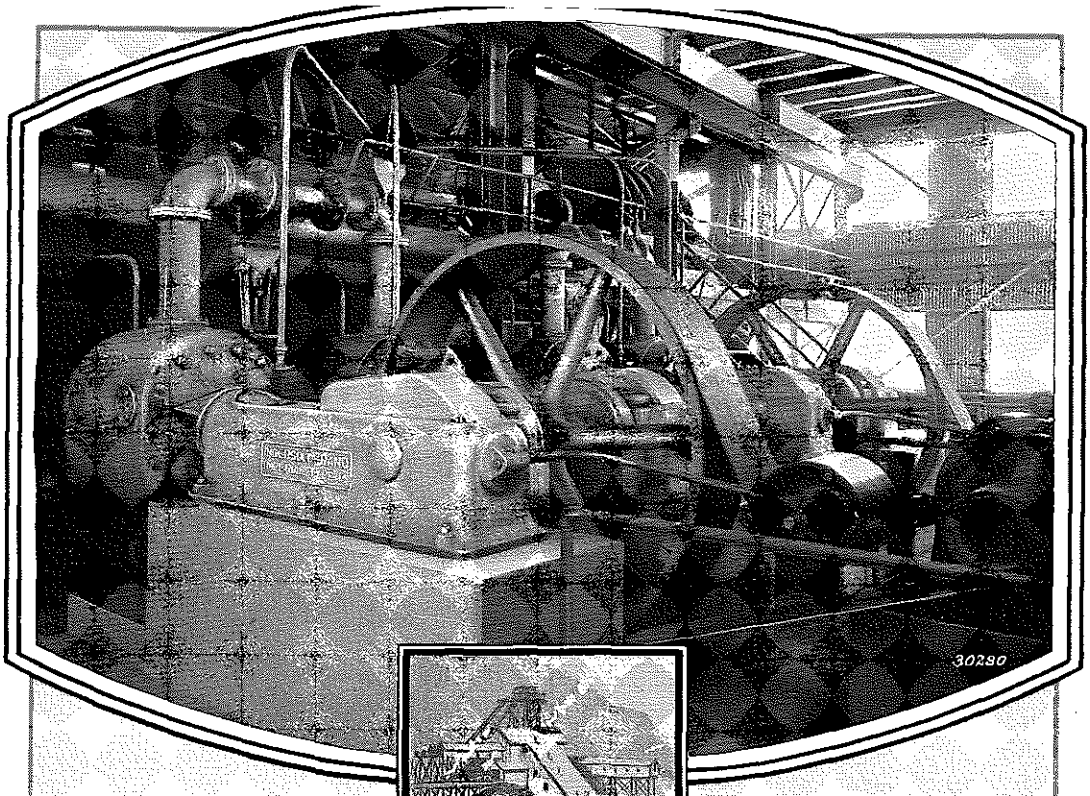
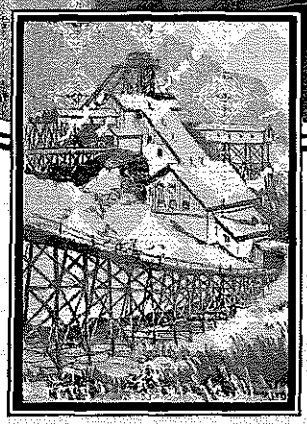
The
COLORADO SCHOOL OF MINES
MAGAZINE

Volume 20 No. 1 *January 1930*

The Pick of the Season





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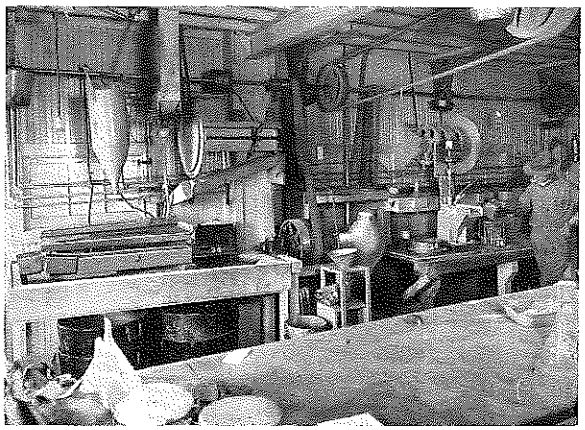

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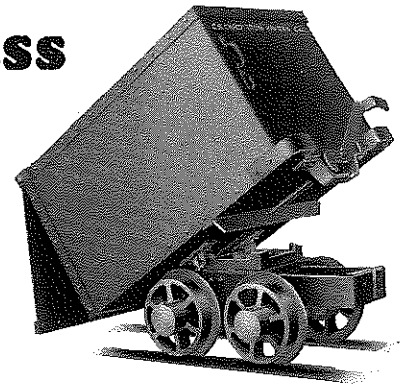

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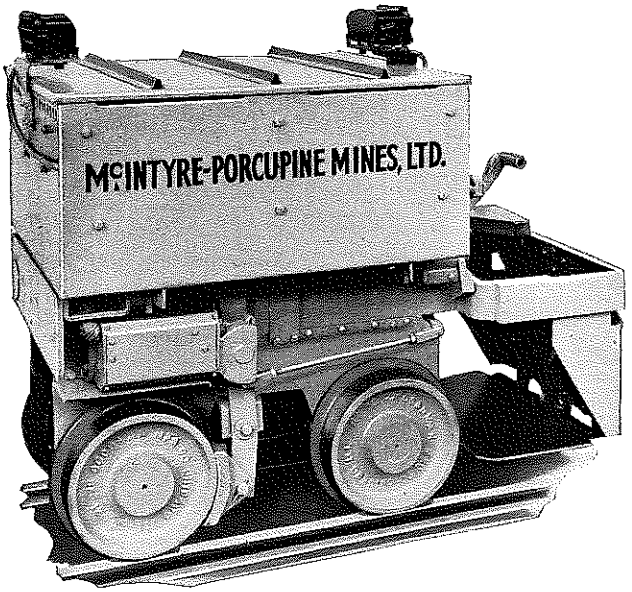

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Engineer's Day January 23

Engineer's Day is now a traditional affair held annually at the Colorado School of Mines. The Engineering Council of Colorado sponsors this Day, and their past programs have been much appreciated by those attending.

The speaker of the Day, January 23, will be Henry McAllister, an attorney of Denver. Mr. McAllister is well acquainted with the intricacies of mining law. His address is expected to be particularly interesting to the engineers of the mining fraternity.

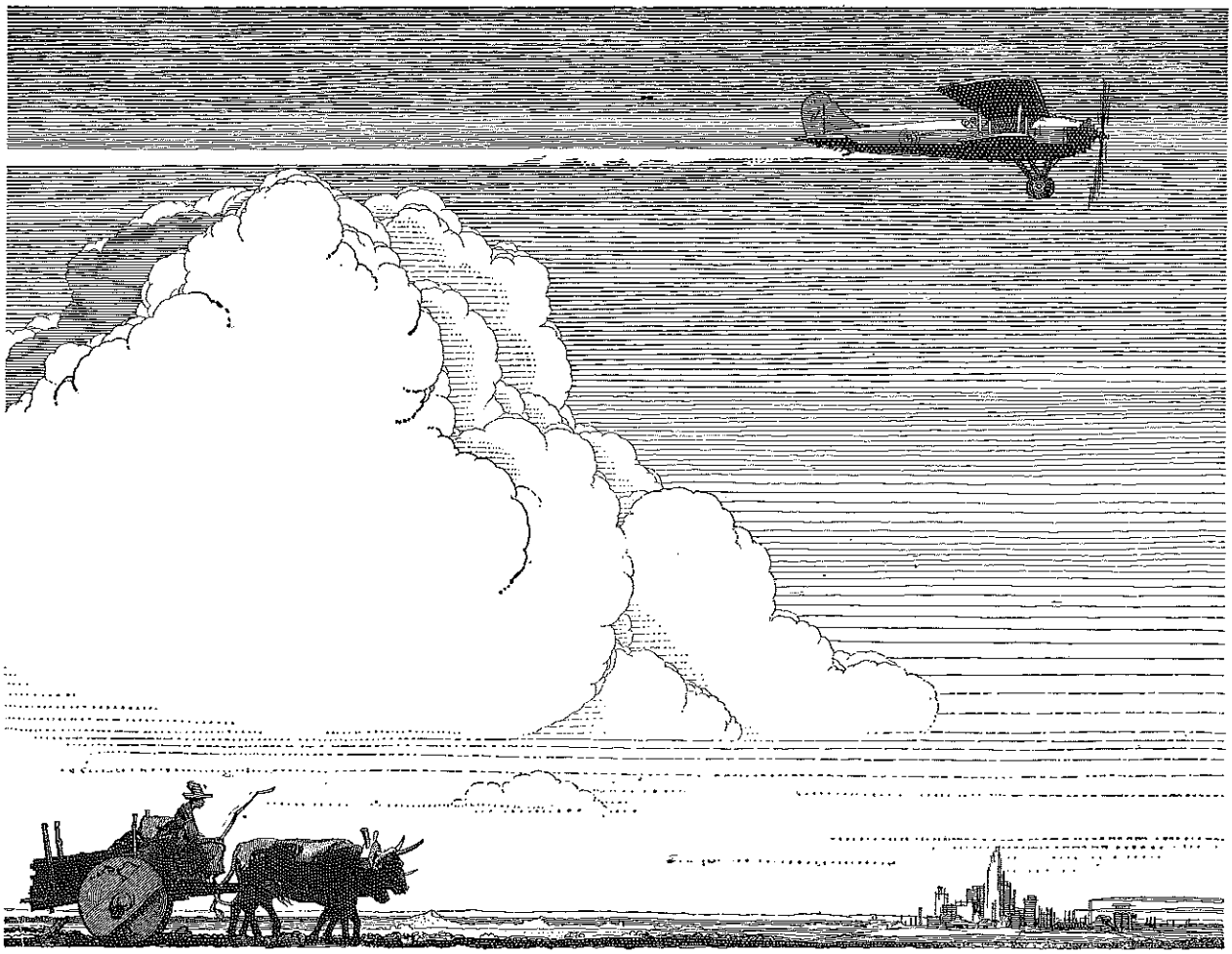
Many prominent Colorado engineers will be present. Every Mines Alumnus who finds it possible to attend is urged to do so. Preparations are being made for a large number, and the Alumni must be well represented.

In addition to the address of the Day, the program includes the ceremony of the presentation of the first medal ever to be given by the Colorado Engineering Council in recognition of meritorious work in the field of metallurgy. The recipient of this medal has not yet been announced. There will be a band concert, and inspection tour of departmental exhibits at the School and Experimental Plant, and a dinner at the Berrimoor Hotel in the evening.

Do not forget the date, Alumni, and come.

Engineer's Day, January 23

Colorado School of Mines



UP FROM THE OXCART

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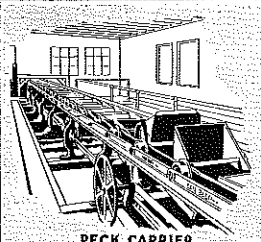
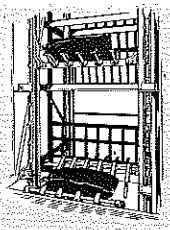
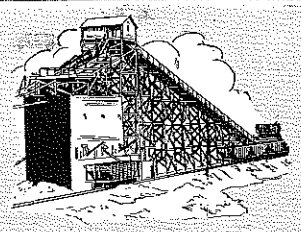
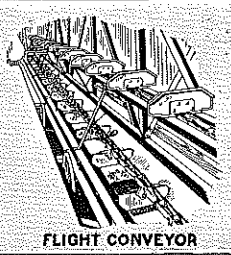

PECK CARRIER


BAG ELEVATOR


SAND AND GRAVEL WASHING PLANT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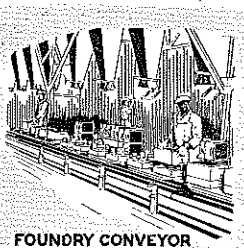
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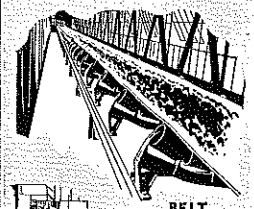
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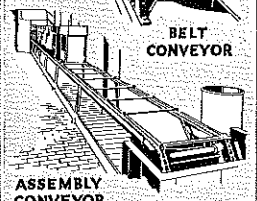
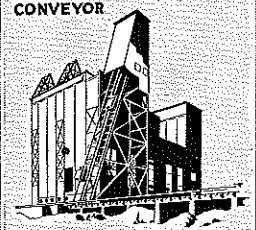

ASSEMBLY CONVEYOR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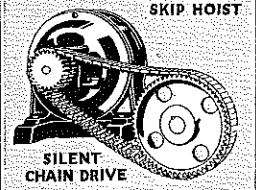
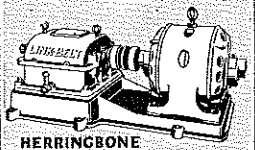
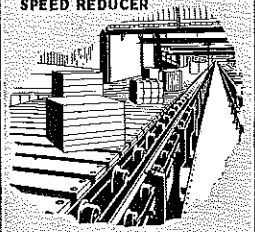

SILENT CHAIN DRIVE


HERRINGBONE SPEED REDUCER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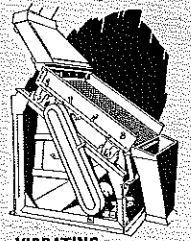
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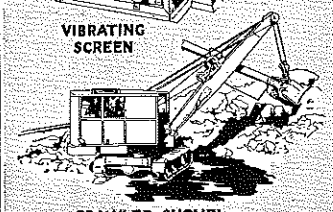
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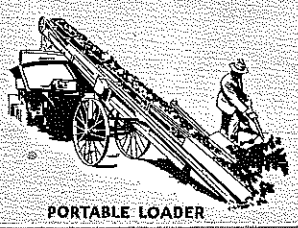
PORTABLE LOADER


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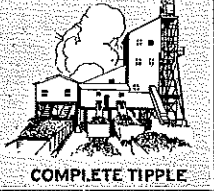
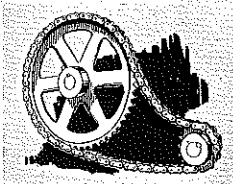
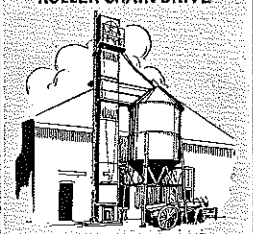
JAK-TUNG TRUCK


COMPLETE TIPPLE


ROLLER CHAIN DRIVE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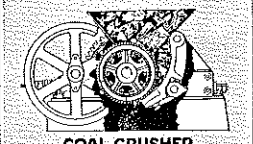
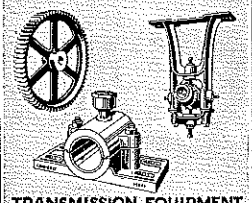

COAL CRUSHER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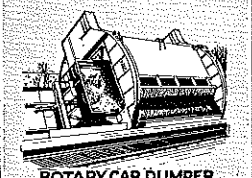
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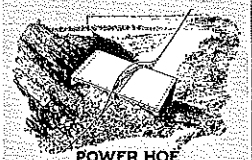
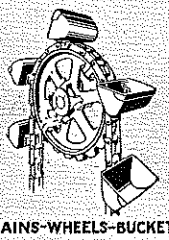

POWER HOE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The
COLORADO SCHOOL OF MINES
MAGAZINE

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One dollar and a half a year

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COURTNEY BALLAGH - - - - *Southern California*
E. E. THUM - - - - - *New York Section*

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LOCAL SECTIONS

COLORADO—F. E. Briber, *President,* J. H. Winchell, *Secretary,* Golden, Colo. Regular monthly luncheon at Auditorium Hotel, January 17, at 6:00 P. M.

GREAT LAKES—A. L. Lynne, *President,* 100 North La Salle St., Chicago. Morton Frank, *Secretary,* 4538 Drexel Ave., Chicago.

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WYOMING—Dudley L. Rankin, *President,* Midwest Refining Co., Midwest, Wyoming. E. W. Ginet, *Secretary,* 139 N. Grant St., Casper, Wyoming.

Editorial Comment

Secretary's Letter

Happy New Year, Fellow Alumnus:

May Good Fortune follow you and stay with you during the coming year!

So far for the greeting—

January 1st is the time to recapitulate. It is the beginning of a new year. The books for the old year were closed on December 31st to which let us turn and analyze the activities undertaken and the results accomplished with a view of planning more wisely for 1930 so that our accomplishments will be larger.

In some respects 1929 was not as big a year as 1928. The Alumni Association was revamped in 1928 and the Foundation was incorporated. Everyone was enthused and many of our fellows worked hard to get things started. But we didn't keep up the pace so there was a slump on the part of many; the renewed interest of others, however, kept the batting average up fairly well.

On January 1st, 1929 we had 875 members of the Alumni Association. On December 31st the number had increased to 952 members. That is an increase sure, but such a small one. We have nearly 1500 living graduates. Why haven't 1500 loyal Mines men stepped up and joined the Association? The officers of your Alumni Association and the members of the various committees, without one cent of remuneration, are giving of their time and are working hard to make the Association of greater value to the graduates of old Golden. Isn't the work of these men appreciated? If so, why then haven't they the wholehearted support of the entire Alumni?

Your Alumni Magazine is a success. It had a good year. Wherever it went it brought credit to the Alumni and to the School. It is appreciated by all who see it and has filled its field so well that it has won many new friends for Mines.

Many people judge a year's activity from the account books. Following is a statement of the Alumni books for the past year:

Jan. 1st, 1929, Balance.....		$1134.23
Receipts:		
Magazine Subscriptions and Advertising	$8188.11	
Dues, Life and Annual.....	1231.50	
Contributions	1911.50	
Miscellaneous	313.14	11644.25
		$12778.48
Disbursements:		
Publishing Magazine	$7724.28	
Office Expense	3201.02	
Miscellaneous	1304.37	12229.67
Dec. 31st, 1929, Balance.....		$ 548.81

Now in regard to the Foundation—The support of the Ways and Means Committee has not been as liberal as last year and, consequently, the Committee has not been able to do as much as it had planned. The present Ways and Means Committee was appointed by President Adami shortly after his election last May. The Committee needed $5,000 to continue the aggressive campaign for funds that had been started by the Ways and Means Committee of the previous year. An appeal was sent out, the response to which was disappointing. Only $1341.50 was received. The Committee had to do the best it could with this allowance. The expenses of the Committee to date are:

Foundation share of office expense.....	$ 777.65
Traveling Expense	431.14
Balance on hand.....	132.71
	$1341.50

These amounts are included in above statements for Alumni.

Needless to say no plan is being adopted which takes money. More responsibility is being thrown on the Local Sections. The success of the Foundation will depend upon the volunteer work of local men in all sections. The Southern California Section has taken the lead with a program to raise $100,000 for the Foundation. It is hoped that this lead will be followed by other local sections.

The Ways and Means Committee has approached several wealthy men for donations to the School. The inquiry has come from all of them as to what the Alumni have done. If the alumni thinks well enough of its own Alma Mater to make donations for its support then it is easier to interest outside men. The future of the Foundation movement and of MINES itself depends upon the Alumni. Let every loyal Mines man resolve to do his utmost to help the School and follow up his resolutions by lining up 100% with the Alumni.

(Signed) C. LORIMER COLBURN
Secretary

A World Figure

HUMAN progress has a fourth dimension that interferes with our charting its course in straight lines, and as engineers we need not think too exactly in terms of country or of nation. Conqueror of time and space, engineering is free from limitations of historic or geographic boundaries; the engineer is a world figure, or I may better say, the world is his."

This statement was made by George Otis Smith at a banquet for the World Engineering Congress in Tokyo the last of October, 1929. Mr. Smith's address was upon the international fellowship of Engineers.

It brings to our mind the world-wide distribution of the Colorado School of Mines graduates, and the cosmopolitan student body at the School. We have said many times that the School of Mines graduates are a force in developing international good will. The Engineering Fraternity as a whole can do more toward a common understanding among nations and world peace than any other group.

School of Mineral Industries

WE note that Penn State has renamed its college of Mining and Metallurgy. It is now called the School of Mineral Industries. This does not mean that the curriculum of the old College of Mining and Metallurgy will be changed to fit the new name. Rather, it means that the curriculum has been extended to the point where "College of Mining and Metallurgy" is a misnomer.

This is nothing new, but has been the trend of education in schools of mines for several years. M. R. Budd, formerly editor of this magazine and a graduate of the Colorado School of Mines, shows this trend in an article in the December *Explosives Engineer*. Two more articles are to follow, making a series of three on "The Trend of Mining Education."

The Colorado School of Mines long ago branched out to include in its curriculum instruction relating to all the mineral industries. A Petroleum course was added in 1921, followed by a graduate course in geophysical prospecting only a year or so later.

The Colorado School of Mines in actuality is a school of mineral industries, giving degrees in mining, metallurgy, geology, petroleum, and options in fuel engineering and ceramics. Yet to change the name of the Colorado School of Mines would be impossible! Those interested in the School must be educated to see that the Colorado School of Mines is a school of mineral industries without a change of name. The name *Mines* is too traditional to be changed. Wouldn't this sound flat: "Give 'em hell. Mineral Industries!"

He'd Make Sure

"I want to get some eggs that you are sure don't have chickens in them," said the woman to the shopkeeper.

"Well," he said, "I could put you up a dozen duck eggs."

Our Column

Editor Willis of *The Mining Journal* gives us almost a column in his November 15 issue. We are sorry that we are just getting round to express our appreciation—maybe that will be evidence which may be used in our defense in so far as concerns the "plenty-of-time-for-golf idea" advanced by Editor Willis.

* * *

As most of us know, the Colorado School of Mines Magazine is not a trade journal, and it is not our intention or purpose to place ourselves in competition with the trade publications. We are pleased to know that *The Mining Journal* maintains a friendly attitude toward us, and understands that we are directing our endeavor in fields other than the one which attracts the interest of this valuable journal.

* * *

Perhaps we should comment briefly upon the purpose of the C. S. M. Magazine, in order that our latest readers may understand what we are striving to do. We feel that we have in the Colorado School of Mines one of the best known mineral industries institutions in the world. The purpose of this School is two fold: first, to train engineers for the mineral industries; second, to *serve* these engineers and these industries.

* * *

The School must keep in touch with its graduates; it must keep in touch with the mineral industries. The Colorado School of Mines Magazine is, therefore, a medium between School, Engineer, and Industry. Semi-technical in nature, this Magazine strives to present to its readers in its technical articles the findings of research at the School; the practice of Mines graduates in the field of engineering, and instructive information given out by members of the faculty. In addition to the technical articles, we purpose to present interesting news about the conduct of the School, the success of the Alumni, and the progress of the industry.

* * *

The C. S. M. Magazine goes little into detail in describing various phases of the industry. A great part of the material published by trade journals is extraneous matter for our purposes. Descriptions of mines, mills, processes and the like which are not closely associated with one of the Colorado School of Mines graduates are not suited to our use. On the other hand, we strive to give to the whole industry whatever knowledge we may have. All of our articles are written by men closely associated with the School, either graduates or faculty members.

* * *

It is to be noted that our whole purpose is founded on the premise that the Colorado School of Mines is valuable to the mineral industries. If this premise be wrong, then our purpose, our efforts, and our Magazine are futile.

The World War with all its horrors visited many a home and in many cases robbed that home of its pride and dependents. This story centers about such a case.

There was a family of comfortable means that boasted of a boy of unusual ability. He was the only boy in the family; the apple of his mother's eye, and the pride of his father. He was tall, handsome, and full of life. At school he was a leader among the boys, and they always gave him a prominent place in their play and fun. When the clouds of war descended on Europe this son was a freshman in a prominent college. He was one of the first to join the colors, and through sheer ability he was made a Second Lieutenant, and assigned to the 7th Field Artillery of the First Division. He was with the first troops that went to France from America, and fought in all the major conflicts with his Division. He was decorated for bravery, and was held in high esteem and confidence by his men.

During one of the closing engagements, within a month of the Armistice, this young lieutenant was killed in battle. His death was the greatest calamity that ever came to this family. His mother and father were overcome with grief; their only son was dead; how could they bear to carry on without him? The father's plan to make this only son his heir and future manager of his business was frustrated. The mother could hardly bear the sacrifice she was compelled to accept. Then the insurance money came to the mother—$10,000 of War Risk insurance. Such are the hazards of war; $10,000 for the loss of one boy. The family didn't need the $10,000; they were comfortably well off. The boy was gone, and in his place there was $10,000. The mother could not touch the money, for her grief was so great. The father could not bring himself to advise with the mother about what to do with the money, so the $10,000 remained in the bank idle for months. The mother wanted to spend the money so that it would bring happiness to others and do the most good. The father wanted it invested so as to give the greatest comfort to the mother, and here is the way the money was invested.

The $10,000 was used to endow a scholarship at a college where the college expense is not too high, and where the instruction is excellent. The money was invested so well that the income amounts to $500 a year, and such an amount is enough to put a boy through this particular school. To date three boys have had the benefits of this scholarship, and have been educated from the income derived from the young lieutenant's War Risk insurance. Each of the boys thus benefitted have spent at least one summer vacation with the parents of the soldier boy. They have been taken into the family, so to speak, to replace the son who was lost at war. It would be impossible for them, and for all the rest who will be educated by the scholarship, to make up for the loss of this only son, but the mother and father get much satisfaction and pleasure in seeing the good that has come to other boys, made possible by their son's sacrifice. What a fitting memorial to this young lieutenant, for it was his money after all that was so ably invested!

Calculations of Gas Analysis *

By Robert A. Baxter†

THE calculations of the composition of gaseous mixtures from the various forms of analytical data fall naturally into a comparative few general classes:

I. *Absorptions*—These are simple contractions by selective solubility or combination at constant pressure. These are the simplest both in manipulation and in calculation and are therefore most desired when a proper selective solvent, absorbent, adsorbent, or reactive agent can be found for one individual gas. The calculation of the gas under consideration involves merely the comparison of the decrease in volume with the original volume. Its most frequent error lies in the assumption that all of the gas desired will be removed and none of any other gas. The ordinary analyses for carbon monoxide and for carbon dioxide are examples of this type. In the latter, any other acid gases such as the oxides of sulfur will be removed along with the carbon dioxide and in the former case there is a strong probability that the cuprous chloride reagent ordinarilly used will fail to remove all the carbon monoxide. An excellent summary of the reactions involved in the separation of gases by solution and of the modern equipment for the performance of these reactions is contained in a publication of the Carnegie Steel Company[1].

Methods of calculation based on absorption, titrations, liquefactions, conductivity, and refractive index are discussed briefly in this article.

Methods of calculation based on combustion are elaborated and the fallacy of calculation of analyses on the basis of "The two predominating hydrocarbons" is emphasized. The simple percentage of mixed paraffin hydrocarbons of a definite average number of carbons per molecule is shown to be a dependable figure which shows as much as anything else concerning the calorific value and the density.

The uses and limitations of the ratio, contraction to carbon dioxide, are shown.

A modification in the sequence in operation is given which will improve the closeness of the approximation, if the paraffin hydrocarbons must be reported separately on the basis of a combustion analysis.

While there is a considerable difference in opinion as to the best reagent to use for the removal of the various constituents as indicated by the use of four entirely different reagents for the removal of oxygen, there is really an application for each reagent to mixtures of different composition. In any instance, the calculations are comparatively simple even when the deviations from the perfect gas laws are taken into consideration.

II. *Titrations*—These reactions are ones in which a very small amount of gas is titrated by some standard liquid reagent rather than attempting to make a direct measurement of the very small volume change produced by disappearance of the gas. The iodometric titration of hydrogen sulfide by the Tutweiler method is one of the most common procedures of this type. It involves the addition of standard iodine solution to a gas containing hydrogen sulfide until an excess of iodine is shown by the formation of a permanent starch-iodide color in the dilute starch solution used as a confining liquid. The oxidation of hydrogen sulfide by iodine is a well known reaction and the preparation and standardization of the iodine solution against thiosulfate is a comparatively simple procedure and very accurate and dependable.

III. *Liquefactions*—Of recent years the vapor pressure method and the fractional distillation processes have been introduced to a considerable extent in gas analysis. While they are essentially different in their operation, they may be grouped together for calculations since the procedure in each instance usually involves the preparation of a graphical record or curve from which the analysis can be read. In each instance, the gas is liquefied as completely as possible and the liquid separated from noncondensible materials if any remain. These are then examined by any appropriate method and the liquid is either placed in a closed device and its vapor pressure corresponding to various temperatures observed[2], or is distilled through an appropriate fractionating column[3].

In the former of these operations a curve is obtained in which the sudden rises at the various temperatures serve to identify the gases, and the amount of the pressure changes at each temperature in a calibrated apparatus gives the quantity of the respective component gases. Whenever enough material is available to make a distillation, the second procedure is much more desirable. Here again the temperature at which sudden rises will take place in the curves identify the individual components, but the actual amount of each is indicated by the volumes produced between the successive temperature rises. When the gases present are readily liquefiable and have enough difference in their vapor pressures to make separation by distillation practicable, this method is one of the very best known. The apparatus necessary is still rather complex and expensive, but much progress has been made in recent years in simplification of it, so that this method bids fair to increase greatly in popularity. The graphical calculations involved are in most instances fairly simple.

IV. *Thermal Conductivity*—Methods of analysis based on thermal conductivity of gases have slowly developed during the last fifty years[4], until finally a hot wire instrument has been devised which is fairly satisfactory[5]. However many of the numerical constants given[6] are still admitted to be open to considerable doubt, so we will not go into details of calculation but will refer those interested to Technologic Paper 249 of the Bureau of Standards. This procedure is most valuable in estimating the amount of hydrogen or helium in a mixture, since these gases have thermal conductivities widely different from most of the other gases with which they may be found.

V. *Refractive Indices*—Over a hundred years ago the first determinations of refractive indices of gases were made, but it was not until the last twenty years that any practical application of this measurement was made to analytical

* Presented before the Colorado-Wyoming Academy of Science, Nov. 3, 1929.

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1—"Methods of the Chemists of the U. S. Steel Co. for the Sampling and Analysis of Gases", Third edition, 1927. Carnegie Steel Co., Pittsburgh.

2—Campbell, Proc. Phys. Soc. of London, 33, 287 (1921).

3—W. J. Podbielniak, Refiner and Nat. Gas. Mfgr., March 1929.

4—Dennis, "Gas Analysis", 1929 ed. p. 444.

5—U. S. Bureau Stds. Tech. Paper 249.

6—Dennis, "Gas Analysis", 1929 ed. p. 447.

procedures. This interferometer as it is now used is a device in which the velocity of light through a gas mixture in one tube is compared with the velocity through another sample of the same gas from which the component to be determined has been removed or to which a known amount of it has been added. The apparatus required and the equations involved in the calculation of the composition of the gas from the difference between the two refractivities are given in Dennis[7], and will not be repeated here.

VI. *Combustions*—The greatest differences in the methods and calculations of gas analysis lie in the procedures involving combustions. The combustion reactions are of three types but they are all undertaken for the same general purpose, namely, to convert materials which can not be fractionally absorbed into other substances which can be absorbed or to produce volume changes which can be used to calculate the amount of non-absorbible ingredients present. These three methods are: explosion, slow combustion, and oxidation by means of catalysts or special oxidizing agents.

In spite of the fact that it has been known for many years[8] that it is impossible to calculate the actual amount of each individual hydrocarbon present, the practice has continued of reporting either hydrogen and methane or methane and ethane, or in general, "The two predominating hydrocarbons". Naturally this practice of calculating the gas on "The two predominating hydrocarbons" has led to the greatest errors in the reports of analyses of natural gases which are rich in the higher hydrocarbons. For instance a natural gas has been reported as 21.8% ethane, 77.7% propane and 0.5% nitrogen and after the gasoline had been stripped out of this gas it was reported that the residual gas was 79.4% ethane, 20.0% propane, and 0.6% nitrogen. It is almost certain that this gas like most other natural gases did actually contain a considerable quantity of methane and also that the gasoline recovered was a mixture of propane and higher hydrocarbons. This is an excellent example of the error involved in the analysis of a mixture of paraffin hydrocarbons by the usual combustion method. For such materials the distillation method[9] or at least the partial condensation method[9] in which a partial liquefaction is accomplished by immersion of the container into liquid air and followed by slow combustion of the different fractions so cut as actually to contain only two ingredients in each portion. At —190° C. the gas is methane practically free of other hydrocarbons. When the liquid condensed in the first cooling is allowed to evaporate partly at about —130° C, the gas is composed mainly of ethane and propane and the residual liquid is propane and butane. If higher hydrocarbons are suspected, another cut is taken at a still higher temperature. This manipulation is fairly satisfactory and does not require distillation columns, but does require liquid air and a good vacuum pump.

The calculation is simple from the combustion observed and the carbon dioxide formed from the combustion of any two paraffins since their relationships fall in accord with their well known oxidation reactions.

$$CH_4+2O_2=CO_2+2H_2O.$$
$$C_2H_6+7/2\ O_2=2CO_2+3H_2O.$$
$$C_3H_8+5O_2=3CO_2+4H_2O.$$

From these equations we see that the contraction observed when methane burns is twice the volume of the methane and that the volume of carbon dioxide produced is equal to the volume of the methane. Similarly, the ethane gives a contraction of 2.5 times its own volume and the propane of 3.0 times its volume, and their respective carbon dioxide yields are 2.0 and 3.0 volumes of carbon dioxide per volume of the original gas.

These results have been correlated by de Voldere and de Smet[10] to give some fundamental laws and equations which show the possibilities and limitations of combustion methods. Their results, translated and condensed, are included in Chapter XII of Dennis, "Gas Analysis". They list the hydrocarbons under the general formula C_nH_{2n+2k} where K=1, 0, —1, —2, or —3 and n=0 or positive integer.

If we now write the general combustion equations we get:

$$C_nH_{2n+2k}+\frac{3n+k}{2}O_2=n\,CO_2+(n+k)\,H_2O.$$

Or oxygen required $=\frac{3n+k}{2}V$, where V is the volume of the gas.

Carbon dioxide $=NV$

Contraction $=\frac{2+n+k}{2}\times V.$

If we now take these equations and set up by their aid the relationships between any number of paraffin hydrocarbons and the sum of their volumes, the oxygen required to burn them, the contraction resulting from this combustion and the carbon dioxide produced, we find as on page 126 in Dennis that these are not four independent equations but only two, since the volume of total paraffins and the volume of oxygen required to burn them can be expressed as functions of the contraction observed and the carbon dioxide produced.

This is the mathematical reason for the ability to solve for only two gases, since only two truly independent equations can be set up if all the gases present are members of the same series. However, any one member of another series can be calculated along with the two of the first series taken, since the addition of the new series introduces a new equation and thereby permits the solution for another variable.

Hydrogen falls in as a member of the first group, k=1, with n=0, and CO falls in as a member of the group k=—2 with n=1, which explains why hydrogen, methane and carbon monoxide can be calculated together, but not hydrogen, methane, and ethane, as illustrated in the equations in the Gas Chemists Handbook[11].

Even in the publications of the Bureau of Mines[9], we find statements such as the following as a result of the calculations based on "the two prevalent hydrocarbons": "According to combustion analyses performed at the Bureau's laboratory, the natural gas used in Pittsburgh contains about 83% methane and 16% ethane. This 99% of paraffins includes some propane and possibly some butane".

The chemists of the U. S. Steel Corporation[1] give on page 88 of their "Methods", the following statement: "It is customary to denote the paraffins present as methane and ethane. This procedure introduces no error into either the volumetric results or the B.T.U. value, because the volume of the paraffins is equal to one third the difference between twice the combustion and the carbon dioxide formed, irrespective of the number or combination of members present". In a note, the above statement is modified to give a calculation as ethane and propane when conditions necessitate such substitutions for the methane and ethane mentioned. They give an empirical formula for calculating

7—Dennis, "Gas Analysis", 1929 ed. p. 437-444.
8—Earnshaw, Jour. Franklin Inst. 146, 161-76 (1898).
9—U. S. B. M. Bull. 197, p. 96.
10—Z. Anal. Chem. 49, 661-688 (1910).
11—Gas Chemists Handbook, pp. 142-144, American Gas Association 1922 (second edition).

the heating value in B.T.U. per standard cubic foot which gives the heating value $H=757n+251$. This checks very closely for all the lower paraffins.

In addition, they might have said that the specific gravity will also be independent of the particular paraffins (including hydrogen) which may be assumed to be present for purposes of calculation of combustion results. This unfortunate circumstance makes impossible the use of the density determination as a check on the combustion analyses. This uniformity of the specific gravity follows naturally as a result of the calculations given thirty years ago by Earnshaw[8], though not pointed out by him. He showed very clearly that the total volume of paraffin hydrocarbons in a mixture $V=\frac{2\ \text{Contraction}-CO_2}{3}$, and that as a consequence the average value for the number of carbons per hydrocarbon, $n=\frac{CO_2}{V}=\frac{3\ CO_2}{2\ \text{contraction}-CO_2}$. If the value of n so determined is used to get the mean molecular weight, we have this value $M=C_nH_{2n+2}=12n+2n+2=14n+2$, and the specific gravity compared to air is $\frac{14n+2}{28.9}$ which is obviously a constant dependent on the mean molecular weight and hence on the average value for n and is independent of the actual hydrocarbons assumed for the calculations. This number can be equally well expressed as a function of the original observed values of contraction and carbon dioxide as follows:

$$M=14n+2=\frac{14x3CO_2}{2\ \text{cont.}-CO_2}+2=\frac{42CO_2+4\ \text{cont.}-2CO_2}{2\ \text{cont.}-CO_2}$$

$$=\frac{40\ CO_2+4\ \text{cont.}}{2\ \text{cont.}-CO_2}$$

$$\text{Specific gravity}=\frac{40\ CO_2+4\ \text{cont.}}{28.9\ (2\ \text{cont.}-CO_2)}=\frac{10\ CO_2+\text{cont.}}{7.22\ (2\ \text{cont.}-CO_2)}$$

An example may help to make clear the fact that the combustion analysis does indicate the specific gravity and the heating value accurately without fixing the actual amounts of the particular hydrocarbons present. Let us suppose that a sample of twenty cubic centimeters of gas be taken for combustion and that the contraction observed is 60 cc. and the carbon dioxide also 60 cc. If we will use these figures to calculate the volume of the paraffins present, we find that:

$V=\frac{2\ \text{cont.}-CO_2}{3}=\frac{120-60}{3}=20$, in other words that there was no nitrogen present in this particular sample but it was all paraffins. We then calculate the average number of carbon atoms per molecule and find:

$n=\frac{3\ CO_2}{2\ \text{Cont.}-CO_2}=\frac{180}{120-60}=3.$

From this we might assume as did Burrell[12] that we had proved that the gas was propane, but we might equally well assume that it was any one of several calculatable mixtures of "two predominating hydrocarbons".

[12]—Burrell, "Recovery of Gasoline from Natural Gas", pp. 95 & 96.

Let us assume for the moment that it is propane. We write its equation and find:

$C_3H_8+5O_2=3\ CO_2+4\ H_2O.$

This checks the volume of propane at 1/3 the $CO_2=20$ cc. Its specific gravity$=44/28.9=1.525$. Its heating value is 2521 B.T.U.

If, instead, we had seen fit to assume a mixture of ethane and butane, we would have had the equations:

$$C_2H_6+\frac{7}{2}O_2=2\ CO_2+3\ H_2O$$

$$C_4H_{10}+\frac{13}{2}O_2=4\ CO_2+5\ H_2O$$

contraction$=5/2\ C_2H_6+7/2\ C_4H_{10}=60.$

$CO_2=2\ C_2H_6+4\ C_4H_{10}=60.$

hence: $C_4H_{10}=10$ cc., and $C_2H_6=10$ cc.

This mixture of equal volumes of these two gases has a specific gravity $\frac{30+58}{2x28.9}=1.525$, and a heating value of $\frac{1764+3274}{2}=2519$ B.T.U.

We might go ahead and assume any pair of paraffins one above and the other below propane or we might even assume hydrogen and any paraffin above propane, such as hydrogen and pentane.

$H_2+1/2\ O_2=H_2O.$

$C_5H_{12}+8\ O_2=5\ CO_2+6\ H_2O.$

Pentane$=1/5\ CO_2=12$ cc.

Contraction$=4\ C_5H_{12}+3/2\ H_2=60.$

$H_2=8.$

This is again a total of 20 cc. of combustible with a specific gravity of $\frac{\frac{12}{20}\times 72+\frac{8}{20}\times 2.}{28.9}=1.525$

and the heating value obtainable by the formula from the Steel Company handbook is $3\times 757+251=2271+251=2522$.

In accordance with the calculations already mentioned[10], we find that the oxygen required for any of these pairs is $\frac{3n+1}{2}V=10/2\ V=5V=100$ cc., so that there is no way of identifying the gases present or even of making an intelligent choice of the "two predominant hydrocarbons" from the combustion data or even from supplementary determinations of heating value or of specific gravity.

An example in which the average value of n was high was taken deliberately but one with a low value would be open to almost as many interpretations. Yet these values are used every day and the results are often distinctly misleading. It is suggested that total paraffins of a certain average value of n would be a dependable figure which would not be open to any misinterpretations and would therefore be much better than the present system of guessing which two hydrocarbons to calculate.

There is one other indication of the nature of the average hydrocarbon present and that is the ratio of contraction to carbon dioxide.

Burgess and Wheeler[13] have stated that the ratio, contraction to carbon dioxide, gives an indication of the nature of the hydrocarbons present. They have been careful to say that if the value falls between those of methane and ethane, it is usually safe to assume that both are present. They call attention to the fact that, whereas it is customary to calculate such analyses on the assumption that no higher hydrocarbons are present, equal volumes of methane and propane will give the same analytical results on explosion as ethane alone. They calculate the results on some hypothetical CH_4 and CH_2 groups which do not give any better values than any other method of calculation based on a single combustion.

The ratio, Contraction to carbon dioxide, does have a considerable value as a check on manipulations since the following tabulated values of it for the paraffins indicate that if all hydrogen is properly removed prior to the combustion, the value can never be greater than that of methane, namely 2, and that it will decrease gradually with increase in n and will approach the value 0.5 as a lower limit.

Values of contraction/$CO_2 = \frac{n+3}{2n}$

methane	2.000
ethane	1.250
propane	1.000
butane	0.875
pentane	0.800
hexane	0.750
heptane	0.714

Of the hydrocarbons of the empirical formula C_nH_{2n}, the olefines should have been all removed by absorption. The value for the polymethylenes will be $\frac{\text{contraction}}{CO_2} = \frac{n+2}{2n}$, and will fall from 0.750 for cyclobutane to 0.643 for cycloheptane. There are not likely to be any members of either the paraffin or cycloparaffin series present with over ten carbons, and the average value of n can not be over four. Consequently a value of the ratio of Contraction to Carbon Dioxide greater than 2.0 or less than 0.8 should be looked on as an indication of faulty manipulation and a careful check determination should be made.

There is one general method with either of two modifications whereby a closer approximation of the actual hydrocarbons present in a mixture may be obtained by means of combustion and absorption apparatus without recourse to the use of liquefying processes at low temperatures.

By this procedure the hydrogen and the carbon dioxide are absorbed as usual, then the unsaturates are removed by means of concentrated sulfuric acid containing silver and nickel sulfates. The oxygen is removed by pyrogallate and the hydrogen and carbon monoxide by heated copper oxide. A part of the residue is then subjected to slow combustion in oxygen over a platinum spiral and a value of V and one of n are calculated from the contraction and carbon dioxide figures obtained. Another fraction of the same size is then taken from the reserved material and is passed through a pipette containing either fuming sulfuric acid or absolute alcohol to remove the higher paraffins. The alcohol or sulfur trioxide fumes are then removed by water or alkali respectively and the contraction is noted. This gives the volume of propane and higher hydrocarbons. The residual gas is then subjected to slow combustion to get another value for V_1 and n_1. These second values for contraction and carbon dioxide give the actual values for methane and ethane, since neither of these are appreciably absorbed by the reagents used. If the volume $V-V_1$ is small, it is more nearly permissible to assume that the value for the average number of carbons per molecule obtained from the $\frac{nV-n_1V_1}{V-V_1}$ really gives the identification of the heavier hydrocarbons. This is especially true if this value is near 3.0, since this would indicate a predominance of propane. If the value is less than 3.0, a faulty manipulation is indicated. If it is much greater than 3.0, the identity of the compounds present is obscure, and if $V-V_1$ is large enough to warrant it, they must be determined by some system of liquefaction.

[13]—J. Chem. Soc. 105, 133 (1914).

Tests of Spherical Steel Shells

One of the news reels going the rounds of motion-picture houses recently showed how a freight car, carrying a great spherical steel container, was purposely wrecked to demonstrate that the violent shocks of railroad accidents would not destroy the container. This test was one of many to which the container was subjected by its manufacturers. The containers are made of two hemispherical shells of steel welded together. They are intended for use in the transportation of helium from the natural-gas fields of the Middle West to the U. S. Navy's dirigible hangars. They are to be shipped in groups of six on specially constructed railway cars, the helium being compressed to a pressure of 2000 lb. per sq. in. The spherical shape is used to reduce the weight of the container, because for a given thickness of metal and volume of contents a spherical shell is stronger than one of any other shape. The various tests to which these great spheres were subjected are reported in "Spherical Containers for Transporting Gas under High Pressure" in *Mechanical Engineering* for December.

MOST KIND OF YOU!

A Scotsman, who answers his correspondence on a typewriter, composed this letter of thanks to a friend who had sent him a case of what appears to have been exceptionally good whiskey:—

"Dear Billy—How extremely kind of you to send me that case of whiskey for Xmas. I have never tasted such marvellous whiskey—and I keep tasting it.

"The whiskey you have sent me for Xmas is marvellous. I keep tashing it and how kind of you to send me thish wonderlous whichkey for Xmas which I keep tashing.

It's really really its moshkind of you tokeepsending me thish wishky in cases which I keep tashing for Xmas and tashing hic doc dicke dock.

"What kind whisky ole man ex thash ex tremly marvellous to tash on Xmas you great fine ul thatthank you ole for extrextra extreme whwhaishy ininain cashcase 6¾ you %%% XXX kisses Kissmus & Xmu (1377233$olc opa 489 Chee Rioo 00$18xx."

HE'D LEARNED TO BE CAUTIOUS

Lady: "I'd be ashamed to be a great strong man like you and ask for money."

Tramp: "So I am, ma'am, but I once got 12 months for taking it without asking."

Science as a News Feature

By Israel Klein*

Israel Klein, Science Editor of the Newspaper Enterprise Association, gave a paper on Science as a News feature at the 1929 convention of the American Association of College News Bureaus. Although Mr. Klein's paper deals with the scientist, and not the engineer, in relation to the layman public, partial reproduction of his article here is not entirely out of order. The engineer, after all, is a "practical scientist." Extracts from Mr. Klein's paper follow.

The scientist and layman have so long been strangers, if not at times antagonistic, that it has become a diplomat's job to bring them to a pleasant understanding of each other. This task the newspaper writer of today is gradually succeeding in doing. He has yet far to go to achieve it, but we believe that ultimately we shall have a condition of scientific news reporting that will be both acceptable to the scientist and satisfactory to the public.

The Scientist's Viewpoint

The average scientist is hard to win over to the idea of presenting his thoughts to the newspaper reading public through the medium of the reporter. It is that he yet has to be shown the man, excluding only a meagre few specialized writers, who will understand him well enough to interpret his work satisfactorily for popular consumption.

He is hardly to be blamed for this viewpoint. Consider the fact that popular reporting of scientific information is still a novelty, that no matter how near to his heart it seems to the scientist it has to take second place to crime news, politics and scandal, and you can understand why he still confines his information to his own limited class. They, at least, will understand him and appreciate him.

We must remember that it is only the last quarter century and more particularly the last decade that has seen the growth of popular interest in science. And that interest lies not so much in science as such, but in science as applied to the person who reads it.

The Layman's Interest in Science

What has brought the layman around to this interest in this scientific age we are living in? That began about the first of the twentieth century and we can almost assuredly say that it began with the popular adoption of the automobile. Then, for the first time in human history, a mysterious mechanical contrivance was actually thrust into the hands and minds of the people. They had to get out and get under in those days, and this getting out and getting under did more to acquaint the everyday layman with what goes on inside of a machine than any previous invention. It was first to direct the lay mind into scientific channels.

The war with its long range rifles, its submarines, its camouflaged ships, its aeroplanes, and its chemical warfare, excited further popular interest in science—and after the war came radio. Here again, the people, especially the coming generation, dabbled in the intricacies of electricity while the older folks were mystified and intrigued by the new science.

Here again, as in the case of the automobile, a science was applied attractively to human affairs and the public became more deeply interested.

But the public would never have cultivated such interest in science as it now has, had not something of the same sort happened in the editorial rooms of America and in fact the world over. This was a change in the system of news gathering from the old foot and pencil days to the present teletype and wireless era. That transformation brought a change in the minds of newspaper editors. It caused them, too, to think scientifically, and, furthermore, to put their thoughts down in black and white.

The Scientist and His Language

It has been pointed out how the minds of the editor and the populace have been educated toward an acceptance of science as news. The kind of scientific news that is acceptable is another matter. For more immediate consideration is the scientist's attitude toward this public acceptance of scientific information if written in a popular vein.

The scientist, from the popular viewpoint, is a "queer duck." From his own angle, however, and from that of the average layman who really looks up to him, he is an educated, serious-minded, deep-thinking individual who has learned to systematize his activities and his very life to a point which is far from popular understanding. So we, the people, call him a "queer duck".

The scientist *is* queer, come to think of it. He is queer in the sense that he is different from most of us. His training has made him so. His work doesn't permit him to be otherwise. Whatever the subject that enthralls him he must study its every detail. He must not take a step in advance before he has cleared up every possible track behind him. He must search for what seems to us the ridiculous, but to him the sublime. He deals in figures far beyond our comprehension. He has a language of his own. He sees things that we do not see. He talks of electrons and orbits and quanta and the fourth dimension. And he concocts terribly involved words to mystify and confuse us. In a word, he is a foreigner to us.

We do not understand him and his ways, and we seem to have little patience with him. Here lies the outstanding reason for the great gap that spreads between the scientist and the people. For, being looked upon as a foreigner, he assumes the role of one. He draws himself within his shell, so to speak. He colonizes. He continues to stick to his own language. And he remains aloof to the general populace.

He has been trained into this attitude. He has been taught, after at least four years of hard mental drilling, never to take a thing for granted, never to jump to conclusions, always to be cautious and thorough. He has studied the minds of others in his field and has acquired that academic viewpoint that points in one straight-forward and determined direction. He has systematized his thinking and his activities and he therefore finds himself in a class apart from a people that thinks and acts surprisingly opposite.

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Well, when a member of this common horde who calls himself a newspaperman, or a science editor if you will, assumes the capacity of liaison agent between the scientist and the people, the foreigner and his host, what happens? A feeling of resentment is added to that of suspicion. The scientist is happy in his own group. He has found fame and glory among his associates. They understand him and appreciate him. What does that liaison agent want but to make a showpiece of him, a means of entertaining his people.

No, the scientist would not accede to the requests and allurements of the people, for they would not understand him anyway. The reporter? How can *he* interpret the scientist's words, his point of view, and his years of effort, even to a people who might lend a willing ear and appreciate and understand, when he himself doesn't know the scientist's language and is far from sympathetic with the scientist's mode of thought.

A Difficult Barrier

That was the attitude of scientists when newspapers first began to interest themselves in science—which was not so long ago—and that still is their prevailing attitude today. There are some who, having a keen news sense, have broken the bonds of their class consciousness and revealed themselves and their thoughts to the public. But the scientist is generally not of that sort. He has the academic, technical viewpoint and that, I am afraid, will continue until a class of newspapermen arises that will have the training and viewpoint of the scientist, that will be able to talk to him in his own language, and that will interpret that language faithfully and unerringly. This class has already begun to take form and is growing gradually. It is a group trained in science, but consisting of newspapermen at heart. The newspaper and the people who read it must be in their minds when they write their stories, just as the scientist must be in their sympathy when they interview him. Compromising both in his problem and it is a serious one.

Its seriousness arises from the fact that what is news to the general public may be mere claptrap to the scientist. And what is worth while to the scientist may be too deep for the layman.

Science as News Feature

Let me analyze the possibilities of science as a news feature. Science stories are presented from the viewpoint of the newspaper reader, rather than the scientist, for he is our customer, our ultimate consumer, and he is the one who decides—by buying or rejecting a newspaper—exactly what type of material should be gathered and how it should be written.

Science may be divided into the pure and the applied. For newspaper purposes, the pure science may be discarded from further discussion. The reason is obvious. The general public will never appreciate the pure sciences. They will never understand why a man will devote his life to research into the intricacies of the binominal theorem, or the deflection of electrons from a crystal. Important as they may be to the scientist, they are of no use to the layman and therefore, since the layman, not the scientist, reads the daily newspapers, the pure sciences are not news. The only exceptions I can think of are astronomy and atomic physics. You'll see why later. The applied sciences, on the other hand, furnish the proper diet of news for the layman. Yet even these must limit their scope to any or all of three foods.

First of these is that of Life. Any science that deals in the living will enthrall the reading public. It will be news and the man who is responsible for that news will be just as interesting to them as the news itself. For the scientist himself represents life, a human life dealing in living things.

The subject of life as scientific news material may be divided into several categories. It may deal with health and disease; it may concern human beings, or animals, or plants; it may cover any distant subject, but so long as there is a tinge of life in it, it is good news for the newspaper reading public. For that public is a living, throbbing mass and can understand only the living and the active.

The second food in the scientific news diet for the public is Adventure. Any science that smacks of adventure is alive and therefore of interest to the public. The scientist searching for an elusive parasite in his laboratory is as much a subject of adventure as is the explorer daring the frosts and winds of the Arctic. The archeologist patiently digging up the signs of a remote era has in his hands just as adventuresome a story as has the scientist who dives into a shark-infested sea to study submarine life. All of it, being adventure, is life in action, and that is what the people want.

In addition to life and adventure, the third food in the popular scientific diet is Mystery—mystery which is compelling, intriguing and beyond human comprehension. It has always aroused deep interest. That is why astronomy, even though a pure science, is such a popular subject. We do not know what real use it is to us, but it deals in such magnitudes, in such awesome figures, that we can not help but feel inspired by it. It is great news. Almost as newsy is its opposite in terms of magnitude—atomic physics. Here again the scientist deals in what is mysterious to the general public and therefore intriguing. Millionths of an inch, billionths of a degree, electrons and Angstrom units—it is all so mystifying that it is interesting.

Must Be Popularized

Such news is acceptable to the editor and satisfying to his readers. This is the type of scientific news that gets into the news columns. But here we strike a snag. As intriguing as this news of life and adventure is to us, so difficult is it for newspapermen to convey it properly to the readers. And as difficult as this is, it is made more so by the scientist in the attitude he maintains against popularizaton of his work and ideas.

While the general field of science has accepted the scientific news writer into its ranks, it is still far from being won over even to a compromise with the general public. It still dreads popular fame. It still is cautious even in its relations with those few newspapermen who understand and appreciate its problems. Academic thought, professional ethics, class pride, fear of being misunderstood, still are its bulwarks of defense against the multitude.

It remains for the science news writer to pierce this defense without breaking it down, to educate the scientist in the viewpoint of the people without having him give up his own language and ideals. To do this, the science news writer must keep faith with the scientist. He must adapt himself to the scientist's point of view and yet not let himself lose track of the popular trend of mind. He must known what the scientist is talking about and he must be deeply interested in that subject. Coming into contact with more and more such news writers, the scientist will soon come out of his shell and be more kindly disposed toward newspapers.

Student's Record Claimed to be Forecast of His Success

THAT a student's college record is a forecast of his success in the business and engineering world is the thought brought out in a recent article by Colonel R. I. Rees, President of the Society for the Promotion of Engineering Education, and Assistant Vice President of the American Telephone and Telegraph company. The material for this article was taken from a previous article "Does Business Want Scholars?" by President W. S. Gifford of the American Telephone and Telegraph Company, published in Harper's Magazine for May, 1928. Many of the readers of The Oredigger no doubt have read both articles, but the material contained in them seems worthy of some repetition.

Men of trained intelligence are being sought more and more by business and industry. Since many of the largest industries in the country depend to a great extent upon the applications of science in their production, engineering graduates of high quality are in great demand.

What does the employer expect to find in a graduate? Fundamentally, he expects to find a man able to think and to work. An engineering education should, and does, develop trained intelligence, analytical ability, and sound judgment based on fundamental knowledge. Another important element necessary to success—cooperation in human relationships—is also developed on the college campus.

How can a man's future success be indicated by his college experience? If this could be answered, then employers and teachers both would profit thereby—and the student could be placed in a field of endeavor suited to his ability. The courses of study selected by the student are one such indication. In an engineering school a well-ordered curriculum, aimed at a definite objective, is a good evidence of a real purpose. Two other important factors must be considered—participation in extra-curricular activities and the necessity on the part of the student of earning his own way through college to a great or small extent.

Some statistics obtained from colleges were used to study the progress of men in the Bell System. Scholastic records are obtained in four groups—one, those students graduating in the first tenth of their classes; two, those graduating in the first third but not the first tenth; three, those graduating in the middle third of their class, and four, those graduating in the lower third of their class. The records of 3,806 men were studied.

The index of progress used in this examination was that of salary advancement. While, of course, the averages of the group were taken, and while it is true that there are poor students who are making good, and similarly, good students who are failures, these averages offer a very striking proof that there is a direct relation between high marks in college and salary progress afterwards, in the Bell System at least.

For example, take the median salary of 498 men who stood in the first tenth of their class. At ten years after graduation, the median salary of this group was something over 10 percent more than the median salary of the entire group; at twenty years after, it was about 30 percent more than that of the entire group; and after 30 years, was 55 percent more than that median.

The median of the first third at thirty years after graduation is 20 percent more than the median of the entire group;

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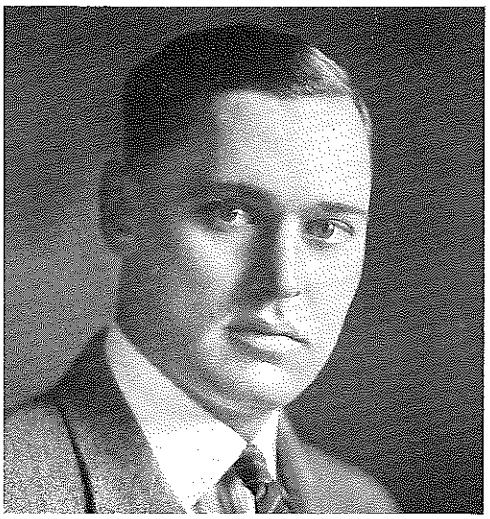
Student Loan Fund Established in Memory of Alumnus



JOHN LOGAN YATES, '23

A gift for the establishment of a student loan fund in memory of John Logan Yates has been made to the Colorado School of Mines by a friend whose name is withheld by request.

John Logan Yates was born near Belgrade Missouri in 1897. He attended the St. Louis public schools and later prepared himself for a career in engineering at the Colorado School of Mines where he was graduated with high honors in 1923. He was a member of the Beta Theta Pi social fraternity at Mines, and was elected to the Tau Beta Pi honorary engineering fraternity in recognition of high scholarship.

After graduation from the School of Mines, John went into foreign service, working with a South American Company. Later he returned to the States and became a part of the St. Joseph Lead Company. He also held a position with the Federal Lead Company, and was for a short time connected with a silica company at Pacific, Missouri. With this practical experience back of him, he was chosen a member of the faculty of Washington University. In this capacity he made a name for himself, and was preparing the way for a greater success which was interrupted by his untimely death, June 25, 1929.

The Trend of Flotation

A Quarterly Published by The Colorado School of Mines

THE third edition, revised, of the *Trend of Flotation* by Arthur J. Weinig and Irving A. Palmer was released by the Colorado School of Mines Publications Department in November, 1929. The first edition of the *Trend of Flotation* was published in 1926, and was exhausted within a few months. Following this first publication, came the second edition, revised; and it likewise was soon exhausted. The continued demand for information in regard to the progress of flotation has been so great that it was deemed necessary to publish a third edition.

The latest revision has added 62 pages to the second edition, making it now a 152 page book. An entirely new feature is the inclusion of a number of formulas and diagrams relating to mill operation and control. These were prepared by Mr. Weinig and contain very valuable information for the mill operator. The section on theoretical considerations has again been extended and in part rewritten; various tables have been revised and many new ones added; the bibliography on flotation has been brought up to the present; and there have been included a number of additional descriptions of the flotation practice followed in important concentrating mills in the United States, Canada and Mexico, while the descriptions of the practice in the mills included in the last edition have been brought up to date.

The Trend of Flotation is written particularly for the practical operator. The authors have taken great care to condense their material so that the information commonly sought by the mill operator may be easily found, and a very complete index makes the book a more convenient reference source. The authors' style is direct and free from overburdening words. Professor Palmer states that this pamphlet could have been made into a 400 page book had the purpose been other than to provide the operator with a useful handbook where information might be had without digging it out of a volume of extraneous material. Although the Trend of Flotation is not primarily designed for student use, the classes in Metallurgy at the Colorado School of Mines have been provided with copies. They are being employed to supplement texts and lectures. The second edition was so used by several departments of metallurgy in universities in the United States, and it is to be expected that these departments will wish to replace the second edition with the latest number.

The importance and extent of the flotation process is shown in the authors' introduction, which is reprinted here:

"The flotation process is undoubtedly the most important development in the recovery of metals from ores that has taken place during the present century. No other method of ore treatment has ever effected such great changes in metallurgical practice in so short a time. This is indicated by the number and importance of the companies now using the process, the tonnage and variety of the ores handled, the grade of concentrates produced and the high recoveries of the metals contained in the ores. In point of tonnage treated, flotation is at present leading all other methods of ore concentration.

"The industrial importance of the flotation process can be emphasized best by reviewing briefly the history of nonferrous metal mining in the United States since the beginning of the present century, although the same conditions have obtained in other countries having long established mining industries. In the United States, at least, the period in question has witnessed in practically every mining district, the almost complete exhaustion of the high grade oxidized ores near the surface, and often of the high grade sulfides in the so-called zones of secondary enrichment, leaving only the low grade, primary sulfides, usually more or less complex, in the lower levels. The mining companies were thus confronted with increased mining costs, refractory nature of the ores. In many cases it became economically impossible to mine and ship the crude sulfides at all. The only alternative was to introduce some method of mechanical concentration. This, of course, had been done many years before in certain districts. The lead and zinc ores of the Mississippi Valley region, for instance, were concentrated almost from the beginning. They were low in grade, easy to concentrate, and the metallurgical treatment used demanded a high grade material. In the retort smelting of zinc, for example, nothing but a concentrated product can be treated, owing to the high costs and the heavy metal losses.

"Early in the century the immense disseminated porphyry copper deposits, such as those of the Utah Copper Company, the Nevada Consolidated Copper Company and others, were opened up. The copper existed largely as sulfides and the percentage was low. As the ore could not be leached and could not be smelted direct, the only possibility was concentration. The successful solution of the problem by D. C. Jackling and others, whereby the porphyry mines now produce more than one-third of the copper output of the United States, constitutes one of the triumphs of American metallurgy.

"Briefly, it may be stated that there is now comparatively little direct smelting non-ferrous ore remaining in the mining districts of the country. There are some deposits of high grade silver-lead ore in Utah and a considerable amount of rich copper ore in Arizona, both sulfides and oxides, but these are about the only important exceptions. By far the larger proportion of all the gold, silver, lead, copper, and zinc now produced in the United States comes from very low grade ores, most of which, with the exception of the greater part of the dry gold and silver ores, are concentrated before going to the reduction plants.

"Less than 5 percent of the copper, lead, zinc, gold and silver ores treated in the United States went directly to smelting plants, and about 87 percent went to concentration mills.

"The proportion of the total amount of ore concentrated that was treated by flotation was probably about 90 percent of the copper ores, 32 percent of the lead ores, 21 percent of the zinc ores and 100 percent of the gold and silver ores. The entire molybdenum production of the country comes from the flotation of low grade ores.

"In the concentration of lead ores, zinc ores, and zinc-lead ores flotation has come into use more slowly than in the case of the copper ores, chiefly because ores containing lead and zinc are usually much more amenable to the older gravity concentration methods than the copper ores. The so-called complex zinc-lead-iron sulfides, however, are con-

centrated almost entirely by flotation; there is no other method by which satisfactory separations can be made with this class of ores. It is probably that at the present time the total amount of ore passing through flotation machines in this country is about 60,000,000 tons annually. This is a tonnage of ore greater than that treated by any other metallurgical process, with the single exception of the blast furnace smelting of iron ores.

"The almost universal adoption of concentration methods for low grade sulfide ores has effected great changes in smelting practice and other means of ore reduction. In copper smelting the blast furnace is rapidly becoming obsolete, because it is not adapted to the treatment of concentrates. Many of the larger copper companies no longer use blast furnaces, although in some cases they still retain them as part of their equipment. The Year Book of the American Bureau of Metal Statistics for 1928 gives the total annual capacity of the copper blast furnaces of the United States for 1927 as 5,149,500 tons of ore, but the same publication states that the total amount of direct smelting copper ore mined in the United States in 1927 was only 3,407,610 tons. The number of silver-lead blast furnaces in the United States decreased from 79 in 1916 to 48 in 1928, and the total capacity in tons of charge from 5,300,000 tons to 3,510,000 tons. In the meantime there was an increase of over 40 percent in the total production of lead from these furnaces.

"The same tendency is shown in the zinc industry, altho not to the same extent. The amount of metal produced per retort smelting unit or leaching tank is constantly on the increase.

"Recently the improvements in flotation practice at the copper concentrating mills have enabled the smelting plants to reduce very materially the number of roasters and reverberatory furnaces that it is necessary to operate. Two copper smelters, the Green Cananea, at Cananea, Sonora, Mexico, and the International, at Miami, Arizona, have discontinued roasting altogether. The concentrates are so high in grade and contain so little pyrite that they are fed directly into the reverberatories. It is obvious that this means a great saving in freight and treatment charges."

The first part of the *Trend of Flotation* is given over to discussion of flotation methods, theory, reagents, general operations, equipment and testing. Extensive tables are given showing various reagent consumption in the United States. Under the heading of Theory of Flotation is a very interesting section dealing with a few fundamental conceptions of flotation, prepared by Mr. Weinig.

The middle portion of the book includes the descriptions of actual practice in all the important concentrating mills in this country and in Canada and Mexico. This section is about 48 pages in extent, and every paragraph is boiled down to the minimum.

In the last pages are given many tables on milling costs, flotation reagent costs, wage scales, and the like. This last portion of the book also includes lists of patents, marketing of flotation concentrates, freight rates on metals, ores and concentrates, etc. A list of manufacturers of flotation machines in the United States is also included, and a complete bibliography.

One feature of this portion of the book are the formulas and diagrams under the heading, Mill Operation and Control. The formulas and examples given are taken from actual practice, for the most part employed at the Colorado School of Mines Experimental Oredressing and Metallurgical Plant. Although the examples given are applicable to

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J. Edwin Clark Succumbs to Attack of Acute Appendicitis

J. Edwin Clark of the class of 1927 died suddenly, a victim of an attack of acute appendicitis, in Tocopilla, Chile, Christmas week. News of the death of Mr. Clark came as a severe shock to his many friends in Golden.

While at the School of Mines, J. Edwin Clark made many friends both among the students and the townspeople of Golden. He was a member of the Kappa Sigma fraternity, and was the youngest man ever to matriculate at the Colorado School of Mines. He entered Mines in 1923, and studied for the Engineer of Mines degree which was awarded him in 1927. Clark was 24 years old when he died.

After graduation Clark went to South America as a Mining Engineer for the Anglo-Chilean Nitrate Company located at Tocopilla. Clark came to the School of Mines with an excellent record. He was a graduate of the Pasadena High School, where he edited the year book during his Senior year in 1923. He had an excellent scholastic record, and his work at the Colorado School of Mines shows that he continued to do work of high calibre after entering college.

J. Edwin Clark is survived by his parents, Mr. and Mrs. Amos Z. Clark, of Pasadena; two sisters also of Pasadena, and another sister, Mrs. Paul Hornaday of Oklahoma City. He also leaves two brothers, John and Amos Clark.

Social Consequences of Engineering Progress

One idea that came to the surface at the World Engineering Congress, and was commented on editorially in the *Japan Advertiser,* is the social consequences of engineering progress. Human welfare as the true aim of engineering was repeatedly touched upon in the addresses of Prince Chichibu and the officers of the Congress as well as in the speeches at the social functions, and this was the topic of Past-President Smith's speech at the American dinner to the Japanese and other delegations. World peace was also a thought constantly in mind as these engineers from many nations met in international conference. The conviction grew that modern engineering has its greatest triumphs in civil life, even though military engineering was so prominent in the earlier period of development of the art. Engineering that serves industry is the indirect but extremely practical avenue of approach to peace and prosperity.

Another gratifying item in the picture of the World Engineering Congress at Tokyo—almost as noticeable as the all-pervading warmth of Japanese hospitality—was the prevalence of English as the language of the Congress. At technical sessions and at social functions alike, English was essentially the only foreign language used. Possibly our European friends thus diplomatically glossed over the American inaptitude for language study. At the closing ceremony of the dozen National responses, only one, that of the U. S. R. representative, was given in other than English—a better than 90 percent indorsement of English as the universal language for engineers.—*Mining and Metallurgy.*

The number of diplomas a young man has in his pocket, isn't half as important as the amount of determination he has in his head.

Oil and Gas Flow Through Reservoir Rocks

By BYRON B. BOATRIGHT*

It has been estimated that less than forty percent of the oil contained in reservoir rocks is being recovered under present methods of production. The petroleum engineer is faced with the problem of increasing this percentage. To accomplish this task a knowledge of the factors which affect the flow of underground fluids is essential.

These factors are so inter-related that it is difficult to evaluate the relative importance of each. Although a considerable amount of work has been done on the subject there has been little attempt at co-ordination. As a result, information must be obtained piecemeal, mainly from technical articles in the various publications relating to the oil industry. In this article the author will endeavor to summarize and co-ordinate available information.

DIVISION OF SUBJECT MATTER

As soon as a well is "drilled in" oil starts to migrate into the well bore and a form of Bernoulli's Theorem, which represents a mechanical energy balance between any two sections of a system, can be applied to a consideration of the fluid flow. Take two sections through the sand. A-1, some point at a distance from the well bore where no movement is taking place and A-2, the face of the well bore. Then the following equation can be modified and applied to the problem:

(Bernoulli's Theorem)—

$$X_1+P_1V_1+\frac{V_1^2}{2g}+R+W=X_2+P_2V_2+\frac{V_2^2}{2g}+F$$

Where
- X=Potential energy due to position.
- PV=Mechanical work necessary to force the fluid into or out of the system.
- $\frac{V^2}{2g}$=Kinetic energy due to velocity.
- R=Any mechanical work done on the fluid by outside agencies. (Pumps, etc.)
- W=Work done on the fluid by itself.
- F=Friction loss (in terms of energy).

A number of these terms can be eliminated. "R" is obviously equal to zero as there is no external source of energy. There being no movement at section A-1, "$\frac{V_1^2}{2g}$" also equals zero. "W" drops out as, in a case of this sort, it is included in the remaining terms. The datum plane is taken at the bottom of the sand so "X_2" becomes zero, leaving the equation in the simplified form shown below.

$$X_1+P_1V_1=P_2V_2+\frac{V_2^2}{2g}+F$$

or

$$(X_1+P_1V_1)-F=P_2V_2+\frac{V_2^2}{2g}$$

In this equation, $(X_1+P_1V_1)$ represents the energy originally contained in the reservoir, F the energy lost due to the movement of the fluid through the formation, and $\left(P_2V_2+\frac{V_2^2}{2g}\right)$ the energy remaining in the fluid after it reaches the well bore, determining whether the well will flow under given conditions.

* Professor of Petroleum Engineering, Colorado School of Mines.

Using the above equation as a basis, the factors which affect the flow of fluids through buried formations may be divided into three main groups.

1. Sources of Energy $(X_1+P_1V_1)$
2. Sources of Resistance (F)
3. Unused Energy $\left(P_2V_2+\frac{V_2^2}{2g}\right)$

SOURCES OF ENERGY

Energy can be expressed in terms of feet head of a certain fluid or more briefly as a "head" of that fluid. With this concept of energy in mind, the forces represented by X_1 can be designated as "potential heads" and those represented by P_1V_1 as "pressure heads". For the sake of clearness, they will be discussed separately.

Potential Heads

The force of gravity and hydrostatic pressure are the two sources of potential head to be considered in fluid flow through reservoir rocks. Potential heads are seldom responsible for all the energy contained in an oil sand. Although not as important in oil and gas flow as pressure heads, gravity and hydrostatic pressure are factors and as such must be given some consideration.

Gravity—Gravity is an important source of energy only during the later stages of a well's production when other sources have been partially or entirely depleted. During this phase of a well's life gravity is responsible for the recovery of some oil that would otherwise be lost, providing the economic limit has not been reached. Production of oil under these conditions is a slow process, in many cases only a fraction of a barrel a day being obtained. Good examples of gravity production are found in the old oil fields of Pennsylvania.

The angle of repose of rock fluids, which tends to leave saturated portions of sand between wells, is lowered by the force of gravity. This force is more effective in thick or steeply dipping sands due to the greater potential head available.

Hydrostatic Pressure—Fields which have water under pressure, in back of the oil with no gas present, must depend entirely upon hydrostatic pressure for energy necessary to cause migration. The energy represented by P_1V_1 is negligible as water is only slightly compressible. Unless the head is very slight the wells "go to water" before gravity becomes operative to any appreciable extent. As a general rule the hydrostatic pressure in pounds per square inch approximates the weight of a column of water one inch square whose height is equivalent to the depth of the formation below the surface.

In fields of this type, the wells should be produced slowly to prevent channeling of the water along the lines of least resistance in the formation. If permitted to occur, channeling allows isolated pools of oil, which cannot be recovered, to remain in the sand.

The process of "flooding" depends upon an artificially created hydrostatic head for energy necessary to cause the oil to flow. Water or saline solutions are mechanically

pumped into the oil formation under pressure through key wells and the oil driven into wells ahead by the solutions.

Although seldom the sole source of energy in a formation, hydrostatic pressure is often present in addition to the other sources represented by P_1V_1 and, if properly controlled by the use of back pressure, can be utilized to increase the ultimate production of the field. Observations of the oil temperatures have been found of value in studying fields with regard to water encroachment.

Aside from its value as a direct source of energy, hydrostatic pressure is indirectly responsible for the P_1V_1 energy contained in the majority of oil reservoirs, and will be more fully discussed under "Pressure Heads".

Pressure Heads

In considering the sources of energy represented by $(X_1+P_1V_1)$, it has been shown that with the exception of fields which are under hydrostatic pressure and those which produce by gravity, potential heads, which are represented by X_1, are negligible. This leaves only the pressure head P_1V_1 to be considered.

Water and oil are only slightly compressible and have no P_1V_1 value. The compressed gas in the formation thus becomes the principal source of energy for the propulsion of oil.

Energy of Gas.—The energy contained in compressed gas is represented by the product of the pressure and volume. When the container size remains constant, doubling the pressure doubles the volume which means that the energy increases as the square of the absolute pressure. For instance, if other conditions are equal a reservoir under a pressure of 200 lbs. per square inch contains four times the energy of a reservoir under 100 lbs. per square inch of pressure.

When hydrostatic pressure is found in addition to gas pressure, the water tends to follow the oil and maintain the pressure in the formation by decreasing the volume of the reservoir. This is a condition much to be desired, if controlled. Not only is the extra energy due to the hydrostatic pressure available, but also the beneficial effects on the oil of maintained pressure.

Causes of Formation Pressures—The pressure usually found in oil horizons is probably the result of a combination of several factors. Under equilibrium conditions at a given temperature, all liquids have a certain vapor pressure. Chemical reactions during the formation of the oil has been mentioned as a possible factor. Geological folding in some cases may be in part responsible. Pressure caused by the weight of the overlying sediments has been suggested, although it is improbable that at the depths penetrated by the drills at the present time that this would be the cause of any great amount of pressure. Except in isolated cases it is not likely that any one or combination of the above factors are entirely responsible for the pressures found in oil fields.

It is highly probable that hydrostatic pressure was responsible for most of the pressure found in oil horizons regardless of the presence or absence of water at the time the field is drilled in. A tabulation of the producing depths and the original pressures found in a great number of fields show a very close approximation of the pressures, which would be expected were they due to a hydrostatic head.

Forms in Which Gas Occurs—Gas is present in oil formations in several different forms. All oils under given conditions of temperature and pressure will absorb a certain amount of gas, depending on the character of the oil. Some oils will absorb as high as fifty per cent of their volume under atmospheric conditions. This absorbed gas in addition to being an important source of energy has a pronounced effect upon the physical characteristics of the oil which in turn determine its resistance to flow.

There is usually some occluded gas present which has not been absorbed by the oil. This gas occupies the unsaturated portions of the sand, usually on the top of the structure. This occluded gas may be an important source of energy.

Any gas whose critical temperature is above that of the oil sand may be liquified if the pressure is high enough. Propane and butane are two constituents commonly found in oil field gases that are easily liquified. The presence of liquid gas increases the energy contained in the reservoir a great deal above what would be expected from PV product alone.

There is also present in the formation a certain amount of adsorbed gas (gas which adheres to the face of the sand particles). The amount of gas adsorbed depends upon the roughness of the sand face, the constituents of both the sand and gas and the pressure and temperature of the formation. Altho not important as a source of energy, it accounts for some of the gas in the reservoir.

In addition to furnishing energy for the flow of oil into a well, pressure, though its affect upon the physical properties, has an important bearing upon the resistance to movement exhibited by an oil.

(*To be Continued in February Number*)

Are Engineers Human?

Are engineers persons of importance? This is a question which L. W. Wallace, executive secretary of the American Engineering Council, and J. E. Hannum, editor of the Engineering Index Service have asked in an article, "Engineers in American Life" in the December 1929 issue of *Mechanical Engineering*. With characteristic engineering directness, these two examined the facts by making a statistical study of the names listed in "Who's Who." They found that of the 28,805 listed, the group of scientists, including engineers, architects, physicians, and surgeons, numbers 8863, or 30.4 per cent. Of these, 2858, or nearly 10 per cent of the total, are engineers and architects. These men have received 2497 scientific degrees and 1417 academic degrees in branches of learning other than science. They hold 4785 official positions in 3928 organizations, of which 2993 are industrial and commercial.

The findings clearly show, say Messrs. Wallace and Hannum, "that engineers and architects are versatile, not narrow; internationally, not provincially minded; leaders, not followers; scholarly, not unlearned; cultured, not rude; lovers, not haters of mankind."

Caller: "Won't you walk as far as the street car with me, Tommy?"

Age Seven: "I can't."

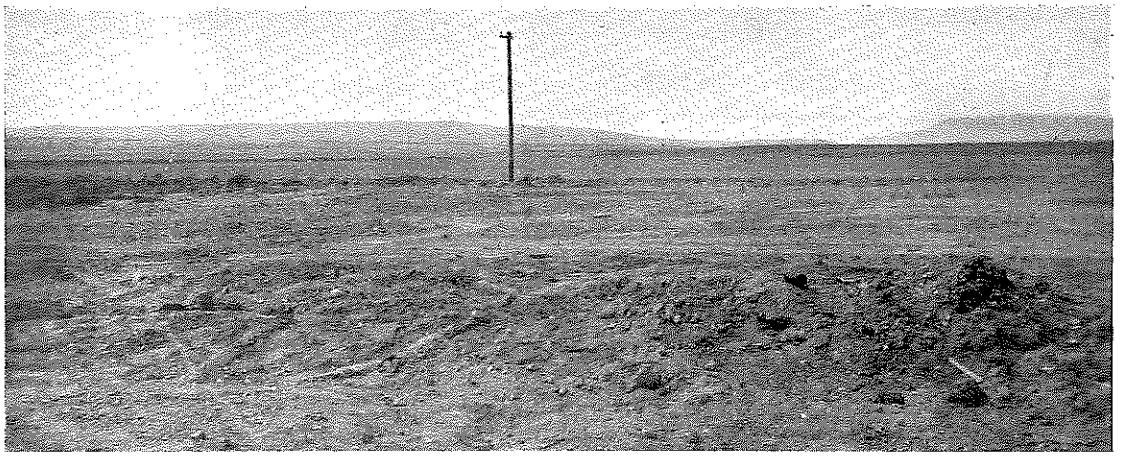
Caller: "Why not?"

Age Seven: "'Cause we're gonna have dinner as soon as you go."

EXPENSIVE SENTENCE

"Has anyone commented on the way you drive?"

"Yes, one fellow made the brief remark, 'Twenty dollars and costs.'"

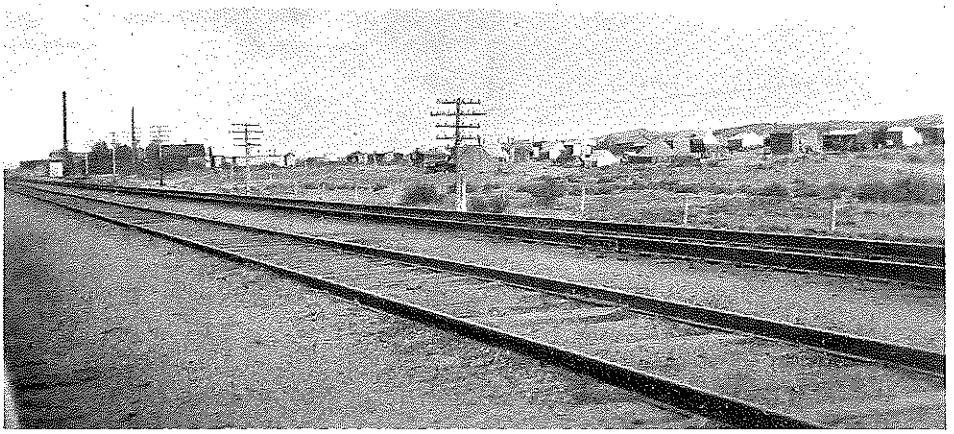


An Oil Tow

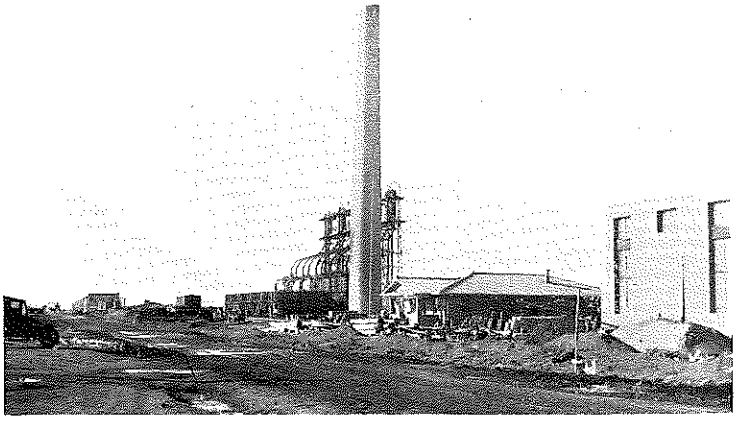
By H. L. M

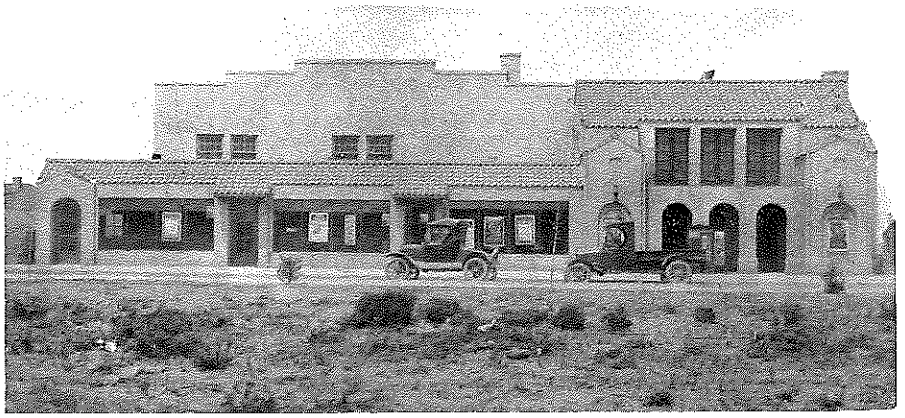
Before the construction work on
first called Grenville—was begun, the
than a desolate stretch of sagebrush.
transformation made almost over night
work on the refinery was started.

As the work progressed, many mor
additional men came the first families
was organized for the purpose of bui
"Parco" was chosen, being a combinati
Refiners Corporation, the company bac



Parco has many natural advantages. It is close to good trout streams and big game hunting grounds; the Lincoln Highway and Union Pacific railroad are routed through the town; there is a plentiful supply of natural gas for domestic use, and an excellent water supply. Parco is an ideal location for a refinery and therefore has a splendid opportunity to grow.





The Refinery was the occasion for building Parco. It is pictured under construction, above right. Above is the town garage.

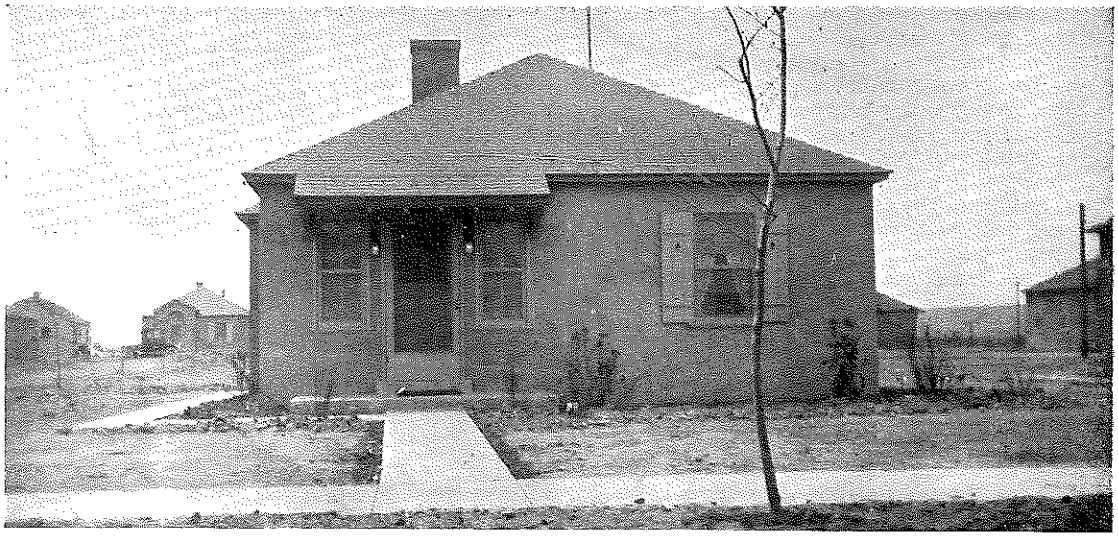
The town complete is a splendid example of the development of the West through recovery of its mineral wealth.

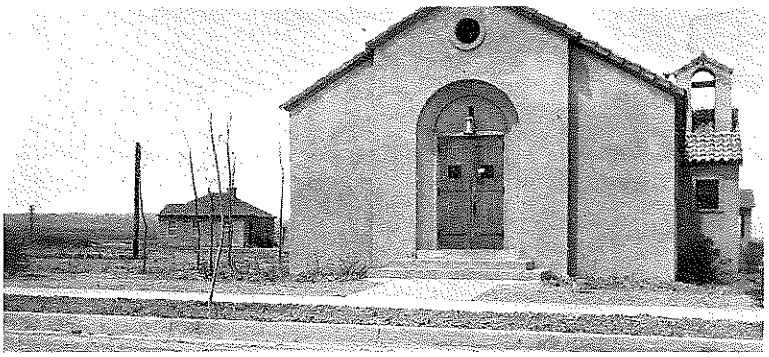
n Overnight

INISTER, '16

the refinery at Parco, Wyoming—at present town site was nothing more The views on the left picture the after a tent city had sprung up when

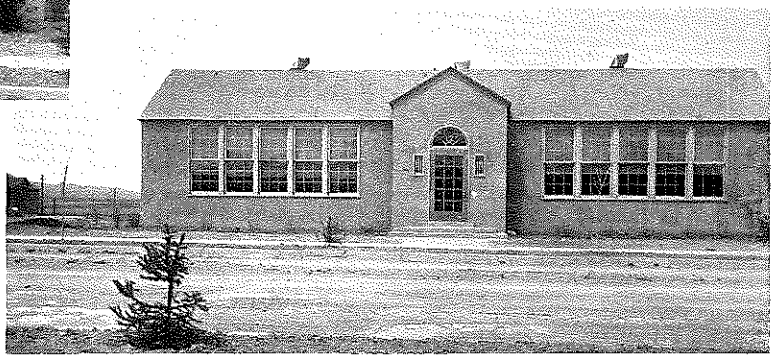
e men were employed; and with these . The Parco Development Company ilding a permanent town. The name on of the initials of the Producers and k of the development.

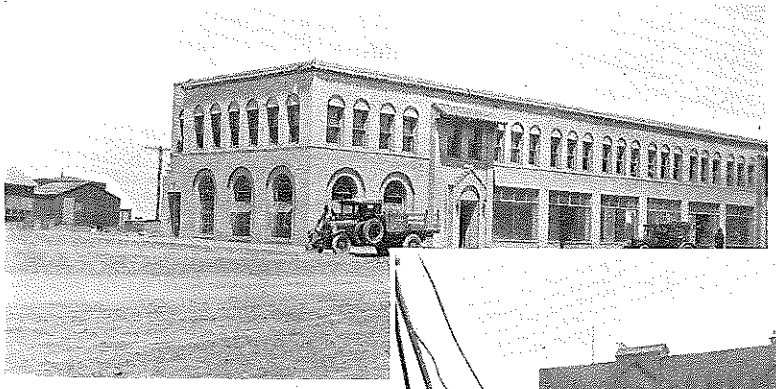




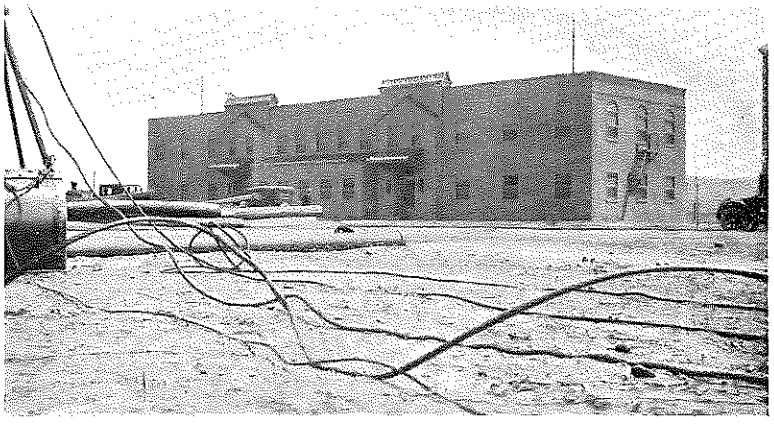
Every thing needed to make a town was included: garage, stores, theater, hotel, town hall, school, church, offices and houses. One of the houses is shown above.

When Parco was built the plans called for a church and a school. The church, pictured above, seats over 150 people and claims no particular denomination. The modern school building is pictured on the right.





Two Pensiones provide living quarters other than in individual residences. One of these buildings is shown below. These hotels, as well as all other buildings in the town are of Spanish design, Pensione being a Spanish word applied to a particular type of architecture.



To the left is the community building with its gymnasium, theater, confectionery and dancing hall. Plenty of provision has been made for wholesome recreation.

Colorado and its School of Mines

PART VII—*Formative Days*

The Colorado Mining College—Hayden's Expedition—The Founders of the School of Mines—Building Begins

By M. R. BUDD, '24

IT would require a divine mind to state specifically who was the founder of the present Colorado School of Mines. Bishop Randall, without doubt, was its guiding genius—without his "University," it is doubtful if a School of Mines would have been founded. E. L. Berthoud, Charles C. Welch, George West, W. A. H. Loveland, all prominent Golden citizens, were not only deeply interested in the founding of a technical school, but they devoted time, energy, and money to such an undertaking, and all may be considered as founders of the institution.

There are two other men, however, not residents of Golden, but very famous in Colorado and national history, who were in some measure responsible for the pioneer mining school in a mining country. These men, to the writer's knowledge, have never before been connected with the history of the Colorado School of Mines. They were Bela M. Hughes and F. V. Hayden.

In the library of the Supreme Court of Colorado will be found the laws passed by the various Legislatures of the Territory of Colorado. In the Private Acts of the Sixth Session, held at Golden City, is the act incorporating the Colorado Mining College. Remember, this was in January, 1867, much before the present school was given mention on the statutes.

Leading the desire for a school of mines, was Bela M. Hughes, whose name leads the list of incorporators of the Colorado Mining College. Gen. Hughes was born in 1817 at Carlisle, Ky. and educated at Augusta College. After serving as a member of the Missouri State Senate, he moved to Colorado where he became a power in railroad circles. He was defeated for governor on the Democratic ticket in 1876, by the small margin of 800 votes.

What became of his college, we do not know. We may merely surmise that it existed on paper only, but it represented a thought that was vital at the time—that Colorado needed a college for instruction in mining.

Because of the rarity of this document, it is published in full:

AN ACT

To incorporate the Colorado, Mining College.

Be it enacted by the Council and House of Representatives of Colorado Territory:

SECTION 1. *That Bela M. Hughes, F. Schrimer, J. J. Cranmer, D. D. Belden and John B. Wolf, their associates and successors, be and they are hereby declared a body corporate, with power to buy and sell property, sue and be sued, plead and be impleaded, for the purpose of establishing and maintaining, at some suitable point within the Territory of Colorado, a Mining College, in which shall be taught all the branches of a thorough mining education.*

SECTION 2. *That said corporation shall have power to make and use seal, issue diplomas, and enact such by-laws as may be deemed necessary for the government of said institution.*

SECTION 3. *The buildings, laboratories, scientific and mechanical apparatus and such other property as may be necessary for the educational purposes of said institution, shall be exempt from taxation.*

SECTION 4. *That the said corporation shall have power to issue stock to the amount of two hundred thousand* (200,000) *dollars.*

SECTION 5. *This act to take effect and be in force from and after its passage.*

Approved Jan. 11, 1867.

Few contributions to the science of geology have been more vital in a nation's history than the reports of F. V. Hayden, director of the United States Geological Survey in the sixties and seventies. Professor Hayden was a geological genius and a scientist of broad ideas. To him, in the writer's opinion, is due much of the credit for the inclusion of a School of Mines in Bishop Randall's University. It is significant that the week Professor Hayden arrived in Golden, an editorial appeared in George West's Transcript citing reasons for the establishment of a School of Mines. West and Hayden were friends; each sought the other's company whenever the noted geologist visited the town, so there is reason to believe that Hayden inspired the editor to write the editorial.

The Transcript records the arrival of the Hayden expedition in Golden on July 14, 1869, in its issue of July 21, 1869, in the following manner:

"Professor Hayden and his party arrived here on Wednesday evening last and went into camp on the bluff north of the paper mill. The expedition is composed as follows: U. S. Geologist, F. V. Hayden; Managing Assistant, James Stevenson; Metallurgist, P. Frazer; Botanists, C. Thomas; Artist, H. W. Elliot; Ornathologist, B. H. Chever. Thursday the fifteenth was spent in exploring the vicinity of Golden City, and on Friday morning they started for Idaho Springs and Georgetown."

The first editorial on record favoring a School of Mines in Colorado, came from the pen of George West in the same issue of the Transcript that recorded the Hayden arrival. It follows:

"A SCHOOL OF MINES"

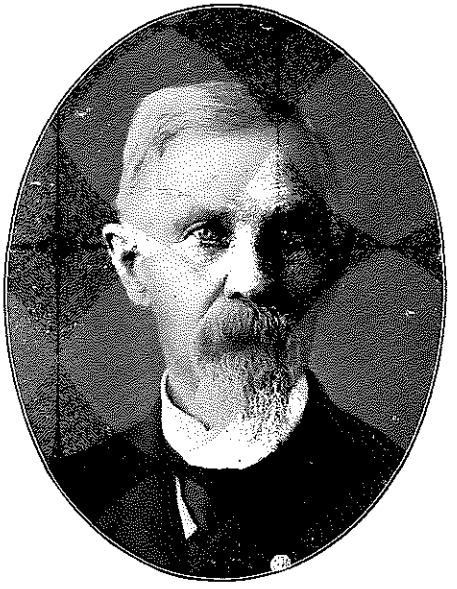
"The establishment at Golden City of a literary institution of high rank for boys, to be shortly developed into a University, is a matter of no small importance. The usual schools of Divinity, Law and Medicine will doubtless soon be added, but the school in which this and the adjoining Territories will feel the greatest interest is a School of Mines. There are two institutions of this character in Europe—one at Paris and another at Freiburg—neither of which, we believe, are convenient to the mines or to the places where large metallurgical operations are carried on. In our country we have a School of Mines in New York City, far away from all the actual working of ores and metals. What, therefore, our country wants, what Colorado and her sister Territories want, is a school of Mines convenient to the districts where the precious deposits of gold and silver, and the other metals, are found in such abundance.

"Golden City appears to us the place for such convenience, and all other requisites of such a school, and our University should start at once with this important branch of education, which is so indispensable for the proper working of our mines, thus affording a place where the youth of the West could gain a thorough and practical knowledge in that direction.

"The advantages for giving to the student a practical and experimental knowledge of the science of mining, are unsur-

passed, as the spot chosen for the University touches the great mineral belt of the country, and affords easy access to the region where the mines and processes for saving the precious metals can be seen and explained. Besides, the place selected—Golden City—is situated in one of the most beautiful and healthy valleys of the whole Territory.

"The appeal is made to all, but especially to the friends of science—to the friends of the mining interests of the Great West—to found and liberally endow at once a School of Mines in connection with the University about to be built in Golden City. Certainly the experience of the past ten years has fully demonstrated the necessity for a more general scientific education for the successful working of our mines, and until such knowledge is disseminated, we may expect disastrous failures for the want of it to continue.



George West, founder of the Colorado Transcript and the first to give publicity to the idea of a Colorado School of Mines.

"We have heard of munificent donations lately made for the establishment of Schools of Mines in connection with the great colleges of the east. The donors have done wisely, but their wisdom would have been more conspicuous had they chosen localities nearer the mines on which graduates hope to bestow their skill. It is patent to everybody's judgment that an investment of a hundred and fifty thousand dollars here at Golden City, convenient to the mines to be developed would do far more for the important sciences connected therewith, than five times that amount two or three thousand miles distant from the great mining operations.

"Will not some come forward and aid science in her efforts to extract the precious metals by liberally endowing a School of Mines in connection with the University now being commenced at Golden City.

"We call upon our Territorial contemporaries, of whatever locality, to aid us in bringing a matter before the people of the country, that must in so great a degree rebound to the benefit of the whole mining regions of the Rocky Mountains, as well as the country at large."

There are so many to whom honors are due for conceiving and erecting a School of Mines, that it is difficult to give all credit to one man. To Bishop Randall must be given primary consideration because he first conceived a University at Golden and his plans called for a School of Mines. To C. C. Welch we will always be indebted because he gave Bishop Randall the ground on which the University was built; George West was the first to express publicly a desire for a School of Mines at Golden, but, as pointed out previously, F. V. Hayden probably was the inspiration of this editorial; W. A. H. Loveland and E. L. Berthoud were, without doubt, prime movers in the enterprise; while Gen. Bela Hughes is worthy of recognition for his Colorado Mining College of 1867. There is praise for all, but Bishop Randall emerges as the guiding genius and the individual most responsible, not only for the School of Mines but also for Jarvis and Matthews Halls.

The entire community became active in urging a School of Mines on the Legislature, which met in Denver in 1870. That astute and illustrious Goldenite, W. A. H. Loveland, not to be denied this time, aided Bishop Randall and secured the passage of the bill "establishing" a School of Mines at Golden and appropriating $3,872.45 for the erection of a building. The act, passed and approved on Feb. 10, 1870, has been printed in full in an earlier installment.

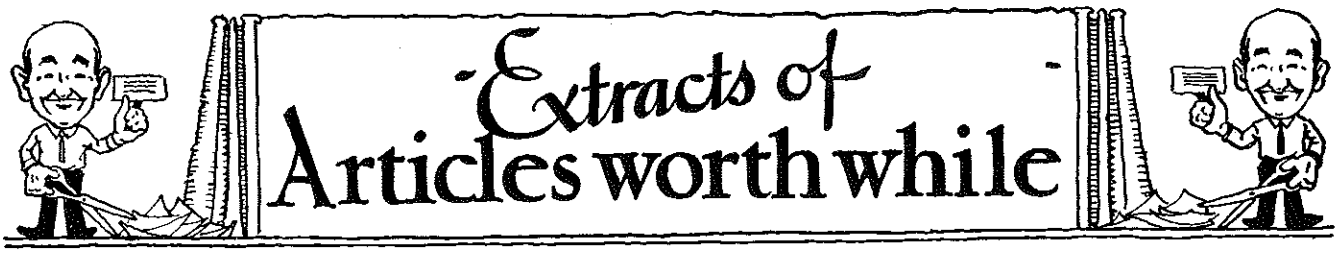
There was no doubt about a School of Mines now, although it is deeply regretted that it was not established according to the wording in the heading of the bill. It merely appropriated a certain amount of money in the trust of a group of men. It was not until 1874 that we can say truthfully that the School of Mines was legally established as a state institution, although the point is certainly open to argument.

With the money granted, the contract for the construction of the building was soon let to J. H. Parsons. Brick work was rushed rapidly, but it was to be several years before funds were available to complete the project.

The first revolt against the location at Golden—the first of many to be heard during the school's history—was made by residents of Central City. On March 23, 1870 appeared a violent editorial in the Central City Register-Call, protesting that Central City was a better location for a mining school than Golden, because of its proximity to the mines. Supported by the Tribune and News of Denver and the Herald of Central City, the Transcript replied that Golden was the better site because of the existence of a school to which a school of mines could be added at slight expense—in fact, an appropriation of less than $4,000 would have been useless without the Jarvis Hall already in existence. The Register would not be downed by this argument, however, and in a succeeding issue took up the religious issue, stating that it was an insult to place a state institution under the dominance of a particular church. This argument was raised repeatedly during those early days when, had it not been for the church, there would not have been a School of Mines. Furthermore, Bishop Randall did all in his power to make the school free from criticism of church control.

On July 13, upon completion of the brick walls of Jarvis Hall, excavation had been completed on the School of Mines building. At the same time the freight depot and Transcript Office were erected by Parsons and Curry. On July 20, 1870, the Transcript announced that the cornerstone of the School of Mines would be laid in a few days.

There was more to be done, of course, but the seed had been planted and was sprouting. An humble beginning? Yes. But it signalized the beginning of an institution that was to take its place at the fore of Colorado educational institutions and become the largest mining school in the world.



Upper Cretaceous Formations of Southwestern Arkansas by C. H. Dane. *Arkansas Geological Survey Bulletin No.* 1. 215 pp., 4 figs., 29 plates including one geological map in colors. September 1929. ($1.70 paper, $1.95 cloth).

The cretaceous of Southwestern Arkansas includes above the Comanche Series the following formations: Woodbine, Tokio, Malbrook mail (restricted), Saratoga chalk, Nacatoch sand, Arkadelphia mail. These are folled by some Tertiary deposits.

A detailed discussion is given of each of these formations including: historical summary, lithology and outcrops, thickness, fauna and correlation, origin, and physiographic expression. Good plates illustrate the fossils characteristic of the formations.

Short general statements follow on the structure of the region, development of the Mississippi Embayment, physiography, and economic geology of the area. The book is well printed, neatly bound, and has good illustrations.

—J. H. J.

* * *

A Comparative Study of Engineering Education in the United States and Europe by William E. Wickenden. *Society for the Promotion of Engineering Education, N. Y.,* 1929. 275 pp., illus. 40 cents.

Most of this valuable and important work is given over to a concise and critical description of European equipment and procedure in engineering education together with an account of its influence on the development of institutions and courses in the United States. A final part, of 15 pages, is a summary review of "the American scene" which points out that we show but little diversity, and suggests that "tradition, the influence of early models, and imitative growth may impose even greater uniformity than bureaucratic authority." In concluding that what we need is "a rational diversification," the author concludes:

"A well proportioned national system of technical education will not grow up spontaneously. The entire situation needs to be visualized, a consistent but duly flexible policy formulated and an effective guiding and promotional effort sustained. These are joint responsibilities of educators, the organized technical professions and industry. In the absence of any national educational authority, we should strive to build up a joint representative agency of the various groups concerned—schools, colleges, professional societies, industries—and put to the test Americal capacity for self-government through cooperation."

* * *

The Mineral Industry During 1928. By G. A. Roush. McGraw-Hill Book Co., N. Y., 1929. 802 pp. $12.

Appearance of the annual volume of Mineral Industry, of which this is the 37th, is one of the events of the year for mining men. The preliminary estimates issued by the Bureau of Mines at the first of the year and the individual pamphlets by commodity, which the Bureau gets out as rapidly as securing the figures in a single volume are naturally much more useful than individual pamphlets, whose ease of filing by subject also conduces to making it more difficult to locate when wanted. That there is a real need for a single inclusive volume, issued as early in the following year as possible, is best attested by the long period over which demand for it has been maintained. This book is of value to all interested in our mineral supplies and industry.

* * *

World Pays Homage to Thomas A. Edison. Staff Article in *Electrical World.* October 26, 1929.

Wizard of Menlo Park re-enacts birth of incandescent lamp amidst surroundings of 1879 re-created by Henry Ford. President Hoover and leaders of industry stand by.

A full page photograph of Edison is given. Also photos of the historic train from which Edison was ejected as newsboy, the recreated laboratory where the lamp was perfected, the 100 foot tower at Menlo Park with a top in the form of the first lamp 18 feet high, and the Edison Institute at Dearborn.

President Hoover's address on this occasion is given. Crowning the whole program is Mr. Edison's simple speech of appreciation, given in full.

Dr. Albert Einstein's tribute to Mr. Edison was broadcast from Berlin across the Atlantic to Dearborn and then rebroadcast throughout the country. This was the first occasion when all radio listeners in the United States could hear the voice of one speaking at so distant a place as Berlin. The translation of Doctor Einstein's message is given.

—W. J. H.

* * *

Horace Bushnell Patton. Alfred C. Lane in *Science.* Nov. 15, 1929.

The writer of this obituary, Doctor Lane of Tufts College was a fellow student of Doctor Patton's in Germany. He relates that Doctor Patton took his degree summa cum laude in 1887 and tells many incidents of their friendship in Germany and in Michigan. His outline of Doctor Patton's work and publications (some in German) probably contains information not hitherto published.

—W. J. H.

* * *

Engineers of 26 *Countries Exchange Views at Tokyo. Electrical World.* November 16, 1929.

Nearly 800 papers were presented by engineers from 26 countries at the World Power Conference and World Engineering Congress which terminated in Tokyo, November 7. Needless to say, these papers cannot be mentioned here even by title. Mr. E. W. Rice, Jr. of the General Electric Company read a paper on the Transmission Lines of Tomorrow in which he told of a five million volt lightning generator for testing lines and equipment. Interconnection of systems is progressing rapidly. One of the most important interconnections is being made by three companies in Pennsylvania with a resulting saving of station capacity of some $40,000,000. Vacuum tube rectifiers are mentioned in connection with transmission as they may be used to convert alternating to direct (high tension) current for

transmission by cable, then reconverted to alternating for distribution by means of the inverted rectifier or "thyration". This process may multiply the power capacity of installed cables two or three times, with immense saving of investment.

—W. J. H.

* * *

Refining of Shale Gasoline I. Relation of Oxidation to Colors and Gums Produced in Gasolines from Colorado Oil Shales. By Robert A. Baxter, Assoc. Prof. of Chemistry, Colorado School of Mines, *Industrial & Engineering Chem.* 21, 1096 (Nov. 1929).

Colors and gums are produces as a result of oxidation rather than polymerization. The effects of various oxidizing agents in accelerating these changes are described. Ozone was found the most satisfactory and is suggested as a possible refining agent.

The stabilizing effects of various antioxidants were studied and phenylhydrazine was shown to be a retarder of color and gum formation, but no complete protector was found.

The gums may be held in suspension by adding alcohol to the gasoline, but are dropped when the mixture is vaporized.

The use of ozone as a reagent for the detection of active compounds or for indicating the stability of gasoline was suggested.

* * *

The Mechanical Engineering Magazine, the monthly journal published by the American Society of Mechanical Engineers, has been added to the publication list in the C. S. M. library along with several other interesting magazines.

One particular feature of this Magazine is worthy of mention and that is the "Engineering Index". Important articles of some 1700 technical publications from all over the world are indexed by topics with complete reference. This index may be of great help in looking up references along certain lines.

—R. W. M.

* * *

Test Code for Liquid Fuels. An abstract of the Tentative Draft of a Test Code for Liquid Fuels is given on pages 958 to 961 of December 1929 issue of Mechanical Engineering.

—R. W. M.

* * *

Elastic and Inelastic Behavior in Spring Materials, Mechanical Engineering, Vol. 51, No. 12, December 1929, page 915.

Investigation of nature's laws frequently reveals comparatively simple relationships that can be represented by simple mathematical expressions. Thus, for instance, Boyle's law, that the product of the pressure and volume of a gas is a constant if the temperature is constant, seems to state the truth unless very accurate measurements are made to reveal the deviations from this relationship in the case of all real gases. The simplicity first noted disappears in the light of more searching truth.

So it is with Hooke's law, says Professor Sayre of Union College. For years it has been a fixed principle in engineering practice that stress is proportional to strain. On making tests on spring materials and using a measuring instrument with a precision five times as great as the one formerly used, Professor Sayre obtained results which seem to indicate that a correction of this law is necessary. The deviation from the law is not sufficient to be noticed in materials commonly used at low stresses, such as structural steel. It is enough to be noticeable in spring stresses in phosphor bronze and spring steel.

—R. W. M.

* * *

Vapor Phase Cracking in Refining Oil. D. M. Evans. *Oil and Gas Journal,* July 12, 1928, page 146 and *Oil and Gas Journal,* Sept. 19, 1929, page 46. A description of the T.V.P. (True vapor phase) process at Texas City, Tex., of which Mr. Evans is the Superintendent for the Petroleum Conversion Corp., owners of the Knox patents and other subsequent patents on which this process is based. This process involves the use of checker bricks which are alternately heated by oil fires and used to vaporize and crack more oil.

—R. A. B.

* * *

Porosity Determination of Oil Sand. Chase E. Sutton. *Oil and Gas Jour.,* July 12, 1928. Page 34. The use of the acetylene tetrachloride method of Russell, which was described in the Bull. Amer. Assn. Pet. Geol. Oct. 1921.

—R. A. B.

* * *

The Petroleum Engineer. The first issue of a new monthly magazine for operating men of the Petroleum Industry appeared in October. It is published by the Petroleum Engineering Publishing Co., Tulsa, Okla. The first three issues are well organized and contain many interesting articles.

—R. A. B.

* * *

Determination of Sulfur in Petroleum Oils. R. C. Griffin, *Ind. and Eng. Ch. Analytical Ed. Vol.* 1, pp. 167-169 (July 1929) Comparison and discussion of the lamp and the bomb methods for the determination of sulfur in petroleum.

—R. A. B.

* * *

Ten Articles Recently Delivered as Papers before the World Power Conference and World Engineering Congress at Tokyo, Japan. General Electric Review. November 1929.

Recent Economic Developments of Electric Power. E. W. Rice, Jr.

Industrial Progress Made Through Research and Its Economic Importance, Dr. W. R. Whitney.

Economic Results of Railway Electrification. A. I. Tatten.

Rolled Steel in the Construction of Electrical Machines. H. G. Reist.

Lightning: Part I. F. W. Peek, Jr.

Emmet Mercury Vapor Process. W. L. R. Emmet.

Structural Steel Welding. T. P. McKibben.

Some Phases of Ship Propulsion as Influenced by Modern Power Plant Engineering. A. Kennedy, Jr. and R. A. Beekman.

Some Economic Aspects Affecting the Design of Large Power Transformers. F. F. Brand and H. O. Stephens.

The General Trend of Steam Turbine Development by the General Electric Company. E. L. Robinson.

—W. J. H.

* * *

Iodine Numbers of Lubricating Oils before and after use in Automobile Engines, Seyer and Allen, *Ind. and Eng. Ch.* 21, pp. 793-794. (Aug. 1929). Description of test and tabulated values for the oils tested.

—R. A. B.

Distillation and Rectification of Comples Mixtures. L. Gay. *Chimie et industrie* 22, pp. 3-18 (July 1929). Continuous distillation with a single column.

—R. A. B.

* * *

Melting Points of Normal Paraffins. Hildebrand and Wachter., *Jour. Am. Chem. Soc.* 51, pp. 2487-88. (Aug. 1929) A critical consideration of the values given in the International Critical Tables, with suggested corrections.

—R. A. B.

* * *

Heat of Fusion of Many Normal Hydrocarbons in Oil. W. T. Ziegenhain, *Oil and Gas Jour.,* Sept. 26, 1929. Vol. 28, p. 143. Table of heats of fusion of paraffin hydrocarbons.

—R. A. B.

* * *

Volumetric Estimation of Sulfur in Crude Petroleum. Gladys Woodward. *Ind. and Eng. Ch. Analytical Ed.* 1, pp. 117-8. Oil is burned in an oxygen bomb and the washings titrated.

—R. A. B.

* * *

60 *Tons of Chlorine a Day. Electrical World.* December 7, 1929.

This is a two page illustrated description of a large installation of Vorce cells in the plant of the Westvaco Chlorine Products Company of South Charleston, West Virginia. The cells are 26 inches in diameter and 42 inches high. They operate at 1000 amperes and 3.5 volts each, producing 65 lb. of chlorine at 93.5% current efficiency in 24 hours. The brine entering the cells is preheated to 170 degrees F.

—W. J. H.

* * *

Estimating Line Costs. Electrical World. December 7, 1929.

An itemized cost sheet for one mile of 33 kv. single circuit line with three No. 1 conductors in flat configuration on 35 feet and 30 foot poles spaced 225 ft. For each item used the size quantity unit price and item cost are given. Included in the cost are transportation, store charge, labor and office supervision. The total cost per mile for 35 feet construction is $2447.84. For 30 ft. poles is $2370.34.

—W. J. H.

* * *

Efficient Hydro Operation. F. Nagler. *Electrical World.* Nov. 2, 1929.

This article shows by curves and calculations how the plant efficiency for various outputs can be obtained by comparatively simple means without a complete test which involves much time and expense.

—W. J. H.

* * *

Why 20 *Railroads Electrified. Electrical World.* Nov. 2, 1929.

Anyone interested in railway electrification will find much to study in this article. It is an abbreviated report taken from Serial Report No. 289-118 of the National Electric Light Association. The original report gives a tabulated analysis of 86 electrifications and an analysis of contracts applying to this country.

The several lines of the twenty roads listed in the abstract all use D. C. or 25 cycles. One road uses 22000 volts 25 cycle. Thirteen use 11,000 volts 25 cycle. Two sections of the c. m. St. P. & Pac. use 3000 D. C. The B A & P uses 2400 volts D. C. and 12 roads use 650 volts D. C. or thereabouts. Two 1500 volt D. C. and two 1200 volt D. C. are listed.

—W. J. H.

* * *

Ethyl Alcohol Industry Improves Distillation Processes. Gustave T. Reich. *Chemical and Metallurgical Engineering.* December 1929.

A four page illustrated description of modern alcohol processes. The production of denatured alcohol was about 29 million gallons in 1930, rising to 105 millions in 1928. Production of synthetic alcohol has spurred the distillers to improve their methods and reduce the costs.

—W. J. H.

* * *

Producing Alumina by Acid and Electrothermal Processes. Junius D. Edwards and Ralph B. Mason. *Chemical and Metallurgical Engineering.* December 1929.

This is the second of two articles by the authors, describing means for making alumina and the present status of the various processes. In the November issue the alkaline methods, typified by the Bayer Process were taken up. Acid processes, chiefly for producing alumina from materials other than bauxite are discussed here. Also the authors explain the electrothermal processes of which the "Day Process" of the Aluminum Co. of America is the most important.

—W. J. H.

* * *

Handling Corrosive Agents. A. H. Cooper. *Chemical and Metallurgical Engineering.* December 1929.

A four page article making recommendations for handling sulphuric, nitric, hydrochloric and acetic acids, alkalies, ammonia and hydrogen sulphide, based upon the practical experience of many concerns. A carefully selected bibliography on corrosion is included.

—W. J. H.

* * *

Electrification of a Large Gold Mine. J. F. Wiggert. *General Electric Review.* September 1929.

This is a very interesting, detailed and profusely illustrated 13 page article on the Homestake Mines at Lead, S. D. It follows the changes in power supply from the wood burning plants used in 1878, through the coal burning period after there were railroad connections to the present complete electrification. Possibly the term "complete electrification" is a misnamer, for air is used in drills and underground locomotives. However this air is furnished by electrically driven compressors.

—W. J. H.

* * *

Essentials of Civilization. By Thomas Jesse Jones. *Henry Holt and Company, New York.* 1929. 267 pp. $2.50. A brilliant discussion of the implications of modern civilization together with a constructive presentation of the answers to some of the questions raised by our machine age. An excellent book.

A MECHANICAL COW

Our 4-year-old son visited the farm. He watched interestedly as his grandfather ran the milk through the separator.

When he got home he got a catalog, and showed his father the picture of a cream separator.

"See here, dad," he said, "if we had one of these things we wouldn't need a cow, would we?"

Athletics

A Glance at Conference Basketball

Set back for the last three years in the playoff for the Rocky Mountain conference basketball championship, eastern division teams, representing the Colorado-Wyoming area of the conference will make every effort to prepare themselves for a desperate attempt to bring the championship this year to this side of the mountains.

The University of Colorado, eastern division champion of 1929, probably will not measure up to previous strength, but the Silver and Gold expects to make a spirited fight for first place once more. Denver, vastly improved, is regarded as a strong contender. The Colorado Teachers have lost the pick of their 1929 material and are rebuilding. Western State is regarded as a serious bidder, and Wyoming apparently is missing Outsen, whose work was one of the big factors that made the Cowboys one of the best last season. Mines as usual is a Dark Horse, and little is known of the Ore-diggers' strength.

The return of Eads, a letterman of the 1928 season, who was out of school last year, will give Coach Hinds three veterans around which to build his 1930 squad, Johnston said. Bond, captain, and Morris, forward, will be depended upon to carry the bulk of the burden during the coming season.

Several promising basketeers have been uncovered in the freshman class, including Fenwick, former Golden high star, and Hilton.

Six conference games have been scheduled here and one game will be played with Regis.

Bill Morris, forward. Morris was one of the freshmen to make the 1929 team. This, his second year of basketball at the School of Mines, should prove to be a great year for Morris.

Ernie Bond, Captain of the 1930 basketball team. Bond is a Sophomore, the first member of this class ever to be elected Captain of a Mines team. He plays a guard position and will be depended upon to fill in the big gap left by the graduation of Red Wells last May.

Capt. "Dutch" Clark's Colorado College Tigers are sure to have a better passing team but it may not be a free scorer.

Eastern division teams have not measured up to the strength shown in the western division, which embraces Montana and Utah, at least not for the last three or four years, and there is little indication that the conference champion will come from the eastern slope of the Rockies in 1930. Montana State, the defending champion, Utah University and Brigham Young all look stronger than any team Colorado and Wyoming can put forth, and the Utah Aggies, early scores indicate, are better than anything on this side of the mountains.

Football Letter Men

The following men were granted football sweaters for 1929:

Floyd Carr, (Captain), Tulsa, Oklahoma; Charles F. Bonnet, Ridley Park, Pa.; K. W. Dickey, Loveland, Colo.; Harold Eads, Greeley, Colo.; A. Y. Barney, Denver, Colo.; Ivan G. Burrell, Findlay, Ohio; Ernest Bond, Westcliffe, Colo.; C. L. Barker, Weatherford, Texas; Robert Hastings, Arvada, Colo.; William Wallis, Enterprise, Oregon; Eugene Pressett, Sunnyside, Utah; Chas. D. Michaelson, Sycamore, Ill.; Theodore Say, Butler, Pa.; Don Peaker, Kearney, Nebraska; Gordon Burk, Denver, Colo.; Clyde True, Mead, Colo.; Dan H. Griswold, Albuquerque, N. M.; Walter Adams, Denver, Colo.

A. T. O.'s Take Rifle Shoot

The intramural rifle cup presented by the military department for the winners in the intramural rifle match at the Colorado School of Mines was won by the Alpha Tau Omega Fraternity. The match was extremely close and the winners won by only a three-point margin over the Beta Theta Pi Fraternity. The Sigma Phi Epsilon Fraternity were third and only 10 points behind the winners.

Robert Stark of the Sigma Nus was the high score man of the match with a score of 179 out of a possible 200.

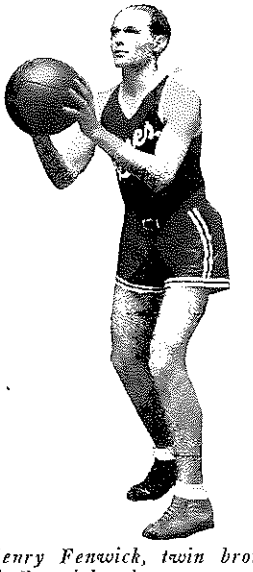
The scores of the various teams were as follows:

Alpha Tau Omega	782
Beta Theta Pi	779
Sigma Phi Epsilon	772
Barbs	762
Sigma Nu	736
Kappa Sigma	691
Phi Lambda Alpha	686
Sigma Alpha Epsilon	657

The Mines' R. O. T. C. rifle team took third place in 1928 in an inter-collegiate match among schools of the Eighth Corps area, including states of Arizona, New Mexico, Oklahoma, Texas and Colorado.

Tennis Tournament is Won by Mike Mercer

The final result of the tennis tournament left Mercer winner over Wilmot. The intramural tennis championship will not be finally decided until next spring when the doubles are played. There were a great many participants in the singles, and it is to be hoped that as much interest is taken in the doubles.



Willis Henry Fenwick, twin brother to Kenneth Fenwick who was a regular on the 1929 basketball five, will make his bid for the varsity this season. He is expected to fill his brother's shoes as a forward.

Football Banquet for Entire Squad

The entire football squad was honored December 3 with a banquet given to them by the Stray Greeks. About 160 students and professors were present at the dinner.

Dr. A. S. Adams acted as toastmaster, and the speaker of the evening was Erle O. Kistler, only honorary member of the Colorado School of Mines Alumni Association. Mr. Kistler reviewed the season and drew a comparison between the Mines team and the Yale team of 1911. He stated that the Mines team of this year like the Yale team on which he played had shown unity of thought and spirit throughout the entire season. Mr. Kistler emphasized these factors, saying that they counted more than a long string of victories.

Among the other speakers were Dean Morgan, Dave Johnston, Coach Allen, Captain Carr, Coach Hinds, and Professor Risley.

Dean Morgan gave a short talk expressing the views of the Administration on a college man who plays football for his school. Coach Allen read the list of men making letters this year, and spoke briefly about the season.

Captain Carr was given a great ovation, and it was some minutes before the crowd quieted so that he could speak. The few words which he said were received with much enthusiasm by the banqueters. The banquet was closed with the "Mining Engineer."

Captain Carr Honored Again

Floyd Carr, the 1929 Miners' football captain, in addition to being selected on the honor teams of the Denver sportswriters for the Rocky Mountain conference, has been given honorable mention as an all-American halfback by both the New York Sun and the Associated Press. The Associated Press gave honorable mention to three players in this conference. Jonas of Utah, Clark of Colorado College, and Carr of Mines were the three who received this honorable mention.

Another honor has come to Carr in that he was asked to play on the Rocky Mountain all-star team New Years Day at Denver.

Carr has been throughout his career at Mines one of the greatest backs that the School has ever produced. During his four years under the tutorship of Coach George Allen, Carr developed into the greatest ball carrier to be found anywhere in the Rocky Mountain conference. It is fitting that his career should be brought to a close in this blaze of glory in the form of the honors which have come to him since Thanksgiving.

Mines Basketball Schedule

Jan. 10—Colorado Aggies at Golden
Jan. 22—Colorado University at Golden
Jan. 25—Colorado Teachers at Greeley
Jan. 28—Denver University at Golden
Feb. 1—Colorado University at Golden
Feb. 7—Western State College at Salida
Feb. 8—Western State College at Salida
Feb. 14—Colorado College at Golden
Feb. 15—Colorado Col. at Colo. Springs
Feb. 22—Colorado Teachers at Golden
Feb. 25—Colorado Aggies at Fort Collins
March 1—Denver University at Denver

R. M. C. 6—N. C. C. 13

The first New Years football game ever to be staged in Denver was a contest between the R. M. C. all-stars and a picked team from the North Central Conference. The boys from the North won 13 to 6.

Coaching the R. M. C. team were Van de Graff, Saunders and the Mines' coach, George Allen. Playing in the backfield of this team were Hoover, DeFrate, Call and the 1929 Miner Captain, Floyd Carr.

Montana State Left Out

The football schedule as arranged by the Conference Coaches in December again leaves Montana State out in the cold with only three conference games. The action of so called "Big Six" coaches in scheduling games with each other, leaving the weaker teams the scraps, has been severely criticized in some quarters.

It is rumored that the faculty representatives of the Rocky Mountain Conference may declare the coaches' schedule void at their annual meeting. Insofar as Montana State is concerned neither the faculty nor the athletic department seem greatly concerned over their failure to schedule games with conference opponents. Yet Montana State has added much prestige to the Rocky Mountain Conference. Its basketball teams of the last three years have attracted nation-wide attention. The Montana team has just finished an eastern tour with honors, proving that R. M. C. basketball is on a par with the midwestern and Atlantic States game.

Basketball Team

Before the Magazine is published the Miners will have played their first basketball game of the season. At present those out for the team who are likely to play in practically every game are: Morris, Dickey, Fenwick and Hylton, Forwards; Bond, Eads and Austin, Guards.

"Lefty" Eads whose return to school this year enables the Miners to count on another good guard. Eads played on the Varsity two years ago.

Alumni Letters

Chicago, Illinois,
Dec. 19, 1929.

Dear Mr. Colburn:—

The above address (316 W. Chicago Ave., Chicago, Illinois), is a laboratory where I have been testing and still am testing materials to determine their resistance to special solutions.

The apartment building in which we are living is immediately on the lake. We have been getting the full benefit of the storms that have occurred in this section. The October storm, that caused so much damage, was quite fascinating to the "landlubbers", meaning ourselves. We've been having quite a blizzard with the waves of the lake starting in to do more damage. Last night it piled a big ice bank up along the shore which should offer a lot of protection from the beating waves.

Sincerely,
F. M. BELLEAU, '23

La Porte, Calif.,
Dec. 3, 1929.

Dear Mr. Colburn:—

I received your letter of November 25 and am very sorry that I missed seeing you. I hope your trip to California was both successful and pleasant.

I read in the Magazine of the forming of a Local Section in San Francisco and will most certainly call on Mr. Eye the next time I am in the Bay region. I would like to meet some Mines men out here and I know I would enjoy attending a meeting of the section.

Here in the high Sierras we are enjoying a most unusual Fall. There hasn't been a cloud in the sky since last May and traveling in autos over dusty roads that by this time of year are usually blanketed with five feet of snow is most unique. Although at the mine we need water badly, for our cleanups, the clear weather and the warm days don't bring tears to anyone's eyes. It's hard on the farmers, but there's always been a scrap in this state between the farming and mining interests, so we in the mines don't care so much about the agriculturists.

I suppose when it starts to snowing our mail will be delayed considerably so I can't expect the Magazine on time. However, I always enjoy reading it, even the advertisements, when it does come and a few weeks delay don't make much difference.

Yours very truly,
FRANK E. DELAHUNTY, '25

Antamok, P. I.,
Nov. 5, 1929.

Dear Colburn:—

I am enclosing herewith a card showing the Antamok Gold Mine of the Benquet Consolidated. We are only nine kilos from the "Summer Resort of the Orient." That is Baguio. That city is really a very pretty place. There are several hundred Europeans there the year round and these with the help of the mines support a rather nice country club. It's amusing to think of the hard rock miner taking off his diggers and advancing to the other end of the social scale in less than an hour. I made the short nine in 42 yesterday so perhaps my associations at school didn't hurt after all. Understand that I'm not bragging about the 42. Robinson turned in a 34 one day before he left.

Frank Joaquin is across the hill at the Itogan mine. He is one fine fellow. As you may know I started where he left off here and now he is doing the same thing in the way of maps across the hill.

We broke the Benquet record last month both for a full month and a half month. The total is over 180,000 in good old American dollars. The best part of it is that there are four years of the same left in the ground as proven ore. Operations will start this week to continue the shaft to the 1070 foot mark. I'm betting that it's ore all the way down. I'm pretty lucky at the betting too; I won three pesos in the world series.

Have only had returns from two football games. It is my understanding that D. U. beat Mines but on the other hand lets shake because Mines beat C. U. at Homecoming. Hope that last is true.

Well, Colburn, it's getting late and Benquet Consolidated's engineer needs the sleep.

Most sincerely yours,
F. L. ROOTS, '27.

Maracaibo, Venezuela,
Sept. 15, 1929.

Dear Colburn:—

Enclosed find check in payment of my dues and magazine subscription and also for George Ordonez and Calvin Townsend.

Several of us got together last week and to hear all the noise you would know that we were a long way from forgetting the School of Mines.

The Alumni Magazine is our only source of information about what is going on at Golden so you can bet we look forward to receiving it each month.

Yours truly,
HUGH A. WALLIS, '28

Chicago, Illinois,
November 25, 1929.

Dear Mr. Colburn:—

Greetings to you, for the Season, the heartiest!

I am now permanently "located" here in Chicago and if you do not already have my address, here it is: 4642 Lake Park Avenue. I am working for the Goodman Manufacturing Company in the Foreign Department.

For some time I have not received any communication from you and I have not received the Alumni news or Magazine. I am, as you know, always interested in news of openings for graduates as are several of the alumni in the Chicago district.

I was in Benton Harbor, Michigan yesterday on a steel foundry inspection trip and on my return stopped at Gary to see L. A. Woroshiloff and wife. He is happily married and is to be heartily congratulated on his choice of life companion.

With best wishes for everyone, I am,
Sincerely,
RAYMOND G. TRAVIS, '25

Campus

Students and Faculty Have Splendid Vacation

The holiday season was occasion for many social functions about the campus, both among the faculty members and the students. Vacation sent large numbers of students home, but those who remained were not left stranded with nothing to do.

Preceding the vacation period was the A. T. O. Pledge dance at the Argonaut Hotel in Denver. More than fifty couples attended the dinner served before the dancing was started.

CONSOLATION DANCE

About 125 couples attended the annual Consolation dance for those students unable to go home for the holidays. The dance was held at Guggenheim Hall, and the auditorium was decorated in blue and white for the occasion. This is an annual affair and the outstanding event of the holiday season.

VARIOUS PARTIES

Dr. and Mrs. Leon S. Ward entertained a number of students at Christmas dinner, making the day a happy one for many who could not be at home.

Prof. and Mrs. W. P. Huleatt entertained at seven o'clock dinner December 26. Guests included several of the faculty members remaining in Golden during vacation.

The Faculty Women were guests at a tea at the home of Mrs. Arthur S. Adams the afternoon of December 19. Otis Miller, Mines student, and Mrs. Laurence Criley provided musical numbers during the afternoon.

Dr. and Mrs. C. A. Heiland entertained at a beautifully appointed New Year's Eve dinner in their home.

Dr. Arthur S. Adams entertained at a stag bridge party during the latter days of vacation.

Conditions of $500 Scholarship Summarized

A summary of the chief conditions under which the $500 scholarship offered by the Woman's Auxiliary of the A. I. M. M. E. for the year beginning September, 1930, are given below for the benefit of those who might have overlooked the previous article regarding this scholarship.

The successful applicant must take degree in mining or metallurgy.

He must signify his intention of completing his course and taking his degree.

He must have first class references as to scholarship, health and character.

He will be expected to refund at least 50% of the value of the scholarship.

He must apply for membership in the A. I. M. M. E.

The final date on which application for this scholarship will be received is December 15th, so all those intending to apply should get busy.

Publicity for Mines Summer School

President M. F. Coolbaugh and Dean J. R. Morgan of the Colorado School of Mines, attended a meeting in Denver December 19 called by the advertising department of the Colorado Association. A plan of expending $50,000 on summer school advertising to be placed in national magazines by the Colorado Association was discussed. This plan would mean an advertising campaign that would stimulate attendance at all Colorado summer schools next season.

Charles Shields, instructor in chemistry at the School of Mines, and Donald Morrison, went to Canon City December 8, to witness the dedication of the suspension bridge over the Royal Gorge. Several of the Mines students were also present at the dedication of this bridge, which is the highest of its kind in the world.

Belgian Educator Visits C. S. M.

Jules Yernaux, Belgian member of the Belgian relief commission educational foundation of New York, who is touring the United States, visited the Colorado School of Mines December 23.

M. Yernaux is head of the School of Mines and Metallurgy at Mons, and is internationally known in both mining and diplomatic circles.

He stated during his visit in Denver that his country has fully recovered from the effects of the Great War, and that business prospects are good. He said that Belgium is on a basis of friendly commercial relations with all countries in Europe, including Germany.

The Freshman Ball

The Freshman Ball December 6 was a tremendous success. This dance is considered an outstanding social function of the year, and is rivaled only by the annual Junior Prom. Students, faculty and guests pronounced the Freshman Ball one of the most pleasant affairs ever held in Guggenheim Hall.

Fraternities held house parties, and several entertained before the dance with dinners and afterwards with midnight buffet suppers. The Freshmen are to be congratulated upon their decorations. Trellises were built at the entrance to the floor and around the orchestra platform. These were covered with flowers and artificial vines. The false blue and white ceiling gave to the hall a cozy effect. The windows were curtained, and in each corner of the ball room were lamps and easy chairs.

Many Alumni from Denver attended the function.

Dr. Walter E. Roloff attended the meeting of the American Economic Association in Washington, D. C. during Christmas week.

Topics

Australian Educator Visits Mines

Godfrey B. O'Malley, lecturer in the Department of Metallurgy at the University of Melbourne, recently visited the Colorado School of Mines while on a tour of the United States and Canada. Professor O'Malley said, "Colorado has one of the most famous schools for mining in the world and its graduates are to be found in important mining centers everywhere."

Mr. O'Malley has visited mine and milling centers in Utah and Montana and has traveled extensively in Canada, visiting the famous mining camps in British Columbia, New Ontario and Quebec, including Porcupine, Sudbury and Rouyn, where extensive gold discoveries have been made in recent years. He has interviewed many of the expert engineers and metallurgists in various colleges and has taken voluminous notes and many pictures to be used in a series of lectures for his university, particularly in the mining centers of Australia and New Zealand.

Mines Men at Science Meeting

The Meeting of the Colorado-Wyoming Academy of Science, November 29 and 30 at Colorado Springs was well attended by Mines members. President Coolbaugh, Prof. J. Harlan Johnson, Dr. L. S. Ward and Prof. R. A. Baxter were present at the meeting.

The Academy met jointly with the Colorado Social Science Association, and many interesting papers were heard at the joint sessions. Professor Johnson read a paper before the Geology-Geography section while Professor Baxter talked to the Chemistry section.

Our Export Trade

Evidence of the soundness of this country's policy in relation to the world's commerce is found in recent figures compiled at the Department of Commerce. The United States closed the fiscal year 1929 with the highest export balance of merchandise trade for any year since 1922. Total exports for the fiscal year were 5,337,510,000 and total imports, 4,290,457,000, showing an export balance of 1,047,053,000. This is 317,053,000 higher than for the fiscal year 1928.

The prediction made some months ago, by those opposed to the Government's foreign trade policy during the last two administrations, that there would be a sharp falling off in this country's export trade as the result of that policy and the attitude in certain foreign countries toward the matter of war debt settlements, has failed to materialize in the slightest degree. On the contrary, our trade relations with foreign countries appear to be constantly improving. Our growing export trade balance also disproves the theory that in order to sell our products in foreign countries, we must allow the products of those countries to come in and freely compete with domestic products which can be adequately supplied by home industries.

General Electric Announces Valuable Fellowship

The Charles A. Coffin Foundation, established some years ago by the General Electric Company, has announced that applications are now being made for the Charles A. Coffin Fellowships for 1930-31.

The terms of the Charles A. Coffin Foundation made provision for the award of five thousand dollars annually for fellowships to graduates of the universities, colleges, and technical schools throughout the United States, who have shown, by the character of their work, that they could, with advantage, undertake or continue research work in educational institutions either in this country or abroad.

The fields in which these fellowships are to be awarded are *Electricity, Physics* and *Physical Chemistry.*

The Committee, composed of Mr. Gano Dunn, representing the National Academy of Sciences, Mr. R. I. Rees, representing the Society for Promotion of Engineering Education, and Mr. Harold B. Smith, representing the American Institute of Electrical Engineers, desires to make the awards to men who, without financial assistance, would be unable to devote themselves to research work. The fellowships will carry a minimum allowance of five hundred dollars. This allowance may be increased to meet the special needs of applicants to whom the Committee decides to award the Fellowships.

Candidates for the Charles A. Coffin Fellowships should file applications on forms provided for that purpose, and obtainable from the Secretary. Applications will be welcomed from seniors desiring to do research work as a part of the requirements for an advanced degree as well as graduates of universities, colleges, and technical schools, but any award to a senior will be conditioned upon his graduation.

The Committee requests that all applications first be sent to the dean of the educational institution at which the applicant is, or has been, in attendance within the year. The Committee desires that the dean or other college executive in turn file all the applications received by him at the same time, together with a statement naming the *two* men applying who in his opinion or the opinion of the faculty are best qualified to receive the award.

Applications must be filed with the Committee by March 1, 1930, and should be addressed to Secretary, Charles A. Coffin Foundation, Schenectady, N. Y.

Professor and Mrs. Ivan L. Hebel spent the holidays in St. Louis and Rolla, Missouri, the home of Mrs. Hebel's parents.

The School of Mines band and the Olinger quartette, were features of the entertainment staged by the Denver "pinch hitters" of the Colorado Association at the Brown Palace hotel in Denver December 13.

News from the Chapters

Tulsa Chapter News

The December monthly meeting of the Tulsa Chapter was held the evening of the fourteenth at the Tulsan Athletic Club. The attendance was not as large as we usually have but there are many of our members who are with the oil companies in positions which demand their services at inconvenient times—at least the times are inconvenient for our meeting nights.

Those present were: Harry F. Stevens, '27. Fred Lichtenheld, '20, Jimmie Baldwin, '21, from Bartlesville, C. O. Moss, '02, Eddie Chapman, '27, F. A. Brown, '21, Raymond Carr, ex-'19, and Ralph D. Curtis, '26 from Tulsa.

Since there were so few at this meeting we held an informal session, and the regular reports were deferred till the January meeting. Among the matters discussed informally was the January meeting, which it was agreed should be a Ladies Night. This agreement has since been confirmed by informal conference with a majority of the Chapter.

The January meeting will be held at the Tulsan Athletic Club promptly at Six Thirty on the evening of the Eleventh. The courtesy of the Club will be ours for dinner, dancing and cards during the evening. A business meeting will be held after dinner in which the ladies can join if they desire, and the balance of the evening will be open for pleasure. The usual announcement cards will be mailed out.

Fred Lichtenheld proposed at the dinner that the Chapter should hold one of our future meetings at Bartlesville where there are a number of the men and their families. The invitation was gladly accepted for a future date.

The meeting closed with a short, snappy Penny-Ante session to the enjoyment of two of the men.

The Tulsa Chapter of Colorado School of Mines Alumni has not been entirely idle since organization, although we have not had our name in the Magazine. We are really alive to the many needs of the Alumni Association, and are endeavoring to do our bit to help the Foundation and Ways and Means Committee. Over the course of time we hope to see these two branches of the Alumni work prosper as they should.

The November meeting of Tulsa Chapter was held at the Tulsan Athletic Club where we heard an interesting, informal talk on school affairs by Max Ball. The following eighteen men were at the meeting: John Bach, Ex-'25; Max V. Ball, '06; Jimmy Baldwin, '21; F. A. (Arcy) Brown, '21; Harold Brown, '28; Raymond M. Carr, Ex-'19; M. E. (Eddie) Chapman, '27; W. M. (Bill) Gebo, '23; Ralph D. Curtis, '26; T. B. (Tom) Leach, Ex-'25; Paul McCune, '24; Micheals, '25; C. O. Moss, '02; H. G. (Snick) Schneider, '18; Kenneth Six, '28; Harry Stephens, '23; and the Chapter president George V. Dunn. A report from the Ways and Means Committee was deferred till the next meeting to allow them to get some additional information.

The December meeting of the Tulsa Chapter will also be held at the Tulsan Athletic Club and we expect the usual good turn-out. If any stray Miners should be passing through here on Saturday, Dec. 14th, we would sure like to see you at the dinner. Our monthly meetings are regularly held on the second Saturday in each month.

Friday noon of every week there is a Mines luncheon at Bishop's on East Third Street, and some one is always dropping in. This last week A. M. Peairs, who is with the Foster Wheeler Corporation, at Dallas had lunch with us, and two weeks ago Earl Dickinson was with us.

Max Ball, Paul McCune, and Micheals are moving their head office to Fort Worth after the first of the year, but will be in Tulsa at times and we hope will get up here for some of our meetings.

Monterrey News

My dear Colburn:—

Hoping that everything is going fine up in school, I am writing you this short letter about the "life and works" of the Monterrey Section:

At the regular November meeting the following officers were elected:
Fidel Martinez, '13.....President
Pablo M. Sada, '29....Secretary-Treasurer

Kindly make these changes in the Magazine Section List.

Ex-President "General" Robinson in true local color style delivered a speech before the House stating that it was just about time to have an election and that a civilian should be chosen to assume the responsibilities of the Executive Power. His suggestion was deemed very pertinent and so "General" Martinez was elected. The slogan for this campaign was "No Reelection" and as he counted with the support of the former administration no other candidates "chose to run" and he was unanimously elected for a term ending at the time the House will change its mind. Immediately after the inaugural speech was delivered, "El Presidente" called a meeting of the Cabinet (Yours truly like Mussolini being the whole cabinet) and after little deliberation the resolution was made, seconded and passed to raise the dues in order to pay him and ALL members of the Cabinet a suitable salary. This resolution will be brought up before the House at the regular January meeting and the Department of War has asked that we all "stand by and listen to the reports".

The December meeting was a sad one. "Tommy" Skeahan is going back to the States and we all hated to say goodbye; he promised to come back and we sure hope he does. "You-can't-put-me-under-the-table" (Karl) Valdes, '22 will be away from town for about a month or so on a vacation. Both are going to Denver and we hope they will drop in your office and tell you something about our bunch; we also hope they will have the oppor-

tunity of attending a meeting of the local Colorado Section and have asked them to carry our sincerest greetings to everybody up there.

As for news of other Mines men in Mexico: We understand "Charley" Pike is still down in Charcas, S .L. P., with the A. S. & R. Amado Chapa, '27 is in Matehuala, S. L. P. Ricardo (Dick) Villarreal C., '27 can be reached at Juarez No. 34, Monclova, Coahuila; "Fat" Haight, Karl Dallmus, Ray McKinless, Clare Hurry and Eddy Borrego are in Tampico, Tamps. Joe Gonzalez is also in Tampico. Dallmus and McKinless dropped in town about two weeks ago and we were very glad to shake hands with them. By the way you might add a couple of weddings to the Romance Column of the Magazine: Joe Gonzalez was married in Mexico City on September 1st, to Miss Guadalupe Perez; Clare Hurry has also been married but we regret that we could not find out the name of the fair Dulcinea.

The Monterrey Section would like to hear from all the Mines men now in Mexico and we are therefore, taking this opportunity to ask them to drop us a card and give us their address.

Well, I guess I better close now. This short letter begins to look like a General Met. quiz.

Asking you to wish all officers and members of the Association a Merry Christmas and a very Happy and Prosperous New Year, we are

Yours for a greater Mines

Monterrey Section,
PABLO M. SADA, '29, Secy.

Minutes of the Nineteenth Meeting of the Wyoming Section

This meeting was held at the dining hall of the Midwest Gas Plant in Salt Creek at 7 P. M., December 19. The first thing on the program was a chicken dinner which more than upheld the reputation of the Midwest boarding houses for putting out good eats. The business session was started with the reading of the minutes of the previous meeting by the Secretary. This was followed by a discussion of scholarship prospects and plans for the January meeting. A motion was passed appointing Dred Rankin to look up high school prospects in Casper and A. W. Buell to take care of those in Midwest.

Two very interesting motion pictures were shown by the two guests of the evening: Mr. T. N. Shaw, Director of Industrial Relations at Midwest, and Mr. A. J. Beagle of the Rock Nitroglycerin Company. The picture shown by Mr. Shaw illustrated all of the processes involved in reconditioning a 4" pipe line running from Midwest to Casper. The other picture, shown by Mr. Beagle, portrayed in detail every step in the shooting of a well from unloading the solidified nitroglycerin at the railroad to lowering the loaded torpedoes into the well.

The following members were present at this meeting: Knowles, Buell, Sanders, Jeffries, Spratt, Butler, Crawford, Ginet, Ferguson, Golden, Young, Andrews, and Kenney.

E. W. GINET,
Secretary.

Nevada White Pine Section

Meeting at the Hotel Nevada on Thursday evening, December 5, local members of the alumni of the Colorado School of Mines, Golden, Colo., perfected the local alumni organization.

Plans were adopted to hold regular meetings each month and combine business and social matters to strengthen the bond between alumni of the school and to co-operate in matters concerning the mining industry of this district. One of the principles will be to encourage study of mining courses and to encourage boys interested in mining.

Officers elected at the meeting were Walter S. Larsh, president; Ed. W. Cowperthwaite, vice president; W. F. Jones, secretary and treasurer.

There are nineteen alumni of the Colorado School of Mines in this district, the following being present at the meeting:

Walter S. Larsh, '05, general superintendent of mines at Ruth, with the Nevada Consolidated Copper Company; E. W. Cowperthwaite, '13, general foreman, Copperflat Mine at Ruth; W. F. Jones, '18, field engineer at McGill; M. H. Salsbury, '26, engineer with the Ely Calumet Piermont mine; Lincoln Ehnbom, '17, assistant general manager with the Ely Calumet Piermont mine; Theodore Zatterstrom, metallurgist with the Ely Calumet Piermont mine; R. C. Nispel, '28, engineer at Ruth; Z. M. Matsen, '30, engineer at Ruth; A. B. Ross, shift foreman at Ruth; Fred D. Gibson, metallurgist at McGill; Ray B. Williamson, '22, shift foreman at Ruth; W. E. Heinrich, '13, shift foreman at Ruth; Jack Gibson, '30, McGill; W. P. Young, '28, engineer at Ruth; Wm. D. Gilbert, '06, engineer at Ruth; Frank W. Millard, '01, Ely; M. L. Tennant, '08, chemist at McGill; W. C. Douglas, '11, assistant general manager with the Consolidated Copper mines at Kimberly.

Announcing Annual Meeting of the Colorado Section

Colorado Section will meet Friday, January 17 at the Auditorium Hotel, 6:30 P. M. Principal business will be the election of officers for the coming year. A program and entertainment committee has arranged for a very interesting evening, and a large crowd is expected to attend.

George W. Schneider, '94, recently returned to his home in Bolivia, South America from an extended tour in Europe. Mrs. Schneider returned by way of the States in order to visit with her brother Lawrence Masterson who lives in Golden.

C. Terry duRell, '95, has moved his residence from 1630 Fuller Street to 2551-17th Street, N. W., Washington, D. C.

Marshall D. Draper, '97, is returning to the United States after an extended stay in China and Burma. He will take up residence in Los Angeles where his address will be care of J. H. Rosenberg, Bank of America of California, Seventh and Spring Streets.

Louis D. Fry, '03, has resigned his position with The Mazapil Copper Company, Ltd., at Saltillo, Mexico and is now being addressed at 2005 Manatee Avenue, Bradenton, Florida.

Harry J. Wolf, '03, Mining Engineer, has moved his offices from 42 Broadway to 2739 Graybar Building, 420 Lexington Avenue, New York City.

Governor Charles A. Parks, '06, of Alaska spent the holidays with his parents in Denver.

Karl G. Link, '08, is Manager of the Horn Silver Mine at Frisco via Milford, Utah.

Charles D. Root, '08, was a visitor in the Alumni office January 2nd.

William A. Wasley, '09, Manager, The Tigre Leasing Company, S. A., is now stationed at El Tigre, Sonora, Mexico (via Douglas, Arizona) instead of La Quemada, Mexico.

Joe Woolf, Jr., '14, of Greeley was elected president of the Greeley Kiwanis club. Mr. Woolf had been acting president for some time. He is in the wholesale produce business at Greeley.

Samuel J. Burris, Jr., '15, Metallurgist for the St. Louis Smelting & Refining Company, has moved his residence to 514 Garfield Avenue, Baxter Springs, Kansas.

Henry G. Schneide, '18, Chief Geologist for the Dixie Oil Company, and his family paid a holiday visit to his parents and brother, George '21, at Shreveport, La. "Snick" was among a large group of Dixie Oil Company employees who were recently transferred to Tulsa when the company opened headquarters there.

George V. Dunn, '20, who is associated with the Eagle Oil & Refining Company at Tulsa, Okla., and his family drove through to Long Beach, California, and spent the holidays with the Guy E. Millers and other relatives.

Frederick Laist, Hon.Sc.D., '21, General Metallurgical Manager, Anaconda Copper Mining Company, has moved his residence from Anaconda to Scarsdale, N. Y.

Lincoln A. Stewart, '15, recently moved from Ajo, Arizona to Chrysotile, Arizona.

Rex (J. R.) Allan, '22, has resigned as Engineer for the Cananea Consolidated Copper Co. and has taken a position at Fresnillo, Zacatecas, Mexico.

Allen E. Hambly, '23, formerly with the Gulf Refining Company at Port Arthur, Texas, has moved to Washington, D. C., where he has an appointment as patent examiner in the U. S. Patent Office, which new position he likes very much. Hambly's new address is 603 H Street, N. W., Washington, D. C.

Edward G. Maddock, '24, who has been associated with the Public Service Company of Colorado in Denver, has been transferred to the New York office of Henry L. Doherty & Company, 60 Wall Street. He will serve them there in the capacity of Marine Engineer.

Graham R. Miller, '24, formerly with the Woodward Iron Company at Woodward, Alabama is now connected with the Public Service Company of Colorado and resides at 963 Lincoln Street, Denver.

Earle B. Blickenstaff, '25, formerly with the American Tin Company in California is now doing some leasing at Milford, Utah.

E. F. Bruhn, '25, is employed in the stress analysis and structural testing department of the Berliner Joyce Aircraft Corporation of Baltimore, his address being 17 Eastship Road, Dundalk, Maryland.

Robley F. Sopris and *John H. O'Connor,* both of '26, are now associated with the Electric Bond & Share Company of New York. Sopris is Engineer on Power Plant Design with headquarters in New York City; O'Connor is on construction work in Argentina.

Norman Whitmore, '26, recently accepted a position in the Geology Department of the Shell Oil Company and is located at Oil Fields, California.

Erik U. Garpner, '27, who is associated with the Dixie Oil Company has been transferred from Shreveport, Louisiana to Tulsa, Okla., Philcade Building, where the general offices of the company are now located.

Albert L. Ladner, '27, who is in the Geophysical Department of The Texas Company has been transferred from Denver to their Houston, Texas office.

Thomas J. Skeahan, '27, who for the past two years has been connected with the Compania Minera de Penoles, S. A., at Monterrey, Mexico, is spending a vacation at his home in Fort Logan, Colo.

Clement A. Weintz, '27, Geologist for the Midwest Refining Company, has been transferred from Denver to Casper, Wyoming.

Walter G. Lofgren, '28, who has been associated with Ingersoll-Rand Company since graduation, has been transferred to their Denver office. Lofgren is glad to be able now to make his home with his parents at 3046 West 34th Avenue.

Ben Angus, '29, and *Ted Adams,* '29, are with the Radiore Company. They have been stationed in Utah the past month.

Leonard Doolittle, '29, who has been for the past year with the Oldsmobile Company at Flint, Michigan spent the holidays in Golden with his parents, Mr. and Mrs. T. C. Doolittle. Leonard will do research in oil shale in connection with the U. S. Bureau of Mines at Boulder.

Gerald Goergen, '29, arrived in Golden, December 6, from Peru, S. A., where he has been in the employ of the Cerro de Pasco Copper corporation, since his graduation last spring. Mr. Goergen will visit at the Myers home for a short time.

Howard S. Rines, '29, is now assayer at the Piermont Mine, Aurum, Nevada.

William Rupnick, '29, is now residing at 774 Redondo Blvd., Apt. 6, Long Beach, Calif. Bill is employed by the Signal Gas and Oil Company situated on the famous Signal Hill which now boasts of 1001 wells as well as the Shell Oil Company's deepest well in the world.

Clare K. Viland, '29, Petroleum Engineer for the Associated Oil Company, Watson Laboratory, Wilmington, Calif., has moved his residence to 7023 Templeton Street, Apt. 105, Huntington Park, Calif.

Floyd Carr, '30, was a welcome guest in Tulsa for the holidays, but had to cut short his trip to play in the charity football game at Denver on New Year's Day.

C. T. Todd, Ex, recently sent in a change of address from South Pasadena to 664 Evans Street, San Bernardino, California.

William F. Koch, '11, Representative of the Hercules Powder Company in Salt Lake City, has moved his offices to 703 Continental National Bank Building.

John S. McGhee, '26, has sent in a change of address from Holden, West Virginia to Box 166, Whitmans, West Virginia.

W. I. Ingham, former Fellow in Geophysics at Mines, is now connected with the Skelly Oil Company and is located at 434 Commerce Exchange Building, Oklahoma City, Okla.

Frank M. Stephens, '13, who is doing examination work for the A. S. & R. Company, has been tied up in Denver for a couple of months with injuries sustained when a horse he was riding slipped and fell.

A. B. Carstens, P. G. '16, is now connected with The Dorr Company in their Denver office.

Albert A. Klamann, '20, has accepted a position with the Mine & Smelter Supply Company in their Wilfley shops.

Samuel G. Lasky, '22, is at present stationed in Washington, D. C. where he is engaged in co-operative work between the New Mexico Bureau of Mines and the U. S. Geological Survey. His residence address is 4516 Walsh Street, Chevy Chase, Md.

Births

Mr. and Mrs. Dell E. Litz announce the birth of Helen Joanne, December 17, 1929. Dell Litz is a member of the class of 1927 and is now located at Anaconda, Montana.

Born to Mr. and Mrs. Arnold S. Bunte a baby girl on December 1, 1929. Her name is Nanita.

Announcements have been received of the arrival of a daughter, Diane, to Mr. and Mrs. Theodore Marvin, at Wilmington, Del., on November 23. Mr. Marvin is a graduate of Mines, Class of 1922. He is now managing editor of the Explosives Engineer.

ENGAGEMENTS and WEDDINGS

Hook-Parshall

James H. Hook was married to Miss Pansy Jane Parshall, December 28 at Golden. The wedding was a fashionable church affair, solemnized at the Calvary Episcopal church.

Miss Parshall is the only daughter of Mrs. Mame Gow Parshall of Golden. She is a graduate of Golden High school, and attended Colorado College.

Mr. Hook is the son of Dr. and Mrs. Charles O. Hook of Fort Worth, Texas. He received his degree in geological engineering last spring, and since graduation has been employed by the Geophysical Research Corporation of the South.

Following the ceremony the couple left for Fort Worth and New Orleans and will make their home in the south.

Hartley-Reed

News has just been received at the Alumni office of the marriage last March of J. Ross Hartley, '27 and Miss Lois K. Reed of Oakville, Indiana. Hartley is with the Eagle Foundry Company at Muncie, Indiana, where he and Mrs. Hartley are at home at 212 East Washington Street.

Crawford-Fitzpatrick

Ronald F. Crawford, '23, and Miss Esther Fitzpatrick were married recently at Bay City, Texas. Mrs. Crawford was formerly a nurse at the Texas Gulf Sulphur Company Hospital at Gulf, Texas. Mr. and Mrs. Crawford will make their home at Gulf where he is stationed as engineer for the Texas Gulf Sulphur Company.

Raymond G. Travis, '25 and Miss Margaret Jane Hoskin were married at Chicago, Illinois, Saturday, December 28th, 1929. Travis is connected with the Goodman Manufacturing Company with headquarters in Chicago. Mr. and Mrs. Travis are at home at 7125 Bennett Avenue, Chicago.

Ex-Professor Beckstrom, now head of the Petroleum Engineering Department at the University of Tulsa, is at present on a trip to Russia.

What Our Contemporaries are Saying and Doing

The Colorado School of Mines receives each month a large number of Alumni Publications from other Associations. It is a pleasure to thumb through these magazines when time can be spared to do so. It should be interesting to all the members of the C. S. M. Alumni Association to hear what other similar organizations are doing to support Alma Mater. And so it is that the Editor takes up his shears and screws the lid off the paste pot.

NEW YORK UNIVERSITY'S NEW GYM

The New York University Alumnus, a 16 page weekly magazine published by the Alumni Association of New York University, has the following to say in one of its recent numbers:

"The active, intensive campaign to raise funds for a New York University gymnasium on the campus at University Heights will start with a dinner of all workers on all committees which will be held at the New York Athletic Club

"Complete architect's plans of the new gym will be on display at the dinner. Plans for the campaign will be explained in detail. Explicit instructions will be given to workers.

"The drive will be short and intensive. The committee has decided not to have long-term pledges. The money must be in hand within a few months in order that the University may be sure of its ground in starting construction. To this end the executive committee has decided that all monies must be in by May 1.

"Arts and Engineering alumni, on whose shoulders the main responsibility of the campaign will naturally fall, will have, however, the full cooperation of the alumni of other schools of the University. Presidents of the various school alumni associations are now in process of appointing cooperating committees."

There has been much talk lately of a new gymnasium at Mines. The building now used for a gym would be converted into a geology building, housing laboratories and class rooms which would relieve crowded conditions in Guggenheim Hall and elsewhere. Perhaps the New York Alumni Association procedure would be a good one to follow.

REX BEACH WRITES FOR HIS ALUMNI MAGAZINE

Rex Beach, the author of many best sellers, has written an editorial in the Rollins College *Alumni Record* on "What is an Alumnus". Mr. Beach was graduated from Rollins in 1897. His editorial follows:

"Not until I returned to Rollins College for my 30th reunion and was elected President of the Rollins Alumni Association did I stop to think what an alumnus is or what he stands for.

"I assume he stands for something in the romantic eyes of the under-graduates, but I don't know just what. To the professors, he is the arch-enemy of their teachings in the classroom partly because he is a horrible example of what education actually accomplishes when allowed to take its course, and partly because he is likely to run to reminiscences and dwell too vividly upon his own illicit and perhaps imaginary under-graduate escapades. To the college president he is the big game upon which there is no closed season. He is an ovis poli whose head may be captured and capitalized for the benefit of the college exchequer. To the world at large he is what Horace Greeley must have had in mind when he referred to all college graduates as "horned cattle."

"In the pilgrimages I have made to Rollins, I have observed a noticeable change has come over it. The old game of outwitting the common enemy, the professor, which we played with youthful gusto, seems to have become unpopular. Instead is a conference plan of study, where the students are on good terms with their teachers, discussing with freedom and with high intelligence this serious business of fitting themselves for a useful and congenial occupation. I have a deep conviction that the exercise of common sense in educational methods and a greater independence of thought on the part of the students, as illustrated at Rollins, will result in a tremendous thinning out of that useless, waste-

ful, tragic standing army of misfits and failures, and result in the production of an alumnus entirely worthy of that good Latin name."

There is no doubt but what Rollins College is proud of Rex Beach. He is one of its outstanding successes. This is a splendid idea to carry to the successful Miners—Write something often for the C. S. M. Alumni Publication!

The Carnegie Report

The Case *Alumnus* devotes a page of its December issue to a criticism of what the various Alumni Magazines of the country had to say about the Carnegie Report on subsidizing athletes. After an introductory paragraph the writer of the article quotes from the Magazines of several nationally prominent colleges. The comments on these quotations are rich in "gentle satire", and leave the reader with no doubt as to where the Case Alumni stand on this question.

"About all we have been able to read in the alumni press of the country during the past month have been sour grapes and alibis occasioned by the now famous Bulletin Twenty-three of the Carnegie Foundation. The reactions of the several institutions mentioned in the report have varied with the state of conscience and the bill of health given. Many have been downright abusive. Some, handed a *carte blanche,* have been almost cocky. One at least, has been handsomely amused. Case, quite ignored, can be anything it chooses."

Mines is left in the same position as Case—We were "quite ignored". The fact that we were not investigated indicates that our athletics are clean.

Missouri Law School Foundation

A clipping from the Missouri *Alumnus*:

"The Trustees of the University of Missouri Law School Foundation report that considerable progress has been made in securing subscriptions for an endowment for the School of Law. The Foundation, of which Hon. Edward J. White of St. Louis is President, was organized for the purpose of promoting the interests and welfare of the School of Law. Among the more important things the Foundation hopes to do are the following:

(1) Establishment of prizes or scholarships in honor of past members of the Law Faculty.

(2) Assist the University in publishing and keeping to date an adequate Directory of the Alumni of the School of Law, especially of those alumni who are engaged in active practice.

(3) Assist in promoting legal research by members of the Faculty."

Scholarships and research—Reminds us of the purpose of our own Foundation.

Mines Alumnus Devises New Shorthand System

R. P. FitzGerald, class of 1910, has invented a new system of shorthand which he explains in a volume, "The Shortner System", published recently by Mr. FitzGerald.

The new shorthand system is not a rehash of older systems, but is truly a "New" method. It may even be written on the typewriter, using the letters of the alphabet as symbols. The key to the system lies in five general rules devised by Mr. FitzGerald. It is possible to use the regular letters of the alphabet in writing this new system, but for greater speed, characters are used, following the same five general rules.

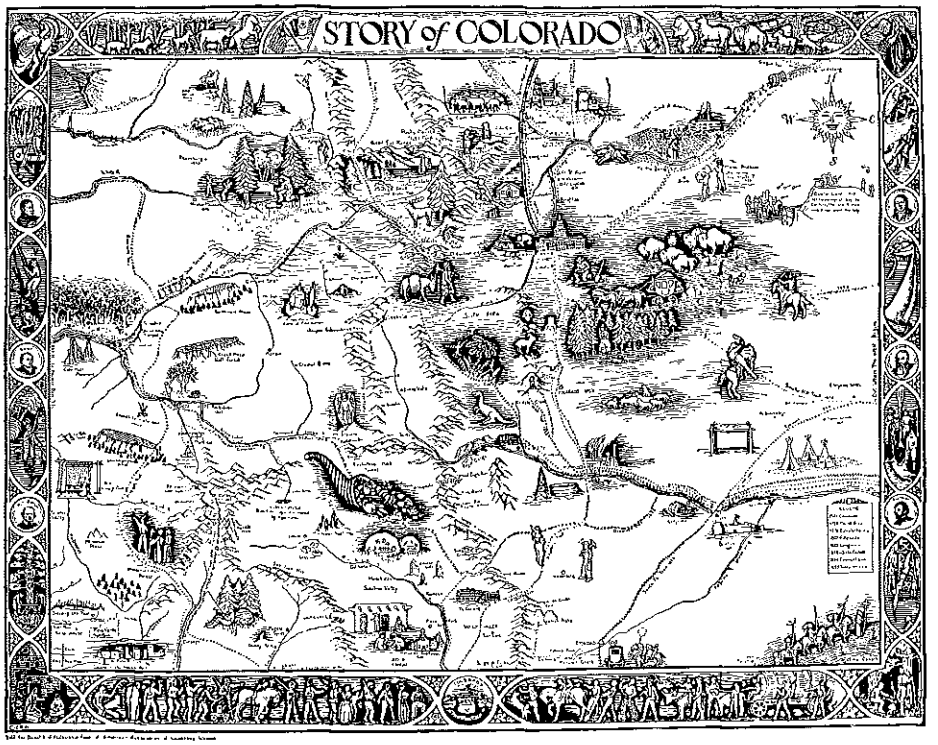
The Shortner shorthand seems remarkably easy. If interested in learning shorthand, write to R. P. FitzGerald, R.F.D. No. 1, Roswell, New Mexico. Engineers, executives and teachers need to take many notes. It is said that President Wilson made thousands of pages of notes, all in shorthand.

Digging 'Em Up

Ping: "Did you write all the jokes in your book?"

Pong: "Yes, every one."

Ping: "I must compliment you. You must be much older than you look."



A civic enterprise for the good of Colorado and Denver is the Story of Colorado map recently published by the American Association of University Women of Denver. It is shown here much reduced. The map shows graphically the whole history of Colorado from its first days until now. It was drawn by Mina Conant of East High School, Denver. The map in its original size may be secured from the Collegiate Bureau of Occupations, United States National Bank Building, Denver, Colo.

The Trend of Flotation

(Continued from page 21)

specific cases, it is the authors' belief that they will demonstrate the principles involved so that operators can work out formulas to meet their own particular needs. Here follows the authors' introduction to this section:

"Modern ore dressing mills are, in general, somewhat less complicated mechanically than those which were operated twenty or thirty years ago, but the detailed operation of the modern equipment is much more involved. Today our flow-sheets show many operations, such as grinding units in closed circuit with classifiers and more especially flotation machines, which were unknown to the millmen of a former generation. The control of these newer plants requires a much higher degree of technical skill than did the plants of an earlier day when richer ores permitted cruder methods. The old methods were largely mechanical; they could be, and often were, carried out successfully, if not efficiently, by men with little or no technical training who relied almost altogether on rule-of-thumb knowledge. Such men are absolutely lost in a modern flotation plant. To control such a mill, exactly what is happening in each department, just what each piece of equipment is supposed to do and how efficiently it is performing its function must be known, not guessed at. If the results are not what they should be, one must know, or be able to discover, why and to vary the conditions in order to better them. Twenty years ago a recovery of over 60 percent of the gross value of the ore treated was considered good work; nowadays anything under 80 percent is considered poor."

Student's Record Claimed to be Forecast of His Success

(Continued from page 19)

the middle third at thirty years, about 5 percent less than the general median; and the lower third at thirty years becomes fully 20 percent below the median for the whole group studied.

Studies on the influence of extra-curriculum activities do not tell us much. The type of activity, such as athletic, literary and editorial, managerial, social and musical and dramatic, has to be taken into consideration. It is a safe assumption, however, that a good record of extra-curriculum activity is not nearly as important as a good record in scholarship. "Substantial campus achievement" does have a definite bearing on progress in the Bell System, but its influence is not as great as that of high grade scholarship. It is interesting to note that the observers found that "substantial achievement" is not as good an index for the future of the engineer, as for the arts graduate.

Another generalization that seems justifiable is that in the type of campus achievement, those who participate in those activities that required intellectual effort seemed to make better progress after graduation. In other words, those in the literary, editorial, and managerial fields seem to have an advantage over those in athletics, musical, social or dramatic endeavors.

It was found, that as a general thing, it helped rather than hindered a man to have been obliged to earn his way in whole or part. Whatever he was obliged to sacrifice in the line of college experience outside his scholastic work seems to have been compensated for by his intensity of purpose.

The conclusions that are to be drawn from these facts are that when an employer is looking for a man, he wants

to know "How well did he perform on his last job?" Since the young graduate's last job was his studies, his scholastic record may well be taken as an indication of how he will carry on in his next job. The evidence is that such an assumption is well based. Participation in campus activities, as indicating some qualities of leadership and a development of the social instinct, has to be taken into account. Earnings indicate the young man's determination and will to get ahead under difficulties. Taking everything into account, it seems clear that the student should so budget his time that his major attention be given to the important objectives of his college life—education, and that his other obligations be left to fit in as best they can.

The fact that two such men as President Gifford and Colonel Rees place such importance on scholastic standing should make most of us ask ourselves: "What sort of record am I making for a prospective employer to examine?"

—*The Oredigger.*

And That's That

He: "What would I have to give you to get a kiss?"
She: "Chloroform."

"Are you a doctor," she asked the young man at the soda fountain.

"No, madam," he replied, "I'm just a fizzician."

INDEX TO ADVERTISERS

Professional Cards

We've started another page of Professional cards. How about yours?
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C. A. Johnson Bldg., 509 17th St., Denver, Colo.

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WM. D. WALTMAN, '99 Franco Wyoming Oil Company 551 Fifth Avenue, New York City 422 First Nat. Bank Bldg., Denver	JOHN H. WILSON, E.M., '23 Geologist and Geophysicist Box 187 Golden, Colo.	H. J. WOLF, INCORPORATED An Investment Trust 15 Exchange Place Jersey City, N. J.

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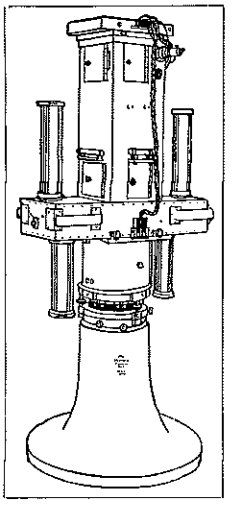

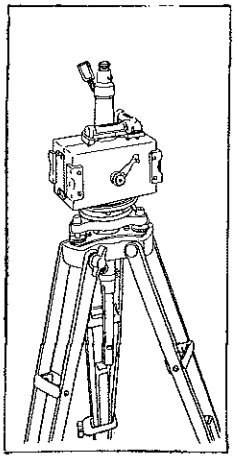

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where you could buy a second hand Marcy Mill we would be compelled to answer most sincerely—

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IN the past 15 years we have manufactured and sold hundreds of Marcy Mills which are now in operation in practically every important mining region in the world. We have kept in close contact with the users of Marcy Mills; we know that they are all in service and we have no record of a Marcy Mill ever having been worn out. The very fact that you seldom find Marcy Mills shown on second hand machinery lists should be conclusive evidence of their stamina and a silent testimonial to a good investment.

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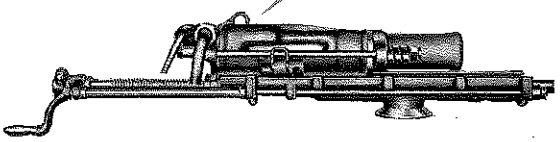
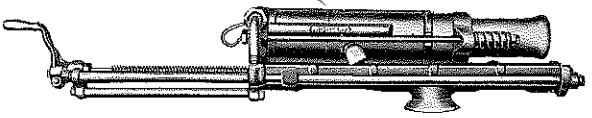


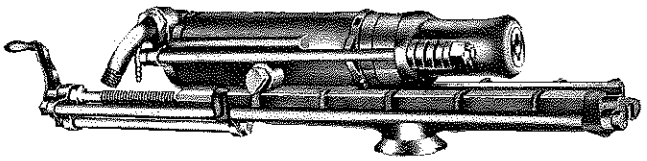
MODEL 107

Bore	3"
Stroke	2"
Weight	109#



MODEL 7

Bore	3½"
Stroke	2⅝"
Weight	141#

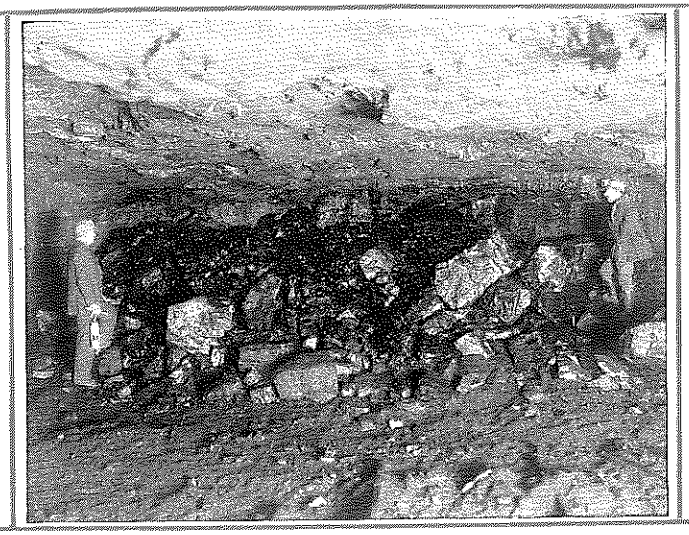


MODEL 17

Bore	4"
Stroke	2⅝"
Weight	177#

GARDNER-DENVER COMPANY
ROCK DRILL DIVISION
DENVER, COLORADO
Sales Offices Throughout the World

GARDNER-DENVER



A PERMISSIBLE FOR EVERY PURPOSE

LOW strength, high strength; slow or fast action; high count, low count—the nine Hercules permissibles listed here contain these qualities in the degrees required to meet every coal blasting need.

Regardless of conditions in your mine, there is a Hercules permissible which will shoot your coal the way you want it shot. Check and mail the coupon for complete information concerning the permissibles in which you are interested.

HERCULES POWDER COMPANY

(INCORPORATED)

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The Permissible For Your Coal Is In This List

HERCOAL-F: The new type lump producer. A very high cartridge count permissible (about 500)* with black powder action.

HERCOAL-D: This Hercoal lies between F and C in count (about 450), and like them is a black powder action, lump producer.

HERCOAL-C: Another black powder action, lump producing permissible. Lower count (about 400), and stronger per cartridge than Hercoal-F.

● ● ●

RED H F-L. F.: Slow and strong with a cartridge count of about 356. A lump producer.

RED H D-L. F.: Slow and strong. Cartridge count around 316. Another lump producer.

RED H C-L. F.: Slow and strong. About 276 count and a lump producer.

RED H B-L. F.: A fast, dense, strong permissible of about 280 count with a smashing action.

● ● ●

COLLIER C-L. F.: Fast and strong but with higher count (about 320) than Red H B-L. F.

HERCOGEL: Dense and strong. Suitable for wet work. Count about 190.

*Note: Cartridge counts refer to the number of 1¼" x 8" cartridges in 100 lbs. of explosives.

● ● ●

HERCULES POWDER COMPANY
(Incorporated)
931 King Street, Wilmington, Delaware

Gentlemen: Please send me pamphlets describing the Permissible explosives checked.

☐ Hercoal-F ☐ Hercoal-D ☐ Hercoal-C
☐ Red H F-L.F. ☐ Red H D-L.F.
☐ Red H C-L.F. ☐ Red H B-L.F.
☐ Collier C-L.F. ☐ Hercogel

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Company.....

Address.....

3609