CLEAN SEPARATION

High efficiency in separation is maintained because the operator has a positive, quick control over the amplitude of vibration.

Positive control over the amplitude of vibration is found exclusively in Traylor screens.

A complete application of screen cloth requires but ten to twelve minutes and requires no skilled labor or special tools.

1400 Delgany Street
The Traylor Vibrator Company
Denver, Colo., U. S. A.

Where the chimneys of industry loom black against the sky, Time, That Tough Old Tester, draws his deadliest weapons. With acids and alkalies, with shattering vibration and ceaseless strain, he here attacks the works of man with greater eagerness, to prove how long things last.

And here, amid the mightiest of Time's destructive forces, you will find Reading 5-Point Pipe . . . resisting corrosive gases and fluids . . . absorbing shock and strain in its tough, fibrous structure . . . lasting from two to five times longer than ordinary pipe under Time's severest tests.

For Time . . . That Tough Old Tester . . . must stay his hand before Reading 5-Point Pipe, whether he finds it installed above ground or below. The long generations have shown that Genuine puddled wrought iron, the material of which this pipe is made, defies Time's onslaughts as does no other. That is why Reading 5-Point Pipe means enduring economy, enduring satisfaction.

READING IRON COMPANY, Reading, Pennsylvania

GENUINE PUDDLED WROUGHT IRON
DIAMETERS RANGING FROM 1/2 TO 24 INCHES
Science and Invention Have Never Found a Satisfactory Substitute for Genuine puddled wrought iron

When Patronizing Advertisers Please Mention Colorado School of Mines Magazine
Let us have yours too...

We receive orders for printing, engraving, embossing, and stationery from ten states in the United States—from Nebraska to Utah, and from Montana down to southern Texas; also from China, Korea, Hawaii, Mexico, South and Central America.

Some suggestions for November

1. You will want Christmas cards, of course. Send for our Specimen Set of 20 cards—make your selection and send in your order.
3. Engraved business or personal calling cards.
4. Printed forms of any kind.

Kistler's

The W. H. Kistler Stationery Co.
"The Business Man's Department Store"
1636 CHAMPA STREET
DENVER, COLO.

Low cost per ton mile haul

The C. S. Card Iron Works Co.
DENVER

Another Dorr Traction Thickener installation is shown in this photo of the mill of the Silver King Coalition Mines, Park City, Utah. The Thickener is dewatering tailings.

Dewatering tailings or concentrates, thickening ahead of flotation, in counter-current decantation work—in fact, for almost any thickening job, Dorr Traction type Thickeners are becoming more and more popular with mining men everywhere. The number of Traction Thickeners sold during the first seven months of 1930 was 33% greater than in the corresponding period last year.

Bulletin 3001

The Dorr Company
247 PARK AVENUE NEW YORK CITY

INVESTIGATION TESTS DESIGN EQUIPMENT

THE DORR COMPANY

When Patronizing Advertisers Please Mention Colorado School of Mines Magazine
THE AKINS CLASSIFIER
Positive Superiority

Recent installations of the Improved Akins Classifier are accomplishing unequalled results on the heaviest work, and with the smooth continuous rotary motion that means so much in uninterrupted operation and low cost of upkeep. Its unusually dry clean sand product and absence of surges over the weir insure the maximum sharpness of separation. Sturdy construction and sound design in a variety of types and sizes meet the most varied requirements and the widest range in scale of operations. On many pulps it can be depended upon to start after a shut-down without special attention, but it is also furnished with a manually or hydraulically operated lifting device which effectively solves the shut-down problem when on the heaviest work. There is no tendency for the spiral to ride on top of the sand when handling the greatest tonnages of the heaviest sulphides.

Write us and learn about the Improved Akins Classifier, the Lowden Dryer, the Improved Impact Screen, the Skinner Multiple Hearth Roaster.

COLORADO IRON WORKS COMPANY
Established 1860
MAIN OFFICE AND WORKS, DENVER, COLORADO, U. S. A.
Head, Wrightson & Co., Ltd., Stockton on Tees, England
Canadian Locomotive Co., Kingston, Ontario, Canada
Clyde Engineering Co., Ltd., Granville, N. S. W.

The Denver Sewer Pipe & Clay Co.
Manufacturers of
Brick for every kind of Building

HOLLOW BUILDING TILE
HIGH DUTY FIRE BRICK
FIRE CLAY TILE

The Denver Sewer Pipe and Clay Co.

G-E Floodlighting Wins Favor for Football - Hockey - Track - Baseball - Tennis

G-E floodlighting equipment has a winning record. Its victories are counted in terms of pleased spectators, increased attendance, satisfied coaches and players.

The development of G-E athletic-field floodlighting equipment was planned with every consideration for the fundamental and special playing conditions it must meet. That is why the big Novalux projectors give ample and evenly diffused light over the entire playing area.

The development of General Electric floodlighting equipment has largely been the work of college-trained men in the G-E organization — other college-trained men are largely responsible for the continuing leadership of General Electric in furnishing the many other products which bear the G-E monogram.

JOIN US IN THE GENERAL ELECTRIC PROGRAM, BROADCAST EVERY SATURDAY EVENING ON A NATION-WIDE NBC NETWORK.

When Patronizing Advertisers Please Mention Colorado School of Mines Magazine
8 lb. to 130 lb. Rails
Rail Fastenings
Structural Shapes
Merchant Bars & Shapes
Furnace Bars
Screen Bars
Reinforcing Bars
Grinding Rods
Spikes, Bolts & Nails
Woven Wire Fence
Made from Copper-bearing Steel

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STAFF
C. H. C. Bevan—Editor
P. C. Davis—Advertising Representative

LOCAL SECTION CORRESPONDENTS
James W. Balch, Jr.—Auburn Section
Charles R. Barlow—Southern California

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Football Number

November is a festival month. Thanksgiving Day meant to the Pilgrims fathers prayers and rejoicings. The warm days of summer were past, and now came on the homeward journey through the long rigorous months of a New England winter.

November is, by tradition, still the month of Thanksgiving. To this festival spirit the college youths have added the gaiety of their game, football. And so in this modern age, November, Thanksgiving Day and the Big Game, are synonyms in the students' dictionary of the calendar.

Magazine Meet

Twenty-three college publications dealing with engineering are members of the Engineer College Magazine Club. A club organization recently held its tenth annual convention at Boulder, Colorado.

The Magazine Club is not a member of this association, but a representative attended the meetings in response to an invitation from the Colorado Engineer convention host.

The standards of the publications belonging to E. C. M. A. are high. This organization is doing much to encourage better magazines in engineering schools.

It would prove to be a great mistake to assume that strength in unity.

Changing Laws

The United States has become a great and wealthy nation on account of the freedom that has been exercised by the Individual Citizens in the development of Natural Resources. Starting with the Middle West and large sections of the West have been settled by taking up free land. All the land and mineral laws up to the passing of the Leasing Act have been to deed the land and mineral laws up to the present time to those who develop it. All the land in the Mississippi valley including the mineral was declared to settlers and nearly all of them became substantial and prosperous citizens. The mineral laws were largely responsible for the development of the West. The mineral laws were written by the prospectors and early pioneers. They granted the minerals to those who developed it. Only a small fee was exacted to cover the cost of administration. It is true that there is public land which may be leased to tenants for the maximum rental that can be wrung from Nature the mineral wealth that has been so carefully stored away. But the nation that these resources be owned and developed by independent American citizens or owned by the government and leased to tenants for the maximum rental that can be exacted is a problem that must be solved in the near future.

Don't Hibernate

Winter is near. On the crisp fall air the odor of burning leaves creeps along, reminding us to clear away the debris that may have accumulated in our own little worlds, and to get ready for the coming year.

Take an inventory, personally and professionally, and ensure that your stock is low. Make additions. If you are out of tune, discard the old and import some new ideas. Don't hibernate; the whole world is getting ready for another round. The fellow who isn't afraid to discard useless but loved ideas and absorb better ones, is the one who will make progress unexpectedly.

Sure, and winter is a fine time of year. Browning knew what he was talking about when he proclaimed winter the last of the four, for what has the cold season to offer to those who are those of us who go into seclusion, mentally and physically, as soon as the spring and summer of the year are complete and miss half the joy of living and progression that is the basis of all the joy of living.

The Seventh International Petroleum Exposition held in Tulsa was bigger and better than ever. This annual meeting gives opportunity to petroleum engineers, operators and technologists to meet each other.

The September Letter of the National City Bank states that the United States seems to exist, in the minds of many people regarding the importance of the volume of currency or money in circulation. It is not uncommon to have a decline in the volume of outstanding currency cited as a cause of business depression, or declining prices, whereas it is only a result.

The prudent individual buys life insurance and the prudent oil company buys oil shale land. Such factors as mining, retorting, refining, transporting, and selling costs, which must be deducted, and the revenues from possible by-products, which may be added, must be figured in arriving at an estimated net return from a mining site.

Another extremely important factor is the difficulty of arriving at the present value of this possible future net return. Interest is figured at only the very modest rate of 3.57, money doubles every twenty years. It requires only a little over 7 per cent to cause the present value of these deposits to be developed in a comparatively few years. If their present value is to be considered as any appreciable fraction of their future potential value.

It is true that there is public land which may be leased for oil shale operations but the regulations under the leasing act are such as to cause many people to think that such operations would be neither pleasant nor profitable. Therefore, it is natural that an effort has been made to get title to land so that operations may be carried on.

The prudent individual buys life insurance and the prudent oil company buys oil shale land, not for profit, but for protection.

Laying aside all charges of graft and competition, the question of the oil shale fields should be carefully investigated and a procedure for the handling of thesements worked out which will permit the development by private capital and at the same time protect the interests of the public and of posterity.

—R. A. Baxter, '23

Oil Shale

It is very unfortunate that the present oil shale companies are being forced out of the business.

Whether or not the disturbance was started for political purposes, it is certain that at this particular time it was not taxed from the business standpoint. Such a situation is not going to help us to a rational solution of the problems of the future oil shale industry.

It is true that the bankers and counter charges, the important part of the press' discussion has hardly been mentioned; namely, the question as to whether or not a dangerous precedent has been set in the handling of the interests of great potential value.

During the Hoover administration title has been granted on only 43,000 acres of oil shale land which had been taken up under the placer laws previous to the passage of the leasing act of 1920.

Without even knowing in what parts of the field this title group is divided, it is not too safe estimate of its present value would fall somewhere between $50.00 and $500.00 per acre. The variations would depend on the accessibility of the shale, amount of water available, hauling and living conditions, and other such factors as well as on the total amount of oil recoverable.

Economic considerations must be taken into account in estimating the average value per acre of the $5,000,000 acres of Colorado oil shale land. Such factors as mining, retorting, refining, transporting, and selling costs, which must be deducted, and the vagaries from possible by-products, which may be added, must be figured in arriving at an estimated net return from a mining site.

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A COLUMBIAN educator, Senior German Archi- studey this past summer, made the following statement before returning to his country.

"Students of our two lands might, by frequent the students at the beginning of an international organization of world-wide influence. The student 'ambassadors' might restrict themselves to the nierooms and dining halls, to the libraries and football games, and I am sure that in this field South America has much to learn from the United States, particularly in the matter of student leadership.

It is the same idea that we hold regarding Mines graduates and other engineers in foreign service—they are, or should be, good will ambassadors.

What is Education?

Dr. WALLACE BUTTRICK has said that educa- tion is a voluntary process. "In the very nature of the idea, one must educate himself. Education is the determined and long continued effort of a serious-minded person to train his powers of obser- vation, thinking and reflection through gain in knowledge," states the Doctor.

Without self-direction no individual can hope to be educated. The process does not end with graduation from a college. Professors, class grades, examinations assigned to all of the acts and most of the acceptedsy of college courses do not enough to simulate the significance of the Mines man's self-interest in his education. They could do little more than point the way; their success would depend upon the man's determination to help himself.

"In America the colleges largely teach students how to remember, whereas in Europe students are taught how to think."

"The only good journalists are dead journalists, for then the historical scholar can draw history out of the news; whereas in Europe students are taught how to remember, whereas in Europe students are taught how to think."

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The Seventh International Petroleum Exposition was held in Tulsa, Oklahoma, from October 4 to 11. The Exposition was the biggest event in the industry, yearly attracts oil men from all parts of the world. So great is the influx of visitors that although there are more and better hotels than is usual for a city the size of Tulsa, the late-comer must, like the Arab, bring his tent with him to avoid lodging. To this fact I can testify personally as I, a late-comer, came to the exposition without a hotel reservation.

The oil show is a complete panorama of the industry: mirrors the progress of the past year, forecasts development for the coming year, has a message for executive, producer, developer, refiner, technologist, roundabout alike, because no phase of the industry is slighted. Time spent there is time invested, which explains why many executives and wholesale delegations attend. Resulting sales run well into six, perhaps seven figures.

Many organizations take the opportunity to hold annual meetings at this time. Those doing so this year were the directors of the American Petroleum Institute, presided over by President E. R. Reeser; the general committees of this organization, divisions of marketing, refining and production; The American Institute of Mining and Metallurgical Engineers; The American Society of Mechanical Engineers, with President Charles Perutz presiding. This last mentioned organization held meetings October 6, 7 and 8 at which valuable papers on pipe line problems, mechanical subjects, refining topics, were presented by authoritative members.

The papers read, the discussion concerning them may be found in the official organ of the respective societies. Some of the more important papers will be reprinted in various technical publications.

Noteworthy among exhibits was that of the American Society of Mechanical Engineers. The expenditure of $85,000, months of toil by unselfish engineers, produced an automatic pumping station, not a toy model, but an actual working station, flexible in operation as a means of further study and research. This exhibit points the way to many other automatic control were on view ranging from the precision of the more important papers will be reprinted in various technical publications.

Objects of my visit were to study new methods and equipment, to meet men, to develop contacts, to gather data for instruction, to ascertain the prerequisites the industry requires of embryo petroleum engineers. I was unusually successful in realizing these. Tangible evidence is the mass of performance data brought back or promised by the manufacturers deserve credit for whole hearted support of this idea. Notwithstanding this inevitable commercialism, an air of willingness to explain, to educate, to allow judgement on facts prevailed. This demonstrates the extent to which science and technology is permeating the petroleum industry.

Economics has fostered this attitude, explains the show, justifies it! The idea underlying each exhibit, the various programs, the whole exposition, seemed to be one of engineering economy. This is in line with conditions prevalent in the industry and the country at large, called depression, hard times, or what would you? Factors such as overproduction, curtailment, restriction of industry, international trade policies, were carefully overlooked except in impromptu hotel room round robins, while officially everyone centered on "Economy." This caused optimism and hope to prevail.

So much for the Exposition in general. As official representative of the Colorado School of Mines it was my pleasure to meet many Miners, "ex's", old grads. Friday, October 10, many of us had lunch together, enjoyed brief contacts so much we wished we could have had more time together. I was impressed with the keen interest of the Alumni in the School, with the remarkable progress of the industry.

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Western Mining Industry Meets

"It is probable that we are rapidly reaching a state wherein the industrial condition is recognized as a social problem," precludes our future prosperity, though this may be the precept of a tariff war, after which normalcy will be reached. Effect may even be said to be produced a tariff to protect.

"Demonstration of silver has brought the realization that high silver prices are dependent upon the foreign use of the metal, and the same true of copper.

"There seems to be a marked stabilization of the metal mining industry. To some, complete stabilization in any industry would spell death to competition, because of the apparent erosion of profit margins. A stabilization between maximum and minimum figures is possible, and is an improvement over a state of affairs that would lead to destruction of a metallic industry. A stabilization between maximum and minimum levels for the metal mining industry would spell death to competition. To some, complete stabilization is not a desirable state of affairs. A stabilization that would permit continuous operation would save $500 a day or $180,000 a year.

"There are many factors that prevent complete stabilization. Among these are the}

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*The C. S. M. Magazine

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An Investigation of the Maximum Size of Floatability of Sphalerite and Galena

By Robert S. Burton, '29

Preliminary

It has often been asserted that flotation should be carried on at a mineral size as small as possible, assuming that the mineral is sufficiently freed from gangue. No one has ever made any statement that size is the condition under which one works the flotation process. Present day flotation is expensive but has so many advantages that it is possible to see the flotation quickly. As an example, consider a company which concentrates by flotation 50,000 tons of ore a day, the ore running one percent copper. A saving of one cent a ton in treatment would save $500 a day or $180,000 a year.

When it becomes known that one can save more cost in flotation or flotation is in a state of discussion, it is not to be expected that as long as the ores are floated in practice that imperfect flotation can be perfect. In this respect the flotation process is a very expensive process. It is in grinding, an investigation of this phase seems to be worth while. It is in grinding, an investigation of this phase seems to be worth while. It is in grinding, an investigation of this phase seems to be worth while.

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The pulp was dried, screened and weighed; with results as shown in Table I.

<table>
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</tr>
</tbody>
</table>

The second test was made to use it if it was possible to use a small batch flotation machine. In test No. 7, there were traces left in the machine from previous ore tests, of thiozincid, zinc sulphide, Cleveland Cliffs, and Barrett oils No. 635-636 and soap, all of which had been cleaned; and as a result, a large batch of ore was in the concentrate. In all the tests, the time of grinding was ten minutes, other conditions were as tabulated below and the results obtained are tabulated and shown on the graphs on following pages.

<table>
<thead>
<tr>
<th>Test No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gms. Zn.</td>
<td>42.9</td>
<td>41.2</td>
<td>29.7</td>
</tr>
<tr>
<td>Gms. Cu.</td>
<td>57.4</td>
<td>58.4</td>
<td>61.6</td>
</tr>
<tr>
<td>Cum. %</td>
<td>96.1</td>
<td>98.2</td>
<td>99.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mesh size</th>
<th>Grams</th>
<th>Per cent Weight</th>
<th>Cumulative Percent Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 to 10</td>
<td>15</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>10 to 16</td>
<td>1</td>
<td>1.0</td>
<td>2.5</td>
</tr>
<tr>
<td>16 to 28</td>
<td>1</td>
<td>0.8</td>
<td>3.3</td>
</tr>
<tr>
<td>28 to 55</td>
<td>0.1</td>
<td>0.2</td>
<td>3.4</td>
</tr>
<tr>
<td>55 to 100</td>
<td>0.1</td>
<td>0.1</td>
<td>3.5</td>
</tr>
</tbody>
</table>

The same apparatus was used for the test on galena as for the previous ones on sphalerite. The reagents used were potassium cyanide, and pine oil.

**Table V—Test Number Four.**

<table>
<thead>
<tr>
<th>Test No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gms. Zn.</td>
<td>42.9</td>
<td>41.2</td>
<td>29.7</td>
</tr>
<tr>
<td>Gms. Cu.</td>
<td>57.4</td>
<td>58.4</td>
<td>61.6</td>
</tr>
<tr>
<td>Cum. %</td>
<td>96.1</td>
<td>98.2</td>
<td>99.1</td>
</tr>
</tbody>
</table>

**Table VI—Test Number Five.**

<table>
<thead>
<tr>
<th>Test No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gms. Zn.</td>
<td>42.9</td>
<td>41.2</td>
<td>29.7</td>
</tr>
<tr>
<td>Gms. Cu.</td>
<td>57.4</td>
<td>58.4</td>
<td>61.6</td>
</tr>
<tr>
<td>Cum. %</td>
<td>96.1</td>
<td>98.2</td>
<td>99.1</td>
</tr>
</tbody>
</table>

**Table VII—Test Number Six.**

<table>
<thead>
<tr>
<th>Test No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gms. Zn.</td>
<td>42.9</td>
<td>41.2</td>
<td>29.7</td>
</tr>
<tr>
<td>Gms. Cu.</td>
<td>57.4</td>
<td>58.4</td>
<td>61.6</td>
</tr>
<tr>
<td>Cum. %</td>
<td>96.1</td>
<td>98.2</td>
<td>99.1</td>
</tr>
</tbody>
</table>

**Table VIII—averages.**

<table>
<thead>
<tr>
<th>Test No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gms. Zn.</td>
<td>42.9</td>
<td>41.2</td>
<td>29.7</td>
</tr>
<tr>
<td>Gms. Cu.</td>
<td>57.4</td>
<td>58.4</td>
<td>61.6</td>
</tr>
<tr>
<td>Cum. %</td>
<td>96.1</td>
<td>98.2</td>
<td>99.1</td>
</tr>
</tbody>
</table>

**Table IX—Test Number Seven.**

<table>
<thead>
<tr>
<th>Test No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gms. Zn.</td>
<td>42.9</td>
<td>41.2</td>
<td>29.7</td>
</tr>
<tr>
<td>Gms. Cu.</td>
<td>57.4</td>
<td>58.4</td>
<td>61.6</td>
</tr>
<tr>
<td>Cum. %</td>
<td>96.1</td>
<td>98.2</td>
<td>99.1</td>
</tr>
</tbody>
</table>

**Table X—Test Number Eight.**

<table>
<thead>
<tr>
<th>Test No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gms. Zn.</td>
<td>42.9</td>
<td>41.2</td>
<td>29.7</td>
</tr>
<tr>
<td>Gms. Cu.</td>
<td>57.4</td>
<td>58.4</td>
<td>61.6</td>
</tr>
<tr>
<td>Cum. %</td>
<td>96.1</td>
<td>98.2</td>
<td>99.1</td>
</tr>
</tbody>
</table>

**Table XI—Test Number Nine.**

<table>
<thead>
<tr>
<th>Test No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gms. Zn.</td>
<td>42.9</td>
<td>41.2</td>
<td>29.7</td>
</tr>
<tr>
<td>Gms. Cu.</td>
<td>57.4</td>
<td>58.4</td>
<td>61.6</td>
</tr>
<tr>
<td>Cum. %</td>
<td>96.1</td>
<td>98.2</td>
<td>99.1</td>
</tr>
</tbody>
</table>

**Table XII—Test Number Ten.**

<table>
<thead>
<tr>
<th>Test No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gms. Zn.</td>
<td>42.9</td>
<td>41.2</td>
<td>29.7</td>
</tr>
<tr>
<td>Gms. Cu.</td>
<td>57.4</td>
<td>58.4</td>
<td>61.6</td>
</tr>
<tr>
<td>Cum. %</td>
<td>96.1</td>
<td>98.2</td>
<td>99.1</td>
</tr>
</tbody>
</table>

**Tables**

- **Table III—Test Number Three.**
- **Table IV—Test Number Four.**
- **Table V—Test Number Five.**
- **Table VI—Test Number Six.**
- **Table VII—Test Number Seven.**
- **Table VIII— averages.**
- **Table IX—Test Number Eight.**
- **Table X—Test Number Nine.**
- **Table XI—Test Number Ten.**
- **Table XII—Test Number Eleven.**

**Galena**

The same apparatus was used for the test on galena as for the previous ones on sphalerite. The reagents used were potassium cyanide, and pine oil.
portion of the galena had been floated off, so that the froth was taken off only so long as it appeared to be relatively high in lead. The results, then, do not show commercial recoveries, but do show the relative fluidity of different sizes of galena.

The ore was low in grade, leading to experimental error in weighing the small amount of concentrate obtained.

It was found that the galena being soft, was reduced in size very rapidly in the rod mill, while the chert gangue was very refractory.

In tests No's. 11, 12, 13 and 14, therefore, the ore was given a very short grind and the plus 10 mesh material, which was largely barren gangue was screened out and rejected.

2500 grams of ore were used in test No. 8; 2000 grams in all the others.

Because of the difficulty of obtaining good results with the lead ore, two tests, No’s. 15 and 16, were run on a pure lead jig concentrate.

The material was given one minute grind in the rod mill and then floated, dried, screened, and the products weighed. Since both the tail and froth were pure galena, it was not necessary to assay them. 2000 grams were used in test No. 15 and 1000 grams in test No. 16.

It appeared desirable to know what size lead was dispersed in the pulp during flotation, so 1000 grams of galena were ground, and placed in the machine with the usual pulp dilution. Two 100 cc, samples were then taken by means of a pipette inserted into the pulp. These samples were dried, screened, and the products found to weigh as shown below.

<table>
<thead>
<tr>
<th>Mesh</th>
<th>Sample No. 1</th>
<th>Sample No. 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td>15</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>3</td>
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<tr>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Table IX—The Difficulty of Dispersing the Larger Mineral Sizes in Commercial Machines.

<table>
<thead>
<tr>
<th>Test</th>
<th>Fine Oil Linseed</th>
<th>K ethyl Stearate</th>
<th>Oil Linseed</th>
<th>Minutes of grind</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>.1</td>
<td>.1</td>
<td>16</td>
<td>11</td>
</tr>
<tr>
<td>9</td>
<td>.1</td>
<td>.1</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td>.1</td>
<td>.1</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>11</td>
<td>.1</td>
<td>.1</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>12</td>
<td>.1</td>
<td>.1</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>13</td>
<td>.1</td>
<td>.1</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>14</td>
<td>.1</td>
<td>.1</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>15</td>
<td>.1</td>
<td>.1</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>16</td>
<td>.1</td>
<td>.1</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Table X—Test Number Eight.

<table>
<thead>
<tr>
<th>Mesh</th>
<th>Sample No. 1</th>
<th>Sample No. 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>150</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>100</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>65</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>48</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>38</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>28</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>19</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>.1</td>
<td>.1</td>
</tr>
</tbody>
</table>

Table XI—Test Number Nine.

<table>
<thead>
<tr>
<th>Mesh</th>
<th>Gms. Pb.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>77</td>
</tr>
<tr>
<td>14</td>
<td>61</td>
</tr>
<tr>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td>38</td>
<td>48</td>
</tr>
<tr>
<td>48</td>
<td>56</td>
</tr>
<tr>
<td>65</td>
<td>40</td>
</tr>
<tr>
<td>100</td>
<td>70</td>
</tr>
<tr>
<td>150</td>
<td>60</td>
</tr>
<tr>
<td>200</td>
<td>30</td>
</tr>
</tbody>
</table>

Table XII—Test Number Ten.

<table>
<thead>
<tr>
<th>Mesh</th>
<th>Gms. Pb.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>77</td>
</tr>
<tr>
<td>14</td>
<td>61</td>
</tr>
<tr>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td>38</td>
<td>48</td>
</tr>
<tr>
<td>48</td>
<td>56</td>
</tr>
<tr>
<td>65</td>
<td>40</td>
</tr>
<tr>
<td>100</td>
<td>70</td>
</tr>
<tr>
<td>150</td>
<td>60</td>
</tr>
<tr>
<td>200</td>
<td>30</td>
</tr>
</tbody>
</table>

Table XIII—Test Number Eleven.

<table>
<thead>
<tr>
<th>Mesh</th>
<th>Gms. Pb.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>77</td>
</tr>
<tr>
<td>14</td>
<td>61</td>
</tr>
<tr>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td>38</td>
<td>48</td>
</tr>
<tr>
<td>48</td>
<td>56</td>
</tr>
<tr>
<td>65</td>
<td>40</td>
</tr>
<tr>
<td>100</td>
<td>70</td>
</tr>
<tr>
<td>150</td>
<td>60</td>
</tr>
<tr>
<td>200</td>
<td>30</td>
</tr>
</tbody>
</table>

Table XIV—Test Number Twelve.

<table>
<thead>
<tr>
<th>Mesh</th>
<th>Gms. Pb.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>77</td>
</tr>
<tr>
<td>14</td>
<td>61</td>
</tr>
<tr>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>28</td>
<td>28</td>
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<tr>
<td>38</td>
<td>48</td>
</tr>
<tr>
<td>48</td>
<td>56</td>
</tr>
<tr>
<td>65</td>
<td>40</td>
</tr>
<tr>
<td>100</td>
<td>70</td>
</tr>
<tr>
<td>150</td>
<td>60</td>
</tr>
<tr>
<td>200</td>
<td>30</td>
</tr>
</tbody>
</table>

Table XV—Test Number Thirteen.

<table>
<thead>
<tr>
<th>Mesh</th>
<th>Gms. Pb.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>77</td>
</tr>
<tr>
<td>14</td>
<td>61</td>
</tr>
<tr>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td>38</td>
<td>48</td>
</tr>
<tr>
<td>48</td>
<td>56</td>
</tr>
<tr>
<td>65</td>
<td>40</td>
</tr>
<tr>
<td>100</td>
<td>70</td>
</tr>
<tr>
<td>150</td>
<td>60</td>
</tr>
<tr>
<td>200</td>
<td>30</td>
</tr>
</tbody>
</table>

Discussion

Sphalerite

Figures No’s. 1, 2, 3, 4, and 5 were plotted from the data obtained from tests No’s. 3, 4, 5, 6, and 7. In figure 5 it will be noted that for screen sizes larger than 65 mesh, the curves do not check very closely, although having the same general trend. This is because the products were rejected only on the nearest grade, and due to the small amount of zinc in the sizes above 65 mesh an error of a fraction of a gram in weighing the concentrate would materially affect the calculated recovery. For this reason,
It was felt to be permissible to average this portion with the rest of the data to obtain the average curves shown in figure 6.

It will be noticed that in figure 6 the curves for cumulative percent of head concentrate and tail are parallel, within the limits of experimental error, except that the concentrate curve gradually flattens as it reaches the larger sizes of mineral.

The method now used at Climax, Colo., of a brief preliminary grind and rough flotation followed by a regrind and cleaning of the froth indicates the trend future development will have to take.

3. Classification is one of the difficulties standing in the way of decreased grinding costs. Since classifiers separate the pulp on the basis of size, it is evident that the classifier present back for regrinding and the large gangue goes into the overflow, which is exactly the opposite of desirable.

The writer wishes to express appreciation for the aid of the Metallurgical Department of the Colorado School of Mines which makes it possible for him to do this work, and especially to Irving A. Palmer, Professor of Metallurgy, to Dr. A. S. Adams, and to Professor S. P. Warren for their very kind assistance.

The thanks of the writer are also due to the St. Joseph Lead Co. who furnished the ores which were used for the work.

Table XVII—Test Number Fifteen.

<table>
<thead>
<tr>
<th>Test</th>
<th>Mass (Gms.)</th>
<th>Conc.</th>
<th>% Sf</th>
<th>Perm.</th>
<th>Recov.</th>
<th>Tail</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
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<td>5</td>
<td>100</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>6</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
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<td>100</td>
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<td>0</td>
</tr>
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<td>0</td>
<td>100</td>
<td>0</td>
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</tr>
<tr>
<td>9</td>
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<td>0</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>0</td>
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<tr>
<td>10</td>
<td>100</td>
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<td>0</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>14</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

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assumptions or specializations of the anhemos effect are to the anomalous conditions are possible and will be considered here in detail since the same conditions are found in adjoining states under similar conditions.

(1) It is noticeable that these anomalous effects occur in Iowa, Illinois, Indiana, and Ohio in other words, in those states covered by the terminal moraine of the Pleistocene ice sheet. Anomalous magnetic effects can be observed in Minnesota, Wisconsin, and Michigan where the glacial till is thinner. It should also be noted that glacial drift has little or no effect in Dakota, Montana, and Nebraska or in New York State. This leads then to the conclusion that the magnetic anomalies in Iowa, Illinois, Indiana, and Ohio are due to local rock anomalies which came partly from the iron formations of northern Minnesota. The iron formations of northern Minnesota and the Dakotas the glacial drift which was derived from ordinary types of rocks, has little or no effect.

According to Dr. Heald, most European geophysicists do not believe that glacial till produces magnetic anomalies. It is interesting to note therefore that results of our research appear to check that belief except in those states where the overlying sedimentaries may have been brought from iron formations.

(2) The crystalline basement rocks may be the cause due to their surface structure not coinciding with that of the overlying sediments.

(3) The crystalline basement rocks may be the cause due to their effects due to irregular concentration of magnetic materials.

(4) The anomalous effects may be due to local causes in the sedimentary formations such as:
   a) erosion of beds containing magnetic materials
   b) various geological conditions existing during de
c) irregular thickness of the magnetic bed.

Of these different possibilities, the writer inclines to the idea that the magnetic anomalies are due to the irregular concentration of magnetic materials. These effects probably proved too strong to attempt to correlate regional structures by means of stations many miles apart.

**INDIANA**

Structurally, based on the upper surface of the Triassic limestone of Ordovician age, this state may be divided into three regions. These regions, as from the northwest to the southeast corners of the state is a structural high with a sag in the central part of the state. The southern end of this high, called the Southeastern geotectonic center, is the northern terminal of the Cincinnati geanticlinal axis. The northern and southern geanticlines are magnetic highs, and in the central region this anomaly is balanced by a magnetic low.

(1) The Cincinnati Arch is undoubtedly the most important regional structure in the state. Its axis extends northeast-southwest and is situated midway between the northern and southern geanticlines. The Cincinnati Arch is a structural and magnetic high which is well shown by magnetic "highs". On the isonomic map of L. Sparagen and found to check closely when the difference in isonomic intervals was considered. Additional magnetic data was also obtained from Bulletin No. 13 of the Kansas Geological Survey.

The surface formations in Kansas are all sedimentary and range in age from Mississippian to Tertiary in the west. The regional dip of the strata is very regular to the east and west, that considered from north to south there is a structural high from the Ohio to the Cumberland river. These diagrams also showed that many sedimentary beds had been eroded from the structural high. This phenomenon is explained by cross section map but could not be located elsewhere. It appears as a "low" just south of the state of Kansas. Structural data was obtained largely through the courtesy of J. W. Ockerman. The isonomic map accompanying the report shows a structure which appears on nomalic map of L. Sparagen and found to check closely when the difference in isonomic intervals was considered. Nevertheless the position of the points of interest may be located upon some of the results obtained. Additional magnetic data was also obtained from Bulletin No. 13 of the Kansas Geological Survey.

Both of these uplifts are shown by magnetic "highs". It is a well known structure which plunges from north to south, and hence it is shown on the map by the isonomic and nomalic map of L. Sparagen and found to check closely when the difference in isonomic intervals was considered. Nevertheless the position of the points of interest may be located upon some of the results obtained. Additional magnetic data was also obtained from Bulletin No. 13 of the Kansas Geological Survey.

A number of interesting points can be brought out in connection with this structure as to whether the anomalies may be divided for convenience into six divisions. These are as follows:

(1) The Cincinnati Arch is undoubtedly the most important regional structure in the state. Its axis extends in a northeast-southwest direction and is situated midway between the northern and southern geanticlines. The Cincinnati Arch is a structural and magnetic high which is well shown by magnetic "highs".

(2) An anticline in the southwestern part from Hamilton to Grant county is not indicated by available stations. For this reason it is necessary to extend the magnetic "high" to the northward of the state. Nevertheless, the position of the points of interest may be located upon some of the results obtained. Additional magnetic data was also obtained from Bulletin No. 13 of the Kansas Geological Survey.

The state of Louisiana lies entirely within the Gulf Coastal Plain. Its surface formations range in age from Eocene to Recent.

The chief structural features are the Sabine Uplift in the northwestern part and the Monroe uplift in the north. Both of these uplifts are shown by magnetic "highs". In all sections of the Gulf Coastal Plain the magnetic "highs" are due to local rather than to regional causes. Igneous intrusions of Pre-Cambrian, Devonian, and Cretaceous age are characterized by positive anomalies which seem to be due to local rather than to regional causes. These anomalies which extend from a point in eastern part to follow a line of magnetic "highs".

**LOUISIANA**

The geology of Maine is very complex can be seen from the following quotations from Dr. H. P. Perkins letter.

"The rocks of the state have been deformed several times. The Pro-Cambrian, Devonian, and Cretaceous rocks are being deformed by these movements, especially during the Appalachian Revolution. The rocks of the Bay of Fundy, Cape Breton, and Caribou have added to the complexity. In the most complex part of the state there is considerable block faulting. The latest movement has been along the line which is a structural high and magnetic "high" which extend from a point in eastern part to follow a line of magnetic "highs".

(For more information on the geology of Maine, see the references at the end of this report.)
Glimpses of Spanish Morocco

The quaint city of Melilla
Business at leisure
No good brooms

By J. A. RILEY

MELILLA, a city of 40,000 people, is about midway between Ceuta and Oran on the southern shores of the Mediterranean, which at this point is about 110 miles wide. Situated on the neck of a small peninsula, the point of which juts northward into the Sea, it commands a due-east view of the ever-widening Gibralfaro peninsula, which extends southward from Spain to reach Africa, one expects to look back north over the water. That one looks east in place of north from the harbor or city is extremely confusing and makes it difficult to orient oneself for an unusually long time.

The harbor comprises a nearly finished municipal dock and breakwater combined, and a privately owned ore-loading dock slightly to the south. Both extend east from the mouth of the city. When the wind does not come from the east—and a breeze, as an east wind is called, is the worst of all the winds that blow—there are no harbor shapes in the harbor because of the unexpected and unannounced arrival of a hard blow from this quarter. Just three years ago March, three ships were lost in the harbor—unable to make their safe departure. Harbor keepers here agree that they are making it only a place to unload vessels or load them; not at a place of safety. However, between six and eight hundred ships call here each year. Most of the ships are 500 tonners, which ship about 1,000,000 long tons annually. This production is divided between one large and one small producer in the proportion of about eight to two.

The most interesting hour in the harbor is just after day breaks, when the ships come in to put off a marble in a mine or mine in the harbor. With their engines chugging away—those that have them—with the added load of several strong men behind that do not have them; all their brilliant gas-halogen lighting still going full; and the yells and hubbub almost attendant upon the scene, they make quite a picture.

Shortly after the daily mail boat from Malaga comes in and in the port then settles down to the routine of loading and unloading from all the ships of the African coast which sit tangent to Algiers, and from ports of Spain and France. They are all small ships and use the dock, but the larger ships, when cargo demands their stopping here, use the outer harbor, discharging into lighters in the usual small harbor manner.

The history of Melilla and the country immediately surrounding undoubtedly goes back to the time of Carthage. The coast has been thoroughly scoured during those times and the position of the town makes it very unlikely that its location was missed. That any settlement was made here is only possible to suppose. Some twenty-five miles westward on the coast, at a small

village called "Afra", the Romans have left unmistakable proof that they were making an effort to exploit some small deposits of iron. The tug piers and their snarlers—snarlers made in the style of hills in the solid rock—still are to be seen. The location of Melilla being so much in evidence from the sea, it is reasonable to suppose that, at least in the time of the Roman Empire, this location was known. Particularly at the point of Cape Tres Foros there are evidences of iron right at the sea. This location is held by one of the operating companies here as a possible site for future operations.

Little of importance has brought this territory into prominence since then. The Portuguese landed not far from Melilla at one time but were driven out by the Moors, who at that time also were making their successful invasion of the Spanish Peninsula in Europe. A rugged, uninviting, semi-barren land, it has not lent itself to any extent of exploitation or exploration of its mineral deposits. Its modern history really dates only from the time of the war-years of the thirteenth century, and the province is probably best known from the war between the Spanish and the Moors which lasted from 1912 to 1926 when "Abdel Glam" the Moorish Chieftain, carried on a guerrilla warfare against the French and was finally subdued by his combined forces. His chief headquarters were near the present town of "Calif-Derni" on the Mediterranean near the Irish Alhambra, about thirty-five miles west of Melilla.

Between the dock and the ever-present Spanish city of Melilla, boats bustle one, of course, is a row of shop-houses eating houses as picturesque as can be seen anywhere. At one corner of New York's lower Third Avenue and a Grand Army Plaza, the streets with the steamers coming-on-the-boat and the hot roast bean sandwichs. In their places are heaps of cooked cold shrimp in the shell, greasy fritters and dishards, a little salad of lettuce and olive oil, tomatoes, fruit, some cheap red wine, and on each small, uncovered, wooden table the ever-present botijo, of water which is drunk. This bottle has a small spout, a holding ring, a conical spout, a holding ring, and an air vent on the top. The spout, a holding ring, and an air vent on the top. The spout is made of some iron or steel and is often twisted into the mouth of the bottle. The spout is made of some iron or steel and is often twisted into the mouth of the bottle. The spout is made of some iron or steel and is often twisted into the mouth of the bottle.

The best view Melilla affords of the Moors' civilization during these times and the position of the town makes it very unlikely that its location was missed. That any settlement was made here is only possible to suppose. Some twenty-five miles westward on the coast, at a small

The old Moorish section of the City of Melilla. Fishing boats in the harbor.

Individuality of its own. So many influences have left it devoid of anything truly typical of the country's parts. But of Spain this is certainly true, a little of the breakwater is a spot of extreme interest. The best view Melilla affords of the Moorish civilization during these times and the position of the town makes it very unlikely that its location was missed. That any settlement was made here is only possible to suppose. Some twenty-five miles westward on the coast, at a small
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Old Ballot Recalls Memories

The election just past has set some of the Miners' grades to reminiscing. A release issued in 1991 was recently unearthed in the vaults at the Jefferson county courthouse. It contained a list of the candidates who ran for office in 1907, when the town was a small mining community and the election was held in the old Miners' Ballot Box.

The list included candidates for various positions, including county surveyor, school board members, and other local officials. It also included some interesting names, such as "Billy" who was a student at Golden High School and graduated in 1893.

The election results were announced during the half Blue Key performed a trick of sawing the loving cup. Scotty Whitman also sang several Scotch ballads. Farraro's band furnished the music for the occasion. The "M" club dance concluded the evening. A lively dance was held.

So far we have been considering the principles governing the methods by which ores and concentrations of metals are recovered, and the methods of separation and purification of the leach pulp and solutions. We have come to the main point of the argument, to wit, the recovery of the main metal, either as such, or as one of its compounds.

In taking up this step in the general scheme of hydro metallurgical operations, it is convenient to list the means employed in metal recovery as:

1. Thermal decomposition.
2. Chemical precipitation of a metal compound,
   (a) Salting out,
   (b) Formation of an insoluble salt, acid, or base,
3. Physical precipitation,
   (a) Thermal precipitation, (b) Evaporation, fractional crystallization.
4. Amalgamation.
5. Electrodeposition.

In every broader terms, we may effect metal recovery from solutions by:

1. Chemical means, (1) and (2).
2. Physical means, (3).
3. Physicochemical means, (4) and (5).

In point of antiquity, amalgamation (as in the Patino Process and stamp-milling), and fractional crystallization (as in salt and caustic soda extraction and purification) should come first. However, in present day processes of importance, metal recovery and electrodeposition hold high rank.

Amalgamation is not, strictly speaking, recovery from solutions but precipitation from suspensions. However, as a process as used today comes simply in allowing amalgamated ore to "float" through mercury to recover mercury and sodium. Depending upon the intimacy of this contact, or less of the free gold and the absence of any free amalgam, "sodium amalgam with the "fundamental requirements in plate amalgamation are:

1. That the precious metals shall be free and have clear, metallic surfaces; (2) that they shall be floated over the plate in a solid sufficiently fluid to permit metallic particles to sink readily; (3) that the surface of the amalgam be clean.

An old ballad has it that the precious material particles sink to the plate surface, and yet, in the absence of any free amalgam, "sodium amalgam with the "fundamental requirements in plate amalgamation are:

1. That the precious metals shall be free and have clear, metallic surfaces; (2) that they shall be floated over the plate in a solid sufficiently fluid to permit metallic particles to sink readily; (3) that the surface of the amalgam be clean.

The problem of amalgamation is a simple one, but the solution is not always easy. Amalgam may be recovered from solutions in various ways: (1) by precipitation, (2) by fractional crystallization, (3) by distillation, and (4) by electrodeposition.

Amalgamation is still used to a large extent as a preliminary to cyanidation, not only because amalgamation is a clean process, but also because of a few milling processes. Amalgamation is also used in some cases to recover metals from metal solutions.

The details of the many processes in practice are too numerous and too highly specialized, to be mentioned here. However, we may cite a few examples:

1. TUNGSTEN occurs naturally in various forms, and is an exogenous tungsten. The common method of extraction is to form a tungstenate, by roasting; leaching with hot water; separate the tungstenate by fractional crystallization, and precipitate with hydroxide. When this process has reached its economic limit, the tungstenate is reduced and the solution treated with hot HCl solution. This precipitates tungstic acid (H\(_2\)WO\(_4\)), which may then be distilled. Sulfuric acid, as well as iron, may be added to the solution.

2. Molybdenum, As, P, S\(_2\), etc., by addition of MgCl\(_2\), concentration of the W solution, and distillation. The W is precipitated by addition of H\(_2\)SO\(_4\) until the solution is clear. The solution is then treated with HCl, and the HCl is removed with H\(_2\)SO\(_4\).

3. Copper (Cu), Ag, Au, etc., by addition of NaCl, concentration of the W solution, and distillation. The W is precipitated by addition of H\(_2\)SO\(_4\) until the solution is clear. The solution is then treated with HCl, and the HCl is removed with H\(_2\)SO\(_4\).

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The 1930 homecoming is now history. Many Alumni returned for the celebration, and although those who never arrived spend half a day getting through, and are only watched over by the Moorish customs officers—-
suiting precipitate contains a considerable amount of NaNO₃. The ores, concentrates, and precipitation products are sold on the basis of their "per cent" (V₂O₅) content.

The preparation of pure Al₂O₃ for production of Al, by fused-salt electrolysis, furnishes a good example of hydroylation. The impure bauxite ore is treated, thermally, to form alumina hydrate (Na₂O·Al₂O₃·2H₂O). This is dissolved in water, the pulp separated, the solution purified, by various means, and the Al is then precipitated as Al(OH)₃, by bringing the solution to normal, or near normal, acidity with CO₂. The hydroylation is catalyzed by the addition of freshly precipitated Al(OH)₃. Agitation for long periods, under these conditions, will bring about a 70% recovery of the Al.

The principles underlying the reactions utilized in the above example, are, for the most part, derived from elementary inorganic chemistry. Once again, these processes may be regarded as representing applications of the operator of quantitative and qualitative analysis. In most cases, it is helpful to write out the equation corresponding to the reaction in question, since this will usually indicate the conditions necessary for the industrial application.

For example, any hydroylation may be looked upon as the reverse of neutralization—

Na₂O·Al₂O₃·2H₂O→2NaOH+2Al(OH)₃

This means the salt of a strong base with a weak acid; the reaction requires the addition of water, and from the thermal values involved, it is probable that the reaction is endothermic. Hence, dilution, agitation, and an high temperature would favor the process, while any excess NaOH would tend to bring about a reverse reaction. The catalytic value of the initial addition of Al(OH)₃, seems to depend upon the fact that Al(OH)₃ can exist in two modified, having different physical and energy characteristics; the solubility of one is near that of the other, as already proceeds, allows the reaction to go. The function of the catalyst then appears to be that of a starter or promotor for the main reaction. The limit to dilution,—and there­


Evaporation involves two, and only two, essential condi­tions: first, an external source of heat to supply the sensi­ble heat (specific heat of solution plus latent heat of vapor­ization of the solvent) and second, required to bring about vaporization of the solvent liquid; and, second, removal of the vapor thus formed from the free surface of the solution.

The heat may be supplied either as direct heat within the body of the solution, or as indirect heat, through the walls of a suitable solid container. The vapor may be removed by means of some inert gas, acting as a scavenger, or simply as undistilled vapor, through convection, or by suction. The whole process may be carried out at atmosphere pressure, in open vessels; or under pressure or vacuum in enclosed vessels.

For the great majority of cases met with in metallurgical practice, evaporation, as leading up to fractional crystallization, is carried out in open pans, or in multiple-effect evaporators, or in a combination of both.

For simple evaporation, for straight crystallization,—as in the recovery of hydrated zinc from the production of black roast,—spray evaporations have been found to be very efficient.

In dealing with multiple-effect evaporators, there is a widespread impression that evaporation under vacuum requires less energy than does pressure or atmospheric evap­oration. This impression, however, is not correct. The energy required for evaporation of a given quantity of water is the same whether the evaporation is carried out under vacuum or atmospheric pressure, since water possesses the same boiling point at both atmospheric and reduced pressure.

The evaporation is catalysed by the addition of freshly prepared Al(OH)₃, or by some other substance, or by application of heat. The heat may be supplied either as direct heat in the interior of the vessel, or by removal of a solution of the substance in water from the surface of the solution. If a given substance is to be separated in as pure a condition as possible, the concentration of the solution, and the cooling effect during crystallization, should be regu­lated so that a certain amount of the substance will remain in solution. The crystals may then be separated as single mother liquor on drain boards, by settling and decantation, or by other suitable means. Some of the mother liquor will, of course, cling to the crystal surfaces, and this may be removed by washing with cold water. This wash water is drained from the evaporation apparatus. Final washing and drying is often advantageously carried out in centrifu­gals. For high yields, it is usually necessary to redisolve the first crystals in fresh water, or in the wash water from a secondary washing, to form a nearly saturated solution. From this solution, the crystals are precipitated, and the excess liquor from this stage being used as wash water in the first stage. The present trend in this field is to use low temperature crystallizers, which are able to separate the crystals at a lower temperature than the liquor, and to keep the crystals from dissolving in the wash water.

Turning now to the case of thermal decomposition, the outstanding example is that of the leaching solutions em­ploying ammonium carbonate. Ammoniacal solu­tions of ammonium carbonate with CuO, probably in the sense of the following equation:

Cu₂O+2NH₄CO₃→Cu(NH₄)₂CO₃+3H₂O

A similar reaction occurs with ZnO in the case of finely divided metallic ZnO. The effluent spent solution, etc., this leach is especially effective in that metallic Cu is not readily attacked by cold, dilute H₂SO₄. In practice, the leaching agent used for metallic Cu is CaSO₄∶9H₂O in contact with the fine Cu, this cupric salt is reduced to the cuprous state, Cu₂O∶(NH₄)₂CO₃. When live steam is passed into the solution of separation of one crystalline, pure solid, from a solution containing two or more molecular species,—depends upon two properties of solids: first, the solubility in solubility, and second the tendency of all solids to crystallize in a pure form. Hence, the process of fractional crystallization is based upon a knowledge of the solubility characteristics at various temperatures of the substances in solution.

If a given substance is to be separated in as pure...
A Mines Man Seeks his Chest of Gold in Central America

Ernst's Note: The following is a letter to Doctor Underhill, Associate Professor of Mining at the Colorado School of Mines. Kurt O. Linder's father, a Mines Man, is the author of the letter, and his pleasant style will be appreciated.

The Letter

About a year or so ago I wrote you a letter from down in the South and you answered it; or if you did answer it, I never got the reply, and so the result remains about the same. But patience is one of the Twin's virtues, and after some six months or so I forgot all about the matter.

Last week, however, I ran across a last year's Mines Catalog, in one of the toughest little outlets of this valley, I can't imagine how it got there. The tendency for evil to spread out is really remarkable. From a sense of duty I stole the catalog and brought it home with me. I'm glad that I did, because it turned out to be mighty interesting reading. All those forgers, all those forgers, and I was the only one who got the catalog undeservedly cleverly. At first it was hard to recognize the old stand thru the rosy haze, and I was almost led to believe for a time that somebody must have died and left the place a lot of money.

But further study revealed that the place must still be the same, in spite of what the printer could do. Many of the same comics in the Faculty list, a number of the veteran students, and the same buildings, climate, and scenery.

Some change has been made in the Math department, it seems. They were the same before I left; but since then, they must have altered my career for me, and forced me out into the world to try to make a living. From the Math Department's lack of sympathy with their system; I wanted it simplified, so that the general run of students could understand it. Things shouldn't be taught in a school of mines claudine fashion.

Then there was their miserable conundrum system. I suggested that they abandon it, because it was unsuited to the dignity of a college, which should deal with facts, not guesses.

Then there was their raisable conundrum system. I suggested that they abandon it, because it was unsuited to the dignity of a college, which should deal with facts, not guesses.

There is one thing which stands in need of great reform here—the Judiciary system. Justice isn't any more predictable here than it is in the States. Why, not long ago, I was sitting in a car outside in San Francisco little enough house in the United Fruit Company's concession—and presently a man drove up and began telling me off on the same table. They ordered beer tossed off a couple of mugs, licked it and ordered more. After a time their conversation turned into personal abuse, left them, while they were still discussing friendly blueprints of the subject. But I didn't, and soon the discussion was turned into an argument, which would always be the most agreeable, till I noticed his other words. Use of Latin, Spelling, terminus, Comma, Commas, and so forth. Concurrency and Conundrums at Flin Flon Pilot Mill: S. P. Lowe in Canadian Mining and Metallurgical Bulletin, X, No. 3, 1929. Reviewed. A description of the Flin Flon experimental and laboratory mills. Flotation tests, and so forth. Art. The Museum of Science and Industry: Waldemar Kaempffert. Published as a bulletin, from Reptile Science, Monthly June, 1929. An interesting description of the restoration tended by Joseph Reitzenstein "to reveal the technical aspect of man." Well illustrated and entertaining as well as instructive.

Russell J. Farrar Dies

News of the death of Russell J. Farrar, honor graduate of the Class of 1910, has just been received in Golden.

Farrar died at Fort Howard, Arizona, Mexico, August 29, 1929, after a four year fight against tuberculosis contracted during his service in France.

After graduating from Mines, Farrar went to Mexico where he followed his profession of mining engineer. Returning to the United States, he came along with the gold Hunter Mine at Mullan, Idaho. From here he went to Arizona, where he entered the employ of the Copper Creek Mining Company. When war was declared, he enlisted in the army and was sent to France with the 349th Machine Gun Battery. The battery was always fought off under heavy fire. In August, 1919, his division was sent into Germany as part of the Army of Occupation and he did not return to the United States until May, 1919.

Farrar was a member of the American Legion, and in the service he received his commission as a Lieutenant.

Upon his return to civilian life, Farrar removed the employ of the Copper Creek Mining Company and was employed by the United Steel and Nevada. He was employed by the United Steel and Nevada until 1925 when his health broke down.

The American Legion had several medical services which were held in Salem, Oregon, August 27, 1929, surviving his mother, Mrs. Isabelle C. Farrar, and a sister, Mrs. R. N. Kellogg, both of Portland, Oregon.

Alumnius Makes Broadcast Possible

A broadcast over K. F. E. L., Denver, of a Mines program Sunday night, for the first time, was made possible by J. H. W. Schulten. Winchell is a true Mines graduate and is one of the hands that would lend a helping hand to give help to any Mines' project. Winchell turned over the regular broadcasting hour of the Parian Fire company, of which he is a member, in the time period. Time passes almost too quickly, because it's a country where time means so little. Time is not punctuated here by expected events, and when you have no idea of anything that can happen, you might as well forget about time.

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After graduating from Mines, Farrar went to Mexico where he followed his profession of mining engineer. Returning to the United States, he came along with the gold Hunter Mine at Mullan, Idaho. From here he went to Arizona, where he entered the employ of the Copper Creek Mining Company. When war was declared, he enlisted in the army and was sent to France with the 349th Machine Gun Battery. The battery was always fought off under heavy fire. In August, 1919, his division was sent into Germany as part of the Army of Occupation and he did not return to the United States until May, 1919.

Farrar was a member of the American Legion, and in the service he received his commission as a Lieutenant.

Upon his return to civilian life, Farrar removed the employ of the Copper Creek Mining Company and was employed by the United Steel and Nevada. He was employed by the United Steel and Nevada until 1925 when his health broke down.

The American Legion had several medical services which were held in Salem, Oregon, August 27, 1929, surviving his mother, Mrs. Isabelle C. Farrar, and a sister, Mrs. R. N. Kellogg, both of Portland, Oregon.

Alumnius Makes Broadcast Possible

A broadcast over K. F. E. L., Denver, of a Mines program Sunday night, for the first time, was made possible by J. H. W. Schulten. Winchell is a true Mines graduate and is one of the hands that would lend a helping hand to give help to any Mines' project. Winchell turned over the regular broadcasting hour of the Parian Fire company, of which he is a member, in the time period. Time passes almost too quickly, because it's a country where time means so little. Time is not punctuated here by expected events, and when you have no idea of anything that can happen, you might as well forget about time.

There's one thing which stands in need of great reform here—the Judiciary system. Justice isn't any more predictable here than it is in the States. Why, not long ago, I was sitting in a car outside in San Francisco little enough house in the United Fruit Company's concession—and presently a man drove up and began telling me off on the same table. They ordered beer tossed off a couple of mugs, licked it and ordered more. After a time their conversation turned into personal abuse, left them, while they were still discussing friendly blueprints of the subject. But I didn't, and soon the discussion was turned into an argument, which would always be the most agreeable, till I noticed his other words. Use of Latin, Spelling, terminus, Comma, Commas, and so forth. Concurrency and Conundrums at Flin Flon Pilot Mill: S. P. Lowe in Canadian Mining and Metallurgical Bulletin, X, No. 3, 1929. Reviewed. A description of the Flin Flon experimental and laboratory mills. Flotation tests, and so forth. Art. The Museum of Science and Industry: Waldemar Kaempffert. Published as a bulletin, from Reptile Science, Monthly June, 1929. An interesting description of the restoration tended by Joseph Reitzenstein "to reveal the technical aspect of man." Well illustrated and entertaining as well as instructive.

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Sprains and Britises By Charles Whipple

The Alumni came out to school homecoming parades, and some of them gave homecoming themes. The Mines men were not the only ones who showed their school spirit. The Orediggers were also there, and their cheering attracted considerable attention. The Mines men, with Howard Jones system, and it proved too difficult to distinguish between a legal and an illegal block, unless the officials were very experienced. The worst thing an official can do is to start a continuity, in as much as the man claiming to have been clipped never fell to the ground. However, after a long "conference" of officials in the middle of the field, it was finally decided that Mines did not deserve the touchdown. The Spanish may be translated: "On the other hand, there are two other things that one must do. Moving pictures of the Yale-Army game revealed that no foul was called because the offensive five player on the Orediggers' squad. He put on his football uniform, and it makes a bad burr. Butler, as he is considered the most consistent tackler, and the best at the job, the referee was justified in calling the foul. Without the pictures it would have been difficult to prove that Butler did not make the tackle. The block is a legal block, unless the blocker plainly falls across the back of the blocked man's legs. (Called "slipping.") His return to the playing field was a great day for football. When Two Great Athletes Shook Hands

On to Pueblo Thanksgiving

Alumni who attended the Mines-Colo­rado Game at Pueblo were treated to a good Thanksgiving Day. The Mines football team was the first to arrive at Pueblo, and by the time the Miners had arrived, the Pueblo crowd was ready for the game. The Mines team put up a good scrap, but it could make little headway. The Mines were not the only ones who showed their school spirit. The Orediggers were also there, and their cheering attracted considerable attention.

Rice Out of Game

The powerful line seems to be fol­lowing the Mines team this year through the medium of injuries.

Following the Denver University game, instructor E. O. Peaker was rather pain­fully injured, Ed Rice, popular veteran backfield, was suddenly struck with an acute appendicitis which necessitated the immediate surgery of a moment.

After an examination, it was decided that Rice should discontinue football for the remainder of the season, or risk the possibility of sudden strain, causing greater complications.

When Two Great Athletes Shook Hands

Voices from the bench seemed to reach the gridiron these days. There might have been some who might not be joining in. As a matter of fact, it seems that many who are not desiring such opportunities, desire, call a foul on some player on the opposing team, and chances are this player may not be able to play throughout, thus allowing the offensive, which there is a great deal of personal contact, to use the power of "unnecessary roughness." It is up to the officials to enforce the rules that are made with a certain amount of discretion, realizing that perfect enforcement is an im­possibility.

Such discretion is too often exercised in credit of one team more than another. It seems there is a lack of understanding on the part of the officials as to what is an "illegal and a legal block, unless the officials are very experienced. The worst thing an official can do is to start a continuity, in as much as the man claiming to have been clipped never fell to the ground. However, after a long "conference" of officials in the middle of the field, it was finally decided that Mines did not deserve the touchdown. The Spanish may be translated: "On the other hand, there are three little men whose names are Townsend, Harris, and Spalding, who excel in the middle of the line, and are responsible for many of the greatest of the Mines' yard gains.

Miners 7—Boulder 36

The game was pretty well even all the way through the Mines line, although heavily out­numbered. Tom Allen was put in at the right end, and he is responsible for many of the greatest of the Mines' yard gains. The game was pretty well even all the way through, and the Mines scored their first touchdown of the season in the third quarter. This was followed by another touchdown, and the Mines were definitely in control of the game. The Mines scored the last two touchdowns of the game, and the Miners were not able to score another point.

The game ended with the Mines leading 25-14, and the Miners were not able to score another point.
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Rhodes Comments on Campbell Articles

Barrettiles, Mihan, Mexio, My Dear Colburn:

You may be surprised to hear from me but I have started a mining magazine, which I think is in order, on the article by Mr. Rhodes on "Metals and their usage." Thomas H. Campbell, which appears in the July 1930 issue.

Referring to his remarks on "unimodal distribution" the relationship of the linear equation representing the same where "x" is called the dilution power of the solution, I think this latter expression needs modification. Since the differential equation as written is a direct function of the concentration in the system at time "t" and it seems to me the source of a substance may be handled in the same way since the oxygen would serve the same purpose. Instead of "dilution" I would suggest "dissolution" or "dissolution" depending on the meaning of the symbol used. I think the solution of the problem would be free from this vagueness which "dilution power" gives it.

On the other hand, if the strengths of the systems involved at any time "x" are used, the problem resolves itself into one involving the simultaneous solution of the system at any time "t". For this case the 5 solutions of the system would be expressed in terms of "x" or "x" or 14. The quantity which would represent the state of solubility of the system at any time "t", and the quantity which is proportional to the concentation of one of the reactants is the amount of salt transformed at the end of 24 hours x = 0.2687S av. ounces of NaCN. At the end of 24 hours, x = 0.2687S av. ounces of NaCN. At the end of 24 hours, x = 0.2687S av. ounces of NaCN. At the end of 20 years, t = 37.70 years, and at this rate one year of solution would be required to convert 100 percent. For simplicity reasons I get eliminiates the more reductio the system "t", then the velocity of the reaction is represented as system at time "t" then the velocity of the reaction is represented as t = log 100 — log (100 — 90) log 100 — log (100 — 90) log 100 — log (100 — 90)

Kindly pass this on to the editor of the Magazine.

Yours sincerely,

W.B. Bowers

Bakerbush, Calif.

My dear Colburn:

I wish to thank you for your kindness and the offer of a friend of mine to work in the M. C. Magazine. The offer was most generous and was very interesting to me. I have always been very interested in all of the fellows present at a yearly meeting of the Colorado School of Mines Magazine.

It was not the story of the hydroclastic terms which I desired to have, but they are interesting, but copies of the magazine itself. A friend of mine has a copy and can forward them. I have read some of them very much and have the experience of being interested. With kindest regards I remain,

Jew M. Savage, Esq.

Dear Colburn:

I certainly enjoy the Magazine. The news and technical articles have been a pleasure as well as a resource.

I feel that missing a single issue.

My dear Colburn,

Just a line to tell you that at the present time I am located in the southeast corner of the United States. If you should happen to be in that neighborhood, I would be very glad to see you. I have a number of old friends in the vicinity who would like to see you. Please let me know when you will be in the region if possible. I am very much interested in your work and would like to see you. I am looking forward to a visit from you. With kind regards,

Mines C. Kiess, Esq.
for the Anaconda Copper Mining company. Kerr returned the middle of October from visiting friends and relatives. He was working on his personal project in the bus in which he was riding and a private plane crashed near his home in Casper after en route to his home in Casper after a vacation visiting at Mines since his graduation. His homecoming. They had as luncheon guests October 11 and 12, in Golden Colorado, was another Alumni visitor.

Clayton “Clay” Kerr, 30, and Mrs. Kerr returned the middle of October from visiting friends and relatives. He was working on his personal project in the bus in which he was riding and a private plane crashed near his home in Casper after en route to his home in Casper after a vacation visiting at Mines since his graduation. His homecoming. They had as luncheon guests October 11 and 12, in Golden Colorado, was another Alumni visitor.

Another potential Miner made his appearance at the home of Mr. and Mrs. Marvin Martin, Midland, Texas. Another potential Miner made his appearance at the home of Mr. and Mrs. Marvin Martin, Midland, Texas. Another potential Miner made his appearance at the home of Mr. and Mrs. Marvin Martin, Midland, Texas. Another potential Miner made his appearance at the home of Mr. and Mrs. Marvin Martin, Midland, Texas.

Paul Lewis, 32, who has been at Arizona, New Mexico, is one of the many Mines men who has been transferred by their companies to the Fort Morgan oil fields. He just opened up a new district.

Donald Bailey, 24, is with the Quadrant Gas and Oil company at Los Angeles. The Bollings are at home at 1134 Maple Avenue, Pueblo, Colorado.

Robert Brunswig, 20, is with the committee for the Mines alumni, visited at Mines at the beginning of the fall quarter. He is with the Federal Land Co.

Prof. Juan Arzalur, head of the geophysics department of the National university of Mayorga, Spain, was visiting in this region as a coal miner as well as a geologist. His address is in Mexico City.

The latest registrant at Mines is Wang Tong Hua, a former student at the university of Yen Ching, and the University of the Philippines. He was visiting in the winter of 1927.

Alumni Register During Summer

The Alumni Register shows that the following Mines men called at Alumni Office during the summer:

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<tr>
<th>State</th>
<th>Name</th>
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<td>R. Kenneth Burgess</td>
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<td>Ohio</td>
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KEEP POSTED ON GOLDEN
through
The Jefferson County Republican
Anomalies of Vertical Intensity

(Much of this material is taken from the report of the State Geologist of Michigan.)

Michigan—This area is structurally a large basin, the center of which is approximately the same as the geographic center of the peninsula. Rocks, of Devonian age, are found along the northern shore and also in the southeast and southwestern corners. Outside of these outcrops, in regular order, are found Mississippian, Pennsylvanian, and Permian formations, the latter occupying the center of the area. This peninsula is also covered by a certain amount of glacial drift.

Oil and gas have been found at a number of points but thus far chiefly in the northern part, where there are many small anomalies, but all are too small in size to appear on this map even though the stations are spaced relatively close together, much closer in fact than those of the western states.

Magnetically the results shown are only fair but promising. In general, the central part of the basin is predominantly "high," with "lows" appearing in the areas of Devonian strata. There are other "lows" in the center of the peninsula but the "highs" are the most extensive. The writer believes that this area may be of the Colorado type in that the "highs" may be due to magnetic effects of the sedimentation which in this case are of later Paleozoic age. Furthermore, the magnetic effects of local structure, should, as in Colorado, therefore be present. It is possible that the topography might have a stronger magentic effect than the geology. Is such the case here? The answer is not revealed on the isonomalic map, hence the first section only will be considered.

Upper Peninsula—This area is one of the most magnetic in the state. It was observed in Colorado that the valleys of the Front Range had a lower magnetic intensity than the ridges, and it is possible that the valleys of this range may have a lower magnetic intensity than the ridges. This is particularly true of the peninsula but the "highs" are much more extensive. The writer believes that this area may be of the Colorado type in that the "highs" may be due to magnetic effects of the sedimentation which in this case are of later Paleozoic age. Furthermore, the magnetic effects of local structure should, as in Colorado, therefore be present. It is possible that the topography might have a stronger magnetic effect than the geology. Is such the case here? The answer is not revealed on the isonomalic map, hence the first section only will be considered.

Structurally, it is possible to divide Maryland into two general sections: the first the area about Chesapeake Bay, and second, the remainder of the state. The strata of the first section range in age from Cretaceous to Recent, and have a general dip to the southeast. The second section, which contains chiefly rocks of Paleozoic and Pre-Cambrian age is complexly warped and has a variety of northwest and southwest dips. The geology of this latter portion of the state is not revealed on the isonomalic map, hence the first section only will be considered.

The northern end of Chesapeake Bay appears as a magnetic "high" while the southern part is "low." This corresponds with the Florida type of magnetic effect in indicating directly the regional dip of the strata in this region.

This area is predominantly "high," with "lows" appearing in the areas of Devonian strata. There are other "lows" in the center of the peninsula but the "highs" are the most extensive.

The writer believes that this area may be of the Colorado type in that the "highs" may be due to magnetic effects of the sedimentation which in this case are of later Paleozoic age. Furthermore, the magnetic effects of local structure should, as in Colorado, therefore be present. It is possible that the topography might have a stronger magnetic effect than the geology. Is such the case here? The answer is not revealed on the isonomalic map, hence the first section only will be considered.

Although the area seems to be amply covered with stations there is little or no connection between the anomalies and either geology or topography. No interpretation will, therefore, be attempted.

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The G. S. M. Magazine

for November, 1930

The So-Called Muffle—This muffle has exceptional properties for meeting high heat conditions and giving the user quicker heat, longer life, and great economy. We are its exclusive distributors for the United States and parts of Mexico and Canada. Complete stocks of standard sizes are carried in our Denver warehouse. Special shapes to order.

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Index to Advertisers
Western Mining Industry Meets

operations that would be drastic and fatal to the future of all industry and a bar to the extension of foreign trade which is so vital to the general situation. Those engaged in metal mining have long realized the alarming results that follow the peaks and depressions in the industry and have sought a solution. The country is confronted with a surplus not possible within our own borders, but we must look to the foreign trade to take care of these surpluses. We have sought a solution. The country is confronted with a problem. Many firms and industries long ago recognized the need for expanding markets and have not only developed extensive foreign trade but have established manufacturing plants in foreign countries with a view of adapting our machine methods to the cheaper and yet potentially efficient labor available.

Mr. E. Von Zwicker, a German mining engineer who is making a tour of all the important mining districts of the west, was a visitor at the school on Tuesday, September 9. He was particularly interested in the geophysical work, having been engaged in that line for the Ohio Oil Company in Louisiana and Arkansas. He was accompanied by Mr. H. Mowitz.

One of my fraternity brothers failed in all the courses he was taking. He telegraphed to a sympathetic mother, "Papa prepared. Prepare yourself"—Cathy White.

Albert G. Pife, Pres. & Treas.

Ira C. Bowser, Sr.

STRUCTURAL STEEL and ORNAMENTAL IRON
THE MIDWEST STEEL and IRON WORKS COMPANY (Incorporated)
Office No. 25 Larimer Street, Denver
Branch Plant P. O. Box 1184, Pueblo, Colo.
How dynamite was used to blast tunnels for anchoring gigantic cables.

In 1932 . . . after five years of stupendous labor . . . the Hudson River Bridge, connecting the states of New York and New Jersey, will be completed. It is a single-span bridge, 3200 feet long. At either end, a gigantic tower, 600 feet high, rises to the sky.

The construction of this mighty bridge is proof enough that, to the modern engineer, nothing is impossible! In this undertaking, as in countless others, dynamite played a huge part. Du Pont dynamite was used for blasting approaches to the Hudson River Bridge . . . and for blasting the undersides of the cables. About 3,000,000 pounds of dynamite were exploded!

The engineer of today . . . and tomorrow . . . needs to know all there is to know about dynamite . . . the tool that helps to build skyscrapers, dams, subways, tunnels, roads and railroads.

Love Taps

"Man, oh, man, who's bin doin'? Bettra stop dat football."

"Football? Wha' yo' get tha' way? Ah's jes been in a lowah's quarrel."

"You mean to say Mirandy done all dat?"

"No, brother; it was Mirandy's other feller."

—Notre Dame Juggler.

Petroleum Exposition

(Continued from page 12)

such material to the student is inestimable. It is his nearest, quickest approach to experience.

Another tangible proof of the success of my visit will be the donations of representative equipment by progressive companies to the petroleum engineering department. These gifts, many of them valuable, range from fittings and valves for use in class instruction as exhibits in our museum, to orifice meters, filter presses, apparatus for actual use in our laboratories. The presentation of such gifts to the department is the highest type of advertising and progressive companies are quick to seize this, to take advantage of it. As these gifts arrive in Golden they will be announced in this organ with due credit to each donor.

I heard many comments from exhibitors and technical men alike concerning the eminence of the School of Mines in engineering, its progressiveness in sending a representative to cover the Exposition. Personally, I feel my visit was worth while from all angles, and I shall always recall with genuine pleasure the Seventh Annual International Petroleum Exposition.

Denver "Sub-A" (Fahrenwald) Flotation Machine

The Denver "Sub-A" has the following exclusive features:
1. Circuit is entirely by gravity from cell to cell.
2. Air is introduced by suction or pressure and controlled.
3. Materials so coarse that too much can be efficiently handled.
4. Check-ups and draining after shut-downs are eliminated.
5. Any cell can be used as an agitator, cleaner or rougher.

Write for Bulletin 200C.

Westinghouse Memorial

The nation's leaders of industry, business, and scientific research assembled in the city for the dedication of a memorial to him in Schenley Park, Pittsburgh.

The memorial may be considered one of the most significant contributions to American art and a remarkably unique work in both architectural and artistic spheres. It represents the combined efforts of Henry Hard路线, architect; Daniel Chester French, sculptor; Paul Pfeifer, sculptor; Mazzanelli Piccirilli; and other talented artists who were associated with them; and is an outstanding achievement in interpreting American culture.

The setting of the memorial was chosen to obtain the greatest beauty and simplicity. It is a wooded glen through which flows a pretty brook into a lily pond. There is an abundance of trees and shrubbery, and the finest growth of rhododendrons in Pennsylvania adds beauty to the locale.

Two years of culture have contributed to the natural beauty of this spot in Schenley Park, one of the largest units in the City of Pittsburgh's public parks system.

Read the Du Pont Company book, "Dynamite-clears the way for modern engineering wonders!" This booklet contains a wealth of information about explosives, and improving explosives. It is the tool that helps to build skyscrapers, dams, subways, tunnels, roads and railroads.

Write for Bulletins 2901-A, 2901-B, 2901-C.
Based upon the results obtained from Marcy Ball Mill installations at Walker, Andes, and Inspiration, the International Smelting Company has chosen the Marcy Mill for its new flotation unit at Tooele, Utah.

This mill is grinding half inch lead-silver ore and reducing it in "one easy step" to feed suitable for selective flotation.

This particular mill, a Marcy No. 86, has detachable heads, manholes in the shell, new type spiral shell liners—all essential to high capacity, low power consumption, and reduced grinding costs.

Let our engineers analyze your milling problems and show you representative installations. Ask for Bulletin No. 69, which is chock-full of interesting information on Marcy Ball Mills.
FOR SCRAPER BLASTING, TOO

With slushing becoming an increasingly greater factor in mining, the importance of correct blasting is again emphasized— for with slushing not only is good breakage necessary, but the ore must be thrown away from the face.

The solution of this blasting problem — and all others — depends to a large extent on the selection of the correct type of explosives. Most underground blasting for scraper loading, and every other purpose, can be done with Hercules Gelatin Extra L. F.; but the water-resisting and more economical Gelamites, with comparable fumes and execution, are also finding favor underground.

Our experience in developing explosives for all kinds of mining work enables us to offer a series of explosives which will meet any blasting need, effectively and economically.

To help make selection easier, this comprehensive list is printed at the right. Use the coupon-list for additional information.

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- **HERCULES GELATIN L. F.** — Dense and strong, plastic and water-resisting; needed only under severe conditions; 1st in fumes — strengths: 50% to 90% — 184 cartridges.*
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- **HERCULES BLASTING SUPPLIES** — A complete series of detonators and blasting accessories.

*NOTE: Cartridge counts refer to the approximate number of 1 1/2" by 8" cartridges in 100 lbs. of the explosive.

**HERCULES POWDER COMPANY**

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Gentlemen: Please send me pamphlets describing the explosives checked.

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