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The COLORADO SCHOOL OF MINES MAGAZINE

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Editorial Comment

Three Score Years

SIXTY years ago, August 8, the cornerstone of the first School of Mines building was laid. The actual date of the founding of the School may be considered, therefore, as 1870; but the official date accepted now is 1874, the year in which the territorial government assumed control.

According to the files of the Colorado Transcript, the oldest weekly newspaper in the State, the territorial legislature appropriated a little over $3,000 toward the construction of this first building. In his history of the School, M. R. Budd, '24, has described in detail the ceremonies attending the laying of the cornerstone. He has told that originally the School of Mines was a part of an Episcopal university, begun by the Rt. Rev. G. M. Randall and that Bishop Randall himself delivered the dedication address. In a recent newspaper article relating to the event, the story was colored in good old popular style to say: "Educators and miners, churchgoers and gamblers, housewives and dance hall girls, mingled in the crowd that heard him."

To those who have been following Mr. Budd's history, which has appeared serially in the Magazine, the story of the delay in opening the School of Mines because of antagonism of territorial officials to the institution due to its Episcopal affiliation, is well known.

Through sixty years of ups and downs the Colorado School of Mines has fought its way to the front, and today is recognized as one of the eminent engineering schools of the world.

The Home Stretch

THE Class of 1931 starts on its last lap this month. Through what has seemed to them three long, hard years, the members of this class have struggled. A number of them have dropped by the wayside. Hard work, lucky breaks, and the determination to win have carried others on through. The majority of these will finish the present school year and will receive professional degrees in May, 1931.

The year will soon roll round. As the finish line looms up closer and closer, many of the class will begin thinking how short, after all, the four years at Mines have been. The hard work, the grind, the financial struggle, for some, will fade into the background of the picture. It is difficult to realize that the finish line marks an end to what, in the future, will be looked upon as one of the pleasantest periods of life.

Success, Seniors, as you round into the home stretch!

Inertia

AMONG other things the dictionary tells us that "Inertia" is "a state of inactivity". When applied to Man, it is evidently a close relation to laziness; perhaps a first cousin or an uncle. Unless overcome, it makes tramps and bums out of men. It is also said to afflict natives of the South Sea Islands, where Nature is bountiful and it is not necessary to work very hard for a living. When Inertia affects football teams, they do not win games. When it affects the student body of a college they do not turn out to see the games nor support the teams of their school.

A world-famous traveler was once asked this question: "In your various travels to the many different countries of the globe, what one characteristic, if any, would you say was common to all people?" After thinking a moment the traveler replied: "My friend, I think the one trait common to all people is laziness. I think that all men and women are just a little bit lazy, and do not like to work any harder than they really have to."

There are probably many employers, and also many professors who think this traveler hit the nail squarely on the head. So many persons like just to "get by" with their job. Their motto seems to be either "Why worry", or "What's the use". They are afflicted with Inertia and need a jar to get them out of their rut. A rut is said to be like a ditch or a grave, on a small scale. But still it is not exactly like a ditch either, because a ditch always has a purpose and is going somewhere. Nor is it exactly like a grave, which always remains stationary, because a rut may be dissolved or wiped out when the person conquers his inertia. However, a ditch and a grave are both alike in one particular; both may be lengthened by cutting off the two ends. Likewise, Inertia may be conquered by an injection of energy, enthusiasm, pep or call it what you will.

—*R. P. FitzGerald,* '10.

* * *

American engineers are in demand for work in foreign countries despite the present world business depression. Scores of Mines men have gone to South America, Africa and the U. S. S. R. in the past six months.

* * *

Dr. Clarence Cook Little voices the opinion that higher education in America is slowly but surely struggling out of the black bogs of intellectual paralysis. It is throwing off the shackles of orthodoxy and the strangle-hold of countless deadening forces.

A Holiday?

"GIVE science a holiday," suggests a noted cleric, "so as to permit the humanities to catch up with it."

Not at all, let Science go ahead, for as Millikan says, "Pure science begat modern industry," and the humanities cannot catch up in the present system without broader gauged scientists.

A ton of earth lies underneath a mountain. Scattered thru that ton is $2.00 worth of copper. That ton of earth is being scooped out of its resting place, transported to mills miles away, the infinitesimal particles of copper miraculously picked out by invisible chemical forces, deposited in sheets by the invisible forces of the electric current, then shipped 3,000 miles and again refined, then drawn into wires to transport the formerly wasted energy of a waterfall, and all these operations, from a buried ton of dirt to refined copper in New York, done at a cost of less than $2.00 a ton.

Cheap copper, cheap utensils, cheap electricity and so on. Science did it, pure science first, then applied science. Was all this a benefit or detriment to humanity?

Facts, not Sentiments

MANY of you Mines graduates are now owners or managers of companies that sell to the mineral industries. Let the Magazine do a good turn for you. An advertisement in the Colorado School of Mines Alumni Magazine will bring results.

We are not appealing to you through sentiment. We do not say, "Alumni, here is your official publication, give it some help by placing an ad in it." The appeal which we make is for *you.* Advertising in the Magazine is valuable to your company, and your being an Alumnus entitles you to get the most advantage out of it.

Facts, not sentiments. Non-Alumni Advertisers tell us that your Magazine has brought to them orders that would not have been received through any other medium. That is because your publication reaches over 2,000 selected, *known* buyers!

Mines men who buy have gotten into the habit of patronizing, wherever possible, the Magazine Advertisers—Perhaps that *is* sentiment. There is no reason why Mines men who sell should not place their products on display, so to speak, before these buyers in the pages of the Magazine. That would be just plain good business.

Let us cooperate throughout. If you have something to sell, give your fellow graduates a look at it in your official publication. When you buy, take a look at the products advertised in the Mines Magazine.

Our Column

The professional man is compelled by the nature of his activities to read more than the man engaged in business pursuits. The lawyer, perhaps, has to peruse more books in the course of his regular work than any other professional man. But no one who follows a profession, whether he be a doctor, lawyer, journalist or engineer, can escape the demand that he keep well posted on the new developments in his particular field.

* * *

To what degree does the success of one in his profession depend upon his reading? One's success depends upon so many things, that it would be absurd to state that there is a direct proportion between reading and success. However, there is a relationship, proved by the fact that there are few successful professional men who are not vociferous readers. Some of those who are considered among the foremost in their particular profession, it may seem strange to say, browse among books that are far without their own field.

* * *

In engineering, as in any other profession, the engineer must follow closely the growth of new ideas, and the development of better methods in his field of practice. This he does by reading the purely technical. There comes a time, however, when his store of specialized knowledge enables him to follow these new expansions more rapidly, and he finds that there are hours left over for reading in other fields. He begins to nose around here and there in books of philosophy, history, literature, fields of science outside his own.

* * *

Without the cultivated habit of reading, the professional man seems doomed forever to mediocrity. There is so much that is basic to any profession—knowledge which forms the foundation for specialized training. And, in like manner, there is so much that is fundamental to the profession, or the art, or the science, as you choose, of living. To follow one's profession successfully, to achieve fame and renown even, is not always to live. The older the man gets, the more he realizes this; and perhaps that is why he seeks other knowledge from other fields when he approaches the top.

* * *

Mr. R. L. Duffus in his recent volume, *Books,* says, "Reading must break down loneliness." This statement may hold for the mass reader, but for those who seek knowledge the factor of loneliness does not enter into any motive to read. There are diversions and diversions in this modern age, and one does not have to depend upon books to drive away his loneliness. Reading *may* "break down loneliness", but there is no reason why it *"must."*

* * *

To read is to make use of a fundamental tool: with it one may build his understanding. An idle wrench turns no nuts.

School of Mines Begins Fifty-seventh Session

Seven new faculty members
Frosh week program
Fine group of new students
Fellowships
Scholarships

Curriculum Changes

The fifty-seventh regular term of the Colorado School of Mines began September 3 when classes first met to start another year of engineering study. Actual class work was preceded by the Freshman period program and registration.

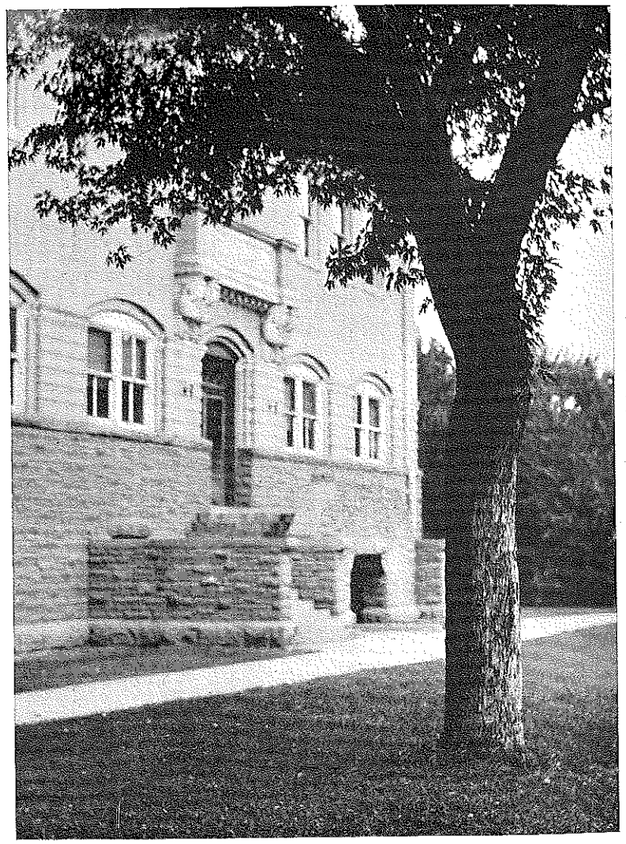
From Friday, August 29, until Monday, September 2, every effort was made to introduce the new men to the Mines campus and Mines traditions. During this Frosh period the new Miners were entertained as follows:

A general assembly was held August 29, presided over by Dean Jesse R. Morgan. President Coolbaugh welcomed the new-comers. Ken Dickey, president of the student body talked upon campus customs. Fred C. Carstarphen, '05, greeted the neophytes on behalf of the Alumni Association. The key to the City of Golden was turned over to all Freshmen by George Duvall.

Following this morning program the new men were guests of the School at a luncheon given at the Mitchell Hotel. All campus buildings were inspected, and the first year entrants were made to feel at home.

Another assembly was held, this time a student meeting. Dr. A. S. Adams, freshman adviser, gave a talk at this meeting upon Mines traditions. Coach Allen spoke of the athletics at Mines, and other talks by students were heard.

One of the features of the Freshman period program was a trip through the mountain parks under the direction of the student council. The M. C. A. sponsored a retreat in the mountains which was enjoyed by many of the new men.



Entrance to Stratton Hall

Seven New Professors

Seven changes in the Faculty for the coming year have been made. Frederick Mangold will replace Ralph N. Morrison in the English department. Mr. Mangold is a Coloradoan and was graduated from East High, Denver. He received his degree from Princeton where he distinguished himself as a scholar by his election to Phi Beta Kappa. Mr. Mangold taught modern languages in the University of Louisiana last year.

Another vacancy left in the physics department by the resignation of George Shue, '26, who has gone to Montana School of Mines, is to be filled by Ronald Dickenson. Mr. Dickenson is a graduate of Colorado Agricultural College and holds an M.S. degree from the University of Michigan.

S. A. McCosh will join the School of Mines faculty as instructor in the civil engineering department. Mr. McCosh is a graduate of Iowa State College where the C.E. degree was conferred upon him. He has spent a number of years in the field and was a member of the Texas A. & M. faculty for three years. He comes to the School of Mines from Marquette, Wisconsin, where he was connected with the Department of Interior.

The metallurgy department will have W. B. Jacobson as an instructor for the coming year. Mr. Jacobson is a Utah University graduate, and comes to Mines from British Columbia where he has been engaged in metallurgical work for a large mining company.

Other additions to the faculty have been announced in previous numbers of the *Magazine*. They are Jervis Fulmer, chemistry department; M. G. Pawley, math department; Dr. W. D. Fletcher, physical education department and Captain F. M. S. Johnson who will head the military department.

Changes in Curriculum

Not only has the School's faculty been strengthened by the addition of these able men, but the curriculum has been changed slightly, bringing about greater correlation among the various options. Through the organization of a department of mechanics the courses in thermodynamics, hydraulics, and analytical mechanics will be brought together under one head. This is considered one of the most progressive steps taken in late years in engineering education in this country. Other changes, less revolutionary, have been made throughout the whole curriculum. A new English course has been introduced which purposes to instruct the young engineer in writing for the technical journals.

The New Students

At the time of this writing no definite information had been received relating to the number of new men enrolled for the 1930-31 term. According to early inquiries for catalogs and information relating to entrance requirements, it is estimated that the freshman class will possibly number 150 men. This will be about the same as the past year.

Frank Wiebelt, who was graduated from Mines in 1916, returns this year to do graduate work in the geophysics department. Kep Brierly, who left C. S. M. a year ago to enter the U. S. Military Academy has returned to Mines, and other former students whose names are not available at this time have returned.

Another Mines man's son has entered his "pater's alma mater." He is Horace Reno, Jr., son of Reno, Sr., '02, and comes from Gunnison.

Ed Borrego, former Mines student, is sending a young man to Golden this year from Estonia. He is Wilhelm Norden, and has been stationed at Tampico, Mexico, with the Huesteca Oil Co., for the past two years.

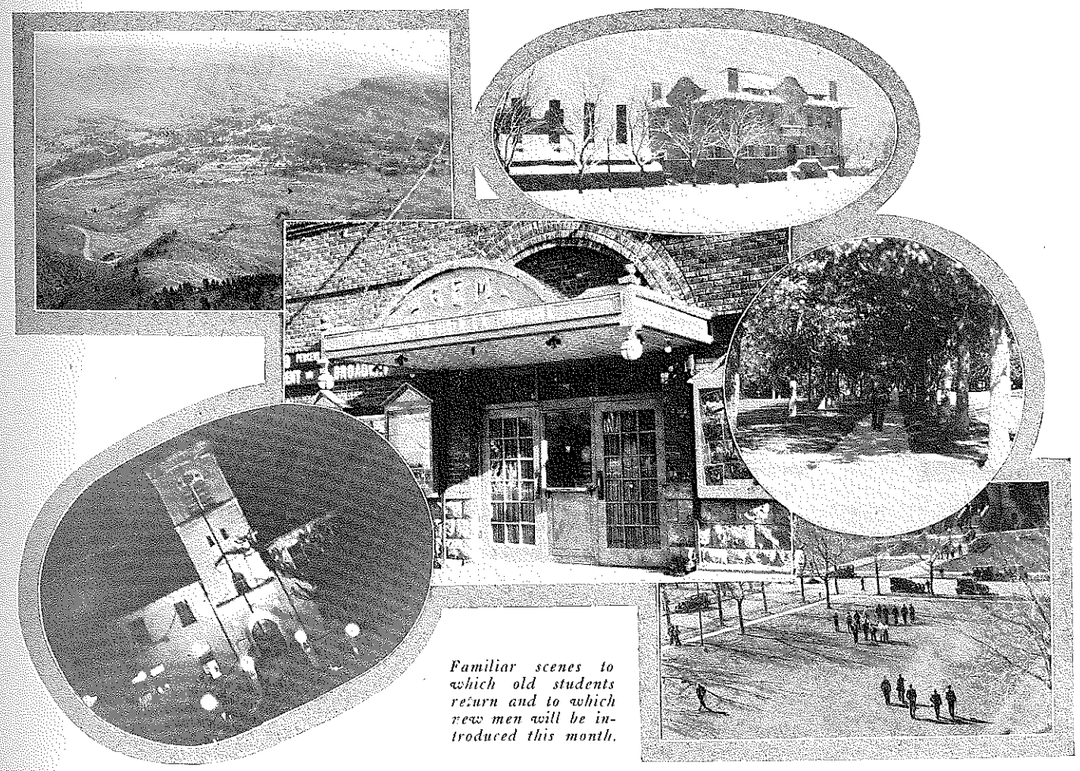
Scholarship Men

Among the scholarship men is W. C. Cullen who comes from Honolulu. Julius Heeren, sent to Mines by the Wyoming Alumni Section, will enter as scholarship man from Midwest. S. Watanabe from Japan and L. K. Deekoff, Bulgaria, were among the first foreign scholarship holders to arrive on the campus.

The Belgian Relief Committee has granted a fellowship to Sylvain Pirson. Mr. Pirson holds a degree from the University of Louvaine, Belgium, and has done work in the University of Pittsburg. He will study geophysical methods of prospecting. Charles M. Tattam is another foreign fellowship holder who will study in the geophysics department this year. His fellowship was granted by the Commonwealth Fund.

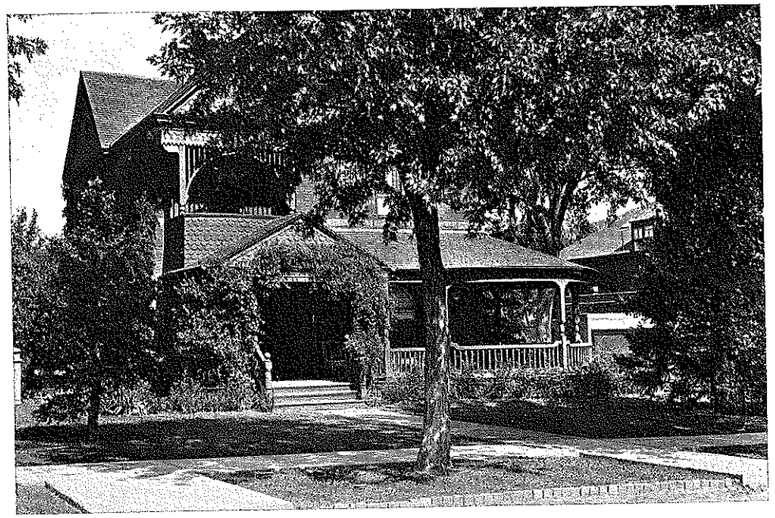
For a Profitable Year

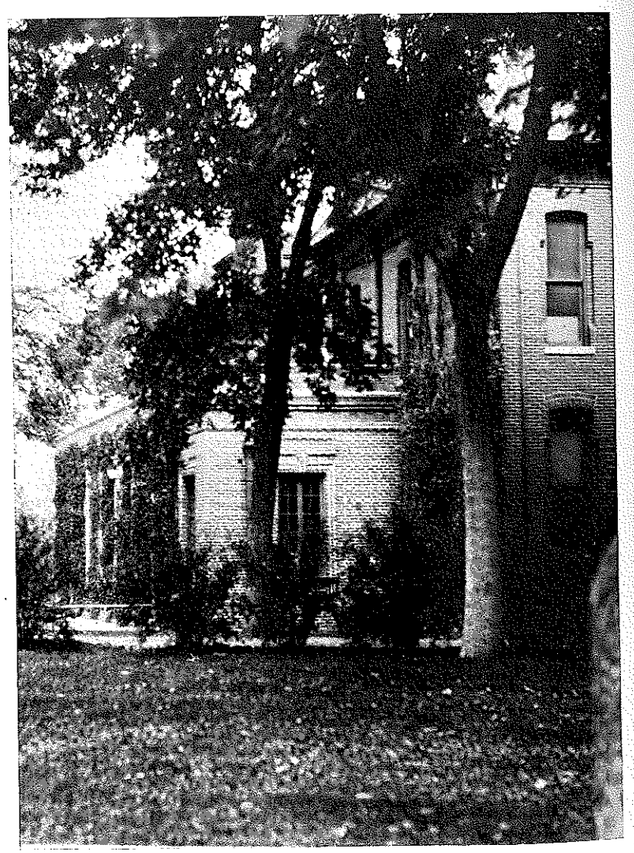
With new members added to the Faculty and a strengthened curriculum together with the splendid caliber of men entering the School, Mines is expecting to experience one of the most profitable years of its recent history.



Familiar scenes to which old students return and to which new men will be introduced this month.

Campus Lights and Shadows





AUTUMN will soon bring color to these shaded spots, and then will come falling leaves.

Above is the Dean's home, a spot beautiful in the early fall. The Chemistry Arcade on the right is a restful nook 'neath the shade of stately trees.

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, '29

Chapter II—Interpretation

The interpretation of magnetic or magnetometer results offers many difficult, yet interesting problems, the solution of which are gradually being worked out by laboratory and field research. Many of these problems may never be solved, but each contribution to the general knowledge of the subject should serve at least to bring about some discussion of value to others.

In attempting to correlate regional structure with vertical intensity anomalies based on government data only, the writer encountered a number of facts and also new problems. These facts have led to a number of hypotheses some of which have been suggested before while others are entirely contrary to present generally accepted ideas. These hypotheses are offered in the hope that they will bring about discussion from those who have observed similar or opposite effects, or who have different hypotheses based on similar observations in order to aid in advancing the subject of magnetic interpretation.

There are two types of interpretation possible in magnetic work, namely, direct and indirect. In the former the results are assumed directly from the data or map available. In the latter a condition is assumed and its results calculated. If these results do not fit the known conditions further assumptions are made and calculations carried out until there is a reasonably close agreement. In the present work the interpretation was all direct, and only used in the correlation of known geologic structures.

Although it is possible to calculate the depth to the disturbing point or pole[6] no attempt to do so was made in this thesis. This was due to the great distance between stations and the resulting interpolation necessary to locate isonomalic lines. An error of several miles in the location of an isonomalic line would lead to errors of such magnitude in calculating depths that the results would probably be worthless.

It was probably at first supposed by early interpreters, since some persons still have the same idea, that magnetic "highs" correspond with geologic highs, and consequently magnetic results were thrown somewhat into disrepute when it was found that a magnetic "high" might represent a geologic low and vice versa, a magnetic "low" a geologic high. This was brought out by a well known oil geologist who remarked in jest at a geologist's meeting "What good are they? I've got a whole wastepaper basket full of magnetometric "highs" that anyone is welcome to who wants them".

The first point of importance then does not seem to be "is there a magnetic 'high'?" but "is there a magnetic anomaly"? The mere presence of an anomaly indicates a geologic feature which differs from the normal. The isonomalic map having thus furnished a clue, the next step is to check the geologic conditions against the magnetic ones. This check may be sufficient to solve the problem, but if geologic data cannot be obtained, and structure, particularly oil structure is suspected, the anomalies can be checked with a torsion balance or other geophysical method.

The second important point is that in general, it has been considered that anomalies found in a sedimentary area were due to the igneous or metamorphic basement rocks rather than to the sedimentaries themselves. The present work indicates that such may not always be the case, and possibly frequently is not. This question arose in studying California and Colorado, and was checked by observing results in other states. The writer's solution was brought about as follows.

Taking Colorado as a typical example it was found by observing both isonomalic and geologic maps, first, that the granitic mountain areas were uniformly magnetically "low", while the plains were "high".* Second, that in the plains of eastern Colorado the magnetic "highs" usually coincided with geologic highs, but that in definite areas where certain sedimentary beds were known to be missing over granite ridges, the "low" occurred over a geologic high. This disagreed with results in many states where magnetic "highs" could be used to locate the exact position of known buried granite ridges. An anomalous condition like this led to an interesting study of magnetic effects in granitic mountains which will now be discussed before completing the argument in favor of magnetic sedimentary beds.

The third point then is the magnetic effects observed in the Front Range in Colorado between Morrison and Boulder. With the assistance of Mr. Jaroslav Malkovsky and Mr. Dart Wantland, instructors in geophysics at the Colorado School of Mines, a number of magnetic profiles were run with a Schmidt vertical intensity magnetometer to determine the magnetic effects of the granite, monzonite and gneiss in the mountains, and the sandstones, limestones and shales of the various sedimentary formations in the Denver basin.

The first discovery was this, that while the edge of the Front Range and the bottoms of the canyons or valleys in it were negative, that the high points between valleys were positive. An increase of roughly 120 to 150 gamma per 1000 feet of elevation was noted. It was evident from a study of the map and data furnished by the United States Coast and Geodetic Survey, that all of their stations were taken near towns. Towns are naturally located in valleys rather than on mountain peaks, hence the general average of mountainous areas, and particularly granitic ones, is "low" magnetically. Basic rocks may have strong or at least "higher" polarity.

The explanation probably lies in the location of the resultant of the magnetic forces in the ridges. This may be considered, for example, as an imaginary bar-pole, or one having length, which coincides with the direction of the ridge. It lies in the ridge between the crest and the level of the valley floor below. A station in the valley, therefore, is below the pole, and consequently has a "low" mag-

[6]—J. Koenigsberger (Concerning the interpretation of magnetic charts and profiles) Fur Deutung der Karten Magnetischer Isoanomaleu und Profile—Beitrager Geophysic 19 (2-3):241-291, 1928.

*—According to Dr. C. A. Heiland, this may be due to topographical effect.

netic reading since the pole acts against the magnetic field of the Earth. On the other hand a station located on top of the ridge over the pole would be positive since the pole strength is added to that of the Earth's field. The variation of intensity with elevation was not great at the point noted near Golden.

Another interesting feature observed in running these profiles was the lack of anomalous results observed over the gneisses and schists found between the granite and the sedimentary rocks. These form part at least of the basement rock of the plains east of the Front Range and apparently are not the cause of the positive anomalies observed in that region.‡

Returning now to the subject of magnetic sedimentaries, it is evident that if the buried granite ridges do not possess greater magnetic properties than the mountains examined in the Front Range, that the "highs" encountered over buried granite ridges may be due to some other cause unless the granite ridge is of huge proportions. One answer appears to be magnetic sedimentary beds, either one alone, or the combined effect of several.

Another, of course, is the different magnetization of the granite at different points but it seems to the writer to be asking too much of the magnetization of buried masses to have them always change just right to suit surface conditions when covered by sedimentary beds which would answer the purpose.

The above conclusion in regard to the magnetic effect of sedimentary rocks seems to the writer to be the logical result of normal sedimentation. Sedimentary rocks derived from igneous ones contain varying amounts of magnetite and while it is true that much magnetite is deposited in stream channels before reaching the seas, it is also true that some sands relatively high in magnetite are found. Why some of these sands should apparently be magnetic while others are not would be a study of sufficient magnitude for a separate thesis, hence no attempt at explanation will be offered. A few possible explanations might be first that some magnetite is more magnetic than others. Second, a greater concentration of magnetite than usual in one or more beds. Third, the orientation of the magnetic particles might vary under different conditions of depositions, etc.[7]

In addition to the work in the mountains, profiles were also run with a magnetometer near Morrison, Golden and Boulder, Colorado by Mr. Malkovsky, Mr. Wantland and myself in an effort to prove conclusively if one or more beds seemed to be magnetically positive. These three towns are all situated along the eastern base of the Front Range. Sedimentary rocks ranging in age from Pennsylvanian to Recent are found in the Denver Basin to the east. In the basin they are relatively flat lying and undisturbed, but are turned up to a vertical position as they approach the range and thereby expose the entire series which is several thousand feet in thickness. The following results were observed or deduced.

(a) An increase of vertical intensity too great to be accounted for in all cases by a buried ridge is found about a mile from the foot of the mountains.

(b) Magnetometer readings were taken over the granite, gneiss, Fountain, Lyons, Lykins, Dakota, Benton and Pierre rocks, or formations, without a noticeable increase in intensity. At Morrison the increase came east of (above geologically) the Niobrara limestone of Cretaceous age. At Golden the increase occurred above the Pierre (Cretaceous) and below the Arapahoe (Pleistocene). At Boulder the increase was found but could not be correlated with a formation.

(c) No sediment is known to contain much magnetite though all have been tested by heavy mineral separation. The Dakota has the most, but stations over it do not indicate this.

(d) With the exception of the area over a known buried granite ridge in Southeastern Colorado where results are negative, (data from isonomalic map) the eastern third of Colorado is a region where magnetic "highs" reflect geologic structure positively.

(e) The rock exposed over the known ridge[8] is the Fountain formation of Pennsylvanian age.

(f) Tertiary formations are apparently eliminated from consideration as they only extend a short distance east of Denver, while the positive effects are found to extend over into Kansas.

It appears from the above that the magnetic sedimentary bed (or beds) if it exists, is, in this area, above the Fountain formation and below the Tertiary.

In studying the State of California a similar phenomenon has been noted in the California Valley. The magnetic anomalies are strongly positive over the center of the valley while the area occupied by the Coast Range is negative.[9] Near the Coast Range, however, negative results have been obtained in the valley over certain oil structures. The conclusion seems to be that the positive anomaly is due to the sediments and that the bed (or beds) causing it have been eroded from over the oil structures thus giving negative effects at this point.

It should be noted however that the extreme "high" in the center of the valley may possibly be due to an uplift of the basement rocks, a fact which could be checked by T. B. and seismic results not available to the writer.

It furthermore seems possible and even probable that when "high" magnetic anomalies are found over known granite ridges, that if these "highs" are too large to be accounted for by the depth and size of the ridge, they may be partly due to a magnetic sedimentary formation lying close to and conformable with the granite. The proof therefore in favor of magnetic sedimentary beds is largely circumstantial since no such bed was actually found, but the available evidence strongly points in favor of this hypothesis.

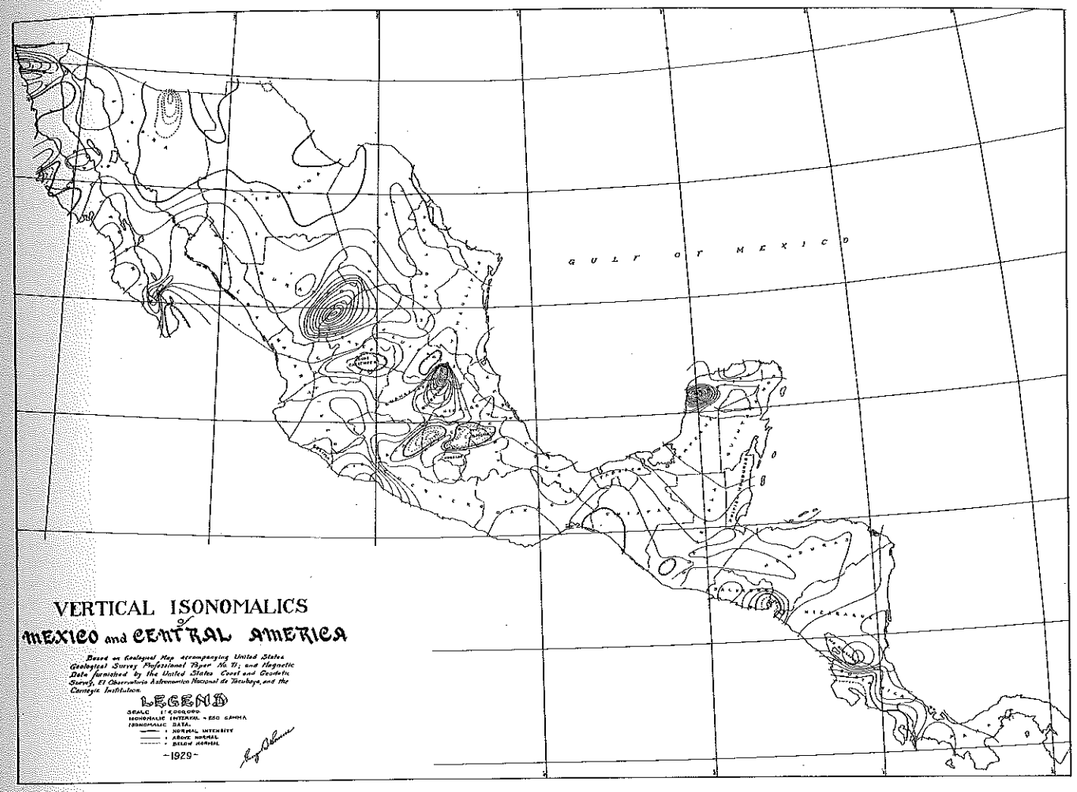
In studying the magnetic effects in sedimentary areas two general types were observed which are best represented by Colorado or California and Florida. In the first type the anomalies are "low" near the sides of valleys or plains where the sedimentaries are thinner and increase farther out where the sediments become thicker and deeper. In this case the anomaly appears to be due to one (or preferably more than one) sedimentary bed since the "high" increases with depth. The second type, represented by Florida has the magnetic "high" coinciding with the regional high point of the structure, and to have the anomaly decrease and often become negative as depth is gained. In this second case the magnetic effect apparently comes from the basement rock or from a magnetic sedimentary bed which is close to and conforms with the basement rock. In either case local structural highs will be indicated by magnetic "highs" unless due to reversed polarity (caused possibly by folding or tilting) or the erosion or absence of the magnetic bed, the magnetic effect

‡Higher anomalies in eastern plains may be explained by different magnetization of granite there (granite may be younger there), according to Heiland.

7—According to Heiland, magnetite stages in river sands deposited on ridges would give anomalies of different origin Magnetometric Investigation of Gold Placer Deposits near Golden, Colorado by C. A. Heiland and W. H. Courtier, pp. 364-384, Geophysical Prospecting, 1929, A.I.M.E.

8—Johnson, J. Harlan. Oral communication.

9—Somers, G. B. Anomalies of Vertical Intensity Compared with Regional Geology for the State of California. Colorado School of Mines Magazine, Sept. 1929. Also Chapter III this work California.



will be negative. Both of these types are frequently met with in studying the individual states and will be referred to at that time under their separate writeups. (See Chapter III Colorado and Florida and Chapter V No. 5).

Fourth—An interesting point was discovered when the interpretation of those states which had been covered by the glacier during the "Ice Age", was attempted. According to Dr. Heiland[10] the general opinion among European geophysicists is that glacial till has little or no effect on magnetic intensity, but the results of the interpretation in this work lead to considerably different conclusions.

It was first observed that there was no apparent connection between magnetic anomalies and structure in Iowa, Illinois, Indiana and northern Ohio. Since these states were covered with the southern end of the glacier during the last ice age in the Pleistocene, it was supposed that these anomalous effects might be due to glacial till or in other words to the terminal moraine. These results were checked by magnetometer work in eastern Illinois[11] where "highs" were found which could not be accounted for by known structures.

The next step was the interpretation of Wisconsin and Michigan, and here the agreement between structure and magnetic results was better than it had been in Iowa, Illinois, etc. though not as good as it had been south of the ice sheet. This again seemed to fit the moraine theory inasmuch as the anomalies were more numerous and had less agreement with structure in those states in which the thickest glacial till occurred.

Difficulties were encountered in states west of Minnesota and east of Ohio, which gave very good results even though covered by till from terminal moraines. This was later confirmed by Mr. John Wilson[12] who reported that magnetic "highs" appeared to correspond with geologic highs in North Dakota.

The hypothesis offered as the solution of this peculiar condition is that the magnetic anomalies in glacial areas are due to the kind of material composing the glacial till and its source, rather than to the fact that it is glacial till. In other words states covered by terminal moraines in which magnetic results do not apparently conform with structure are those which are south of the extensive iron deposits and iron formations of northern United States and Canada. In those states that are covered by glacial till which did not come from the iron formations, the normal magnetic effects due to structure can be expected.

It is quite possible that part at least of the states of Iowa, Illinois, Indiana and northern Ohio would give satisfactory results if worked with a magnetometer where a careful study could be made of the anomalies. The reverse appeared to be true when correlation was attempted by scattered stations as in this work, for although there seemed at times to be indications of regional structure shown by the isonomalics, it was too thoroughly covered up by local anomalies to be of value.

Fifth—In general it was found that basaltic areas were shown by large magnetic "highs". It is possible, however, for basalt to give negative results if movement has taken

10—Oral communication.

11—Heiland, C. A. Oral communication.

12—Wilson, John Consulting Geophysicist—Oral communication.

place which has overturned the poles[13]. The exception to this general rule of magnetic "highs" appeared in Oregon and Washington where the geologic map shows large areas to be covered by a thick series of basalt flows. A comparison of the isonomalic map with a topographic one showed that the magnetic "lows" encountered here where "highs" were to be expected, occurred in mountainous regions. It is quite probable therefore that the same explanation given for the "low" effect of granitic rocks in Colorado, namely that the valleys where the stations were taken were below the magnetic poles in the adjoining ridges and hence appeared negative, will also serve here. Plains and plateaus in these two states gave normal basaltic "highs" as expected.

It should be pointed out that this peculiar condition of areas being marked "lows" because stations were taken in valleys is not given as a criticism of the work performed by the United States Coast and Geodetic Survey. It would be utterly impossible for their parties to climb numerous peaks to get high results, and if they did so the average would only be "high" instead of "low". It would also be impossible to locate a mean position without a large expenditure of time and money. Magnetic parties can cover the area and get the data desired by the survey far more quickly and cheaply by taking stations in the valleys. The anomalous results are mentioned here merely to bring up some interesting points.

In regard to the effects of topography an interesting example was apparently encountered in the State of Maine. Comparison of the isonomalic map with geologic structures led to no results. The isonomalics were then compared with a topographical map and seemed to match very closely. In this case, however, the hills were not high like the western mountains so that stations probably more nearly conformed with the topography rather than being entirely in valleys. If they were in valleys, the walls of the intervening ridges were apparently far enough away to have had much less effect on the magnetic results. Inasmuch as the geology of Maine is very complicated, and the rocks greatly metamorphosed, the explanation is offered that under certain conditions topographical anomalies may cover up geologic ones.

In the interpretation of the isonomalic maps accompanying this work a number of assumptions have been made which seem to have been borne out by the results obtained. These are as follows:

(1) Where only one station represents an extreme anomaly, or where two or three stations very close together show such an effect it has been considered as due to a local pole or structure which has no effect on the general regional structure.

(2) Where extreme magnetic "highs" (or "lows") are found in areas known to contain basalt rocks, it was assumed that these extremes were due to the presence of local poles.

(3) That as a general rule the stations were too far apart to show any local structures.

In addition to the above assumptions another condition which was occasionally met with in drawing the isonomalic lines was as follows. Let us consider four stations placed in such a manner that we can designate them as north (N), south (S), east (E) and west (W). Assume N and S to be magnetically negative while E and W are positive. The question immediately arises, will the zero isonomalics run from southwest to southeast and northwest to northeast, or from northwest to southwest and northeast to southwest. A fifth station equi-distant from N, S, E and W would settle the question conclusively but fifth stations could not be obtained for this work. In each case therefore, this condition was decided upon its logical merits according to the rules of drawing contour lines, rather than according to geological evidence. The natural result can be illustrated by a case found in Colorado where at one point two high stations were connected which later proved to be probably due to local poles in basalt on opposite sides of a range that was magnetically negative. By drawing the zero isonomalics the other way the ridge was clearly shown while the "highs" indicated the location of the basalt. Fortunately, this condition was not common and was checked where found.

Additional data on interpretation will be found in Chapters III and IV where the different states and countries are considered individually.

Summary

(1) Magnetic anomalies, either "high" or "low" represent geologic irregularities and should be checked by geological or other geophysical means to determine the true structure.

(2) In many cases magnetic anomalies appear to be due to sedimentary beds rather than to igneous or metamorphic basement rocks. This is shown by:

(a) positive anomalies over certain sedimentary areas, and negative anomalies in places where the basement rock is known to approach the surface.

(b) the increase in intensity is greater in sedimentary areas that could be expected from buried granite ridges, unless due to a change in the basement rock at that particular point.

(c) negative anomalies over oil structures where certain sedimentary beds have been removed by erosion, while positive areas are found when all the beds are present.

(d) Increase of intensity with increase in the thickness of sediments and depth to basement rocks.

There are two types of anomalies found in sedimentary areas. The first has the magnetic intensity increasing with the depth and thickness of sediments and appears to be due to the magnetic properties of the sediments and has been called for convenience the Colorado type. The second and by far the more common has the intensity decreasing with an increase of the depth of sediments and appears to be due rather to the effect of the basement rock or to a sedimentary bed close to and conformable with the basement structure and is called the Florida type. In either case local magnetic "highs" may agree with geologic structure. In the first type (and possibly the second) there would not be agreement if the magnetic bed were removed by erosion.

(3) Granitic mountainous areas (and some basaltic ones) which appear magnetically "low" on the isonomalic map have been shown by magnetometer work to be "high" on the ridges. The difference in intensity is about 120 to 150 gamma per 1000 feet of elevation. The map stations were taken in valleys below the local magnetic poles and are therefore negative.

(4) Anomalous magnetic effects in states covered by glacial till or preferably terminal moraines are probably due to iron minerals brought from the iron formations of northern United States and Canada, since these effects do not appear east or west of this magnetic source.

(5) Basalt covered areas usually show extreme "highs" but sometimes appear "low" or negative, particularly in the mountainous regions of Oregon and Washington. The explanation is similar to that given for granitic areas, name-

(Continued on page 45)

[13]—Heiland, C. A. Geophysical Methods of Prospecting—Colorado School of Mines Quarterly Vol. 24 No. 1 p. 56, 1929.

Principles of the Hydro-metallurgy and Electrodeposition of the Metals

VII. Chapter on Separating and Washing

By Thomas P. Campbell*

Apparatus and Procedure

As stated above, the most effective method of washing is that employing the counter-current principle. In applying this to the case of batch leach products, the layout of tanks, etc., has already been indicated, also a method of calculation of performance of the system.

In the case of agitation, or slime leach, pulps, several types of apparatus are available, the choice depending upon the characteristics of the pulp, the type of process, and other technical and economic factors involved.[42]

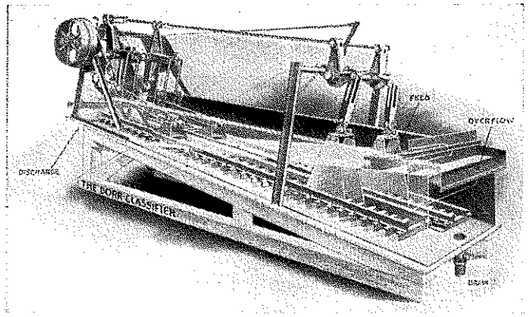


Figure 10—*The Dorr Classifier, Duplex Model "C".*

First, for rather coarse particles, classifiers (Figure 10) may be used, but their power consumption is excessive in comparison with that of circular tank thickeners, and their range of application is distinctly limited. In the "good old days" cones (Figure 11) were largely employed, not only for thickening, but for classifying as well. Cones (e.g., Callow Tanks) have relatively small capacity, occupy excessive floor space and headroom, and are best suited to only small operations; they also have an annoying tendency to choke in the goose-neck discharge, especially when coarse material is being fed. By and large, and taking one thing with another, the circular settling tank, arranged as a continuous thickener, is the most satisfactory type of apparatus for general purposes.

The Dorr Thickener (Figure 12) is typical. Here the dilute pulp enters at the center; the bottom of the tank is slightly conical; a central shaft carries arms on which are set rakes which just clear the bottom and, with the rotation of the shaft, tend to move the settled material toward the drain, or discharge, at the bottom center. This "underflow", or thickened pulp, may then be elevated to another thickener, or to other apparatus, by means of a diaphragm pump[43], while the clear supernatent liquid, overflows to a gutter around the top perimeter of the tank. Figure 13 shows a typical layout of agitators and thickeners as used in cyanidation.

Dewatering and washing by means of centrifugals are not much used in hydrometallurgical work, although very largely employed in many chemical engineering operations, —e.g., in the sugar industry. However, centrifuging is essentially a batch process, power and labor costs are high, the machines have relatively small capacity and are very expensive, not only in first cost, but in upkeep as well.

Filters are extensively used in many processes, sometimes simply for final dewatering, and sometimes for combined dewatering and washing. For instance, in the extraction of zinc (low acid process), practically all the washing is accomplished by pugging the cake from continuous filters with fresh water and refiltering. Sperry[44] has derived an empirical formula for filter capacity under various conditions of pressure, thickness of medium, etc.; but the easiest and most practical way to select a filter for any given job is to consult the trade catalogues and then get in direct touch with the manufacturer.

In arranging a separation and washing system, the most effective method is that of continuous counter-current decantation. Figure 13 illustrates the general principle and arrangement. But obviously the first consideration involved is that of size of tanks required to obtain the necessary settling capacity. From the discussion on settling, above, it follows that for most practical purposes the best way to determine tank capacity is by actual test.

To this end, it is usual to prepare a series of pulps, varying in composition from the normal feed mixture (to

[42]—Taggart, Handbook of Ore Dressing, Sec. 16; N. Y., 1927. Liddell, Handbook of Chem. Eng., Vol. I, pp. 269-281.

*Associate Professor of Metallurgy, Colorado School of Mines.

[43]—Taggart, op. cit., p. 1108.

[44]—Taggart, op. cit., Sec. 17. Walker, Lewis & McAdams, op. cit., Ch. XI.

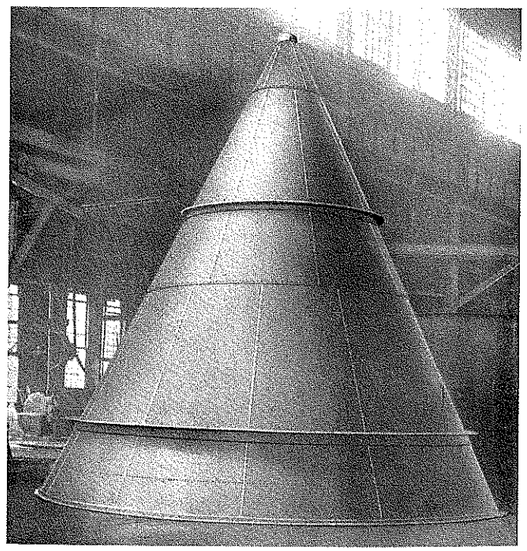


Figure 11—10 *ft. Classifying Cone or Conical Tank.*

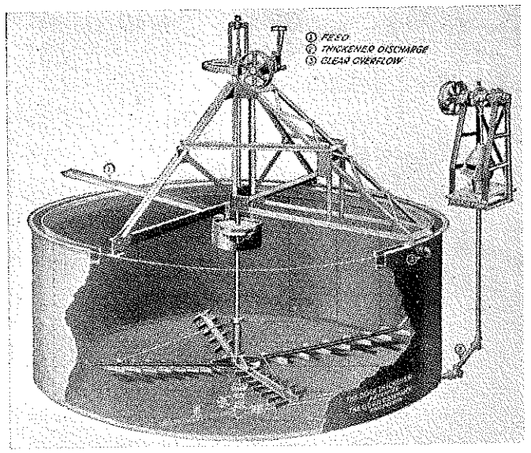


FIGURE 12—*The Unit Type Dorr Thickener.*

the thickener) to the thickest free-settling pulp. "Each sample, diluted to the desired consistency, with decanted liquor, is allowed to stand until the upper surface of the solids has settled about ⅛ in., then a reading is taken and the rate of subsidence for a period ranging from 2 to 3 minutes for thin pulps to from 6 to 10 minutes for thick pulps determined. A decrease in rate indicates departure from free-settling conditions. The rates should be converted into feet per hour. . . ."[45]

"Let it be supposed that a test sample has been prepared showing a proportion of water to solids of 14.04 to 1, and that after 17 hrs. the pulp has settled to 1.13 to 1, and only 1.12 to 1 after 24 hours, then evidently the economic point of thickening is 1.13 to 1. Settlement tests show an average rate of 1.78 ft. per hour, hence there can be decanted 1.78 cu. ft. times 62.3 or 111 lbs. of water per hour per square foot of tank surface. Since the feed contains 14.01 water to 1 of solids, and the discharge 1.13 water to 1 of solids, the overflow must contain the difference between the two ratios, or 12.91 of water in the overflow to 1 of solids settled, and is 111 lbs. of water. The solids consequently represent 8.59 lbs. solids settled per hour, or 206 lbs. solids in 24 hours. For a ton there would be required 9.7 sq. ft. for 24 hours, which is the capacity of the tank with the dilution given.

"The computations may be expressed in the following formula:

Sq. ft. tank surface required per dry ton per 24 hr.

$$A = \frac{(F-D)\ 2000}{R \times d \times 24}$$

where R = rate of settlement in ft. per hr.,
F = parts water to 1 part solids in feed,
D = parts water to 1 part solids in discharge,
d = wt. of 1 cu. ft. of liquid (sp. gr. of liquid times 62.3).

"The series of tests which follow the first one will give the following factors and capacities:

R	F	F—D	A
1.250	11.18	10.05	10.70
0.666	8.32	7.19	14.40
0.464	6.89	5.75	16.60
0.345	5.47	4.34	16.85
0.2331	4.03	2.90	16.65
0.150	2.607	1.477	13.10

"The series of tests show that 16.85 sq. ft. of surface will be required for each ton settled.

"With 8 parts of liquid to 1 of solids the settling area required by Dorr thickeners ranges from 5 to 25 square feet per ton of solids."[46]

The two following examples will serve to show the application and calculation of performance of typical counter-current decantation and washing systems.[47]

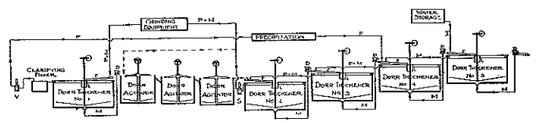


FIGURE 13—*Arrangement of a Separation and Washing System.*

EXAMPLE I—CALCULATIONS FOR DISSOLVED VALUE LOSS

(*All figures refer to solution tonnages*)

(See Figure 14)

Conditions Assumed:

(a) 100 tons of ore per day crushed in cyanide solution.
(b) Discharge from all Thickeners with 50% moisture.
(c) $10.00 value dissolved per ton of ore.
(d) 50% in mill and 50% in Agitators.
(e) 400 tons of solution from Thickener V precipitated to $.02.
(f) Agitation with a dilution of 2 of solution to 1 of solids.
(g) Let V, W, X, Y and Z represent value in dollars per ton of solution discharged from the respective Thickeners.

Equating out of and into each Thickener:

(1) 100V+400V=500W+(.50×$10.00×100).
(2) 100W+600W=500X+100W+(.50×$10.00×100)+100V.
(3) 100X+500X=100W+500Y.
(4) 100Y+500Y=100Z+100X+(400×.02).
(5) 100Z+100Z—100Y+100 tons of water value $0.00.

Simplifying:	Solving:
(1) V =W+1.00	V=$2.51111
(2) W =X+1.20	W= 1.51111
(3) X =Y+0.24	X= 0.31111
(4) Y =.2Z+0.064	Y= 0.07111
(5) 2Z=Y	Z= 0.03556

To check these figures:

The amount precipitated from 400 tons @ ($2.51111—.02) =$996.444
The amount lost in tailings, 100 tons @ $0.03556 = 3.556

$1,000.000

$1,000.00

[45]—Taggart, op. cit., pp. 998-999. Coe & Clevenger, Trans. A. I. M. & M. E. 55, 356.

[46]—Liddell, op. cit., vol. I, p. 285.
[47]—Dorr Co. Bulletin No. 15, 1923.

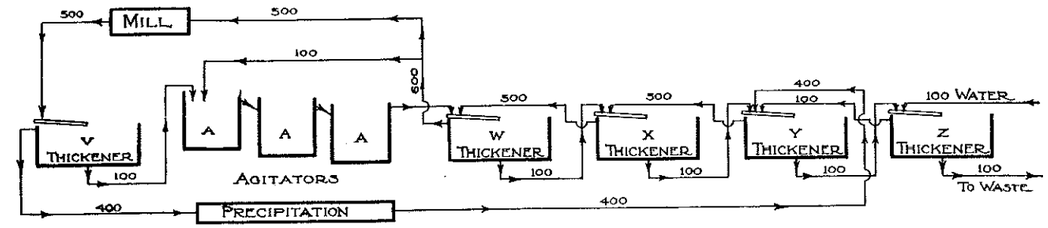


FIGURE 14

The amount dissolved, 100 tons @ $10.00=$1,000.00

From the foregoing the following results are deduced:

Assay value of the pregnant solution, i. e., value of V =$2.51111
Assay value of the discharged solution, i. e., value of Z = 0.03556
Loss of dissolved value per ton of ore, = 0.03556
Dissolved value saved 99.64%.

Calculation for Mechanical Loss of Cyanide

Conditions Assumed:

(a) Neglect the cyanide consumption throughout the system.
(b) Strength of cyanide per ton of solution 1.0 lbs.
(c) Let V, W, X, Y and Z represent the strength in pounds of cyanide in solution discharged from the respective Thickeners.

Equating out of and into each Thickener:

(1) V=1.0.
(2) 100W+600W=100W+100V+500X.
(3) 100X+500X=100W+500Y.
(4) 100Y+500Y=100Z+400V+100X.
(5) 100Z+100Z=100Y+100 tons of water.

Simplifying:	Solving:
(1) V=1.0	V=1.0
(2) 6W=5X+1	W= .9109
(3) 6X=W+5Y	X= .8932
(4) 6Y=Z+X+4	Y= .8898
(5) 2Z=Y	Z= .4449

$\frac{100}{100}$Z=.4449 lbs.=Mechanical loss of cyanide per ton of ore.

EXAMPLE II—CALCULATIONS FOR DISSOLVED VALUE LOSS

(*All figures refer to solution tonnages*)

(See Figure 15)

Conditions Assumed:

(a) 100 tons of ore per day crushed in cyanide solution.
(b) Discharge from all Thickeners with 50% moisture.
(c) $10.00 value dissolved per ton of ore.
(d) 50% in mill and 50% in Agitators.
(e) 300 tons of solution from Thickener W precipitated to $.02.
(f) Agitation with a dilution of 2 of solution to 1 of Solids.
(g) Displacement efficiency of filter, 60%; that is, 60% of the value of the solution in the solid cake, which is assumed to contain 33⅓% moisture or 50 tons of solution to 100 tons of solids, is recovered. The 50Z returned from the filter to the last Thickener represents 50 tons of solution removed in loading the filter, which will, of course, still have the value of Z.
(h) Let W, X, Y, Z and F represent value in dollars per ton of solution discharged from the Thickeners and filter, respectively.

Equating out of and into each Thickener:

(1) 100W+300W=400X+(.50x10x100)
(2) 100X+500X=100W+100X+400Y+(.50x10x100)
(3) 100Y+400Y=100X+400Z
(4) 100Z+400Z=100Y+50Z+50 $\frac{3}{2}$(—F)+(300x.02)
(5) 50F+50Z+50 $\frac{3}{2}$(—F)=100Z+50 tons of water value $0.00.

Simplifying:	Solving:
(1) W=X+1.25	(1) W=$3.3439
(2) X=Y+1.5625	(2) X= 2.0939
(3) Y=Z+0.3906	(3) Y= .5314
(4) Z=.2143F+$0.1287	(4) Z= .1408
(5) F=.4Z	(5) F= .0563

To check these figures:

The amount precipitated from 300 tons @ $3.3439—$.02 =$ 997.17
The amount lost in tailings 50 tons @ $.0563 = 2.815

$ 999.985
Amount due to neglected decimals .015

$1000.00

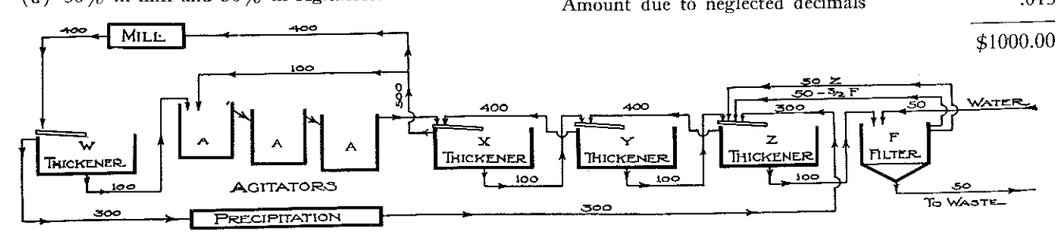


FIGURE 15

The amount dissolved 100 tons @ $10.00=$1000.00.
From the foregoing the following results are deduced:

Assay value of the pregnant solution, i. e., value of W =$3.3439

Assay value of the discharged solution, i. e., value of F = 0.0563

Loss of dissolved value per ton of ore $\frac{50}{100}$ F=.02815

Dissolved value saved, 99.72%.

Calculation for Mechanical Loss of Cyanide

Conditions Assumed:

(a) Neglect the cyanide consumption throughout the system.

(b) Strength of cyanide per ton of solution 4.0 lbs.

(c) Let W, X, Y, Z and F represent the strength in pounds of cyanide per ton of solution discharged from the Thickeners and filter, respectively.

Equating out of and into each Thickener:

(2) $100X+500X=100W+100X+400Y$

(3) $100Y+400Y=100X+400Z$

(4) $100Z+400Z=50Z+50(\frac{3}{2}F)+300W+100Y$

(5) $50F+50Z+50(\frac{3}{2}F)=100Z+50$ tons of water

Simplifying:

(1) W=4.0
(2) X=.8Y+.8
(3) Y=.9524Z+.1905
(4) 324.76Z=1219.05
(5) F=.4Z

Solving:

(1) W=4.0
(2) X=3.8124
(3) Y=3.7655
(4) Z=3.7537
(5) F=1.5015

$\frac{50}{100}$F=.7507=Mechanical loss of cyanide per ton of ore.

The methods given in these two examples may be applied, *mutatis mutandis,* to any similar system treating pulps of metals other than gold and silver and solutions other than cyanide. The values may be expressed in pounds of metal per ton of solution, or in grams per liter, or in any convenient units, so long as they are consistent. One point should be noted, however, in applying this method: in cases where there is a notable change in the density of the solution, allowance, on a weight basis, must be made.

Systems of the types shown above can be calculated also by means of the logarithmic function given above. The essential point to be kept in mind, in any event, is that the calculation really represents a material balance sheet of the system: if the system is to operate continuously, it must follow that the weights (or values) entering the system must be equal, in any period of time, to the weights (or values) leaving the system. Or, from the kinetic view point, the system must be in a state of dynamic equilibrium; that is, not only must we equate into and out of each unit of the system, but we must also strike a balance into and out of the system as a whole.

Not to Be Outdone

Quarterback: Listen, I've got a little play up my sleeve.
Halfback: That's nothing. I've got a big run in my stocking.—*California Pelican.*

Canadian Institute Meets

Mining men and others interested in the development of mining enterprise in Canada gathered in Northern Manitoba the first week in September on the occasion of the annual western convention of the Canadian Institute of Mining and Metallurgy.

Three busy days were filled with a varied program of entertainment. The first day, September 2, was spent at Flin Flon where members were guests of Hudson Bay Mining and Smelting Company and will be shown all over the great, modern mining plant that has been installed to handle the output of ore from Canada's newest big mine.

At the Flin Flon all the newly installed machinery that is to handle the 3,000 tons of ore to be taken out of the mine every day of the year was open to close inspection. The open pit operation, where recently high grade material was uncovered, with the immense electric shovels scooping out 2,000 tons per day, was of especial interest to those unfamiliar with this manner of mining practice. Mandy's well known glory-hole and the more recent mining operations also were visited.

The history of development and organization at Flin Flon mine, by W. A. Green, General Superintendent, and the concentration and cyanidation practice at the famous pilot mill whose results decided the entry of Hudson Bay Mining and Smelting Company into Canada's newest mining province, by S. P. Lowe, Mill Superintendent, were highlights of the instructive phases of the Annual Convention of the Canadian Institute.

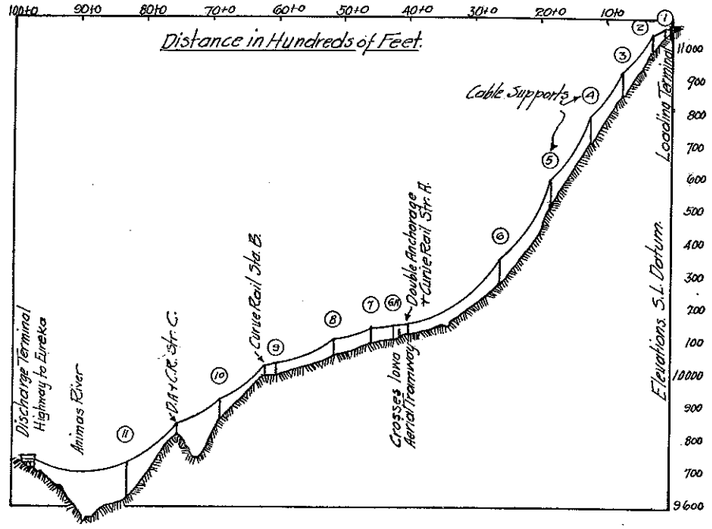
This is the first time any conventions of the Institute have been held in Northern Manitoba, and it is reported the members of the "North of 53" branch of the Institute made it a red letter occasion.

J. W. Finch Dean at Idaho

Dr. John Wellington Finch, member of the Colorado School of Mines faculty, has been selected as dean of the mining school at the University of Idaho. He will take up his new duties at the beginning of the present school term.

The Mayflower Aerial Tramway of the Shenandoah—Dives Mining Company

at Silverton Colorado



F. C. Carstarphen, '05

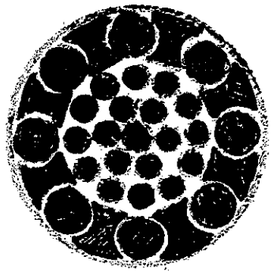
Mr. Charles A. Chase has upset the opinion long held by mining men that the values of the veins of the Silverton quadrangle, did not persist with depth. In this he has again shown his skill as a mining engineer and geologist. He is well known for the excellence of his work on the Liberty Bell mine, near Telluride.

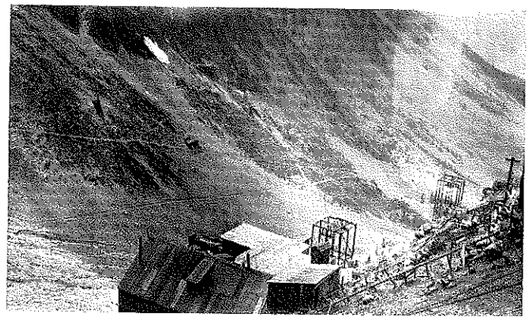
Since January 1926, Mr. Chase has been developing a group of claims totaling 8100 ft. in length that were known to the old timers as the Mayflower, Slide, Terrible, North Star Group of the Contention Mining Co., and the Shenandoah-Dives Group. These mines have yielded more than $4,000,000, and with the confirmation of Mr. Chase's geological hypothesis that the ore shoots are to be found deep below the outcrop, these properties, now the holdings of the Shenandoah-Dives Mining Co., bid fair to yield many more millions. In 1929 it was decided that the property had been tested and that it should be provided with the latest equipment. Mr. A. J. Weinig, '08, and T. R. Hunt, '05, gave their attention to checking the flow sheet. Harvey Mathews, '13, and Harry O'Niel, were pillars of strength in aiding Stearns-Roger in designing and constructing the mill, and in making most of the machinery for the aerial tramway.

The writer had charge of the design, and purchase of the parts of the aerial tramway and supervised its erection in part. Reference to the accompanying profile will show that the location of the line is concave upwards, which is always troublesome if the track cables are fitted with weight boxes. If the line is stripped the position of the empty cable is high in the air. When loaded, the cable approaches the ground. To eliminate this condition, advantage was taken of the property possessed by anchored spans, that the position of the cable does not vary greatly between loaded and empty conditions, the change is in the tension. The line is divided into three sections, by the

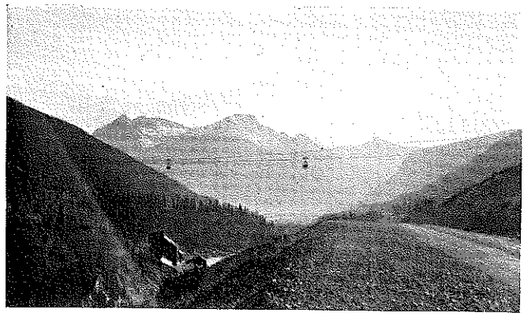
(Continued on page 26)

Above is profile view of the Mayflower Aerial tramway built by Carstarphen, '05. Left is cross-section of the track cable.





Above is level span from loading terminal to tower, preventing carriers from getting out of control. On the left, tram crossing highway. The Silver Lake Mill is in the foreground.



Professional Cards

A. E. ANDERSON, E.M. '04
E. I. DuPont de Nemours & Co., Inc.
701 Hoge Building
Seattle, Washington

EDWARD P. ARTHUR, '95
Mining Engineer
Cripple Creek, Colo.

MAX W. BALL
Consulting Petroleum Engineer
First National Bank Building, Denver
Exchange National Bank Bldg., Tulsa

CHARLES N. BELL, '06
Mining Engineer
C. A. Johnson Bldg. Denver, Colo.

T. D. BENJOVSKY, '09
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Assayers Proof Gold and Silver .9999+
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JACK P. BONARDI, '21
Sales Manager
The Mine & Smelter Supply Co.
225 Broadway, New York City

FRANK C. BOWMAN, '01
Mining & Metallurgical Engineer
1412 Franklin St., Apt. No. 4
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LIONEL BROOKE, '14
Mining Engineer
824 Royal Bank Bldg.
Montreal, Canada

W. E. Burlingame, '01 Charles O. Parker, '23
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G. MONTAGUE BUTLER '02
Mining and Geological Engineer
Dean College of Mines and Engineering, University of Arizona, Tucson. Examinations and problems involving persistence, change in character, and loss of ore.
Diamonds and other gems secured for Miners or their friends at reduced rates.

FRED C. CARSTARPHEN, '05
Specializing in Design and Erection
Aerial Tramways
Consulting Engineer
721 Marion St. Denver, Colo.

C. LORIMER COLBURN, '07
Mining Engineer
C. A. Johnson Bldg. Denver, Colo.

SHRIVE B. COLLINS, '01
Consulting Mining Engineer
1765 Glencoe Street Denver, Colo.

ARTHUR V. CORRY, '98
Member Corry and Morris
Mining Engineers
Butte, Mont.

A. E. CRAIG, '14
Metallurgical Engineer
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DENVER, COLORADO

MARSHALL D. DRAPER, E.M., '97
Mining and Metallurgical Engineer
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Beverly Hills, Calif.

DONALD DYRENFORTH, '12
THE DORR COMPANY DENVER

JOHN WELLINGTON FINCH
Consulting Geologist and Engineer
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JOHN HAYS HAMMOND, Hon. '09
Mining Engineer
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THOMAS S. HARRISON, '08
Consulting Oil Geologist
Post Office Box No. 324
Encinitas, California

FREDERICK B. HYDER, '03
Mining Engineer—Certified Public Accountant
Management Engineering—Valuation of Mines—Income Tax Specialist
100 Montalvo Avenue, San Francisco, California

HARVEY MATHEWS, '13
Sales Engineer
Stearns-Roger Manufacturing Co.
Denver, Colorado

MONTANA LABORATORY CO.
E. E. Blumenthal '98
Chemist and Assayer
Phillipsburg, Mont.

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JOHN EDWARD NORMAN, '98
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ALFRED E. PERKINS, '10
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2635 Walnut Street Denver, Colo.

WARREN PROSSER
District Manager
Federated Metals Corporation
U. S. Natl. Bk. Bldg. Denver, Colo.

CHARLES M. RATH, '05
Petroleum Geologist and Appraiser
Midwest Refining Co. Denver, Colo.
Not available for private work

FRANK J. REINHARD, '05
Equitable Life Assurance Society
Security Bldg. Denver, Colo.

OSCAR REYNOLDS, Ex-'04
Metallurgist
The Mine & Smelter Supply Co.
Salt Lake City, Utah

ROBERT H. SAYRE
Mining Engineer
715 First National Bank Bldg.
Denver, Colo.

WILLIAM P. SIMPSON, '01
Root & Simpson
Metallurgical Chemists, Assayers
Denver, Colo.

W. G. SWART, HON., '17
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DULUTH, MINNESOTA

JAMES UNDERHILL
Mining Engineer
Idaho Springs, Colo.

WM. D. WALTMAN, '99
Franco Wyoming Oil Company
551 Fifth Avenue, New York City
422 First Nat. Bank Bldg., Denver

ROGER F. WHITE, '18
Consulting Petroleum Engineer
804 Hellman Bank Bldg.
Los Angeles, Calif.

ELMER R. WILFLEY '14
Wilfley Centrifugal Pumps
Denver, Colo.

I. B. WILLIAMS, '11
Williams Oil Well Flow Device Co.
Specializing in oil recovery by pressure control
1912 S. Gary Ave. Tulsa, Oklahoma

JOHN H. WILSON, E.M., '23
Consulting Geologist and Geophysicist
Box 187 Golden, Colo.

HARRY J. WOLF, '03
Mining Engineer
42 Broadway New York

HARRY J. WOLF, '03
Manager, Co-operating Investors, Inc.
An Investment Trust
15 Exchange Place Jersey City, N. J.

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.

INTRODUCING—

HARVEY MATHEWS. '13
Sales Engineer
Stearns-Roger Manufacturing Co.
Denver, Colorado

WARREN PROSSER
District Manager
Federated Metals Corporation
U. S. Natl. Bk. Bldg. Denver, Colo.

natural change of slope and curvature of the site and the cables are anchored to concrete blocks. While this method requires an accurate survey for the proper calculation of the erection tension so that when the cable is loaded the resulting tension will not exceed a predetermined value, it is nevertheless the best method of handling cables on such a profile.

This tramway is the best line ever installed in the San Juan. Its cables are supported upon steel towers. The track cable is made of high tensil strength wires of such a cross-section as to withstand the rolling and pounding that is developed by the carrier. The carriages have four wheels, timkin mounted, and by their light pressures insure long life of cable. The grips have sufficient holding power to lift the loaded carrier vertically, although gripping a wire rope without tension.

The tramway is designed for eighty tons per hour, and will then develop more than 100 horse power. Electric motors are used for the primary control, backed by automatic solenoid, and hand operated band brakes. To prevent the traction rope from slipping when under moderate tensions, two grip sheaves are used. These grip sheaves are equipped with gear rings, and brake rims that are bolted to the periphery of the sheave so that the torque is not transmitted thru spokes to the shaft and keys, as has been done in the past. Helical teeth cut on heat treated alloy steel are used in the speed reducers next to the motors. The bin gates are air operated. The buckets discharge onto a belt conveyor that commands the raw ore bins of the mill.

This arrangement puts the discharge terminal on the ground level and facilitates the assembly of the back freight for the tramway. In fact this back freight consisting of mine timbers, and all kinds and types of supplies is just as important as the ore, so attention has been given to ways of facilitating its delivery. The tramway went into service without difficulty and is in daily operation, under Mr. A. F. Andrean, Tramway Foreman.

Separation of Quartz and Feldspar by Flotation

Quartz and feldspar constitute a large part of the earth's crust and also are the most widely distributed of all minerals says the United States Bureau of Mines. The uses of these minerals are almost innumerable and when pure, they are much sought for and command a relatively high price.

Feldspar and quartz not only occur contaminated with other minerals, but invariably are found together, generally quite intimately intermixed. These facts, especially the latter, account for the present market status of these minerals in spite of the universal distribution and unlimited quantities of the same.

Feldspar is obtained in commercial quantities from especially favored localities where certain portions of the earth's crust cooled very slowly, thereby causing the feldspar and also quartz to a lesser extent, to form in relatively large pure crystals. These large crystals of pure feldspar are hand picked from the mixture of minerals. At the present time this is our only source of pure feldspar. There is need, therefore, of a method of mechanical separation for treating the vastly larger supply of quartz-feldspar minerals, which at present cannot be hand picked because the component minerals are too finely dispersed. Hence, a commercially feasible process for the separation of quartz and feldspar would not only reduce the present cost of feldspar, but would likewise also afford a supply of quartz, for in a general way, what has been stated concerning feldspar also applies to quartz. Therefore, an efficient mechanical method for the separation of quartz and feldspar would result in obtaining two useful commodities from an at present worthless material.

Moreover, if a commercially feasible process is devised for the separation of quartz and feldspar, it will have a direct bearing on the beneficiation of the non-ferrous base metal ores, due to the almost universal presence of quartz and feldspar as a worthless and objectionable dilutent in such ores.

In order to assist the mining industry to devise a commercially feasible process for the separation of quartz and feldspar, the Intermountain Experiment Station of the U. S. Bureau of Mines, in cooperation with the Department of Mining and Metallurgical Research of the University of Utah at Salt Lake City has made a study of the problem, and as a result of the work that has been done, it is believed that a method has been devised which will meet the requirements. Moreover, in connection with the work, considerable data have been obtained which will be a distinct contribution to our present knowledge of flotation.

With Mines Men in Print

Two papers dealing with geology and written by Mines men appeared in June. One, a discussion of *Transverse Fractures as Co-ordinate Structures,* by Samuel G. Lasky, '22, was published in the American Journal of Science for June.

Professor J. Harlan Johnson, '23, is the author of the paper, *Benton Fauna of Eastern Colorado and Kansas and its Recorded Geologic Range,* which was published in the June issue of the Journal of Paleontology.

Clark F. Barb, '25, has written, in conjunction with P. G. Shelley, a bulletin for the Penn State School of Mineral Industries. This is bulletin number 6 and its subject is, *Production Data on Appalachian Oil Fields.*

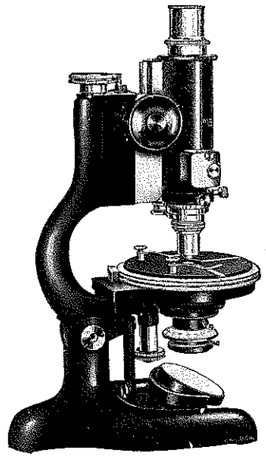
All three of the papers described here are available in reprint form.

* * *

The recent research on beryllium alloys with the thought of its use in aeroplane construction has received such publicity that there has been a widespread search for beryllium minerals, the United States Bureau of Mines observes. While the present consumption scarcely warrants the popular enthusiasm, a good deposit would be distinctly valuable. The only common beryllium mineral is beryl. It is widely distributed but even the pure mineral rarely contains more than 5 per cent beryllium.

Both quartz and beryl have somewhat similar physical properties, such as hardness, specific gravity, lustre, color, and insolubility in acids. They differ in the index of refraction and this is a quick test to determine between them. The following method is used: A fragment of the mineral is crushed to a fineness about —100 mesh and +120 mesh. A liquid is chosen with an index midway between quartz and beryl, say about 1.60. A few of the crushed particles are mounted on a microscope slide in a drop or two of the liquid and covered with a cover glass. By viewing the slide under a polarizing microscope, it can be seen at once if the mineral has a higher or lower index than the liquid. If the mineral is lower the sample can not be beryl. If higher it may be beryl and warrants the longer chemical method for determining the percentage of beryllium.

Microscope to Be Used More in the Mineral Industries



The mining, milling, and smelting of ores are allied operations that are based primarily on certain well defined physical conditions that exist in the natural state or that may be induced through the application of agencies subject to human control. Knowledge of these subjects, therefore, consists of an understanding of the facts involved in each operation respectively. In the location and mining of ore bodies, it is highly essential that as much geological information as possible be obtained in order that money may be expended judiciously and that prospecting and development be carried on in areas where favorable conditions exist.

High grade ore bodies are rapidly becoming depleted, and as their lower grade extensions of milling ore must be followed and developed, more refined methods of deciding where and how money should be expended must be adopted. A greater and more detailed understanding of geologic facts must be obtained on which to base these decisions. The day of cursory and perhaps inaccurate determination of complex rock formations is rapidly passing and will undoubtedly be replaced by a more general study of thin sections to ascertain genetic facts.

The successful engineer and geologist of the future must use the microscope and know his petrography in order intelligently to give advice concerning the expenditure of money for prospecting and large scale development. Determination of certain rock formations made without thin sections are often greatly in error and may be the basis for costly mistakes which could be avoided by careful work based on reliable facts. The limits of vision of the human eye are restricted but can be extended by the use of the microscope to see and interpret important features in rocks and mineral formations that would otherwise remain unknown. In many cases success or failure hinges on an understanding of conditions or facts that can be obtained only through the use of the microscope.

Milling and ore dressing procedure are based primarily on the characteristics of the ores treated. If exact and trustworthy facts concerning ores and the minerals composing them were known, processes could be more intelligently selected and modifications could be made to meet existing or changing conditions. The mill operator knows the cost of every step in mill operation to a small fraction of a cent. He has countless assays of his ore made on all sieve sizes, and likewise of the concentrates and tailings, but he does not know a great deal about the mineralogy of his ore nor the products resulting from concentration treatment, except insofar as its general features are concerned or can be deduced from the recalculation of chemical data. Such data may be of value in certain instances, but in cases involving problems of a complex character they are quite often so far removed from existing facts as to constitute a menace to the improvement of existing practice because of their misleading character.

Operating mills in general are in need of reliable quantitative facts concerning the mineralogical composition of the ores treated and the resulting concentrates and tailings. Tailings are of special importance because they are discarded and their metallic content becomes an economic loss.

The microscope is the most valuable agent available for obtaining mineralogical facts and data and the application of microscopic methods of study would result in much enlightenment concerning the underlying causes of metal losses in many cases.

The opportunities for the application of microscopic methods of research in the field of smelting are fully as broad and attractive and present similar informative possibilities as exist in the ore dressing operations; the cost involved in each individual cycle has been determined with remarkable accuracy, but much regarding physical conditions remains a closed book.

* * *

The Government's Helium Plant, near Amarillo, Texas, designed, built and operated by the United States Bureau of Mines, Department of Commerce, produced 9,801,060 cubic feet of helium in the year ended June 30, 1930. This was the first fiscal year of operation after the plant was constructed. Although the plant operated only ten months of the fiscal year, having been closed in December, 1929, and February, 1930, for lack of orders for helium, the production was the largest ever turned out by the Government in one fiscal year, being about 800,000 cubic feet greater than the largest fiscal year's production of the Government's Fort Worth Helium Plant, which formerly supplied helium used by the Army and Navy.

Even with this production the plant was operated at only a fraction of its present capacity, as it is capable of a production of 24,000,000 cubic feet per year. Its output is limited by the demand of the Army and Navy for helium rather than by its capacity to produce.

The Persuasive Salesman

Customer: Are you sure this coonskin coat will be warm?

Salesman: Yes, sir. The fur in this coat came from coons that died of suffocation.—*Carolina Buccaneer.*

The Royal School of Mines of Spain

Courses of study in the mining schools of America and Europe, especially Spain, are compared by Edmundo Roca, traveling fellow from the Royal School of Mines of Spain, in the August *Mining Congress Journal*.

Mr. Roca writes the curricula of most of the mining schools of Europe are different from those in the United States, The Royal School of Mines of Spain is the fourth oldest in the world, having been established by Charles III on July 14, 1777, and is the oldest engineering institution in Spain. Among its alumni are many who are distinguished both at home and abroad and internationally known in the mining industry.

The mines of Spain have been worked since the most remote historical times. Medina discovered the amalgamation process for silver in 1557. Spain's present importance as a mining country is due not only to the mines of Almaden and Rio-Tinto but because the common metals can be found in sizeable quantities. An American mining engineer recently referred to the many opportunities in Spain for the development of additional mining enterprises.

The Royal School differs from the majority of mining schools in the United States in that it has no connection with the University or with other branches of engineering studies. The Colorado School of Mines is the only institution in this country so organized. Every engineering college in Spain is a unit by itself. The degree of high school graduate in the United States is equivalent to the degree of 'bachiller' in Spain. In old times a person had to have this degree in order to have the title of 'Don' and it is now a requirement for entrance to the engineering schools.

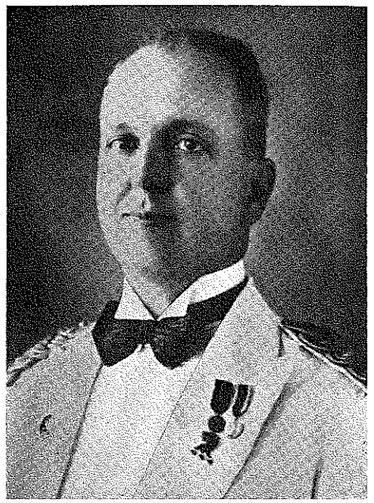
In Spain there are schools which have no parallel in the United States such as schools for foremen training, which are comparable to those for engineer training. The director of the Royal School is also the head of the seven foremen schools located in different Spanish cities. The foremen schools are known as trade schools, while the purpose of the Royal School is to train students to be future executives and administrators of mining properties. The school entrance ages are between 16 and 22 and two or three years study are necessary before students can take the entrance examination. The system operates to avoid an oversupply of graduates as the number of students in each class is limited to 15 or 20. Three years are spent in a preparatory academy prior to the students taking up the course at the school of mines, whose schedules are so heavy as to prevent part-time work. The training is thorough, the purpose being to develop thinkers. There are no electives, the courses being established, and require the students to take the courses which in the United States are divided into mining, metallurgical or geological options. The school offers no courses in mathematics, which are supposed to have been mastered in the preparatory course, together with two languages, a real knowledge of French being stressed. There are also courses in economics and law, two years of electrotechnics and one year in geodetics, in addition to topography, the whole avoiding over-specialization.

No written examinations are required, but in addition to the final oral examination, daily oral quizzes are held for the purpose of training the student to think quickly.

The school also requires the student to secure some practical experience during the last two years of the course, divided into two periods, the second lasting 6 months during which he learns the mine operations from a managerial standpoint, and receives the engineer degree. Four inspection trips, one in a foreign country in order to compare outside practices, are required of the students, in addition to many visits to nearby power plants, electric stations, etc., at government expense, to give them a broad outlook on industry. Tuition fees are practically negligible because of the generous aid allowed by the government which invests a large amount per student.

The Spanish mining student is a different type from the American. He is more serious in his studies as there are no extra curricular activities to which he must give his time.

New R. O. T. C. Head



Capt. F. M. S. Johnson

Captain Frank M. S. Johnson, U. S. A., will take charge of the Colorado School of Mines R. O. T. C. Unit for the coming year. Captain Johnson will succeed Capt. Heston R. Cole who has been transferred to Louisville, Kentucky.

The new head of the Mines Military department comes to Colorado from Rock Island, Illinois where he has been on duty as assistant United States district engineer. He has been actively engaged in the river regulation work for the six-foot channel in the upper Mississippi.

Captain Johnson was overseas with the Fourth Engineers and has participated in three major engagements. Following the World War, he commanded the Fourth Regiment of Engineers and later was in command of the engineer troops at Fort Winfield Scott. He spent four years in Panama, serving as Regimental Adjutant with the 11th Engineers.

A. I. M. E. Will Hold Five Fall Meetings

Five meetings, their programs together covering almost the entire range of interest of the members of the Institute, have been arranged for the fall of 1930. In a little more than one month, meetings will be held from Pennsylvania to the Pacific Coast—at Pittsburgh, Sept. 11-13, the Coal Division; at Chicago, Sept. 22-26, Iron and Steel and Institute of Metals Divisions; Tulsa, Oct. 2-3, Petroleum Division; El Paso, Oct. 13-16, Regional Meeting; Los Angeles, Oct. 17, Petroleum Division. By dropping in at Durango after the El Paso meeting one may attend the annual meeting of the Mexican engineers and see a bit of old Mexico and at several of the meetings contacts may be made not only with fellow members of the A.I.M.E. but with those of related organizations. From any angle this year's series of fall meetings offers much to both young and old engineers.

The meetings will be held at convenient points. The Iron and Steel and Institute of Metals Divisions meet during the week of the National Metal Congress, when many metallurgists will be in Chicago. The members of the Coal Division will be at home in Pittsburgh and petroleum engineers of the Mid-Continent will be similarly situated as to Tulsa. The latter, whether by train or plane, will find it an easy journey to El Paso, and members from East and West can arrange their itineraries so as to attend the Tulsa, El Paso and Los Angeles meetings in their vacation time, thereby seeing much of the most interesting part of the United States, visit well-known plants, mines and oil fields, and renew old acquaintances—all without losing step with the job. The Los Angeles meeting is so dated as to follow that at El Paso without loss of time.

The Pittsburgh meeting, September 11-13, will be the first fall meeting of the new Coal Division. Special programs on anthracite and bituminous coal preparation have been arranged, with other papers on general subjects. Inspection trips to coal-cleaning, burning and coking plants will occupy the last day.

The Chicago meeting, September 22-26, of the Iron and Steel and Institute of Metals Divisions will be held during the week of National Metal Congress, at the same time as meetings of the American Society for Steel Treating, the American Welding Society and the Iron and Steel Division of the American Society of Mechanical Engineers. The Iron and Steel Division will feature sessions on iron ore, theoretical metallurgy (a joint session with the Institute of Metals Division) and on alloys. Besides the joint session, the Institute of Metals Division will have sessions on aluminum and general subjects. Both Divisions have arranged interesting visits to well-known Chicago plants.

The Tulsa meeting, October 2-3, of the Petroleum Division, will precede the annual International Petroleum Exposition (October 4-11). Papers on production engineering and unit operation of oil pools will constitute the program.

The El Paso meeting, October 13-16, will be held jointly with the Western Division of the American Mining Congress. The American Association of Petroleum Geologists, the West Texas Geological Society, the Centro Nacional de Ingenieros and other organizations will cooperate in the program. Many excellent papers are in hand. Visits to large plants in El Paso and vicinity and a glimpse of old Mexico are among the attractions offered.

Alumnus in Accident

Harold E. Harris, '24, was critically injured when the steering apparatus of the automobile he was driving gave way and the sedan plunged seventy-five feet to the D. & R. G. W. tracks near Carbon Junction, Colorado, the evening of August 20. In the car with him were his wife and Mr. and Mrs. D. E. Nelson. The latter two incurred painful injuries while Mrs. Harris escaped with slight bruises.

The foursome had left their homes in Durango and were on their way to a dinner party at Bayfield when Harris, who was driving, remarked that something was wrong with the steering wheel. A few seconds later the car swerved sharply and went over a bank turning over five times. The driver was thrown onto the railroad tracks and incurred injuries to the extent that he lay unconscious for days in Mercy Hospital, Durango. Upon his regaining consciousness it was found that his left side was paralyzed.

Mr. Harris is assistant superintendent of the Durango plant of the A. S. & R. and has been with that company five years. He married Miss Marian Perkins of Durango two years ago and the couple have a tiny daughter who had been left at home the evening of the accident.

Mrs. Emma Harris of Louisville, Colorado, has gone to Durango to be with her son during his convalescence.

The United States Civil Service Commission announces the following open competitive examination: Assistant Ceramic Engineer, $2,600 a year; Senior Topographic Draftsman, $2,000 a year; Topographic Draftsman, $1,800 a year; Assistant Topographic Draftsman, $1,620 a year; Junior Topographic Draftsman, $1,440 a year.

Youngest Professor

Prof. Roscoe W. Morton, head of the mechanical engineering department, is the youngest full professor and head of a department in any Colorado educational institution. For Morton is only 29 years old. He has been a member of the faculty of the Colorado School of Mines for the past five years.

Extracts of Articles worthwhile

Bulletin Geological Institute of Poland—Vol. 4, 1928. 764 pages, 13 plates, 9 figures and maps.

This volume is written in Polish but resumes of each chapter and headings are given in French or English.

The papers included are:—Work of the survey in 1927, the program for 1928, the granite of Korzec; the geology of the Carpathians north of Krosno, Contribution to the petrography of the lower Cambrian, the Ordovician near Lagow, the structure of the paleozoic dome of Debnik near Cracow, the oolitic iron minerals of Parczow near Opoczno.
—J. H. J.

* * *

Structure of Typical American Oil Fields Vol. 2. Special Publication American Association of Petroleum Geologists. 780 pp. 4 pl. many figures, maps and diagrams. 1929. $6.00.

Part One of this publication was reviewed in the July 1929 number of this magazine.

Volume two contains forty new papers by forty-five authors describing other typical fields in Arkansas, California, Colorado, Illinois, Kansas, Louisiana, Montana, New York, Oklahoma, Pennsylvania, Texas, West Virginia, and Wyoming. Includes a critical summary on the "Role of Geologic Structure in the Accumulation of Petroleum", based on the facts in both volumes.

We strongly recommend this volume to all who may be interested in petroleum geology or who wish a reference book on the geological features of American Oil Fields.
—J. H. J.

* * *

Geologic Structures, by Bailey Willis and Robin Willis. Second Edition, 518 pages, 164 illustrations. 1929. ($4) McGraw Hill and Company. This new second edition contains all of the original text, revised and rewritten, together with considerable new matter added to broaden its usefulness.

Sedimentary processes are given consideration. The action of vertical forces is discussed and warped structures are described. Igneous and metamorphic structures are more fully considered. The chapters dealing with mechanical principles as applied to the analysis of structures have been rewritten. The substance of the original work, thus revised, is included in Sections 1 and 2.

Section 3 deals with methods of attack and comprises the original chapter on field methods, together with the chapter on graphic methods and practical problems, the latter being added to.

The treatment of the general subject, geologic thought, has been materially amplified by an account of the current theories of the origin of the earth and its dynamical development, taken up in Section 4.

Altogether, it is a book every geologist and mining engineer will need for his personal library. —J. H. J.

* * *

Human Nature and Management. By Ordway Tead. McGraw-Hill Book Co., New York. 1929. 31 pp. $3.50. Mr. Tead offers one of the best books to come to our attention in recent years on the application of modern psychology to management. We commend it to every executive and personnel director.

* * *

The Financing of Business Enterprises. By Avard L. Bishop. Harper and Bros., New York. 1929. 616 pp. $5.00. A comprehensive study of all the different phases of the work of financing corporations. Of extreme value to business executives and investment bankers and dealers.

* * *

The Railways and Economic Progress. (Miscellaneous Series No. 50) Bureau of Railway Economics, 1929. 20 pp. A booklet giving a resume of how railroads have aided industry and stimulated economic progress, through purchases, wages, tax payments, freight and passenger movements, etc. Figures are given for 1928 and to September 30, 1929.

* * *

Year Book of the State of Colorado, 1928-1929. Compiled and edited by T. R. Ingram. Colorado State Board of Immigration. 290 pp. Illustrations, maps and tables. 1929. The Colorado Year Book is an annual publication prepared and published by the state. The information is obtained chiefly from official data.

Because of a financial situation which restricted state finances in 1928, no edition was published in that year. This volume includes the data which otherwise would have been published in that year as well as the later material.

Anyone interested in the natural resources of Colorado will find a wealth of information in this book.—J. H. J.

A Source of Mine Accidents of Which One Seldom Hears

A mining company which runs several mines received among its dynamite, which is ordinarily of the gelatin type, several boxes of straight dynamite such as is used in quarries. The later contains a large amount of carbon in the form of wood-pulp, paper, and paraffin the last mentioned being needed for waterproofing. The carbon is converted into carbon monoxide and dioxide during the detonation, and as the amount of carbon in the cheaper explosives is large, the greater part of it will go to carbon monoxide.

The result of letting this straight dynamite go into the mines was that all the miners who returned to the places where it had been used got sick and two who returned to a raise which had been advanced some 40 feet above a drift died.

As no special warnings have been issued regarding the danger of letting the wrong explosives go into a mine, nobody could be severely blamed for the accident. It was said that the men had probably wished to sleep a little before commencing their day's work and the powder smoke had killed them which put all the blame on the dead men. The men indeed had probably decided to sleep a little, but never knew that it was carbon monoxide that made them drowsy. The dead men were entirely blameless.

Athletics

This Big Six Stuff

The preseason dopesters are at it full speed already. Sports writers who are classed as those in the know (or who class themselves so) are predicting Colorado University to repeat this year in the Eastern Division. No one seems to doubt the power of Utah in the Western half of the conference.

The "big shots", according to the newspapers are still Utah, Colorado University, Denver University, Colorado College, Colorado Aggies and the Utah Ags. However "big" these members of their self-styled "Big Six" may be, they cannot be entirely deaf to the thunder-like rumblings that are growing louder and louder each year over in Provo. As a matter of fact, Brigham Young has been building slowly and surely for the past several years, and in two more seasons this Utah school is likely to take into camp more than one of the self-styled "Big Six."

This situation is not peculiar to the Western Division. In Colorado, we have watched the Teachers' teams gain power each year until now it looks as though the boys from Greeley are about in a position to do some "Big Six" gunning themselves. Nothing would excite the sportsman more than to read of the victory of Teachers over Colorado Aggies.

Such a thing is not possible, one will say. Well, Coach Hughes is fast losing ground over at Fort Collins and Coach Saunders is fast gaining momentum down in Greeley—Figure it out as an engineer. If the two keep going steadily in the same directions in which they are headed at the present, a time may come when Teachers will take Aggies!

The University of Wyoming has a new coach who will bring power to the Laramie aggregation. As a consequence, the Cowboys may begin a march which, over a period of three or four years, may result in something else now called impossible. But that is looking too far into the future. We may look over this year's prospects and fly less into pure fancy.

This fact cannot escape those who are following the game in this region: football in the Rocky Mountain Conference is changing its face. The self-styled "Big Six" are getting smaller and smaller each year when compared with the remaining six schools in the conference. In what the self-styled "Big Six" call the "small school group", are Western State, Colorado Teachers, Wyoming, Brigham Young, Montana State and Colorado School of Mines. Brigham Young and Teachers are building rapidly. Wyoming is a potential threat in the seasons to follow. Mines gets more strength each year, and there is not a school in this group which fails to promise improvement.

UNWRITTEN HISTORY

Football may be as hard fought as it ever was, but there is little comparison between the fighting done by the spectators of today and those of 20 and 30 years ago.

School of Mines supporters, in particular, counted that day lost which brought forth no black eyes and bloody noses. On several occasions, when the Miners played in Denver, riot squads were called out to quell the fighting on the field after the game and in the theatre lobbies. The fact is several times when the Dynamiters lost the football game the day was a success nevertheless because the rooters won the after-the-game fight.

Not only Mines students and alumni, but Golden townspeople joined in these near-riots and a chap's loyalty to the school was measured by the number of eyes he had blackened in the course of a football season.

BURKE—*End*

During what we may call the Allen regime at Mines, the Orediggers have grown steadily stronger. Coach Allen has been more successful and with meager material, than any preceding Mines coach of late years. This will be his fourth year, and there is every reason to expect a little more growth.

Analyzing the past season, and comparing it with previous years, we can show definitely how the Miners have improved under Allen's tutelage. The worst defeat that Mines suffered last season was 13 to 0. The much touted Aggies could manage, with all of their Hughes power, only 12 points against the Miners. The University almost lost to Allen's men, score 13 to 9, and the University had a great team. The officials declared Teachers winners over Mines by a score of 16 to 13—but that is another mouth full to spit out when homecoming day rolls round October 25. A lot of us still believe that the game ended with the score tied at 13 all. Dutch Clark made 13 points to Mines zero in the Thanksgiving day game. Not a bad season, and it shows improvement.

If Mines continues to improve this year, would it be out of order to hint at the possibility of some of the self-styled "Big Six" falling before the Dynamiters?

Night Game With D. U.

Mines will play its first game of the season against Denver University at night, October 4. The game will be staged in the Denver stadium, and as an experiment in this region should attract a large crowd. Every Miner living in Colorado should be able to attend.

The game between Mines and Denver has always attracted many football fans. It has always been a real contest because of the rivalry existing between the two institutions. Two years ago Mines was the victor by a score of 13 to 12, one of the greatest thrillers ever witnessed in the University stadium. Last year Denver avenged her past defeat by a 7 to 0 victory. It was a game that enthused the onlookers.

The remainder of Mines schedule is as follows: October 18, Colorado University at Boulder; October 25, Teachers at Golden. This is the homecoming game. November 1, Western State at Golden; November 11, Regis College at Denver; November 27, Colorado College at Pueblo.

The short schedule is thought to be desirable because it will offer less likelihood of injuries which might keep regulars out of the game for a week or so. The rest intervals will be long enough to overcome such injuries, it is believed.

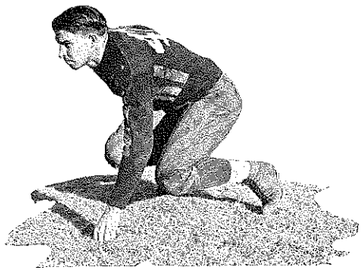
TRUMBULL—*Tackle*

A Baker's Dozen

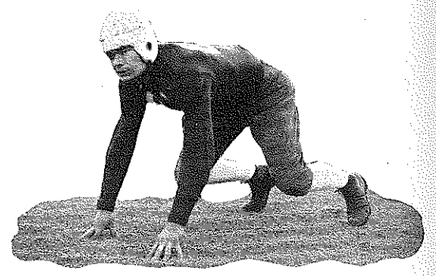
BURRELL—*Guard*

RICE—*Half*

BARKER—*Center*



EADS—*Half*



ADAMS—*Tackle*

COACH ALLEN

PEAKER—*Half*

SPEARS—*Guard*

WOODBURN—*Guard*

BONNETT—*Quarter*

PRESSETT—*Guard*

BOND—*Full*

MICHAELSON—*Tackle*

FLOYD CARR, '30

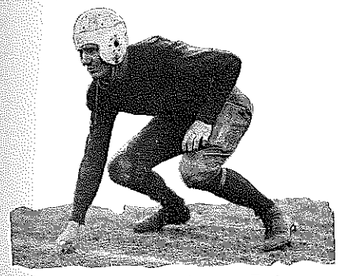
The Miners will miss Carr, for two years All-Conference halfback. But the "brook flows on forever", and someone will come up the ladder to take his place.

Prospects for 1930

Like all coaches, George Allen will say very little this early in the season in regard to his prospects for the coming year. But Allen cannot be so despondent as his silence would indicate. He has a number of old men coming back, and for once there aren't a half dozen or more that are ineligible.

In the line Allen will have a veteran of two years ago—no other than "Pop" Spiers, himself. Spiers played against D. U. in the famous game of 1928 when the Miners won by a single point. Martin, another old timer returning, and Woodburn, still another, are both available for the line. Trumbull, ineligible last year will be eligible this season. Ted Adams of the 1928 team is back in school, and there are:

Burrell, True, Rice, Peaker, Bonnett, Bond, Pressett, Michaelson, Adams, Eads, Barker, all of last year's team.



CLYDE TRUE—*Veteran End*

New Paint

The interior of the gym has been gone over during the summer, and Miner athletes now have new looking quarters. The locker rooms have all been painted together with the showers and the swimming pool.

The equipment store rooms have been remodeled in order to provide more storage space. New equipment to care for the athletes has been installed in the training quarters.

All the additions and repainting cannot, however, meet the need of a brand new gym. The Alumni Association, it has been hinted, has taken under consideration the need for a new gym at Mines, and perhaps there will not pass many more seasons until it is a reality.

Reorganized Staff

Dave Johnson is about the only one in the athletic department whose duties will be the same this year as last. George Allen will direct the physical education work in place of Erne Hinds, resigned.

Dick Moles has been promoted and will assist Allen in the coaching of the football team. Moles will also be in charge of basketball.

A new man has been added to the staff, Doctor Fletcher, who will act as trainer and Frosh Coach. Fletcher will help Moles round out the basketball candidates this winter.

COACH MOLES

Carstarphen's Problem Solved

August 21, 1930.

Mr. C. Lorimer Colburn,
C. A. Johnson Bldg.,
509 17th Street,
Denver, Colo.

Dear Colburn:

Enclosed please find the solution of the problem appearing in the last issue of the Magazine. I hope it will arrive on time to help Professor Adams' student keep his job.

Please don't publish tricky problems any more. This one kept me away from the employees' Club and my daily pint of cold beer for two successive evenings.

As I seldom or never write to the Association let me use this opportunity to congratulate you for the splendid way in which the Association and the Magazine are being improved.

Yours truly,
J. ZAMBRANO, '21.

SOLUTION OF MR. CARSTARPHEN'S PROBLEM

Let x=total No. of balls in the pile. Then:

$$(x-1)\frac{4}{5}=\frac{4x-4}{5}=\text{balls left 1st day.}$$

$$\left(\frac{4x-4}{5}-1\right)\frac{4}{5}=\frac{16x-36}{25}$$

=balls left 2nd day.

$$\left(\frac{16x-36}{25}-1\right)\frac{4}{5}=\frac{64x-244}{125}$$

=balls left 3rd day.

$$\left(\frac{64x-244}{125}-1\right)\frac{4}{5}=\frac{256x-1476}{625}$$

=balls left 4th day.

$$\left(\frac{256x-1476}{625}-1\right)\frac{4}{5}=\frac{1024x-8404}{3125}$$

=balls left 5th day.

Now let y=one of the five equal parts made the 6th day. Then:

$$\frac{1024x-8404}{3125}=5y$$

$$1024x-8404=15625y$$
$$1024x=15625y+8404$$
$$1024x+1024x4=15625y+8404+1024x4$$
$$1024\ (x+4)=15625y+12500$$
$$1024\ (x+4)=3125\ (5y+4)$$
$$x=\frac{3125(5y+4)}{1024}-4 \qquad (1)$$

Equation (1) being indeterminate, to obtain for "x" and "y" values in round numbers, we will have to choose for (5y+4) multiples of 1024 whose last digit is 4. Or expressed algebraically:

$$5y+4=1024(1+5n)$$

where "n" can be zero or any positive round number.

Let n=0	y= 204	x= 3121
n=1	y=1228	x=18746
n=2	y=2252	x=34371
etc.	etc.	etc.

Agujita, Coah, Mexico
J. ZAMBRANO, '21.

News from the Chapters

Summer Recess

Many of the Local Sections have been inactive during the summer months. With the return of cool days and the regular order of business which marks the winter season, the Sections will reconvene for their regular luncheons and business meetings.

The enthusiastic gathering in Houston has overshadowed any meeting held anywhere for several months. Other Sections will now have to follow suit.

There has been no word from the Monterrey gang for some time. Wonder if the heat has got them down (or maybe there has been no beer). Some of the boys in the States have been going round with the corners of their mouths all wet since reading the account of that all-Mexico meeting.

And Old New York? The heat wave is over now, and it is time to hear from you "first to organize."

How about Chicago, San Francisco, Casper, Los Angeles, and the boys up in the coal district on the U. P. line? Nevada, write us a note! You fellows in Butte, forget the price of metals and send in a message of good cheer.

Recess is over!

A Good Dinner Draws the Largest Gang of Miners in South Texas

An informal meeting was held Thursday night, August 14th, at the Rice Hotel, Houston, Texas. There were thirteen Miners present.

The gang met in Purdum's room and "Tex" Stanfield was the last and thirteenth man to show up, but Tex was evidently not superstitious and his "spirits" were not dampened in the least.

Everyone had a high time and it is hoped that more of these informal get-together meetings can be held in the future.

A. R. Brousseau '14 and Fred Nelson '25 came in from New Gulf and Ron Crawford '23 made the trip from Gulf. All of these men are with the Texas Gulf Sulphur Company.

George Lemaire '26, P. A. Washer '26, Tom Pulver and Ralph Schilthius both '30 came in from Baytown. These men are with the Humble Oil & Refining Company.

The rest of the gang were A. G. Wolf '07, D. M. Davis '25, A. S. Ladner '27, R. K. Tracy '28, J. F. Purdum and "Tex" Stanfield '30.

During the feed on the Rice Roof, Harold C. Price '13, who is manager of the Welding Engineering Company at Bartlesville, was in Houston on business and saw the gang. Although he was not able to remain he made his presence known and renewed old acquaintances as well as making new ones.

It was not convenient to have pictures taken of the gang but everyone present signed their names and signatures will probably be almost as familiar to friends as their faces would be. These signatures are enclosed and we hope you can reproduce them for the magazine.

Albert G. Wolf '07.
A. Reynold Brousseau '14.
Ronald F. Crawford '23
F. M. Nelson '25
Donald M. Davis '25
Geo. Le Maire '26
Palbert Washer '26
A. L. Ladner '27
R. K. Tracy '28
J. F. Purdum '30
W. T. Pulver '30
Ralph J. Schilthius '30
Geo. Tex Stanfield '30

Alumni Letters

Guijas Mine,
Ruby-Star Route,
Tucson, Arizona.

Dear Mr. Colburn:—

My mailing address for your records and for the Magazine should be changed to the above.

I have had occasion to see Dean Butler, of the University of Arizona School of Engineering, several times; he was kind enough to take me on a personally conducted tour of the University engineering buildings, which prompted me to make some rather odious comparisons relative to Arizona vs. Colorado educational appropriations.

Last week while on a visit to the Montana Mine of the Eagle-Picher Co., located about 15 miles from here, I met Walter Frimmer of the Class of 1917. I also have a recent letter from Coly Broun, of the Class of 1930, who is at Nuevo Leon, Mexico, with the Mexican Gulf Oil Co. in the capacity of geologist, and informs me he is doing everything from aereal geology to micro palentology.

Sincerely yours,
THOMAS L. WELLS, '29.

West Newton, Penna.,
July 21, 1930.

Dear Mr. Colburn:—

Have just returned from two weeks of active duty with the 324th Engineers at Fort Humphreys, Virginia. The second day there while wandering about, a familiar face popped into view and upon further examination, it turned out to be none other than the infamous Bill Austin, '27.

It seems he's back here in the States for his vacation and is returning to Chile sometime in August. Bill is now a member of the Benedicts, having been married in May. His wife, a charming English girl, accompanied him. We had quite a time panning all the Miners we could remember. It certainly pepped me up for those two weeks to find Bill there.

Sincerely yours,
JACK CRAWFORD, '27.

Canal Zone,
August 15, 1930

Dear Braden:

I received your copy of the Alumni which indeed was very interesting. I must say that some of the alumni who do not get the Magazine are missing a lot. Needless to say that I saw my poem printed, at last. I had given it up for lost. Unfortunately I cannot let you see my last three, as they are love poems.

Mr. Grier, a friend of the family, and a railroad man, took me up to the Madden Dam site where I saw some of the old familiar scenes of eight years ago. The road all the way up is of reinforced concrete, and the few bridges are pieces of art. At the end of the road we saw the present camp where none other than Kellogg of the class of '27 is temporarily in charge doing important geological work. Of course we had quite a chat about the school. He is doing well. After lunch, Mr. Grier took a picture of the two of us, which I am enclosing.

I have been busy "mining" some old files on the gold mines in the republic of Panama. The British have concessions covering one fourth of the republic. I have seen some of the places and nearby I have been primarily interested in the geological formations that show up through the extensive work that is in progress in leveling several places.

Sincerely yours,
THOS. E. NORTHROP

La Porte, Calif.
August 22.

Dear Mr. Colburn:

Of interest to the mining world is the steady increase in popularity of gold mining. This is natural in periods of business depression like the present one, because the value of an ounce of gold increases as the cost of production lessens, and during the recent high wage era the ounce of gold didn't have much buying power.

The most recent development in this district is the purchasing of the Bellevue Mine, between La Porte and Gibsonville, by the recently-formed Bellevue Mining Company, of Washington. According to reports, operations on the property will begin within a month, aiming at a 500 cubic yard per day output. Machinery and equipment is now being purchased by the new operators.

Since the 'sixties, when the mine was a big producer of placer gold, approximately $1,000,000 has been recovered. During the World War the former owners were forced to close down, and since that time no work has been done on the property. Prior to the shut-down, a drainage and haulage tunnel over a mile in length was run at an expense of $400,000 to bottom the channel at the downstream boundary of the property. The new company will take advantage of this tunnel in proceeding with development work.

Mr. John P. Hartman, President of the new Company, is enthusiastic about the prospect and believes it to be the greatest unworked placer field in California.

To date, only one of the numerous mines which operate in this district has been forced to close down because of "hard times".

Yours very truly,
FRANK E. DELAHUNTY.

Campus

Student Publications

The student publications board directs the Oredigger and Prospector. Editors have been appointed and work upon both the paper and year book is well under way. Frank Hayward, oldest member of the Board and former editor of the Oredigger predicts one of the most successful years for the student publications.

The Board has under consideration a plan for helping to pay off a portion of the bonds held on Brooks Field, Hayward announced.

Emil Holmberg, editor of the Prospector, has already selected his staff and is beginning work on the 1931 book. A number of Alumni, after seeing last year's annual, have sent in subscriptions for Holmberg's book. A canvass for new subscriptions is now under way.

FRANK HAYWARD
Member Publications Board

M. C. A. Holds Retreat

The M. C. A. was host to the freshmen at a week-end retreat in the mountains the last two days of August as part of the entertainment program for the new students. Rex Yeager's pavilion on the Kiwanis ground was turned over to the fifty men who drove up for the retreat.

Games under the direction of George Allen were the order until a steak dinner filled the attention of the frosh. After chow Professor Adams gave a talk on "Be Yourself." Coach Allen spoke on "Athletics and Study." These two subjects provoked a general discussion which eventually turned into a Mines "bull session."

Sleeping under the stars was the course followed by most of those present only ten of the men taking advantage of the quarters in the pavilion.

Sunday morning brought an early breakfast and a short meeting during which President Coolbaugh spoke on "Sincerity" and Dean Morgan on "Service."

Sigma Gamma Epsilon, honorary engineering fraternity at Mines, pledged eight men, Tuesday evening, September 2. The new pledges include four juniors, three seniors, and an honorary member. The actives entertained the new men at dinner at the Golden Waffle Inn. H. L. Hays, Harry McFarland, Luther Dempsey, C. B. Michaelson, Clyde Spears, H. F. Welker, A. V. Quine and Jim Boyd, honorary, are the S. G. E. pledges.

Frats Pledge Men

The first group of pledges under the new rushing system was announced Tuesday morning, September 2.

Kappa Sigma announced the following pledges: R. C. Delauney, Baltimore; A. R. Mathews, Macon, Georgia; R. W. Brown, Bisbee, Arizona; E. W. Reed, Larkspur, Colorado; R. J. Fooks, Jr., Hoboken, N. J.; and Glenn Johnson, Louviers, Colorado.

Men wearing the Beta Theta Pi pledge pin are J. J. Holland, Jr., Arcola, Mississippi; H. L. Beckman, St. Louis; G. P. Grant, M. E. Coates, Topeka, Kansas; and W. K. Daggett, Kearney, Nebr.

Sigma Alpha Epsilon pledges are Duane Gleghorne, Casper, Wyoming; L. A. Patterson, Denver; H. D. Squibb, Denver; D. W. Chase, Denver; Anthony Bradasich, Denver; P. R. Asel, Denver; R. L. Middlekauf, Denver; T. W. Nelson, Fort Collins; B. H. Anderson, Denver; E. M. Farrier, Union Springs, Ala.; and Allen Crowell.

Freshmen at the Sigma Phi Epsilon fraternity are Otto Eastland, Jr., Denver; W. B. Greenlee, Denver; N. F. Wetzel, Mohrland, Utah; and E. S. Hanley.

A. T. O. announced the pledging of R. C. Alsop, Salinas, Calif.; J. W. Rockwell, Jr., Waynesboro, Pa.; C. B. Schmidt, Denver; L. H. Boyd, Los Angeles; C. V. Whitehead, Minatare, Nebr.; B. G. Messer, Juneau, Alaska; and R. H. Sayre, Denver.

The Sigma Nu group includes C. H. Mousel, E. M. O'Byrne, Denver; Worth Jackson, Chicago; G. A. Barnes, E. M. Sipprelle, Grand Valley, Colorado; Paul Smith, Denver; L. W. Fortman, Galesburg, Illinois; R. E. Sidford, Sandwich, Illinois; Anderson Morey, Chicago; A. C. Ingersoll, Jr., Cincinnati; E. B. Woodward, Colorado Springs; C. A. Allen, La Junta; B. A. Collins, Denver; J. E. Finn; and W. E. Babb.

New A.T.O. House

"A man's fraternity house is his college castle."

The new Alpha Tau Omega house on the Mines campus is the latest thing in clubs for college men. From the knocker on its Colonial door to the chapter room in the basement, it is well planned and beautifully decorated.

The hall, living room, sun porch and dining room are all connected by archways and French doors. When these are open there is a large space for dancing. Other rooms on the first floor include the kitchen and a guest room.

Upstairs are accommodations for thirty men. The bed rooms all have different color schemes. Each man has a study table. Beds are double-deckers. The showers on the second and third floors are the sort that made Saturday night a delight. Another convenience for A. T. O. men is the telephone connection on each floor.

A huge chapter room in the basement with a wide fireplace features the A. T. O. badge in color set in the cement floor.

Furnishings and hangings of this fraternity home are in keeping with the Mayflower idea—sturdy and American.

Dominating the living room is a big fireplace, made for use, that already gives promise of cheery winter evenings for Mines men away from home.

Sophomores Issue Warnings to Frosh

A decalog for freshmen to obey was among the many impositions the sophomores showered upon the first year men the opening week of school. The sophomoric prescriptions for frosh health included the command that the Class of 1934 wear fez caps indicative of their low station in campus life. Freshies were forbidden the use of the front door of Stratton Hall, and also were told to leave the green grass for the use of the upper lords. The initiates were ordered to step off the walks when encountering the older Miners. The last of the ten instructions, directed the youngsters to meet in front of Guggenheim Hall on Saturday, September 6, and proceed in a body to give the giant "M" on Mount Zion its bath of white paint.

Sophomore ideas of fun for the new men at Mines included an impromptu vaudeville at the Gem theatre in Golden. While other Mines men howled in delight at the antics of the freshmen who gave command performances, the frosh pranced about the stage giving their interpretations of ballet dancing, singing, stunts, and real old-fashioned "meller-drama."

Topics

An Ode to the "M"

The mighty M of old
Still stands upon the hill
An emblem of the brave and bold
The product of the will!
From East to West
From North to South
Her name is blest
By word of mouth.
Her sons have travelled far
By rail, by boat, by air
To force the earth ajar
For precious metals there!
While at her feet lies there
The halls of worldly fame
Since days of mining care
Attention there to claim!
The mighty M of old
Has stood the gaff of time
Though brave D. U. and bold
Had tried to blast her lines!
The white above the green
The frosh have painted well
That all the world has seen
From the air and from the dell!
May all her sons be brave and bold
And stand the test of time
As in the days of old
In every land and clime!

—*Tommy Northrop*, '32.

"Can you loan me ten dollars for a few days?"

"I am very sorry, but I have only nine dollars and seventy cents with me."

"Well, let me have that—I am not afraid to trust you for the thirty cents!"

PRESIDENT

"Ken" Dickey, President of Student body. "Ken" was one of Mines hardest hitting fullbacks in past seasons. He has played his allotted years of college ball and will not play this year.

EMIL HOLMBERG, *Editor of the Prospector*

Student Government

The Student Government of the Colorado School of Mines is vested in the Student Council. This council is a representative body of the students, each student being represented by some member of the council. Each of the fraternities have one representative. The Barbs or nonfraternity men have four representatives.

The purpose of the Student Council is to enforce such student laws as are made by the student body; to bring into closer association the various campus organizations and associations; and to bring to light such opportunities for the betterment and advancement of school ideals and traditions.

The officers of the Student Council for the year 1930-31 are: President, Kenneth W. Dickey; athletic council, Kenneth W. Dickey and Ivan G. Burrell.

Dumke-Hartman

Walter H. Dumke, '29, and Miss Edna Hartman were married in Denver, August 20. Dumke, who received his master's degree last year, is an instructor in the University of Iowa and he and his bride will make their home in Iowa City.

McBrian-Bryan

A Mines romance of long standing was climaxed Saturday, August 30, when Miss Frances Bryan, of Golden, was married to Joe McBrian, '23, of Shawnee, Oklahoma. The couple departed the same day for a honeymoon in Yellowstone Park.

The old lady was looking for something to grumble about. She entered the butcher's shop with the light of battle in her eyes.

"I believe that you sell diseased meat here!"

"Worse," replied the butcher blandly.

"What do you mean, worse?" demanded the astonished patron.

"The meat we serve is dead!" confided the butcher in a stage whisper.

Faculty members of Mines are among those promoting a golf course for Golden. Two sites are under consideration, one north of town and the other west of city limits, near Brooks field. An addition of this sort to the life of the town and School would be most welcome.

An item from a summer issue of the Industrial School Magazine tells of the wrecking of a little brick building on the school's ground. This, used as a carpenter shop in recent years, was a remnant of the large building which burned in 1924. Its wrecking marks the final passing of Jarvis Hall.

Louis C. Hill, professor at Mines in the latter nineties, who supervised construction on the Roosevelt, Elephant Butte, and Laguna dams, and who is a member of the Boulder Dam Consulting Board, has been appointed consulting engineer to the International Water Commission.

ENGAGEMENTS and WEDDINGS

Knutsen-Graves

To the already long list of '30 men who chose commencement for their wedding, is added the name of Eivind Knutsen. He and Miss Fern Graves, a teacher in the Golden schools, motored to Colorado Springs, May 17, and were married in the Episcopal church. Knutsen is stationed at Ouray with a mining company.

Allan-Frost

A winter's tale in the marriage of Tanton Allan, senior at Mines, and Miss Germaine Frost, popular Golden girl, has just come to light. The couple plan to make their home in Denver.

Bartholomees-Sullivan

A pretty wedding was solemnized at the Cathedral of the Immaculate Conception, Denver, Aug. 14, 1930, when Miss Pauline Sullivan became the bride of George Bartholomees, '28. The bride wore a frock of lavendar crepe chiffon and a small taffeta hat of the same shade. She was attended by Miss Dorothy Sweeney, who also chose a lavendar costume in a shade deeper than that worn by the bride. Both carried bouquets of orchids and gardenias. Louis Bartholomees was best man.

After the wedding there was a breakfast at the Olin Hotel to which members of the bridal party were invited. The couple then left on a honeymoon trip. They will go to New Orleans by boat and then take an extended tour of the South. They will make their home in Bonne Terre, Missouri, where Mr. Bartholomees is connected with The St. Joseph Lead Company.

BIRTHS

Donald M. Davis, '25, and Mrs. Davis are rejoicing over the arrival of a fine daughter, Loretta, born August 3rd. Loretta weighed 7 lbs. 14 ozs. Both Mrs. Davis and the baby are getting along nicely.

Personal Notes

Will V. Norris, '21, has accepted the position of Assistant Professor of Physics in the University of Oregon, his address now being Box 635, Eugene, Oregon.

Clarence A. Farlow, '22, is another Mines man who went to Russia this past Spring. His address is c/o Zvetmetzoloto, Centr-Vetoshni, Per 15, Moscow, U. S. S. R.

A. C. Kinsley, '20, Inspector for the U. S. Geological Survey, has been transferred from Denver to the General Land Office, Anchorage, Alaska.

Will E. Jones, Ex-'06, is with the Penn Mutual Life Insurance Company, American Bank Building, Portland, Oregon.

W. Ray Cox, '02, Consulting Mining Engineer, Portland, Oregon, recently visited the immense concrete power dam under construction on Lewis River at Ariel, Washington, 43 miles north of Portland, with a party of engineers as guests of the Northwestern Electric Company.

Samuel G. Lasky, '22, who is doing cooperative work with the New Mexico School of Mines and the U. S. Geological Survey and who has been in Washington, D. C. for the past six months has returned to New Mexico, his address there being Box 482, Socorro.

Willard S. Briscoe and *Elmer J. Garbella,* '30, are taking the Student Training with the Bethlehem Steel Corporation. They both are residing at 217 East Packer Ave., Bethlehem, Penna.

R. L. Boeke, Ex-'29, is now associated with the Rare Metals Corporation at Nucla, Colorado.

Ralph J. Schilthuis, '30, is taking the Student Engineer Training Course offered by the Humble Oil & Refining Company. His mailing address is Box 1244, Baytown, Texas.

A. R. Patten, '30, is General Roustabout for the Texas Production Company and is located at Hamilton, Colorado.

Russell P. Luke, '14, who has been associated with the American Smelting & Refining Co. at Velardena, Mexico, recently left for South America where he has been appointed Assistant General Superintendent of the South American Development Company, Apartado 655, Guayaquil, Ecuador.

Marion Mercer, '30, is now Assistant Curator of Mining at The Museum of Science and Industry, Jackson Park, Chicago, Illinois. His residence address is 300 West Adams Street, Chicago.

Ernest J. Ristedt, '09, who has been Ventilation & Safety Engineer for the Santa Gertrudis Co. at Pachuca, Mexico, is now associated with the Cerro de Pasco Copper Corp. at Oroya, Peru, S. A.

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

William H. (Bill) King, '27, who has been located with the De Laval Separator Company at Poughkeepsie, N. Y., since his graduation, is one of the chief members of a staff which has developed a new type vacuum still for reclaiming dry cleaners solvent. This equipment is being built and sold by the De Laval Company and is receiving an enthusiastic reception in dry cleaners circles. Bill has been doing his bit to make the world cleaner and his still should be warmly received in the vicinity of Pittsburgh.

John A. Poulin, '21, Geologist for the Apure Venezuela Petroleum Corporation, has sent in a change of address to Conde a Carmalitas No. 11, Caracas, Venezuela, S. A.

William L. Beck, '14, who has been in Argentina for the past year as Manager of South American Sales for the Harnischfeger Corporation, has been transferred to their Export Department at their Home Office, 38th & National Avenues, Milwaukee, Wisconsin.

Joseph A. Haskin, '22, has been made Chief Engineer, Hudson Bay Mining & Smelting Company, and he is now located at Flin Flon, Manitoba, Canada.

Ralph C. Maxwell, '23, is now associated with the Ontario Refining Company, Ltd., Copper Cliff, Ont., Canada.

Dewey A. Dutton, '21, formerly Metallurgical Engineer with the U. S. Bureau of Mines, has taken charge of the Geo. J. Ermlich & Co. laboratories at 1727 Champa Street, Denver. He is specializing in ordinary mining and metallurgical assaying and preliminary testing, but is also prepared to give a variety of service to other industries.

Edmund M. Field, '12, attorney in Kansas City, Missouri, has recently moved his offices to 915 Grand Ave. Temple Building.

Ronald O. Walker, '24, is Petroleum Engineer with George F. Getty, Inc., Los Angeles, Calif. His residence is 543 North Greenleaf Avenue, Whittier, Calif.

William F. White, '28, is now connected with the Humble Oil & Refining Company, in their Technical Service Division. His postoffice address is Box 95, Ingleside, Texas.

George H. Playter, '30, is associated with the American Smelting & Refining Company in the Laboratory at their Selby Plant. His mailing address is Box 793, Selby, Calif.

A. C. "Tex" Stanfield, '30, is making his home in Houston, Texas where he is associated with the Mountjoy Parts Company, 1420 Dallas Street.

J. F. Purdum, '30, with the Oil Well Supply Company, was in Houston, Texas for several days the middle of August. His headquarters will be at Fort Worth.

Thomas B. Romine, '19, Assistant Chief Geologist for The Texas Pacific Coal & Oil Company, has been transferred from Great Falls, Montana to Fort Worth, Texas, his address there being 1710 Fort Worth National Bank Building.

V. C. Robbins, Ex-'12, Chief Engineer for The McAlester Fuel Company, returned to McAlester, Oklahoma the early part of August from a trip North, during which he had visits with A. L. Toenges, '12, in St. Louis and W. G. Ramlow, '12, in Minneapolis.

Earle A. Strong, '14, is now associated with Selection Trust, Ltd., with offices in Selection Trust Building, Masons Avenue & Coleman Street, London, E. C. 2.

C. A. Weintz, '27, and *C. F. Sheldon,* Ex-'30, on a recent trip to Yellowstone Park, saw Mr. Hull of the school instrument shop who with his family was on a short tour of the Park. Weintz and Sheldon are doing reconnaissance work in Southern Montana.

Harry L. Daasch, '27, is Assistant Professor of Mechanical Engineering at Iowa State College, his residence address being 517 Hayward Avenue, Ames, Iowa.

Clarence G. Purcell, '30, has accepted a position in the Engineering Department of the Standard Oil Company of Indiana at their Wyoming Refinery, Casper, Wyo.

R. V. Whetsel, '16, formerly General Manager for the Cia. Gas y Combustible "Imperior" at Tampico, Mexico has been transferred to Europe as European Manager of the Cities Service Company, with headquarters at 25, Rue la Boetie, Paris, France.

Ted Adams, '29, has been appointed fellow in the geology department at Mines. Since graduation he has been with the Radiore Company of California and has spent considerable time in the field.

Hial Gernert, '30, who is stationed at Midwest, Wyoming, spent a couple of days visiting in Golden and Denver the latter part of August.

H. W. Waterfield, '25, called at Mines while on his vacation. He has been with the Tintic Standard Mining Company, Dividend, Utah, since leaving school.

R. F. White, '18, and his wife were Mines visitors in July. His headquarters are in Los Angeles where he is an appraiser of oil properties.

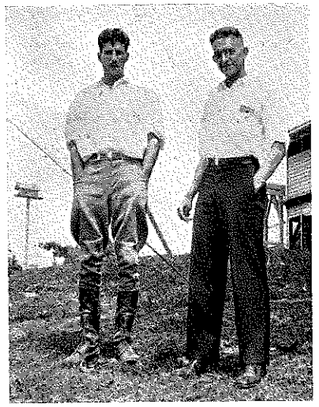
Karl Dallmus, '27, with the Transcontinental Petroleum Company in Mexico, was looking up old friends at Mines in August before returning to Monterrey.

Elvin Yoksh, Ex-'31, plans to return in the near future to complete his engineering training. He lives in Los Angeles but was in Colorado to attend his sister's wedding.

Sterl Kincade, '30, is in the producing end of the oil business at Hobbs, New Mexico. His address is Box 273. He writes that *Bart De Latt,* '30, who is with the Gypsy Oil Co., was in Hobbs the first part of August.

Marion Mercer, '30, and his family are established in an apartment at 7341 Phillips Avenue, Chicago, Illinois. "Mike" is Assistant Curator of Mining with the Museum of Science and Industry, 300 West Adams Street, Chicago.

Frederic H. Kellogg, '27, is Geologist for the Panama Canal at Alhajuela, C. Z., residing at Balboa Heights, Canal Zone.



Fred Kellog and Tom Northrup in the Canal Zone.

Prof. Robert Otis, who was a member of the mechanical engineering department at Mines fifteen years ago, and his family were guests of friends in Golden the fore part of August. They stopped in Golden on their way home to Milwaukee after a visit to Yellowstone.

Edwin Crabtree, '26, is with the Canani Metal company at Miami, Oklahoma.

Frank Wiebelt, '16, who was graduated from Mines with a degree in mining, is coming back this year to specialize in geophysics after fourteen years spent in the field. Since leaving Golden, he has been engaged in mining in Nevada, where he was manager of the Yellow Pine—a lead-zinc property; as engineer for copper workings at Miami, Arizona; besides time in Colorado. For the past few years, Mr. Wiebelt has been located at Claypool, Arizona.

With the increasing importance of geophysics in the mineral industries, he decided to specialize in this field and will become a graduate student with the opening of the fall term.

Mr. and Mrs. Wiebelt and their two children plan to make their home in Arvada.

Ernest J. Ristedt, '09, formerly of Old Dominion and Inspiration Consolidated of Arizona, sailed from New York, July 18, for Peru, to take charge of safety work for Cerro de Pasco Copper Corporation. His headquarters are at Oroya.

E. E. Thum, '06, formerly associate editor of Iron Age, has resigned to become editorial director of Metal Progress, to be published by the American Society of Steel Treating.

Arthur C. Terrill, '05, is in the engineering department of the Fullerton District Junior College, Fullerton, Calif. For the past three years he has been in the geology and engineering division of the San Bernardino Junior College.

A. Saharoff, '29, has been sent to Paris as a representative for the American Rolling Mills.

G. D. Thomas, '21, who is a geologist with the Shell Oil Company, Dallas, Texas, was a July visitor at Mines.

Harrison "Curly" Ellis, Ex-'30, is planning on finishing his course at C. S. M. within the near future. He visited the school in August while on his vacation from his work in the Division Engineer's office of the Santa Fe, Emporia, Kansas.

Robert Williams, '30, is in Tocopilla, Chile, with the Anglo-Chilean Nitrate Company.

Lisle Van Burgh, '17, who decided to add a degree in law to his E.M., has offices in Los Angeles where he does work as a mining and petroleum engineer as well as that of legal advisor.

Ray Farmer, '23, is engaged in the building and contracting business in Phoenix, Arizona.

Roswell B. Downing, Ex-'23, stopped over in Golden the last of August on his way to attend a geological convention in Colorado Springs. He is with the Barnsdall Oil Company of Kansas.

D. C. Deringer, Jr., '24, who has been associated with The British Metal Corporation (Canada) Limited for the past few years, has been transferred to Spain, his address now being, c/o Minas de San Telmo, Val de la Musa, Prov. de Huelva, Spain.

Kenneth Ferguson, '17, Geologist for the Midwest Refining Company who has had headquarters in Rapid City, South Dakota for the past year, has been transferred back to Denver.

O. R. Whitaker, '98, Consulting Mining Engineer, with A. H. Seep, President, and Clark Grove, Executive Vice-President of The Mine and Smelter Supply Company, recently returned from an inspection trip of the Barstow Mine in Commodore Gulch, above Ironton, Colorado. This mine is owned by The Mine and Smelter Supply Company of Denver and officials of the company are making a careful study of the property looking toward resumption of operations.

President M. F. Coolbaugh has been ill for several weeks. He is now back in his office.

Dr. Paul Meyer has improved in health to the extent that he is now able to care for his practice.

The Alumni Association wishes to extend its sympathy to *Lorenz Woeber,* '22, and to *Howard Montague,* '26, whose mothers died recently.

With Our ADVERTISERS

Policy of this Department

It is the policy of the Colorado School of Mines Magazine to cooperate with its advertisers to the fullest extent. All of our advertisers are specialists in their field of endeavor. They accumulate vast stores of information of an engineering and technical nature—information that holds great interest for our readers. This space is set aside for them to use for the publication of such information. It is free to our advertisers and limited exclusively to their use.

There seems to be no definite remedy for the reactions experienced periodically by business throughout the world. At least, no cure has been found up to the present. It must be accepted as an economic fact that depression will regularly follow periods of prosperity, and business concerns must look ahead in order to be prepared for these times of reversal.

Advertising plays an important part in regaining prosperity. In times of depression normal demand for goods drops and an increased sales resistance is the result. The business houses problem becomes one of distribution rather than one of production.

No manager or owner of an industrial plant wants to see business drop off; no engineer or executive wishes to experience the results of decreased production; no laborer or workman wants to look forward to a time of cut wages and unemployment. No one profits by a reduced output—yet it is inevitable. Just where the break begins, it is difficult to determine.

The turn in the curve upward, however, begins with increased consumption. Although there are other factors involved, advertising seems to be of tremendous importance in bringing about such an increase. A study of the situation following the last depression of 1920 has shown definitely that firms who increased their advertising appropriations during this dull period profited more, both during the depression and following, than did those firms whose advertising budgets were reduced.

The results of the study made of the 1920 business depression are as follows: Companies increasing their advertising lost 12 per cent in sales; companies decreasing their advertising lost 26 per cent in sales. In 1921, the following year, the increase of the first group amounted to 7 per cent; the second group were still 12 per cent below. Three years later, those that "believed in advertising" were able to show a 31 per cent increase in sales while the firms that had decreased their advertising during the dull period could show only a 5 per cent increase.

The Colorado School of Mines Magazine reaches a special class of known buyers.

Index to Advertisers

SAFETY in the Handling of Explosives in Coal Mining

Storage

The storage of explosives has a much deeper relation to safety in their use than is commonly realized. Improper storage of explosives, detonators, fuse and squibs leads directly to misfires, to the incomplete detonation which leaves unexploded powder in the bore hole or thrown out among the coal, and to the burning of charges in the bore hole. Even a small leak in a magazine roof may allow a few cartridges of explosives to become wet, and the use of these cartridges may result in any one of these troubles. A dilapidated magazine, or a magazine with floors close to wet ground, or any condition of storage which would expose ammonium nitrate explosives—and these include most of the permissibles—or blasting caps, or safety fuse, to moisture is almost sure to result in some or all of the aforesaid troubles.

Inadequate ventilation of magazines may also lead to misfires, incomplete detonation or burning charges, for unless air circulates freely through a magazine the atmosphere may become hot and humid, and long exposure to such atmosphere has much the same ultimate effect upon ammonia explosives, blasting caps and fuse as has dampness.

If a steel magazine is used without protection of some kind from the direct rays of the sun, there is danger that the metal will absorb so much heat as to cause the explosive inside to become hard and insensitive. Especially is this likely to happen in a climate of hot days and cold nights where the explosive is subjected to repeated alternations of high and low temperatures. Numerous instances are on record of misfires and partial detonations due to just this cause. A steel magazine in a region of hot sunshine should be protected by a wooden roof supported on posts so as to leave free circulation of air between it and the magazine, or by a coat of aluminum paint. A steel magazine is not recommended in any case for carload storage.

The handling of misfires and the existence of undiscovered misfires constitute two of the chief sources of accident from explosives. Likewise, incomplete detonation or a burning charge underground may cause fatal accidents, for the gases given off by such shots are extremely poisonous. For all these reasons it is imperative to prevent deterioration of explosives and detonators in storage, and dry, well-ventilated and reasonably cool magazines are essential to safety in the use of explosives.

In addition, storage magazines should be so located, so protected by natural or artificial barriers, so constructed and so managed as to guard against accidental explosion of their contents and to prevent injury to persons or property in case such an explosion does occur. The du Pont Company is always willing to furnish specifications for the construction of magazines and to advise concerning their location, if requested.

Transportation from Magazine to Working Face

The transportation of explosives and detonators from the main storage magazine to the bore holes involves many problems of safety which vary with all the varying conditions at different operations. Certain general principles will be stated first and then some of the ways and means of applying these principles will be discussed.

First, explosives and detonators should be kept apart until the last possible moment. Whenever feasible, they should be transported in separate conveyances or be carried by different men. If both must be transported in the same conveyance, or be carried by the same man, they should be placed in separate insulated containers.

Second, high explosives and detonators should always be carefully and not roughly handled, protected against shock and friction.

Third, all explosives and detonators should be protected from fire, flame or sparks.

Fourth, they should be protected from moisture.

Fifth, wires of electric detonators should be kept from contact with stray electricity or electrically charged surfaces, this being especially important if the wires are not short circuited.

At many coal mines a distributing magazine is necessary near the mouth of the mine. This should conform to the same general standards as main storage magazines. In particular, the same distributing magazine should never be used for both explosives and detonators and the temptation arising from the convenient location of a distributing magazine to allow tools, carbide, oil and other supplies to be kept in it should be rigorously guarded against. A distributing magazine should never contain more than one day's supply of either explosives or detonators.

Whether the operator provides haulage into the mine for explosives and detonators or whether they are carried in by the men depends upon local conditions, but, whatever the system employed, it should be safeguarded as closely as possible. In the former case, explosives should be hauled in a covered, insulated powder car, or if covered, insulated boxes are provided to hold the miners' individual insulated containers, these boxes may be hauled in an ordinary mine car. Various satisfactory types of insulated powder cars are in use. The car may be built entirely of wood, the different sections being put together with wooden pegs instead of nails, or it may be of wood lined with sheet asbestos or rubber, or of metal, lined with wood with all nails or screws countersunk so that there is no exposed metal whatever. The body of the car may consist of a single compartment for carrying explosives or it may be divided into small compartments for the miners' individual powder boxes or bags.

Explosives and detonators may be hauled on separate trips, or detonators may be carried into the mine by shotfirers. A type of powder car being used today by some coal mines which seems reasonably safe has two separately

insulated compartments, a larger one, opening from the side of the car, for explosives, and a smaller one, opening from the end of the car, for detonators.

The safest way to haul a powder car into the mine is to shut off all electric power and haul the car by mules. If the car is hauled by an electric motor with an overhead trolley it should be separated from the motor by two or three empty cars so that sparks from the trolley cannot fall on it. It should be attached to the preceding car by an insulated coupling. The powder car should never be attached to the man trip, nor immediately precede nor follow it. If both are in motion at the same time in the same split of air, their relative position should be such that the air current will be passing from the man trip toward the powder car so that, in case of an explosion in the powder car, the flame, smoke and fumes will be carried away from the men, not toward them. The best plan is either to send the powder car into the mine between shifts or to have it precede the man trip by sufficient time to reach its destination before the man trip leaves the outside.

The powder car may deliver explosives and detonators to the various sections of the mine, or, in case the men's individual containers are filled on the surface and hauled in the car, the men may claim these directly from the car at some central station underground. To facilitate this, each man's container should be marked with his check number.

Miners should be equipped with non-conductive boxes or bags in which to carry explosives to their working places and no explosive should be issued to a miner unless he brings such a container to receive it. If the miner does his own shooting, he should also have a separate, non-conductive container for detonators.

If shot-firers are employed, as in many coal mines today, they usually carry the detonators into the mine—only the explosives being sent in by powder car—and should, of course, have non-conductive, waterproof containers. A very satisfactory type of container for electric detonators consists of a canvas belt with compartments for individual detonators which is folded and placed in a leather case with lock and carrying strap.

A record should be kept at the distributing magazine of all explosives and detonators issued to miners and shot-firers. Any powder or detonators left over at the end of the shift should be returned to the magazine at the end of the shift by miner or shot-firer and this should be issued to him again on his next shift. If any part cartridges remain at the end of the day they should be left in a moisture-proof container and used the next day.

If explosives and detonators are not sent into the mine in special powder cars, it becomes necessary to provide safeguards for their transportation by miners and shot-firers. If the latter are employed, they generally carry the detonators and the miners the explosives. Sometimes the shot-firers carry both explosives and detonators. If miners do their own shooting, they carry both. The same safety regulation should be enforced under all these conditions, namely, that explosives and detonators be carried in separate non-conductive cases. For men to carry blasting caps or electric blasting caps in their pockets is a not uncommon but highly dangerous practice. Every available means should be used to prevent it.

The next problem of safety that arises is what the miner shall do with explosives after they reach his working place and before they are loaded in the bore holes. Where the explosive is delivered in the case, probably the safest method is to open the case and place the cartridges in a wooden

box provided for the purpose at a considerable distance from the face, and lock the box. Explosives taken into the working place in a carrying container can be locked up in such a box, container and all, or the container can be placed in a cubby-hole cut in the rib of a crosscut. If the miner has detonators, these should be locked up in a separate storage box or put in a cubby-hole, either one being at least ten feet distant from the box or cubby-hole for explosives. In a crosscut, the cubby-hole for the explosives may be on one side and that for the detonators on the opposite side. All such cubby-holes should be from six to ten feet distant from the track and from trolley wires. To leave explosives or detonators lying on the floor where they may be stepped upon, or run over, or struck with tools or may come in contact with electric currents is inexcusably careless and invites disaster.

The disposition of explosives and detonators left over at the end of a shift has a very important bearing on safety. Aside from the danger that if left in the mine they may be accidentally exploded as by a fall of rock, for example, there is also the hazard that explosives or detonators or electric squibs which have absorbed moisture from the mine atmosphere will cause misfires. If at all possible, left-over explosives, detonators and squibs should be taken out of the mine and stored in the proper magazine. If they must be left in the mine they should be placed in a moisture-proof container and this locked up in a wooden box. Of course, explosives and detonators should never be left in the same container or in the same box.

Loading Bore Holes

The most important precautions to prevent accidents in loading bore holes are to protect the explosives from all grinding friction and from sparks and flame. These are the most frequent causes of premature explosions.

It is always dangerous to force a cartridge into a bore hole. The best means to prevent cartridges from getting stuck in bore holes are to order cartridges of the proper size to slide easily into the hole, to keep the drill bits up to gauge, and to have the holes drilled as straight and even as the nature of the seam will permit. If a cartridge does become stuck, efforts to dislodge it should be made only with a wooden tamping stick or block, never a metal bar or a drill steel or an auger, and the wooden implement should be used only to exert a firm pressure, never a quick, sharp blow. Undoubtedly, there are times when the hazard of dislodging a stuck cartridge is so great that it would be wiser to let it alone, put the primer in and fire the hole.

It is sometimes desirable to tamp the explosive solidly in the bottom of the hole, but this should never be done by violent use of the tamping stick. Moreover, the tamping stick should always be a wooden rod cut square across and having no metal parts. If the tamping is done too violently, so that the rod penetrates the cartridges of explosives, there will also probably be some explosive smeared on the sides of the bore hole. The grinding of a heavy metal or metal-tipped rod against the sides of the hole may strike a spark which will explode the powder smeared there and lead to the premature explosion of the charge. Some metals, such as lead, copper, brass, bronze and babbitt, are less likely to strike a spark than iron and steel, but the weight of any metal or metal-tipped rod makes it a dangerous implement for tamping explosives.

The most important precautions that should be observed in loading permissible explosives in coal mines are designed to prevent accidents from misfires, burning charges

and blown-out shots rather than accidents in the process of loading. The chief of these precautions are to clean all dust out of the bore hole, to place all the cartridges for a charge in the mouth of the bore hole one after another with the part cartridge, if there is one, at the back end of the column with its cut end toward the back of the hole, and push them back all together, and to tamp holes with clay, sand or other non-combustible stemming which has sufficient weight and cohesiveness to pack solidly enough to prevent the shot from blowing out.

Tamping holes properly also precludes the dangerous practice of short fusing, which is still followed despite the fact that it is contrary to law in many states, and which is responsible for many accidents. Short fusing is so hazardous that if it can not be stopped by any other measures, electric firing should be substituted.

Of course, permissibles are the safest of all explosives for coal mining and the only type that should ever be used in gaseous or dusty mines. In non-gaseous mines, pellet powder, in turn, is safer than granular blasting powder. The chief safety feature of pellet powder lies in its compressed form and paper wrapper; therefore, the pellets should never be crushed in the bore hole nor should the wrapper be taken off. The chief danger of granular blasting powder is its great inflammability; therefore, it should be vigilantly protected from sparks and flame. When pouring powder from keg to jack and when making up cartridges, the miner should always remove his cap lamp, unless it is an electric lamp, and place it a safe distance away in the direction opposite to that from which the air current is coming. He should try to avoid spilling powder and should always close the keg or jack immediately after pouring powder out or in. Blasting powder kegs should never be opened with a pick.

Making and Handling Primers

The proper making and careful handling of primers is of first importance for safety in blasting. For an illustrated description of methods recommended see our Explosives Service Bulletin, "Making Primers" by Paul F. Lewis, August, 1929.

The most important point about putting the detonator in a cartridge to make a primer is to place it as nearly as possible parallel to the long axis of the cartridge and not across the cartridge in such a position that the pressure of pushing the primer into the bore hole may cause the end of the cap to protrude through the cartridge and scrape against the wall of the hole. Such friction against the cap might easily cause a premature explosion. Placing the detonator in line with the long axis of the cartridge and loading the primer in the hole so that the detonator points toward the bulk of the charge also decreases the dangers of blasting by aiding complete detonation and thus lessening the chances of unexploded powder, burning charges and noxious fumes.

If the miner wears any other kind of lamp than the electric lamp, he should remove it while making primers and place it a safe distance away in the direction toward which the air current is moving. At no time during the handling of explosives should a lamp be worn or carried in such a way that sparks or flame from it will come into contact with the explosives or that the lamp may accidentally fall into them.

All primers should be handled with the realization that their potentialities for doing damage are much greater than those of either the detonator or the cartridge alone. The greatest care should be taken to keep the wires of

electric primers from contact with charged rails, pipes and machinery and from stray currents, especially if the wires are not short circuited. The best insurance against premature explosion of electric primers is the use of short-circuited electric blasting caps, or of short-circuited electric squibs with pellet powder. And be it remembered that when short-circuited caps or short-circuited squibs are used, the short circuit should not be broken until the very moment of connecting them in the blasting circuit.

G. E. Announces

The General Electric Company announces a new line of electric brazing equipment to have wide application in all industries. The method and equipment involved are simple and inexpensive, and have many advantages over other methods of joining metals.

Brazing with this equipment is caused by the heat generated by the flow of electricity through carbon blocks. As these blocks offer high resistance to the flow of electricity, the heat generated is correspondingly high, and but small pressure is needed to complete the joint.

The equipment consists of a transformer, foot switch, and tongs for holding the carbon blocks and work. The sizes of the various parts depend on the size of work to be handled and joints to be made.

Anomalies of Vertical Intensity

(Continued from page 18)

ly, that the stations were taken in valleys below magnetic poles. Plain and plateau areas have the normal "high". Basalt may, however, also show reversed polarity due to folding, flowage, or tilting of the formation.

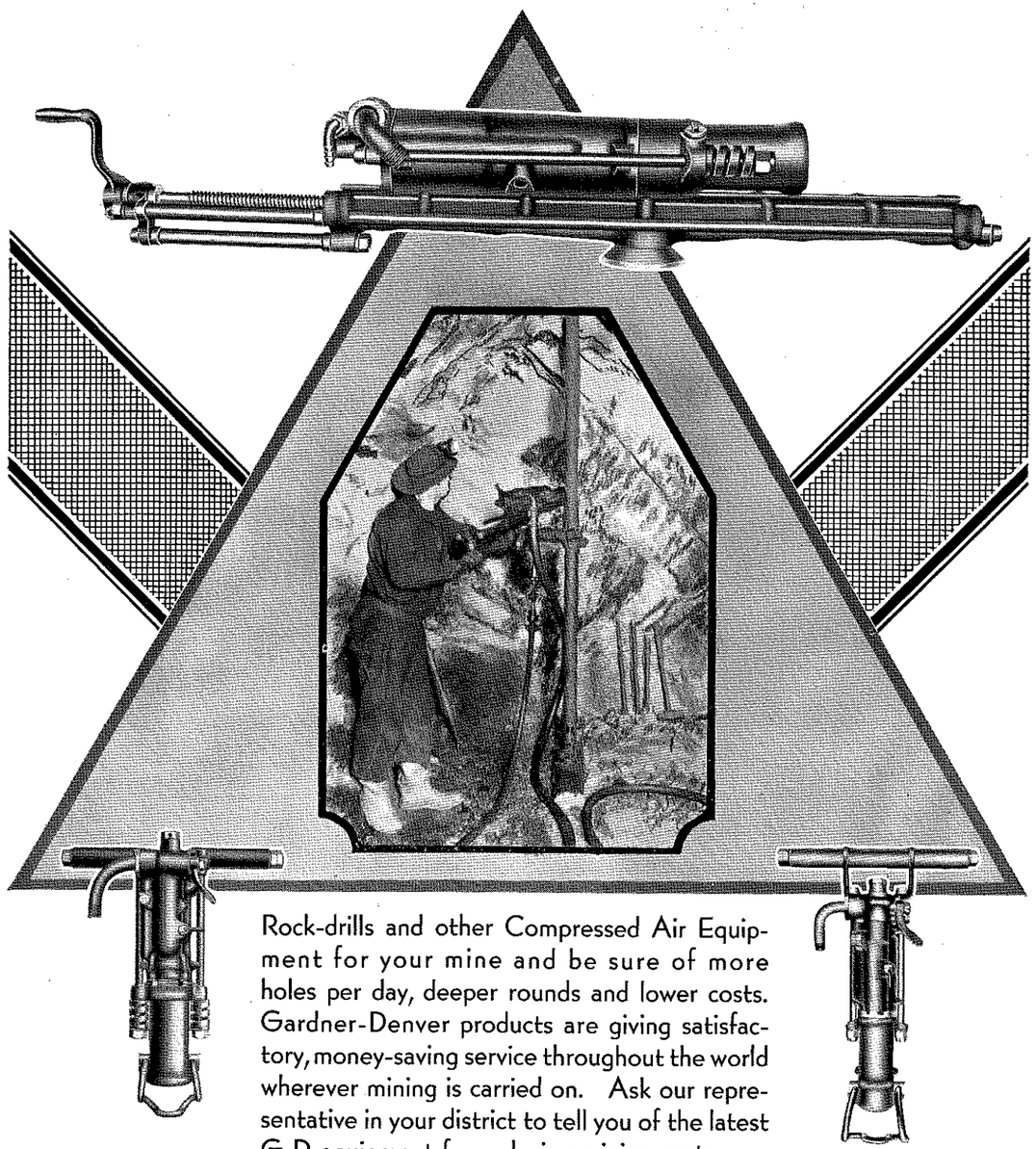
(6) Under certain conditions (Maine an apparent example) it seems possible that anomalies caused by topography may overcome or cover up those due to geologic structures.

Flat Tire

Sir: We hear a lot these days about moral support, but it seems to me that moral support is like a spare tire—without anything in it but air and usually very little of that.

—*The Desert Rat.*

GET THE BEST



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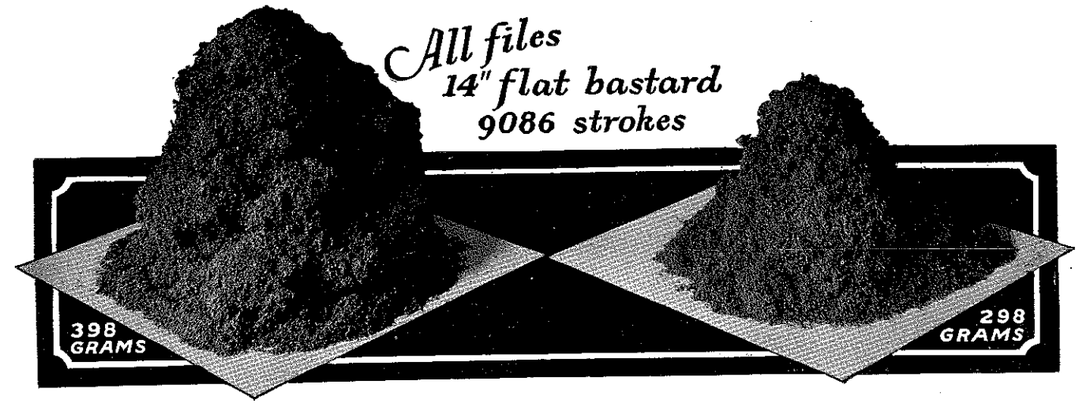
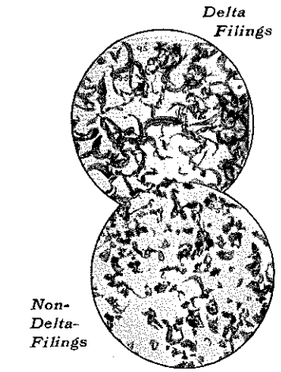


Do your files make chips or dust?



Filings from Delta and non-Delta 12-inch flat bastards. Enlargement, 5½ diameters.

THE TWO piles of filings shown above were made in a testing machine. Pressure, stroke, speed, number of strokes, and material of test bars were uniform, and duplicated hand filing as nearly as possible.

The Delta, with only *one* side tested, removed 398 grams of tool steel in 9086 strokes, and finished with that side still good. *Two* competing files were worn out on *both* sides: and they removed only 298 grams.

That test was not made by Delta, but by a large machinery builder who wanted to settle the file question once for all. They tested six well-known brands against Deltas. All six—their "pet" brand included—were badly beaten.

If you wonder why there are such amazing differences in file performance, use a lens. Delta filings are miniature chips, like those from a sharp lathe tool.

Because a filer is worth only as much as his file, it pays you to buy files that are really sharp.

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