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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 1873, 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 $5,000 toward the cost of the cornerstone. He has told that originally the government assumed control. He has told that originally the government assumed control. Therefore, as 1870; but the official date accepted now is 1873, the year in which the territorial government assumed control.

In his history of the School, M. R. Budd, ’24, has described in detail the ceremonies attendant on the laying of the cornerstone. In his history of the School, M. R. Budd, ’24, has described in detail the ceremonies attendant on the laying of the cornerstone. In his history of the School, M. R. Budd, ’24, has described in detail the ceremonies attendant on the laying of the cornerstone.

Three Score Years

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 of many have kept them on the road. The majority of these will finish the present school year and will receive professional degrees in May, 1931. The year will soon roll around. As 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

A MONG other things the dictionary tells us that "Inertia" is a "state of inactivity". When applied to Man, it is evidently a close relation to Inertness. One is a first degree of the other. Inertia affects the student body of a college, and will receive professional degrees in May, 1931. The year will soon roll around. As the finish line marks an end to what, in the future, will be looked upon as one of the pleasantest periods of life.

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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 Frosh week 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 Mines traditions. Fred C. Carstarphen, '05, 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 which was enjoyed by many of the new men.

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 the University of 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 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 welcome W. B. Jacobson as an instructor in the civil engineering department. Mr. Jacobson 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.

Another vacancy left in the physics department by the resignation of George Shue, '26, has been filled by Donald Dickenson. Mr. Dickenson is a graduate of Colorado Agricultural College and holds an M.S. degree from the University of Michigan.

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 recent 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 purpose is 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 catalog 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 Wibbelt, who was graduated from Mines in 1916, returns this year to do graduate work in the geophysics department. Kep Briefly, 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 Guntomos.

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 Hueneme Oil Co., for the past two years.

Scholarship Men

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

The Belgian Relief Committee has granted a fellowship to Sylvan Pheas. Mr. Pheas holds a degree from the University of Louvain, Belgium, and has done work in the University of Pittsburgh. He will study geophysical methods for prospecting. Charles F. Tatum 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.

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
Anomalies of Vertical Intensity

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

CHAPTER II—INTERPRETATION

The interpretation of magnetic or magnetometer results offers many difficulties yet interesting problems, the solution of which is 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 mounted 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 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 disarray 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 about by the oil geologist who remarked in jest at a geologist's meeting "What good are any magnetic "highs" if they can be worthless.

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 writer indicates that such may not always be the case, and possibly frequently is not. This assumed that 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 high, 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. Janosik Malkovsky and Mr. Dart Wearhead, 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 gabbro 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 horizontal 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-
magnetic reading since the pole acts against the magnetic field of the Earth. On the other hand a location 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 basement rocks, or formations, without a noticeable increase in magnetic intensity. This fact could be true when correlation was attempted for September, 1930

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, who reported that these results corresponded to corollar results obtained in states west of Minnesota and east of Ohio.

In general it was found that the magnetic effect at the point is due to the kind of material comprising 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 confirm with structure are those which are south of the extensive iron deposits and iron formations of northern 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 southern Ohio which are covered by glacial till may 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 write-ups. (See Chapters IV, V and VI.)
The question immediately arises, whether the zero isonomalics are to be magnetically negative while E and W are positive. South (S), East (E), and West (W) are assumed to be positive. Assume N and S are negative. A pole or structure which has no effect on the general regional structure. It shows such an effect it has been considered as due to a local anomaly, or where two or three stations very close together give such results. In this case, however, the hills were not high like the peaks to get high results, and if they did so the average would only be 'high' instead of 'low'. It would also be possible to locate a meaningful position without a large expenditure of time. The case local magnetic 'highs' may agree with geologic structure. It is quite probable therefore that the same effect 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 South Dakota where at one point two high stations were connected which later proved to be probably due to local poles in basalt on only the other side of a range that was magnetically negative. By drawing the zero isonomalics the other way the ridge was clearly shown while the 'high' at the location of the basalt. Fortunately, this condition was not common in the basin and was checked where found.

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 Geological 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 possible to locate a meaningful position without a large expenditure of time. The case local magnetic 'highs' may agree with geologic structure. It is quite probable therefore that the same effect 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 South Dakota where at one point two high stations were connected which later proved to be probably due to local poles in basalt on only the other side of a range that was magnetically negative. By drawing the zero isonomalics the other way the ridge was clearly shown while the 'high' at the location of the basalt. Fortunately, this condition was not common in the basin and was checked where found.

In the interpretation of the isonomal maps accompanying this work a number of assumptions have been made (a) positive anomalies over certain sedimentary areas, and negative anomalies in areas showing these structures. (b) increase of intensity with increase in the thickness of beds. There are two types of anomalies found in sedimentary areas. The first has the magnetic intensity increasing with the thickness of beds. (c) negative anomalies over oil structures where certain sedimentary areas are covered by a thick series of basalt flows. A comparable regional map was made with a topographical one and seemed to match very closely. In this 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 or eroded. In the second type it is difficult to determine whether the bed is removed or eroded. In the second type it is difficult to determine whether the bed is removed or eroded. In the second type it is difficult to determine whether the bed is removed or eroded. The article has been written for general purposes.

For September, 1929

Principles of the Hydro-metallurgy and Electrodeposition of the Metals

By Thomas P. Campbell

Dewatering and washing by means of centrifuges is not much used in hydraulic and industrial work, although very largely employed in many chemical engineering operations, especially in the sugar industry. However, centrifuging is essentially a batch process, and 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 concentration.

In the treatment of topography an interesting example was apparently encountered in the State of Maine. Comparison of the isonomal map with geologic structure or the results. The isonomal maps were compared with a topographical one and seemed to match very closely. In this 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 or eroded. In the second type it is difficult to determine whether the bed is removed or eroded. In the second type it is difficult to determine whether the bed is removed or eroded. The article has been written for general purposes.

FIGURE 11—The Class Classifier, Duplex Model "C". This 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 mounted rakes and beaters; the overflow is collected and conveyed to a second stage. Operation is continuous in character. The classifier is useful for continuous thickening, but for classifying as well. Cones (e.g., Taggart, op. cit., p. 1108. Taggart, Handbook of Ore Dressing, Sec. 17. Walker, Lewis & McAdams, op. cit., Ch. XL

APPARATUS AND PROCEDURE

First, for rather coarse particle classifiers like (Figure 10) may be used, but their power consumption is excessive in comparison with that of similar 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 classification as well. The "good old days" cones (Figure 11) were largely employed, not only for thickening, but for classification as well. The "good old days" cones (Figure 11) were largely employed, not only for thickening, but for classification as well. The "good old days" cones (Figure 11) were largely employed, not only for thickening, but for classification as well.

FIGURE 11—The Dorr Thickener, Duplex Model "C".

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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 sample, diluted to the desired consistency, with decanted parture from free-settling conditions. The rates should be converted into feet per hour. . . .

Let it be supposed that a test sample has been processed showing a proportion of water to solids of 14.0 to 1, and that after 17 hrs the pulp has settled to 1.13.1 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 62.4 = 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, there can be 0.87 water to 1 of solids, or 50% moisture. 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 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."

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

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

**EXAMPLE I—CALCULATIONS FOR DISCHARGED VALUE LOSS (All figures refer to solution tonsages) (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 per ton of ore.
(f) Displacement efficiency of filter, 60%; that is, 60% of the value of the solution in the solid cake, which is assumed to contain 33% moisture or 50 tons of solution to 100 lbs. 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.

**Equating out of and into each Thickener:**

1. $100W=100V+100X.$
2. $100X=60W+100V+500X.$
3. $100X=50X+100W+500Y.$
4. $100Y=100Z+400V+100X.$
5. $100Z=100Y+100$ tons of water.

**Simplifying:**

1. $V=1.0$
2. $W=0.5W=1.5625$
3. $X=W+5Y$
4. $Y=2Z+X+4$
5. $Z=0.4449$

**VALUE Loss = $3.3439—0.0563 = $3.2876** lbs. Mechanical loss of cyanide per ton of ore.

**EXAMPLE II—CALCULATIONS FOR DISCHARGED VALUE LOSS (All figures refer to solution tonsages) (See Figure 15)**

**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 value in dollars per ton of solution discharged from the respective Thickeners.

**Equating out of and into each Thickener:**

1. $V=1.0$
2. $100W=100V+100X+500Y.$
3. $100X=500Z+100W+500Y.$
4. $100Y=400V+100X.$
5. $100Z=100W+100Y.$

**Simplifying:**

1. $V=1.0$
2. $W=0.5X+1.25$
3. $X=W+5Y$
4. $Y=Z+0.3906$
5. $Z=0.03556$

**VALUE Loss = $2.51111—0.02 = $2.49111$ lbs. Mechanical loss of cyanide per ton of ore.**

To check these figures:

1. $W=1.25$ $V=2.51111$
2. $X=2.09389$ $Y=1.00111$
3. $Z=0.39066$ $F=0.02$
4. $Z=0.39066$ $F=3.189$
5. $F=0.0563$

**Amount due to neglected decimals:**

$0.015$ and $0.003$
The C. S. M. Magazine

Canadian Institute Meets

Mining men and others interested in the development of mining enterprise in Canada gathered in the annual 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 the Hudson Bay Mining and Smelting Company was shown all the great, modern mining plant that has been installed to handle the output of ore from Canada's newest big mine. At Flin Flon, the new plant is to handle the 3,000 tons of ore to be taken out of the mine every day of the year was opened to close inspection. The open pit operation, where previously high grade material was uncovered, with the immense electric shovels scooping out 2,000 tons per day of ore, was of especial interest to those unfamiliar with the manner of mining practice. Mandy's well-known sight-seeing and the more recent mining operations were also visited.

The history of development and organization at Flin Flon mine, by W. A. Groen, 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.

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

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.
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—

Harry Mathews, '13
district manager
Stearns-Roger Mfg. Co.
denver, Colorado

William Mathews, '11
Williams Oil Well Plug Device Co.
Selling oil by recovery by pressure control
1312 S. Clark Ave.
Tulsa, Oklahoma

John H. Wilson, C.E., '23
Consulting geologist and geophysicist
Box 157
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.

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for September, 1930
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 required tension, the method is used to load 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. The cables are supported upon steel towers. The track cable is made of high tensile strength wires of such a cross-section as to withstand the rolling and pounding that is developed in the carrier. The carriages have four wheels, twin wheels, mounted, and by their light pressure insures 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 controllers to which are connected hand brakes. To prevent the traction rope from slipping when under moderate tension, 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 through spokes to the shaft and keys, as has been done in the past. Helical teeth on cut treated steel are used in the speed reducers next to the motors. The big gears are oil lubricated. The handbrakes disengage into a belt converter 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 of supplies is just as important a freight as ore, so everything has been given to ways of facilitating its delivery. The tramway went into service without difficulties and in a short time, under Mr. A. F. Andrews, 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 the non-ferrous minerals. The United States Bureau of Mines. The uses of these minerals are enormous in number and when pure, they are much sought for and command a relatively high price. The separation of pure quartz and feldspar not only occurs contaminated with other minerals, the United States Bureau of Mines, in cooperation with the Department of Geology and Mineralogy 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 commercially feasible process is now on the horizon.

In order to assist the mining industry to devise a commercially feasible process for the separation of quartz and feldspar, the United States Bureau of Mines, in cooperation with the Department of Geology and Mineralogy 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 commercially feasible process is now on the horizon.

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

With Mines Men in Print

Two papers dealing with geology and written by Mines men appeared in June. One, a discussion of "A Dry Mill Fracture Determination System," by Samuel G. Lucky, 22, was published in the American Journal of Science. The other, a bulletin for the Penn State School of Mineral Industries, is entitled "Production Data on Appalachian Oil Fields." All these of the papers here are available in reprint form.

The recent research on beryllium alloys allows with the thought of its use in aerospace construction has received such public attention that the United States Bureau of Mines. The Bureau of Mines, in cooperation with the United States Department of Commerce, produced 9,801,060 cubic feet of helium in the year ending June 30, 1930. This was the first year in which the plant was operated at full capacity, as it is capable of producing 24,000,000 cubic feet per year. Its output in 1930 was remarkable accuracy, but much regarding physical conditions remains a closed book.

The successful engineer and geologist of the future must be smart enough 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 to 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 bulky 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 5,938,000 cubic feet of helium in the year ended June 30, 1930. This was the first fiscal year after the plant was constructed. 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 of the last quarter was only a fraction of its present capacity, while the plant was operated at full capacity, as it is capable of producing 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 comes from coons that died of suffocation. —

The C. S. M. Magazine

for September, 1930

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. The determination 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 4.

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The Royal School of Mines of Spain

Courses of study in the mining schools of America and Europe, especially Spain, are compared by Eldorado Roca, traveling fellow from the Royal School of Mines of Spain, in the August issue of the association magazine.

Mr. Roca writes the curricula of most of the mining schools in Europe, especially Spain, are divided into mining, metallurgical or geological engineer specialization. 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. Madrid discovered the smelting process for silver in 1557. Spain's present importance in the mining industry is due not only to the mines of Almadén and Rio Tinto, but because the copper mines can be found in sizable quantities. An American mining engineer recently returned from the mining 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 graduates in the United States is equivalent to the degree of "bachiller" in Spain. In old times this law had to have this degree in order to have the title of "Doctor" and as it is now a requisite 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 also requires the student to secure some practical experience during the last two years of the course.

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

The school also requires the student to secure some practical experience during the last two years of the course. Following the World War, he commanded the 20th Regiment of Engineers and later was in command of the 1st Unit for the coming year. Captain Johnson will succeed Captain Henton R. Cole who has been transferred to Louisville, Kentucky. The Pittsburgh meeting, September 11-13, will be the first full meeting of the new Coal Division. Special programs on underseale and bituminous coal preparation have been arranged, with other papers on general subjects. Inspection trips to coal cleaning, burning, and cooking plants will occupy the last day.

The new head of the Mines Military department comes to Colorado from Rock Island, Illinois where he has been a foreman in the United States district engineer. He has been actively engaged in the river regulation work for the six-foot channel in the upper Mississippi. Professor Roscoe W. Morton, head of the mechanical engineering department, is the youngest full professor and head of a department in any Colorado educational institution.

Youngest Professor

CAPP, F. M. S. JOHNSON

Capt. Frank M. S. Johnson, U. S. A., will take charge of the Colorado School Mines R. O. T. C. Unit for the coming year. Captain Johnson will succeed Captain Henton 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 Engineer 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 Worden, 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, programs together covering almost the entire range of interest of the members of the Institute, have been announced for the fall of 1930. In a little more than a month, meetings will be held from Pennsylvania to Oklahoma, and from Texas to New Mexico. The Royal School of Mines of Spain, is the head of the seven foremen schools located in different Spanish cities. The school also requires the student to secure some practical experience during the last two years of the course.

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

For year 1931, the officers of the United States Civil Service Commission announces the following open competitive examination: Assistant Ceramic Engineer, $2,000 a year; Assistant Topographic Draftsman, $1,800 a year; Assistant Topographic Draftsman, $1,620 a year; Junior Topographic Draftsman, $1,440 a year.

Youngest Professor

Harold E. Harris, '24, was critically injured when the steering apparatus of the automobile he was driving gave way and the vehicle plunged seventy-five feet to the D. & R. W. tracks near Junafer, Colorado, the evening of August 20. In the crash, his wife, Mrs. Harris escaped with slight bruises.

The four sons left their homes in Durango and were on their way to a dinner party at Rifle 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 injured severely to the extent that he lay unconscious for days. He was left at home by his family, and was left at home by the accident. Mrs. Harris of Durango, has gone to Durango to be with her son during his convalescence.

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The premonition做梦家 are at it full blast already. Spooks writers who are fledged as those in the know (or who claim to be themselves as) are predicting Colo­
rado University to repeat this year in the Eastern Division. No one seems to doubt the power of Utah in the Western half of the nation. The "Big show", according to the bookies, is still Utah, Colorado University, Denver University, Colorado College, Colorado Aggies and the Utah Ag­
ows. However, "big" means of that sort, self-styled "Big six" may be, they cannot be entirely deaf to the thunder­
loud cry of the sea unless the wave is strong. The observer in the bowl may be noise in 1929 number of this magazine.

A mining company which runs several mines received a large order for explosives. The order was for several boxes of straight dynamite such as is used in mining. The cost of the order was $50.00. A contract study of the accounts showed that this was the work of financing corporations. Of extreme value to business executives and investment bankers and dealers.

The Rocky Mountain Progress. (Miscellaneous Sec. 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 pur­
chase, wages, tax payments, freight and passenger move­ments, etc. Figures are given for 1928 and to September 30, 1929.

A Source of Mine Accidents of Which One Seldom Hears

A mining company which runs several mines among its many projects, is of the opinion that the type of gale, the type of ground, or the wind, is the cause of most of the accidents in this region. The company has a large number of men in charge of the mines, and these men have been instructed to report any accident which occurs, no matter how small. The reports are then sent to the company's head office, where they are carefully studied.

The result of letting this straight dynamite go into the mines was that all the miners returned to the places where they had been working, and the company immediately stopped the work of dynamiting the mines. A new company was formed, and the new company has been advertising its dynamite as being safe.

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The C. S. M. Magazine

A Baker’s Dozen

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 first year will be eligible this season.

Ted Adams of the 1928 team is back in loo, and there are: Burrell, True, Rice, Peaker, Bonnett, Bond, Pressett, Michaelson, Adams, Eads, Marker, all of last year’s team.

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 Mole has been promoted and will assist Allen in the coaching of the football team. Mole will also be in charge of basketball. A new man has been added to the staff, Dave Powers, who will act as engineer and French Coach. Further, he will help Mole round out the basketball candidates this winter.

The Colorado Alumni

SCHEDULE

Oct. 4—D. U. at Denver
Oct. 18—C. U. at Boulder
Oct. 25—G. T. C. at Golden
Nov. 1—W. S. C. at Golden
Nov. 11—Regis at Denver
Nov. 27—C. G. at Pueblo
* Homecoming Day.

If you are in Colorado during the football season—

Be At the Games

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 storage 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 said, 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.
SOLUTION or MR. CARSTARPHEN’S PROBLEM

To congratulate you for the splendid way

more. This one kept me away from the
time to help Professor Adams’ student

of the Magazine. I hope it will arrive on

the problem appearing in the last issue

Mr. C. Lorimer Colburn,

HUBAR &

C.

S

BOSTON BLDG., DENVER, COLORADO

TOTAL NO. OF BALLS IN THE PILE.

Let n = 0

where “n” can be zero or any positive

digit is 4. Or expressed algebraically:

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

Now let y—one of the five equal parts

etc. etc.

June 21, 1930.

Dear Mr. Colburn:

My maturing address for your requests

for and for the Magazine should be changed

because the value of an ounce of gold in-

creases as the cost of production lessens,

and during the recent high wages the

many of our members have been going round

in the States have been going round

world there has been no beer). Some of the

members there were not dampened in the least.

“Tex” Stanfield was the last and thir-

dest man to show up, but Tex was evi-

dent he is doing everything from aereal

in the capacity of geologist, and informs

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The actives entertained the new men at Mines campus; and an honorary member. honorary, are the S. G. E. pledges. Hays, Harry McFarland, Luther Demp­ing two. The new pledges include four juniors, eight men, 'Puesday evening, September 2. the frosh pranced about the stage giving their command performances, the old lady was looking for some­ thing to the life of the town and the life of the campus. From North to South, the old lady, had tried to blast her lines! The white above the green. The fresh have painted well! Talk to the old lady, not from the air and the debt! May all her boys be brave and bold and stand the test of time! As to the days of old! In every land and time! —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.”

—Tommy Northrop, '32.

Knutson-Graves

A Mines romance of long standing was celebrated at the Campuses. Diane and Ivan G. Burrell. were married in Denver August 20. Diane, who received his master’s degree last year, is an instructor in the University of Iowa and she and the bride have made their home in Iowa City.

McBriar-Bryan

A Mines commerce of long standing was celebrated at Mines campus when Miss Frances Bryan, of Golden, was married to Mr. McBrian. 23, at St. Simon’s church, Oklahohn. The couple departed the same day for a honeymoon in Yellowstone Park.

Knuteson—Graves

The old lady was looking for something to the life of the town and the life of the campus. From North to South, the old lady, had tried to blast her lines! The white above the green. The fresh have painted well! Talk to the old lady, not from the air and the debt! May all her boys be brave and bold and stand the test of time! As to the days of old! In every land and time! —Tommy Northrop, '32.

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Colorado College and the School of Mines Alumni Association has the responsibility of keeping their alumni and friends informed about the latest developments at the Colorado School of Mines. The Alumni Association has the goal of keeping its alumni associated with the school and its activities.

The Alumni Association also sponsors various events and activities, such as reunions, athletic events, and social gatherings, to encourage alumni to stay connected with the school and each other. It also promotes the school's mission and values and contributes to the overall success of the institution.

The Alumni Association is focused on ensuring that the school's legacy continues to be preserved and that its alumni remain engaged and committed to the institution.

If you are interested in learning more about the Alumni Association or getting involved, you can visit their website or contact them directly.

For more information or to get involved, please visit the Colorado School of Mines Alumni Association website or contact them directly.
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 business 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 wishes to experience the results of decreased production; no laborer or workman wants to look forward to a time of cut wages and unemployment.

The turn in the curve upward, however, begins where the break begins, it is difficult to determine. A study of the situation following the last depression reveals that the increase in sales while the firms that had "believed in advertising" were able to show a 31 per cent increase in sales while the firms that had "believed in advertising" were able to show a 31 per cent increase in sales while the firms that had "believed in advertising" were able to show a 31 per cent increase in sales while the firms that had "believed in advertising" were able to show a 31 per cent increase in sales while the firms that had "believed in advertising" were able to show a 31 per cent increase in sales while the firms that had "believed in advertising" were able to show a 31 per cent increase in sales while the firms that had "believed in advertising" were able to show a 31 per cent increase in sales while the firms that had "believed in advertising" were able to show a 31 per cent increase in sales while the firms that had "believed in advertising" were able to show a 31 per cent increase in sales while the firms that had "believed in advertising" were able to show a 31 per cent increase in sales while the firms that had "believed in advertising" were able to show a 31 per cent increase in sales while the firms that had "believed in advertising" were able to show a 31 per cent increase in sales while the firms that had "believed in advertising" were able to show a 31 per cent increase in sales while the firms that had "belie...
EXCEPT on the tread, you can machine a Card Wheel any place as smoothly and easily as mild steel. Yet the tread is so hard and well chilled it is almost impossible to wear it out. Such construction is the result of our 37 years' experience in what miners demand from mine haulage.

Complete Laboratory Equipment

DENVER "BUB A" FLOTATION MACHINES
DENVER CONCENTRATING TABLES
DENVER BALL-ROD-TUBE MILLS
DENVER PRESSURE FILTERS
DENVER REAGENT FEEDERS
DENVER BATCH BALL MILL
DENVER ROCK CUTTER

Write Today for Bulletin-2904-C

DENVER EQUIPMENT CO.
1309 14th Street - Denver, Colorado

Telephone MAIN 6135 Cable "DECO"

Several compartments, a larger one, opening from the side of the one, 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 circuit fall on it. It should be attached to the preceding car by non-conductive ropes. The powder car should not 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, they are relative positions 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 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 man 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 both the detonators into the mine. The explosives being sent in by powder car—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, but are brought in by other means, proper safeguards for their transportation by miners and shot-firers. If the latter are employed, they generally carry the detonators. The miners are supposed to carry the tamping and the tamping is done too violently, so that the rod penetrates the cartridges of explosives. This may lead to the premature explosion of the charge. 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.

The most important precautions that should be observed in loading bore holes are to protect the explosives from all grinding friction and from sparks and flame. There 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 is 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 tampering stick and not with 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.

The grinding of a heavy metal or metal-tipped rod against the sides of the bore hole may lead to the premature explosion of the charge. 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.

The most important precautions that should be observed in loading permissible explosives in coal mines are designed to prevent accidents from misfires, burning charges...
Temper the costs too, with the DFC Oil Forge

For here is a forge economical in fuel, maintenance, and operating time. Drills are under observation at all times and loss of steel is held to a minimum. Intense heats are quickly secured. Special air-curtain protectors control Clay linings are easily replaced without interfering with the operation of the forge. New steel is so hardened that if it can not be stopped by any other measures, electric forging should be substituted.

Tempering holes properly also eliminates 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 heating is so hazardous that it can not be stopped by any other means, electric forging should be substituted.

Of course, permissible are the safest of all explosives for coal mining and the only type that should ever be used in gas or oil mines. In non-gasous mines, pellet powder, in turn, is safer than granular blasting powder. 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 an electric lamp, put it a safe distance away in the direction opposite to the one 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 bore 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 point toward the bulk of the charge also decreases the danger of blasting by aiding complete detonation and thus lessening the chances of unexploded powder, burning primers and explode fumes.

If the primer were 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 explosive or lamp may accidentally fall into them.

G. E. Announces

The General Electric Company announces a new line of blasting 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

Sirs: 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

IRA C. BOWER, Pres. & Trst.

Positions Open

Men are wanted for following jobs:

1. Young engineers who have been engaged in the oil fields. Drilling experience essential. Around thirty years of age, preferably unmarried. Good personality, energetic. * * * * * * * * * * * *


Submit copy of service record. Write at once.

$11 S. A. Johnson Building Denver, Colo.

C. S. M. Alumni Capability Exchange

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C. S. M. Alumni Capability Exchange

Structural Steel and Ornamental Iron

The Midwest Steel and Iron Works Company (Incorporated)

Office No. 25 Larimer Street, Denver
GET THE BEST

Rock-drills and other Compressed Air Equipment for your mine and be sure of more holes per day, deeper rounds and lower costs. Gardner-Denver products are giving satisfactory, money-saving service throughout the world wherever mining is carried on. Ask our representative in your district to tell you of the latest G-D equipment for reducing mining costs.

GARDNER-DENVER COMPANY
QUINCY, ILL.  DENVER, COLO.

Do your files make chips or dust?

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 file is worth only as much as its file, it pays you to buy files that are really sharp.

DELTA
1 SIDE - STILL GOOD

All files
14" flat bastard
9086 strokes

“C” BRAND
4 SIDES - WORN OUT

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