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The income of our association is from two sources, membership dues and revenue derived from the sale of advertising in Mines Magazine. If our members would remit their dues early in the year instead of procrastinating until a dozen reminders have been sent them, the work of our secretaries and office force would be greatly expedited. Our publications committee has entered wholeheartedly into the task of increasing both the quantity and quality of advertising displayed in our publication.

Internal strength of our group such as ours is measured by the proportion of alumni association members to the number of graduates, and by their interest, activity, and the solidarity of the support of the functions of the organization. This internal strength is the most important element in the entire structure of our association, and without it we cannot plan any constructive program or engage in any external activities. If the yard sticks of internal strength mentioned above are true, our organization falls far short of the boast often made. We have one of the strongest alumni organizations in the country.

President Roosevelt continually refers to the "ill-fed, ill-housed, ill-clad" one-third of our nation. This figure must be accepted American factor for the underprivileged, because, by a strange coincidence, one-third of Mines Graduates, who are not members of the association that our organization merits its support. That puts the burden of proof upon us and we are prepared to accept that responsibility.

Your officers, this year, expect to concentrate on building internal strength in the organization and plac­ing the graduate organization on a sound financial basis. These problems, while perplexing, can certainly be handled in a constructive manner. We have one of the foremost alumni organizations in the country.

The deficit in the treasury was the direct result of the heroic efforts of the Badger, as the year unfolds, adjust­ments will be necessary to exercise rigid economy by a strange coincidence, one-third of the graduates of the Colorado School of Mines have shown no inter­est in affiliating with our alumni group. Certainly, this figure should be much lower. "Mines Spirit" seems to be, or was, a campus reality and a myth after graduation.

Internal strength is fostered by the personal contact of our members with each other. This is difficult to obtain because of the scattered geographical distribution of our membership. The final result will be indicated in the yearly report.

One of these two facts that we have determined to concentrate all our re­sources and energy to solve these problems as the major objective of the Alumni Association for 1940. It is the in­flexible purpose of this administration to endeavor to remedy these situations.

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natives who wore the most colorful costumes. As you know, the men who wore the most colorful costumes on the island were the Kandyan, Singhalese, and Tamil dress, one sees the slow-moving, two-wheeled, covered carts known as bullock-bandies. They are known as bullock-bandies. They are slow traffic is mixed with the large stores mixed among bullocks. The slow traffic is mixed impressive. Along with the con-

street scenes of Colombo are very interesting. Along with the con-

vivialization of golden colored native dress, one sees the slow-moving, two-wheeled, covered carts known as bullock-bandies. They are generally driven by two cream colored bullocks. The slow traffic is mixed with bicycles and automobiles (generally American made). A trip around the city shows the European influence with the large stores mixed among small shops, beautiful hotels, and a lovely residential section. The “pet-

us around town as we wanted to see the native market at night. We had a difficult time convincing the ricksha boys that we wanted to go there but finally got started merrily on our way. The first we knew we were in a great mass of natives—probably somewhere between 10,000 to 20,000. We told the “boys” to get us out of there but it was not so easy because all avenues of retreat had been closed. After some little time trying to make ourselves understood, ten ricksha boys came to our assistance and cleared a way to a very narrow and dark alley. The alley was just a little wider than our ricksha and only once in awhile could we see a very dimly lighted window; reminding one of the stories of an old opium street in China. About after fifteen minutes of this we came upon the well-lighted main street and proceeded directly to the ferry and the old SS President Garfield. Next morning the papers told of some sixty people being killed in a labor riot the previous night. We were glad to have had the experience but assure our names were not listed among those dead.

About 3:00 A.M. the morning of July 28 we woke because of strange sounds. I looked out the port hole and saw beautiful trees and flowers, which caused me to rub my eyes wondering where we were. I soon learned we were going thru the locks at Bombay. After our breakfast we decided to be real smart and get over to the American Consulate before the crowd arrived there. We wanted an Egyptian visa as well as passes to the Burning Ghats and the Tower of Silence. We were informed that office hours in Bombay, due to the extreme heat, were from 10:00 A.M. to 11:00 A.M. and from 2:00 P.M. to 4:00 P.M. We left our passport with a note explaining what we wanted and returned the next afterno on to find out requests had been very satisfactorily taken care of.

From the Hanging Gardens 180 feet above the sea in Bombay you will overlook Mahatma Ghandi Beach where this well known figure holds meetings. You will see fishermen huts along the beach with the ever present sacred cows. In the background are the beautiful colleges, the new apartment buildings that stretch for miles over mostly reclaimed ground, and it all gives one the impression of a very modern and powerful city. We were amused at a sign displayed in front of a recently completed apartment which read, “For Vegetarians Only.” All of Bombay is not modern, and with its many castes and creeds, strange and interesting sights are everywhere. No trip to Bombay would be complete without a trip to the Tower of Silence where the Parsees religious practice of feed­

ing their dead to birds of the air is carried out. (This religion teach that fire, earth, and water are sacred.) Vultures weighing about 20 lbs. each are to be seen everywhere around this tower. Also a trip to the Burning Gaths will show you where the Hindus cremate their dead in huge masses.

During our travels around Bombay our guide took us to see the holy men. As to what sect they belong I do not know, but they do lie on a mat with only a small loin cloth on and cover their bodies with ashes. They will pray for those who come to them for aid. One of these holy men was supposed to be 108 years old. A street scene in the native quarters is an ever changing one of vivid colors. Since so many of women are veiled, while others wear large nose rings. Ox carts are seen everywhere as well as the victoria—generally drawn by worn out horses. The oriental smell of dirt is ever present in this section of the city.

An hour in the Prince of Wales Museum will be worth the time spent there. You will see modern and antique silver, chinas, glassware. There are many beautiful paintings. We noted a picture of Abraham Lincoln.

There are many shops in Bombay, most of the smaller ones are dirty with hundreds of dirty people mingling around. The large meat market seemed fairly clean, the silk market was very extensive but we did not stop. When we got into the silver, gold, cotton, and foreign exchange I thought we were in a riot with hundreds of men hoarding every­

where, but our guide explained it was just the wealthy ^brokers at work. We drove thru the streets one night and found poor souls sleeping on the sidewalks, on the ledges of windows, anywhere there was a place to lie down.

Books may be written about interest­

ing things in Bombay but we must go on with the story, so we leave Bom­

by for March, 1940

The ten-day trip from Bombay to Suez proved to be one of many cock­
tail parties and general good times aboard ship. Part of the time the Indian Ocean was very rough, but after we got into the Red Sea the water was smoother; however, it was very hot. An Australian friend of mine once told me the reason for giv­

ing the Red Sea that name was because it was so bloody hot, and I know that is about right. One afternoon about 4 o’clock I was standing on the deck and noticed a very dark cloud ahead. In only a few minutes the air was full of sand and you could not see anything without the lights, and it lasted about three hours. It gave one a peculiar feeling to be in a sand storm at sea.

We arrived in Suez about 9:30 P.M. and before we cleared customs, immigration and quarantine it was well after 11:40 P.M. We tried to hire a car to take us across the desert to Cairo and into the west oriental cuisine and a Samphair—

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I have ever seen. They would give you a price and when you got in the car, they would raise the price or change drivers or something. Two hours were spent before we finally started on our way.

Cairo is hot and we arrived there at the hottest time of the year but we enjoyed our stay very much in spite of the heat. The Pyramids are the greatest attraction, and the most famous of these is the Pyramid of Cheops, the largest in Egypt and the greatest monument that any man has built for a woman, in this case his wife. This was built in 3700 B.C. and is 739 feet at the base and 420 feet high. We climbed up inside 225 feet to the King's tomb. From the Pyramids we went to the Sphinx. An item of note is that in the last year there have been many interesting finds with one glance are seen buildings with stone and at the hottest time of the year but we enjoyed our stay very much in spite of the heat. The Pyramids are the greatest attraction, and the most famous of these is the Pyramid of Cheops, the largest in Egypt and the greatest monument that any man has built for a woman, in this case his wife. This was built in 3700 B.C. and is 739 feet at the base and 420 feet high. We climbed up inside 225 feet to the King's tomb. From the Pyramids we went to the Sphinx. An item of note is that in the last year there have been many interesting finds with one glance are seen buildings with stone and...
time our train arrived so we boarded it for Switzerland very much worried and unable to get any information. As we crossed the border our baggage was scarcely looked at but our passports were examined and was allowed to pass. We noted that many passengers were taken from the trains. As a matter of fact they all the train crew including all the hallies in the dining car, we did not know who they were or why they were taken off the train. We went to Zurich, Switzerland, without stopping at Locerne as we originally had planned. Upon registering at a hotel in Zurich I tried to get some information from the clerk who spoke English. While we were talking an English woman came up and told me all about it. Her words were, "England, France, and the United States have declared war on Germany this afternoon." I told her I was sure the United States had not declared war on any nation. I tried to get more information that night but it was without success.

We decided to see the American Consulate early the next morning which I did, and he informed me that we had been warned to return at a hurry and that things would blow over in a few days. I was told to take in the sights and enjoy my stay. I was told the war did break out I was in the safest place in the world as long as I did not leave. While I was in no position to spend four or five years in Switzerland should a war last that long. The American ship was due in Marseilles, France, within a few days so we tried to buy passes and train tickets but found a notice in the paper stating the British had closed the Suez Canal which blocked an exit by way of southern France. The only solution left was to go to Paris to secure information and see if the time get closer to a port, which is where we wanted to go. We could not cross the border since Zurich felt there was to be no war but I was watching qualifications on the pond stepping and it was dropping every day, and I was sure that meant war. We knew it would be difficult to ever get to a port after war was declared so we decided to go to Paris immediately.

In Paris we were told we could find good friends, and we were not disappointed. We had left Mailla in the back of the boat. We traveled together as far as Venice when we separated. They were going to Budapest and Vienna, and we were going to Milan and Switzerland and intended to sail from England some two or three weeks earlier than Pereyras. They experienced much trouble such as being able to cash American Express check, no trains, so they headed for Zurich hoping to find us there. I assure you it was a grand and unusual sight.

Our trip from Zurich to Paris proved to be one of great anxiety. As we boarded the train we found two compartments next to each other which was something because as a rule the five of us, including our three-year-old son, were lucky to get one compart­ ment with something one else.

This train runs along the Swiss-German border for many miles and then turns north into France running along the French-German border, with the Rhine River being the boundary.

After starting our way Doc and I decided to find out who was on the train. Much to our surprise there were only two men besides our party. This made us wonder and finally decided every one was afraid to ride alone, which did not help our state of mind. After it became dark that evening we stopped at a station, two men came aboard the train and examined our baggage and passports; we were followed by two men carrying a warrantor who removed the funds from the compartment. They left one small bag covered with a heavy coat of blue plastic. A notice was posted telling a large fine for lighting matches or using a flashlight. At the next station this bag was removed the small blue plastic. This left the train in complete dark­ ness. We did not know if it was declared or not and expected any moment to hear bullets coming through the windows.

We arrived safely in Paris the next morning and our wives decided after leaving Paris to a few hotel clerks and cab drivers, there was to be no war. They unpacked the furnishings in a hotel and intended to spend a week or so in Paris. Doc and I went to the Embassy. They advised us to go to La Harve and tried to discourage us. We decided to move in closer to La Harve. So we had to move on to La Harve. On the way there we got there we learned that the government had taken all the hotels in Paris so we had to move on to La Harve. We went to Deauville or Trouville, but we got there on the train and our government had taken all the hotels in the town we had to move on to La Harve. Deauville or Trouville, but we got there on the train and our government had taken all the hotels in the town.

Our stay in Caen proved to be days of worry. We would spend all our time trying to get some news and after some time worrying about what we should do. Whichever the changing from day to day and we could not get this information in Caen, so decided to get aboard a train for Haver. This move was made in a little French town and we found the French police department. We decided to go to Deauville or Trouville, but when we got there the government had taken all the hotels in the town we had to move on to La Harve. On the train we went to Deauville or Trouville, but when we got there the government had taken all the hotels in the town we had to move on to La Harve. We went to Deauville or Trouville, but when we got there the government had taken all the hotels in the town we had to move on to La Harve.

The raw materials of the Roman Empire were pozzuolana or volcanic ash from the vicinity of Pozzuoli, Italy, and quicklime. The record of the discovery of the cementing proper­ ties of these materials is far inferior to the cement of the Romans. Without the discovery of the cementing proper­ ties of these materials, the Romans could not have laid foundations for all their buildings. The Romans were products of these early times, many of which are in existence today.

The Roman Empire of ancient times was built on cement. Without cement, the Empire would have crumbled long before it did, and we would have no lasting evidence of the civilization that preceded our own. From then until the time we left France everything was war. There were complete blackouts every night; all raids signals any time from early morn­ ing until night; soldiers and equip­ ment would be picked up off the streets; women taking over the men's jobs; bread lines; rationing; blackouts; sand bags being filled and placed around buildings; windows being taped to keep the glass from flying. There was nothing much one could do on the Frenchmen's faces, just a look of helplessness. The French put their army up to 7 million in three days in such an efficient manner that it was a spectacle to behold.

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However, this discovery led to many investigations in England and on the Continent and after the lapse of some six­ ty years patents were issued on what we now term "Natural Ce­ ment."

Natural cements are the product of burning the naturally occurring argillaceous and calcareous material—burning carbon dioxide but seldom to the point of fusion. Variable in quality, still, the natural cement served a great need in the early days of our advanc­ ing civilization.

In 1824 a bricklayer of Leeds, England applied for a patent on what we now know as Portland Cement. He was followed by many investigators who finally produced the cement in the late 1870's. The Portland Cement produced and is defined by the Portland Cement Association.

This is the second of a series of articles on non-metallic minerals which will appear in THE MINES MAGAZINE during 1936. The non-metallic minerals are of consider­ ably increasing importance to our national industrial progress. Readers will be interested to become better acquainted with the use and importance of this branch of our mineral wealth.

Portland Cement now accounts for over ninety-nine per cent of all the cement produced and is labeled by our American Society for Testing Ma­ terials, as follows: "Portland ce­ ment is the product obtained by finely pulverizing clinker produced by calcining in suspension fini­ nite and properly proportioned mixu­ res of argillaceous and calcareous materials, with no additions subse­ quent to calcining except water and calcined or uncalcined gypsum."

Production

The major cement materials are limestone and shale which furnish the calcium, alumina, silica, and iron present in the finished Portland Ce­ ment. Raw or secondary materials are mixed in the cement proper­ tions, called "clinker" and pulverized to obtain the familiar cement of wide commercial use.

Limestone is frequently aggre­ gate, it is sometimes happens that the correct proportions of limestone and shale are present in one single bed. Happy is the manufacturer who has such an ideal set of conditions. Gen­ erally, the limestone and shale are mixed separately and mixed in proportions determined on the chemical analysis of the materials.

Power shovels, draglines, and bull­ dozers are used to strip the deposit.
and are also used in the mining operations, where open cuts are used.

Occasionally, one or more of the raw materials are produced from underground mines, but generally at a higher cost than by open cut. Quarring or underground operations depend on the depth of the beds, daily tonnage to be mined, drainage, and a multitude of other factors. Each particular deposit has its own characteristics which present problems which probably are not exactly duplicated in another locality.

The individual raw materials are crushed and screened then sent to storage bins from which they are drawn in the amounts necessary for correctly proportioning the mix. This crushing and storage is generally a part of the cement plant proper. This may be an individual and separate operation if the cement plant purchases a portion of its raw materials.

The plant proper should be located as near as the quarry as is feasible to cut down transportation costs on the raw materials. Fuel, a major item of expense should be easily available. Natural gas can be piped to any location but transportation costs on materials may be a deciding factor in the location of the plant if natural gas is not available at reasonable cost.

The manufacture of cement in the United States is a large industrial business. The value of the cement produced annually leads all other non-metallic products and about 90% is produced from limestone and sand or quartzite. In 1938, the United States produced 105,357,000 barrels of cement, or an average of a value of about $154,000,000.

**Beneficiation**

Cement is such a low priced product that any increase in cost will have a correspondingly low cost in and in addition must offer advantages which will affect the cost of the process as a whole.

Grinding the raw materials before blending represents one of the major cost items in any cement plant and this cost is also one of the chief items of any beneficiation process. Since the raw materials are ground and blended in the same process, the cost of grinding the raw materials directly affects the cost of the plant.

In general, limestone is the material constituting the greatest tonnage so the cost of the analysis of the limestone to be controlled by concentration is much easier to compute than the final mix than if one of the minor constituents of the mix was concentrated. Thus, we find that flotation of limestone is coming into fairly wide use in localities where suitable raw limestone is becoming exhausted.

Limestone is being treated by flotation at the plant of the Valley Forge Cement Company, West Conshohocken, Pennsylvania at the rate of 700 tons per day.

The limestone containing mix, quartz, and iron oxides as impurities is ground wet to 85—90%—200 mesh and is treated with a hydroxypatite which makes a separation between the very fine and the coarser material. In addition, the hydroxypatite controls the tonnage of feed to the flotation cells.

Collective Acid is added to the coal feed and is thoroughly conditioned in a turbo-mixer ahead of the cells. Creasyl Acid is added to the cells to produce frothing. Concentrates high in calcium and low in silica, mica, and iron, join the fines from the hydroseparater and the combined product goes to a final thickener for desludging.

The flow sheet permits great flexibility in the control of the calcium content of the final mixture of concentrates and fines. Recovery of the Calcium Carbonate is around 98% based on concentrates plus hydroseparater fines.

Several advantages to be derived from the flotation of limestone are:

- Reduction in the cost of mining because selective mining is unnecessary. Dry or lean spots in the limestone beds can be avoided and sent to the milling plant where the impurities are rejected.
- Lower grade limestone in proximity to marketing centers now becomes available for cement manufacture when treated by flotation, whereas this limestone was heretofore unsuitable.
- Also increases the available reserves of limestone for the cement manufacture at locations near the marketing centers.

Costs of grinding the raw materials are reduced because the quartz is removed at relatively low costs. Since the quartz is much harder to grind than limestone, hence more expensive, the retention of quartz by grinding results in lower grinding costs.

Savings in fuel results from the elimination of coarse quartz, and mica because lower temperatures may be used to produce the desired chemical reaction when these impurities are absent.

Costs of grinding the cinder are reduced because it commonly happens that the coarse quartz particles pass through the kilns unchanged. The elimination of these coarse quartz particles results in lower grinding costs on the burned cinder.

By producing a high-grade limestone concentrate, a cement plant will be able to buy high-grade limestone for their mix. These purchases of high-grade limestone have a beneficial effect on the cost at many plants. The cement is improved in quality because it is obtained which permits an optimum proportion of elements for combination in the finished product. This results in better properties in the finished product. Various types of cement may be produced from a single bed of limestone where a high-grade limestone is utilized with or permits blending with other materials to give any desired cement depending on the market.

By-products from the flotation of the coal are used. These products are sold if the market warrants. As far as is known this has not been done, yet, but the possibility remains.

A few of the disadvantages inherent to any concentration process give the other side of the picture and may have such a weight to negate the advantages to be derived from the process.

The cost of the concentrating plant represents a considerable investment which may mean additional financing in the form of a bank loan. Amortization of this plant cost means that every barrel of cement produced must bear its part of the cost of the installation.

Over all costs of the concentrating plant must be absorbed into the selling of the finished product.

Tailing losses of limestone must be charged against the concentration process and this is reflected in increased cost of grinding the raw materials produced from unit of limestone produced as a finished product by the concentrating plant.

Whether limestone processing by flotation or other means of beneficiation would be economically advantageous is a problem which will vary with every plant. Careful study of the individual problem and the balancing of advantages against disadvantages is necessary to arrive at any conclusion.

Quartz is present in every limestone where limestone is processed by flotation are reported in Argentina, South Africa, France and Palestine.

The tendency in the cement industry is beginning to turn away from the concentration of limestone and as far as can be predicted the trend is becoming stronger and more widespread every year.

(Continued on page 140)
Baxter: That explanation may not have much to do with oil, but it does make the picture clearer.
Coach: Why not call it a smoothness number? That is somewhere near the definition of octane number.
Baxter: Why doesn’t it work like that?
Coach: The actual value of a material increased much by cracking?
Baxter: It’s often more than doubled. Coach: Then it is gasoline made by cracking which you mentioned generally superior to the actual gasoline.
Baxter: Right you are. That cracked material is about ten octane numbers better than the so-called natural gasoline.
Coach: You make the premium gasoline sound almost as good as it does in my car.
Baxter: Now, my car is about five years old. Is it worth while for me to buy premium gasoline?
Coach: Probably not, unless it was one of the few of that vintage that was designed for high temperature.
Baxter: That’s about right. There’s no direct relation between the octane number and ease of starting. Coach: But gasoline is quick-starting depends on the volatility at which it boils or vaporizes.
Baxter: It boils at a low temperature, doesn’t it? That means it will burn quicker.
Coach: But the high-octane gasoline burns more completely, more of it is drawn in with the air as the engine intake, and there is more fuel to burn.
Baxter: That’s why we use the choke then and not just bring that high-octane fuel up as quickly as you can. I think we’ll get a big smile off the0S.
Coach: Well—I hope so. Here y’are.
Baxter: What gas were you using on that hill between Cheyenne and Laramie which made a specialty of missing cylinders?
Adams: Kerosene?
Baxter: —with gasoline to make it possible for cars to get over that kind of hill in winter.
Coach: What did they do?
Baxter: To decrease the vapor locking tendency by reason of lower volatility of the kerosene.
Adams: Is that still done?
Mechanic: No, in modern automobiles fuel lines and pumps have been improved and relocated so that they don’t get so hot. Then, too, gasoline have much more uniform related than they used to have.
Baxter: That’s about it. Tests were run to the East with low-octane gasoline, down in Kansas trying to make it run.
Driver: That’s practically what I did. Sometimes folks will have trouble with this kind of gas.
Mechanic: Where did you get the high test?
Driver: I just had that fuel line cleared out before I started on my trip.
Baxter: How about the starting properties of this high-octane gasoline?
Coach: Can’t help that. Not enough gasoline to keep the carburetor to keep the low tell.
Baxter: That sure beats me. Some gas is room enough. I can see it—smell it, too.
Mechanic: Tell you what you do. But, see that your oil will not go any further.
Driver: That’s practically what I did.
Mechanic: They get it together again about the time the gas line’s cooled and away they go. They never do find out what was wrong in the first place.
Driver: Well, I’ll sure know next time. Thanks a lot, Bob. What do we owe you?
Mechanic: Oh, that’s O.K. We’ll get you money when you come back down the road.
Coach: You’re not getting any gas into the carburetor any more.
Driver: Hey, wait a minute, I can see how they can crack the rocks here, but the gasoline will be cracked, not the engine.
Coach: I agree, but there are times when one must do things in order to keep cars going. There actually are some concerns which are better.
Baxter: I don’t like to put anything into my car which may run up re-
 Coach: Neither do I. But even may stick the valves and cause a lot of trouble. That’s the time when one may be very expensive if used regularly.
Baxter: But, there are times when one must do things in order to keep cars going. There actually are some concerns which are better.
Mechanic: I agree, but there are times when one must do things in order to keep cars going. There actually are some concerns which are better.
Mechanization and Labor in the Mineral Industries

By CHARLES R. CUTLER, '39

The history of mineral exploitation is a record of a struggle against increasing natural difficulties. It is commonplace that the richer and more accessible of the known deposits are wasted first. As these are exhausted, the mining industry moves on to new locations in the same district. For a while, operators at the single mine happens also in time to an entire district. For a while, operators at the single mine happen also in time to an entire district.

For the anthracite coal district of Pennsylvania, the opening up of the anthracite coal fields known to exist but previously inaccessible. At the present time many of the western mining districts, first worked for placer gold, were known to contain the baser metals, but not to yield the valuable ore from the waste, and the improvement of technology.

First among the factors offsetting the tendency toward diminishing returns in the discovery of new deposits. In the United States the factor of discovery was exceedingly influential during the nineteenth century, and to it the increasing supply of minerals was largely due. As in other countries, the period of maximum activity in exploration followed on the heels of discovery. The wealth of discovery reached its crest in the thirty years following the California gold rush and by the end of the century the great finds possible through surface exploration and prospecting had largely been made.

Among the metals, no prizes comparable with Burtie or the Comstock Lode have been found in the central United States in the last thirty-five years. In almost every district, applied geology has developed large-scale operations to minimize the cost of mining. The capital costs and decreasing profits.

But at length the easier locations have fallen, the depth has greatly increased and the overburden of 4-2 feet of dirt and rock have been removed, waste as well as valuable material and the inferior. The contributions from this older selective mining to the mass methods where all the material in the mineralized area is removed, waste as well as ore, and the sorting and cleaning are done on a large scale, constitute a major change in the art of mining.

Running through all branches of mining is the tendency to replace hand labor by machine labor. It can be most clearly illustrated by reference to coal mining. Steam and compressed air have given way to electricity. Horse-drawn carriages have been superseded by electric trucks. The cutting machine has almost entirely by the use of electric drills. The railroad has been replaced by the automobile.
The “Doodlebug” vs. Applied Science

PART I

By DART WANTLAND, ’36
Assistant Professor of Geophysics, Colorado School of Mines.

A Lot of Banjo Work

A geophysicist is sometimes embarrassed by the fact that in the public mind geophysical instruments are often considered to be “Doodlebugs”. To some observers geophysical apparatus is apparently quite mysterious. This was once brought home to us by the remark of a cowboy who visited the camp of a Treasury balance survey party which we were on some years ago. One of our small, Zeb raw, balance was set up in a corner of the tent for adjustment when the cowboy dropped in. He had probably never seen one of these instruments at close range and was slightly awed by the seemingly intricate wiring through the batteries to the lights required in photographic recording. To him the automatic clock work for switching on these lights and for turning the instrument into different azimuths must have been somewhat amazing. After some silent contemplation his comment was “These are a lot of banjo work on one of them there instruments”.

Pliers Affect the Reading

We can also attest to the difficulty of trying to explain to a farmer what we were doing on his land and taking a reading with a magnetometer. If the station were not completed before we arrived on the scene, the situation was further complicated by the necessity of taking him to a point back a few paces, as the pliers in his pocket were affecting the instrument so that we could not take the reading. An unignorable explanation of the magnetometer in words of one syllable is not satisfying to anyone, especially to a farmer, under such circumstances. Tact also was called for as generally agricultural gentlemen are “big and hazy” and moreover, the magnetometer operator was usually legally a trespasser.

Arguing With a Lawyer

The general public belief that geophysical instruments and “Doodlebugs” are synonymous and in the entire case of the “Doodlebug” vs. applied geophysics is covered by letters which we exchanged with a lawyer in Nevada in 1933. The first letter from this gentleman, whose real name will not be mentioned, was as follows:

Dear Sir:

August 26, 1933

“The writer is carrying on an investigation and study into the general subject of mineral detectors such as are commonly called ‘divining rods’, mineral roads, seismograph, torsion balance, etc.”

Our answer to the above was:

September 6, 1933

Dear Sir:

“We are sending two quarters of the School of Mines. One of them covers the applications of geophysical exploration of lower grade ore bodies and the other has been prepared as well, from the Colorado School of Mines to see this correspondence in action.”

The Mines Magazine
prospecting, and the second gives a list of references to various phases of the subject. Dr. Blank, therefore, ask you to cover your inquiry.

There is no coincident line, as you do not know between dividing rocks and mineral, and geological instruments. Geophysical prospection is a general subject not treated of in this article, therefore, I shall not discuss it.

"We undertook geophysical surveys, such as determining the density of the rocks and minerals. We know that there is nothing miraculous about our geological instruments. We know that they are scientific inventions or discoveries, or chemical devices, which rely upon certain physical properties of other mineral bodies, and that we shall not be able to detect the particular deposit or geological condition are different in each instance."

"To this we replied:

Dear Mr. Blank:

I took up the question raised in your letter with Dr. Helland, head of the department. He advises that if Mr. X. will send us his instrument or if he, or one in his department, will take it to a known and understood scientific principle.

"After all this rambling, I hardly know what to write to you anyway to express again my appreciation for your cordial letter. As you have indicated, I will do everything within the power of my office to assist you in any way possible.

John W. Blank"

"Upon reading your last letter, I could not help but feel a sense of pleasure and satisfaction that this proposition somewhat akin to the setting of the "atmospheric" or "doodle" bug. For in this respect, as in so many others, it is not the mere description of the bug, but the spirit in which the writer presents his ideas, that is important."

"As a result, I have been able to determine the density of the rocks and minerals, but I was not able to discover any thing more."

"I have the honor to be, very truly yours,

John W. Blank"

"Dear Mr. Wantland:

"It is not so much a point that we are interested in the "doodle bug", as it is the method, or rather, the instrument by which it is accomplished."

"As for "doodle bugs", I have been able to determine the density of the rocks and minerals, but I was not able to discover any thing more."

"I am glad to have you in mind and I shall be glad to forward your letter to Mr. X."

John W. Blank"
November 24, 1933

Dear Mr. Wantland:

Many thanks for your letter of today of the clipping taken from Engineering & Mining Journal concerning the doodlebug story. It surely provoked a laugh from myself and others in the office at the time I opened the letter.

I have never invested any money in my client's enterprise, nor even made a statement to anybody else concerning the usefulness of his instrument. Before doing such things, I corresponded with you and the U.S. Bureau of Mines at Washington and studied the material sent to me. After these or four months have passed, I have come to the same attitude of mind as yourself.

"However, in all this, I have learned one thing and realize it more fully now; that is, when a matter is placed before me concerning which we are professional men working and studying, I will not hesitate to take it up with them before going very far. Naturally so, because I am experiencing the same thing from those whom I become your clients in legal matters.

"You have certainly been a wonderful help to me in setting me right concerning doodlebugs, etc., and I hope the day will come when I can return the favor. To date, I preserve only one correct classification is thin—a small town, struggling lawyer, so I am not able to reward you financially. So thanking you for past favors and wishing you the best of success in your chosen field, I am,

Very truly yours,

John W. Blank"

Conclusion

We do not know whether a moral can be pointed out a tale adored from what has been presented above. We are, however, coming to the conclusion that the raised eyebrow and implication of heresy applied to all doodlebugs and to all doodlebugs is not a sufficient answer. The owners of such devices are sometimes very sincere men; one of them from Kansas and the clergyman. It is probable that Mr. X. has not submitted his instrument to a test without prejudice. Yours truly very truly,

P. S. It might be added that "willow" was the name given to the device by the enclosed picture taken from the ancient book, 'De Re Metallica,' published in 1556.

It is of note that even to this day Mr. X. has not submitted his instrument, with its tender 24-inch twig, to the enclosed picture taken from the Los Angeles basin, these conditions are obvious at once even to a man who is blinded. In that region oil fields all invariably are found on topographically high peaks which would lead to the obvious, and in that respect, a most accurately accurate conclusion, that wherever there was a high place there was a likelihood of oil. To date, I preserve only one correct classification is thin—a small town, struggling lawyer, so I am not able to reward you financially. So thanking you for past favors and wishing you the best of success in your chosen field, I am,

Very truly yours,

John W. Blank"
can be changed and the mill kept from overheating, even though the hardness of the feed changes, due to its ability to shape or adjust to other causes.

Grinding in closed circuits, either wet or dry, with screens or air classifiers, provides for better control of the mill. In these designs, the classifier is controlled independently of the main mill to maintain the proper ratio of solids to water within the classifier pockets. M. White, Manager and Chief Engineer of the Company's Grinding Section, has pointed out the advantages that the "Electric Ear" provides in closed circuits.

**New Line of Valves**

The Kennedy Valve Manufacturing Company, Elkhart, N. Y., announce a new line of bronze globe and angle valves with controlled-seating seats and.
CATALOG and TRADE PUBLICATIONS

FOR YOUR CONVENIENCE
Read your product listings to Mines Magazine, 324 Cooper Building, Denver, for the benefit of others. Readers may request Mines Magazine when requesting publications from the manufacturer. Readers may order publications from this issue giving the index number.

(43) OIL & GAS OIL HISTORY Vol. X, Nos. 1, 2 and 3, 1937-1939, 200 pages. Contains the most complete collection of oil history in the United States, compiled by the late H. E. Bohn. Published by American Oil Publishing Co., Houston, Tex.

(44) A GAYLAD VALVES, the latest models of this manufacturer's valves and other products, are illustrated and described in this bulletin. Available from Gaylard Valve Co., Chicago, Ill.

(45) APPLICATIONS OF MILLWRIGHT MACHINERY, a bulletin issued by the Machinery Exchange, Chicago, Ill., contains the most extensive listing of machine tools and equipment available in the United States. A comprehensive catalog of machinery available in the United States.

(46) BOLTED FRAME CONSTRUCTION. Bulletin No. 100, 20 pages. Contains information on the latest developments in bolted frame construction, with practical advice on its application. Available from the American Institute of Steel Construction, New York, N.Y.

(47) PORTABLE POWER PLANT. Bulletin No. 101, 16 pages. Describes the latest developments in portable power plants, with practical advice on their application. Available from the American Institute of Steel Construction, New York, N.Y.

(48) UNDERGROUND CHAIN CONVEYORS. Bulletin No. 102, 24 pages. Contains information on the latest developments in underground chain conveyors, with practical advice on their application. Available from the American Institute of Steel Construction, New York, N.Y.

(49) STEEL WORKS TOOLS, a bulletin issued by the American Iron and Steel Institute, contains the most extensive listing of steel works tools available in the United States. A comprehensive catalog of steel works tools available in the United States.

(50) ELECTRICAL ENGINEERING. Bulletin No. 103, 24 pages. Contains information on the latest developments in electrical engineering, with practical advice on their application. Available from the American Institute of Steel Construction, New York, N.Y.

(51) APPLICATIONS OF MILLWRIGHT MACHINERY, a bulletin issued by the Machinery Exchange, Chicago, Ill., contains the most extensive listing of machine tools and equipment available in the United States. A comprehensive catalog of machinery available in the United States.

(52) BOLTED FRAME CONSTRUCTION. Bulletin No. 104, 20 pages. Contains information on the latest developments in bolted frame construction, with practical advice on its application. Available from the American Institute of Steel Construction, New York, N.Y.

(53) PORTABLE POWER PLANT. Bulletin No. 105, 16 pages. Describes the latest developments in portable power plants, with practical advice on their application. Available from the American Institute of Steel Construction, New York, N.Y.

(54) UNDERGROUND CHAIN CONVEYORS. Bulletin No. 106, 24 pages. Contains information on the latest developments in underground chain conveyors, with practical advice on their application. Available from the American Institute of Steel Construction, New York, N.Y.
LOCAL SECTIONS

Oklahoma

New York

Houston

Great Lakes

Kansas

Southern California

Bay Cities, California

Birmingham Steel Empire

Meetings announced later. C. F. P. Roberts, 91, President; A. H. Johnson, 92, Secretary; 118 P Street, Oklahoma City, Okla.

Boquio, P. I.

Meetings announced first Wednesday each month, Pines Hotel, Bagdad, W. T. Graham, Ex-72, President; P. E. W. Huddleston, secretary, Bagdad, P. I.

Manila, P. I.

Dinner meeting, first Friday each month, A. F. Duggins, 73, President; Earle K. Hulse, secretary, Manila, P. I.

Colorado

The February meeting of the Colorado Section, C. S. M. Alumni Association was held at the Oxford Hotel, at Noon, February 16, 1940. Twenty-two members and one guest were present. After the luncheon our new President, Dent L. Lay, occupied a few minutes commenting upon his program for 1940, asking for better attendance at local meetings and cooperation with the Parent Association and President Eddie Brook. Committees were appointed as follows:

Budget Committee: Earl Durbin, Chairman Robert Barney, Secretary Henry Low

Publication Committee: Tom Northrop, Chairman John Taylor Ellsworth Watson

Program Committee: Ralph Johnson, Chairman Bruce LaFollette

Athletic and Instruction Committee: Kerry Bierley, Chairman Art Bunte Duane Goghborn

President Lay suggested that attendance might be increased by occasionally changing the place of meeting and/or the time.

Carl Dismant offered some extremely interesting news and commentaries on his trip through the Far East and the American war. He has quite recently returned to the states, having been caught in France at the time the present European war was declared. His comments on the difficulties of travelers during the state of war were very well put and apropos.

Members present were:

Frank C. Bowman, 71: Hugh M. Condon, 53; Arthur M. Eddelstein, 40; G. R. Harbor, 71; Charles S. Parkin, 72; Bruce B. Brummett, 72; H. W. Katzen, 72; 13, (Steel House, 785; C. S. M. R. W. Hatfield, 72; H. B. Bailey, 72; Charles J. Brandt, 72; W. A. Blaurock, 71; D. L. Lay, 72; C. D. Danielson, 72; W. P. McCullough, 72; L. E. Masterson, 72; W. E. Bailey, 72; D. R. Chamberlain, 72; 9701 Lamont Ave., Cleveland, Ohio.

Cleveland

Meetings during the year, 4th Monday of each month, American Club, Cleveland, Ohio.

Colorado

Meetings during the year, 4th Monday evening, 400 P. M., Lamar Hotel, Houston, Texas. Thomas K. D. True, 73, President; R. J. McGlone, 52, Vice-President; R. J. Melka, 73, Secretary, 4537 Drexel Blvd., Chicago.

Texas

Meetings announced later. John Traylor, 72, President; R. D. Skirvin, 72, Secretary, 2112 University Terrace, Dallas, Texas.

Utah

Meetings announced later. Ona Herrera, 71, President; Ron Deere, 92, Secretary, A. S. C. Cobbler, Sack Lake City, Utah.

Mines in Winter Sports

By JOHN A. BAILEY

Riding high on a string of nice straight victories and one defeat, the basketball team will enter the national A. A. U. basketball tourney in Denver this week to try its luck. It is the first time a Mines team has been entered in the tournament, and it will be in particularly fast company this year with such nationally known teams as the Denver Nuggets and the Phillips Oiler. A number of other strong college teams are in the tourney, and they are slated for initial games with the Mines quintet.

The team finished its regular season February 24 assured of at least a tie for second place in the R. M. C. The final standings won’t be determined until Western State and Colorado College finish their schedules of four remaining games. If C. C. should win all of its remaining games, she will be in a tie for first place with Montana State, and if she should lose one game C. C. will be tied for second with Mines. The hap­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­…
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Wrestling
After an auspicious start with a win over Wyoming, the wrestling team has suffered two defeats by Greeley State and Denver University. The defeat by Greeley meant the loss of the R. M. C. championship for the season.

Greeley won the meet by a score of 25-19. The teachers won four matches by falls and took one draw. Mines got two falls, one decision and a draw.

Nobby Taschiro of Mines and Campbell of Greeley wrestled to an overtime match in the fourth round of the meet. Everett Smuckh, sophomore star, won his second win of the season by throwing his man in the 145 pound class. Lee Gibson again won by two points. Bob Rogers, Talbott, and Bousman are all seniors in their first j'ear as head basketball players. Mines are as well as five green sophomores and one junior in his first year as head basketball coach.

Hopfland will be the only player to graduate this year. Thompson, Rogers, Tallbott, and Brussman are all sophomores and have two more years of eligibility; Comeock is a junior and has one more year. The rest of the team members who made up the starting season were as follows: Bob Retallack, '42; Ivan Gilbert, '41; George Bernostein, '42; Pearce, '42; Glenn Lacauters, '40; Clay Creager, '41; Joe Richelieu, '40; Davis, '42; Roy Deenon, a junior broke his ankle in the early part of the season and had to drop out of the games; he will probably return to the squad next year.

The Mines Magazine

For March, 1940

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Greeley won the meet by a score of 25-19. The teachers won four matches by falls and took one draw. Mines got two falls, one decision and a draw.

Nobby Taschiro of Mines and Campbell of Greeley wrestled to an overtime match in the fourth round of the meet. Everett Smuckh, sophomore star, won his second win of the season by throwing his man in the 145 pound class. Lee Gibson again won by two points. Bob Rogers, Talbott, and Bousman are all seniors in their first j'ear as head basketball players. Mines are as well as five green sophomores and one junior in his first year as head basketball coach.

Hopfland will be the only player to graduate this year. Thompson, Rogers, Tallbott, and Brussman are all sophomores and have two more years of eligibility; Comeock is a junior and has one more year. The rest of the team members who made up the starting season were as follows: Bob Retallack, '42; Ivan Gilbert, '41; George Bernostein, '42; Pearce, '42; Glenn Lacauters, '40; Clay Creager, '41; Joe Richelieu, '40; Davis, '42; Roy Deenon, a junior broke his ankle in the early part of the season and had to drop out of the games; he will probably return to the squad next year.

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Skiing
The ski team captured the school's invitational meet February 3 as they scored almost twice as many points as the nearest contender. Fred Nagel, intercollegiate ski champion, took first place in the slalom, and placed fourth in the downhill to give Mines a total of 29 points. C. U. was second with 13 points, and C. C. and C. A. were third, fourth, and fifth respectively, with 7, 3, and 1 points in the event of the two.

The championship meet ends the skiing season for the school for this year. Coach Stevens expects to have Bryan, Shaw, and Berger back next year to form the nucleus of his 1941 team.

Spring Football
Started March 11. Coach Mason has been working on alternate days with the linemen and the backs. Fundamental principles are being stressed, and the coaches are getting a line on their available material for the picture that Watson will send next fall. The whole team will begin practicing together for the three-weeks period beginning April 1.

Campus Topics—

(The Geophysical Wing of the new Geology building was opened for use with the beginning of the new semester. Although the completion of the wing was completed in December, very little lecture classes were held in the new building until the beginning of the first semester. With the new equipment set up, all the classes in Geophysics are now being held in the new wing.

New Barb Pins
made their first appearance on the campus during registration days of the second semester. They have been of considerable comment and have carried invariable compliments.

Local Sections—

(Continued from page 128)

as that many Mines graduates as possible attend at least a part of their vacations in Denver and Golden to observe the changes which have been going on out there. After the group party we joined the A. I. M. S. Smoker for dinner and entertainment. It is hoped that your correspondent may obtain a complete list of the men present, but a few may be omitted.

At any rate his records show:


Hopfland will be the only player to graduate this year. Thompson, Rogers, Tallbott, and Brussman are all sophomores and have two more years of eligibility; Comeock is a junior and has one more year. The rest of the team members who made up the starting season were as follows: Bob Retallack, '42; Ivan Gilbert, '41; George Bernostein, '42; Pearce, '42; Glenn Lacauters, '40; Clay Creager, '41; Joe Richelieu, '40; Davis, '42; Roy Deenon, a junior broke his ankle in the early part of the season and had to drop out of the games; he will probably return to the squad next year.

The Mines Magazine

For March, 1940
Mines Men and their accomplishments — great shape and no doubt you will be same period of last year. Many improvements have been made in the Alumni office. It will aid the Alumni in keeping in touch with the members and those interested in the Department of Mines. The Alumni Association Endowment Committee has plans for the year under consideration. The Alumni Association has increased its membership and is growing in every market in the country. The Alumni Association is growing in every market in the country.

The Alumni Association has improved with the help of James Boyd, Vice-Chairman, Donald Dyrentorth, Chairman of the Publications Committee, was absent on account of illness but stated he would send a comprehensive report covering Local Sections and an increase in membership figures, and a colored geological map of the Elburz mountains. Mr. Denunzio was elected Secretary of the Jos. Denunzio Fruit Company and is located at Pampa, Texas. Mail addressed to his home, 67 Home, Ark., will reach him.

The Aiumni Capability Exchange was discussed by Allan E. Craig and the fact that the current shortage will continue into the future. The national Works Projects Administration arose the over and under supply of petroleum products, and is a matter of some moment. It is a matter of some moment.

Alumni Affairs

Executive Committee Meeting, February 18th, 1940.

In the absence of Edward J. Brook, President, and Donald Dyrentorth, Vice-President, who were absent on account of illness, the following officers were present: George S. Volk, Secretary; George S. Volk, Treasurer; and John H. Johnson, Secretary. The meeting was called to order by George S. Volk, Secretary.

The printing of the Mines Men magazine was discussed by Allan E. Craig, Chairman of the Alumni Association Endowment Committee, and Mr. Denunzio, who stated that the price of the magazine is now $1.50 per year. The price of the magazine is now $1.50 per year.

At the meeting, Mr. Denunzio volunteered to prepare data on the various accounts to the new members of the Alumni Association.

The meeting adjourned at 8:00 P.M.

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Mechanization—

(Continued from page 118)

petroleum, a very large part of this coal may never be recovered. The mercury mines of the United States are comparatively unimportant at present due to the fact that the ore is rapidly being exhausted. The New Almaden mine in California was closed in 1926 for want of ore, although it had produced between 65 and 75 million dollars worth of mercury and was the deepest mercury mine in the world. This New Almaden mine, also in California, is at present the greatest producer in the United States, and this production has increased in spite of the application of mechanical aids in mining, its costs per unit are increasing.

In general, all of the mineral industries, where the pinch of increasing natural handicaps is not yet serious, show particularly rapid increases in productivity in the period from 1919 to 1929 and probably even greater increases since then. In copper, ore, phosphoric acid and gypsum productivity doubled between the World War and 1929. In bauxite, coal, the largest of the mineral industries, the record is one of steady increase.

Although the Lake Superior district is the oldest copper camp in the United States, it is still likely to provide more than 7% of the U. S. supply. The effect of mechanization in these mines is clearly shown by the following quotation from U. S. B. M. Bull. 300, p. 339: "Along with power drilling, concentration of haulage, and selective mining, scrapers have been one of the principal economies that have enabled the Michigan copper miners to combat the difficulties of increasing depth and to survive the competitive struggle.

The graph on page 12 shows how the yield of copper per ton decreases with increasing tonnage, treated in spite of improved methods of extraction. It will be noticed that since 1910, the effect of business depressions on this curve is to increase the yield of copper per ton of ore and to decrease the number of tons treated. In other words, the numbers of tons of ore treated each year depends upon the price of copper, and the tonnage curve roughly parallels the price curve, while the yield per ton of ore (grade of ore curve) is the reciprocal of this. Graphs of the other base metals would be similar to the copper graph.

Of all branches of industry, the mineral industries have developed faster than any other major division, far outracing agriculture and exceeding even the growth of the nation's manufactures and rail transport. The following table shows how the growth of mineral production from 1899 to 1929 compares with that of population, agriculture, manufactures and rail transport.

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
<th>Agriculture</th>
<th>Manufactures</th>
<th>Rail transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>1902</td>
<td>1,656,254</td>
<td>210%</td>
<td>219%</td>
<td>219%</td>
</tr>
<tr>
<td>1910</td>
<td>2,341,100</td>
<td>219%</td>
<td>218%</td>
<td>219%</td>
</tr>
<tr>
<td>1919</td>
<td>2,502,122</td>
<td>219%</td>
<td>219%</td>
<td>219%</td>
</tr>
</tbody>
</table>

It is probable that mechanization has decreased and will continue to decrease the amount of seasonal changes in employment, particularly in the coal mines. As the investment in machinery increases in these mines, the fixed charges also increase, until a point is reached at which it is more profitable to keep a mine in constant production rather than in seasonal production. Although it is evident that the mechanization of the mineral industries has greatly improved the welfare of miners in many ways, it is certain that their welfare has been improved more by mechanization than that of any other industry.

The average annual wage of miners in the United States has increased from $1.00 to $3.75.
Non-Metallic Minerals

(Continued from page 112)

Processing

Depending upon the locality of the plant, we find that raw materials going into the manufacture of cement contain: limestone, shale, sand, clay, slate, coal ash, blast furnace slag, granite, sandstone, and possibly other contaminants.

These raw materials are mixed in approximately the proportions: Calcium carbonate, 65%; silica, 25%; alumina and iron combined 10; and 5% of impurities such as Magnesium, Potassium and Sulfur Oxides.

This "Mix" is ground to a fine powder and then introduced into a kiln. Carbon Dioxide is driven off as the temperature increases but the chemical reactions are not completed until incipient fusion is reached. This incipient fusion produces the "Clinker" which looks very much like the clinkers produced in a foundry furnace, white, with which most of us are familiar.

The chemical reactions which take place at the elevated temperature of this kiln cause a combination of the calcium and silicates to produce tricalcium silicate, tricalcium aluminoferrite, and calcium alumina silicate. Many other compounds are undoubtedly formed at different temperatures of the kiln; as many as twenty-six different compounds have been reported by investigators.

Unfortunately, magnesium oxide does not combine with silica nor alumina at ordinary kiln temperatures so most cement has a certain amount of uncombined MgO in it. This may have been the cause of many early failures of concrete.

U.S. landowners have been encouraged to form associations in order to avoid the expense of building a cement plant and to reach larger markets.

Cement materials occur in practical every state of the United States and even the Mexican border states.

Thirty-five of the eighty-eight states have cement plants operating within twenty-five miles of the border, and every state has cement within twenty-five miles of its border.

Geographical Distribution of Cement Materials

Cement materials occur in practical every state of the United States and even the Mexican border states.

U.S. landowners have been encouraged to form associations in order to avoid the expense of building a cement plant and to reach larger markets.

Man and Minerals—

(Continued from page 115)

Announcer: You have just listened to another program prepared and presented in cooperation with the Rocky Mountain Radio Council by the faculty members and students of the Colorado School of Mines, an institution devoted to the advancement of the mineral industries.

Another similar informative program will be broadcast next week at the same time. It will deal with the subject of lubrication and what it means to the automobile owners. Address any questions you may have about this program to "Man and Minerals", care of the station to which you are listening.

Announcer: The Colorado School of Mines.

Miners Men in Print—

Clifford Frondel, '29, published a 23-page book—"Elements of Analytic Geometry"—in 1940. He is now teaching at Harvard University, Massachusetts.

Ronald K. DuFeld, '31, in cooperation with E. Russell Lloyd edited a West Texas-New Mexico minerals map which was published by the Bureau of Economic Geology. They wrote a 14-page editorial introduction.

Elements of Analytic Geometry—Smith & Gale $1.50

Practical Metallurgy for Engineers—Boeckh & Co. $1.00

Elements of Chemical Engineering—Curtis, Gmelin

FELLOWSHIP, The Biography of a Man and a Business

The first two days out of South America. It was a most happy crowd when the Statue of Liberty was first sighted. We knew "Old Glory" was a real protector and we were safe in the good U.S.A. With all its troubles it is the best place to live that I have seen.

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Cripple Creek Mining Co., U.S.A.
De Reel del Monte y Pachuca, Mex.
Dorado Lead Co., U.S.A.
Eagle Pitcher M. & S. Co., U.S.A.
Ergastenia Pluton Co., Greece
Federated Tin Mines, Tasmania
Fibresboard Products Inc., U.S.A.
Freemont Co., Mex.
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Lakeview Coal & Min. Corp., U.S.A.
London Gold Mines, U.S.A.
London Butter Gold Min. Co., U.S.A.
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Mendocino Min. Co., U.S.A.
Mount Kellet Min. Co., Fiji Islands.
Nevada Mining Corp., Alaska.
Nevada Consolidated Paper Co., U.S.A.
New Jersey Zinc Co., U.S.A.
Northwestern Terra Cotta Co., U.S.A.
Omaha Gold Mines, Ltd., Canada
Ontario Gold Min. Ltd., Canada
Penhold & Athabasca, Mex.
Cia Minera De Falecida, Mexico
Paymaster Cons. Gold Min., Canada
Peacham Raybestos Corp., U.S.A.
Cia Industrial El Potosi, Mexico
Phillip Dodge Corp., U.S.A.
The Pickle Crowe Co., Ltd., Can.
Potsah Co. of America, U.S.A.
Relief Arlington Min. Ltd., Can.
Russel Gulch Gold Mines, U.S.A.
San Francisco Min. of Mexico
San Juan Metal Co., U.S.A.
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