:

"Agreement between the Mine and Smelter Supply Company and the Colorado School of Mines relative to Research Fellowship in Metallurgy.

"The award shall be made to a graduate of the Colorado School of Mines. A member of the most recent class is preferred, although members of previous classes may be considered, provided no member of the recent class has the proper qualifications.

"The award shall be made by the Colorado School of Mines upon the recommendation of the Metallurgical Faculty and the President of the School with the concurrence of the Mine and Smelter Supply Company.

"The award is to be made on the basis of outstanding character, vigor, personality, good health, and metallurgical and mechanical ability.

"The recipient of the award shall be required to pursue at least one regular school year of advanced study in metallurgy at the School of Mines, becoming a candidate for an advanced degree. He shall also undertake work of a research nature in the metallurgical field on a subject to be suggested by the Mine and Smelter Supply Company, and to be concurred in by the metallurgical faculty of the School of Mines.

"The recipient, after completing his studies and investigations at the Colorado School of Mines under the aid of this fellowship, shall give first consideration to employment with the Mine and Smelter Supply Company, provided he is offered a place in that organization.

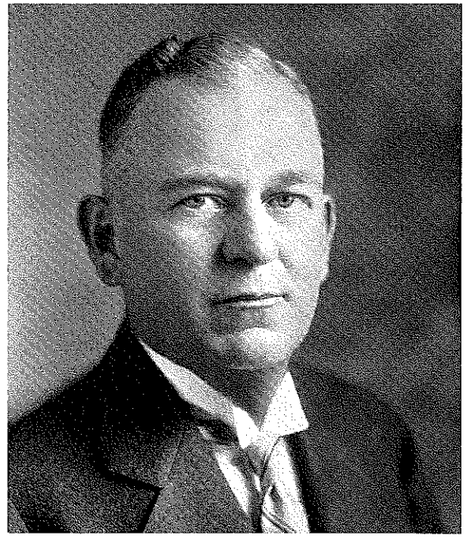
"The Mine and Smelter Supply Company will pay the Fellow $100 per month so long as he shall pursue his studies and investigations with vigor and handle his affairs in a businesslike manner, for not more than ten months, but may in its discretion extend the period of such award to any recipient.

"The Colorado School of Mines will give its regular facilities for the advanced training of the recipient of this award and will, within its financial possibilities and upon the consent of the Board of Trustees, furnish such extra facilities as are essential to carry on the investigations efficiently. The recipient will pay the same tuition and fees and be subject to the same rules and regulations as other students of the School."

The first holder of this fellowship is Kenneth Hickok, of the class of 1926. Since his graduation Hickok has been employed in South America. For two years he worked for the Cerro de Pasco Copper Corporation as shift boss at their mill in Quilacocha, Peru. After that he was engineer on mine examinations for the Cajabamba Mining and Milling Company of Lima, Peru. During that time he traveled extensively through Peru. Later he became general superintendent of properties operated by this same company in the state of Ancash, Peru.

Hickok is a member of Beta Theta Pi, Sigma Gamma Epsilon and Tau Beta Pi. While attending Mines he participated in tennis, track and golf.

Frank Reinhard Passes On



Frank Reinhard, '05

Frank Reinhard, member of the class of naught-five, died October 6 in a Denver hospital. Death followed an operation for appendicitis. His condition was reported favorable Sunday, and he was expected to recover. The sudden change for the worse resulting in his death Monday night was unexpected.

Reinhard was prominent in Colorado business circles. He was associated with the Equitable Life Insurance Company, and maintained offices both in Golden and Denver.

He had been active for many years in Alumni and School affairs. His interest in Mines athletics was manifested in the many little services rendered to the coaches and the department of physical education at the School.

John Has Served for 30 Years

This month John Ahlstrom completed his thirtieth year with the Colorado School of Mines. John is very proud that he is the oldest man employed by the school and is more active at 70 than many young men.

John came to this country from Sweden when he was eight years old and arrived in Ralston creek in 1869. His father moved to Golden and built a house at Eleventh and Illinois streets in 1872. John has lived in this house practically ever since. Because of poor health he did not go to school until he was eleven years old. Then he stayed only a short time because he had to work. He did however learn the English language during his short time in school.

In September 1899 John applied for a job with the School of Mines. He was put to work in the assay laboratory which was then in the southwest corner of the present freshman chemistry laboratory. Guggenheim, Stratton Hall, the power house, the present assay laboratory, the gymnasium, have all been built since he has been working here. John is the oldest employee of the school, both in years and in service. He can tell you many stories of old times in Golden.

Anomalies of Vertical Intensity

Correlation of the Anomalies of vertical intensity of the earth's magnetic field with the regional geology of North America

By George B. Somers, '30

Chapter III
Interpretation of Results in The United States

The correlation of regional geologic structures with magnetic anomalies has, for convenience, been considered by states. These have been arranged alphabetically rather than by regions or districts in order to aid the reader in readily locating the territory in which he may be interested.

In cases where structures are known to extend from one state into another the description of the anomaly will be found under both states. Fortunately, my request to the various State Geological Surveys or Universities, for their most recent structural data, met with splendid response in all but a few cases, and a large amount of valuable information was thus obtained. Where no reply was received the write ups were made from data available in the library and geological department of the Colorado School of Mines.

Alabama[14]

The northeastern part of Alabama is mountainous while the southern and western parts belong to the Gulf Coastal Plain. The former area consists chiefly of rocks of Pre-Cambrian and Paleozoic age, the formations of the latter range from Cretaceous to Recent.

Considering first the mountainous area of the northeast, it can be seen that the Pre-Cambrian portion in the east is chiefly "low" with a high area in the eastern part. An examination of the geologic map shows that these areas represent different types of rocks but it is quite possible that the "low" part can be accounted for by considering the stations to be in valleys in the mountains. The Paleozoic area in the north is chiefly "high". This may possibly be due to the presence of the iron deposits which occur around Birmingham* or to magnetic sedimentary beds, although they consist of brown iron. It is to be noted that in numerous instances in adjoining states the Paleozoic areas also appear as "highs" which indicates the Colorado type of sedimentary effects, but which may be due to the type of rock or proximity of the basement.

In the northwestern, west central, southeastern and southwestern parts are anticlinal structures which coincide well with magnetic "highs". The southwestern "high" referred to extends from a point just west of "L", to "B" of Alabama. The southern end of this "high" is a known anticlinal structure while its northeastern trend indicates an extension of this geologic high in that direction.

The Coastal Plain Region here therefore, as in adjoining states, is of the Florida type and appears favorable for magnetic prospecting. This is well brought out by the fact that local structure rather than regional shows itself so clearly on the isonomalic map although in general the increase in "low" areas toward the south indicates dip in that direction.

[14]—Jones, Walter B. State Geologist. Personal Communication.
Jones, Walter B. Oil and Gas in Alabama. Special Report No. 15. Geological Survey of Alabama.
Smith, Eugene A. Geology of Alabama. Special Report No. 14. Geological Survey of Alabama.
Emmons, W. H. Geology of Petroleum. p. 361.
*—In this connection see W. O. Hotchkiss: Magnetic Methods for Exploration and Geologic Work. Transactions A. I. M. E. (1923) p. 69-36.

Arizona[15]

Relatively speaking, there were very few magnetic stations (about 40) for this state but in spite of this some interesting results were obtained. The chief magnetic features are,

(1) The large "low" area which occupies the central part of the state.
(2) The "high" in the center of the large "low" area.
(3) The "high" in the eastern part.
(4) The "low" in the southeast which extends into New Mexico.
(5) The "high" in the southwest.

According to Mr. Wilson, the large "low" area in Central Arizona corresponds closely with the known location of "Mazatzal Land", a Pre-Cambrian nuclear mass. Slight discrepancies in the location of the "low" as compared with the Mazatzal mass may be due to shortage of stations, errors from interpolating between such distant stations, or to the fact that the exact outlines of this nuclear land mass are not known.

By comparing the station map with the geologic map of Arizona it is noticeable that the "high" area in the north-central part is in a volcanic or basaltic area. This area represents three stations, and it is quite probable that the "high" is due to local polarity which is so frequently encountered in volcanic districts.

A similar explanation will account for the "high" in the eastern part of the state. It represents two stations, one near the northern end, and one at the southern. Both stations are in areas of volcanic rocks, and are apparently caused by local polarity. The continuation of the magnetic "highs" extends throughout the southwestern part of the state. Here too, the geologic map shows a considerable area covered by volcanic flows so that again the few stations located here may owe their "high" effect to local polarity.

In the southeastern part there is a "low" which has been connected by isonomalic lines to the "low" of western New Mexico. The stations here were taken in granitic mountainous areas which accounts for the "low" as described in Chapter II. Whether these masses actually tie up with the New Mexico mass as shown is questionable, and may be due entirely to the method of drawing the isonomalics. There are no intermediate stations which would aid in determining this point. The "low" area in the extreme southeastern part also seems to represent a granitic area.

The extreme "high" in between the two "lows" just described is from a station at Tombstone. As this "high"

[15]—Wilson, Eldred. State Geologist. Personal Communication.
Darton, N. H. Resume of Arizona Geology. Bul. 119. Arizona Bureau of Mines.

represents only one station it cannot be used to represent regional structure. It is undoubtedly caused by some local disturbance which does not appear on the geologic map.

The "low" in western Arizona which extends into California represents the results of so few stations that no attempt is made at its interpretation.

Arkansas[16]

The regional anomalies of Arkansas are not in general so easily explained as those of many other states. Topographically the state is divided into two main divisions of nearly equal size. The northwest half is mountainous and comprises the Ozark uplift in the north, the Ouachita mountain region to the west, and in between these two the Arkansas valley. Most of the rocks in this region are Paleozoic sediments with only a few small areas of igneous rocks, at most covering fifteen square miles in the central part of the state. The southeastern part belongs to the Gulf Coastal Plain, the exposed rocks here being Cretaceous and Tertiary in age.

In the northwestern part a magnetic "high" is found in the area occupied by the Ozark plateau. Two "lows" in this region, which extends into Missouri, will be discussed under that state. Just south of the plateau on the west are the Boston Mountains, shown on the map by a "low". The explanation of this (see Chapter II) possibly is that the stations here were in valleys. Perhaps, however, it is due to the erosion of a magnetic sediment since these mountains are composed of Paleozoic sedimentary rocks. This explanation coincides best with the interpretation of the Arkansas Valley. In Alabama, the Paleozoic area was a "high", the difference being possibly due to the character of the rock, proximity of the basement, etc.

This valley, which lies between the Boston mountains on the north and the Ouachita mountains on the south, is represented by a "high" and hence appears to be of the Colorado type. If such is the case the positive anomalies are considered as due to the presence of magnetic sedimentary beds. According to the recent structural and geological map of Arkansas published by the Arkansas Geological Survey in September 1929, there are many minor folds in this valley. It is possible therefore, that the two "lows", each due to one station, which appear above the ARK of Arkansas are caused by these local structural effects and that the area is not of the Colorado type. From all indications, however, magnetometer results in this area would be positive with respect to geologic structure.

The Ouachita Mountain region, Athens plateau and southwestern part of the state are represented by a "low" which again indicates that the stations were taken in valleys, or else, possibly, that a magnetic bed has been eroded. The one "high" in this area is from the station at Murfreesboro and is undoubtedly due to local causes. One very peculiar anomaly is noted here in the oil district around El Dorado. This region appears as a "low".

The "low" in the central part which encloses the N S of Arkansas is in a region of granitic intrusives, while the "high" just to the west is in a volcanic area, both conditions being normal (see Chapter II). The extreme high directly south of the N seems to have no geological significance although it represents several stations.

In the remainder of the Gulf Coastal Plain area of this state the writer was unable to find either a local or regional structure to compare with the anomalies shown. They undoubtedly reflect some geological subsurface condition with considerable accuracy if the rest of the Gulf Coastal Plain is any criterion.

It can be readily seen, however, from the above data that the geological information from this source is too meagre to be of use in the location of local structures.

California

The correlation of the magnetic anomalies with the regional geology in this state has been discussed by the writer in a previous article[17]. Since that article was published considerable new material has come to light so that this description of the state will vary somewhat from the first article mentioned.

Briefly, the state can be divided into four zones or regions each of which will be discussed separately. These are:

(1) the Coast Range which is shown by a line of magnetic "lows".

(2) the California Valley, characterized by a line of "highs".

(3) the Sierra Nevada element, which with one or two exceptions is a "low" area and

(4) Southern California, including both the mountainous region along the coast and the desert, or basin and range country to the east.

Considering first the Coast Range province we find this to be composed of intrusive acidic rocks surmounted by sedimentaries of all ages. The results here compare with those of the mountain ranges of Colorado and is undoubtedly due to the fact that the stations in this region were taken in the valleys rather than on the ridges. As explained in Chapter II they are thus situated below the local magnetic poles and hence appear negative.

Contrary to this, the California Valley element which is a downwarp or geosyncline[17a] lying between the Coast Range and the Sierra Nevadas, gives positive magnetic anomalies. It thus appears to be the Colorado type of valley in which the positive results are possibly due to the sedimentary strata. It was previously considered by the writer that this positive anomaly in the center of the valley was due either to the uplift reported by Dr. Heiland or to a granitic mass which according to Dr. Blackwelder[18] was intruded along the length of the valley into the highly folded rocks forming the basement.

It was shown in the Chapter on Interpretation that granitic masses did not give such high anomalies as those found in this area. It is, furthermore, extremely improbable that intrusive basic rocks associated with the granite would cause such anomalies from so great a depth. It therefore appears to be much more probable that the "highs" are due at least to a considerable extent to the magnetic effects of the sediments themselves, an increase in thickness corresponding to an increase in intensity.*

The sedimentary theory is further aided by three important points. First, it was shown in Colorado that local structures would be reflected positively by the magnetic intensity providing the magnetic bed has not been removed from over them. In such a case the anticline along the centerline of the valley would register positively and thus tend to increase the positive effects of the sediments. Second, many oil structures along the eastern slope of the Coast Range in the western part of the valley give negative results with a magnetometer. Here the magnetic sediment appears to have been removed by erosion. Third, any increase of intensity due to an intrusion of igneous rocks into the basement structure would also be in agreement with the facts. It might be added here that Dr. Heiland[19] reports that a certain geophysicist, whose name he has withheld, has reached the same conclusion from magnetometer work in California.

The Sierra Nevada element with a few exceptions appears as a magnetic "low" area. There are so few stations though, in this region, that the isonomalic map is none too reliable. Nevertheless, we find a "high" at the north end of the range in a volcanic area, a normal effect. Another "high" appears near the southern end of the range but this only represents two stations one of which at least is in a volcanic area. The "low" parts are probably due to valley effects described elsewhere.

The southern element in California cannot be explained satisfactorily. The desert portion is "low" but represents only two or three stations, hence is without significance. The mountainous portion along the coast is "low" in the southern part but "high" from there to the point where the Sierra Nevada and Coast Ranges unite. There are so few stations that no further explanation is given.

Colorado[20]

When the mountainous area of this state was considered together with the relatively few stations available it was thought at first that little could be accomplished in the way of correlation. On the contrary, it was found that practically every anomaly could be explained, and in such a way that many problems, which had arisen in the work on other states, were solved here. Magnetometer work carried out by Jaroslav A. Malkovsky, Instructor in Geophysics at the Colorado School of Mines, in the eastern part of the state indicated at first that the results obtained from United States Coast and Geodetic Survey data might be of little value in correlation with regional structure. However, a close comparison of the two sets of results, together with additional field work near the mountains, solved the problem with the result that this state is considered as one of the key states upon which this thesis is based.

It had been known for some time that in general in eastern Colorado the magnetic "highs" coincided positively with geologic highs, and it had been considered that this condition reflected basement structure. The isonomalic map, however, made for this thesis showed the granitic and metamorphic areas to be negative, or in other words that in the mountains magnetic "lows" corresponded to geologic highs. This was the condition which required solution before further work could be done. It also appeared that although in general the magnetic effects over geologic structure were positive here, that a buried ridge in the southeastern part gave negative results.

The final solution was brought about by running magnetometer profiles from the mountains out into the plains country. These profiles showed clearly that although the mountains gave negative results, that at a short distance from them, less than a mile, the magnetic effects over the sedimentary rocks became positive. This indicated therefore, that the magnetic effects were not due to basement conditions inasmuch as the composition of this rock probably remained the same, but to the effect of one or more of the sedimentary beds. A complete resume of the solution of this problem has been given in Chapter II.

The magnetic effects of the sedimentary deposits as noted in eastern Colorado have been designated as the "Colorado Type" for convenience in describing and explaining similar effects in different states to distinguish them from the opposite effect, referred to as the "Florida Type". The "Colorado Type" therefore, is one in which the vertical intensity of the Earth's field increases with increase in the thickness of the sediments, or depth to basement rock. It appears to be due to the magnetic effects of sedimentary rocks rather than to those of the igneous or metamorphic basement ones. Local geologic structures coincide positively with the isonomalic lines unless the magnetic bed has been eroded from above the structure, in which case there will be a magnetic "low" over the structural high.

Another interesting point discovered in running the magnetometer profiles, and also described in Chapter II was the fact that the negative effect of granitic and even basic mountain masses was due to the fact that the magnetic stations had been taken in valleys. Had they been taken on the ridges instead the results would have been positive, a difference of 120 to 150 gamma having been noted for each 1000 feet of elevation. The increase, however, was not enough to account for all of the strong positive effects obtained over granite ridges and also discussed under Chapter II.

Topographically, Colorado can be divided into three sections of nearly uniform width, each of which extends from the northern to the southern boundary of the state. The eastern zone is the plains country, the middle one is mountains, and the western one a plateau that slopes gently to the west.

In the north central part is a large "low" area which corresponds very closely with the old nuclear granitic land mass described by Dr. Lovering[21] of the United States Geological Survey.

Just below the O L O of Colorado is an extreme "high" which is in a basaltic area. The southwest corner of this "high" represents one station only. If, as would be just as possible, the "low" enclosing C O were connected with the "low" south of the extreme "high" south of L, this enlarged "low" would outline the Uncompadre nuclear mass. The "highs" would still be in basaltic areas, and the isonomalics just as correctly drawn. Another station in the disputed area would be necessary to settle this question definitely.

"Erratta"

Attention is called to the following minor errors in the first installment of this series:

The word "Position" in line 21, left column, page 9, should read *"Positive"*.

The word "issued" in line 6, left column, page 11, should read *"used"*.

The word "hundredths" in the seventh line from bottom, left column, page 11, should read *"hundredth."*

The second sentence of the next to last paragraph, right column, page 11, should read: "First, the normal value *of the* vertical intensity . . . etc."

The word "position" in thirteenth line from the bottom of left column, page 12, should read *"positive"*.

16—Branner, George C. State Geologist, Personal communication.
Branner, George C. On Outline of the Physical Features of Arkansas. Arkansas Geological Survey 1927.

17—Somers, George B. Anomalies of Vertical Intensity Compared with Regional Geology for the State of California. Colorado School of Mines Magazine. Sept. 1929.

17a—Heiland, C. A. Oral communication. Says that torsion balance and seismic surveys show an uplift.

18—Blackwelder, Eliot "United States of North America" p. 185.

*—Colorado School of Mines Quarterly, Geophysical Methods of Prospecting, March, 1929 by C. A. Heiland, p. 56—concerning abnormal polarity.

19—Oral communication.

20—Lovering, T. S. United States Geological Survey. Oral communication.
Johnson, J. Harlan Professor of Geology. Colorado School of Mines. Oral communication.

21—Lovering, T. S. The Front Range (in press) Colorado Sci. Soc.

In the northwest corner is a "low" which extends into Utah and marks the Uinta Mountain uplift. Between this "low", the Uncompadre "low" and the north central "low" is a "high" which extends into Utah. This is drawn from only five stations including one in Utah. The area covered is a plateau of Mesozoic and Tertiary formations, some of which are volcanic. The "high" is apparently due to the positive magnetic effect of basalt.

The San Juan country in southwestern Colorado is shown by a series of "highs" and "lows". This is accounted for by the presence or absence of basalt flows.

The Sangre de Cristo mountains on the south central border are also shown by a "low" and represent a granitic structural high. There is also an extensive "low" in the northeast corner the reason for which is unknown.

As discussed in Chapter two the high granitic nuclear masses all give negative results and this regardless of their age. It is also shown that basaltic lava flows here give extreme "highs" which are undoubtedly due to local polarity.

Considering now the eastern part of the state where the writer believes the magnetic effect to be due probably to Mesozoic rocks, we find in the central part a large "high". The central and eastern part of this represent the Fort Morgan anticlinal structure, and from the location of stations might also have been drawn separately from the Western part of the "high". It is also known that the Berthoud structure is positive.

In the southeastern corner is a "low" over a known granite ridge, and it is here that the Fountain or Pennsylvanian formation outcrops. The Mesozoic formations stop just north of this point. Here can be observed the negative effects where magnetic sedimentary formations are absent.

It can be observed that in general the Denver Basin is magnetically "high". This appears to be partly due at least to magnetic sediments and partly to local structure of those sediments. It is also close to the old nuclear masses and the logical point for the deposition of magnetite.

Connecticut[22]

The following quotation is an extract from a letter from Professor Flint which I received in reply to a request for information sent to the State Geological Survey:

"I am afraid you will be unable to secure any reliable data from Connecticut. The geology of the state is extremely complex, not well worked out, and magnetic observations are exceedingly few. If you will examine a geologic map of Connecticut, you will realize that your search here is hopeless."

A careful study of both the geologic and isonomalic maps appears to confirm his opinion. Considering first the isonomalic map it is readily seen that the state is magnetically "low" although "highs" appear at each of the four corners, and also at one point near the center of the eastern boundary. The state geological map was so complex that it was thought better to get the geology roughly from the government map[22a]. This map divides the state into four zones which extend from north to south. The three western zones are approximately equal in size, while the fourth is smaller and is found chiefly in Rhode Island. They will be described in order from west to east.

The western zone consists of undifferentiated Pre-Cambrian gneisses, Paleozoic sediments from Cambrian to Beekmantown and Post-Cambrian granites. The second zone comprises the Newark group of continental deposits with Post-Cambrian intrusive granite. The third zone includes undivided metamorphic Paleozoic rocks and also Post-Cambrian intrusive granite, while the fourth zone, which extends into Rhode Island consists chiefly of undifferentiated Pre-Cambrian gneisses.

Apparently the basement rock is predominately negative in magnetic character. A thorough search of all available maps failed to reveal any reason for the five positive areas mentioned above. They apparently are due to local polarity at those particular stations. There was no opportunity to check the effect of any glacial till which may be present, but judging its results in neighboring states leads to the conclusion that it is magnetically neutral.

Delaware

Magnetically, this state can be divided into three groups as follows:

(1) a "high" area in the northern portion.
(2) a "low" area in the central part, and
(3) a "high" in the south.

No information being available from Delaware itself as there is no State survey, a careful search of the literature of the United States Geological Survey was made but without results as far as the southern half of the state was concerned.

The northern part of Delaware consists chiefly of gabbros which seems to account for the "high" found in that region. In the central portion Tertiary sedimentaries are found which dip in general to the southeast. Many water wells have been drilled here but none are reported as reaching basement rock since a plentiful water supply is found within three hundred feet of the surface. The conditions resemble those of the Florida type of sedimentaries (Chapter II), the low being accounted for by the increasing depth to the basement rocks.

It seems impossible to give any explanation for the southern "high" since the same type of rocks as they pass southward into Maryland are "low" magnetically. It may be due to local structure, a buried ridge, local concentration of magnetite or other causes.

Florida[23]

The structure contour map of Florida is based on the top of the Ocala limestone. This map gives only a general idea of the major structural features since it is based on insufficient data for great detail. It undoubtedly follows the regional structure, though, much more closely than is possible with the magnetic data available. The comparison of the two is interesting, and apparently shows that the magnetometer could be successfully used in this state.

Mr. Gunter also reported a well in central Florida which passed through the sedimentaries, and into metamorphic rocks at a depth of 4250 feet. This is an interesting point inasmuch as first, the sedimentaries in Florida appear to be chiefly limestone, and hence probably largely nonmagnetic; second, the structure and isonomalic maps do not exactly coincide, a feature which may possibly be explained in several ways. Some of the possible explanations offered for the off-setting and irregularities of the isonomalic map are these; first, the basement structure and Ocala limestone may not be conformable; second, the magnetic effects coming from depths down to 4000 feet may be offset slightly as frequently happens; third, errors arising from drawing isonomalic lines by interpolation may have caused irregularities; fourth, local anomalies due to structures in formations other than, probably above, and not strictly conformable with, the Ocala limestone; fifth, local polarity in the basement rock.

In a general way, a description of the structure map of Florida is as follows, based of course on the top of the Ocala limestone. The chief high point, given as 0 to + 100 feet (see level datum plane) extends in a northwest-southeast direction from longitude 83° W, latitude 30° 25′ N to longitude 82°W, latitude 28° 25′N. In width it extends from the western coast, northeastward to the center line of the state. From this high point the limestone dips regularly to the south to below 1000 feet, to the east to 100 feet, to the northeast to below 500 feet, and to the west to below 500 feet. There is another rise also along the Georgia-Florida boundary near to, and extending into Alabama, where the structure contour line again reaches sea level near Jackson, and rises to 100 feet above sea level just west of the junction of Alabama, Georgia and Florida.

Comparing the structure map with the geological one we find the following. Marked by the letter R of Florida is a strong magnetic "high" which is slightly east of, but closely compares with, the structural high. South of this area the state is predominately "low". There are four "highs" here which represent nine stations, four of these being in the southern "high" on the west coast. Just what causes these four "highs" in an area that should be "low" the writer does not know, but the following explanation is offered as a possibility.

By checking against the state structure map it will be observed that at three of these "highs", the one at Miami being the exception, wells have been drilled for oil. This would indicate that the wells, unless pure wildcats, were drilled on local structure, not necessarily in the Ocala limestone but probably above it, which do not appear on the structure map. Thus these local "highs" may possibly be on local structures and thus produce the anomalous regional results. This same explanation will also check with similar anomalies in the western part of the state.

Mr. Gunter was asked for information regarding such structures, and part of his reply is quoted:

"So far as the geologic work in connection with most of the wells drilled in Florida, and particularly so of the southern portion of peninsular Florida is concerned, I do not place any value upon the work said to have been done by the so-called geologists who take credit for locating such test wells. I feel that the men responsible for the work said to have been performed are not prepared for such tasks. While it is true that we have recorded small anticlines and folds in the Caloosahatchee and later formations as exposed along the upper Caloosahatchee river in southern Florida, we do not feel that such structures necessarily bear any relation to structures in the deeper lying formations. Personally I think they do not."

"That there may be local structures superimposed on those of a regional extent is of course a very plausible supposition. We have tried to obtain cuttings from water wells, and also those wells drilled as tests for oil in every section of the State. We have been more or less successful and by this means have obtained at least a regional view of structure in Florida. Unfortunately we lack samples from southern Florida and our information from that region is very meager. Such information as we have however, makes us reasonably sure that so far as the Eocene limestones are concerned there is a monoclinal dip to the limestone. All the information that we have obtained from water wells leads to this conclusion. However, as just suggested, it may be that with more detailed data minor structures will become apparent."

Although exact data cannot be obtained at present to correlate or disprove the explanation offered it will be continued until a better one is introduced, since it also seems to fit the structural conditions found in other states in the Gulf Coastal Plain. Inasmuch as it was first worked out for Florida these magnetic conditions have been referred to elsewhere as the Florida type. They can be summarized as follows. In the Florida Type the regional magnetic effects appear to be due chiefly to the basement rock or to a sedimentary bed close to, and conformable with the basement. Magnetic results therefore indicate regional structure positively or definitely i.e. a magnetic "high" over a structural high etc. Local anomalies due to local structures, and caused possibly by more or less weakly magnetic sediments near the surface, will appear superimposed on the regional magnetic results, and usually coincide positively with structure. They might be negative providing the magnetic bed had been removed from the top of an anticlinal structure.

To the east and northeast of R of Florida, the magnetic results are "low" and check the regional structure or dip.

Near the O is found a magnetic "high". The extreme "high" is for the station at Tallahassee and may be due to any one of many local causes. The "high" lying at O is at the northern end of the structural high, but this does not seem to account for it. Its cause is unknown.

"Local structure" seems to fit nicely the "high" at L, while at F the normal regional "low" is again encountered.

More Data on Gas Lifts

In the California oil fields, the most valuable function of the gas lift is to bridge the gap of inefficient production which exists usually between the time that natural flow in wells is no longer efficient and the time when production is still too large to be handled by plunger pumps. This conclusion follows comprehensive experimental investigations and field operations made by production engineers and operators. The data collected should be an aid to the further development of the gas-lift method. They are published in full in a bulletin, *Gas Lift Method of Flowing Wells*, by H. C. Miller*. Much data on actual gas-lift operations are given and theoretical hypotheses and conclusions are supported wherever possible by field data acquired by consultation with engineers and operators.

Mr. Miller in his study found that fundamental data concerning the operation of the gas lift are meager; that little is known about the velocities and resistances to flow of oil and gas in vertical pipes, about the design of tubes best adapted to the upward flow of gas and oil where the gas is expanding constantly, and about the rate of expansion of gas in the eductor tube. Although a knowledge of these and other data of a fundamental character are necessary in designing, installing, and operating gas-lift systems efficiently, until such data are available, experience and the ability to interpret correctly well records and underground conditions will remain the governing factors in making gas-lift installations.

In spite of the fact that the technique of the gas-lift is still underdeveloped with many fundamental data lacking, production engineers in California have secured results that justify continued use of the gas lift wherever conditions are suitable for its application. It is an axiom that each well is a separate problem which requires individual study and experimentation to attain maximum lifting efficiency.

[22]—Flint, Richard Foster. Asst. Prof. Geol. Yale University. Personal communication.
[22a]—United States Geological Survey P. P. No. 71.

[23]—Gunter, Herman. State Geologist, Personal communication.
Mosson, Stuart. A Review of the Structure and Stratigraphy of Florida, 17th Annual Report of the Florida Geological Survey, pp. 169-268, 1926.
Mosson, Stuart and C. Wythe Cook. Geology of Florida. 20th Annual Report of the Florida Geological Survey. pp. 29-228, 1929.

*United States Bureau of Mines, Bulletin 323.

Cost of Magnetometer Surveying

By Dart Wantland*

The following report on the cost of magnetometer surveying was made to the class in geophysics 401 at the Colorado School of Mines. This report was submitted September 18, 1930, and received the highest grade. Those making the report are M. A. Tibbetts, F. S. Wiebelt, and George Welch. (By way of explanation, geophysics 401 is the course in "Review of Geophysical Methods.")

The report follows:

Factors to Be Considered

Weather, *personal*, topography, transportation, location in respect to section corners, lost time, depreciation of car and instrument, and salary.

Of these factors the personal factor is by far the most important one in a discussion of real cost; that is, cost measured in quality of work done.

Data

The following data were furnished by a reputable oil company as a favor to the committee making this report. It is accurate within 5 per cent.

Cost of magnetometer surveying in search for petroleum.

Case Number 1:

Location	California
Time of Survey	3 months
Area covered	10,000 square miles
Number of stations	1500
Expenses:	
Car	$ 225
Car depreciation	225
Instrument depreciation	75
Personal expenses	525
Salary	600
Miscellaneous	25
Total cost	$1675
Cost per station	$ 1.10
Cost per day	18.60
Cost per month	550.80

The work on this job is considered first class. The effect of good weather and roads is evident.

Case Number 2:

Location	Western Canada
Time of survey	1 month plus 20 days driving time
Number of stations	100
Expenses:	
Personal	$ 300
Car	300
Car depreciation	125
Instrument depreciation	41
Salary	333
Miscellaneous	20
Total cost	$1119
Cost per station	$11.19
Cost per day	22.38

Case Number 2 may be taken as an extraordinary example of the effect of the seasonal factor on magnetometer work. The work was done in a northern latitude in October. The roads were muddy, there were also many storms and the auto was in bad condition. The operator reported that much trouble was experienced with the instrument due to 'freezing'. (The balance froze to the springs above it and could not be readily released.)

Case Number 3:

Location	Southwestern Texas
Time of survey	15 days
Number of stations	200
Expenses:	
Personal	$ 50
Salary	100
Auto	20
Auto depreciation	37
Instrument depreciation	13
Total cost	$220
Cost per station	$ 1.10
Cost per day	14.70
Cost per month	440.00

Case Number 4:

Location	Texas (Panhandle)
Number of stations	1200
Area	7200 square miles
Time of survey	3 months
Expenses:	
Personal	$ 225
Auto	150
Auto depreciation	225
Instrument depreciation	75
Salary	600
Miscellaneous	25
Total cost	$1300
Cost per station	$ 1.10
Cost per day	14.45
Cost per month	433.00

This case may be compared with Case 1. Personal expenses are less but cost per station is the same. The chief geologist states that the *quality* of work in Case 4 was much lower than the quality of Case 1. So the real cost which can not be expressed in dollars per station is much higher in Case 4 than in Case 1. It is noteworthy in considering Cases 1, 3 and 4 that the cost per station is $1.10 despite the difference in location and operators. It appears that under favorable conditions magnetometer work costs this company about one dollar per station. As the conditions grow more unfavorable however, the cost mounts rapidly. The company states, without publishing figures, that work in East Texas and Louisiana cost about two to three dollars a station, the increasing cost being due to bad roads and necessity of using motor boats.

Estimate for Cost of a Magnetometer Survey.

Relatively ideal conditions—level country good roads.
Location—N. E. Colorado.
Time of survey—2 months.
Number of stations—approximately 25 per day when working.
Lost time—6 days on account of storms, transportation, instrument adjustment.

Expenses:		
Salary—$150 and expenses	$ 5.00	per day
Hotel	2.50	per day
Meals	2.50	per day
Car—150 miles per day at 7 cents a mile	10.30	per day
Miscellaneous	2.00	per day
Total cost	22.30	per day
Cost per station (600)	1.11	
Cost per day	22.30	
Cost per month	669.00	

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Principles of the Hydro-metallurgy and Electrodeposition of the Metals

VIII. Purification and Clarification

By Thomas P. Campbell*

As noted several times before, there is no such thing in practice as an absolutely selective solvent. In the hydrometallurgical treatment of ores and concentrates, therefore, the solution coming from the leaching and separation divisions invariably contains one or more impurities which would interfere with, or make impossible, the recovery of the main metal.

In general, such impurities may be in true solution or in suspension, as colloids or neo-colloids. In either event, they must be removed; the solution going to the metal precipitation step should be as pure and as clear as economically possible. The problem of purification of leach solutions involves, then, not only the elimination of impurities by chemical means, but also by physical means,—as by filtration. In dealing with metals, as with plants and animals, it is well to remember that the product is no better than the parent stock,—and usually is much worse.

From the considerations developed in the chapter on leaching, and with particular reference to the e.m.f. series of the elements, it is apparent that the lower (more noble) the metal in the series, the fewer the elements that can precipitate it from solution. This is just another way of saying that it is easier to get pure gold than copper from solution; and by the same token, copper precipitation is relatively simple as compared to zinc precipitation.

The simplest case of purification, then, is that of metal replacement. For example, a neutral zinc solution contains cadmium and copper; it is impossible to deposit zinc from sulfate solution in the presence of even very small amounts of these metals; hence it is common practice to treat the impure zinc solution with an excess of zinc dust to replace the Cd and Cu,—

$$Cd(\text{or } Cu)SO_4 + Zn = Cd(\text{or } Cu) + ZnSO_4.$$

As pointed out before, such reactions must be regarded as involving an oxidation of the zinc at the expense of the less electronegative metal: the zinc *metal* thus acts as a *reducing agent;* and therefore such reactions should be carried out under reducing conditions.

It should also be pointed out that there are other essential conditions which may and do influence the course and end-point of such reactions. First, the reducing metal must form a soluble compound with the anion of the metal to be replaced. Thus, in ammoniacal solution iron cannot replace copper, since iron does not form a soluble ammonia complex salt; that is

$$Cu(NH_3)_4SO_4 + Fe = Fe(NH_3)_4SO_4 + Cu$$

since any Fe that might get into solution simply forms $Fe(OH)_2$ or $Fe(OH)_3$. Second, the reducing metal must be kept in excess in the solid phase, especially when it is desired to remove very small amounts of the more electropositive metal. This follows from the fact that these replacement reactions take place at the surface of the reducing metal: hence the more surface exposed, the faster and the more complete the reaction. From this it also follows that the reducing metal should be added in as finely divided a form as possible, since the greater the degree of subdivision the greater the ratio of surface to mass. Third, some sort of agitation should be supplied in order to remove the "cement" metal deposited on the surface of the reducing metal. For example, in removing copper from solution by "precipitation on iron", part or all of the iron surface may become blanketed and rendered inert by the deposited copper; hence the copper-bearing solution should be circulated past the iron at a fairly rapid rate, or the iron surface should be scraped or shaken, to remove the film of "cement copper".

Finally, in dealing with replacement reactions in general, the tendency for any metal to be oxidized by one above it in the series is a function of the metal ion concentrations in the solution,—or of the "ion activities". The actual potential of any metal toward a solution containing its ion varies with the concentration of that ion according to a logarithmic function. The values of potential given in the e.m.f. series are assumed to be those displayed by the metal in contact with a solution which is molal with respect to the metal *ion*,—that is, a solution which contains one gram-mole of the metal *ion* in 1000 gm. of water. This value is called the "standard single potential" of the metal. The variation of the actual potential with ionic strength is then given by the relation

$$E = E_o + \frac{RT}{nF}\log_e(M^+)$$

where E is the observed potential, E_o the "standard single potential" at the absolute temperature T, R is the gas constant, n the valence of the metal ion, and F the value of the Faraday (about 96,500 coulombs). The derivation and full significance of this equation will not be taken up now; for the present it is sufficient to point out once more that chemical reactions are essentially energy changes, that energy, like water, tends to flow from points of high pressure to points of low pressure, and that the potential given by the above equation is proportional to the energy liberated when one gram-mole of the metal is oxidized to one gram-mole of its ion in solution of concentration (M^+).

For example, in the replacement of copper by zinc, as shown above (Ch. II), the total potential of the reaction

$$Cu^{++} + Zn = Zn^{++} + Cu$$

for molal solutions is the difference of the two metal single potentials—

$$E = E_{Cu} - E_{Zn} = 0.3448 - (-0.7581)$$
$$E = 1.1029 \text{ volts at } 25°C.$$

Now if the copper ion concentration in solution is less than 1-molal, then the actual copper single potential must be less than 0.3448 volt, since the logarithm term in the above equation becomes negative for values of (Cu^{++}) less than 1. Hence, the lower the copper concentration, the lower its potential, and the less energy is available from the reaction. In fact, for very low values of (Cu^{++}), the value of E_{Cu} becomes negative,—that is, as the copper concentration drops, the tendency for Cu to go back into solution in-

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creases. And if this is true for copper, how much greater must be that resolution tendency in the case of a metal like Cd? The answer, in the quaint parlance of the day, is, "and how!"

These considerations also show, in at least a qualitative way, why some metals, and other impurities, cannot be removed by simple replacement. That ubiquitous element, iron, is particularly troublesome; also there are other polyvalent, amphoteric, elements which can exist either as anions or cations, depending upon the pH of the solution. The removal of these "diplomats" may be effected in several ways. Each case is more or less of a law unto itself; but a few examples may be cited.

In the extraction of copper from low-grade oxide ores, dilute sulfuric acid is the common solvent; but in some of the ores there are native chlorides which get into solution. The presence of Cl^- ion causes rapid deterioration of the insoluble anodes in the electrolytic tanks. To keep the Cl^- concentration at a minimum, the leach solutions are treated with cement copper; this leads to the formation of CuCl which is insoluble, and may be separated along with the excess Cu.

Iron also causes trouble in the electrolysis of copper solutions. Ferric sulfate is formed at the insoluble anodes, and reacts with the metallic Cu at the cathode—

$$Cu+2Fe^{+++}=Cu^{++}+2FE^{++}$$

which leads to low current efficiency and high power cost. The electrolyte in the tank-house must therefore be treated with SO_2 at periodic intervals to keep the iron in the reduced state.

Cobalt and nickel are particularly detrimental to the deposition of zinc: in some cases it has been found necessary to limit the concentrations of these elements by means of special reagents, such as dimethylglyoxime, nitroso-beta-naphthol, etc.

It has been well said that, insofar as chemical purification is concerned, the methods of the analytical laboratory are the surest guide to success in attacking any problem. The judicious application of the time-honored reactions of qualitative and quantitative analysis,—with due regard for the economics of the situation,—seldom fail to yield satisfactory results.

But these simon-pure methods are not always sufficient. Or, by taking advantage of some physical property or mechanism, a long and tedious chemical process may be circumvented. For instance, it often happens that such pernicious and persistent elements as arsenic and antimony get into solution. These elements, being polyvalent and of acidic persuasion, are notably impervious to ordinary means of chemical elimination. But, like all things animate and inanimate, they have their weakness: they are readily adsorbed by certain insoluble metal hydroxides,—notably ferric hydroxide and aluminum hydroxide.

Adsorption means condensation or local concentration at a surface or interface between two unlike phases. As mentioned before, every free surface of a liquid or solid exerts, or is possessed of, a "stray field of force". Now one manifestation of that field is its ability to attract and hold at the surface from which it acts one or more of the constituents of an unlike, immiscible phase in contact with that surface. Thus, whenever a liquid is in contact with a solid, one or more of the constituents of the liquid are adsorbed by (condensed upon) the solid surface. This phenomenon is perfectly general thruout nature, yet the effects are highly specific: a given solid usually has a selective adsorption for the constituents of a given liquid; and the adsorption of gases by liquids and solids is even more noticeably specific.[48]

The exact nature and *raison d'etre* of and for adsorption are not at all well understood; but this much we can assert: that adsorption is a surface effect; and as such, the adsorptive capacity of a given solid must necessarily be a function of the surface exposed. Further, for any given system, at constant temperature, we may utilize the following relation as a first approximation:

$$(x/m)^n=kc,$$

where x is the amount adsorbed by m units of the solid adsorbing agent, c is the concentration of the solution, and n is not necessarily an integer, though experimentally never less than unity.[49] This equation is known as the "adsorption isotherm", or sometimes as "Biltz's Equation"[50].

The adsorption of arsenic acid by charcoal, albumin, and the hydrous oxides of aluminum and iron have been studied quantitatively by Lockemann and Paucke[51]; and the application of this general method of purification, especially as applied to the elimination of arsenic and antimony, has been discussed by Tainton and Leyson[52], in connection with the precipitation of ferric hydroxide from zinc sulfate solutions.

The essential points to be kept in mind in any consideration of purification by adsorption are, first, that the adsorptive properties of a given solid are selective,—not all solids, even of the same general class or type, display the same adsorptive power to the same ionic or molecular constituent; —second, that the adsorbing agent should expose a large surface to the solution; third, that increase of temperature tends to increase the *rate* of adsorption, though not always the amount adsorbed; and fourth, that the extraction of the dissolved constituent by the adsorbing agent is an exponential function of time,—i.e., the adsorption curve is of logarithmic form; the time required to extract the last few units is much greater than that for the first units. Hence, it is good practice to supply a sizable excess of adsorbing agent.

In certain special cases, chemical and physico-chemical methods other than those mentioned may be employed. Hydrolysis, thermal decomposition, preliminary electrolysis, etc., etc., may be utilized; but it is impossible to lay down hard and fast rules for their employment, since each case necessarily calls for individual treatment and must be worked out separately. As exemplifying the number and complexity of purification processes occasionally required, we may cite here the steps taken in the treatment of cadmium sulfate solutions prior to electrolysis at one operating plant[53]:

The solid feed consists of concentrated lead blast-furnace bag-house dust which has been sulfated by roasting with concentrated H_2SO_4 (66°Be) at about 725°C. This treatment renders all of the Cd water-soluble, but breaks down most of the other metal sulfates present and volatilizes a large part of the water-soluble arsenic. This product is leached in warm water by grinding in a ball-mill, followed by paddle agitation. The chief impurities present in the leach solution which might interfere with the electrolytic precipitation of cadmium are iron, arsenic, antimony, lead, copper, bismuth, silver, mercury, and thallium. Freshly precipitated CdS is added to the leach agitators; this precipitates CuS, Ag_2S, PbS, HgS, and Bi_2S_3, and any other second group (H_2S group) metals below Cd. The agitator pulp is settled, and the overflow treated with $NaClO_3$ to oxidize iron; then CaO is added until the solution is neutral

48—Applied Colloid Chemistry, Bancroft, N. Y., 1921.
49—Ibid., p. 100.
50—Ber. Deut. Chem. Gessell. 34, III, 3138 (1904).
51—Zeit. Kolloidchemie 8, 273 (1911).
52—Trans. A. I. M. & M. E. LXX, 502 (1924).
53—Globe Plant, A. S. & R. Co., Denver, Colo.

to methyl-orange. This precipitates $Fe(OH)_3$; and this, in turn, frees the solution of As, and Sb.

The solution is again settled, and to the overflow is added sodium chromate in excess. This oxidizes the thallium to $Tl_2(SO_4)_3$ which is unstable in neutral solution, and hydrolizes to form $Tl(OH)_3$ and probably some basic thallium sulfate. The excess chromate is then reduced with $NaHSO_3$ to chromic sulfate; and finally the solution is filtered preparatory to electrolysis.

Clarification

As mentioned in the chapter on washing and settling, in handling solutions of electrolytes, it is usually impossible to obtain a clear settler overflow. Furthermore, clean, pure metal deposits cannot be obtained from murky, foul electrolytes. All solid particles, whether of true colloidal dimensions or larger, tend to migrate with the electric current: the actual charge displayed by the particle of a given substance depends upon the nature of that substance and, to a certain extent at least, upon the medium in which it exists.[54] Every solid tends to adsorb a film or layer of liquid to its surface; this adsorption may be either "positive" (adsorption of a solute constituent) or "negative" (adsorption of a solvent constituent); hence the potential of the particle plus its film relative to the bulk of the solution may be either positive or negative. But, as a matter of practice. most solids display positive adsorption; hence the net charge on a particle is usually positive or negative according as it exists in an acid (pH less than 7) or a basic medium. This should not be taken as a hard and fast rule, but only as a general guide or first approximation, since, especially in the case of metals, the "solution pressure" of the solid also plays an important role.

The *solution pressure* of a solid is the tendency of the solid mass to eject positively-charged ions into the solution in contact with the solid surface. As soon as any ions escape from the surface, the mass, as a whole, must become negatively charged. Furthermore, the solution pressure is opposed by the osmotic pressure of similar ions already present in the solution. Metals below hydrogen have small solution pressures; in fact, the e.m.f. series gives the order of the metal solution pressures. Thus it happens, for instance, that a base metal, such as copper, may show a positive charge in the massive state; but when in suspension, copper particles will migrate to the anode, and when precipitated by electrolytes will drag down cations (M^+).

For present purposes, however, the important point in all this is simply that solid particles tend to migrate with and be deposited by the electric current; they may also be precipitated by electrolytes, and be adsorbed upon other precipitates. Hence, if we want a pure metal deposit, by chemical, physical, or electrochemical means, we must avoid cloudy, murky solutions containing solid particles.

For the removal of those particles which would not settle, and for the final dewatering of settler underflow pulps, then, filters are commonly employed. "Filtration is the process of separating suspended solid material from a liquid by forcing the latter through the voids of a porous mass called the filtering medium."[55]

Filters may, therefore, be classified according to the medium employed, or according to the method used to force the liquid through the medium. Under the first we may distinguish between:

1. Filters with a loose or granular membrane;
2. Filters with a felted or woven membrane;
3. Filters with a rigid, porous membrane;
4. Filters with a semi-permeable membrane.

In the second classification, we find:

1. Vacuum filters,
   a. Continuous,
   b. Intermittent;
2. Pressure filters,
   a. Stationary,
   b. Centrifugal.

From the hydrometallurgical standpoint, the first classification is the more satisfactory; and within this, the types most usually encountered are the first two. It is not necessary here to go into the details of construction and operation of the various mechanisms employed, since these may be found completely described, with data on ratings, performance, etc., in various handbooks and texts on ore dressing, etc.[56]

In general, it should be noted that, regardless of how the driving force is applied, the separation of solids from liquids by a filtering medium may be effected in either one or all of three ways: First, the size of the channels or pores through the medium may be smaller than the size of the particles to be retained, and thus only the fluid can pass through; Second, the channels may be larger than the particles, but be of such a character that the solids will adhere to their walls and only the clear liquid pass through; or, third, the channels may at first be larger than the solid particles, but of such a size that they will fill up with the solids to an extent such that the openings finally become smaller than the solid particles. In practically all cases, as soon as the medium begins to function as such, whether the pores are in the original medium, or in the cake formed, the oncoming solid particles tend to form bridges over the pores, the coarser particles acting as "key-stones" and supporting the overlying finer particles[57].

The net result is a "filter cake" consisting of a mass of small particles, irregular in shape, closely packed together. The greater the pressure used in forming the cake, of course, the smaller will be the channels through the cake. As soon as any regular film of cake has been built up, the flow of liquid necessarily becomes slow. Under these conditions, the flow of the liquid through the pores of the cake tends to assume straight-line motion, and for any finite thickness, the cake may be regarded as equivalent to a series of capillary tubes of definite *average* diameter. The flow through any one of these capillaries is then given by Poiseuille's equation,

$$P=\frac{32\mu Lu}{gD^2},$$

where P is the pressure drop through the length L of the tube, μ is the absolute viscosity of the liquid, u the linear velocity of the liquid, and D the diameter of the tube. Hence, for a filter cake of thickness L and Area A, with N capillaries per unit area,

$$\frac{dV}{dt}=\frac{N\pi D^4PgA}{128\mu L},$$

where dV/dt is the rate of flow in volume per unit time.

These equations, while not directly applicable to filtration problems, indicate that, first, the filtration rate is proportional to the pressure and to the area, and inversely proportional to the thickness of the cake, for incompressible sludges. For compressible sludges, the size of the channels must become smaller with increased pressure, hence the change of rate of flow with pressure will follow some sort

54—Freundlich, Kapillarchemie, Leipzig (1923), p. 336; Zeit. Elektrochemie 15, 161 (1909).
55—Walker, Lewis & McAdams, op. cit., Ch. XI.
56—Taggart, Handbook of Ore-Dressing, Section 17.
Liddell, Handbook of Chem. Eng., Vol. I, pp. 290-311.
57—Hixon, Work, & Odell, Trans. A. I. M. & M. E. 73, 225.

of an exponential function, the value of the exponent of pressure depending upon the nature of the sludge. Also, since viscosity decreases with increase in temperature, filtration must be retarded by decreased temperature.

To derive equations which can be applied to filtration problems, it is helpful to note the analogy of this case of flow of liquids through tubes to the flow of current through a conductor. Thus, we may assume that filtration rate is equal to the driving *force* (pressure per unit area), divided by the resistance. This resistance, in turn, is made up of two parts: the resistance of the cake itself, and the resistance of the mechanism and medium. Neglecting, for the time being, this latter resistance,—which should be small in a well-designed apparatus,—the resistance becomes inversely proportional to the filtering area; that is, since

$$dV/dt = P/R. \quad \ldots\ldots\ldots \quad (1)$$

and $R = rL/A$,

and since the volume of the cake is LA, while the sludge brought in by the pulp is vV (where v is the volume of cake as it collects on the filter, in cu. ft. per unit volume of filtrate), hence

$$L = vV/A,$$

and

$$R = \frac{rvV}{A^2}.$$

Substituting this in (1),

$$\frac{dV}{dt} = \frac{PA^2}{rvV}, \quad \ldots\ldots\ldots \quad (2)$$

which is entirely satisfactory for dealing with non-compressible cakes, and for filters such that the resistance of the pipes, valves, spigots, and medium is negligible in comparison with that of the cake. If this apparatus resistance becomes an appreciable factor, then we must introduce a term ρ/A, where ρ is a coefficient, and (2) then becomes

$$\frac{dV}{dt} = \frac{P_t A^2}{rvV + \rho A} \quad \ldots\ldots\ldots \quad (3)$$

The pulps resulting from most hydrometallurgical separations are relatively incompressible, being essentially crystalline in character, however small-grained they may appear. However, gelatinous substances, such as $Fe(OH)_3$, and $Si(OH)_4$, may be present; and in any event, there must always be a certain amount of packing with increase in pressure. This is more strictly true as the pressure increases over one atmosphere. Hence, for rotary filters (vacuum), where the total pressure drop, P_t, cannot be greater than one atmosphere, the cake compression quickly reaches a constant value, and equation (3) can be employed.

However, for final clarification, it is usual in many cases to employ pressure filters, such as the Kelly or Burt filter presses, and in these types the pressure changes as the cake builds up. This follows from the fact that it is better practice to filter at constant rate rather than at constant pressure in batch filters under positive pressure. Thus, a Kelly filter may be started at only 5 lbs., but toward the end of the run the pressure may go up to 50 or 60 lbs. gauge. Consequently, for operations involving compressible cakes, we must assume that the specific resistance of the cake is an exponential function of the pressure; that is, $r = r'p^s$. Then equation (2) becomes

$$\frac{dV}{dt} = \frac{PA^2}{r'vVP^s} = \frac{P^{1-s}A^2}{r'vV} \quad \ldots\ldots\ldots \quad (4)$$

Since "filter aids" are seldom, if ever, used in hydrometallurgical practice, it is not necessary to take up the derivation of the differential equations for such conditions.

There is no way of predicting, *a priori,* the values of r, r′ or s for any given case. These must be derived by tests. Very often, too, it is possible to arrive at approximate values from manufacturer's data. In the case of drum filters, such as the Oliver and Portland, it must be remembered that the actual filtering surface increases as the cake becomes thicker, and that, therefore, the value of A in the above equations must be calculated from the relation

$$A = \frac{A_2 - A_1}{2.3 \log \frac{A_2}{A_1}}$$

where A_1 and A_2 are the inside and outside areas of the cake, respectively. The thinner the cake, the more nearly this logarithmic mean will approach the arithmetic mean,

$$A = \frac{A_1 + A_2}{2}.$$

The capacity of a filter is commonly stated in terms of weight of dry solid separated per square foot of medium. On cement slurry, ores and flotation concentrates the capacity of vacuum filters ranges from 200 to 1300 lbs. per sq. ft. per 24 hours. If the capacity runs much under 200 lbs., the limit of vacuum filtration has been reached, and some form of pressure filter should be used. For best results, the feed to a vacuum filter should not exceed 1 part liquid to 1 part solid; and the thicker the pulp, in general, the higher the filter capacity. In continuous vacuum filters, the cake may run as thin as ⅛ in.; but ordinary cakes run from ¼ to ¾ in. thick. The more finely divided the solids, and the higher their colloid content, the thinner must be the cake in any kind of filtration. Moisture content of good filter cake varies usually between 10 and 20 per cent., depending upon the fineness of the solids.

In conclusion, the choice of a filter for a given job can usually be made from analogous experience at other plants or from similar work. The value of the equations developed above lies largely in arriving at conclusions as to efficiency, and as to probable gains by use of different schedules of washing, different media, etc.

Mineral Production in 1929

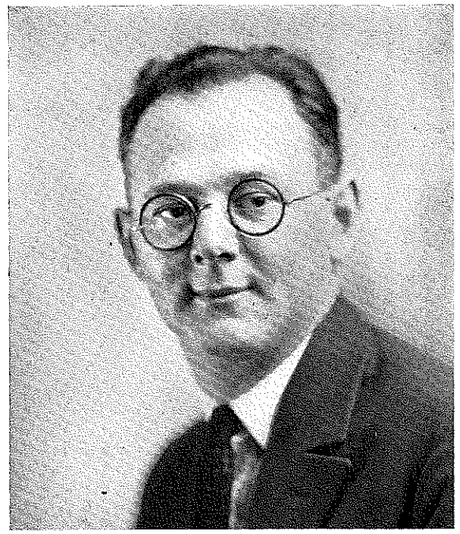
The value of the mineral products of the Nation in 1929 was $5,830,000,000, or 8 per cent greater than the value of the 1928 mineral output, according to the Bureau of Mines. The upward trend was, however, neither general nor uniform and did not bring the total to preceding high levels of the last decade—$6,213,600,000 in 1926, a year of marked prosperity, and $5,986,500,000 in 1923 and $6,981,340,000 in 1920, two years of high price levels. Comparisons for the major groups of mineral industries show that the total value of metals produced in 1929 has been exceeded only twice—in 1923 and 1920—in the past decade; that the total value of all nonmetallic products, except fuels, was less in 1929 than in any year of the decade except the first three; and that the value of all mineral fuels in 1929 surpassed that for each year of the decade except 1926, 1923, and 1920.

"It's a fine day, miss."

"It's a fine day, all right, but I'm not a 'miss,' I'm a 'mister'."

"Ah, I beg your pardon. You looked so much like a boy that I took you for a girl."—*Minn. Ski-U-Mah.*

Soupcoff Dies Suddenly



S. M. Soupcoff, '10

S. M. Soupcoff, '10, succumbed to a sudden heart attack on the night of September 19. The news of his death came to the Alumni office as a sudden shock, as he had been in excellent health until the time of his demise.

According to communications received from his friends, Soupcoff returned home from his office early on the nineteenth, complaining of a slight "heart-burn"; he ate a light meal and retired early. In the morning, since he did not arise at the usual time, he was sent for. There was no response to the knocks at his door, and it was found that he had died during the night. An autopsy revealed that death had resulted from heart failure.

S. M. Soupcoff was graduated from the Colorado School of Mines in 1910. Following his graduation he took a position with the Anaconda Copper Mining company.

This was the beginning of a successful career in mining engineering. His second position was with John B. Farish as a consulting engineer and his work here carried him into the Hudson bay country, Alaska, South America and many other countries in the western hemisphere.

In 1913 he became affiliated with the Guggenheim interests and was with this organization for 14 years.

At the time of his death Soupcoff was associated with the Moore, Leonard and Lynch company, New York investment bankers and brokers.

Mr. Soupcoff was widely known in the west as an expert adviser on mining problems and for his activities in Masonic and club circles. He resided in Salt Lake up until August 1, 1930, when he moved to New York.

He is survived by his widow and son, Tom.

Martinez Killed in Duel

News of the death of Jacobo Martinez following a duel with a Mexican army office, September 13, was received by his friends at the School of Mines early this month. Martinez was an ex-Mines man.

According to the information received, Martinez entered into a heated argument with an army officer and in the melee the officer slapped his face. Martinez being of the hot blooded Spanish type and holding honor dearer than life itself, retaliated by challenging him to a duel. In doing so he, thru courtesy, allowed the officer the choice of weapons. The decision was a duel with pistols.

The combat took place that same evening in a remote spot, near the city of Victoria, Mexico, and resulted in the challenger being mortally wounded. He was immediately removed to a hospital in a very critical condition where he died three days later.

Martinez received his education in the United States. He attended high school at the Western Military Academy of Indiana, from which he was graduated in 1927. He then entered Purdue University where he remained for one year. In the fall of 1928, Martinez entered the Colorado School of Mines and remained as a student here for the ensuing school year.

Former Trustee Dies

Joseph S. Jaffa died in the Presbyterian hospital, Denver, September 15, following a heart attack. He was stricken while attending a dinner at the Green Gables country club, and lived only a few hours after being removed to the hospital.

Mr. Jaffa was a former trustee of the Colorado School of Mines. He served in this capacity for eight years, from 1903 until 1911. He had taught mining law at the School for over twenty years.

Joseph S. Jaffa

The first associate membership in the Alumni Association was granted to Mr. Jaffa. His application for membership was the first received following the amendment to the constitution providing for associate members.

Mr. Jaffa was born in Philadelphia and attended schools there. He was a graduate of the University of Pennsylvania and the Columbia law school.

Later he went with his parents to Trinidad, Colo. He came here 30 years ago.

Mr. Jaffa is survived by his wife, Mrs. Alma Jaffa and three sisters.

Fourth Annual Field Conference of Kansas Geological Society

By Neil H. Wills, '26, and Ronald K. DeFord, '21

The Fourth Annual Field Conference of the Kansas Geological Society was made the first week in September, starting from Colorado Springs, Colorado, and ending at Amarillo, Texas. One hundred and twenty men (also two ladies) made the trip in about forty-five cars.

The itinerary of the trip is as follows:

Sunday, August 31.
Arrive at Colorado Springs for registration.
Meeting to outline plans for trip.
Night at Colorado Springs, Colorado.

Monday, September 1.
Study of sections from granite to Dakota in vicinity of Colorado Springs.
A study of similar sections in vicinity of Canon City (including Ordovician Beds).
Lunch at Canon City (Strathmore Hotel).
Visit to Florence and Canon City oil fields.
Night at Pueblo, Colorado.

Tuesday, September 2.
Study of Apishapa uplift between Pueblo and Walsenburg.
Study of great thickness of Pennsylvanian and associated red beds (10,000 feet thick) in vicinity of La Veta Pass.
Lunch at La Veta—by ladies of South Methodist Church.
Study of Cretaceous and Tertiary ? beds on east side of Raton Coal Basin.
Night at Raton, New Mexico.

Wednesday, September 3.
Study of south side of Raton (Cretaceous-Tertiary?) Coal Basin.
Study of Carboniferous beds near Taos.
Visit to Taos Indian Pueblo and artists' studios.
Lunch at Don Fernando Hotel at Taos.
Visit to Santa Clara Indian Pueblo.
Visit to Puye ruins.
Night at Santa Fe, New Mexico.

Thursday, September 4.
Study of upper Pecos River Carboniferous section above Pecos City.
Lunch in Field near Pecos City.
Study of Mesozoic, Carboniferous and Pre-Cambrian section at Tijeras Canyon at the south end of the Sandia Mountains.
Night at Albuquerque, New Mexico.

Friday, September 5.
Study of Abo Canyon section at the south end of the Manzano Mountains—Carboniferous and Pre-Cambrian.
Lunch in Field at Willard, New Mexico.
Study of recent lake beds in southern end of the Estancia Valley.
Study of Permian overlap onto Pre-Cambrian quartzite in Pedernal Hill.
Over Glorieta Mesa to Las Vegas.
Night at Las Vegas, New Mexico.

Saturday, September 6.
Study of Cretaceous through Pre-Cambrian at Mora Canyon.
Disband for trip to Amarillo.
Night at Amarillo, Texas.

In the evening, papers were read by various members of the trip, and discussions followed. J. Harlan Johnson, '23, gave a preliminary report at Pueblo on the Permo-Pennsylvania beds and their relationship to the Ancestral Rockies. The field work for this paper (in Colorado) is being conducted by Prof. Johnson for the U. S. G. S. He spoke again at the evening meeting in Raton.

In the "Proceedings of the Fourth Annual Field Conference of the Kansas Geological Society" is a compilation of geological data on the area covered by the trip. Certain contributions to this book made by Mines men are of interest:

"Stratigraphic Sections in the Rocky Mountains of Colo." By H. L. Baldwin, '25, and others.
"The Pennsylvanian Section at Lost Lake, Colorado." By H. L. Baldwin, '25, and others.
"Stratigraphic Sections in Northeastern New Mexico." By Ben H. Parker, '24, Donald Beeth, '24, and others.
"Notes on the Occurrence of Clastic Plugs and Dikes in the Cimarron Valley of Union County, New Mexico." By Ben H. Parker, '24.

The trip was a huge success, although a long and hard one. The Colorado School of Mines contributed their share of the men present on the trip. The following men made the trip in part or in whole:

Allan, T. H., '18, Division Geologist, The Midwest Exploration Co., Russell, Kansas.
Baldwin, Harry, '25, Division Geologist, Independent Oil & Gas Co., Tulsa, Oklahoma.
Butcher, C. P., '24, Geologist, Cranfill-Reynolds Co., San Angelo, Texas.
DeFord, R. K., '21, Division Geologist, The Midwest Refining Co., Roswell, New Mexico.
Downing, R. B., Geologist, The Barnsdall Oil Corp., Wichita, Kansas.
Johnson, J. Harlan, '23, Professor, Colorado School of Mines, Golden, Colo.
Kessler, D. L., '25, Geologist, The Midwest Refining Co., Carlsbad, New Mexico.
Miller, Milward, '26, Geologist, Humble Oil & Refining Co., Roswell, New Mexico.
Reynolds, K. W., '20, Division Geologist, Skelly Oil Company, Roswell, New Mexico.
Romine, Tom, '19, Asst. Chief Geologist, Texas & Pacific Coal & Oil Co., Fort Worth, Texas.
Roth, Fred, '26, Geologist, The Midwest Exploration Co., Russell, Kansas.
Wills, Neil H., '26, Geologist, The Midwest Refining Co., Roswell, New Mexico.

D. L. Kessler, '25, is co-author of a paper "Symposium on the Age and Structural Relationships of Uplifts of Colorado and Vicinity to the Buried Mountains of the Texas Panhandle". The paper was read at the evening meeting in Las Vegas, Friday, Sept. 5.

Production of stone in the United States in 1929, exclusive of stone manufactured into lime, cement, and abrasive materials, or crushed into sand, amounted to 141,109,580 short tons, valued at $202,692,762, according to a compilation of reports from producers made by the United States Bureau of Mines. The figures show an increase of 5 per cent in quantity and 3 per cent in value over the 1928 production figures of 133,869,510 short tons, valued at $196,820,697.

Stone sold for flagging, rubble, furnace flux, manufacturing industries, construction, monumental stone, crushed stone, riprap, agricultural limestone and stone sold for miscellaneous uses increased in quantity and stone sold for paving blocks and curbing decreased.

Athletics

Intramural Sports

Due to the shortness of the season and the inability of all of the participants to arrange baseball schedules last spring, the Alpha Tau Omegas still must play the Sigma Phi Epsilons for a semi-final decision in this sport. The winner of this game will meet the Sigma Alpha Epsilons for the championship. This ends fall competition in baseball.

Intramural tennis singles began September 16. More than a score of men are participating in this tournament. The results have not yet been announced.

The volleyball tournament began September 23. Because of repairs being made on the playing floor of the gymnasium, all practice was scheduled for out of doors. Coach Moles set up a net for this purpose on the lawn at the rear of Guggenheim Hall.

The volleyball tournament really starts the race between fraternities for athletic supremacy. Other sports will follow in their order, boxing, wrestling, basketball, swimming, track and baseball.

Much interest has been manifested in the past in intramural sports at the Colorado School of Mines.

COLORADO SCHOOL OF MINES 1930 FOOTBALL SQUAD

Name	*No.*	*Pos.*	*Ht.*	*Wt.*	*Exp.*	*Home Town*
Adams, Ted	35	E.	5' 9"	166	1 yr.	Denver, Colorado
Adams, Walter	22	T.	5' 10"	167	1 yr.	Denver, Colorado
Austin, Art	11	T.	6' 1"	172	No	Houston, Texas
Bond, Ernest	33	F. B.	5' 10"	160	1 yr.	Canon City, Colorado
Bonnett, Chas.	9	Q. B.	5' 10"	157	2 yr.	Ridley Park, Penn.
Burrell, Ivan	10	C.	5' 8½"	177	2 yr.	Findlay, Ohio
Canning, T. V.		E.	6'	157	No	Denver, Colorado
Coolbaugh, J.	17	C.	6' 1"	170	No	Golden, Colorado
Eads, Harold	6	H. B.	5' 10"	162	2 yr.	Golden, Colorado
Elgin, Jack	29	T.	6' 1"	160	No	Leesburg, Virginia
Fallis, P. M.	23	E.	5' 11½"	175	No	Montebello, Calif.
Fernald, L. L.	19	F. B.	5' 7"	155	No	Tarpon Springs
Fishman, Ben		H. B.	5' 6"	117	No	Denver, Colorado
Flournoy, E.	16	H. B.	5' 7"	131	No	Denver, Colorado
Glanding, N. G.	14	E.	5' 10"	160	No	Norristown, Penn.
Green, L. O.	5	H. B.	5' 4"	150	No	Danville, Ill.
Harris, H.	1	H. B.	5' 6"	150	No	Kearney, Nebr.
Johnson, S. W.	39	E.	5' 11"	150	No	Salt Lake City, Utah
Lebar, Frank	18	H. B.	5' 7"	150	No	Rock Springs, Wyo.
Manhart, T. A.	3	E.	5' 11"	160	1 yr.	Sedalia, Colorado
Martin, Harvey	21	G.	5' 10"	173	1 yr.	Wheatland, Wyo.
McClave, Jack	20	G.	5' 10½"	151	1 yr.	Fort Lupton, Colo.
McClure, Frank	4	C.	5' 11½"	154	No	Denver, Colorado
McNutt, Hal	2	H. B.	5' 6"	142	No	Golden, Colorado
Michaelson, C. D.	38	T.	6' 1½"	197	1 yr.	Sycamore, Ill.
Peaker, Don	76	Q. B.	5' 8"	130	2 yr.	Kearney, Nebr.
Pressett, E.	7	G.	5' 11½"	176	1 yr.	Sunnyside, Utah
Preston, R. D.	25	T.	6' 1½"	175	1 yr.	Denver, Colo.
Putz, H. T.	34	G.	5' 10"	155	1 yr.	Jackson, Mo.
Quinn, J. B.	28	G.	5' 9"	167	No	Balboa Heights, C.
Rice, Ed.	26	H. B.	5' 8"	156	2 yr.	Grantwood, N. J.
Reigle, R. G.	27	H. B.	5' 10"	155	No	Denver, Colo.
Robison, Jack	31	T.	5' 10"	170	1 yr.	Urbana, Ohio
Rosenbaum, Joe	36	E.	5' 10½"	155	No	Denver, Colo.
Rump, J. S.	16	E.	5' 11"	155	No	Grand Junction, Colo.
Rump, W. C.		H. B.	5' 8"	135	No	Grand Junction, Colo.
Spalding, B. R.	15	E.	5' 11"	151	No	Denver, Colo.
Switzsavage, A. C.		E.	5' 11"	165	No	Reinerton, Pa.
Volin, M. E.	24	T.	5' 11"	165	No	Willows, Calif.
Wells, W. M.		H. B.	5' 8"	151	No	Denver, Colo.
Wilkerson, J. C.	30	E.	5' 9½"	142	1 yr.	Denver, Colo.
Woodburn, Jim	37	G.	5' 8½"	185	1 yr.	Philadelphia, Pa.
Zwick, W. H.		T.	5' 4"	161	No	Fort Wayne, Ind.

Denver Wallops Regis

After holding Denver University scoreless in the first quarter, Regis college was handed a 40-0 defeat Saturday night, September 20, at the D. U. stadium.

An estimated crowd of 17,000 people witnessed this first night game of the year.

With the score ending 6-0 at the end of the half in favor of D. U., the Pioneers came back with a hard, fighting offense. Specken, veteran quarterback at D. U. and Noonan of Regis, were the outstanding players.

Mines-Denver U.

Mines lost to Denver University by a 16 to 0 score in the first football game of the 1930 season. The Mines fans had not expected this lop-sided score, and were banking on the Orediggers to hold the powerful Denver eleven to a one touchdown margin.

The strength of Denver U. had been underestimated in spite of the 40 to 0 trouncing which the Pioneers handed the Regis Rangers. Many spectators who saw the Denver-Mines battle stated that the Miners did an excellent piece of work in holding the D. U. Boys down to 16 points. In fact, sports writers in the Rocky Mountain Conference are talking Denver up for the champions this season.

So It Goes

We get all pepped up and things happen to spoil it. Spiers and Rice are out on account of heart trouble and appendicitis. And now that True is back, he is declared ineligible. Three good men lost—what next?

Freshmen Football

Forty freshmen football candidates are reporting regularly for practice at the new field by the Experimental Plant. Two pass plays have been given out for practice and a number of new ones will be issued by the end of this week. As yet, no definite lineup could be formulated. The line material looks exceptionally good, especially the guards and tackles.

Coach Fletcher expressed himself well pleased with his yearlings. "We ought to win both Frosh games," he said.

Campus

Captain Cole Writes Letter to Miners

Well, the old school is open again and my thoughts turn to Mines and Golden. It will not seem the same to have to miss the tug of war, the barbeque, and then the team at Brooks field.

You may be sure I will be there in spirit at least and will be following your fortunes just the same through your pages of the Oredigger. Surely hope you all have a big year in all activities at Mines.

Since arriving here I have already seen "Bob" Herndon, and MacCullough, both of '27, I believe. "Bob" is one of my Reserve Officer Students. I keep my Mines sign on and hope to attract more "Miners."

My work proves interesting with the Ohio River to keep us busy. I expect to investigate one of its tributaries as to possibilities of future commerce, power development and flood control reservoirs. Aerial mapping comes in for a share of the time too, as does disbursing about one million dollars per annum and legal work. You can see this keeps me out of mischief at least. I'll send you a news item about an interesting feature as soon as I get more familiar with it.

Give my best to all the gang. Hope you all get lots of good Frosh. This goes for all the gang and the Stray Greeks too. Then I hope the Barbs make you hustle. This is all political, you see no party or sect left out.

Up and at 'em Miners and give the other teams H——l to remember us by. Keep the old fight and lots of new fight to boot on the field and in the best ROTC unit I know of.

Adios Au-Revoir and So Long,
CAPTAIN COLE.

Professor L. W. Harkemeier of the Chemical department recently returned from the annual meeting of the American Chemical Society, which was held this year at Cincinnati. Doctor C. W. Knudson, formerly of the Mines faculty, accompanied him. While at Mines Doctor Knudson was in charge of freshman chemistry.

At the invitation of the Colorado Section, the Society will hold its 1932 meeting in Denver.

New Rushing System Tried

Following a week of organized rushing, the fraternities on the campus announce their pledges for the semester. Most of the men so honored are freshmen, although some upperclassmen were pledged. According to the rules of the Interfraternity Council, each fraternity was allowed two dates with the rushee. On Monday evening, September 8th, the Rushing Period ended. The rushees gathered in Guggenheim, and went before the Council to state their choice. Each fraternity submitted a list of men preferred by it, and the Council reconciled the choices of the fraternities with the choices of the rushees.

Largest Enrollment Since 1924

The first semester registration of this school year has revealed many interesting facts. The distribution of students according to class indicates somewhat larger groups than during the previous few years. There are at present, eleven post graduates, seventy-one Seniors, one hundred and eighteen Juniors, one hundred and twenty-five Sophomores and one hundred and forty-seven freshmen enrolled.

Some sidelights of registration include the enrollment of three foreign students, Uordan, from the University of Tortu, Estonia; W. E. Pirson of Belgium, and Watanabe, from Nankin College, Japan. Among the post-graduates are Chappa '27, Mexico, and Odonez '28, also of Mexico. There are forty-two advance standing students from thirty-nine colleges represented among the Miners.

Colorado still predominates among the new students, with both New York and California running close seconds. However, almost every state and possession is well represented.

New York Section Praises Student Annual

A letter to the director of publications from the New York section of the Colorado School of Mines Alumni association praises the 1930 Prospector. The letter said "the New York Section considers the 1930 Prospector an excellent piece of work, in fact the best that has come to our attention in years."

Topics

Prexy Writes Letter to Students for Oredigger

Following is a letter from President Coolbaugh addressed to the students. This letter was published in the first issue of the *Oredigger*, student paper.

To the Mines Students:

The Administration is well pleased with the large enrollment this year. It is believed that this increase in students is an expression of faith in the ability of the Colorado School of Mines to train capable engineers.

The loyalty of the alumni and you old students is fully appreciated—without it we could not make progress. It will be interesting to observe the new men, being assimilated into the student body, strive to live up to your standards. They will have to exert themselves to the limit to do it, but we have confidence in them.

Mines Spirit is contagious.

Sincerely,
M. F. COOLBAUGH.

Mines R. O. T. C. Rated Excellent

The general rating of the Colorado School of Mines R. O. T. C. unit is "excellent," according to a report from headquarters, Eighth Corps Area, Fort Sam Houston, Texas.

The War Department found no irregularities or deficiencies in the School of Mines unit as a result of the inspection held before the close of school last spring. A letter from the commanding general of the Eighth Corps Area states that "The unit is well administered and very good results are being obtained. The faculty cooperates and the students take very kindly to the work. The general rating of the School of Mines unit is excellent."

Palmers Celebrate Thirty-fifth Wedding Anniversary

Professor and Mrs. I. A. Palmer celebrated their thirty-fifth wedding anniversary with a party at their home recently, at which time they entertained several faculty members. Professor Palmer has taught metallurgy here for more than ten years and is one of the leading authorities on the subject in the state.

Allen Writes Letter to Student Body

The following is a letter addressed to the Mines student body by Coach Allen. It sums up his point of view regarding this year's football situation. This letter appeared in the first issue of the *Oredigger*, student weekly.

Gentlemen:

"This year marks a decided step in the physical Educational program of this school. For the first a thorough physical examination is required of each Freshman and Sophomore. From these examinations the Physical Education Department can determine the actual physical status of each man. The department is fortunate in having the services of Dr. Fletcher, who, though not acting as school physician, is able to correct some of the minor ailments of these men in the classes.

"He is also freshman football coach and trainer for all athletic teams. This should greatly aid the conditions of the personnel of the teams.

"Now for the great fall sport, football.

"Prospects for a good team this fall are bright. To have a winning team, winning spirit is required of the team and of its backers. Each student should encourage the team individually and collectively to win. With the return of several lettermen, Adams, an end, Spiers and Martin, guards, Woodburn, fullback, and with some good men from the Frosh team, the outlook is considerably brighter than it was last spring.

"Football in the Conference is improving so that the competition is keener than in years past. Mines is to play the first Conference night game with Denver University on October 4th. Naturally, the Miners are anxious to make a good showing."

Sincerely,
GEORGE ALLEN.

The formal opening and house warming of the new chapter house of the Alpha Tau Omega fraternity took place Sunday, September 21, from two until five p. m. Many friends of the chapter in Golden attended.

September's share of visitors at Mines was as great as ever. Dr. Robert Landon of the U. S. G. S. was in Golden, September 15, and intends returning later for further work with this group. Another Mines guest was Dr. Q. D. Singewald, formerly of the geology department of the School who has been working around Alma, Colorado, during the summer. He spent several days in Golden before returning to his position at the University of Rochester, New York. Dr. C. H. Behre, professor of economic geology at Northwestern University, who has been with the U. S. G. S. in its work near Leadville this summer, spent September 15 at Mines. Professor McCarthy, a botanist of Riverside, California, also visited Mines. He has been doing work for the Carnegie Institution during the summer on Pike's Peak. While in Golden, he was a guest at the home of Professor and Mrs. J. Harlan Johnson.

Abie—I hear you had a fire at your store last Tuesday night.

Ikie—Sh, sh! It's this Tuesday night.

News from the Chapters

New York Section

The 93rd regular meeting of the New York Section of the Colorado School of Mines Alumni Association was held at the Fraternities Club, 22 East 38th St., New York City, on Friday, September 12, 1930. Dinner was served at 6:30 P. M.

The following men were present:

Bilisoly, J. M., '23, 247 Park Ave., N. Y. C.; Burgess, C. W., '09, 247 Park Ave., N. Y. C.; Downes, F. A., '13, 247 Park Ave., N. Y. C.; French, C. L., '13, 11 Bartlett St., Brooklyn, N. Y.; Gross, LeRoy, '14, 39 Broadway, N. Y. C.; Miller, A. L., '17, 247 Park Ave., N. Y. C.; Pilger, T., Ex-'10, 55 Wall St., N. Y. C.; Ryan, J. A., '23, 61 Broadway, N. Y. C.; Soupcoff, S. M., '10, 111 Broadway, N. Y. C.; Walmsley, H. P., Ex-'24, 1239 Graybar Bldg., N. Y. C.; Wolf, H. J., '03, 42 Broadway, N. Y. C.

Following the dinner President Wolf called the meeting to order. The reading of the minutes of the previous meeting was dispensed with. The Treasurer's report was read and accepted.

A letter from the Director of Publications at the Colorado School of Mines regarding the 1930 Prospector was read and the Secretary was directed to advise the Director of Publications that the New York Section considers the 1930 Prospector to be an exceptionally good issue.

The speaker of the evening was Mr. Theodore Pilger, Ex-'10, now in the Foreign Bond Department of the National City Bank and who following the World War spent several years abroad with headquarters in Berlin for the U. S. Dept. of Commerce under Secretary Hoover. His work was primarily promoting the sale of American made machinery and engineering equipment, and it required him to cover all of Europe.

With a vote of thanks to Mr. Pilger the meeting was adjourned at 9:00 P. M.

We wish to remind those who may have occasion to visit New York that we hold regular meetings on the second Friday of each month. Telephone Harry J. Wolf, Digby 2486 or F. A. Downes, Wickersham 5030, for details.

Monterrey Section

The Monterrey Section is at work now on plans for their annual meeting, the day following commencement.

This section will run a series of ads in the *Magazine*, the first of which appears in this issue. Give the Boys from Monterrey a big hand!

Southern California Section

The Southern California Section of the Alumni Association met at the University Club for dinner, Wednesday September 24, to meet with and hear the Secretary of the parent Association, C. Lorimer Colburn.

Forty-two members came to the party and as the invitation said there would be no soliciting of funds, a good time was had by all—except Secretary Colburn, as he evidently had come out to tell us all the needs at the school, in the way of new buildings, equipment, endowed professorships, and lastly, athletics.

After the Secretary's interesting outline there was considerable discussion which was indulged in by men ranging from the class of '00 to the class of '30, including Col. Louis Ball, Ben Wells, F. P. (Spike) Lannon, Bladholm and L. H. Henderson.

There was quite a display of the old "Mines spirit" and it was finally passed that the secretary keep in touch with Coach Allen throughout the football season.

Then followed election of officers and A. H. Bradford, '09 was elected President; J. C. Ballagh, '10, Vice-President, and Wm. F. Dugan, Ex-'12 was reelected Secretary-Treasurer. Prexy treated with a box of cigars. There being no further business, the meeting adjourned.

WM. F. DUGAN, Sec'y.

Those present: Walter Abel, '06; Howard Armington, '07; Louis R. Ball, '00; J. C. Ballagh, '10; F. M. Bell, '21; Ward Blackburn, '08; E. F. Bladholm, '29; Sidney Blum, '11; A. H. Bradford, '09; S. D. Cunningham, '21; Wm. F. Dugan, Ex-'12; J. H. Easthagen, '28; C. T. Emrich, '09; H. A. Everest, '08; H. P. Fidel, '23; Harry Fiske, '21; Sidney French, '08; Rich. M. Fullaway, '16; C. B. Gauthier, '16; W. A. Harrod, '16; L. H. Henderson, '28; J. C. Herron, '23; Julius Hornbein, '05; B. C. Hoalst, '30; H. L. Jacques, '08; F. P. Lannon, '07; Richard Leahy, '13; L. D. Mulford, '19; V. Y. Pentegoff, '28; W. J. Rupnick, '29; Weston M. Smith, '06; Robert Snow, '11; C. A. Spicer, '05; H. Spangler, '05; C. C. Stillman; W. P. Thomson, '21; L. R. Van Burgh, '17; C. K. Viland, '29; Gower Waters, '09; Ben T. Wells, '04; Roger White, '19; John C. Worden, '23; C. LORIMER COLBURN.

Dear Coach Allen:

This is the Los Angeles Alumni Section broadcasting on a School of Mines program. The forty-two members present ranging in members from '00 up to the present date, were unanimous in expressing to you and your teams, particularly football right now, that the shades of the old Mines Spirit are stalking about ready to push the opposition aside or to push along and forward the Mines players.

Knowing that you might not know just what was going on in our minds, we take this means to let you know that even though you do not hear from us at the time, we are always behind you in spirit, win or lose. It would have done your heart good, and those of the players too, if you could have heard some of the old players like Spike Lannon, Colonel Ball, Ward Blackburn, Ben Wells, etc., relate incident after incident where the only thing that carried the teams through to victory was that intangible but yet very evident stuff, Mines Spirit.

We all realize the handicaps that have kept Mines from topping the list in recent years. Nevertheless, we want you to know that the old Mines Spirit was one that could also lose but losing, know that the best and even a little bit more, was spent in trying. We have every confidence and belief that the same spirit and effort prevail at the School even now and therefore have no criticism to make. We just want you to know that there is nothing but good wishes and encouragement from every old Mines man in the hope and belief that the present Mines man in "giving 'em HELL!"

WM. F. DUGAN,
Secretary, Southern California Section.

"My dear, I'm sure he must have been some sort of an engineer for he left blue prints on my neck."

Alumni Letters

Sprains and Bruises

By CHARLIE WHAURSE

The Editor of the Colorado School of Mines Magazine thinks I can improve the publication by contributing to it. Almost anything would be an improvement over the stuff he writes and calls editorials. In fact, I heard it said at the annual meeting of the Alumni Association just last May that if it were not for the contributions of hundreds of the members of the Alumni the Magazine would have long ago been a flop.

In a way, I am sorry that the Editor ever found out who I am. It makes more work for me, of course; but I am willing to join in with the other hundreds of contributors to make this Magazine a success. I don't know a lot about the Alumni Association, so I am sure of being able to write a great deal about it. It is the principle of editors and columnists in general to write best on those subjects about which they know nothing—They like to show their ignorance for some strange reason or other.

* * *

I attended the Junior Member Initiation Affair the other night, and I came to the conclusion that, if the Alumni Association is going to insist on shooting so much bull all the time, what it needs is more men who are real orators like Fred C. Carstarphen, '05. Max Ball, '06, is not so bad, but his wife (he admitted this himself) helps him along with his English. She is a graduate of Boulder.

* * *

Prexy Coolbaugh wrote a letter for the Oredigger. It was a good letter, and it was a short one. That is my idea of shooting hot air—open the valve wide and let it escape fast. A columnist can't do it that way because he has to *fill* a column! The Editor will do something worthwhile, if he'll get the Prexy to write a snappy letter to the Alumni, and publish it in this issue. (I am turning my copy in early so that he can take the hint. He needs lots of good advice like that.)

* * *

The Alumni Association has published another Directory. Keeping track of a bunch of Mines grads is just like watching an automobile race—Here they come, and there they go! There are quite a few on the lost address list. It must get tiresome, this dodging one's creditors all the time.

EDITOR'S NOTE—A contributor to the student paper using the pen name of "Charlie Whaurse" has attracted the attention of the Editor, and he has been induced to write a column for the Magazine. This is his first contribution. The Editor believes that the Alumni will appreciate the gentle irony of this budding young columnist. What he says is meant to be taken in good humor—the same as Will Rogers' famous sarcasms. If you have any comment to make upon his column, write to him in care of the Editor.

Moscow, U. S. S. R.,
Aug. 21st, 1930.

My dear Colburn:

I just received your letter and the Magazines of April, May and June. I certainly enjoyed them very much because we get so little reading matter here these days.

I just returned from an investigation trip of two months through Kazakstan which is East of the Ural Mountains and South of the Trans-Siberian Railroad.

As I am the only engineer (American) in the Kagmenstroy Trust I have plenty to occupy my mind and keep me out of mischief with several milling projects on hand for the future.

We are now working on the design of one 500 ton flotation plant and, later on, will begin one a 12,000 flotation sulphide and oxide copper mill, one 3,000 ton same, one 350 ton copper and lead, one 2,000 ton copper flotation, one 150 lead and zinc, and one 150 ton copper, lead and zinc plant. How is that for an advanced program?

Conditions are rather tough in many localities, but we hope to see them improve in the future.

Several C. S. M. men have been thru here during the last few months, among them were L. M. Banks, Prommel, Downs and Wilson.

Best of luck to C. S. M. during this season's football and I hope that they land on top.

Sincerely yours,
BYRON M. JOHNSON, '08.

Dear Braden:

I just received my August copy of the Alumni Magazine and read the first installment of Anomalies of Vertical Intensity. I haven't seen any proof, as yet, and I am sorry, for it would aid in keeping out errors.

It was a very good job, although a few errors crept in. Thought I'd write about the few I picked up so that you could eliminate them from the final reprint. (Errors mentioned are printed as Errata in this issue.)

As ever,
GEO. SOMERS, '30.

September 3, 1930.

Dear Colburn:

You will be surprised to know that the Secretary of the Monterrey Section of the Alumni Association is now located in San Luis Potosi. Well, I guess it can't be helped at present since the Monterrey Plant of the A. S. & R. shut down for a while and, believe me, it is not half bad here, although there is no place like Monterrey.

Some of the late arrivals around this part of the world are Federico Videgaray, former Mines baseball star, who is now working with the American Smelting & Refining, Apartado No. 2, Matehuala, S. L. P., and William Wallis, working for the Cia. de Petroleo Mercedes under "Pop" Haight, '27, at Cerralvo, N. L.

I drove up from Monterrey to Laredo, Texas, the latter part of last month, 150 miles of the best paved road you ever saw and met old Sam Kobey who is working as research metallurgist for the San Francisco Mines of Mexico under S. R. Brown, '13. Well, he took me around to see Clare N. Hurry, '28, who, by the way, is the proud papa of an eight-pound little queen; believe me, Clare sure was a proud one, too!

Here in San Luis, I ran across Miguel Espinosa, '14, who is ore buyer for this same outfit. He is a good one, Mike is, and he can sure sing, "On the Railroad Track". I understand Amado Chapa, '27, is going back to Golden to take up some post-graduate course. Mike tells me he has been doing very well with the Kildun Mines Co. at Matehuala.

I don't remember whether I told you or not that D. C. Valdez, '21, has been promoted to assistant superintendent of the Torreon Smelter of the Cia. Minera de Penoles at Torreon, Coah.

And last, but not least, Salvador del "Poopooh" (I mean Del Rio, of course) came through town the other day and gave us a long talk about that big article he had published about gold placer mining in Colombia. I think he said he was going down to buy Tampico or paint it red.

Well, that's all there is and there won't be any more till next month, so we must sign off with compliments from Queen Marie.

Good luck and stay in the buggy,
PABLO M. SADA, '29.

Jay Walker: What's the quickest way to the emergency hospital?

Cop: Just stand right where you are.
—*Ala. Rammer-Jammer.*

Personal Notes

J. C. Ballagh, '10, and Mrs. Ballagh will sail from New York on October 25 for a trip to England and Roumania. Although this is primarily a pleasure trip it is expected that Mr. Ballagh will look after the business of his firm, Patterson-Ballagh Corporation in Europe.

J. F. Purdum, '30, drove up from Fort Worth, Texas, the middle of September to get his wife and young son. The three left immediately to make their home in Texas. Purdum is with the Oil Well Supply Company and says he likes his work fine. Mrs. Purdum was prominent in the affairs of the Dames Club while her husband was at Mines.

Ermile Caster, '25, who is with the Empire Oil and Refining Company of Madison, Kansas as production engineer, returned to the campus for a visit the first of September.

John Adamson, '21, came back to the good old U. S. A. on his three months' leave from his work with the Braden Copper Co. at Rancagua, Chile, and spent part of his vacation renewing friendships at Mines.

O. D. Brooks, '30, is working in Texas. His address is La Salle Hotel, Bryan, Texas.

W. S. Levings, '30, is finally settled in West Africa where his address is Companhia de Petroleo de Angola, Caixa Posta 315, Loanda, Angola, Portuguese West Africa. He is with the Sinclair Exploration Co.

A. S. Donnelley, '28, lost his father August 20. Mr. Donnelley died at his home in Denver. The Alumni Association extends its sincere sympathy to his son and family.

William D. Weimar, '25, is associated with the Southern California Telephone Company in their Plant Department. His mailing address is 675 So. Coronado Street, Los Angeles, Calif.

Axel E. Anderson, '04, Technical Representative for E. I. Du Pont de Nemours & Co., has been transferred from Denver to their Seattle office, 701 Hoge Building.

Clarence T. Todd, Ex-'15, Civil Engineer for the California State Highway Commission, has been transferred to San Luis Obispo, California, his residence address being 1920 So. Broad Street.

Walter W. Barnett, '11, Engineer for Compania Minera Choco Pacifico at Andacoya, Colombia, returned to South America last month after a vacation of several months spent with his family in California.

Arthur C. Terrill, '05, who has been Professor of Geology and Engineering at the San Bernardino Junior College, Colton, California, for the past three years is now Professor of Engineering at the Fullerton District Junior College. His address is 208 East Commonwealth Avenue, Fullerton, Calif.

Arthur D. Davis, '22, who is connected with the American Smelting & Refining Company, has been transferred to Charcas, S. L. P., Mexico.

Vernon L. Mattson, '26, Mining Engineer for Norroe & Tower, New York City, is now located in Burnsville, North Carolina, with P. O. Box 104.

H. A. Dumont, '29, spent last year at the University of Oklahoma from where he obtained his Master's degree in June. He is now associated with the Cities Service Company of Oklahoma, his mailing address being 902 Keeler Avenue, Bartlesville, Okla.

Neil Whitmore, '29, production engineer for the Gypsy Oil company at Caw, Oklahoma, visited in Colorado Springs, Kansas, and Denver while vacationing this summer.

Ken Bowie, '30, is one of several of last year's graduates who have gone to the Oklahoma oil fields. Ken is stationed at Asher, Oklahoma, gasoline division of the Empire Oil and Refining Co.

Floyd Carr, '30, Box 877, Seminole, Oklahoma, has cast his lot with the Sinclair Oil and Gas company and writes that he is enjoying his work. Naturally he is interested in football prospects at Mines. They're pretty good Floyd, but we could still use you again.

Joe Maxwell, '30, went to Oklahoma with Ken Bowie and for a time they were in the same plant but Joe has been transferred to the Wilson plant of the Empire Oil and Refining company near Seminole, Oklahoma.

Ben Angus, '29, has acquired a distinctive address. It is: Glavegeupr, Moscow, Kotelnicheskaja Pier 17, U. S. S. R. At present he is in Armenia where his party is working an old copper property.

John H. Wilson, '23, is doing consulting geophysical work in New Mexico. His headquarters are at Artesia.

Paul ("Tiny") Lewis, '29, and *H. H. Pratley,* '22, are associated with him.

F. W. Harsh, '29, and his wife, who have been spending their vacation in Morrison, Golden, and Denver, have returned to Los Angeles where he is production engineer with the Signal Indian Oil Company.

Harold Haight, '27, and his wife spent their vacation in Colorado. Their home is at Loredo, Mexico.

H. W. Lawrence, '23, stopped over to visit Golden friends the week of September 7. He was on his way to Oregon from Panama.

President and Mrs. Coolbaugh were at home to members of the School of Mines faculty and their wives the evening of Sunday, September 7. The Coolbaugh gardens were filled with guests at this, the opening reception of the year.

Earl Wolters, '30, has a Texas address. It is Kincaid Hotel, Uvalde, Texas.

Glenn "Bud" Stephens, '27, who spent his vacation visiting with his parents, Mr. and Mrs. L. H. Stephens of Golden, left September 14 for Wood River, Illinois, where he is engaged in research work for the Shell Oil Company.

Charley Stott, '25, is on the entertainment committee for the Mining Convention to be held in El Paso, Texas, on October 13-14-15. He is making special effort to see that all Miners in the vicinity receive invitations to attend. Some of the organizations taking part in the meeting are: American Mining Congress; Western Division A. I. M. E.; American Association of Petroleum Geologists; American Association of Engineers; West Texas Geological Society; and Centro Nacional de Ingenieros de Mexico.

Jack Paddleford, a junior at Mines, has returned from a trip to Paris. Besides gay Paree, Jack visited in the southern portion of France. His companion on the trip was *Karl Kithill,* Ex-'30, who decided to stay in Europe and be a correspondent for the Paris edition of the New York Herald. He is spending most of his time in Norenburg, Germany. *Robert "Red" Wells,* '28, and Paddleford met on the streets of New York City by chance not long ago. Wells is in the office of Ingersoll-Rand.

A. S. MacArthur, '27, and his wife made a stopover at Mines on their way to Silverton where he has accepted a position as mine superintendent. The MacArthurs have been living in Butte.

Walt Lofgren, '28, was a dinner guest at the Sigma Nu house several weeks ago. Lofgren is another Mines man who has gone with Ingersoll-Rand. He is with the Denver branch.

Fred Steinhauer, '99, has recently been made manager of the Rocky Mountain Mausoleum company with headquarters in Denver.

El Lobo Guerro, graduate student at Mines last year, returned to the campus to say "hello and good-bye" September 24. He has been doing field work in geology at Stanford University and was on his way to Tampico, Mexico, where he is employed with the Cities Service Company.

Reamer Patten, '30, was in Golden the last of September to get Mrs. Patten and take her to Hamilton, Colorado, for the winter. Patten is with the Texas Production Company.

G. Frank Look, '27, and Mrs. Look have made a move of several blocks and are now at 1216 142nd Street, East Chicago, Indiana.

Norman E. Sears, '24, sales engineer with one of the big powder companies, was in Golden, September 23, visiting the profs and old friends.

Joseph U. G. Rich, '08, wife and two sons, vacationed in Colorado spending several weeks making the rounds of the cliff dwellings, the Royal Gorge, and Estes park. The Riches live at 1900 28th Avenue, S., Nashville, Tenn., where he is in the contracting and real estate business.

Fred Roth, '27, who is with the Midwest Exploration Company, Russell, Kansas, made Mines a stopover point while on his vacation in September.

Harry E. Strong, '30, sends in a change of address to 920 Broadway, Houston, Texas.

Clarence G. Purcell, '30, in the Engineering Department of the Standard Oil Company (Ind.) has his mailing address Box 951, Casper, Wyoming.

Henry A. Twigg, Ex-'27, sailed for Korea, September 26, where he has accepted a position as surveyor for a placer mining company. For the last six months he has been employed as a government surveyor at San Francisco.

L. C. Fopeano (Fope), '21, now lives in El Paso. He is employed by the Nichols Copper Co.

Joseph M. Maxwell, '30, Geologist for the Empire Oil & Refining Company, has been transferred to Seminole, Okla.

Ben Arkin, '27, who is with the Texas Company, has recently had his district enlarged and is now doing engineering work not only in Texas but in Old Mexico as well. His address is care of Texas Company, S. A., Apt. 2635, Mexico, D. F. He visited at Mines recently.

Silas Kobey, '29, who has been test operator, San Francisco Mines of Mexico, Ltd., 1603 Matamoris, Laredo, Texas, is back in Colorado, and spent a day at Mines, September 23.

S. P. Warren, '13, who is on a year's leave of absence from the Mines faculty and is teaching at Queen's College, Kingston, Quebec, drove 1,700 miles to make a ten days' visit with his family. He arrived in Golden, September 20.

G. C. Weaver, '26, was a visitor in the President's office in September. He had just returned to the States after having spent the past three years in Peru with the Cerro de Pasco Corporation. On his return home, he went to Europe for a three months' tour. Since that time he has been visiting with his people at Kremmling, Colorado.

Max Pellish, '25, was a Mines caller September 23. He is sales engineer for the Jeffrey Manufacturing Company, Salt Lake City, Utah.

Robert I. Kirchman, '09, is in charge of operations at a mining property near Silver City, New Mexico.

Kenneth Lebsch, '30, passed through Golden, September 29 on his way to Boulder where he has accepted a position with the Bureau of Mines.

Herman Tryansky, '30, is employed in the Experimental & Research Laboratory of the Kanotex Refining Company. His mailing address is 817 So. A Street, Arkansas City, Kansas. This plant manufactures napthas, gasoline, kerosene, absorption oils, road oils and fuel oils. It has a thruput capacity of 15,000 barrels, but at the present time is running only 6,000 barrels.

Frederic Kellogg, '27, is doing important geological work at the Madden Dam site, near Balboa Heights, Canal Zone. He is temporarily in charge of the camp there.

C. E. Dobbin of the U. S. G. S. visited the geological department at the School of Mines, September 29.

Mr. H. W. Gartrell, of the mining department of the University of Adelaide, Australia, who has had some experience with geophysical work in the far-off continent, made a visit to the School of Mines, September 26. Mr. Gartrell is on a round-the-world tour of mining and metallurgical inspection.

S.P.E. Mothers Meet

The Mothers Club of the Sigma Phi Epsilon fraternity met at the home of Mrs. Reigle in Denver last week. At the meeting the mothers decided to give a bridge party at the chapter house in Golden some time the last of October.

Mines Exhibit in Denver Theater

An exhibit prepared by the Colorado School of Mines was on display in the lobby of the Paramount theater recently. This exhibit shown in conjunction with Rex Beach's popular story of the Alaskan gold rush, The Spoilers.

The feature of this exhibit was a valuable book, De Re Metallica, published in 1621. This book which is one of the original copies of the second edition, is the first complete and systematic treatise on mining and metallurgy ever written.

The author is Agricola, which is the Latinized form of the German name Bauer. He was born in 1490, and was one of the foremost scholars of his time.

Agricola made the first attempt to reduce to scientific order the knowledge won by practical work. He wrote in Latin, which was the language of the educated in the Middle Ages.

The first edition was written in Latin, which was the language of the educated in the Middle Ages. The book was translated into English by President and Mrs. Herbert Hoover in 1912.

This original volume printed in Latin was presented to the Colorado School of Mines by the late D. W. Brunton, honored Colorado Mining Engineer.

The remainder of the exhibit consist of native gold, models of platinum and gold nuggets, tellurium gold, rich ores, fools gold and samples of marcasite, galena, calcopyrite and tetrahedrite.

Stray Greeks Organize

The following men are members of the Stray Greeks Club at Mines:

J. S. Adams, Pi Kappa Phi; Louis Bartolomees, Phi Kappa; C. H. C. Braden, Lambda Chi Alpha; W. H. Corbusier, Theta Xi; L. V. Dempsey, Pi Kappa Alpha; Richard Fearheiley, Theta Xi, H. W. Gardner, Phi Delta Theta; Capt. F. M. S. Johnson, Pi Kappa Alpha; Paul Lofgren, Sigma Chi; John D. Marr, Phi Kappa Psi; Floyd Messner, Phi Kappa Tau; J. Perryman, Sigma Chi; M. I. Signer, Pi Kappa Alpha; Gorden A. Smith, Lambda Chi Alpha; C. E. Strong, Chi Psi; Dart Wantland, Sigma Chi.

BIRTHS

Clare N. Hurry, '28, is the happiest fellow in Laredo, Texas. He now answers to the name of "papa". Lately an eight-pound daughter made her appearance in the Hurry home.

Parke Huntington, '26, is in the "proud parent class." The Huntington son, a seven and a half pounder, was born in Carlsbad, New Mexico, September 19. His dad is a geologist with the Midwest Refining company.

Announcement has recently been received of the birth of a daughter to Mr. and Mrs. "Bill" King. "Bill" graduated from Mines in 1928, and is employed as a mine superintendent at Mariposa, California. He is a member of Beta Theta Pi, Theta Tau, and Blue Key. While in college Bill was President of the Student Council, and manager of the basketball team.

Assumes New Duties

Professor J. C. Fitterer, head of the mathematics department, has been appointed to take the place of Dr. L. S. Ward as the Mines representative of the Rocky Mountain Faculty Athletic Conference. Doctor Ward served Mines in this capacity for two years, and was the president of the conference in 1930.

The duties of the athletic representative consists chiefly in determining the eligibilities of the members of the various teams. According to the rules of the conference, a player must not only be eligible to participate in a sport at the beginning of the season, but weekly reports must be made on his scholastic work.

Last fall not a single player was declared ineligible before a game—and it is hoped that such will be the case again this year.

ENGAGEMENTS and WEDDINGS

Rustam-Daugherty

Naorooz Rustam, '27, and Miss Gladys M. Daugherty of Ganley Bridge, West Virginia were married at the home of the bride's parents on August 2. After a honeymoon in the mountains of West Virginia the couple are at home in Glen Ferris, West Virginia where Rustam is associated with the New-Kanawha Power Company.

Briscoe-O'Brien

Willard S. Briscoe, '30, and Miss Catherine O'Brien of Denver were married September 8 at St. Joseph's Cathedral, Buffalo, New York, where Miss O'Brien had gone on a vacation from Chicago. They spent a honeymoon in Canada and are now making their home in Buffalo where Briscoe is at work in the Lackawana Plant with the Blast-Furnace Division of the Bethlehem Steel Corporation.

Pfeil-McLouth

Word of the marriage of Adolph Pfeil and Mary Ann McLouth at Long Beach, August 16, has just been received in Golden. Mr. Pfeil, who graduated in 1927, is assistant chemist for the Richfield Oil Company at Long Beach where the couple will be at home.

Crabtree-Stuckey

Mines men will be interested in the announcement of the marriage of Edwin H. Crabtree, Jr., and Miss Thelma Stuckey, September 17 in Venita, Oklahoma. Crabtree, a graduate of 1927, is general superintendent for the Canan Metals Corporation, Picher, Oklahoma. An article on milling problems by him appears in a recent issue of *Mining and Metallurgy.*

Shaw-Clark

The marriage of Douglas Shaw, '28, and Miss Caroline W. Clark at San Diego, California, has just been announced. While at Mines, Shaw was an outstanding football star and also a prominent member of the S.A.E. fraternity.

Explosives Engineer Publishes Reprints of Articles on Foremanship

The Explosives Engineer, published by the Hercules Powder Company, is publishing the entire series of Doctor Rutledge's lectures on mine foremanship. These lectures appeared in serial form in the Explosives Engineer.

The reprint of these authoritative mine foremanship articles will be bound and distributed by the Explosives Engineer, Wilmington, Delaware.

The articles deal with the attributes of the successful mine foreman, and they have aroused much interest among men connected with the mining industry.

These articles in themselves are equal to an extension course in mine foremanship from any school.

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Frederick F. Smith, assistant director of sales, explosives department, Hercules Powder company, succumbed to an illness of just a few days on September 6. His death was attributed to a heart attack.

Homecoming Day October 25

(Continued from page 14)

Other features will be a history of Mines football in the early days; A review of the previous encounters with the comparatively young Teachers' College team; A short history of Brooks Field; Plans for expanding athletics at Mines, and others.

Turn to the announcement page in the front of this Magazine for the program of homecoming day.

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Chief Petroleum Economist

The appointment of E. B. Swanson as Chief Economist of the Division of Petroleum Economics of the United States Bureau of Mines, is announced by Scott Turner, Director of the Bureau. Mr. Swanson has been serving as acting chief of the division since October, 1928. He is a graduate of the University of Washington and did graduate work in economics at the Robert Brookings Graduate School in Washington, D. C. Other recent personnel changes in the Petroleum Economics Division of the Bureau include the promotion of G. R. Hopkins from Associate Petroleum Economist to Economic Analyst and of A. H. Redfield from Assistant Scientist to Associate Economic Analyst.

The Petroleum Economics Division was established as a unit in the Economics Branch of the Bureau of Mines on January 1, 1926, at which time H. H. Hill, chief engineer of the Petroleum and natural Gas Division of the Technologic Branch, was designated to serve as Chief of the Petroleum Economics Division during its formative period.

Future work of the Petroleum Economics Division will include additional studies of the distribution and utilization of petroleum products, according to C. P. White, chief of the Economics Branch of the Bureau. The appointment of additional personnel to conduct these new studies is anticipated. Mr. White stated that a number of problems related to distribution and utilization are under consideration and that final selection and appointment of additional personnel may be expected within a short time.

Separation of Quartz and Feldspar by Flotation

In connection with the work done by the Bureau of Mines, it was found that carefully controlled minute amounts of certain reagents would cause the feldspar particles to float and did not affect the quartz similarly. By this treatment 90 per cent of the feldspar of a quartz-feldspar ore was floated and this flotation product contained more than 90 per cent feldspar. The necessary quantities of the reagents range from a few hundredths to one-half pound per ton of ore. These reagents are all relatively inexpensive and are easily obtained.

Further work is to be done on this problem, and later the results will be published in the form of a Bureau of Mines technical paper.

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Unless the advertiser succeeds in making a deeper and deeper impression upon the minds of those who read his advertising, his message will suffer the fate of the seed blown upon barren rock. As the volume of advertising increases so increases the need of Penetration in advertising. Penetration is needed not only to win a place in the crowded and besieged minds of modern men and women; but what is more important—to hold that place if consideration, desire and action are to follow.
—*Chas. A. Clark, President of Cocks-Clark Engraving Co.*

Index to Advertisers

Dupont Releases Films

Announcement is made by E. I. du Pont de Nemours & Company of the release of the fourth of their series of motion picture films produced for exhibition before the engineers and engineering students of the country. The new film is entitled "Blasting the Water Highways of America" and shows the work being done in New York Harbor and the Great Lakes to keep these waters safe for navigation.

Three films in this series have already been released as follows: In 1927, "Building New York's Newest Subway"; in 1928, "Driving the Cascade Tunnel"; and in 1929, "Hydroelectric Power Production in the New South". They have all been shown in every state in the Union to thousands of engineers.

The current release adds a picture of submarine work to the library and should be of interest because of the unusual problems which are encountered. Animated graphs are used to make clear what is going on under the surface of the water, while actual photographs depict the drill boats at work, the loading of the explosives into stove pipes, for lowering into the water, the actual "shot", the dredges lifting the broken material from the river bed to the waiting scows and the methods used in determining the correct depth of the channels. An interesting feature also is the maintenance of water storages for the dynamite and its delivery to boats in operation.

This film is one reel in length, requires fifteen minutes for showing and is available in either standard or amateur size film. This subject as well as any of the others mentioned above will be loaned, free of charge, to any interested party upon application to the Motion Picture Bureau of E. I. du Pont de Nemours & Company, Inc., at Wilmington, Delaware.

Bituminous to Anthracite

A new process whereby bituminous coal can be converted into a high-grade anthracite coal on a commercial basis has been invented by Clarence S. Lomax according to press reports. A plant for the conversion process was opened August 16 in Chicago.

The new process was developed after eight years' experimentation, and it is said to duplicate in a few hours the work of millions of years by Nature. Low temperature carbonization is the secret.

The factory manufacturing the product has a capacity of 600 tons a day. The bituminous material has a volatility of thirty per cent, but the new process reduces the volatility to twelve per cent.

Lomax is the inventor of the coke oven and numerous other chemical inventions.

U. S. Civil Service Examination

The United States Civil Service Commission announces the following-named open competitive examination:

METALLURGIST

Applications for metallurgist must be on file with the U. S. Civil Service Commission at Washington, D. C., not later than October 29, 1930.

The entrance salary is $3,800 a year.

This examination is to fill vacancies in the Departmental Service, Washington, D. C., and in the Federal classified service throughout the United States.

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About Professional Cards

Professional card space is limited to alumni, associate alumni members, and men intimately connected with our school.

These two pages are read by 2100 engineers every month. What we are trying to drive home is just this: Your card here will attract many men with whom you may do business. Since college associations are at once a natural bond there is a strong tendency even though all other things may not be equal to patronize those men whose interests are yours. *It is only natural that an alumnus should preferably want to deal with another alumnus* . . . . and a card on these pages provides just that proper amount of continual contact to insure the selection of services or materials when the proper time arrives.

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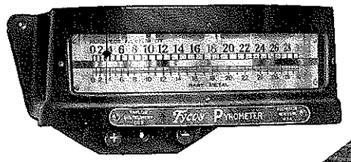

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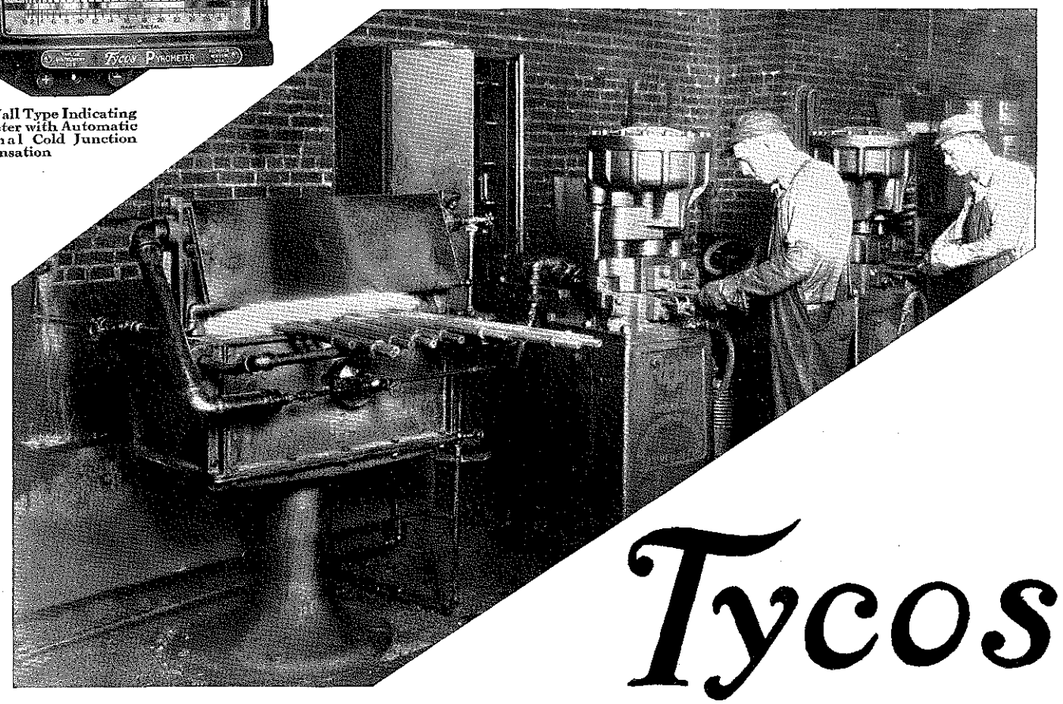

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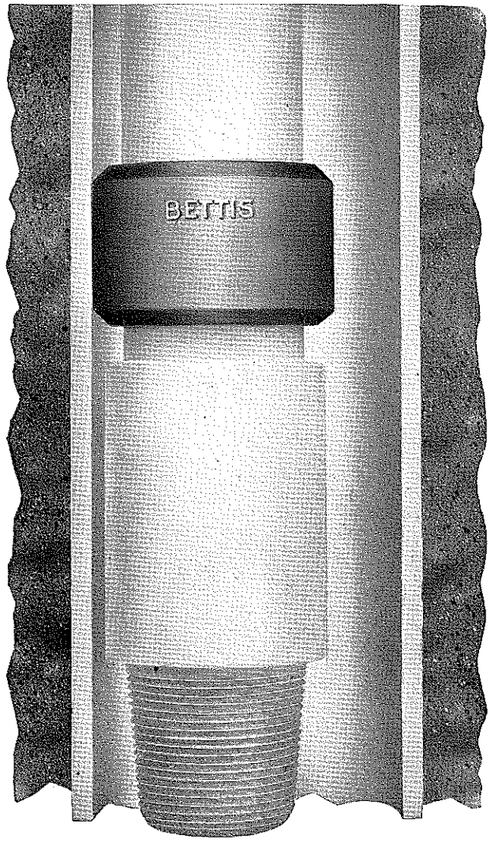

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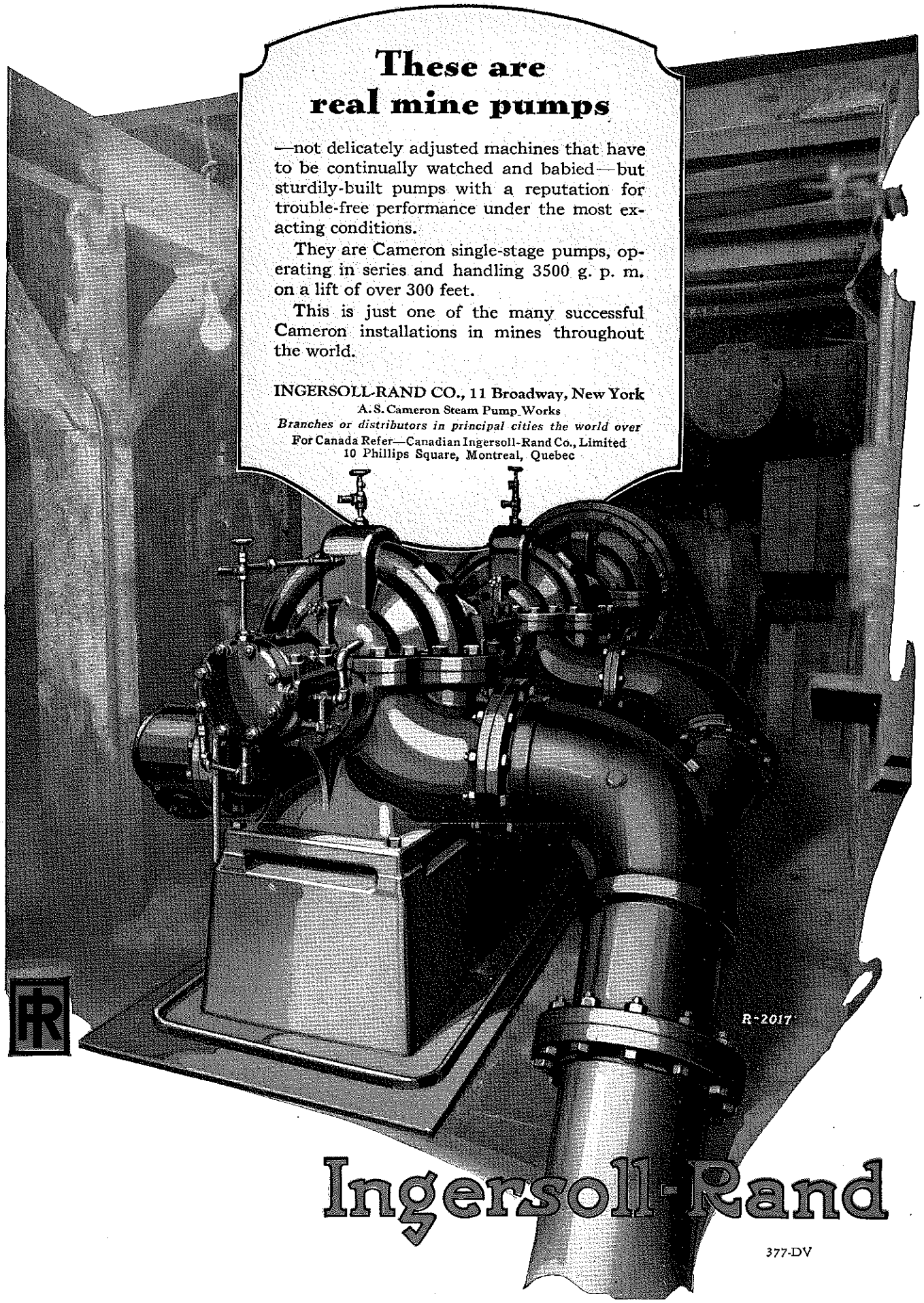
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