

# The Engineering and Mining Journal

WITH WHICH IS CONSOLIDATED "MINING AND METALLURGY."

VOL. LXXVI.

NEW YORK, SATURDAY, OCTOBER 10, 1903.

No. 15.

## THE ENGINEERING AND MINING JOURNAL

PUBLISHED EVERY SATURDAY,  
261 BROADWAY, NEW YORK.

TELEPHONE 6865 CORTLANDT. P. O. BOX 1833.  
CABLE ADDRESS "ENGINJOUR" NEW YORK.

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of quotations in Kaffirs—as South African mining shares are styled—has continued to depress the mining market ever since the day the Transvaal war ceased and stale bulls tried to realize on their holdings. It has been a grievous disappointment to a great number of careful investors. In some respects the conditions on Throgmorton avenue are parallel to those in Wall street; the flotation of numberless schemes all requiring further capital from time to time has produced indigestible securities whose effects have been a financial dyspepsia, producing a general condition of gloomy discontent. Only a process of assimilation and the distribution of the shares among strong holders can restore the confidence which has been wantonly abused.

THE EPISODE at the Government Printing office, to which we referred at the time when foreman Miller was dismissed, has ended satisfactorily in the declaration of President Roosevelt, the significance of which lies in the fact that it establishes the principle of the open shop in the Government service. If the Government cannot, and will not, distinguish between union and independent labor, why should other business concerns be continually threatened for the exercise of a similar freedom of choice in regard to the men they employ? The incident at Washington, which was interesting because of Mr. Roosevelt's friendly relations to the labor leaders and the political consequences involved, has become of much greater importance by reason of the enunciation of a principle which will serve as a precedent in other cases.

THE FINANCIAL PRINCIPLES underlying the management of mines have undergone development during the last ten years, mainly by reason of the business sense injected into all mining operations. An interesting example is afforded by Mr. Hennen Jennings' remarks at a recent company meeting. In the case discussed by him the ore reserves amounted to 1,000,000 tons, with an estimated profit of \$6 per ton; it became a question of spending \$350,000 on a new 100-stamp mill, doubling the existing reduction works. By milling 111,000 tons per annum, as at present, the property will yield \$666,000 in dividends for a period of nine years. By consulting compound interest tables it will be found that, at 5 per cent, the present value of these dividends amounts to \$4,733,795. But if the given quantity of ore is extracted and treated in four and a half years, there will remain four and a half annuities of \$1,332,000, with a present value of \$5,245,016 or a difference of \$510,221, showing that even if the new mill to cost \$350,000 should be useless at the end of four and a half years, the building of it would be good finance. As a matter of fact, the larger tonnage handled per annum would be accompanied by a considerable lessening of costs. Not many mines have a million tons of ore in reserve, nevertheless the point is of interest and is applicable on a much smaller scale.

ON ANOTHER page we quote the resolutions passed at the recent meeting of the Mining Congress at Deadwood relative to the collection of mineral statistics and the enlargement of the work of the

IT IS ANNOUNCED that the China Commercial Steamship Company has won its contest for the right to bring Chinese coolies into Mexico, the government of that Republic having finally decided to permit the Chinese to land. This is likely to be an important factor in the future mining development of Mexico.

THE ENGINEERING FIRM of Bewick, Moreing & Co., which controls the management of a large number of mines in Western Australia and elsewhere, has issued orders to its staff that the outputs of the mines must be stated in terms of short tons, of 2,000 pounds, so as to have a uniform standard with the United States and South Africa. This is an intelligent departure, which we hope will be imitated by all the mines in the English-speaking countries.

A FIRM OF BOILER-MAKERS at Jersey City got into trouble with the labor-union because it employed several men to whom \$3.75 per day was paid, while the union rate was \$3 per day. Because the employers were willing to pay extra for especially good work, they were notified that a strike would be called unless the uniform rate of a lower wage was established. The firm refused and a strike followed. Even the men who got the higher wages went out on strike. Since then only non-union labor has been employed in that particular factory. Acts such as these prove what an unintelligent tyranny masks under the guise of trades-unionism.

THE LONDON MINING MARKET continues in the dumps; while the unprecedented fall in consols has discouraged investors generally, the steady decline

United States Geological Survey. This expression of opinion represents, we believe, the views held by a large majority of the mining men of this country. In the past there has been warrant for some unfavorable criticism of Government statistics, but, on the whole, the work of this department of the Government Geological Survey has always been fairly satisfactory, and of late it has been steadily improving.

The resolution referred to is correct in its premises that the mineral statistics of the country can be intelligently and correctly collected only by persons familiar with the mineral and mining conditions. Consequently, one of two policies must be followed: either the collection of these statistics must be left with the Geological Survey, or the bureau to which this work is to be referred must train a number of experts who will gradually prepare themselves for this special work. Such a policy would result in a duplication of specialists in two different government bureaus, which duplication is altogether unnecessary.

It is hoped, therefore, that President Roosevelt will adopt the reasonable and wise course of leaving the work of collecting the mineral statistics of the country where it now is—in the hands of the Geological Survey. And, furthermore, that he will use his influence to so strengthen and enlarge the work of the Survey as to enable it to meet the enlarged requirements of our expanding mineral industry.

#### RAW SULPHIDE SMELTING.

With a view to eliciting the best professional opinion upon the factors controlling the success of raw sulphide smelting, we have sent a list of questions to a number of successful metallurgists. Their replies will be published in our discussion department, with the hope that those of our readers who have experience in this branch of technical practice will contribute their views freely.

Raw sulphide smelting may be defined as the treatment of unroasted sulphide ores with a view to the formation of a matte. Pyritic smelting and matte smelting are terms which fail to cover the ground because the former omits pyrrhotite ores, themselves an integral part of the material to be considered in this branch of metallurgy, while the second includes the smelting of pyrite which has been previously roasted, in part or altogether. Raw sulphide smelting is based upon the utilization of the heat derived from the combustion of sulphide ores in a blast furnace, in contradistinction to the heat obtained directly from carbonaceous fuel. Of the sulphides, those of iron and copper are the best available, the sulphides of lead and antimony, for instance, being prejudicial to successful work by reason of their easy volatilization at the high temperatures required for a proper matte fall, while the sulphide of zinc tends to form an infusible slag. The formation of matte and its downward passage through the charge plays the important part of collecting the precious metals which may be disseminated through the ores and, in this way, renders the process a form of concentration by fire as contrasted with ordinary wet milling practice. This feature of the process—the formation of a matte which acts as a collector of minute quantities of precious metals—has led to its extended application during recent years in the treatment of pyrite and pyrrhotite ores containing small quantities of gold and silver. Copper sulphide is usually considered a better collector than iron sulphide alone, but experience has proved that a very small percentage of copper, in the presence of an iron matte, is sufficient to yield a clean slag. What the irreducible minimum of copper is, remains still a mat-

ter for difference of opinion, and, we may add, a subject for discussion, among specialists.

Just as in the concentration of ores by water, it is necessary to limit the number of operations, because, aside from the cost, there is also a loss entailed by each treatment; so in raw smelting it is economical to concentrate the valuable metals in as few smeltings as possible. Ores so heavy in copper and iron sulphides as to approximate the composition of matte, itself an artificial sulphide, do not gain by direct smelting unless they are mixed with silicious material, not as a flux alone, but as ore, able to defray a portion of the total cost of treatment. When one operation yields a 40 to 50 per cent matte with a concentration of less than two into one, it is obvious that the gain secured by the concentration may be largely offset by the cost and loss in treatment, so that it may be more profitable to dispose of the ore otherwise, as, for example, by reducing its sulphur contents by roasting or by slagging off the excess of iron by a preliminary fusion, so that it may become part of a charge containing roasted material and silicious ores such as have not an excess of iron and sulphur, the matte-forming ingredients. When the ores to be treated are so poor in copper sulphides as to form a low-grade matte, requiring further concentration, it may be necessary, in order to secure a high-grade product fit for shipment, to repeat the process so many times as to entail a cost and a loss in treatment which will not justify the result. A large percentage of matte usually favors a clean slag and a small loss in precious metals, while a small proportion of matte indicates conditions unfavorable to the gathering together of the gold and silver, producing an unclean slag.

Nowadays near well-established mining centers the individual problem of ore reduction is often overcome by the disposal of the ore in the open market, but in the early days of a new mining region, before custom smelters offer a satisfactory market for the product of the mine, it is frequently economical to concentrate the values into a high-grade matte, so rich that the expense of transport per ton of original crude ore is comparatively small. The shipment of bullion from a stamp-mill is the extreme phase of the same view of the problem of concentrating the values into as small a bulk as possible in order to minimize the cost of transport to the refinery. For this reason small matte-smelters have flourished, in days now nearly past, in the mountainous parts of Colorado and in the deserts of Arizona—to mention two representative conditions. From this point of view the matte-smelter may be regarded as a metallurgical pioneer, for it has helped notably in the early development of mining districts. With the advent of the railway and the consequent nearness of industrial centers, either the matte-smelter has been shut down in the face of the facilities afforded by central establishments which have bought the ores, or, when the mines of any one locality have warranted it, the matte-furnaces have been followed by the converter, so that shipments of matte have given place to shipments of blister copper.

This phase of the subject is now of less importance in the United States, although in the more remote places of the earth it may still be an important feature in the progress of mining. At the present time raw sulphide smelting, in this country, in Canada and in Mexico, is of particular importance as affording a cheap method of beneficiating those pyrrhotite and pyrite ores which carry small quantities of gold and silver, with enough copper to permit of a good matte fall. As the costs of the operation are reduced until they approximate the expense of stamp-milling, the smelting of such ores renders valuable a proportion of gold and silver

which not many years ago was considered negligible. With the attainment of so low a cost for raw smelting as 90 cents per ton, the operations of the furnace begin to compare in point of economy with the wet concentration mill and the stamp-mill, itself held to be the cheapest form of ore reduction invented by man.

#### THE CITY AND THE ENGINEERS.

The meeting of the American Institute of Mining Engineers which takes place next week promises to be most successful. On another page we publish the program in full. Arrangements have been made so that the social side of the convention will not interfere with the sessions to be held for the discussion of technical matters; in this way it is hoped to secure a good attendance throughout. New York and vicinity boasts over three hundred members and, at this season, the number is augmented considerably by members from elsewhere whose business brings them to the city; so that a representative attendance is assured. The City Government and the Chamber of Commerce have extended every courtesy and other institutions have not been behind in affording facilities for meetings and excursions, as the program abundantly shows.

New York is a most suitable place of meeting; it is the financial center of, at least, the western hemisphere; it is the gateway of a continent and, to the mining engineer, it is the point of departure to all those countries where American professional skill is in demand. Even the most seasoned traveler, who knows the world from the Malay to the Seward peninsula, can find in New York a splendid exemplification of modern civilization as based on the industrial arts. Whether you climb to the top of a building 393 ft. high or stand upon the ridge of Staten Island, which is just equal in altitude to the sky-scraper, you can, without much trouble, secure a panoramic view which for impressiveness outvie even such famous havens as Sydney, Rio de Janeiro and Auckland. The fine waterways which have determined the growth of the community on Manhattan Island are alive with ocean and river craft of every kind, from the impulsive tug to the imposing liner gliding out to sea with quiet dignity; besides these, the barges laden with railroad cars, the ferries black with passengers and the frequent flash of a white sail contribute to a moving scene of great animation. Looking down on the furrowed waters are cities of commanding importance; New York, Brooklyn, Jersey City, New Brighton and their lesser neighbors form a community numbering no less than five million people. Elevators, warehouses and sugar refineries, a long succession of docks, big railroad terminals, and the occasional tall chimney of a metallurgical establishment unite with noble buildings and restful church spires in emphasizing the manifold activity of the people whose dwellings cover the surrounding shores. And if day shall have failed to impress the visitor, he has but to wait until the approach of night accentuates the beauty of the scene.

Then from the flash-light of Sandy Hook to the many storied structures of lower New York rising through the twilight in irregular lines like the ruins of a Titan's stronghold, there is a scintillation of light and a tracery of brilliant illumination such as speak eloquently of the unbroken activities of the human hive whose pleasure ships go down the bay like costly glow-worms, while from the land the intermittent flare of furnace fires suggests the contrast of insistent labor. And all the while there is the muffled throb of a ceaseless toil, which is digging tunnels under the estuary on the Jersey side, piercing the rock beneath the city itself like a mole that



burrows in the dark, arching the strait to Long Island with woven threads of cable and piling story after story upon steel-girt buildings which over-top the church steeples and soar far above the turmoil of the streets, in whose canyon depths an unrelenting procession of electric cars passes ceaselessly. New York is the fulfillment of engineering imagination and a fitting meeting-place for the men whose mining and metallurgic skill has provided the metal and the stone upon which rests this complicated civilization.

#### MINING IN CHINA.

On the eighth of October, at Shanghai, the United States minister to China signed the new commerce treaty with the Chinese commissioners. This is an event overlooked by the daily press, but of particular importance to those interested in mining affairs. We may explain that under the treaty made between Great Britain and China, signed by their respective commissioners on September 5, 1902, and confirmed in July of this year, it is agreed that within one year China will, of her own initiative, revise her mining laws and afford facilities for mining explorations. The particular clause (Article IX) covering this point reads as follows:

"The Chinese Government, recognizing that it is advantageous for the country to develop its mineral resources, and that it is desirable to attract foreign as well as Chinese capital to embark in mining enterprises, agree within one year from the signing of this treaty to initiate and conclude the revision of the existing mining regulations. China will, with all expedition and earnestness, go into the whole question of mining rules, and, selecting from the rules of Great Britain, India and other countries regulations which seem applicable to the condition of China, she will recast her present mining rules in such a way as, while promoting the interests of Chinese subjects and not injuring in any way the sovereign rights of China, shall offer no impediment to the attraction of foreign capital or place foreign capitalists at a greater disadvantage than they would be under generally accepted foreign regulations.

"Any mining concession granted after the publication of these new rules shall be subject to their provisions."

This means that China is to be thrown open to general mining under conditions similar to those obtaining in other countries, such as Mexico and Australia. A mining expert, Mr. Wallace Broad, was appointed advisor to the Chinese Government, and he has been there since the end of last year, engaged in framing the rules and regulations for the new Bureau of Mining, of which Prince Tsai Chen is chief.

Under the "most favored nation clause" the United States would, in any case, be entitled to the facilities granted to Great Britain by the treaty just referred to, but it is known that the new compact, signed two days ago, contains a specific clause giving the right to American citizens to own and operate mines in China. This treaty will be confirmed by Germany, France and other nations, each one, in the course of revision, strengthening the position, until the final result will be that China will be thrown wide open to modern mining enterprise.

This should afford a fine field for American energy. English capitalists have done a good deal, and the Chinese Engineering Mining Company controls coalfields in northern China, while the Pekin Syndicate, the Shansi Syndicate, and other companies, have secured rights to mine and explore, largely under the direction of American mining engineers. But the United States has a great advantage over other countries because of the good-will created

by accepting payment of the war indemnity in silver and by reason of the humane actions of the United States military forces when recently engaged in putting down the Boxer insurrection. Besides the good sentiment thus cultivated, it may be mentioned that about thirty years ago China sent an average of forty students per annum to our leading universities, and these young men are now potent factors in the government of their own country; among them may be mentioned the present Ambassador at Washington and the Commissioner to the St. Louis Exposition. The entire tone of opinion concerning foreign countries is largely moulded by the views expressed by the secretaries who were educated at Harvard, Yale and Columbia. The aloofness of the United States to any attempt at land-grabbing or spoliation has won recognition in China, so that the leading officials realize that a concession or permit to explore mineral lands, if granted to Americans, would have no ulterior political object, and would lead, not to territorial aggrandisement, but simply to the development of industry.

Of China's mineral resources not much is known with precision. The coalfields of Shansi and Hunan are important; in Yunnan and Kweichan there are copper, lead and tin lodes, which have been mined in a primitive way for centuries. In Hunan copper deposits of large extent are indicated by acres of slag produced by aboriginal smelting operations. In the provinces of Szechuan and Kansu there are gas and oil-wells of great local reputation. In Mongolia there are silver mines, and in the country tributary to the Amoor gold-placer diggings abound. And so on.

There is every reason to believe that future years will see a notable expansion of mining in China. The country has two important advantages in possessing a network of rivers and canals, which afford a splendid system of waterways, and it is in a position to afford an abundance of cheap labor. In this regard it stands in violent contrast to several regions where the mining industry has made much greater strides. The walking delegate has not as yet met the mandarin; when these two forms of misrule meet the sparks will fly; but we trust that before that consummation arrives both will have gone the way of the dodo, the mammoth and other things unfit to survive.

#### MARKET CONDITIONS.

The metal markets have been variable, showing increased activity in some directions, while in others only a moderate business has been done.

In copper, more buying has been done at the lower range of prices established. This has been especially the case with foreign buyers, who seem to have reached the conclusion that no further fall is to be expected. Stocks abroad, both for sale and in manufacturers' hands, are not large, and if the present movement continues exports will show a considerable increase.

Tin has been very variable, showing considerable fluctuations in price, which are largely based upon speculative movements here and abroad.

Lead has been rather quiet, with about the usual amount of buying for consumption. The higher rate of prices recently established is still maintained, and there seems to be no immediate probability of a change.

Spelter is somewhat easier, as the galvanizers are about through with their fall trade, and demand from that source is falling off. Brass manufacturers continue busy, but supplies are now fully equal to the demand. Zinc ore prices continue rather high.

There has been little change in silver, prices con-

tinuing good. More purchases have been made here, on account of Philippine coinage. The expected demand from the East is developing rather slowly, but dealers abroad are still basing their views upon heavy orders for India and China.

The iron trade continues in rather uncertain condition. The latest movement is the proposed agreement of the blast-furnace owners to restrict production, the object being to maintain prices, and to prevent any further fall in raw material. This movement has not fully developed as yet, though it seems quite probable that a large number of furnaces will go out of blast within a short time. Buying, however, has not been affected by this proposed production, and consumers are still holding back with their orders. In finished material conditions are very much the same, and what new business is reported is somewhat of a retail character.

The price of steel billets is still maintained on the basis of \$27 Pittsburg, but purchasers do not seem anxious to take any considerable quantities at that figure. Foreign billets are being pressed for sale in the East, but without much result in actual trading.

In the Western coal markets lake shippers are beginning to press coal forward, owing to the abundance of tonnage offered. Local trade is generally good, but we are once more hearing complaints of car shortage and delays in transportation. These, however, do not appear to be worse than usual at this season when grain shipments are making heavy demands upon the railroads.

The Atlantic Seaboard bituminous coal trade continues very quiet, with no particular change in conditions since last week. Demand is slack, and car supply is sufficient, while prices rule low.

The anthracite trade is showing a little improvement in some territories, but in general the market is quiet. In the East, business is now very light, and will be until cold weather stimulates buying.

#### METALLICS.

Culled from all sources. Our readers are invited to assist this department by sending similar material.

The Cœur d'Alene region, in Idaho, contributes about 26 per cent of the domestic production of lead.

There are 1,378 rock-drills in use in the mines of the Rand. Of these 1,129 are used in breaking ore, and 249 in non-productive ground.

The Homestake Mining Company has produced, up to the present year, about \$70,000,000 of gold. This company controls 250 claims, aggregating 2,616 acres and covering 8,000 ft. along the lode.

The late Lord Salisbury was no less a philosopher than a statesman, as is shown by the following sentiment: "We live in a small, bright oasis of knowledge surrounded on all sides by a vast unexplored region of impenetrable mystery, and from age to age the strenuous labor of successive generations wins a small strip from the desert and pushes forward the boundary of knowledge."

The Miners' Phthisis Commission of the Witwatersrand makes the following statement in the report recently presented:

The composition of compressor air as shown by analyses has revealed the very great danger that attends the use of inferior oils (or oils of low flash point) for lubricating the air-cylinders of the compressor engine. The analyses of compressor air show that in some of the samples carbonic oxide gas was present in sufficient quantity to be extremely dangerous to health.

## DISCUSSION.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the ENGINEERING AND MINING JOURNAL.

## RAW SULPHIDE SMELTING.

The Editor:

Sir.—I beg to inclose answers to your questions on pyritic smelting. We have two 48-in. water-jackets, with 12 4-in. tuyeres. The distance from charging floor to tuyeres is 5½ ft.; from tuyeres to taphole is 18 in. The capacity of each furnace is 50 tons each per 24 hours. The blast is heated entirely by waste gases from the furnaces and boilers (and gas engines later on).

The analysis of our slag is:

Silica.....	41 to 45 per cent.
Iron.....	27 to 31 (as protoxide).
Alumina.....	5 to 7, seldom above 5.
Lime.....	5 to 15, seldom above 10.
Magnesia.....	2 to 5 per cent.

The color is green, a dark green silicate of protoxides.

Pyritic smelting, so-called, is purely a roasting process, and what we cannot burn off goes to matte, so that it is really the exact opposite of ordinary smelting.

1. *What types of ores are suited to the process?* All kinds of ores are suitable so long as you have sufficient sulphur and iron. We find after two years' continuous practice that 20 per cent of FeS<sub>2</sub> in the charge gives good results.

We have three well-marked classes of ores:

1. Quartz-pyrites = 70 per cent quartz and 30 per cent pyrites.

2. Spar ores = 35 per cent quartz, 10 per cent pyrites and 55 per cent calcite.

3. Red ores = 40 per cent quartz, 25 per cent iron oxides, 20 per cent calcite and 10 per cent alumina. Also pure pyrites and some brown iron ores.

These classes of course shade off into one another.

A general analysis of the ore from the mine made three years ago gave: Silica, 44 per cent, Al<sub>2</sub>O<sub>3</sub> 5 per cent, CaCO<sub>3</sub> 32 per cent, MgCO<sub>3</sub> 2 per cent, FeS<sub>2</sub> 15 per cent, FeCO<sub>3</sub> 3 per cent, copper 0.25 per cent, manganese 0.20 per cent, gold ½ oz. and silver ¼ oz. per ton. The copper now runs about one-half of one per cent and seems to increase with depth. We have also more iron and less lime now. This sample gave poor results, both with barrel and vat chlorination, and cyaniding, both raw and roasted; and so we were led to try pyritic smelting.

2. *Is hot blast advisable?* A warm blast of 200° C. is a *sine qua non* with us; it spelled success, cold blast meant failure. I have not as yet found any advantage in heating above 200° C. Our hot blast costs us nothing but the stove (designed at Pittsburg, Pa.) The furnace itself and the waste heat from boilers and gas engines will give all the heat necessary if intelligently applied. Furthermore, with a hot blast you can run clean slags without using barren fluxes to the extent required in cold blast plants; for example, lime may be cut down to 5 per cent without danger.

The man who has never used hot blast can form no opinion on its use, as the results are so different from cold blast practice. It not only saves fuel, but gives the smelter a wider and more economical range of clean fluid slags, and makes work easier and pleasanter.

3. *To what extent can fuel be eliminated?* We find five per cent of coke to be the lowest percentage giving good results. We generally use 7 per cent of the ore charged.

4. *What amount of copper is needed for the collection of the precious metals?* We use half of one per cent of copper in the charge to collect the gold and silver; it is quite sufficient and the slags run clean. We concentrate fifteen to one, i. e., 15 tons of ore to one ton of matte; and the copper runs from 7 to 8 per cent in the matte which we ship to the smelter.

5. *What percentage of lime is necessary to a clean*

*slag?* Seven per cent of lime is enough with hot blast.

6. *What percentage of zinc in the charge can be treated profitably?* Zinc sulphide is a very good fuel, but I do not know how much we could profitably use.

7. *What is the degree of desulphurization attainable?* At present about 80 per cent of the sulphur in the charge is burned off, but I think we can do better.

8. *What are the possibilities as to capacity of furnace?* This is quite unknown to us at present. We have two 48-in. diam. furnaces running continuously. The capacity is 50 tons each per 24 hours.

9. *What are the limitations of the process?* A lack of sulphur and iron. You must have FeS<sub>2</sub>.

10. *What is the relative economy as compared to rival processes?* In our case after failing with free-milling, concentration, chlorination and cyanide, both separately and combined, we succeeded in saving practically all our values by pyritic smelting. To me it seems that cyaniding is the only possible rival, but it did not save the silver and copper, and only about 70 per cent of the gold in our case.

We take the ore as it comes from the mine and dump it straight into the furnace, merely spalling the big chunks. The ores required reducing, in rolls, and roasting for both chlorination and cyaniding in our case, and you can smelt pyritically about as cheaply as milling and roasting. A milling and roasting plant costs more than a pyritic smelter and takes more power to drive it, and then you have to add cost of cyanide or chlorination plant. Again, and worst of all, you have divided superintendence, the millman, roaster-man, (concentrator-man if needed) and cyanide expert have all to be considered, whereas by taking your ore straight from mine to furnace, this friction is avoided. The copper and silver lost in the cyanide and chlorination methods now yield us over \$100 per day and the sulphur is utilized as it should be, half a pound of sulphur being equal to one pound of coke in fuel value. As far as I know, there is no single process which can save practically all the values of gold, silver and copper in ores such as ours, so simply and economically as the hot blast pyritic method.

WALTER E. KOCH,

Gen. Mgr. Compañia Minera Lustré.  
Santa Maria del Oro, Durango, Mex., June 8, 1903.

## RAW SULPHIDE SMELTING; THAT IS, SMELTING OF SULPHIDE ORES WITHOUT PREVIOUS ROASTING.

The Editor:

Sir.—Herewith please find replies to questions:

1. Types of ore suited to the process. Any ore carrying sulphur in the form of iron pyrite, copper pyrite or pyrrotite.

2. Hot blast is advisable where it is necessary to increase the grade of matte produced, and where coke is expensive.

3. Fuel can be eliminated entirely, provided there is sufficient pyrite in the ore charged. This condition is rarely encountered, the lowest practical elimination in the United States being probably down to 4 per cent.

4. Copper is not necessary for the collection of the precious metals; they will collect readily in an iron matte.

5. Zinc has not been found in large quantities in the ores of this vicinity, so that the limit of the amount that can be treated profitably has not been reached here.

6. Not given.

7. The degree of desulphurization attainable on pyrite is 80 per cent with the Butte ores; we readily get 75 per cent. This can be varied with the depth of the charge, heat of blast.

8. Capacity of the furnace is best regulated by the means of getting rid of the slag, and the facilities for charging the furnaces. We consider 600 tons in 24 hours the capacity of our 56 in. by 180 in. at the tuyeres. To put more than this through the furnaces would require another crew of feeders, which would not be economy.

9. Limitations of the process. Ore too fine, say less than quarter mesh, or too clayey. To have good work it is necessary to have fairly open charge.

The percentage of sulphur may vary greatly in most cases. The grade of matte produced fixes the limit of the process. Where the matte is too low grade by the raw smelting process roasting has to be resorted to. The aim, in most copper smelters, is to produce 50 per cent at the first smelting, though some have to smelt twice to get it to this point, roasting the first matte between the smeltings. Matte charged again to a furnace raw loses hardly any sulphur in the smelting process, as it merely smelts and runs through the charge.

10. Relative economy. Where this process can be used at all it is practically the cheapest known.

E. P. MATHEWSON.

Anaconda, Montana.

## GOLD MINE ACCOUNTS.

The Editor:

Sir.—It is, perhaps, not astonishing that so little has been written on this discussion which Mr. Hoover so comprehensively opened on July 11, but, none the less, I own to a disappointment which can but be shared by an important contingent of the profession.

The subject is so large that engineers may well hesitate to attack it in the limited arena of "Discussion," and yet I, for one, believe that much can be gained by an unlimbering of ideas upon the subject.

Bookkeeping pure and simple is a matter of arithmetical accuracy and has been developed into a science. Accounting is a broader term and depends for its value upon the proper segregation of items. The subdivision of Mine Accounting (I take the liberty of dropping Mr. Hoover's word "Gold," which seems to draw a distinction scarcely necessary in this country at least) is one of the tools of the mining engineer and one that nowadays is of increased importance and it certainly seems that the developments in other lines, in Mine Surveying, for instance, or Economic Geology or Metallurgy, have outrun those in this no less important one. It would seem, then, that a discussion of the subject could not but result in a clearer appreciation of the needs of the case and at least a nearer approach to uniformity in practice, though it is scarcely probable that anything approaching the uniformity of surveying methods could be hoped for.

Mr. Jenkins has indicated how easily segregations can be accomplished, and I for one can bear witness to that from personal practice. Probably the majority of engineers would cordially adhere to a practicable uniform system for this. Still, it is doubtful if any two managers desire or many mines demand the same degree or kinds of segregations of costs so that any "universal" system must be one of great elasticity. We can scarcely expect that mine managers will favor any system that demands the carrying of accounts for which they see no use, so that our proposed system must be capable of simplification to a few basal accounts as well as of infinite elaboration. There are cases where, to properly manage and check up a business and to carry on the "interminable campaign for economy and improvement" the manager may have to subdivide extensively, and it is almost conceivable that there are other cases where the "morbid" misapplication of General Ledger Accounts, spoken of by Mr. Comstock, quite fills the need; and this diversity of need must be duly considered in devising any general system.

But there is a particular class of accounts that have always been a stumbling block, in the handling of which there are serious and fundamental divergences. Mr. Hoover has referred to these in the second column of his discussion, and on another page of the same number of the JOURNAL are two and one-half columns on a similar subject.<sup>1</sup> The gamut of common variations is clearly and concisely run

<sup>1</sup> "Payment of Extensions of Mining Plant out of Revenue." ENGINEERING AND MINING JOURNAL, July 11, p. 48.



up by Mr. Hoover, while Mr. G. A. Denny, in the 'Deep Level Mines of the Rand,' expends the matter most luminously. I am referring, of course, to that list of accounts that includes Capital, Depreciation, Maintenance, Reserve Fund, Amortization of Capital and Mine Development Redemption, to use Mr. Denny's own headings in the latter half of Chapter X. of his book.

I am not so foolhardy as to open a discussion on these vexed questions here, but the arguments stated by Mr. Denny *pro* and *con* show most clearly the disparate views that may logically be held. In view of this, then, it would seem that the most that could be done in regard to this system of accounts by any such joint commission, as was proposed by Mr. Hoover and seconded with elaborations by Mr. Comstock, would be to urge the general adoption of certain broad principles involving the demand for an explicit statement in each instance as to just what each account included. In regard to the Operating Accounts, segregations should be so made in the books of first entry, even though not carried into the ledgers, that expert examination could re-apportion costs at any time.

On lines such as these it seems to me that a reasonable uniformity could be expected. Beyond that it would scarcely be possible to go.

R. GILMAN BROWN.

San Francisco, Sept. 16, 1903.

#### MINE SAMPLING.

The Editor:

Sir.—It is the belief of the writer that the results of mine sampling should be considered as only close approximations to the average values of the ores exposed, and that it is hardly worth while to take the trouble of making fine-haired calculations, to obtain average values. If proper care is used with regard to abnormal assays, the usual method of "foot-ounces" or "foot-dollars" gives results as close as are practical.

It is well enough to talk and write about taking a sample that truly represents the value of the ore, but doing it is another matter. If the ore for the full width of the section cut is more or less uniform as to hardness, and is not crumbly, a good sample can be obtained; but if it is decomposed, porous and crumbly, no amount of care will enable one to cut a true sample. In such cases it is well to take very large samples; and, in a general way, it may be said that there is greater safety, not only in large samples, but also in large numbers of them. If the ore varies greatly as to hardness, the hard or soft parts occurring in spots or bunches scattered promiscuously throughout the vein, it is difficult to do accurate sampling. If the hard or soft ore occurs in streaks, the difficulty may be obviated by sampling the streaks separately. Sometimes the only practical method is to do the sampling as carefully as possible, realizing that it does not truly represent the ore values, and then, after thorough study of the subject, apply a percentage correction to the average value thus obtained, as in the two following cases:

(1) *Conditions*.—Large bodies of low-grade gold ore, in which it was suspected that the soft ore was better than the hard; ore-bodies thoroughly prospected in the upper levels, and about 700,000 tons developed before milling was begun; ore-bodies carefully determined by samples taken 10 ft. apart and assays accurately plotted upon maps; successful development of ore was continued after the mill was started; as a general rule, ore decreased in value with depth. After 140,000 tons had been milled, a second examination of the mine was made; new ore-reserves were sampled, and what remained of the old ones were resampled. Resampling of old ore-bodies gave practically the same results as first sampling. By use of the assay-maps, stope-maps, and records, a close comparison could be made between the mine sampling of the 140,000 tons, and the results from milling it, and it was found that the mine samples should have been discounted 14 2-3 per cent. This

rate of discount was applied in calculating the average value of the large tonnage yet remaining, and with good results, as was afterward proved in the milling of it.

(2) *Conditions*: Enormous body of very low-grade copper ore, occurring in form of small grains of chalcocite; could be determined easily by the eye that the soft parts of the ore were leaner than the hard; adits were driven into the ore-body, and samples were taken every 5 ft., alternating from side to side, so that samples were 10 ft. apart on each side; a separate mill-test was made on the ore from each adit; thus it was possible to compare the average of the mine samples with the average value of the ore as milled. Varying results were obtained in the different adits; in those where bunches of soft ore were scattered promiscuously throughout the harder ore, it was found necessary to add as much as 15 per cent to the average values shown by the mine samples, to make them correspond with the mill-tests.

One point that I do not remember having seen emphasized in this discussion is: The ore should be sampled in the same manner as it is to be mined.\* This is especially true in Mexico, where labor is cheap and where Mexican miners are very clever at mining small streaks and assorting ore. The "plodding sampler," fresh from the States, with no experience in Mexico, might go through the workings in an irregular lead deposit in limestone, taking his "cold-blooded" samples at regular measured intervals, and then easily turn the property down as being of no value; while, afterward, by using Mexican methods, modified somewhat, perhaps, by American intelligence and skill, the mine might be made to pay thousands of dollars.

Another practical point, that might have been covered to advantage by the many engineers of wide experience who have contributed to this discussion, is this: In calculating ore-reserves, what allowances are to be made on account of "horses" included within ore-bodies? Naturally, the percentage to be deducted varies widely with different veins or deposits, but results in some cases from actual experience might be of help in others. The following is contributed as one case:

*Conditions*: Large bodies of low-grade gold ore in an altered limestone, thoroughly developed; samples carefully taken 10 ft. apart; limits and thicknesses of ore-bodies determined by the extensive development and sampling; average specific gravity determined by a number of tests; stope-maps and records during mining kept in such a manner that comparison could be made between tons calculated and tons actually mined; about 450,000 tons mined by caving system; estimated loss due to caving system, not over 3 per cent. *Result*: Many lime "horses" found within supposedly solid bodies of ore, and tonnage mined was 20 per cent less than tonnage calculated.

R. C. GEMMEL.

Avalos, Zacatecas, Mexico, Sept. 22, 1903.

#### STATISTICAL WORK OF THE GOVERNMENT.

At the recent meeting of the American Mining Congress, held at Deadwood, S. D., the following resolutions relative to the collection of mineral statistics and the enlargement of the work of the Geological Survey were adopted:

"The members of the American Mining Congress realize that the mineral statistics of the country can be intelligently and accurately collected only by persons familiar with mineral and mining conditions, and they believe that the work of Government in relation to mining interests should be concentrated and strengthened, and not weakened by the separation of its integral parts; and,

"WHEREAS, It has been proposed that the President of the United States, acting under the authority recently conferred upon him by Congress, should remove from the Geological Survey the work of

\*This was discussed in the original articles on sampling, in our issue of March 27, 1903.

collecting the mineral statistics of the country and transfer the same to the newly established Department of Commerce; it is, therefore,

"Resolved, That the American Mining Congress respectfully petitions the President that he permit the collection of mineral statistics to remain a part of the Geological Survey; and, further,

"Resolved, That this Mining Congress asks the President to use his influence in behalf of strengthening and enlarging the work of this branch of the Government service to the end that it may the more fully meet the various needs of our rapidly growing and complex mining industry."

#### PROGRAM OF THE MEETING OF THE AMERICAN INSTITUTE OF MINING ENGINEERS, NEW YORK, OCTOBER 13-17, 1903.

TUESDAY, OCTOBER 13.

4 P. M.—Headquarters open at Murray Hill Hotel.

8 P. M.—Opening session in the hall of the Board of Education, Park avenue and Fifty-ninth street. The session will be opened by the chairman of the local committee, who will introduce the Hon. Seth Low, Mayor of the city of New York, who will welcome the members of the Institute to the city. President Albert R. Ledoux will respond for the Institute.

Biographical notices of the following members, lately deceased, will be presented in oral abstract: J. Peter Lesley, honorary member, by Benjamin S. Lyman, Philadelphia; William E. Dodge, by James Douglas, New York city; Theodore D. Rand, late treasurer of the Institute, by Thomas M. Drown, president of Lehigh University; George S. Morison, by Leonard Waldo, New York city.

WEDNESDAY, OCTOBER 14.

10 A. M.—Session in Schermerhorn Hall, Room 305, Columbia University, and inspection of the university buildings. The university may be reached by the Sixth Avenue Trolley Line (Amsterdam Avenue Cars), or by the Sixth Avenue Elevated to 110th street, walking thence by the New Episcopal Cathedral of St. John the Divine. Luncheon will be served at 1:30.

2:30 P. M.—Session in Schermerhorn Hall, Columbia University. No session Wednesday evening.

THURSDAY, OCTOBER 15.

10 A. M.—Session in the hall of the Society of Mechanical Engineers, 12 West Thirty-first street. Luncheon will be served at 12:30.

Afternoon.—Optional trips to metallurgical plants in the vicinity of New York. The following establishments have very kindly opened their works for the inspection of members: American Smelting and Refining Company, Orford Copper Works, Nichols Chemical Company and Balbach Smelting and Refining Company. Members will be kind enough to give notice of their intention to visit these works, when detailed information will be furnished. Those members who prefer may visit the new Chamber of Commerce, 65 Liberty Street, through the courtesy of the president, Mr. Morris K. Jesup; also the new Stock Exchange, by invitation, and caissons under construction, as foundations for large buildings by Mr. John F. O'Rourke.

9 P. M.—Reception and dance at Sherry's, Forty-fourth street and Fifth avenue.

FRIDAY, OCTOBER 16.

10 A. M.—Inspection of New York Rapid Transit subway. Members will please meet at the Murray Hill Hotel promptly at hour designated. Mr. W. Barclay Parsons, chief engineer, will be introduced by Mr. Benjamin B. Lawrence. Visit to the subway, between Forty-second street and Thirty-fourth street; also, if desired by those especially interested, the deeper tunnel workings on the McCabe contract, at 186th street. Through the courtesy of the Engineers' Club, 374 Fifth avenue, a light luncheon will be served to those members who find it convenient to be there.

1:45 P. M.—From Hudson Day Line pier, foot of

West Twenty-second street, trip by water around Manhattan Island. The committee has accepted the courtesy of the Department of Docks and Ferries, the Street Cleaning Department, and the Cornell Steamboat Company, who have placed the boats at its disposal. Return to West Twenty-second street about 6 p. m.

8 P. M.—Session at the American Museum of Natural History, Seventy-eighth street and Central Park West. Mr. George F. Kunz and Mr. Charles Baskerville will contribute a paper on the Roentgen ray and radium, and will exhibit specimens of radium and radium compounds. View of collections and informal reception.

SATURDAY, OCTOBER 17.

Visit to West Point by regular Hudson River Day Line steamer, leaving (from Brooklyn by Annex at 8 a. m.) foot of Desbrosses street, 8.40 a. m.; West Twenty-second street, 9 a. m., and West 129th street, 9.20 a. m. A light collation will be served, weather permitting, on hurricane deck, forward, at 11 a. m. Steamer due at West Point 11.50 a. m.

The party will be taken by stages to Memorial Hall where Colonel Albert L. Mills, Commandant of West Point, will receive the members and guests and detail officers to show them about the various buildings and points of interest. There will be a review and inspection of the battalion of cadets at 2 P. M., which will be terminated in time for those desiring to return by the down day boat leaving West Point dock at 3 P. M. to do so. During the afternoon luncheon will be served to the members of the Institute in the dining room on the main deck, aft.

Those who prefer to remain at West Point to see the football game between Harvard and West Point will find a special car on the first West Shore train that leaves West Point station after the completion of the game. The committee has reserved the car, but each member returning to New York by rail will be expected to pay his own railroad fare.

#### WHAT CONSTITUTES A SLIME?

By W. J. SHARWOOD.

The purpose of this article is to call attention to some of the definitions which have been suggested for the word slime, as applied to certain classes of tailings or crushed ore, in connection with lixiviation and concentration processes. Its application to such material as the "anode mud" of electrolytic refineries, or the "cyanide slime" resulting from acid treatment of zinc precipitates, is not here considered.

The earliest English definition which I have been able to find is in "An Explanation of the Cornu-technical Terms and Idioms of Timmers," forming an appendix to "Mineralogia Cornubiensis," published in London in 1778 by William Pryce of Redruth, Cornwall, and is as follows:

*Slime*.—Ore or Slime Tin; the pulverized Mineral mixed with water in the state of Slime or Mud, or the superfine particles of Ores, which are carried down by the water in stamping ore dressing until they settle in a pit of water called the Slime-Pit. In order to recover the Ore in this Slime, they dress it in a frame, whereby they wash off Sludge earth and save the Ore." No definition of Sludge earth is given.

Agricola in "De Re Metallica," 1553, mentions the old German *Schlam* or slime as being equivalent to the Latin *limus* or mud.

*Webster's Dictionary*, 1882 edition, gives the following derived from Pryce's book: "Slime (Mining) Mud containing metallic ore obtained in the preliminary dressing."

*Standard Dictionary*, 1896, says: "Slime (Metallurgy). A mud-like substance formed of ore in an almost impalpable powder, mixed with water (usually plural)."

*Century Dictionary*, 1897, says: "Slime (Metallurgy). Ore reduced to a very fine powder and held in suspension in water, so as to form a kind of thin ore-mud; generally used in the plural. In the slimes

this ore is in a state of almost impalpable powder, so that it requires a very long time for settling."

In reference to etymology these dictionaries mention the term *slime* as being equivalent to the modern German *Schlamm*, and to various words of similar sound in Northern European languages, all related to the Latin *limus* or *slimus*, and generally meaning mud.

*The Coal and Metal Miners' Pocket Book*, 1900, gives in a glossary: "*Slime, Sludge* (1) The pulp or fine mud from a mill or from a drill hole. (2) Silt containing a very fine ore, which passes off in the water from the jigs."

The next following definitions are from standard works on the cyanide process.

W. Feldtmann, "*Notes on the Cyanide Process*," Johannesburg, 1894: "The very fine, or in the case of free milling ores the clayey, portion of the tailings."

M. Eissler, "*The Cyanide Process*," 1896: "The very fine particles of talcose and clayey material, mixed with the very fine grains of quartz, iron oxides and sulphides."

F. L. Bosqui: "*Practical Notes on the Cyanide Process*," 1899, says: "By the term slimes we mean the finely divided clayey residues which settle in a tailings reservoir, at points furthest from the tailings sluice discharge, and pack in the form of dense adhesive layers. Pulverized slimes, with no admixture of coarser material, are practically impervious to cyanide liquors."

Charles Butters, *Eng. and Mining Jour.*, Oct. 8, 1892: "The very finely divided material produced during the crushing, which has a tendency to accumulate in pasty masses."

A. James, "*Cyanide Practice*," London, 1901, speaks of slimes as the finer and almost impermeable products of the mill," and says further: "The portions of the tailings dump farthest from the intake yield a mass of matter practically untreatable by the percolation process. . . . In Western Australia and other districts even coarsely ground dry-crushed ores may contain so great a proportion of clayey calcareous slimes as to impede percolation."

The subject was discussed several years ago before the Chemical and Metallurgical Society of South Africa, and the following definitions are among those proposed by various members, and are to be found in the first volume of the *Proceedings* of that society, the 1898 volume of its *Journal*, and other published reports of its meetings.

J. R. Williams: "The clayey portion of the ore, mixed with fine sands."

A. Von Gernet: "The unleachable portion of the battery pulp."

Dr. J. Loevy: "That portion of the crushed ore which, owing to its physical condition (consisting as it does chiefly of silica and clay) is an unleachable product."

W. A. Caldecott: "That portion of the crushed ore which, owing to its finely divided condition, is non-leachable, and from which no leachable product can be separated."

W. Bettel suggested that the term be confined to "particles under one one-hundredth millimeter in diameter, that is, under one twenty-five-hundredth of an inch in diameter."

More recently Mr. Clement Dixon (*Jour. Chem. & Met. Soc. of S. Africa*, June, 1903), says: "As yet we have not arrived at any decision as to what really are slimes."

From its derivation and from Pryce's definition it is evident that the term was restricted originally to material passing from metallurgical works in a "superfine" or nearly impalpable state of division, and in a wet condition. This usage has been modified to extend it to almost any class of tailings, as for instance the relatively coarse middlings passing from the jigs of zinc mines. At the present time the tendency, in connection with lixiviation processes, is to confine it to finely divided products, wet or dry, which are nearly impermeable to solutions, and which settle very slowly in water. Both of these properties affect the work of the cyanide metallurgist; the lat-

ter specially concerns those who are concentrating ores of copper, tin or gold. The non-leachable quality is characteristic, but even non-leachable tailings may contain a considerable proportion of fairly coarse sand mixed with the true slime. Similarly it one classifies tailings by sizing through wire sieves—for instance crushed ore passing a sieve of 200 meshes per linear inch, which is as fine as can be practically used—will often contain fully half its weight of freely leachable sand. This latter point has been strikingly brought out in the description of the classification of the Homestake tailings by C. W. Merrill (*Trans. Am. Inst. M. E.*, 1903, and *Eng. & Min. Jour.*, Mar. 7, 1903), who calls attention to the distinction between "angular" or granular and "amorphous" particles, the former yielding a leachable product even when in an exceedingly fine state of comminution, the latter forming a flocculent slime.

A complete and exact definition must take into account all these points: (1) The fact that the slime is a product of some process—some crushing or pulverizing treatment of ore or gangue; (2) the relative state of division or impalpable character of this substance; (3) its non-leachable or its slow-setting character. It should refer to physical conditions only, and not be restricted by chemical or mineralogical composition. A definition based on the exact dimensions of slime particles cannot be accepted, as these do not admit of determination by readily applicable methods. It seems preferable to omit any reference to the wet or dry condition; the material may be "in suspension," a "thin mud," or in a plastic or even leather-like condition, while admittedly remaining a slime, and there seems to be no reason why any particular limit should be placed on the degree of drying, at which it should cease to be a slime; in fact, the term "dry slime" is now frequently used in technical literature, while the word sludge is sometimes applied to a slime-pulp or semi-liquid mixture of slime with water.

Of the above-quoted definitions the one which seems most in accordance with the generally accepted modern usage among cyanide metallurgists is that of W. A. Caldecott: "That portion of the crushed ore which, owing to its finely divided condition, is not leachable, and from which no leachable product can be separated." It must be admitted, however, that the final clause is not applicable to all the material commonly classed as slime.

**MANUFACTURE OF STEEL IN THE ELECTRIC FURNACE.**—Up to date nine methods of making steel with the aid of the electric furnace have been described. These are the methods of Gil-Leleux, Stassano, Kjellin, Gysinge, Froges-Heroult, Keller, Harmet, Schneider, Ruthenburg and Conley. Among the best known of these is Stassano's method. Recent tests of the latter have shown that Stassano has succeeded in making high grade iron, with a carbon content of less than 0.2 per cent, directly from ore. He has used the very pure iron ore found in Northern Italy. The heating of the charge in Stassano's furnace is effected by the radiation from a powerful arc. The furnace is operated at about 170 volts, with an alternating current of about 2,000 amperes. After the furnace has been some time in operation, and has attained a constant temperature, the length of the arc is about 1 meter long, operating with a loud crackling sound.

The process of manufacturing Portland cement was discovered by a Yorkshire brick-maker and first patented in 1824. The new material attracted little attention at first and many years elapsed before its value was generally recognized.

Superphosphate of lime and acid phosphate of lime are commonly used as synonymous terms in this country. The former, however, is the product of the reaction of phosphoric acid upon tri-basic calcium phosphate, while acid phosphate is made from tri-basic phosphate and sulphuric acid.



### THE QUICKSILVER DEPOSITS OF OREGON.

By W. B. DENNIS.

The continuing steady decrease in the world's production of quicksilver, in face of increased demand and higher prices, is significant. The United States and Spain, from which countries the bulk of the world's supply has been obtained for the last fifty years, have shown, with slight variations, a persistent decline in production since 1899.

During the past few years, under the stimulating influence of prevailing higher prices, many new mines and prospects have been opened in various parts of the world. Some of these have become productive. But the increase from this source has not been sufficient to offset the steady decline of the old mines, and, excepting for a slight increase shown in 1902 over the previous year, the world's record of a constantly diminishing production of the metal remains unbroken.

constantly growing sources of trade to dealers in the metal; nor is the consumption in the manufacture of vermilion paint, carried on chiefly in China and England, likely soon to diminish. Its use for this purpose is almost as old as history itself, for even centuries of experience and constant scientific experimenting, howsoever actuated by the commercial instinct of later years, have been unable to discover a cheaper substitute. In the paint of commerce, such adulterations as red lead, chrome red, and gypsum are used, but they are easily detected and invariably vitiate the brilliant vermilion and rich carmine colors produced by the mercurial paints.

The price of quicksilver is controlled by the London market, which in turn is dominated by the Rothschilds whose house has controlled the product of the Spanish mines since 1836. At these ancient mines, owned by the government of Spain and situated on the northern flank of the Sierra Morena mountains in the province of Ciudad Real, owing to

it longer than its influence would aid them in securing the desired permanent concessions from the Spanish government, there is every reason to believe that the price of quicksilver will materially advance in the near future, unless some new fields of great extent and richness should be discovered, which does not seem probable.

The bulk of the quicksilver produced in the United States is handled by an association of the leading mine owners of California known as the Eureka Company, of San Francisco, and commonly spoken of as the quicksilver trust. This concern operates under an amicable agreement with the Rothschilds, whereby the world's market for the metal is divided, each company being limited to certain prescribed countries. Thus all competition between the two large concerns handling the quicksilver product of the world, is eliminated. But since the demand is greater than the supply, the smaller independent producers profit by the compact between the two leading concerns. Their output being eagerly sought by outside dealers, they are generally able to get a little better than the prevailing trust prices.

For more than fifty years California has held practically a monopoly of the American production of quicksilver, very little having been produced outside of that State. During the last few years, however, under the stimulant of increasing demand and higher prices, explorations have been extended beyond the borders of the State, with the result that discoveries of importance have been made in Texas at the south and Oregon at the north. In 1901 Texas produced 2,935 flasks of quicksilver, as compared to 5,252 flasks in 1902, but as the persistence of these deposits is regarded with misgiving, the future of the industry in America would appear to lie with the northern extension of the California belt into the neighboring State of Oregon, where the geological conditions appear to be especially favorable.

As far back as 1888, when very little was known of the Oregon deposits, the eminent geologist, Mr. Geo. F. Becker, recognized that the quicksilver belt of California, which has brought over \$88,000,000 of wealth into that State, extended far north into the State of Oregon, and that the volcanic phenomena with which the cinnabar ores of California are so closely related, as well as the associated chemical conditions leading to the deposition of cinnabar, had been repeated in the Cascade Mountains of Oregon, which mountains Mr. Becker regarded as merely a continuation of the Sierra Nevada and Coast Range of California after they come together. In his monograph upon the quicksilver deposits of the Pacific Slope, published by the United States Geological Survey, Mr. Becker says: "The entire belt of country from the mines of Douglas county (Oregon) to Santa Barbara county (California) is thus structurally continuous. In a broad sense the entire zone, six hundred miles in length, may be considered as a quicksilver belt."

Although for many years cinnabar deposits have been known to exist in a number of localities in the western portion of the State, Oregon has been slow to recognize their commercial possibilities and until the past four years comparatively little attention had been paid to them, and even up to the present time only one cinnabar property in the state has been developed to any considerable extent.

The existence of cinnabar in Oregon first became known through the pioneer placer miners of the auriferous gravel deposits of Jackson county. The heavy purple-red sand which settled in their sluice-boxes, clogged the riffles and interfered with amalgamation, was a source of great annoyance. When it became known that the "red sand" was cinnabar, the ore of mercury, that necessary metal for which the miners of the then isolated district were paying upwards of two dollars per pound, several attempts were made to recover the mercury by distillation in common gold retorts, and more than one instance is reported of miners who were thus able to distill sufficient mercury for their own use. In operations of



OUTCROP OF QUICKSILVER ORES AT BLACK BUTTE, OREGON.

During the later part of 1902 the visible supply of quicksilver in New York and San Francisco touched the lowest point in the history of quicksilver for the last twenty-five years. On several recent occasions New York dealers in the metal were forced to the expediency of borrowing quicksilver from their larger customers in order to supply the demand of the smaller consumers.

Numerous attempts have been made to find a substitute for mercury in some of its uses, but so far without success. In the meantime the demand for the metal is constantly increasing. This demand comes chiefly from its metallurgical use in recovering gold and silver in ores and placer gravels. With a continuance of the present rate of expansion in these branches of mining in nearly every part of the world, it will be a matter of only a short time when the present producers of quicksilver will be unable to keep up with the consumption. A continually increasing demand comes also from the arts and sciences. New uses for the metal are being constantly found. Its application to numerous electrolytic processes, including the manufacture of caustic soda and chlorine, is only the beginning of a use likely to undergo further expansion. The employment of mercury in the manufacture of electrical machinery is one of the

great richness of the ore and cheap labor, quicksilver is produced cheaper, per unit of mercury, than in any other mining region. This fact, together with a favorable contract with the Spanish government, has enabled the Rothschilds to control the world's market price of the metal. It is said, however, that this ancient contract came to an end some time during the late Spanish-American War, and that, by offering large monetary advances in that hour of Spain's extremity, the Rothschilds secured a temporary renewal, but that the ratification of a permanent contract, for which negotiations have ever since been pending, still remains a matter of uncertainty. Whether this explains the attitude of the Rothschilds toward the market, or as to the authenticity of the story, the writer cannot undertake to say, but at any rate, at a time when growing scarcity of supply and constantly increasing demand would seem, by the ordinary laws of commerce, to justify a material advance in price, the Rothschilds have insistently maintained a bearish attitude toward the market, and, to enable them to sustain this position, they have been making a strenuous effort for the past eighteen months to force the output of the Spanish mines beyond their normal capacity. Since it is not likely that this condition can be long maintained, nor would it be to the interests of the Rothschilds to maintain

the present day many gravel miners of southern Oregon find cinnabar in their riffles, although no attempt is being made to save it.

About thirty-five years ago cinnabar was discovered near the head of Little Applegate river on the northwest slope of Siskiyou peak, in the southern part of Jackson county. In 1871 a man by the name of Mullen constructed a crude furnace and attempted, in a primitive way, to reduce the surface ores. For a short period he succeeded in supplying the local demand of the placer miners, but the escape of mercurial fumes from his rudely constructed furnace soon salivated his men, and the project was abandoned. In 1899 these claims were re-located, and in 1901 the property was acquired by a Montana company, which has since done considerable development work, resulting in the opening up of a promising property. Other claims have been located in the same locality, and are being developed.

The cinnabar of this district occurs in very fine crystals saturating a gangue of granular calcite; the veins have nearly a north and south strike and dip at an angle of about 48° west. They lie in near proximity to the granite on the east. The foot-wall is a much decomposed arcose sandstone; the hanging wall is a dark massive serpentine passing over into carbonaceous shales and slates a short distance from the veins. The shales are serpentinitoid. Some of the veins of the district have a comparatively thin casing on the hanging-wall, consisting of dark colored crushed country rock, familiarly known among the Mexican miners of California as *alta*. In general the geological structure of the district differs in but few particulars from the conditions found at many of the quicksilver mines of California.

Further northward cinnabar is again encountered in the region of Evans creek, a tributary of the Rogue river, about twenty miles northeast of the town of Gold Hill, a station on the Oregon and California Railroad. Croppings of cinnabar appear at intervals for a distance of some six miles stretching from the Meadows to Ramsey Cañon; the belt appears to be about three-quarters of a mile wide. Within this belt four prospects have been opened to some extent; two of these make a fair showing, but sufficient work has not been done to demonstrate the extent of the deposits. Here similar geological conditions exist to that described in the Applegate district, excepting the gradual disappearance of the serpentine which trends toward the northwest, while the cinnabar deposits appear to be following a diverging line toward the northeast.

On Calapooia creek in Douglas county, where the next cinnabar deposits to the north are encountered, the serpentine has wholly disappeared, and it is not encountered again at any of the quicksilver deposits further north. In this locality, eight miles east of the town of Oakland, two quicksilver mines, known as the Bonanza and Nonpareil, were opened some years ago. At one of these a small furnace was built, but as the furnace was in advance of development work, after a short period of operation and the production of a few flasks of quicksilver, the usual inevitable failure followed, since which time the discouraged owners have never attempted to re-open the property.

Twelve miles north of the Bonanza and Nonpareil in the extreme northern part of Douglas county, on a branch of Elk creek, is located the Elkhead mine. This property is credited with having produced about \$30,000 gross value of quicksilver. Some fifteen years ago surface ore was quarried from a large pit on the top of a low hill and treated in a coarse ore furnace. Subsequently the property fell into the hands of new owners and in 1895 a 10-ton Scott continuous furnace was built. This was operated for a short time on the screenings of the old coarse ore furnace. The death of the principal owner and the lack of ore reserves caused the mine to be shut down. It has remained idle ever since.

In the present workings of this property two veins

are disclosed. These veins have nearly the same strike but opposite and converging dips. The main vein dips to the south at an angle of about 80°, while the lesser veins dip to the north at an angle of only 20° from the horizontal. To reach the level of intersection of these two veins would require a vertical shaft about 500 ft. deep.

In an air-line four miles east of the Elkhead mine, in the southern part of Lane county, lies the Black Butte quicksilver district. Since the development work in this district has been quite extensive it will be described later in a separate paragraph.

prospecting of any kind difficult, slow, and uninviting.

The Black Butte quicksilver district is about four miles long and two miles wide, and lies on the northern slope of the Calapooia mountains near the head of the Coast fork of the Willamette river, in the southern part of Lane county. The elevation at the apex of Black Butte mountain, the highest peak in the district, is 2,750 ft. above sea level.

The entire district is owned by two companies. A private company of Portland, Oregon, controls about one thousand acres, including the Bald Butte and



LODE CROPPINGS AT BLACK BUTTE, OREGON.

All of the above described cinnabar deposits are located on the westerly slope of the Cascade range.

Recently, however, a discovery of cinnabar was made on the east slope of the range, about thirty miles from the town of Prineville, in Crook county. Some good ore from this section has been exhibited. A number of claims have been located and one of the properties recently passed into the hands of a company with sufficient capital for its development.

So far as the writer knows, no cinnabar has been discovered in the Coast Range in Oregon, although he has seen some specimens of rich ore said to have come from the region of the Sixe river in Coos county. The Coast Range, however, has not been prospected for cinnabar. In fact, very little prospecting for the mineral has been done in any part of Oregon. The dense growth of timber and underbrush covering the entire mountain region, renders

Cinnabar Butte mines. The Black Butte Quicksilver Company, a Washington State corporation, together with its allied interests, controls practically the balance of the district. Some five years ago this corporation acquired the mine. A Scott continuous furnace, having a capacity of 50 tons per diem, was installed, together with other surface improvements. Subsequently the control of the corporation passed into new hands under whose management over twelve thousand feet of underground work has been accomplished.

The Black Butte mine is admirably placed for economic mining. Situated at a moderate altitude, mining operations both above and below ground are unhindered throughout the year; an ample supply of water, abundance of water power, unlimited timber for fuel, wide veins and soft rock, are some among the favorable factors. The erosions that left Black



Butte mountain standing abruptly 1,750 ft. above the valley at its base have made it possible to reach the veins of its fissure system to a depth of 1,600 ft. by comparatively short adits, thus affording natural drainage and the opportunity for gravity haulage of the ore. Over 2,000 ft. of 'backs,' on the dip of the main vein, may thus be explored at minimum cost, before it will become necessary to install any pumping or hoisting machinery. It would seem that nature has afforded every possible facility for cheap production. The average cost of quicksilver ore mined and treated in California, as shown by the published reports of the principal mining companies, ranges from \$3 to \$4.80 per ton; the average cost of production at the Black Butte mine has been \$1.40 per ton. These figures include all charges of every kind, such as mining, transport of ore, treatment, flasks, and delivery of the marketable metal at the railway station, excepting pro rata charges for development work, interest on capital invested and deterioration of plant. The management estimates that with increased furnace capacity and facilities for handling the ore on a large scale the above production cost can be appreciably reduced.

The conspicuous geological feature of the Black Butte district is the immense vein of cinnabar-bearing volcanic breccia which apexes along the ridge of Black Butte mountain and is exposed by its outcrop for a continuous distance of over 7,500 ft. The average strike is S. 70° E., and the average dip 57°. A remarkable outcrop of ore crowns the summit of the mountain, huge boulders, massive columns; and gigantic cliffs of cinnabar-bearing rock, furnishing an immense tonnage susceptible to open-cut quarrying.

In main geological features, general structure, occurrence of the ore in association with the volcanic phenomena, etc., the Black Butte quicksilver deposits do not differ materially from the quicksilver deposits of California, except perhaps in the noticeable absence of the serpentine rocks with which a majority of the California deposits are more or less closely associated. In common with all other mercurial deposits of commercial value, the Black Butte ores consist mainly of the red sulphide of mercury, known as cinnabar, although the black sulphide (meta-cinnabar) and a little native mercury have also been encountered.

The main fissure of Black Butte mountain is 400 ft. wide. This entire width is cinnabar-bearing. The richest ores, however, occur along several partition walls within this mass of lode matter. While for the most part this partition forms the footwall of the ore, yet the occasional occurrence of the ore underneath it, and again on both sides, has necessitated frequent cross-cutting. The richer ores along this wall furnish stoping widths ranging from seven to twenty feet in addition to a very wide adjacent area of lower grade ore which will come in for treatment under the system of averaging a large tonnage.

Besides the main fissure three others of importance have been discovered on the property and opened up sufficiently to insure a large supply of ore. Two of these have a parallel strike of S. 20° E., but dip in opposite directions. Openings on these veins have been made at a depth of 1,300 and 1,600 ft. respectively, below the apex of the mountain. While these openings are, topographically speaking, near the present surface, geologically they must be regarded as affording evidence of the depth of the deposit since the present cañons which have exposed these veins are unmistakably due to the direct process of erosion. The openings described may therefore be regarded, in mine practice, as deep levels upon the deposit, and the presence of cinnabar at these exposures must be regarded as indicating that the hydro-thermal solutions, from which the mercuric sulphides of this region were undoubtedly precipitated, began the process of deposition at a level below the present exposures.

The frequent occurrence of exceedingly rich ores, assaying from 40 to 70 per cent mercury, led the early exploiters of the Black Butte mine to expect

the immediate discovery of great bonanzas such as were encountered some years ago at New Idria and New Almaden, but, while similar ore-bodies may be found, none have been encountered as yet, and the present management has confined its attention to the development of the immense masses of average and lower-grade ores. In spite of the exceedingly rich ores which the Black Butte mine produces, a conservative estimate of the district from a commercial standpoint, so far as present development shows, must deal with the question of handling large masses of ore of average low grade, calling for extensive reduction works, modern appliances, and general operations on a large scale, for which local conditions are peculiarly favorable.

PIPE LINE CONSTRUCTION.

There are said to be approximately 25,000 miles of pipe line laid for the conveyance of natural gas in the United States. These are of various sizes, ranging from 2 in. in diameter up to 36 in. For the transportation of large quantities of gas, or even comparatively small quantities when the line is a long one and pumping is not resorted to, the pipes have to be of considerable diameter. Thus the transportation of 4,000,000 cu. ft. of gas per 24 hours (166,667 ft. per hour) a distance of 20 miles, with intake pressure of 200 lb. and discharge of 20 lb., requires a 6-in. pipe. Reckoning 25,000 cu. ft. of gas as equivalent to 2,000 lb. of coal 4,000,000 cu. ft. of gas per 24 hours corresponds to only 160 tons of coal. The construction of a 6-in. line will probably cost about \$4,750 per mile, or \$95,000 for 20 miles. Allowing only 10 per cent for interest and depreciation, the daily charge is  $\$9,500 \div 365 = \$26$ , which would be equivalent to paying for the carriage of coal at 0.8c. per ton-mile. When the intake pressure, i. e., the pressure at the gas wells, falls below 200 lb., either a pumping plant must be put in or a larger line must be put down. Remoteness from sources of the gas therefore increases the cost of the latter very rapidly. The construction of a pipe line of large diameter is an expensive undertaking, the larger sizes exceeding in cost that of a first-class railway line.

Pipe lines for the transportation of natural gas are commonly constructed of wrought iron pipe, technically known as "line pipe," which is tested up to 1,500 lb. Line pipe is made with longer couplings than ordinary pipe. The standard sizes range from 2 in. to 12 in. diameter. The smaller pipe lines, say 10 in. in diameter or less, are usually laid with the standard, screw-joint line pipe, but lately plain-end pipe with couplings and rubber packing has become very popular, and is to a large extent taking the place of screw-joint pipe, it being equally cheap in first cost and more readily laid. The pipe line should be buried under ground, so that the distance from the surface of the ground to the top of the pipe will be 18 to 20 in. This puts the line out of the way and makes it comparatively free from the expansive and contractive force to which it would be subject if it were exposed on the surface of the ground to the direct heat of the sun. The ditching is not very ex-

required. A well-laid pipe line suffers comparatively little depreciation in value, and the pipe, after having been in the ground for four or five years, may be taken up and sold at a discount of only 15 to 25 per cent from the first cost, according to the demand at the time. Second-hand pipe in large quantity is always more or less in request.

Sizes of pipe from 10 in. to 2 ft. in diameter are frequently laid with the Converse joint, in connection with which the pipe has plain ends, the connections being made by heavy cast-iron sleeves, or hubs, fitted with molten lead, which is calked into the space between the pipe and the sleeve. This joint has the disadvantage that the packing may be loosened by the settling of the pipe and the movement due to changes in temperature. However, by the addition of a rubber packing pressed against the outside of the joint by means of iron clamps, a satisfactory connection can be made. Pipe lines of this construction have operated under a pressure of more than 300 lb. per square inch. For pipe lines of more than 2 ft. diameter, cast iron water pipe or riveted steel pipe are put down. A line of riveted steel pipe, 36 in. diameter, extending 20 miles southward from Pittsburg, Pa., cost approximately \$50,000 per mile. At present, Pittsburg is receiving gas from points in West Virginia more than 100 miles distant, while the lines which supply Chicago, Toledo and Cleveland are considerably longer, the gas in some cases being conducted 200 miles.

THE CERMAK-SPIREK FURNACE.

By ARTHUR A. FRANCIS.

A Cermak-Spirek furnace was installed at Ponte di Nossa by the English Crown Spelter Co., Ltd., in 1901, for the calcination of calamine. Certain modifications from the furnace of this type used elsewhere for the distillation of quicksilver ore were found necessary. The furnace as first erected at Ponte di Nossa had insufficient grate area. By converting what were originally two small grates into one large one, traversing the entire furnace, and fitting a water-bath below it, the difficulty was obviated. The furnace has now been practically in continuous operation for 18 months with successful results. The ores which have to be calcined are argillaceous fines from the mines and concentrates from the dressing works. The former assay from 29 to 32 per cent zinc; the latter from 31 to 35 per cent; the general average of the ore calcined up to date is about 33.2 per cent. The maximum size of the ore is 35 mm. After working a short time on the argillaceous fines, it was found that their moist condition necessitated considerable hand labor to cause the ore to descend between the spaces of the first row of shelves, which also proved detrimental to the shelves (fire clay) themselves. This difficulty was overcome by a preliminary drying of the ore by means of the waste gases from the furnace. The ore remains in the furnace from 24 to 27 hours.

The actual results of the furnace from August, 1901, to the end of January, 1903, are summarized in the following table:

Date.	Input = 1,000 K tons.	Zinc, per cent raw.	Output = 1,000 K tons.	Zinc, per cent calcined.	Coal = 1,000 K tons.	Total cost of calcining, including loading, Lire.	Cost per ton calcined, Lire.	Percentage of coal used (compared with)	
								Input.	Output.
Aug., 1901, to Jan., 1902...	1430.200	...	1168.840	40.50	124.864	6477.05	5.54	8.73	10.68
Feb., 1902, to July, 1902...	1487.700	33.39	1240.800	42.14	120.150	6699.65	5.39	8.08	9.68
Aug., 1902, to Jan., 1903...	1525.800	33.04	1263.500	42.00	113.700	5917.45	4.68	7.45	8.99
Totals .....	4443.700	33.21	3673.140	41.84	358.714	19094.15	5.19	8.07	9.76

pensive; in ordinary soil it ought not to cost much more than 6c. per lineal foot. The pipe should be well protected with coal tar on the outside before laying. Expansion joints should be put in from time to time, say at one-half mile intervals, and also a certain number of gate-valves and tees to permit connections to be made at points where they may be

It will be observed that the furnace shows a continuous improvement in operation, with the result that the ratio of coal used per ton of ore charged has reached the low figure of 7 per cent. The costs given in the table are calculated on the basis of coal at 34.5 francs per ton. The company is now erecting a second furnace of the same type.



## CYANIDE TREATMENT OF SANDS.\*

By H. S. DENNY.

As a general statement, it may be said that the cyanide process upon the Witwatersrand is principally confined to the treatment of what is designated as sands, after classification always from slimes and, in a few isolated cases, from "sulphurets." The average amount of sands so classified is in the neighborhood of 70 per cent., the balance consisting of slimes and, where concentration is employed, of slimes and sulphurets.

Leaving the question of concentration out of consideration for the moment, the general practice is to pass the ore, after being crushed to about 25-mesh, over amalgamated copper plates. The pulp is then lifted, ordinarily by means of a tailings wheel, to a point where it is introduced into one of a series of spitzkasten, the overflow from which carries off the bulk of the water and 30 per cent of the crushed ore consisting of slimes. This overflow is then either passed through a slimes plant, or, in the majority of cases, simply led into settling pits, where the slime is allowed to accumulate and the overflow water is returned to the mill-reservoir.

The bottom discharge from the spitzkasten is so arranged that its product may be conveyed into one of several vats, where it is settled either by means of an automatic distributor, or a hand-hose arrangement. In some cases fresh water is supplied at the point of discharge at the bottom of the spitzkasten in order to avoid the possibility of slimes going through with the sands, but this is not generally considered necessary.

One form of automatic distributor is the well-known Butters distributor. Most mining men, however, prefer the hand-hose distributor, which is generally operated by a native, who carries the hose to different points in the vat and regulates the overflow discharge in each vat so that it leaves at the furthest possible point from where he has deposited the sands. With the Butters distributor the vat is in some cases first filled with water and a series of pipes, automatically rotated by the force of the coming pulp, divides the stream into several channels and deposits it at various annular distances from the center. One objection to this method is that if for any reason the incoming flow is stopped there is a settlement of slime with the sands which prejudicially affects the subsequent leaching operations; where the side discharge is adopted, it is claimed that this objection is overcome. A good settlement is one which leaves a deposit of clean sand entirely free from slime and which loses no sand in the operation. The settling tanks are supplied with filter-beds by means of which the sands are thoroughly drained.

From the settling-vats—which in some cases are superimposed above the treatment vats, while in others they are placed on the same level—the sands are removed through the discharge doors by hand-labor, and put into the treatment tanks. The treatment vats are supplied with filter-beds, beneath which are two or three outlets connecting with mains running to the extractor-boxes. Through these mains the strong, medium and weak solutions, or strong and weak solutions, if only two mains are used, are conducted to the zinc separator-boxes, where there is provision for conducting the solution coming from any one main to any extractor-box desired. The connections between the outlets from the vats and the mains are so arranged that the flow of solution from any one vat may be regulated to the various boxes at will. The solution mains are provided with meters, by which the amount of solution passing through any main may be estimated, and drip samples are taken from the top of each extractor-box in order to check the amount of gold entering any one box.

The usual practice on the Witwatersrand is to give each charge of sands a six days' treatment, and the washes used are about as follows:

1. Strong solutions (0.25 per cent KCy) regulated

to drain in 24 hours, the weight of solution being about 20 per cent of that of the ore. The charge is then allowed to stand for 12 hours.

2. This operation is repeated.

3. Washes of 0.1 per cent solution, drained dry each time and occupying two days, the proportion of solution to ore being in the ratio of 4 to 5.

4. Washes of 0.02 per cent solution in the ratio of 1 to 10.

5. Water wash in the ratio of 1 to 10.

It has come before my notice in the past few years that after the installation of new filter-beds the value of the residues after treatment reaches its minimum point, and as the filter-beds become older the residues increase in value. Careful attention to the condition of the beds and proper cleaning will obviate any material loss in this direction, but there is no doubt that a limit is reached when it pays far better to incur the expenditure entailed in putting in new filter-beds rather than continue with the old ones.

The strength of the solution used and the time of treatment given will vary slightly with different ores, but the general practice is the same in all cases. The clean-up of the gold slimes from the extractor-boxes is at some mines conducted monthly, while at others a light clean-up is made in the first half of the month; and, personally, I favor the latter procedure, as it increases the efficiency of the boxes and enables one to estimate more accurately what the output is likely to be.

The treatment of zinc slimes is simple, the first operation being to treat it with sulphuric acid and get rid of the bulk of the zinc, the second to calcine it, and finally to melt it with suitable fluxes in clay-lined plumbago furnaces of the reverberatory type.

A new process has been introduced recently by Mr. Taverner, cyanide manager of the Bonanza mine, by which the acid treatment may or may not be used, but the subsequent operation consists of melting with lead and final cupellation, and it is claimed that a considerable saving is effected by it.\* There is no doubt that the presence of zinc in smelting gold always brings with it a tendency to carry off a portion of the gold, and, whatever the subsequent operation may be, *i. e.*, whether cupellation or direct smelting, I think the operation is benefited by a preliminary acid treatment, if it can be done economically.

The main points to be observed in cyanide practice are, first, to study the consumption of cyanide, and, by neutralizing any free acid that may be contained, to keep that consumption at its lowest point; second, to have a leachable product free from slimes, and, third, to secure a high extraction and a low residue.

The details of handling both the slimes and sands depend entirely upon the arrangement of the plant, and it is generally agreed that the superimposed settling-tanks enable the operator to work more economically than in any other design.

Attached is a drawing reflecting the outlines of a modern plant shortly to be erected on the New Goch mine. In this design there are many little improvements introduced, all of which will tend to facilitate the various operations comprising the treatment of sands. The most conspicuous feature of the cyanide plant is the installation of conveyor-belts for the handling of the residues, and it is anticipated that in this section of the work a considerable saving will be effected as against the methods of trucking in vogue to-day. It is more than probable that conveyor-belts will play a very important part in all of our handling work in the near future, and even to-day there is plenty of evidence to show that their utility will not be confined to dealing with residues or even the handling of rock on surface.

I confidently look forward to the time when the huge plants necessitated by the prolonged percolation methods in vogue to-day will give way to something very much more simple and effective, both in design and operation, and, although as elsewhere shown,

the results of our experiments on the short treatment of sands have not thus far resulted in a success that would justify too much optimism, I cannot but feel that on an ore offering to the metallurgist so few difficulties as that of the Witwatersrand, that the time is not far distant when the present difficulties will be overcome.

## SPECIFICATIONS FOR PAINTING STEEL STRUCTURAL WORK.

The painting specifications for the superstructure of the Blackwell's Island Bridge across the East River at New York, contracts for which have just been let, are of general interest to engineers. They are as follows:

All material shall be received and painted under cover; and no painting, either at the works or in the field, shall be done in wet or freezing weather. All structural steel and iron before leaving the shop must be thoroughly cleaned of all mill scale, dirt and rust, by the use of small hammers, steel scrapers and wire brushes, and of oil by the use of benzine, and must then receive one coat of red lead and boiled linseed oil. These materials must be brought to the work in their original packages and mixed in a revolving churn just before using, in the proportion of 33 lb. of dry red lead to one gallon of linseed oil.

The red lead must be strictly pure, and shall contain at least 80 per cent of true red lead (of the composition  $Pb_3O_4$ ); the total amount of lead present shall not be less than 89 per cent, of which not more than 0.1 per cent shall be present as metallic lead. The color shall be clean and pure tint. The red lead shall be of the fineness that when washed with water through a No. 19 silk bolting cloth no more than 1 per cent shall be left on the screen. The linseed oil shall be an absolutely pure boiled oil, containing no matters volatile at  $212^\circ$  F. in a current of hydrogen; it shall not contain any resin or manganese. The oil shall be perfectly clear on receipt and no deposit shall form on standing, provided the oil is kept at a temperature above  $45^\circ$  F. The film left after flowing the oil over the glass and allowing it to drain in a vertical position must be dry to the touch after 24 hours. All finished surfaces shall be coated with white lead and tallow before being shipped from the shop.

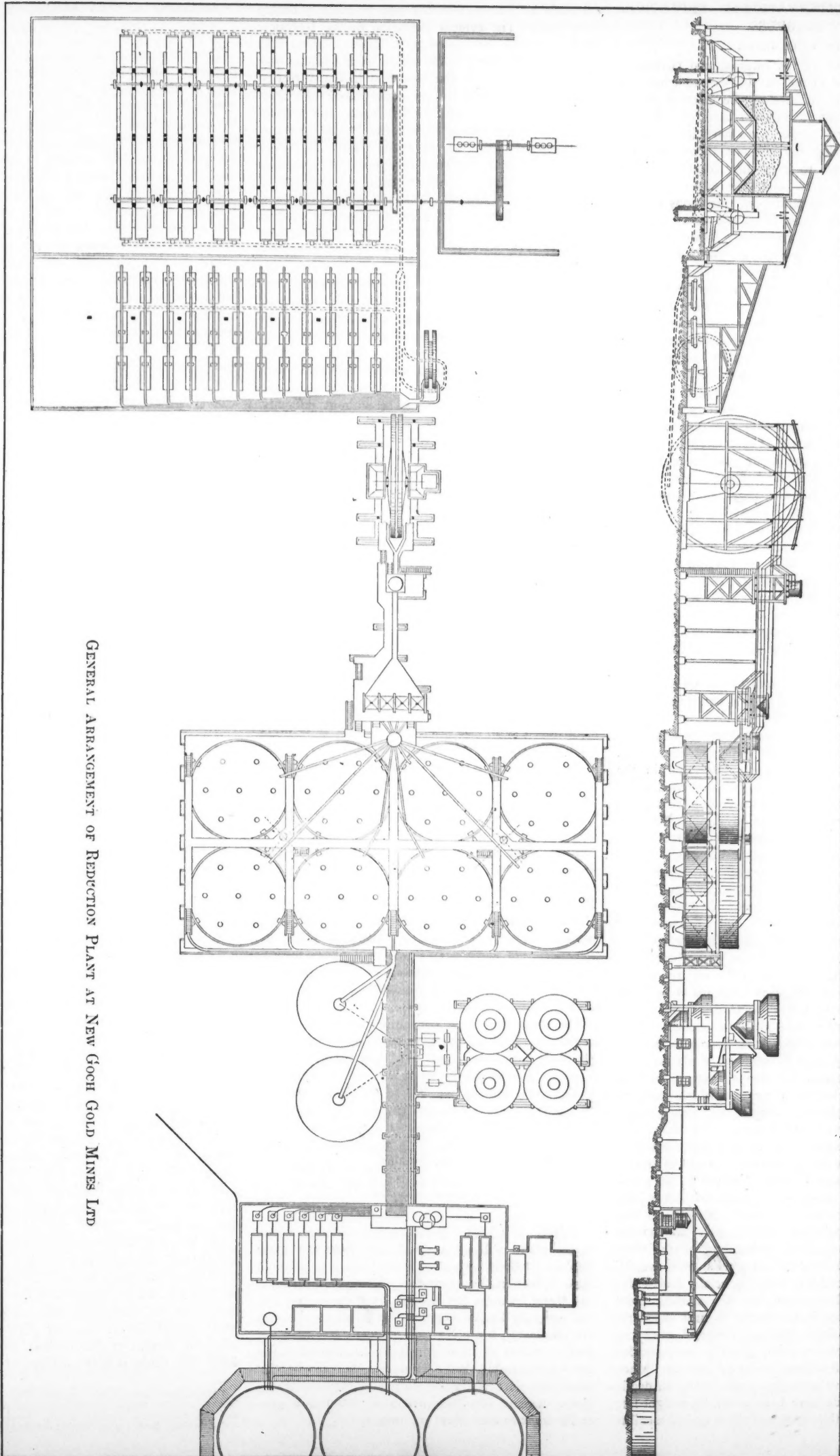
After the structure is in place all mud and dirt that may have accumulated during the erection must be removed and all abrasions in the first coat of paint must be thoroughly brushed with a stiff wire brush and such places "touched up," and all bolt heads and location marks thoroughly painted with the paint, as described, and then all the steel and iron work shall be thoroughly and evenly painted with an additional coat of red lead and boiled linseed oil, of the quality stated, mixed in a revolving churn in the proportion of 33 lb. of red lead to one gallon of oil, with the addition of  $\frac{1}{2}$ -lb. of best lamp black (ground in oil) to every 99 lb. of red lead used. The second field coat shall consist of red lead and boiled linseed oil, without lamp black.

JACOBS' METHOD FOR MAKING CAUSTIC SODA.—Chas. R. Jacobs, of East Orange, N. J., has patented a method of producing caustic soda by the reaction between solutions of barium hydrate and sodium sulphate (United States Patent 737,740). The solution of sodium sulphate is, of course, readily obtained from salt cake. The barium hydrate is made by the reduction of barium sulphate in an electric furnace by the process previously patented by Jacobs, which is now in commercial use by the United Barium Company at Niagara Falls, N. Y. In mixing solutions of barium hydrate and sodium sulphate in molecular proportions, barium sulphate is precipitated and sodium hydrate is formed. The sodium hydrate is filtered off, evaporated to dryness, fused and packed for market. The barium sulphate is washed free from sodium hydrate with hot water, and after drying may be sold as blanc fixe.

\*Abstract from advance sheets of paper entitled "Observations on the Metallurgical Practice of the Witwatersrand," read before the Chemical, Metallurgical and Mining Society of South Africa.

\*This method was fully described in THE ENGINEERING AND MINING JOURNAL of Jan. 31, 1903.





GENERAL ARRANGEMENT OF REDACTION PLANT AT NEW GOCH GOLD MINES LTD

### THE NINTH INTERNATIONAL GEOLOGICAL CONGRESS.

By E. O. HOVEY.

The ninth session of the International Geological Congress was held in the city of Vienna from August 20 to 27 inclusive. Before the meeting several geological excursions to different parts of Bohemia, Galicia and Austria proper were participated in by the members; during the sessions there were excursions at intervals to interesting localities in the vicinity of the city, and after the adjournment of the meeting there were additional excursions to Bosnia and Herzegovina, the Tyrol and other portions of southeastern and southwestern Austria. Three hundred and fifty-seven members registered as in attendance, representing nearly every civilized country in the world. This congress as a whole did not offer a great deal to mining men, and there were not many of them present, still there were some papers and excursions which were of interest and value to the fraternity, in common with geologists in general.

In order to give definite direction to most of the deliberations of the sessions, the following great problems in theoretical geology were proposed by the committee of arrangements for discussion on three days of the meeting: The crystalline schists; overthrust beds, folds and faults, and exotic blocks; the geology of the Balkan Peninsula and of the Orient. In addition to these there were papers on various other topics which occupied the afternoon of the first and the morning of the fifth day of the reading of papers. The afternoon of the last day was devoted in large part to the reading of the reports from the various standing committees of the congress. The Spendiarioff prize (which was established at the St. Petersburg Congress in 1897) was awarded to Prof. W. C. Brögger, of Christiania, for his classical work on the "Rocks of the Christiania Region."

The "Livret Guide," prepared by the Organization Committee of the Congress, gives a complete résumé of the present knowledge of the geology of Austria, and consists of forty-seven pamphlets intended primarily for use in connection with the excursions, but also valuable to everyone interested in the geology of that part of Europe for condensed statement of fact and theory. The portions of this guide which are of especial interest to mining men are those entitled: "Die geologischen Verhältnisse des Steinkohlenbeckens von Ostrau-Karwin," "Geologische Skizze des Salzgebirges von Wieliczka," "Geologische Exkursionen im Salzkammergut," "Die geologischen Verhältnisse der Erdwachs- und Erdölagerstätten in Boryslaw" and "Exkursion in die Ziegeleien der wienerberger Ziegelfabrik und Baugesellschaft bei Inzersdorf am Wienerberg."

The paper of most interest to the readers of the JOURNAL was that by Claudius Angermann on "The Petroleum Region of Boryslaw, Galicia." In his introduction the author said that on account of its richness in oil-sands, which have now been worked for half a century, and on account of the advance in methods of boring, and the activity in sinking wells, Galicia had become the region which promised to furnish the explanation for the occurrence of petroleum. Productive and barren wells alike have been studied in respect to their geo-tectonic relations. These studies have led to the establishment of certain fundamental principles which heretofore have not been recognized. The usually accepted theory that the sedimentary rocks have been left with no free cavities appears to be no longer tenable, and no one is in position to speak of richer and poorer veins (*Naphtalinien*, to use the speaker's own word). In this regard Boryslaw is an especially instructive region. The author stated that the starting point of his investigations had been the natural exposures of petroleum products, the quarries and mines of earth-wax or ozocerite. From these he had extended his observations to a great series of borings. Many of these borings are more than 1,000 meters in depth. The Boryslaw beds have been generally assigned to Miocene age, but the exposures show typical menilite

to such an extent that the age is more probably Oligocene. The evident extension of the Boryslaw region toward the southeast indicates a broad field for the development of the wells. It is possible, too, that the strata again rise, and that in that direction other rich anticlines will be encountered. Furthermore the district still waits upon the exploitation of every section where the "clefs" abound. The productiveness of the sands varies, the lower horizons being richer than the upper. It generally may be said that the productiveness is a function of the frequency of fissures, the depth and the thickness of the bed. Thus far no pumping has been done at Boryslaw. Hundreds of siphons work throughout the year with the best of success. Wells have been opened which furnished 3,000 quintals of oil per day at the beginning, and are still in operation. At Boryslaw persons with small capital have been particularly successful in forming combinations for the exploitation of oil, there being shafts which belong to more than forty proprietors. Recent improvement in financial conditions and in technical methods is astonishing. Shafts 1,000 meters in depth and 5 ft. in diameter are sunk here without difficulty. The richest ozocerite veins are in the vicinity of the oil-wells. On account of the structure of the Carpathians, there must have been open means of communication with the surface, and circulating waters deposited salt, gypsum and other materials in the fissures. Later natural gases displaced the water, and then the process of condensing the gases had its beginning. Thus there were here springs of water followed by gas-wells, which in turn were succeeded by petroleum springs. The flow of petroleum was finally checked by the accumulations of natural paraffin (ozocerite or *erdwachs*) separating therefrom. The production of ozocerite in 1892 amounted to 2,680,000 quintals, valued at 152,500,000 crowns (about \$31,000,000). The production of crude petroleum, which was 915,853 quintals in 1901, was much greater in 1902, and formed more than 25 per cent of the total output of Galicia. The speaker predicted a bright future for Boryslaw, if scientific methods were followed in prospecting.

Invitations for the tenth meeting of the congress, which will be held in 1906, were received from Mexico and Canada. After considerable debate the invitation of Mexico was accepted, and the hope expressed that the following meeting would be held in Canada. The officers of the ninth congress were: President, Emil Tietze, director of the Austrian Geological Survey; general secretary, Charles Diener, professor of geology in the University of Vienna; treasurer, Max von Guttman. The honorary president was W. von Hartel, minister of public instruction, and the congress was held under the patronage of the Archduke Rainer. The vice-president for the United States was Samuel F. Emmons of the United States Geological Survey.

The social side of the convention was by no means neglected. Each of the excursions was attended by pleasant functions, and the hospitality of the Viennese was shown by an elaborate formal banquet in the great banquet hall of the Rathhaus, and by invitation to a gala performance at the opera, while president Tietze, treasurer von Guttman, Prof. Edward Suess and Prof. M. von Mojsisovics entertained the men at private dinners.

**PURE NICKEL WIRE.**—The ordinary nickel of commerce will neither roll into sheet nor draw into wire. Both hot and cold it cracks into pieces if these operations be attempted. Erwin S. Sperry, in the *Metal Industry* for August, 1903, states that it is not generally known that pure nickel sheet and wire are obtainable, but a German company has been importing nickel in those forms to the United States for a considerable time. At present the use of nickel sheet and wire is limited, but it is believed that a larger demand for them will arise when it is generally known that they are obtainable.

### MILLING AT THE ALASKA TREADWELL.\*

By ROBT. A. KINZIE.

The character of the ores on Douglas Island is peculiarly adapted to the simple methods of extraction in use. The gold is contained in an altered syenite in the form of free gold, and in the sulphides, the principal gold-bearing minerals being iron pyrite, arsenopyrite, molybdenite and calcite. The ore on the surface has been subject to little oxidizing action, and perhaps that on the lowest level is even more free-milling than that in the surface pits. By reference to Table III. it will be seen that 48.04 per cent of the gold is caught on the plates by amalgamation, and the balance, or 51.96 per cent, is contained in the sulphurets and tailings. Table III. shows very plainly the effect of coarse crushing on the percentage of extraction in the various places.

**Crushers.**—The crushers are placed in the head frames of the various mines, and are of the gyratory type. When the ore is hoisted out of the mine it is spilled by self-dumping skips on a grizzly formed by 1-in. by 10-ft. pieces of iron, bolted together by 1-in. iron bars, and placed 2 in. apart by disc-shaped pieces of cast iron. The over-size from the grizzlies goes direct to the crushers, and the under-size passes through and falls into the ore-bins, situated directly beneath the crushers.

Too much stress cannot be laid upon the great effect of efficient crushing as related to the duty and output of a stamp-mill. This is particularly true on the island, where the crushing capacity is in excess of the demand, and where there is abundant water power, which costs practically nothing. During the past year the duty of the mills has been increased over 1 ton per stamp in 24 hours, and without a doubt 50 per cent of this increase has been caused by setting the crushers to break the rock 20 per cent smaller than before. An efficient crushing plant for mines similar to the Treadwell would consist of four Gates crushers arranged in pairs, one above the other, the upper to be of such a size that they would receive rocks 18 by 36 in., and the lower to turn out a product not larger than 1½ in. in diameter. The rock when hoisted would be dumped on grizzlies with 5-in. spacing between bars; the over-size going to the upper crushers and the under-size falling on a second grizzly with bars set 1½ in. apart—over-size going to the lower pair of crushers and under-size passing into the storage-bins. The product from the upper pair of coarse crushers to be spilled on a grizzly with bars 1½ in. apart, the over-size going to the lower crusher and the under-size and crushed product from the lower crushers falling into the bin. If the above method were used it would do away with a great deal of the "bulldozing" in the mines, making a very appreciable reduction in the cost of mining.

There are three different methods in use for conveying the ore from the crusher-bins to the mill ore-bins. At the Treadwell, small locomotives are used, drawing trains of six cars, each car holding 2½ tons. At the Mexican, where the crusher and mill are practically under one roof, the 2½-ton cars are pushed by hand; while at the Ready Bullion the ore is handled by means of a gravity-tram operating a train of four 2½-ton cars, the cars being returned by means of a small winding engine placed at the crusher-bin. The tracks from the crusher ore-bin are continued along the top of the mill ore-bins, so that the ore can be dumped directly from the cars into the bins.

In the 300-Treadwell and 240-stamp mills, the stamps are arranged back to back, and the bottoms of the bins are made in the shape of an inverted V, so that the ore will be equally divided and fed uniformly to the stamps on either side. In the other mills, where the stamps are arranged in a single row, the bottom of the ore-bins, from a point 8 ft. below the track, is given a slope of 45° to the open

\*Abstracted from a paper entitled "The Treadwell Group of Mines, Douglas Island, Alaska," by Robert A. Kinzie, Assistant Superintendent, Treadwell City, Alaska. Transactions of the American Institute of Mining Engineers, October, 1903.



ore-chutes at the level of the cam-floor. The bins are double-boarded, and on the side next the stamps are lined with 1/4-in. steel plate, to protect them from the scouring action of the rock. From the bins the ore is taken out by openings at the level of the cam-floor and conveyed by chutes to the hoppers of the Challenge feeders. There is one chute and feeder for each five stamps. The 300-Treadwell, Ready Bullion and 700-Foot mills are provided with the suspended Challenge feeders. These are preferable to the standard feeder, being more compact and very accessible for repairs. Both types are central feeders, the bumper rod being placed next to the central stamp and guided in the usual way.

There are three different kinds of mortars in use on the island. The 300-Treadwell, Ready Bullion and 700-Foot mills use the Fraser & Chalmers No. 67-A Type; the Mexican uses the Fraser & Chalmers

mill so essential to its efficiency as a good and lasting mortar foundation. There are two kinds used on Douglas Island. The Ready Bullion, 700-Foot and the 300-Stamp mill at the Treadwell have concrete foundations, capped by cast-iron anvil blocks, while the Mexican and the Treadwell 240-stamp mills have the ordinary wooden foundation.

On account of the peculiar climatic conditions prevalent on Douglas Island, the life of a wooden foundation made of the best Oregon or Douglas fir has been about six years. It then commences to rot, causing the mortar bolts to loosen, which results in an uneven wearing of the top surface of the block. The life of the mortar block can be prolonged from six months to a year by planing down the top and leveling it up by placing strips of rubber belting between the old mortar block and the mortar, but this is at best a makeshift. The rotting in every

mortars were then raised and a sheet of 1/4-in. rubber belt inserted between the mortar and the anvil block. This lessened the crumbling, but did not stop it, and during the third year full one-quarter of the mortar blocks in the mill had their anchor bolts broken off at the point of contact of the concrete and the anvil block. In nearly every instance, on removing the anvil block, it was found that when the foundation was installed, instead of surfacing up the concrete to the correct level, it was allowed to set; then cement was poured in between the anvil block and the already hardened concrete to raise the foundation to its proper height and level. This caused a plane of weakness and consequent crumbling, resulting in the breaking. The above condition might be remedied in the first instance by properly finishing the concrete, and making it 8 in. wider on either side than the bottom of the anvil block, as shown in Fig. 1.

TABLE I.—Showing Equipment of Mills and Cost of Mining on Douglas Island, Alaska.  
Equipment of Mills.

Name of Mill.	Crushers.			Capacity of Ore-Bins, Sq. Ft.	Stamps.				Feeders.		Mortars.		Amalgamating Plates.				Vanners.			Motive-Power.		Time.				Average Tons Crushed in 24 Hrs.	
	Number.	Size.	Make.		Number.	Weight.	Drops Per Min. etc.	Height of Drop.	Number.	Style.	Number.	Style.	Number of Chute & Blocks.	Apron-Plates.		Number.	Style.	Size.	Kind.	Number.	Style.	Time Run.					
														Grade Per Ft.	Area in Sq. Ft.							Per Cent. by Water.	Per Cent. by Steam.	Total.	Per Cent. Time Lost.		
Treadwell "300".....	2	"E."	Comet.	81,795	300	1,020	98	8 1/2"	60	Suspended Challenge.	60	"67-A," F. and C.	60	4	1 1/2"	45	120	Frue.	6'	Water.	4	Pelton	93.19	.....	93.19	6.81	5.53
Treadwell "240".....	2	.....	Gates.	59,400	240	850	98	.....	48	Challenge.	48	Moran.	48	4	1 1/2"	45	56	Frue.	4'	Steam and Water.	2	Pelton	51.64	40.19	91.83	8.17	4.86
Mexican.....	1	.....	Gates.	31,960	120	1,020	98	8 1/2"	24	Challenge.	24	"67-A," F. and C.	24	4	1 1/2"	45	48	Frue.	4'	Steam and Water.	1	Pelton	41.64	36.42	78.06	21.94	5.73
Ready Bullion.....	1	"E."	Comet.	49,380	120	1,020	100	8 1/2"	24	Suspended Challenge.	24	"67-A," F. and C.	24	4	1 1/2"	45	48	Frue.	6'	Steam.	.....	.....	97.82	97.82	2.18	5.34	
700-Foot Claim.....	1	"E."	Comet.	33,150	100	1,020	99	8 3/4"	20	Suspended Challenge.	20	"67-A," F. and C.	20	4	1 1/2"	45	40	Frue.	6'	Steam and Water.	1	Pelton	92.22	4.88	97.10	2.90	5.69

TABLE II.—Cost of Milling (Per Ton of Ore) for Ten Months Ending Sept. 15, 1902.

Name of Mill.	Crushing.			Concentration.					Sulphurets.					Total of All Expenses.												
	Labor.	Supplies.	Total.	Labor.		Sulphurets.	Supplies.	Power.	Total.	Labor.	Supplies.	Car.	Assay.	Total.	Labor.	Supplies.	Iron and Steel.	Foundry.	Electric Light.	Hauling.	Supplier.	Repair.	Assay.	Power.	Legal.	Total.
				Concentrators.	Sulphurets.																					
Treadwell "300".....	.0032	.0046	.0128	.0091	.0042	.0005	.0003	.0117	.0068	.0007	.0015	.0003	.0033	.0560	.0141	.0211	.0103	.0001	.0003	.0057	.0004	.0004	.0051	.0055	.1205	
Treadwell "240".....	.0035	.0040	.0135	.0133	.0047	.0002	.0003	.0308	.0007	.0007	.0012	.0005	.0103	.0720	.0370	.0038	.0053	.0010	.0003	.0103	.0003	.0016	.0058	.0032	.2040	
Mexican.....	.0109	.0007	.0116	.0035	.0090	.0060	.0090	.0325	.0032	.0003	.0012	.0005	.0103	.0334	.0360	.0302	.0135	.0003	.0003	.0009	.0001	.0017	.0600	.0033	.2362	
Read. Bullion.....	.0201	.0014	.0280	.0147	.0070	.0177	.0185	.0570	.0087	.0002	.0032	.0005	.0140	.0334	.0360	.0302	.0135	.0003	.0003	.0009	.0002	.0020	.0232	.0030	.3193	
700-Foot Claim.....	.0095	.0008	.0104	.0103	.0035	.0014	.0086	.0295	.0047	.0003	.0049	.0003	.0103	.0712	.0285	.0165	.0001	.0002	.0002	.0004	.0004	.0014	.0575	.0062	.1981	

No. 67, while the 240-Treadwell mill uses a special mortar made by Moran Brothers, of Seattle, Wash. End and slide liners are used in all the mills, and false bottoms are used, except in the 240-Treadwell mill, where the die rests on the bottom of the mortar. The false bottoms and liners are cast at the company's foundry, which does excellent work. The false bottoms in use consist of a piece of cast-iron 3 in. thick, and of the size and shape of the flange portion of the die. Their object is to protect the bottom of the mortar from excessive wear.

The stamps in the 300-Treadwell, Ready Bullion, Mexican and 700-Foot mills weigh 1,020 lb., while those in the 240-Treadwell weigh, when new, 850 lb. The stems, tappets, boss-heads and shoes are joined in the usual manner. The Koppel shoe is used in all the mills. A shoe lasts 3 months and crushes 489 tons of ore, which means that 0.27 lb. of iron are consumed per ton of rock crushed. The dies are cast at the company's foundry and last on an average 4.49 months, crushing 732 tons and consuming 0.16 lb. of iron per ton crushed.

Battery Foundations.—There is no one part of a

case has been confined to the surface, while the interior of the block remains sound. The blocks are built in the usual way, with four pieces of Oregon pine, 1 ft. 28 in. by 26 in., bolted together by iron bolts. The holes for the anchor-bolts are drilled into the mortar block from above, at distances apart corresponding to those on the flange of the mortar. At a distance of 4 ft. below the top, holes are cut out to receive the nuts and washers that secure the lower end of the bolts. It is evident that when the decay of the wood penetrates to, say, a depth of 4 in., there is no longer a secure fastening for the mortar, and the mortar block becomes useless. If a 2-in. iron rod be passed through the ends of opposite mortar bolts and through the block, the life of the foundation will be prolonged from two to four years. The best wooden block is one built up of 2-in. plank, bolted and nailed together, and the mortar bolts fastened as above.

Fig. 1 shows the character of foundation used in the newer mills. Soon after the mills were started it was noticed that the edges of the concrete next to the mortar showed signs of crumbling. The

With the above exceptions, the concrete foundation with the anvil block has answered the purpose for which it was designed, and with a few minor changes it is preferable to the wooden foundation under the conditions existing on Douglas Island.

Power.—Starting with the 5-stamp mill of the Treadwell, erected in 1881, the number has been increased from time to time, until at present there are 880 stamps dropping on the island, and these are distributed in the various mills, as shown in Table I.

During the summer months there is sufficient water to run 760 of the 880 stamps, and during the winter there is always enough to supply the batteries and vanners and run a portion of the mills.

This water-supply is obtained from a series of ditch-lines running along the mountain sides and aggregating 18 miles in length. The main Treadwell ditch starts from a lake in the mountains 14 miles distant from the mines. It then follows the contour of the mountain range, gathering the water from numerous small springs and streams, and delivers it to the penstocks at an elevation of 480 ft. above the

mills, and at a distance of 1,500 ft. from them. On account of the heavy snowfall and low temperature in winter, the ditches are covered throughout their entire length by split lagging and boughs of trees. The snow on the mountains usually lasts until the end of April, and from then to the end of November rains are depended upon to supply the requisite amount of water.

At the Ready Bullion mine no provision has been made for a supply of fresh water for mill use other than that for the boilers. Here salt water is pumped from the channel and used for all purposes in the mill. Experience has shown that while it is very destructive on all exposed iron in the batteries and on the vanners, it is better than fresh water for amalgamating purposes, but this advantage by no means compensates for the loss caused by its corrosive action on all exposed iron and on the vanner-belts. The coal—about 22,000 tons per year—is obtained from the mines on Vancouver Island, at reasonable rates. This coal is transported to the mines by means of barges, which on their return trips carry concentrates in bulk to the Tacoma smelter.

**Methods of Catching the Free Gold.**—The free gold is caught both inside and outside of the mortars by means of quicksilver. There is a diversity of opinion among the various amalgamators as to where, when, and in what quantities the quicksilver should be fed. Table II. gives quantities used. The result of a series of tests in the various mills shows that the quantity of quicksilver fed in the mortars and on the plates varies directly with the gauge of the screen, and, consequently, with the coarseness of the ore. The coarser the crushing, the more quicksilver it is necessary to add to the mortars to make any saving at all.

On the other hand, the scouring action of the coarse sands on the plates necessitates frequent dressing to keep them well coated with silver. It was the practice up to 1901 to keep the plates very wet, and even though the crushing was much finer an excessive amount of quicksilver was used. It will be seen from Table III. that, although the tonnage crushed per stamp has shown a marked increase, the quantity of quicksilver used per ton is only about one-half the quantity formerly used.

The only amalgamated copper plates used inside the mortars are the chuck-blocks. Two sizes are used at present (the 4 in. and 6 in. in height), but very little amalgam is collected from them. Formerly they furnished 13.7 per cent of the amalgam collected, but since the fine screens were replaced they collect practically no amalgam, except during short periods in the winter when salt water is used.

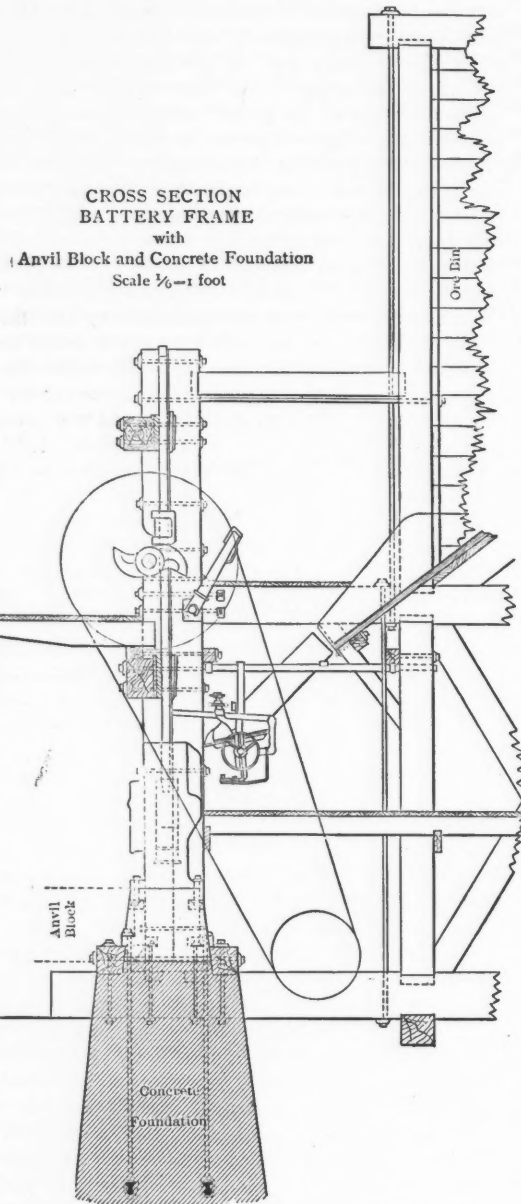


FIG. 1.

At these times the chuck-blocks become coated, but as soon as fresh water is again used the amalgam is scoured off, leaving the copper bare.

**Screens.**—The diagonal slot screens which are used in all the mills are made of No. 23-gauge heavy Russian iron. Both the No. 4 and No. 5 are in use, these being equivalent to the 20 and 18-mesh wire screens, and are mounted in frames in the usual manner. Two widths are used, viz.: 9 in. and 12 in., the former giving the better satisfaction.

A screen lasts about seven weeks in all the mills except the Ready Bullion, where it lasts only fifteen days. Salt water is used in this mill, and the corroding action seems to be intensified by the scouring of the sands in the mortar, which keeps the inside surface of the screen bright, thus always furnishing a fresh surface for the action of the water. These screens do not wear out as in the other mills, but become brittle and break.

Experiments are now in process with a make of iron-wire screen, but they have not advanced far enough for any conclusion to be reached.

**Apron Plates.**—The motion of the battery water, caused by the falling of the stamps, throws the pulp against the screen, and all particles fine enough pass through it and fall on the lip of the mortar. At the edge of the lip are placed two dash-boards arranged in steps to stop the rush of the water and sand, and cause it to drop in a steady flow on the apron-plates, which are placed immediately in front of the lip of the mortar, with the upper edge under the lip. This diminishes the scouring action, allowing the amalgam to collect near the upper end of the plate. The amalgam here is kept harder than at the lower end. This allows the lower end of the plate to be kept quite wet, which gives a better chance to catch the finer particles of gold that otherwise might float off.

These plates are made of the best Lake copper, 3-16 in. thick, 4 ft. wide, 10 ft. long, and are given a fall of 1 1/2 in. to the foot. The plates are prepared in the usual manner by cleaning with a weak solution of potassium cyanide and rubbing in quicksilver until the upper surface is thoroughly amalgamated. While in use they are dressed with quicksilver twice a day, and the time taken for dressing should not exceed four minutes per day.

At the lower end of each plate is placed a wooden trough lined with copper, called the tail-box, where very little amalgam is caught. From the tail-boxes the pulp is conveyed through 3-in. pipes to the mercury-traps. These traps are made of cast-iron in the shape of a four-sided truncated pyramid, having the smaller end down. The trap is 14 in. square

TABLE III.—Showing Detail of Clean-Up and the Effect of Coarse Crushing on the Distribution of Amalgam.

Results for Ten Months, 1902.

Mill.	Tons Crushed Per Stamp in 24 Hours.	Oz. Quicksilver Fed Per Ton Ore Crushed.			Distribution of Clean-Up. Per Cent.								Value Amalgam Per Ounce.	Value Bullion Per Ounce.	\$ Free Gold Per Ounce Quicksilver Fed.	Per Cent of Clean-Up in Free Gold.	Per Cent. of Concentrates.	Value Tailings Per Ton.	Gross Value Per Ton Ore Crushed.
		Battery.	Plates.	Total.	Blocks.	Bar. el.	Vanners.	Tanks.	Traps.	Tail Boxes.	Ashes.	Tables.							
Treadwell 240.....	4.00	.2098	.0319	.2417	.0742	.1938	.0181	.0188	.0199	.0151	.0017	.6584	\$6.12	\$18.65	\$5.00	57.87	1.75	.083	1.943
Treadwell 300.....	4.59	.1204	.0695	.1955	.0896	.0961	.0282	.0107	.0136	.0128	.0015	.7475	6.12	18.65					
Mexican.....	4.33	.1794	.0845	.2639	.1052	.0793	.0082	.0284	.0302	.0037	.6550	6.48	18.70	4.15	67.85	1.65	.101	1.842	
700-Foot.....	3.97	.....	.....	.2022	.1893	.1285	.0111	.0167	.0262	.....	.....	.6282	6.19	18.50	5.73	47.40	1.77	.038	1.498
Ready Bullion.....	4.24	.1316	.0861	.2177	.8955	Blocks, Barrel, Table.		.0823	.0207	.....	.0015	.....	5.94	18.25	6.12	70.00	1.74	.068	2.058
Total.....	4.27	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18.59	.....	.....	.....	.076	.....

Results for Ten Months, 1902.

Treadwell 240.....	4.86	.0849	.0357	.1206	.....	.0901	.0216	.0119	.0303	.0277	.0011	.8172	\$6.12	\$18.65	\$5.80	45.99	2.	.104	2.031
Treadwell 300.....	5.53	.0117	.0532	.0649	.....	.1067	.0483	.0357	.0366	.....	.0003	.7724	6.12	18.65					
Mexican.....	5.73	.2076	.0366	.2442	.0221	.0556	.0111	.0423	.0401	.....	.0031	.8257	6.48	18.70	3.63	48.87	1.71	.105	1.979
700-Foot.....	5.70	.2209	.0279	.2578	.....	.0421	.0164	.0295	.0382	.....	.....	.8738	6.19	18.50	3.57	48.36	1.83	.088	1.933
Ready Bullion.....	5.34	.0824	.0381	.1205	.0012	.0963	.0069	.1936	.0444	.....	.0019	.6557	5.94	18.25	7.18	53.75	2.07	.091	1.796
Total.....	5.38	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18.59	.....	48.04	.....	.094	.....



at the top, 15½ in. deep, with the lower end 6 in. square. In the bottom is a 2-in. top closed by a plug for drawing off the contents when cleaning up. Inside the trap is a block 14 by 8 in. on top, 11 in. deep and 8 by 8 in. on the bottom. The pulp from the table enters the trap through a 3-in. pipe that reaches to within 2 in. of the bottom. It then flows up through the space between the trap and the wooden block, and thence over the block into the discharge-launders.

These boxes are usually suspended under the battery-floor and from them the pulp flows through launders, where it is divided and conveyed by 3-in. iron pipes to the distributing-boxes of two vanners.

On the floor of the distributing-box of each vanner is placed an amalgamated copper-plate, varying with the size of the vanner used, those on the 4-ft. vanner being 18 in. by 3 ft. 4¾ in., and on the 6-ft. vanners 18 in. by 5 ft. 9 in. From this plate the pulp flows over the vanner. The heavy particles, including sulphurcts and some free gold, being saved, while the lighter passes over the tail of the vanner into the tailings-launders, which discharge into Gastineaux channel.

**Concentration.**—By reference to Table III. it will be seen that 47 per cent of the value contained in the ore is recovered by concentration. For purposes of concentration two sizes of Frue vanners are used:

into special cars holding 2½ tons, and hauled by locomotives to the wharf, where they are dumped through chutes directly into the hatches of the barges which transport the concentrates to the Tacoma Smelter, where they are treated.

Table II. shows in detail the cost of the different departments of milling as well as the equipment and running time of the various mills for the last 10 months.

**Clean-Up.**—The clean-ups in the various mills are all conducted in the same fashion, and are so regulated that they will be finished by the 15th of each month.

The first day of the clean-up is devoted to the amalgam-traps and the tank in the amalgamating room.

To clean a trap, 5 stamps are hung up and the feed-water shut off. When the pulp has ceased to flow through the trap, the wedge that holds the wooden center-piece is loosened and the center-piece removed, first being carefully washed to cleanse it of any adhering amalgam. Then the tap in the lower end is opened and the contents of the trap allowed to flow out into a smaller launder, which conveys the material to a central tank. The trap is then carefully washed out, the tap and wooden center-piece replaced, and it is ready for use. It takes an average of 5 minutes to clean each trap. When all the traps have been cleaned, the contents of the re-

is stopped, the cannon-balls are taken out and put in the pan, which is immediately started. By the motion of the pan the heavy contents are concentrates in the middle, while the lighter are washed off by means of a stream of water flowing through it, the concentrated product being kept in motion, and at the same time ground, by means of the cannon-balls.

When the concentrate is cleaned of all light material, the pan is stopped and the pieces of iron, etc., removed. The amalgam is then put in a pan, the finer particles of iron removed by means of a magnet, and the other foreign material by a sponge or other means. When the amalgam is clean, it is put in small cloth bags and the quicksilver pressed out by means of a hydraulic ram, designed by one of the mill foremen. The pressed cakes of amalgam are weighed and sent to the assay office to be retorted and melted into bullion.

The second and succeeding days are devoted to the cleaning of the batteries and amalgamating-plates. These are cleaned at the rate of 4 batteries of 5 stamps per day. (In the Treadwell 300-stamp mill 5 batteries are cleaned per day.)

To clean up a battery the feed is shut off and the stamps allowed to drop until they begin to pound on iron, then they are hung up. The water is then shut off, and the splash-boards, curtains, screens and chuck-blocks are removed. The water remaining in the mortar is dipped out, and the coarse sand around the top of the dies shoveled into buckets to be put back into the mortar when the clean-up is over. The lip of the mortar and the plates are then carefully hosed off (a trough being first put in the tail-box to catch any loose amalgam) and the entire surface of the plate covered by a wooden cover for steaming. A space of ¾ in. is left between the cover and the plate by means of three slats ¾ in. thick nailed to the bottom of the cover. Sacks or other coverings are placed over the ends and edges to prevent the escape of steam; the end of a steam hose is then introduced through a hole in the cover, the steam turned on and allowed to remain so from 20 to 30 minutes. In the meantime a second battery is prepared, and any renewals made ready, so that no time will be lost when the mortar is cleaned out. While the plate is being steamed the chuck-block is cleaned of any adhering amalgam, re-coated with quicksilver, and is ready to be replaced; while the sand-distributing box on the vanners, corresponding to the batteries shut down, are taken off and the amalgam removed from the copper-plate by means of chisels. This amalgam is collected, the plates dressed in the usual manner, the distributing-box replaced, and the vanner is ready for starting. When the plate has been sufficiently steamed, the steam is shut off and the cover removed and taken to the next plate that has already been prepared for its reception. The steamed plate is then allowed to cool for a few seconds, when the operation of removing the amalgam commences. This is done by scraping the plates with sharp chisels, and as much amalgam as possible is removed without exposing the copper. The amalgam is then collected, taken to the amalgamating room and locked up for further treatment.

Two men now begin work on the mortar, and to protect the plates a wooden platform is placed at the head for the men to stand on. If there are no renewals necessary (but this is unusual) only a portion of the sand is taken out. If necessary, the shoes are removed by driving a wedge through the eye left in the boss-head just above the end of the shank of the shoe and forcing it out. The sand is then dug out of the mortar by means of sharp-pointed hand-picks and scoops, the die and liners removed, and the mortar thoroughly cleaned. All pieces of iron, together with the worn-out shoes and dies and liners, are taken to the amalgamating room to be thoroughly cleaned, and the heavy sand taken to the clean-up barrel.

The liners and false bottoms are then put in and the die set on the false bottom, while the fine sand first removed from the mortar is tamped around the die to hold it in place. The shoe is then set on the

TABLE IV.—Mill Labor.

Title.	Treadwell Mills.						Mexican.			Ready Bullion.			700-Foot.		
	300-Mill.			240-Mill.			No. of Men.	Length of Shift.	Rate of Wages.	No. of Men.	Length of Shift.	Rate of Wages.	No. of Men.	Length of Shift.	Rate of Wages.
	No. of Men.	Length of Shift.	Rate of Wages.	No. of Men.	Length of Shift.	Rate of Wages.									
Foreman	1	12	\$150.00	1	12	\$150.00	1	12	\$150.00	1	12	\$150.00	1	12	\$150.00
Amalgamator	4	12	90.00	2	12	90.00	2	12	90.00	2	12	90.00	2	12	90.00
Feeders	4	12	70.00	2	12	70.00	4	12	70.00	4	12	70.00	2	12	70.00
Vannermen	4	12	75.00	2	12	65.00	2	12	65.00	2	12	65.00	2	12	65.00
Oilers	2	12	65.00	2	12	65.00	2	12	65.00	2	12	65.00	2	12	65.00
Sulph. Pulvers.	2	10	2.00	2	10	2.00	1	10	2.00	1	10	2.00	1	10	2.00
Sulph. Shovel F.	2	10	2.00	2	10	2.00	1	10	2.00	1	10	2.00	1	10	2.00
Engineers	2	12	2.50	2	12	2.50	2	12	2.50	2	12	2.50	2	12	2.50
Firemen	2	12	2.50	2	12	2.50	2	12	2.50	2	12	2.50	2	12	2.50
Coal-passers	2	10	2.00	2	10	2.00	2	10	2.00	2	10	2.00	2	10	2.00
Crusher-men	4	10	2.25	4	10	2.25	2	10	2.25	2	10	2.25	2	10	2.25
Repairs.															
Vanners	1	12	\$100.00	1	12	\$100.00	1	12	3.00	1	12	3.00	1	12	3.00
Carpenters	1	10	4.00	1	10	4.00	1	10	1.00	1	10	1.00	1	10	1.00
Laborers	1	10	2.00	1	10	2.00	1	10	1.00	1	10	1.00	1	10	1.00
Total	30			34½			21½			22½			14		

NOTE.—The above wages include board and lodging. Engineers, firemen and coal-passers are only employed part of the time by the mills. (a) Amounts of \$65, or greater, refer to monthly wages, and those of \$4 or less refer to daily wages.

the 4 ft. and 6 ft. These vanners are so arranged that the pulp from 5 stamps is divided between 2 vanners. This style of concentrator is very well adapted to the ore, and from a study of the tables given above it would be hard, indeed, to realize a much better saving. The wear and tear on the machines is very light in all the mills, with the exception of the Ready Bullion, where the vanners get more than their share of the destructive effects of salt water in use.

When a stamp is crushing 5.6 tons of ore in 24 hours, each stamp requires 4.25 gallons, and each vanner 1.5 gallons, of water per minute. In the mills where the 4-ft. vanners are used they are overloaded. This accounts for both sizes of vanners using the same amount of water.

There is a little less than 2 per cent of concentrates in the ore. The concentrated product has a value of about \$51 per ton in all the mills, with the exception of the Ready Bullion, where the concentrates assay about \$35 per ton.

In connection with each mill is a storage-bin for concentrates, holding about 400 tons. These bins are situated near the mill, and when the concentrates have been collected at the vanners and shoveled into cars, they are trammed to a small hydraulic elevator which raises the loaded car to the level of the top of the bin, where it is dumped. From these storage-bins the concentrates are drawn off through chutes

ceiving-tanks, after being roughly washed, are collected and taken to the amalgamating-barrel for further treatment. In the meantime the contents of the tank in the amalgamating room have been removed. This is added to the product from the mercury-traps, and the total charged into the amalgamating-barrel.

This barrel is made of cast-iron, 20 in. in diameter and 4 ft. long. It is supported in a horizontal position by iron trunnions cast in the head, and is driven at the rate of 15 rev. per min. by a belt leading to one of the vanner-countershafts.

The barrel is charged through a hand-hole in the top, which can be hermetically sealed; from 300 to 500 lb. of ore constituting a charge. From 75 to 125 oz. of mercury is then added, 6 iron cannon-balls put in to act as grinders, and the barrel filled with water. The hand-hole cover is then put on, and the barrel started revolving. The charge is left in the rotating-barrel 12 hours; the barrel is then opened and the charge allowed to run out into the amalgamating-pan. This pan is made of cast-iron 4 ft. in diameter. Around the edge, with the exception of a space 8 in. wide to serve as an outlet, is a rim 2.5 in. high. The bottom is made slightly concave to resemble a Mexican *batea*. The concentrating motion of the *batea* is imitated as closely as possible. This is obtained by means of an eccentric belt, driven from one of the counter-shafts of the mill. When the barrel

top of the die with a collar of wooden shims around its neck. A 3/4-in. block is then placed on the top of the neck of the shoe, and the stamp lowered until the boss-head rests on the block. The keys of the tappets are loosened and the tappet is allowed to fall down to the finger, where the keys are tightened. If the shoe has not been removed, a 9/4-in. block is placed on top of the die and the tappets set as above. Each shoe is then successively dropped and hung up, when the shoe is firmly fixed in the boss-head. The recesses for the chuck-block, screens, etc., are washed out, and the chuck-block, screens and dash-boards put in place. The plate is then washed with a weak solution of cyanide, when quicksilver is sprinkled over its surface and thoroughly rubbed in with whisk-brooms. The quicksilver is evenly distributed by rubbing with cloths moistened with a weak solution of cyanide. Some ore is now fed into the mortar, working the feeder by hand, the water turned on, the small clean-up through removed from the tail-box, and the stamps allowed to drop. Particular care is paid to the feeding of ore when the stamps are started, as the mortar is empty of all ground material.

The heavy sands from the mortar are treated in the clean-up barrel in the manner described above, while the amalgam removed from the plates and chuck-blocks is simply ground in the clean-up pan and the amalgam cleaned in the usual manner.

#### PLINY ON GOLD MINING.\*

Gold is found in our part of the world, not to mention the gold extracted from the earth in India by the ants, and in Scythia by the griffins. Among us it is procured in three different ways; the first of which is in the shape of dust, found in running streams, the Tagus in Spain, for instance, the Padus in Italy, the Hebrus in Thracia, the Pactolus in Asia, and the Ganges in India. Indeed, there is no gold found in a more perfect state than this, thoroughly polished as it is by the continual attrition of the current.

A second mode of obtaining gold is by sinking shafts or seeking it among the debris of the mountains, both of which methods it will be well to describe. The persons in search of gold in the first place remove the 'segutium,' such being the name of the earth which gives indication of the presence of gold. This done, a bed is made, the sand of which is washed, and according to the residue found after washing, a conjecture is formed as to the richness of the vein. Sometimes, indeed, gold is found at once in the surface earth, a success, however, but rarely experienced. Recently, for instance, in the reign of Nero, a vein was discovered in Dalmatia, which yielded daily as much as fifty pound weight of gold. The gold that is thus found in the surface crust is known as 'talutium,' in cases where there is auriferous earth beneath. The mountains of Spain, in other respects arid and sterile, and productive of nothing whatever, are thus constrained by man to be fertile, in supplying him with this precious commodity.

The gold that is extracted from shafts is known by some persons as 'canalicium,' and by others 'canaliense.' It is found adhering to the gritty crust of marble, and altogether different from the form in which it sparkles in the sapphirus of the East, and in the stone of Thebias and other gems, it is seen interlaced with the molecules of the marble. The channels of these veins are found running in various directions along the sides of the shafts, and hence the name of the gold they yield, 'canalicium.' In these shafts, too, the superincumbent earth is kept from falling in by means of wooden pillars. The substance that is extracted is first broken up and then washed, after which it is subjected to the action of fire and ground to a fine powder. This powder is known as 'apitascudes,' while the silver which

becomes disengaged in the furnace has the name of 'sudor' given to it. The impurities that escape by the chimney, as in the case of all other metals, are known by the name of 'scoria.' In the case of gold, this scoria is broken up a second time and melted over again. The crucibles used for this purpose are made of 'tasconium,' a white earth similar to potter's clay in appearance, there being no other substance capable of withstanding the strong current of air, the action of the fire and the intense heat of the melted metal.

The third method of obtaining gold surpasses the labors of the giants, even. By the aid of galleries driven to a long distance, mountains are excavated by the light of torches, the duration of which forms the set times for work, the workmen never seeing the light of day for many months together. These mines are known as 'arrugia,' and not unfrequently the clefts are formed on a sudden, the earth sinks in, and the workmen are crushed beneath; so that it would really appear less rash to go in search of pearls and purples at the bottom of the sea, so much more dangerous to ourselves have we made the earth than the water. Hence it is that in this kind of mining, arches are left at frequent intervals for the purpose of supporting the weight of the mountain above. In mining either by shaft or by gallery, barriers of silex are met with, which have to be driven asunder by the aid of fire and vinegar, or more frequently, as this method fills the galleries with suffocating vapors and smoke, to be broken to pieces with bruising machines shod with pieces of iron weighing 150 pounds; which done, the fragments are carried out on the men's shoulders, night and day, each man passing them on to his neighbor in the dark, it being only those at the pit's mouth that ever see light. In cases where the bed of silex appears too thick to admit of being penetrated, the miner traces along the sides of it, and so turns. And yet, after all, the labor entailed by this silex is looked upon as comparatively easy, there being an earth—a kind of potter's clay mixed with gravel—'gandadia' by name, which is almost impossible to overcome. This earth has to be attacked with iron wedges and hammers, like those previously mentioned, and it is generally considered that there is nothing more stubborn in existence—except, indeed, the greed for gold, which is the most stubborn of all things.

When these operations are completed, beginning at the last, they cut away the wooden pillars at the point where they support the roof. The coming downfall gives warning, which is instantly perceived by the sentinel, and by him only, who is set to watch upon a peak of the same mountain. By voice, as well as by signals, he orders the workmen to be immediately removed from their labors, and at the same moment takes flight himself. The mountain, rent to pieces, is cleft asunder, hurling its debris to a distance with a crash which it is impossible for the human imagination to conceive; and from the midst of a cloud of dust, of a density quite incredible, the victorious miners gaze upon this downfall of nature. Nor yet even then are they sure of gold, nor, indeed, were they by any means certain that there was any to be found when they first began to excavate, it being quite sufficient, as an inducement to undergo such perils and to incur such vast expense, to entertain the hope that they will obtain what they so eagerly desire.

Another labor, too, quite equal to this, and one which entails even greater expense, is that of bringing rivers from the more elevated mountain heights, a distance, in many instances, of 100 miles, perhaps, for the purpose of washing the debris. The channels thus formed are called 'corrugi,' from our word 'corrivatio,' I suppose; and even when these are once made they entail a thousand fresh labors. The fall, for instance, must be steep, that the water may be precipitated, so to say, rather than flow; and it is in this manner that it is brought from the most elevated points. Then, too, the valleys and crevasses have to be united by the aid of aqueducts,

and in another place impassable rocks have to be hewn away and forced to make room for hollowed troughs of wood, the persons hewing them hanging suspended all the time with ropes, so that to a spectator who views the operations from a distance the workmen have all the appearance not so much of wild beasts as of birds upon the wing. Hanging thus suspended, in most instances, they take the levels, and trace with lines the course the water is to take; and thus, where there is no room even for man to plant a footstep, are rivers traced out by the hand of man.

The water, too, is considered in an unfit state of washing if the current of the river carries any mud along with it. The kind of earth that yields this mud is known as 'urium,' and hence it is that in tracing out these channels, they carry the water over beds of silex or pebbles, and carefully avoid this urium. When they have reached the head of the fall, at the very brow of the mountain, reservoirs are hollowed out a couple of hundred feet in length and breadth and some 10 ft. in depth. In the reservoirs there are generally five sluices left, about 3 ft. square; so that the moment the reservoir is filled the flood gates are struck away, and the torrent bursts forth with such a degree of violence as to roll onward any fragments of rock which may obstruct its passage.

When they have reached the level ground, too, there is still another labor that awaits them. Trenches—known as 'agogoe'—have to be dug for the passage of water; and these, at regular intervals, have a layer of ulex placed at the bottom.

This ulex is a plant like rosemary in appearance, rough and prickly, and well adapted for arresting any pieces of gold that may be carried along. The sides, too, are closed in with planks, and are supported by arches when carried over steep and precipitous spots. The earth, carried onward in the stream, arrives at the sea at last, and thus is the shattered mountain washed away—causes which have greatly tended to extend the shores of Spain by these encroachments upon the deep. It is also by the agency of canals of this description that the material, excavated at the cost of such immense labor by the process previously described, is washed and carried away, for otherwise the shafts would soon be choked up by it.

The gold found by excavating with galleries does not require to be melted, but is pure gold at once. In these excavations, too, it is found in lumps, as also in the shafts which are sunk, sometimes exceeding 10 pounds, even. The names given these lumps are 'palagae' and 'palacurnae,' while the gold found in small grains is known as 'baluce.' The ulex that is used for the above purpose is dried and burnt, after which the ashes of it are washed upon a bed of grassy turf, in order that the gold may be deposited thereupon.

DETERMINATION OF CALCIUM AND MAGNESIUM.—A. d'Anselme states in *Bull. Soc. Chim.*, 1903, p. 734, that calcium and magnesium can easily be determined when present simultaneously in a solution of sodium chloride. A normal solution containing  $4 \text{ Na}_2\text{CO}_3 + \text{NaOH}$  is standardized against normal  $\text{H}_2\text{SO}_4$ , using methyl orange as indicator. This solution of sodium carbonate and hydrate completely precipitates magnesium from a solution saturated with sodium chloride. To 100 cc. of the solution in which calcium and magnesium are to be determined add 10 cc. of the soda solution, heat, filter, and wash. Titration of the excess of alkali in the filtrate then gives the alkali-equivalent of the two metals. To another 100 cc. of the solution containing calcium and magnesium, add 100 cc. of a 10 per cent solution of  $\text{NH}_4\text{Cl}$ , and then 10 cc. of the soda solution. Filter cold and wash. Titration of the filtrate will give the alkali-equivalent of the calcium alone, wherefore the quantity of magnesium present can be computed by difference.

\*Plinius Secundus, "Historia Naturalis," Lib. XXXIII. Chap. 21.



**NICKEL STEEL: ITS PROPERTIES AND APPLICATIONS.**

By ALBERT LADD COLBY.

The credit of making the first systematic series of practical tests on nickel steels belongs to Mr. James Riley, whose elaborate paper on 'The Alloys of Nickel and Iron' was read by him before the Iron and Steel Institute of Great Britain on May 8, 1889. From a discussion of this paper it appears that J. W. Hall, of Sheffield, had been working on similar lines to Mr. Riley, but his results had not been publicly put on record. Mr. Riley's paper gave the impetus to the introduction of nickel steel in a commercial way.

Since Riley's practical and suggestive paper, the technical men of many steel works in France, Germany, Great Britain and America, have made nickel steel, studied its physical properties and have put it on trial for a wide variety of purposes. In this work they have been aided by consumers looking for a better material, by the scientists connected with the technical universities in each country, as well as other independent investigators.

**Manufacture of Nickel Steel.**—No detailed reference to the melting of nickel steel and its subsequent rolling, forging and machining is possible within the scope of this paper. As is well known, nickel steel is melted in both the acid and basic open-hearth furnace, in the bessemer converter and in the crucible. From personal observation, the writer has found that the valuable properties of this special steel have been recognized and applied by the principal steel makers of Great Britain and the Continent, as well as by several of the steel melters of America. The physical constants of the metals, nickel and iron, are so closely allied, a fact proven by their occurrence in metallic meteorites, that no special precautions, other than those incident to good melting practice, are necessary during any of the above standard processes of steel melting, in order to insure a thorough mixture of the nickel and iron in the manufacture of nickel steel of any desired percentage of carbon, and with or without the presence of special elements, such as chromium, manganese, tungsten, molybdenum, etc. This fact is of great practical importance especially in such applications as armor plate, marine and stationary shafting and engine forgings, rails and bridge material, which necessarily involve the casting of large masses of this special steel. Precautions must be taken in the rolling or forging of nickel steels, and especially in their final heat treatment; the steels below 15 per cent nickel are also more difficult to machine than simple steels of the same carbon content. These difficulties have, however, formed no serious barrier to its successful introduction for a wide variety of purposes.

**Physical Properties of Nickel Steel.**—When the physical properties of nickel steel, as compared with those of carbon steel, are better known and more fully appreciated, the amount now used for the purposes for which it has already been successfully introduced will be considerably augmented and new applications will undoubtedly result. It is appropriate, therefore, to review some of the more striking physical properties, obtained as suggested by Snelus, by "following Nature's teachings and alloying nickel with iron."

**Modulus of Elasticity.**—The modulus of elasticity or co-efficient of elasticity of such materials as steel, which has a well-defined elastic limit, is determined by dividing the tensile stress in pounds per square inch at any point in the test below the elastic limit, by the elongation per inch of length produced by said stress. The modulus of elasticity which may therefore properly be regarded as the measure of the stiffness of the material is remarkably constant in steel notwithstanding great variations in chemical analysis, temper, etc.

A prejudice exists against nickel steel in the minds of some engineers owing to items which have appeared in the technical journals that the modulus of elasticity is lower in nickel steel than in carbon steel.

The fact is, however, that while the high nickel steels, especially those containing 20 per cent nickel or over, do have a lower modulus of elasticity than carbon steel, nickel steels containing, say 4 per cent nickel or less, such as are applicable for shafting, forging, bridge construction, rails, etc., have the same modulus of elasticity as carbon steels, viz., about 29,000,000 lb. per sq. in.

In proof of this assertion, the writer could quote the results of many calculations of the modulus of elasticity of various steels, containing below 5 per cent nickel, made from the detailed records of the physical tests published annually by the U. S. Army Testing Laboratory at Watertown, Mass., under charge of Mr. J. E. Howard, the accuracy of whose work is beyond question. Evidence could also be cited from the experiments of foreign scientists such as Mercadier, Wedding, Rudeloff and Guillaume, all of whom support the above assertion that the presence of 4 or 5 per cent nickel in steel has no appreciable effect in reducing its modulus of elasticity.

**Tensile Strength and Elastic Limit.**—If space would permit, a large amount of evidence could be cited to prove that nickel steel is chiefly distinguished from simple carbon steel by its proportionately high elastic limit. Furthermore, if 3 per cent nickel is alloyed with an open hearth steel of 0.25 per cent carbon, it produces a metal equal in tensile strength to a simple carbon steel of 0.45 per cent carbon, but having the advantageous ductility of the lower carbon steel.

On low carbon steels not annealed, the addition of each 1 per cent nickel up to 5 per cent causes approximately an increase of 5,000 lb. per sq. in. in the elastic limit and 4,000 lb. in the ultimate or tensile strength. The influence of nickel on the elastic limit and ultimate strength increases with the percentage of carbon present; high carbon nickel steels showing a greater gain than low carbon nickel steels.

In short, the addition of nickel to steel raises the proportion of elastic limit to ultimate strength and adds to the ductility of the steel. This effect of nickel in increasing the ratio of the elastic limit to tensile strength, without sacrifice of ductility, accounts for the increase in the working efficiency of nickel steel over carbon steel; in other words, its increased resistance to molecular fatigue.

**Elongation and Contraction of Area.**—The comparison of the results obtained from a large number of tests cut from full sized prolongations of forgings of both carbon steel and nickel steel, show that for a given tensile strength the presence of 3 to 4 per cent nickel increases the elongation and to a greater extent the contraction of area. On the other hand, comparing simple carbon steel and 3 to 4 per cent nickel steel of the same carbon content, the nickel steels will be found to have from 35 to 40 per cent greater tensile strength with practically the same elongation and contraction of area as the simple carbon steel. This increased ratio, in the nickel steel, of ductility to elastic limit and tensile strength, is another index of its increased value over carbon steel and for purposes where in service the material must resist severe and sudden shocks or rapidly repeated alternating stresses.

**Effect of Compression.**—The exhaustive series of experiments made by Wedding and Rudeloff, show that the resistance of compression of nickel-iron alloys increases steadily with the per cent of nickel present, until 16 per cent nickel is reached. Hadfield has also made a very complete series of experiments on the resistance of nickel steel to compression. He has found that a steel containing 0.27 per cent nickel shortened, under a compression of 100 tons (224,000 lb.) per sq. in. 49.90 per cent in a length of 1 in.; a steel with 3.82 per cent nickel only 1.05 per cent. He states that an ordinary mild carbon steel without nickel, under similar conditions would be shortened 60 to 65 per cent. He also states that the increased resistance to compression of nickel steel is not due to its hardness, an important point in the practicable application of nickel steels where machining is nec-

essary. He argues that the toughening action of nickel when added to steel is caused by a very intimate combination of the molecular structure, and that this advantage is further enhanced by the fact that the nickel does not show a disposition to segregate in steel like other elements; in other words, it appears to be more intimately combined.

**Rigidity.**—The superior stiffness of nickel steel over carbon steel without any sacrifice in its toughness has been proved in numerous applications coming under the writer's observation; this combination of properties forms one of the strongest arguments in favor of the use of nickel steel for a wide variety of applications where the service demands a rigid, as well as a strong elastic and tough material. H. A. Wiggin states that, in his experience, he found that nickel steel under the drop test gives better results than carbon steel, even in a greater ratio of superiority than exists in the comparison of the tensile tests of the two steels.

J. G. Eaton made a comparative test of nickel steel plate and carbon steel plate with a view of subjecting both plates to the same strains as those experienced by bottom plating. Both plates were riveted to angles in a manner intended to imitate the riveting of a ship's plate between the frames. A round-faced punch placed on each plate was then struck by a heavy falling weight. Each plate endured 13 blows before rupture and at the next blow each plate showed a clear aperture; that in the carbon steel plate, however, was 23.1 sq. in. in the clear, while the aperture in the nickel steel plate was 0.75 sq. in.; a ratio, therefore, of 30.5 to 1 in favor of nickel steel.

**Cold and Quench Bending Tests.**—Nickel steel will resist bending both before and after quenching better than carbon steel of similar tensile strength. This has been strikingly illustrated in a long series of practical tests made on nickel steel plates by Mr. Beardmore at his Parkhead Steel Works at Glasgow, Scotland. These tests included quench bends, cold bends, and also cold bending tests of the nickel steel plates with holes drilled in the tests prior to the bending. The results of Hadfield's careful experiments on the bending properties of cast and forged nickel iron alloys, varying from 0.27 to 49.65 per cent nickel, may be summarized in his statement "that from about 2.50 to about 6 per cent nickel, the bars certainly showed greater bending angles than those of any other iron alloys experimented on" by him.

In a series of comparative tests of carbon steel and nickel steel, such as is used for forgings, made at the works of the Bethlehem Steel Company, the writer obtained bending tests on the unannealed, annealed and oil-tempered nickel and carbon steels which show the superiority and freedom from brittleness of the nickel steel. A comparison of the physical properties of the two steels is as follows:

	Heat treatment.	Tensile strength, lbs.	Elastic limit, lbs. per sq. in.	Elongation, % in 2 ins. area.	Contraction of area, %.
Annealed	Carbon steel...	109,500	51,440	19.50	30.31
	Nickel steel...	100,330	66,720	25.00	54.50
Oil-tempered	Carbon steel...	129,360	67,230	17.50	38.53
	Nickel steel...	103,890	76,390	25.00	61.56

**Hardness of Nickel Steel.**—It has been definitely proved that a very low carbon steel cannot be made hard by the mere addition of nickel. Nickel steel is tougher than carbon steel but is not harder in the true meaning of this latter term.

The hardness of nickel steel below about 15 per cent nickel depends upon the proportions of nickel and carbon jointly. Thus while a steel with 2 per cent nickel and 0.90 per cent carbon cannot be machined, a steel with 3 per cent nickel and 0.60 per cent carbon can be machined. The freedom from hardness of comparatively low carbon nickel steel is strikingly illustrated by the writer's experience in cutting with a penknife the rifle barrels made, at Bethlehem, of steel containing 4.50 nickel and 0.30 per cent carbon, and yet this steel had an elastic limit of over 80,000 lb. and a tensile strength of over 100,000 lb. per sq. in.

\*Abstract of paper read before the American Society for Testing Materials.



At 20 per cent nickel, as stated by Riley, successive increments of nickel tend to make the steel softer and more ductile, and even to neutralize the influence of carbon.

**Resistance to Torsion.**—Nickel steel resists torsion or twisting stress better than the same class of carbon steels.

Riley's experiments indicate that it is not necessary to use steels high in nickel to obtain the best effect in torsional resistance.

The writer has found that several of the French steel works have appreciated this property of nickel steel by applying it to the manufacture of special wire and springs.

**Resistance to Wear or Abrasion.**—The rigidity and toughness of nickel steel make it a desirable metal where, in service, the material is subjected to wear or abrasion.

Practical evidence of this statement is found in the three years' comparative trial of nickel steel and carbon steel rails on the "Horse-shoe" curve of the Pennsylvania Railroad, which has recently resulted in orders being placed for some 10,000 tons of nickel steel rails for the sections of the tracks of the Pennsylvania, Baltimore & Ohio, and New York Central railways, where in the past frequent renewals of the carbon steel rails have shown their inability to withstand the severe abrasion due to the sharp curves and heavy traffic.

**Expansion of Nickel Steel.**—The co-efficient of expansion of nickel steel varies greatly with the percentage of nickel present; especially in the series of nickel steels containing from 20 to 45 per cent nickel. The 36 per cent nickel steel called in France *Invar* (from the word "invariable") has a lower co-efficient of expansion than any other metal or alloy known.

Guillaume, of the International Bureau of Weights and Measures, the best authority on this subject, and whose opinion is also supported by other experts, states, however, that there is no practical difference between the expansion of simple carbon steel and of steel containing up to 5 per cent nickel. In the use, therefore, of low carbon 3 to 5 per cent nickel steels in bridge construction the same allowance for expansion can be made as when carbon steel is used. This is an important point especially when both carbon steel and nickel steel are to be used in the same structure.

The different co-efficients of expansion of steels, containing from 30 to 45 per cent nickel, have resulted in their application in France and Germany to a wide variety of purposes, which will be referred to later.

**Effect of Punching and Shearing.**—Beardmore, the Scotch steel maker, places the loss of strength due to punching ordinary mild steel at 33 per cent of the original strength, and claims that the loss of strength in punching nickel steel varies from 15.5 to 20 per cent of the original strength, and furthermore that on thicker sections of nickel steel plate the loss of strength is only about 10 per cent. A number of other experimenters have also found that nickel steel plates are not weakened by punching to as great an extent as carbon steel plates.

There is ample evidence that the presence of nickel in steel increases its shearing strength. This is important especially in connection with riveted work, as the strain on the rivet is not a simple strain but rather a shearing or cutting action. Moreover, in the shearing of nickel steel rivets, the fracture is fibrous and the metal appears to have torn gradually, whereas in ordinary carbon steel rivets, the metal breaks off short.

From the results of a comparative test made at Bethlehem on nickel steel and carbon steel rivets, the conclusion was drawn that it may be safely deduced that a  $\frac{3}{4}$ -in. nickel steel rivet will replace a 1 1/16-in., or even possibly a 1 1/8-in. common steel rivet, thus effecting a saving of considerable plate section and giving increased strength.

Experiments made by Beardmore, Abraham and

Rudeloff and at the Creusot Steel Works, also testify to the increased shearing strength of nickel steel rivets.

**Segregation.**—The writer's opinion, based upon a large number of chemical analyses made at Bethlehem, is that nickel in itself segregates but very slightly even in large armor plate and shafting ingots. This is natural, as the atomic volume, atomic weight and specific gravity of nickel are similar to those of iron.

Some experimenters testify that nickel tends to check the segregation in steel of the other elements such as sulphur, phosphorus, carbon, manganese and silicon. Mr. Hadfield thinks that the tendency of nickel to check segregation is probably due to the fact that it raises the melting point of the carbides or cementing material and causes the whole mass to set more nearly together, and quotes in proof that nickel steel ingots have a finer grain than carbon steel ingots. Mr. Chase of the Midvale Steel Company states that "nickel is supposed to lessen the segregation and liquation of carbon by combining with the carbon which cements the particles of iron together, and thus bringing the specific gravity of the carbon compounds nearer to that of the rest of the alloys in the fluid mixture. It also seems to cause this cementing carbon to solidify at more nearly the same temperature as the other alloys."

Mr. Campbell, of the Pennsylvania Steel Company, made a series of tests to prove what he states to be the current impression among manufacturers of nickel steel, that the presence of this element prevents segregation. His conclusion is that there seems to be good ground for the assumption that nickel prevents the separation of the metalloids, but that it does not prevent it altogether, and he states that it is not probable that any other agent will ever be found competent for this task.

Within the limits of this general review, it is impossible to refer in detail to many interesting subjects connected with nickel steel, but sufficient evidence has probably been presented to prove that this material possesses many advantages of practical importance over simple carbon steels.

**Application of Nickel Steel.**—The advantageous physical properties of nickel steel over carbon steel that have been outlined suggests numerous applications where this special steel is of decided practical advantage, and where the demands in service amply warrant its somewhat increased cost. Within the limits of this paper the writer can but briefly summarize the applications for nickel steel, which he has found during the past year's special study of the subject.

As is well known, the advantages of nickel steel for armor plate have been recognized for many years, so much so that nickel steel, with or without chromium, is now used by the manufacturers of armor plate in all countries. It is also used for the manufacture of various apparatus on battle-ships, such as ammunition hoists, communication tubes, etc.

Nickel steel is used for a wide variety of forgings and drop forgings, including axles and other parts of automobiles and marine engines, shafting and crank-shafts for steam-ships and stationary engines and for locomotive forgings.

The advantages of nickel steel castings are also generally recognized. Test specimens cut from coupons from annealed nickel steel castings can be guaranteed to show an elastic limit of 50,000 lb. with an elongation in 2 in. of at least 18 per cent. In some locomotives now building a large number of parts are made of nickel castings, and they have also been introduced for large hydraulic cylinders, for crank webs of shafting, for propeller blades, rudders, etc.

The application of nickel steel for rails has already been referred to. It is about to be applied in this country to the manufacture of locomotive tires, for which purpose it has been successfully tested in Europe.

There is little doubt but that in the near future nickel steel will enter into bridge construction and

certain other structural purposes. Its properties are especially attractive for long-span bridges, and also in cases where the charges of transportation enter so largely into the cost of the structure as to make lightness in construction a desirable factor.

Among the other applications of nickel steel may be mentioned ship-plate, artillery plate, ordnance, wire cables, resistance wire as a substitute for German silver, springs, dies, caps, screws, etc. Some of the lower nickel steels when drawn into tubes furnish a very stiff material with an elastic limit of about 100,000 lb., applicable for all sorts of machine construction where strength and lightness must be combined. The field for this application of nickel steel is a wide one, and after a few manufacturing difficulties have been overcome, this class of tubing will be placed on the American market. Its use for non-corrosive seamless tubing for boilers has recently been introduced into America by the Shelby Steel Tube Company. It is manufactured from a 30 per cent nickel steel furnished by the Bethlehem Steel Company.

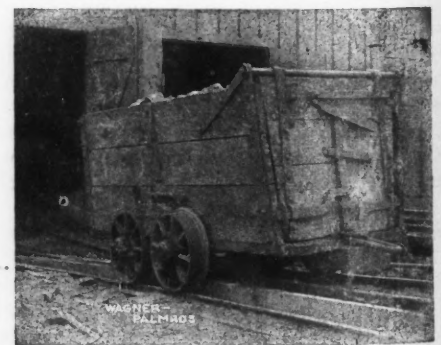
It is impossible within the limits of this paper to enumerate all the applications of nickel steel, but one may gain an idea from the above of the wide variety of purposes for which it has been successfully used. The United States is perhaps in the lead in the applications which have been made of 3 to 4 per cent nickel steels, while France holds first place in the applications of the higher nickel steel.

The wide range in physical properties of steels containing from 2 to 45 per cent nickel, and the variations in each grade resulting from different carbon content, or the presence of some special element, such as chromium, molybdenum, tungsten, etc., make the study of the alloys of nickel, iron and carbon imperative to the engineer in search of a material that possesses an advantageous combination of physical properties.

#### CAR RETARDERS FOR INCLINES.

At coal mines where the seams worked are opened considerably above the tippel, the loaded cars must often be lowered over an incline. In mines where the coal can be opened by slope the chain hoist has been frequently applied, and at the present time is the most common means of handling the cars under such conditions. The problem of handling the cars over an incline in numbers which will give a large output for a mine has been under investigation some time, but many devices used have been of limited capacity.

An equipment recently put on the market by the Wagner-Palmros Manufacturing Company, of Fair-



mont, W. Va., receives the loaded cars automatically at the top, carries them down the incline, delivers them automatically to the dump, receives the empty cars automatically, carries them up the incline, and delivers them automatically at the top, thus greatly reducing the labor in connection with these operations.

The illustration shows the first of these plants, now in operation at the mine of the Clark Coal Company. This plant has been in constant operation for almost a year. It is handling a daily capacity of about 1,200 tons, only about half the capacity of the retarder, the capacity having been calculated upon a run-of-mine basis. The length of the incline is 340



ft. and pitch 33 per cent. The cars weigh about 1,800 lb., and hold approximately two tons of coal. The retarder is designed to handle constantly 14 loaded cars going down, and the same number of empty cars going up, and deliver the loaded cars to the dump at the rate of three cars per minute.

The device consists of an endless rope running around a sheave at the head of the incline and around another at the bottom. The sheave at the top is

35 per cent pitch, length 350 ft. and capacity 3,500 tons per day, this in a general way being the limit of capacity and pitch of incline. A greater capacity could, of course, be obtained on an incline of less pitch and a greater length, or, of less length and the same pitch. A plant is now under construction which will have a capacity of about 4,000 tons on a very short incline of about 150 ft. length and 23 per cent pitch. In cases where the capacity is small and the

year. Two dividends of £81,000 each were paid, making a total distribution among shareholders since the formation of the company of £464,000, and the sum of £69,568 was carried forward.

The general manager's report states that work was carried on at all levels from the San Juan to the 786-ft. level, the largest quantity of ore being obtained from the hanging wall ore-body above the 286 ft. and 386-ft. levels. The vein varies from 22 ft. to 33 ft. in width. On the 86-ft. and 186-ft. levels the ore has been proven practically continuous from the north end line to the incline shaft. On the 786-ft. level the drifts running north and south from the main cross-cut have been mainly in the faulted blocks, and the north drift has just entered the ground corresponding to the hanging wall ore-body. The values on this level have not been of paying character as yet, but there is a probability that sulphides will be found at no great depth below. A cross-cut is being run from the north shaft east on the 486-ft. level to top the Descubridora vein in the northern part of the property. On the Somera property a vein 13 ft. in width has been opened, showing fair values on the hanging wall side. The ore extracted during the year amounted to 114,436 tons. The reserves of ore in mine and dump are estimated at 543,890 tons, with an average assay value in gold of \$11.75 and 3 oz. in silver.

The mill of 100 stamps crushed 110,953 tons of ore. About 16 per cent of the values were recovered by amalgamation on the plates. The tailings from the mill were treated in the cyanide plant, which saved about 65 per cent of the assay value of the ore, a considerable improvement over the previous year: The total recovery in bullion was \$1,522,951, or 82.7 per cent of the assay value of the ore. The following table shows the working costs for the year.

	Total.	Per ton.
Total tons milled.....	110,953	.....
Mining .....	\$161,570	\$1.46
Development .....	88,780	0.80
Milling .....	83,861	0.76
Cyaniding .....	110,868	1.08
General expenses .....	96,979	0.87
Total working costs.....	\$551,049	\$4.97
Construction expenses .....	55,867	0.50
Total costs .....	\$606,916	\$5.47

The figures are in Mexican dollars. There was an increase in the total costs over the previous year, which was due to increased construction and larger costs for cyaniding, milling and development. Re-

mounted on a shaft, which is turned by a gear retarded by a worm and wheel, the worm being driven by a small engine of sufficient power to haul a number of empty cars up the incline when there are no loads going down. On the rope are attachments at regular intervals which handle the cars. The grades on the empty and loaded tracks at the bottom and top are so arranged that the cars are fed to the retarder without requiring an attendant. The cable runs entirely on the surface of the ties when on the incline and does not require an excavation or trough under the tracks, all parts being exposed and accessible.

The advantage of this arrangement over the drum and rope, or gravity incline, is principally the increased output which can be obtained, as the number of cars which can be delivered to the tibble is limited only by the strength of the component parts of the device; and as the cars are delivered continuously at a fixed rate, the man who is operating the

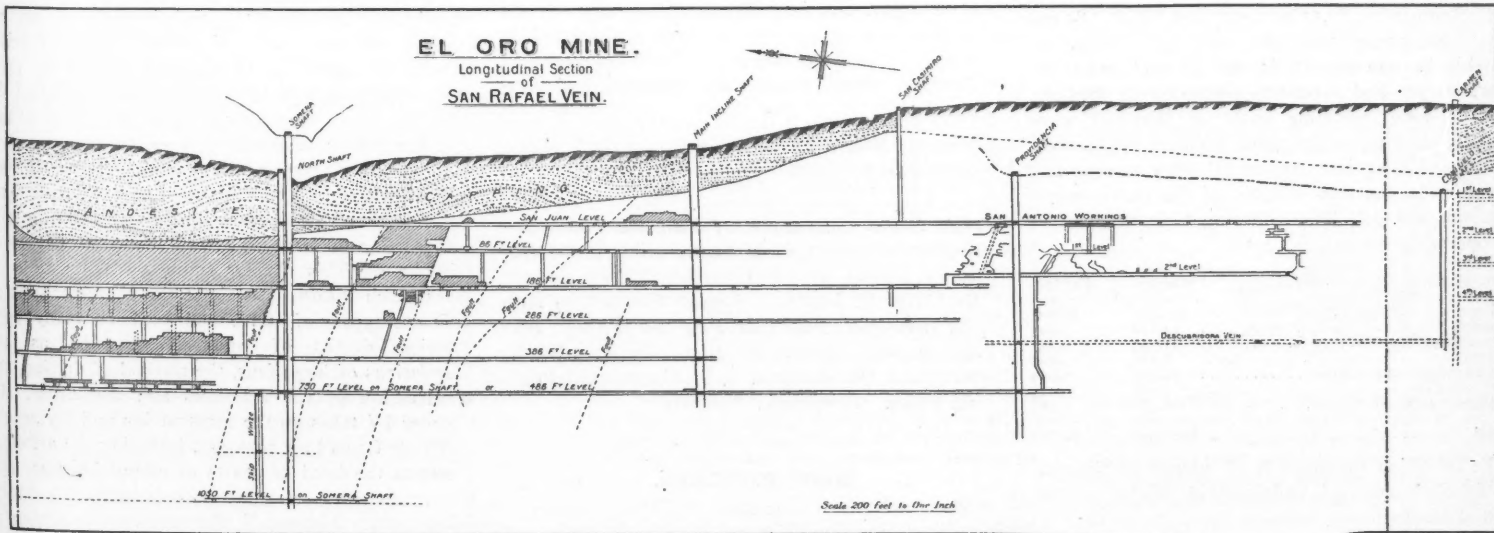
incline comparatively long, from 500 to 1,000 ft., and the pitch slight, this arrangement can be used to advantage.

While the outfit has been designed particularly with a view to handling cars on an incline, it has also been adapted to slopes, for which it has certain advantages. It does not necessitate excavating under the tracks in the slope. The rope being supported, does not drag or rub on the ties or any part of the machinery, and its life is consequently increased. A chain will wear at each joint or link, and the opportunities for observing the wear on it are more limited, so that the chain may break before a weak point is detected.

ABSTRACTS OF OFFICIAL REPORTS.

El Oro Mining and Railway Company, Mexico.

The report of this company, which owns gold mining and railway property in Mexico, for the



dump can regulate the dumping of the cars to correspond with the capacity. Means are provided for stopping or starting the mechanism at the will of the operator, so that in case the cars are being fed to the tibble too fast the man at the dump can by signals have the retarder stopped, even though the incline should be full of loaded cars. When the man at the dump is ready again the cars can at once be delivered as fast as required.

The most favorable conditions for the use of a device of this kind would be an incline not exceeding

year ending June 30, 1903, shows a very satisfactory condition of affairs. In the statement from the London office the total income is placed at £361,386, of which £319,942 was received from bullion, £40,873 from the railway and £571 from interest, exchange and sundry items. The total expenditures were £157,949, divided into mining £135,562, railway department £18,367, London office £2,220, and directors' fees £1,800. The net profits of the year's operations accordingly were £203,437, while the sum of £39,647 was carried forward from the previous

pairs in the mill and bad water partially account for the increase. In the railway department the results were better than in the previous year, owing to the increased amount of freight handled. The timber rights on a large tract of land has been acquired in exchange for land that has been cleared.

The directors' report states: "The ore reserves blocked out and awaiting extraction on June 30 are estimated at 543,890 tons. In addition to this amount there is, as stated by Mr. Raymond, a large quantity of ore exposed in various sections of the mine,

but not yet sufficiently blocked out to justify its inclusion in the above estimate. It was the existence of this additional tonnage, concerning which the directors have not any doubt, that enabled them to state in the circular of February 11 that above the limit of present development the mine would yield at least 1,000,000 tons of ore which could be profitably treated on a large scale. To handle this large quantity of ore successfully and economically, and to provide means for the treatment of the additional reserves which it is anticipated will be exposed by further developments in depth, the directors decided to increase the present milling capacity by the erection of a new 100-stamp mill, making 200 stamps in all. This mill, which will embody the latest practice in cyanide treatment, is now in course of construction and will be in operation before the close of the current fiscal year. The estimated cost of the new mill and general equipment incidental thereto is £70,000, and the directors propose to meet this expenditure out of surplus profits. In view of this decision the directors do not consider it necessary to make any further provision at the present time for depreciation."

During the year the company secured, in conjunction with the Exploration Company, an interest in a working option on the Mexico mine, which is a northerly extension of the San Rafael vein. Development work on the new property thus far has been of promising character.

#### Bunker Hill & Sullivan Mining and Concentrating Company.

The Bunker Hill & Sullivan Company owns several silver-lead properties and a large concentrating plant near Wardner, in the Cœur d'Alene district, Idaho. The manager's report for the year ending May 31, 1903, contains a very full statement of the company's operations, and is particularly noteworthy for its admirable classification of expenses, which are given in great detail. In every way the report is a model one and reflects credit upon the management.

The results of the mining operations for the year show an output of 260,070 tons of concentrating ore at a cost of \$544,650, and 430 tons of shipping ore at a cost of \$2,721, making the total ore mined 260,500 tons, at a cost of \$547,372, or \$2.10 per ton. The ore was obtained from the different mines as follows: Sullivan, 1.05 per cent; Bunker Hill, 33.97 per cent; Stenwinder, 61.13 per cent, and Tyler, 3.85 per cent. The approximate gross value of concentrates and shipping ore was \$1,623,290. Freight and treatment charges and discounts amounted to \$725,562, and the total operating costs at Wardner were \$685,946, showing an operating profit at Wardner of \$211,782. Taking into account all other receipts and expenditures, the total surplus of the year's operations was \$98,632. The following table summarizes the operating costs:

Ore mined—	Total 260,500.	Per ton.
Stoping .....	547,372	\$2.101
Tramming .....	24,656	0.095
Concentrating .....	61,793	0.237
Shipping .....	6,996	0.027
Superintendent and office.....	24,549	0.094
Legal services.....	4,200	0.016
Contingent expense.....	16,380	0.063
Total .....	\$685,946	\$2.633

The following statement is of interest as showing the detailed costs of underground mining in the Cœur d'Alenes:

	Total	Per ton.
Foremen, machinists, blacksmiths, etc....	\$67,981	\$0.261
Timbermen and carpenters.....	17,402	0.067
Miners .....	111,359	0.429
Car men.....	31,719	0.122
Shovelers .....	173,873	0.668
Power labor.....	8,612	0.033
Repair labor.....	9,960	0.038
Explosives .....	23,747	0.092
Illuminants .....	9,025	0.035
Lubricants .....	964	0.004
Iron and steel.....	5,075	0.019
Miscellaneous supplies.....	10,095	0.039
Timber and lagging.....	53,321	0.205
Power supplies.....	2,892	0.011
Wood .....	10,234	0.039
Stable and stock.....	2,153	0.008
Exploration .....	6,237	0.024
Total .....	\$544,650	\$2.094

New ore bodies were discovered on Nos. 3, 5, 5½ and 6 levels of the Bunker Hill mine, on Nos. 6 and 7 levels of the Tyler mine and on No. 4 level of the Sullivan mine. The ore reserves at the close of the year were estimated at 145,000 tons.

The report of the manager says: "It will be seen that the production of the mines was lighter during this period than during the preceding year, but to the low prices received for both lead and silver is mainly due the smaller net financial result shown. The condition of the ore bodies exposed in our stopes made it necessary on the first of the present calendar year to reduce the stoping force by 35 per cent, and to lessen the tonnage of ore mined. But the grade of ore handled was so maintained that one yield of shipping product was but slightly decreased under that of preceding months, and the cost per ton of both shipping product and run-of-mine ore greatly reduced.

"The most remarkable event in our development during the past year was the completion of the connections between all our mines and the Kellogg tunnel, thus suspending the work of the Bleichert tramway, and affording a direct outlet to the concentrator for all our ore, as well as giving splendid ventilation and drainage to all our workings.

"Exploration has been carried on systematically during the entire year, and ore bodies of value found in the Bunker Hill, Tyler and Sullivan mines. The development in the latter mine shows such ore bodies as will produce greater tonnage and profits than have been taken from it in a long period.

"No expenditures for improvements are planned for the coming year, other than that for electrical machinery to utilize the long-distance power transmission now building from Spokane Falls, which will be completed this fall, and enable us to purchase power in excess of that developed by water, cheaper than we can generate it by steam, as now done. The purchase price of this machinery, and the cost of its installation will amount to between \$12,000 and \$15,000."

#### BOOKS RECEIVED.

In sending books for notices, will publishers, for their own sake and for that of book buyers, give the retail price. These notices do not supersede review in a subsequent issue of the ENGINEERING AND MINING JOURNAL.

*List of Lights and Fog Signals on the Atlantic and Gulf Coasts of the United States.* Corrected to June 30, 1903. Washington, D. C.; Government Printing Office. Pages, 244; with map and illustrations.

*Estadística Minera de España, 1902.* Madrid, Spain; Government Printer. Pages, 180.

*United States Commission of Fish and Fisheries—Report on Collections of Fishes Made in the Hawaiian Islands, with Descriptions of New Species.* By Oliver P. Jenkins. *Aquatic Products in Arts and Industries: Fish Oils, Fats and Waxes. Fertilizers from Aquatic Products.* By Charles H. Stevenson. Washington, D. C.; Government Printing Office. Pamphlets; illustrated.

#### BOOKS REVIEWED.

*Modern Practical Electricity.* By R. Mullineux Walmsley. Chicago, Ill., W. T. Keener & Co. In three volumes. pp. 888. Small quarto. Price \$3 per vol.

This is the most complete treatise by an authoritative English writer; the three volumes are handsomely illustrated and the letterpress is clear cut. The field of applied electricity is covered throughout and in detail; the history and principles of electric science serve as an introduction to the technology of electricity, the scope of the treatise being such that both are fully dealt with. All those who are en-

gaged either in the academic or the industrial study of electricity will find these volumes of great value.

*Tabellen zur Bestimmung der Mineralien mittels äusserer Kennzeichen.* By Albin Weisbach. Sixth Edition, revised by Dr. Friedrich Kolbeck. Leipzig, Germany; Arthur Felix. Price 3 marks.

This is a new edition of the mineral tables originally prepared by Albin Weisbach, for many years professor of mineralogy at Freiberg. The tables are intended for the use of students as a means of rapid determination of minerals by physical characteristics. The various minerals are divided on the basis of luster into three principal groups, within which each species is entered in the order of its hardness, with information regarding its streak, color, crystal form, etc. These characteristics when satisfactorily determined will give a clue to the identity of most common minerals, but in some cases they will have to be supplemented by reference to a text-book on mineralogy, or by blow-pipe analysis. The tables have been used in many of the German schools with marked success. In the new edition such corrections and additions have been made as to make them thoroughly up to date.

*Die Entwicklung des Nieder-rheinische Westfälischen Steinkohlen-Bergbaues in der zweiten Hälfte des 19 Jahrhunderts.* Issued by the Verein für die Bergbaulichen Interessen im Oberbergamtsbezirk Dortmund in Gemeinschaft mit der Westfälischen Berggewerkschaft-Kasse und dem Rheinisch-Westfälischen Kohlensyndikat. Vol. VI. Berlin; Julius Springer, 1903. Pages, 586, illustrated. Price of the entire work, 160 marks.

This volume of the monumental work, undertaken by the interests named, treats of coal mine ventilation. It is marked by the same painstaking thoroughness of treatment that has characterized the preceding volumes, and contains, therefore, a wealth of information about the manner in which German engineers have tried to overcome the danger involved in working, at great depths, narrow and gassy seams. The low death-rate in German collieries is sufficient evidence of the efficiency of the methods used. The present volume contains articles written by many different professors, government mining officials, etc. Chapter I discusses the composition of fresh air, mine air and the gases found in the coal mines. Chapter II takes up the quantity of fresh air for ventilating, according to the amount of ground opened and the number of persons employed below ground; the effects of variation in atmospheric pressure upon mine ventilation, the determination of the strength of air currents as shown by water gauge, and the theory of mechanical ventilation. Chapter III, in some respects the most interesting one in the book, since it contains most new material, takes up methods of ventilation and discusses the use and construction of furnaces and of the various types of mine fans. This chapter comprises 125 pages. It gives much information about the characteristics of different types of fans, and contains many cuts, showing details of construction, such as the foundations of large fans, the method of driving, the construction of the entrances and discharges, etc. Chapter IV takes up the construction and laying out of air shafts and air passages, including the arrangements at the head of shafts to permit hoisting, and the construction of mine doors, splits, regulators, bridges, etc. Chapter V discusses the ventilation of working faces in the mine, includes the use of hand ventilators, and ventilators of larger size driven by steam engines or electric motors. It also treats of ventilation by the use of water jets, or steam, the construction of pipes for conveying air to working faces, and the general control of ventilating systems.

The book is, like its predecessors, well illustrated, and these illustrations are where they should be, that is adjoining the text which refers to them. In typography and binding, the work is excellent. The price may keep it from being part of the library of



many mining engineers, but it contains such a wealth of information about the latest German practice in coal mining, that it should be in the libraries of all universities and technical schools.

QUESTIONS AND ANSWERS.

Queries should relate to matters within our special province, such as mining, metallurgy, chemistry, geology, etc.; preference will be given to topics which seem to be of interest to others besides the inquirer. We cannot give professional advice, which should be obtained from a consulting expert, nor can we give advice about mining companies or mining stock. Brief replies to questions will be welcomed from correspondents. While names will not be published, all inquirers must send their names and addresses. Preference will, of course, always be given to questions submitted by subscribers.

**Petroleum Indications.**—In drinking from a spring brook here I discovered an unmistakable odor and taste of kerosene oil. Does crude petroleum taste or smell like kerosene?—W. S. C.

**Answer.**—Crude petroleum varies considerably in odor, but is a darker fluid than kerosene; by comparison it has a very unpleasant odor, and it forms a heavier scum on standing pools of water. However, the occurrence of petroleum in your locality is altogether unlikely. The odor of kerosene is probably the work of some camping outfit or possibly some one is trying to work up an oil excitement. The finding of kerosene on pools or in streams would certainly not indicate the occurrence of petroleum. Several years ago an oil boom was started in Florida by the use of kerosene—but the fraud was soon exposed.

**Silica.**—I have quite an extensive deposit of white quartz which assays from 98 to 99 per cent pure silica. Who would be likely to use this rock?—H. S.

**Answer.**—Lump quartz, which we suppose you refer to, is too low priced to stand the cost of freight from any long distance to the consumer. At New York lump quartz is sold at \$2.50 per short ton in quantity. Customarily the rock is ground for use as an abrasive and as an ingredient in the manufacture of pottery. Ground quartz, analyzing 98 to 99 per cent pure silica, and clean, sells f. o. b. New York at \$10-\$12 per ton, according to quantity. You are advised to correspond with dealers, among whom may be mentioned Hammill & Gillespie, 240 Front street, New York, and Charles Cooper & Co., 194 Worth street, New York.

PATENTS RELATING TO MINING AND METALLURGY.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by the ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared:

Week Ending September 29, 1903.

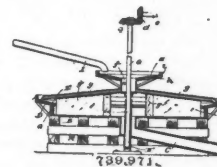
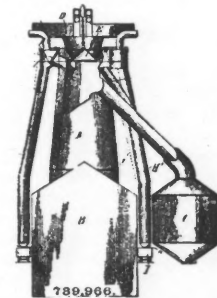
- 739,812. OIL WELL JACK. Josiah Barrett, Bellevue, Pa. The combination with a frame having a passage-way there-through, of means for securing the same to a floor, a rack-bar arranged to reciprocate horizontally in the passage way in the frame, and operating mechanism for the bar in frame.
- 739,815. COMPRESSED COAL COMPOUND.—George H. Becker, Covington, Ky. The process consists of melting rosin and oil together until they fuse, adding to this while the mass is heated to about 150° F. diluted sulphuric acid, mixing the resulting compound with a mixture of coal-dust and black oxide of manganese that has been heated for about an hour to a temperature of 200° F., and subjecting the resulting product to pressure in molds.
- 739,835. ART OF MAKING ARTIFICIAL STONE.—Matthilde Cordes, geboren Müller, Hanover, Germany. The process consists in adding to an aqueous lime and barium mixture comminuted peat combined with a comminuted substance of greater specific gravity which has the property of attaching itself to the peat particles, and also adding wood shavings to such mixture.
- 739,837. SLATE PICKER.—George W. Cross, Carbondale, Pa. A slate-picker plate or segment curved between its

ends and provided with a series of elongated slots, the metal being canted between the slots and extending above and below the plane of the slots.

- 739,843. HOISTING APPARATUS.—Hugh Dyer, Neck City, Mo. A hoisting device, comprising a shaft, a drum loosely mounted thereon, connecting mechanism for operatively connecting the drum with the shaft, a controlling device for the connecting mechanism, comprising a sleeve mounted on the shaft and provided with a screw-thread, a nut surrounding the shaft and engaging the screw-thread, so that when the nut is rotated the sleeve is moved along the shaft, an eccentric on the nut, provided with an eccentric-strap, and a braking device for the drum, the braking device connected with the eccentric-strap so as to be moved thereby.
- 739,859. METALLIC PACKING FOR PISTONS, RODS, ETC.—William S. Halsey, Pittsburg, Pa. A packing-ring formed of light sheet metal, possessing elasticity, drawn into an integral and unbroken annular body and a shell and projecting from the inner side thereof, the shell being tapered away from the body to a diameter slightly less than that of the surface against which it is to abut when placed in operative position.
- 739,860. WELL-BORING MACHINE.—Daniel A. Harmon, Ingraham, Ill. The combination with an independently-rotatable driving member and a windlass, of means for connecting the driving member with an auger-shaft, and a connector between the driving member and the windlass.
- 739,863. DUMP-CAR. Harry S. Hart, Chicago, Ill., assignor to the Rodger Ballast Car Company, a corporation of Illinois. The combination of a car-frame, a dumping-door, a rotatable shaft provided with means for connecting it with the dumping-door, means for rotating the shaft, a friction-wheel mounted upon the shaft and rotatable therewith, and a friction-strap in engagement with such friction-wheel.
- 739,864. DUMP-CAR.—Harry S. Hart and Otto W. Meissner, Chicago, Ill. In a hopper-bottom dumping-car, the combination of a supporting-framework comprising longitudinal sills, a V-shaped hopper extending longitudinally of the car with its apex at or near the longitudinal center thereof, the lower side portions of which are pivoted to the sills of the car and extending below the same, and means for holding such pivoted portions in operative position.
- 739,880. DUMPING-CAR.—Richard Jonas, Bochum, Germany. A dumping-car, comprising a movable bed, hooks pivotally secured to the frame and supporting the bed at either side, means for releasing the hooks on one side whereby the bed is free to turn as on a hinge in the hooks on the opposite side, and gear for positively raising and lowering the thus-hinged bed, the gear being positively connected to the bed.
- 739,881. BRICK MACHINE.—Chauncey W. Kilborn, Rosenhayn, N. J., assignor to two-thirds to James D. Cox and Thomas L. Woodruff, Brighton, N. J. The combination with a feed-spout and two dies spaced apart and communicating with the spout, of a separate frame disposed between the dies and having a downwardly and forwardly projecting duct in its upper portion, a cylinder supported on the separate frame and communicating with the duct, a shaft mounted in the cylinder, an auger on the lower portion of the shaft and a scraper secured to the shaft above the auger.
- 739,892, 739,893 and 739,894. DUMP-CAR.—George B. Maltby, Chicago, Ill., assignor to National Coal Dump Car Company, of South Dakota, Rapid City, S. D., and Chicago, Ill., a corporation of South Dakota. The combination of a supporting framework comprising longitudinal center sills, a movable central floor portion comprising a plurality of relatively movable sections arranged longitudinally of the car over such center sills and extending outward and downward transversely of the car at an incline in opposite directions in one position, and horizontally in a second position.
- 739,913 and 739,915. DUMP-CAR.—Spencer Otis, Chicago, Ill., assignor to National Coal Dump Car Company, of South Dakota, Rapid City, S. D., and Chicago, Ill., a corporation of South Dakota. The combination of a supporting frame portion, dumping bottom portions forming a flat floor of the car and provided with grooves at or near its free edges, and depending tongues in the frame of the car arranged to engage the grooves in the edges of the car-door so as to help position and seal the joint between the same.
- 739,914. BOTTOM-DUMPING CAR.—Spencer Otis, Chicago, Ill., assignor to National Coal Dump Car Company, of South Dakota, Rapid City, S. D., and Chicago, Ill., a corporation of South Dakota. The combination of a supporting-framework, a bottom portion formed of one or more dumping-doors pivoted at their inner edge and with their free or discharging ends extending outside to a point at or near the outer side of the car, rock-shaft mechanism, and chain mechanism secured to the rock-shaft and passed around and under the free discharging end of the dumping-door section.
- 739,921. APPARATUS FOR TREATING GASES.—Harry Pauling, Brandau, Austria-Hungary. An apparatus for treating gases, vapors and the like by electric-spark discharges, comprising a cylinder of insulating material fastened upon a rotarily-mounted shaft, a conductive wire wound around the cylinder in the form of a helix, the ends

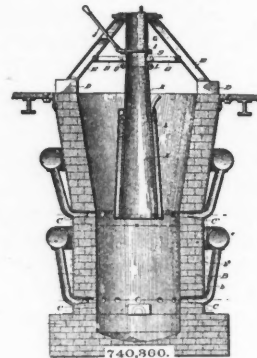
of the wire being connected with the shaft, a metal strip arranged parallel to the shaft and at some distance from the cylinder, a set of nozzles arranged parallel to the strip at a short distance therefrom and half-way between the strip and the cylinder, means for rotating the cylinder, means for blowing air through the nozzles and electric connections between the strip, the shaft and a source of electricity.

- 739,936. ARTIFICIAL FUEL.—John T. Smith, Heron Lake, Minn. A process of making artificial fuel of vegetable or wood fiber which consists in first subjecting the material while held in suspension by an air-current within a confined area to treatment by a moistening agent, then mixing the product of such treatment and finally compressing it.
- 739,937. MACHINE FOR MAKING ARTIFICIAL FUEL.—John T. Smith, Heron Lake, Minn. The combination, with a receptacle having a discharge-opening, of means for delivering the refuse of a flax-break thereto, means for dampening the refuse in the receptacle, means for mixing a binder with the refuse after it is discharged from the receptacle, and means for compressing the mixture.
- 739,957-739,958. DEVICE FOR BURNING PULVERIZED COAL.—Benjamin J. Walker, Erie, Pa. The combination with a fire-box; and a feeding and blast mechanism; of a means for delivering pulverized coal to the fire-box under blast in directly-opposed confined jobs of sufficient force to spread the fuel by the impact of the jets.
- 739,965. ELASTIC-FLUID TURBINE.—James Wilkinson, Birmingham, Ala.—In an elastic-fluid turbine, the combination with rotating elements, of two or more separate compartments, inclosing the elements, and intermediate stationary passages between the compartments to which they deliver the fluid in succession, and automatic means to regulate the leakage from the compartments.
- 739,966.—FURNACE.—George Winston, Chicago, Ill.—A furnace constructed at its top with explosion openings, hoods arranged over the explosion openings, a dust catcher suitably connected with the upper portion of the furnace and discharge flues independent of the dust catcher and leading downwardly from these hoods to points below.
- 739,971.—COMBINED ORE CONCENTRATOR AND AMALGAMATOR.—Dorsey W. Almond, Leadville, Colo. The machine consists essentially of a bed, a stationary receptacle arranged thereon, and made up of a pan, an annular, downwardly and inwardly inclined wall mounted on the upper edge of the side wall of and arranged to discharge into the pan, and equipped with means for catching and holding gold and silver, a wall extending upwardly from the outer edge of the wall, and a discharge conduit leading from the center of the bottom of the pan, a fixed bearing extending through the conduit and the bottom of the pan, a vertical shaft journaled in the bearing, a rotary tray fixed on the shaft, above the center of the pan, and comprising a receptacle, an annular downwardly and inwardly inclined wall mounted on the upper edge of the side wall of and arranged to discharge into the receptacle, and equipped with means for catching and holding gold and silver, and a wall extending upwardly from the outer edge of the wall, radial pipes connected to the receptacle of the tray, and arranged to discharge on the wall of the stationary receptacle, means for supplying pulp and water to the inclined wall of the tray, and sweeps connected to and carried by the radial pipes, and movable in the stationary receptacle.
- 739,978.—MINE GATE.—Newton K. Bowman, North Lawrence, Ohio. In electric haulage lines, for mines and in combination with the trolley line and mine gate, a bridge for spanning the gate to carry the trolley wheel thereby without necessitating the interruption of the electric current or power.
- 740,013. MECHANISM FOR RABBLING MATERIALS.—Alfred J. Diescher, Pittsburg, Pa. The combination of a



roasting furnace, a rabbling frame, turning tables at the ends of the furnace for carrying or transferring the rabbling frame and a track connecting the tables.

- 740,014. PROCESS OF TREATING ORES.—John Herman, Lincoln, Neb. A process of extracting copper from ores, which consists in utilizing ferrous chloride and free acid to dissolve carbonates and oxides of copper; the free acid being adapted to neutralize interfering substances, and to attack the surface of the particles of copper oxide or carbonate, and leaching the ore thus treated with ferrous chloride and common salt or other suitable chloride.
- 740,025. METHOD OF CARBURIZING IRON.—William A. Kōneman, Chicago, Ill.—The method consists in pouring the iron in a molten state upon a comparatively deep column of incandescent carbonaceous material, effecting the continuous percolation of the iron through the column, and introducing oxygen into the column during such percolation, whereby the iron in its state of fine division and while descending is subjected to the carburizing effect of the carbon mass and the gas continually generated in the mass.
- 740,024. CEMENT BRICK MOLD.—Solomon M. Kimble, Corunna, Mich. The combination of a shaping shell having a vertical bail attached thereto, a follower within the shell adapted to move vertically, a handle attached to the follower and extending vertically, through the medium of which the follower may be actuated independently of the shell, and means for exerting an upward pressure upon the bail and a downward pressure upon the handle when the follower is raised.
- 740,026. RATCHET SWIVEL.—Harry H. Krohn, Los Angeles, Cal. Assignor of one-half to Lester Grant Loomis, Los Angeles, Cal. The combination with a vertically movable rope, of a drilling swivel suspended thereon and comprising two relatively revoluble members secured together and having opposed superposed faces, one of which faces has a runway oblique to the other face; and a movable member in the runway adapted to engage the other face to wedge apart the revoluble members axially when the relative rotation is in one direction, and to free the members when the relative rotation is in the other direction.
- 740,027. DRIVING MECHANISM FOR ORE CONCENTRATORS.—Marcus S. Levé, Fruitvale, Cal. In a driving mechanism for converting uniform rotary motion into varying reciprocating motion, the combination with a part to be reciprocated, of a crank, a relatively long connecting rod, a link having one end connected to the rod, means operating to guide the point of connection in an arc of definite length, means connecting the other end of the link with the part to be reciprocated, and arranged to guide that end of the link in an arc approximately at right angles to the arc in which the opposite end of the link attached to the connecting rod travels, the means also operating to confine the link within the last mentioned arc.
- 740,040. MANUFACTURE OF BRICKS.—Max Peikiewicz, Ludwigsberg, near Moschin, Germany. The process consists in first shaping the bricks, then coating them with a solution of gelatine and flour.
- 740,072. PROCESS OF MAKING PIGMENTS.—William J. Armbruster, St. Louis, Mo. The process of adding a solution of barium sulphide to the sulphate of an alkali metal, then adding a soluble zinc salt to the resulting solution, and recovering the final precipitates.
- 740,073. PROCESS OF MAKING PIGMENTS.—William J. Armbruster, St. Louis, Mo. The process of making pigment composed of zinc sulphide and barium carbonate, which consists in bringing together solutions of barium sulphite, the carbonate of an alkali metal, and a suitable salt of zinc, and recovering the resulting precipitates.
- 740,078. COKE OVEN.—Theodor von Bauer, Berlin, Germany. The combination of a battery of coke ovens provided with charging shafts at their top parts, gas distributing flues connected by lateral channels with the shafts, return gas flues below the upper flues, connecting channels between the gas distributing and return flues, vertical combustion flues in the partition walls of the ovens, sole channels below the ovens connected with the combustion flues, and air supply pipes connecting with openings in the upper ends of the combustion flues.
- 740,082. HYDRO-CARBON BURNER.—George W. Boyd, San Francisco, Cal. Assignor of one-half to Josiah O. Low and Louis M. Bourbaud, San Francisco, Cal. An oil burner, comprising in combination a casing inclosing a generator chamber, an oil supply pipe terminating within the chamber, vapor outlets having petticoats substantially as described constructed to discharge the vapor downwardly, and steam generating means carried by the casing and interposed between the vapor outlets and the casing and in the path of the downwardly diverted vapor.
- 740,084. MELTING FURNACE.—Martin J. Burns and Jerome J. Aull, Cincinnati, Ohio. Assignors to the Lunkenheimer Company, Cincinnati, Ohio, a corporation of Ohio. A melting furnace consisting of a cylindrical chamber set horizontally and arranged to turn on its longitudinal axis, the chamber being provided with an interior refractory lining, and having a blasting aperture at one end for the introduction of the hydrocarbon or other melting flame, and also provided on opposite sides adjacent to the flame en-
- tering end with filling and discharge openings, one of which openings is kept closed while the other is used.
- 740,095. EXCAVATING MACHINE.—Taylor E. Daniels, Chicago, Ill. The combination of a frame provided with vertical guides, a slide movable along the guides, a shaft journaled at the base of the frame, a vertical shaft, means for transmitting motion from the first-named shaft to the second-named shaft, a transverse shaft journaled in the slide, a cutter-chain operated by the transverse shaft, a gear on the transverse shaft, a gear having slidable connection with the vertical shaft and serving to communicate motion to the gear on the transverse shaft, and means for feeding the slide downwardly.
- 740,097. FUEL FEEDING APPARATUS.—Lewis K. Davis, Indianapolis, Ind. Assignor to Grace P. Davis, Indianapolis, Ind. The combination with a furnace, of means for conveying a layer of fine fuel thereto, and means for forcing fluid upon the fuel while upon the conveyor to carry it into the furnace.
- 740,099. BUILDING OR ROOFING BLOCK OR MATERIAL.—Silas C. Davidson, Birmingham, Ala.—A building and roofing block comprising a body portion composed of a filling material, a binding agent, and a color face composed of a mixture of hard rosin, common dirt and coloring means.
- 740,102. MECHANISM FOR RABBLING MATERIALS.—Alfred J. Diescher, Pittsburg, Pa. A roasting furnace in combination with a frame carrying rabbling blades and provided with hooks, rack bars extending through the furnace and means for reciprocating the bars alternately.
- 740,146. BORAX RUBBING MACHINE.—Anthony La Francis, East Orange, and Frank J. Krumeich, Newark, N. J.—The combination of a horizontal and rotatable grinding disk presenting a flat top in the form of a complete circle and being supported wholly from beneath, means for rotating the grinding disk, a fixed arm extending radially in over the top of the grinding disk and carrying a single integral supporting frame having a perforation in vertical line with the center of the grinding disk and a series of apertures around the perforation, a water supply tube having a straight discharge end seated in the perforation and terminating at its open extremity close to the grinding disk, and tubular holders adjustably mounted in the surrounding apertures of the supporting frame and adapted to receive sticks of borax.
- 740,150. BUNSEN GAS HEATING BURNER.—James J. Lawler, Mount Vernon, N. Y.—A primary mixing chamber merging into a contracted neck and having an air inlet, an enlarged secondary mixing chamber surrounding the first-named chamber and having air inlets located beneath the contracted neck, and a nozzle having a set screw extending into the inlet thereof and in horizontal alignment with the air inlet of the primary mixing chamber.
- 740,166. ELECTRIC HOIST.—Martin B. McLauthlin, Malden, Mass.—a rotary hoisting drum carrying a rotary motor field, an armature mounted to rotate within the drum and field, a journal for the drum having one or more conductor channels, conductors occupying the channels for carrying the current to and from the drum, collectors on the journal connected with the conductors, and a bearing for the journal interposed between the collectors and the drum.
- 740,165. ELECTRIC SHOVEL.—Alfredo Musso, New York, N. Y. Assignor of three-fifths to Anthony Masino and Lawrence J. Barrett, Port Reading, N. J. An excavating apparatus comprising a car-body and a shovel mechanism mounted on the forward part thereof, in combination with automatic mechanism for advancing the apparatus toward the work.
- 740,167. MECHANISM FOR PULVERIZING AND FEEDING FUEL.—Lucian B. Nash and Robert E. Moore, Chicago, Ill. A combination with a furnace, a plurality of pulverizing devices, a source of unpulverized fuel common to and communicating directly with all of the pulverizing devices, a plurality of unrestricted passages leading from the pulverizing devices to different parts of the furnace, and means for separately and forcibly delivering the pulverized fuel from the pulverizing devices through the passages to the furnace.
- 740,176. METHOD OF ROLLING BLACK PLATES OR SHEETS.—James R. Phillips and Charles W. Bray, Pittsburgh, Pa. Assignors to the American Tin Plate Company, Orange, N. J., a corporation of New Jersey. The method consists in coating bars or plates with copper, forming a pack of the coated plates and rolling them to the desired gage.
- 740,188. MANUFACTURE OF ARTIFICIAL BUILDING MATERIAL.—Adolphe Seigle, Lyons, France. In the manufacture of artificial building material in which silica and lime are chemically combined by the action of steam under pressure, the process consists in combining with the lime and silica well pulverized calamine.
- 740,193. BARREL FILTER.—Edward D. Sloan, Denver, Colo. In a barrel filter, the combination with the barrel, of a partial lining of porous filter blocks fitting closely together and having grooves formed on their under sides which interconnect from block to block and form drain channels; means for sealing the drain channels from the inner space of the barrel, and a discharge port leading from the drains out of the barrel.
- 740,195. OIL ENGINE.—Henry Soeldner, East Williamsburg, N. Y. The piston, the cylinder having the explosion



chamber at its outer end, the inlet nozzle for the vapor to the chamber, means for admitting air to the outer portion of the cylinder after the piston recedes therefrom to be compressed into the chamber on the succeeding outstroke of the piston, and an exhaust from the cylinder, said nozzle having in its discharge end the plug provided at one side with an outlet and a deflecting lip combined with means for feeding the oil, and a driving shaft operatively connected with the piston.

740,360. METALLURGICAL FURNACE.—William F. Hannes, Deming, N. Mex. Assignor of one-half to Walter J. Browning, Concepcion del Oro, Mexico. In a metallurgical furnace, a lower chamber having twyers at the

lower portion, an upper chamber merging into the lower chamber and decreasing in area from the upper end, twyers located at the merging portion for supplying an oxidizing blast, a fuel casing located in the furnace with its discharge end located slightly below the zone of the oxidizing twyers.

740,364. PROCESS OF MAKING ALUMINA AND BY-PRODUCTS.—Lucius R. Keogh, Hamilton, Canada. The process consists in admixing together sodium chloride, water, and aluminum sulphate contaminated with iron sulphate, then adding carbon and heating the admixture to a red heat in the presence of steam, thereby producing a mixture of sodium aluminate and iron sulphide.

740,372. PROCESS OF EXTRACTING ZINC FROM SULPHIDE ORES, ETC.—Charles Rogers, Kew, Victoria, Australia. Assignor of two-thirds to Alice Mary Oswald, Caulfield, Victoria, Australia. The process consists in subjecting the ore or tailings to a partial sulphating roast, discharging the same while hot into water, leaching the same with the water and with dilute sulphuric acid, subjecting the leached ores or tailings to a second sulphating roast, re-leaching the same with the lixivium from the former leaching, and repeating the operations until sufficient zinc and sulphur are removed.

#### GREAT BRITAIN.

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy:

Week Ending September 19, 1903.

- 21,213 of 1902. IMPROVED METHOD OF ELECTRICALLY IGNITING MINERS' LAMPS.—W. Patterson and C. Darrah, Manchester.
- 21,880 of 1902. BRIQUETTING FINE ORES.—T. Rouse, London. Method of forming fine ores into briquettes by adding quicklime, and a soluble silicate and exposing the molded bricks to heat in a chamber in an atmosphere of steam.
- 22,812 of 1902. LID FOR CRUCIBLES.—Joseph Starkey, Worcester. An improved lid for crucibles used in melting brass, in order to prevent the escape of fumes.
- 23,544 of 1902. COKE OVEN.—E. Coppée, Brussels. Improvements in coke ovens with the object of equalizing the incoming air and so making the temperature constant.
- 26,089 of 1902. DISINTEGRATING BLAST FURNACE SLAG.—V. Francois, Bouillon, Belgium. Disintegrating blast furnace slag by pouring it over rapidly revolving beaters which throw the particles on water.
- 28,306 of 1902. FIREPROOFING PAPER FOR CARTRIDGES.—W. Hartig, Liverpool. A paper free from alkali and coated with rubber and made non-inflammable for use in casing blasting cartridges containing hygroscopic explosives.
- 6,811 of 1903. TREATING IRON PYRITES.—H. F. Campbell, Melrose, Mass. Magnetizing iron pyrites in mixed ores without driving off any sulphur by passing the ores rapidly through a roasting furnace and then immediately sending them through the magnetic separator.
- 14,564 of 1903. CALCINING FURNACE.—M. P. Boss, San Francisco. Improvements in the inventor's furnace for calcining smelting and refining all in one structure.



## TO ENGINEERS VISITING NEW YORK.

A room for the exclusive use of visiting mining engineers is maintained at the New York office of THE ENGINEERING AND MINING JOURNAL. Visitors to the metropolis are cordially invited to take advantage of the facilities it offers, by having their mail addressed in care of the JOURNAL and making this office their headquarters. The managers of the branch offices will also be glad to welcome visiting engineers and to be of any service to them that they can.

We are informed that the Instruction of Mining and Metallurgy offers to all members of the American Institute of Mining Engineers non-resident in Great Britain, the privilege of free use of the Institution offices and library in Salisbury House, London Wall, E. C. Visiting engineers may have their letters addressed to the offices of the Institution, and thus enjoy the advantages of temporary office accommodation in the city of London.

## PERSONAL.

Mining and metallurgical engineers are invited to keep THE JOURNAL informed of their movements and appointments.

Mr. J. H. Curle has left London for Australia.  
Mr. John A. Church has returned from Arizona.  
Mr. Theodore Dwight has returned from Scotland.  
Mr. A. C. Beatty is at the Camp Bird mine, Ouray, Colo.

Mr. F. H. Minard, of Denver, is visiting New York.

Mr. T. E. Schwarz has returned to Denver from Mexico.

Mr. A. H. Goobe has returned to Salt Lake City from Montana.

Mr. Edgar S. Cook returned from London by the *Cedric* on October 3.

Mr. F. Du Bois, of Seattle, has been examining mines in Oregon.

Mr. Richard Pearce is due on the *Celtic*, arriving at New York on October 9.

Mr. Thomas King Muir recently returned to Portland, Ore., from Chicago.

Mr. James B. Lewis has been appointed manager of the Anchor Tin mine in Tasmania.

Mr. Philip Argall has returned to Denver from inspection work in Gunnison county, Colo.

Mr. Chas. Kirchhoff, editor of *The Iron Age*, has returned from a holiday spent in Europe.

Mr. Thomas H. Michell, manager of the Akrokerris mines, is on his way back to West Africa.

Mr. W. C. Ralston, of San Francisco, was at Sumpter, Ore., examining properties recently.

Mr. R. W. Rodda has left Seattle, Wash., for Juneau, Alaska. He will return about October 25.

Messrs. Stanly C. Dunn, E. H. S. Sampson and R. L. Sawyer have returned to Keneh, in Egypt.

Mr. H. E. Vail has been appointed manager of the Bellevue Proprietary mine, in Western Australia.

Mr. John T. Grayson, of Portland, Ore., is in poor health, and will soon go to Arizona for the winter.

Mr. Harry James is consulting engineer to the Murchison Consolidated mine at Cue, Western Australia.

Mr. A. F. Holden, managing director of the United States Mining Company, returned to Salt Lake City recently.

Mr. R. J. H. Bradley, who has recently been in the Cold Bay oil fields of the Alaska peninsula, is now in New York.

Mr. W. Smith Wooley, of Pocatello, Ida., has been appointed assayer in charge of the United States assay office at Boise.

Mr. L. C. Fletcher of the United States Geological Survey arrived at Spokane, Wash., from Washington, D. C., recently.

Mr. Harry Lees succeeds Mr. J. W. Westlake, deceased, as superintendent of the Big Kanawha Company at Creede, Colo.

Mr. Juan Felix Brandes, of Denver, Colo., and Mr. Reginald Renshaw Ward, of London, Eng., were at Salt Lake City recently.

Mr. W. T. Bailey, of Duluth, one of the owners of the Continental mine, near Port Hill, Ida., was a visitor in Spokane recently.

Mr. Walter H. Weed was at the Cobre copper mines, near Santiago, Cuba, last week, and is expected in New York this week.

Mr. T. Simmonds, superintendent of the Bunker Hill & Sullivan mine, who has been in California, has returned to Wardner, Idaho.

Mr. George A. Anderson, general manager of the Gold and Silver Extraction Company of America, Limited, has returned from England.

Mr. W. E. Simpson has succeeded Mr. W. W. Barton as manager of the Great Boulder Main Reef mine at Kalgoorlie, Western Australia.

Mr. R. T. Bayliss and Mr. Philip L. Foster arrived by the *Cedric* on October 3, and proceeded at once to the Tomboy mine at Telluride, Colo.

Mr. W. C. Thomas, of Salt Lake City, superintendent of smelters for Mr. Samuel Newhouse, has returned from New York and Boston.

Mr. Charles E. Greene, of New York, vice-president and general manager of the Greene Reduction Company, was in Salt Lake City recently.

Mr. Samuel Storrow, of Los Angeles, Cal., was in Tacoma recently. He is engineer for a large hydraulic proposition in western Washington.

Mr. Frank S. Jones has been made manager of the Miller Creek Coal Company with two mines at Coalfield, Ia., to succeed Mr. L. R. Rosebrook, retired.

Mr. Jefferson E. Doolittle has been appointed a trustee of the State Mining Bureau in place of Mr. Ross E. Browne, who has resigned to go to South Africa.

Mr. W. H. D. de Jongh, a Dutch mining engineer from the East Indies, arrived by the *Rotterdam* last week to visit the principal mining districts of this country.

Mr. C. S. Warren, of Butte, Mont., passed through Spokane from Tonopah recently on his way to Rossland and Republic. He will spend the winter at Tonopah.

Mr. Charles L. Welch, who has done considerable work for the city of Chicago, has become associated with the Engineering Company of America at its Chicago office.

Mr. A. E. Johnson has been elected president of the Norfolk & Western Railroad; to succeed the late F. J. Kimball. Mr. Johnson will continue to act as general manager.

Mr. E. G. Banks, metallurgist to the Waihi Gold Mining Company, New Zealand, has left for the United States, where he intends visiting the principal mining and metallurgical centers.

Mr. A. Stanley Elmore has arrived from London by the *Etruria*, on his way to Rossland, B. C., where he will supervise the oil concentration plant which has been erected at the Le Roi No. 2 mine.

Mr. Charles E. Willis, managing director of the Humber Consolidated Mining and Manufacturing Company, with headquarters on the Bay of Islands, Newfoundland, arrived in New York recently.

Prof. W. Edgar Wilson, for the last two years in charge of a division of the United States Great Lakes Survey, has accepted a position with the Colorado State School of Mines in the civil engineering department.

Mr. L. B. Wickersham, who has been reporting on mines in Alaska, Montana and eastern Oregon, has accepted the superintendency of the Granite Hill mines, operated by the American Gold Fields Company, of Chicago.

Mr. Thomas O. Bishop, till lately director of the School of Mines at Reefton, New Zealand, has been appointed battery superintendent to the new Inkerman mines. Mr. John Henderson has been appointed in Mr. Bishop's place.

Among the out-of-town members of the American Institute of Mining Engineers who will probably attend the annual meeting in New York next week are Messrs. G. A. Burr, Parral, Mex.; Albert Doerr, Asientos, Mex.; R. G. Leckie, Sudbury, Ont.; P. Kirkegaard, Deloro, Ont.; Fred D. Smith, Sumpter, Ore.; Arthur De W. Foote, Grass Valley, Cal.; Benjamin B. Thayer, Santa Rita, N. M.; R. J. Grant, Denver, Colo.; Hopewell Clarke, St. Paul, Minn.; and James B. Cooper, South Lake, Linden, Mich. Mr. Henry Ide Willey, Campo Santa Nino, Sonora, Mex., will be present if possible.

## OBITUARY.

Paul Babcock, who died at his residence in Montclair, N. J., October 6, was the son of the late Paul Babcock, who was well known as a merchant in New York for many years. The son, a number of years ago, became connected with the Standard Oil Company, and served that company in various capacities, chiefly in connection with the transportation department. Mr. Babcock was a director of the Standard Oil Company, of New Jersey, until last January, when he retired from business on account of ill health. He was also a stockholder and director in the British Columbia Copper Company. He was 62 years old at the time of his death.

## SOCIETIES AND TECHNICAL SCHOOLS.

PENNSYLVANIA STATE COLLEGE.—The first semester has opened with an increased attendance in the department of mines and mining. The mineralogical laboratory has been moved during the past summer and greatly enlarged. The courses of instruction have been increased, while various movements are underway to increase the amount of practical work. The following new appointments have been made: C. P. Linville, of the Globe Iron Company, instructor in metallurgy; Edward N. Zern, instructor in mining and mineralogy; Horatio C. Ray, assistant in mineralogy.

WORCESTER POLYTECHNIC INSTITUTE.—President Engler recently had a conference with a number of leading foundrymen from different parts of the country respecting the building and exhibit which the latter propose to have at the St. Louis Exposition. It is proposed to erect and operate a model foundry, fully equipped with all necessary apparatus and exhibiting in operation all the processes of modern foundry practice. An advisory committee has been appointed to organize the work, and of this committee President Engler is a member. The Worcester Polytechnic Institute has been invited to prepare complete plans for the building, having in mind special reference to ideal conditions as to light, heat, ventilation and sanitation, and to a maximum of economy and efficiency by convenience of arrangement and use of the best modern devices in machinery and methods. Besides furnishing space for all ordinary operations in iron, brass, aluminum, steel and lead, the building is to provide accommodations for a chemical laboratory, an exhibition room, a library and reading room, etc. This foundry exhibit is designed to be primarily educational in its character, and during the entire time while it is in operation at St. Louis it will be under the direction and charge of the Worcester Polytechnic Institute.

## INDUSTRIAL.

The new car shops of the Delaware, Lackawanna & Western Railroad, at Scranton, Pa., will cover an area of 158,400 ft.

The A. Leschen & Sons Rope Company, of St. Louis, is erecting an aerial tramway for the Standard Copper Company of Clifton, Ariz.

Ottumwa box car loaders have been installed by the Chicago & Big Muddy Coal Company at Pollard, Ill., and by the Bulger Block Coal Company at Bulger, Pa.

The Hecla Portland Cement and Coal Company, of Detroit, Mich., a \$5,000,000 corporation, has closed down its plant. The embarrassment is said to be only temporary.

At the new Zug island furnaces of the Detroit Iron and Steel Company, the first cargo of Lake Superior iron has been unloaded. C. W. Baird is manager of the company.

The Sullivan Machinery Company, Chicago, has filled an order for the Junction Development Company, of Bisbee, Ariz., for a Sullivan diamond drill and equipment.

The Austin Manufacturing Company, of Chicago, Ill., has recently sold Corrigan-McKinney & Company for their iron mines at Crystal Falls, Mich., a No. 6 crushing plant.

The Brown Corliss Engine Company, of Corliss, Wis., has received an order from the Lorain Steel Company, of Lorain, O., for a 30 and 60 by 60 in. cross-compound corliss engine.

It is announced that the Decatur Car Wheel Works, located just outside of Birmingham, Ala., will not be a party to the combination of car-wheel manufactories recently formed in the East.

J. W. Pickard, of California, is now manager of the Puget Sound Tent and Duck Company's business and factory at Seattle, Wash., and is turning his attention to the manufacture of mining hose.

The Ingersoll-Sergeant Drill Company has received orders for 31 air compressors from St. Louis, and for eight from the subway contractors in New York City in the past month. The company is making considerable headway with its new plant at Phillipsburg, N. J.

F. D. Weeks, who has charge of the smelting department of the Engineering Company of America, has gone to Copper Cliff, accompanied by Mr. Edward Everett, who goes as his assistant. The Engineering Company of America has charge of the design, plans and specifications of the new smelter which the Canadian Copper Company is erecting at Copper Cliff.

The Holthoff Machinery Company, Cudahy, Wis., has made plans for an addition to its boiler and sheet metal shop, practically doubling the capacity. The company is also adding new machinery to its machine shop, and has broken ground for a foundry. Recent shipments from its plant include a large pipe line for the Pike's Peak Hydro-Electric Company, Colorado Springs, Colo.; mining machinery for the



Old Dominion Copper Company, Arizona, and the British Columbia Copper Company, in British Columbia.

The sale by the Speyer syndicate of the Consolidated Lake Superior Company's assets, as well as the assets of the subsidiary companies, has been postponed for a week. It is said that the Consolidated Lake Superior Company, which owes the Speyer syndicate \$5,050,000, has not yet secured the 60 days' extension asked from the syndicate, and may have to resort to legal proceedings. Receiver Carruth, P. F. Rotbermel, of the reorganization committee; Edward H. Sambon, vice-president of the company, and John R. Dos Passos will probably apply for an injunction to stop the sale if no extension of time is granted.

A receiver has been appointed for the Reese-Hammond Fire Brick Company, of Greensburg, Pa., principal stockholders of the defunct Bolivar National Bank. The company has a capital stock of \$500,000 and has \$250,000 in bonds outstanding. It is a large stockholder in the Hammond-Berkey Supply Company, which has a store at Bolivar; the Pennsylvania & Kentucky Fire Brick Company, of Kentucky; the United States Enamel Brick Company, of Fairmont, W. Va., capital \$100,000, and the Curwensville Fire Brick Company, Curwensville, Pa., capital \$250,000. An estimate of the company's assets is \$1,200,000. Some of the best fire brick clay mines in Pennsylvania are owned by the company.

The United Lead Company, which was organized by interests identified with the American Smelting and Refining Company and the Morton Trust Company, has elected the following officers: President, Barton Sewell, of the American Smelting and Refining Company; vice-president, E. R. Hoyt, of the Hoyt Metal Company; secretary, F. W. Hills; treasurer, Thomas J. Phillips. The company is capitalized at \$27,000,000, comprising \$15,000,000 stock and \$12,000,000 bonds and is a consolidation of eleven companies, including the Chadwick-Boston Lead Company, of Boston.

The water supply of the city of Washington is shortly to be improved by the construction of a large filtration plant, work on which is now in progress under the supervision of Lieut.-Col. A. M. Miller and Mr. Allen Hazen, consulting engineer. The contract for the centrifugal pumps and the engines has been awarded to the Worthington Company, of New York, who will supply three 36-in. pumps of the triple-vane impeller type, each direct connected to a Harrisburg four-valve tandem-compound condensing engine. Each unit will be capable of supplying 30,000 gal. of water per minute at a total head of 35 ft. The government specifications require an exceptionally high efficiency in the pumping equipment, and every part of the plant will represent the latest and best practice. The company supplying the centrifugal pumps will also furnish the wash-water pumps, which will be of the direct-acting, compound-condensing type.

The Pelton Water Wheel Company, of San Francisco, reports a fine business in water wheels. Its plant is working night and day to keep up with orders. Among the important contracts closed during the past few months for hydro-electric plants, are the following, which aggregate 56,400 h. p.: American River Electric Company, Placerville, Cal., head 575 ft., two double Pelton units, each of 2,500 h. p.; Pike's Peak Hydro-Electric Company, Colorado Springs, Colo., head 2,200 ft., three Pelton wheels, each of 1,500 h. p.; Columbia Improvement Company, Tacoma, Wash., head 850 ft., four Pelton units, each of 7,500 h. p.; Vancouver Power Company, Vancouver, B. C., head 390 ft., three double Pelton units, each of 3,000 h. p.; Northern California Power Company, Anderson, Cal., head 1,150 ft., two double Pelton units, each of 3,000 h. p.; Rock Creek Power and Transmission Company, Baker City, Ore., head 960 ft., two Pelton units, aggregating 1,760 h. p.; Columbus Consolidated Mining Company, a Pelton unit, 494 ft. head, 660 h. p.

The Fred. M. Prescott Steam Pump Company, of Milwaukee, Wis., reports the following recent shipments of pumping machinery: Triple-expansion mine pumping engine to the Buffalo & Susquehanna Iron Company, Hibbing, Minn., and a triple-expansion mine pumping engine to the Iroquois Iron Company, Hibbing, Minn., each with a capacity of 1,200 gal. per minute; part of a large order, which includes two triple-expansion pumping engines of large capacity to the El Oro Railway and Mining Company, Limited, of El Oro, Mex.; a deep mine triple-expansion pumping engine to the Penn Iron Mining Company, Vulcan Mich., with a capacity of 1,000 gal. per minute against 1,200 ft. head; a triple-expansion high-service pumping engine, with a capacity of 1,500,000 gal. per day against a 145-lb. water pressure to the New Castle, Pa., water works; a compound and condensing mine pumping engine, with a capacity of 500 gal. per minute against 1,200 ft. head, to the Calumet & Arizona Mining Company, of Bisbee, Ariz. Among recent orders booked by the Frank M. Prescott Company are: Vertical beam condenser for the Denver Tramway Power Company, Denver, Colo., with a capacity of 70,000 lbs. of steam per hour; two triple-expansion pumping engines for the Mesabi range in Minnesota, each

with a capacity of 2,000 gal. per minute; a triple-expansion pumping engine for the East St. Louis, Ill., water works, with a capacity of 6,000,000 gal. of water per day.

#### TRADE CATALOGUES.

Circular No. 10, sent out by the Rand Drill Company, of New York, describes the company's Imperial pneumatic tools. The descriptive matter is brief, but the circular contains numerous fine half-tone cuts.

The General Specialty Company of Buffalo, N. Y., calls attention to a new boiler tube cleaner it is putting on the market. This cleaner of the hammer and piston type is designed to give a quick, light blow rather than a blow heavy enough to damage the tubes. In actual tests this device has shown a speed of 3,000 strokes and upward per minute.

The Chicago Pneumatic Tool Company, of Chicago, Ill., continues to send out printed matter describing the various tools that it manufactures. One of the latest products of the company is the new Chicago plug drill, which is intended for all classes of plug and feather work. The company states that the weight, 18 lbs., permits this drill to be used for either top or side-line work. In a recent test at a Vermont granite quarry, 60 plug holes,  $\frac{5}{8}$  in. by 3 in., were drilled in 60 minutes, each drill used sinking 20 holes without resharpening. The drill is described in circular No. 42, issued by the company.

The Overstrom concentrator is described in detail in catalogue No. 12, published by the Allis-Chalmers Company, of Chicago, Ill. The company states that the No. 3 concentrator has been redesigned through the experience gained during the past three years. As a result the table is now constructed of structural steel and iron throughout, except for the table top, thus giving greater rigidity of frame and increased smoothness of action. A new head motion is used, also a new method of giving reciprocating motion to the table. The table top rests on four long rollers, the whole width of the table. These rollers cannot wear flat. In addition, double-tapered rifflers are employed. These details and the general principle of the table are described at length.

The Broderick & Bascom Rope Company, of St. Louis, Mo., issues a catalogue of its iron and steel wire ropes and rope accessories as price list E, a 52-page pamphlet having on the cover an illustration of the company's new factory. The company makes wire ropes for hoisting, for underground haulage, for tramways and many other purposes. The company's brands of wire rope include "Power" wire rope, patent steel rope, plough steel hoisting rope and crucible steel hoisting rope, all with 19 wires to the strand and bemp centers; besides crucible cast-steel haulage rope, Swede's iron transmission rope and galvanized charcoal iron wire rope, all with 7 wires to the strand; also 6-strand ropes and hawsers. The wire rope accessories include sockets, hooks, thimbles, clamps, blocks, etc. The company sends copies of this pamphlet on request.

The Jeffrey Manufacturing Company, of Columbus, O., issues a 40-page pamphlet chiefly given to descriptions of the company's Badger rock drill, formerly made by the Phillips Rock Drill Company. This drill has a valve of the spool type with ends of different diameters. It is balanced and free to move endwise, as well as to rotate in the chest, and has no mechanical connection with any other part of the machine. A special bushing is used for practically the entire length of the front head of the drill, which, when worn too much for further use, can be quickly renewed. The pawls are of tool steel, and when worn can be turned upside down, thus giving double service. The drills are made in five sizes, drilling holes from 1 to  $3\frac{1}{4}$  in. in diameter. The Jeffrey Company also makes an electric drill for use in coal mines, which is stated to drill coal at the rate of 5 ft. per minute. It is driven by a  $1\frac{1}{2}$  or 2-h. p. motor. The company also makes hand-power rock and coal drills and the Giant air-power drill, which is stated to drill holes in coal at the rate of 7 ft. per minute.

#### SPECIAL CORRESPONDENCE.

Denver.

October 3.

(From Our Special Correspondent.)

The enforced idleness of the chlorination mills at Colorado City and Florence, in consequence of the miners' strike at Cripple Creek, is telling on the receipts of gold at the Denver branch mint. For September the receipts were \$848,031, as compared with \$1,283,627 in September, 1902. In the opinion of some persons, the backbone of the miners' strike at Cripple Creek is broken, but it will be months before normal conditions again prevail, as many of the best and most law-abiding miners have left the district and scattered for employment. It is now recognized that the strike was unwise and that the miners' unions committed a great blunder when, at the late national convention in Denver they gave the execu-

tive committee (largely composed of pronounced socialists) power to declare a strike and maintain it. A decided majority of the men in the miners' unions throughout Colorado are reputable citizens, but it is deplorable that they servilely obey a radical minority in league with the mischief-breeding socialistic executive committee of the Western Federation of Miners. On September 30 the Woods Investment Company closed the Gold Coin mine and the Economic mill, telling the employes that they could return to work the following day if they renounced allegiance to the Western Federation of Miners. The company has been one of the largest employers of labor in the district and has favored the unions so far that only miners in good standing in the unions could obtain employment. Hereafter this policy will be abandoned. When working all its properties full force the company employs nearly 500 men.

Notwithstanding the strike, the output of the Cripple Creek district for September is estimated at 21,250 tons of ore of a gross bullion value of \$612,700.

At Telluride not a mine or mill is operating and the mine owners are prepared to keep closed down indefinitely. At Ouray and Silverton all the mines and mills are in full operation and the union miners are being assessed \$5 per month per man for the support of the strikers at Telluride and elsewhere. It is even yet possible that the executive committee of the Western Federation of Miners may call out the union miners around Ouray and Silverton, in which case it is said that the mine operators will close down indefinitely.

San Francisco.

Sept. 30.

(From Our Special Correspondent.)

In Eldorado county the largest producing mine, the Union, at El Dorado, owned by A. Harpending, has closed down and the men have been discharged, the owner declaring he will not again employ union miners under any circumstances. Fifty-two miners are out of work, as well as a number of other men on surface, besides teamsters, etc. A miners' union was organized at El Dorado and nearly all the miners at the Union and Crusader mines joined it. At the Union mine the miners were paid better than at most mines in the State, the owner having voluntarily raised wages some time ago. But he said if they joined the Western Federation of Miners he would pay them all off and close the mines. He intends to put a barbed wire fence around the property and let it rest.

Another miners' union has been organized at Placerville, in the same county. Mr. Thos. Clark, the manager of the River Hill, the principal mine there, declares that if the union tries to raise wages beyond the limit at which his company can profitably operate he will have to close the mine. A union has been formed at San Andreas, Calaveras county, composed of the wood choppers, who intend fixing a price for cutting wood. The scope of this union is to be enlarged to include all laborers who will affiliate with it. At Randsburg, Kern county, the Yellow Aster still keeps bringing miners from Missouri and quite a number are at work. No outrages have been committed.

The Mokelumne ditch system is almost without water and the mines along that side of Calaveras county have nearly all suspended work temporarily. The Utica system still has some water. In Tuolumne county a number of mines are shut down, though not so many are affected this year as has been the case in previous years. Those mines with steam plants are all right, as there is still water for battery purposes. During the time of enforced shut down repairs are being made to ditches, mills, machinery, etc., and development work continues.

The long pending contest between the mineral and agricultural claimant of the land at Poverty Flat, east of Whiskey Slide, Calaveras county, has been finally decided in favor of the agricultural claimant and the agricultural character of the land. The big Esperanza ditch was built to this place in early days and considerable mining was done, but the camp petered and the ditch was abandoned. In 1877 a homesteader filed on the land. The suit has been on since. The failure of the mines and ditch brought about the name of Poverty Flat.

Copperopolis, Calaveras county, where years ago considerable copper mining was done, shows evidence of again coming to the front. If an electric road were built to convey the ores to Milton or to tidewater, numbers of the mines could be made profitable.

More prospecting is being done in Alpine county at present than for some years. The success of the Curtz-Evans mines, at Loope, has had something to do with this possibly, as they are the only producers in the county. Conditions have changed since the early work in the county and mining and milling are now done much more cheaply. The county is cut off by mountains and is somewhat difficult of access.

In the corner of Alameda, Stanislaus and Santa Clara counties quicksilver and magnesite properties are being opened on a large scale. The Stanislaus county supervisors took steps to build a road which



would bring the mining trade in its direction, and Alameda county did likewise. As the traction engines to be used need water every four miles, and this was not available on the Stanislaus side, the Alameda county proposition has prevailed, and men are working on the building of the road to Livermore. One four-mile stretch of the road is to cost \$9,297, according to the contract just let. The Martel Mining Company, which is now opening the magnesite deposits, will be largely benefited. J. W. Merchant, the pioneer prospector in that region and discoverer of most of the deposits of chrome ore, manganese, talc, magnesite and other minor minerals, died this week. He went into those mountains as far back as 1852 and had been there ever since prospecting and mining, but was hampered by lack of capital. On the morning of his death he was to have received from the Martel Company \$20,000 in bonds for his interests.

A report is current that the Utica Mining Company's properties at Angels, Calaveras county, including the Utica, Cross, Stickle, Gold Cliff, Madison and other claims, are about to be sold to the Rothschilds, the sale to include the water system and electric light plant. The published price is \$3,000,000. Messrs. Hayward and Lane, with the Hobart Estate, own the mines.

Frank A. Salmon, of Pala, San Diego county, has obtained an option from his partners for their share in the Tourmaline and Kunzite claims and is about to start east to dispose of them. Some very nice gems have been taken from these properties.

Oil has been found in small quantities at Point Arena, Mendocino county, the most northern point so far developed in this State. The well is about 1,600 ft. deep and is filled with water. At Point Reyes, between San Francisco and Point Arena, in Marin county, several wells have been sunk without success. The most northern well previously found is near Alma, in Santa Clara county, about 50 miles south of San Francisco. Point Arena is, by sea, 100 miles north of San Francisco.

Victoria, B. C.

Sept. 30.

(From Our Special Correspondent.)

The poor returns of the Le Roi mine for the past two months call for comment. In July a small loss was reported, and in August the estimated profit on shipments approximating 16,000 tons was but \$15,000, and the greater part of this was from old accumulations of ore lying on what is known as the second-class dump, the 12,000 tons shipped from the workings yielding a profit of only \$2,500. The mine manager has reported there is no improvement in the developments at the 1,200-ft. level, but prospecting with diamond drills continues. Some 350 tons of I. X. L. ores are being treated at the O. K. 10-stamp mill at Rossland. The I. X. L. mine was recently acquired under leasehold rights, and like several other mines now worked under lease promises to be a profitable enterprise.

At Camp McKinney, the Waterloo mine continues to make a satisfactory showing, having cleaned-up \$19,000 in the past two months. An additional 5-stamp battery has been ordered.

Some apprehension has been felt at the likelihood of further labor troubles at the Morrissy coal mines in East Kootenay, the miners complaining that the spot at which the cars were examined for rock and dirt did not admit of check weighmen being present; that neither the company's weighman nor the check weighman had knowledge of what miner produces the coal. The grievances, however, were quickly adjusted. The pay-roll at the Crow's Nest collieries is steadily increasing.

In the Lardeau district a promising discovery is reported on the Oregon, a claim near the Silvercup, now beginning to make heavy shipments, and it is being very completely equipped with an aerial tramway and concentration and chlorination mills.

Activity in the Ymir district continues. The B. C. Standard Company is building an aerial tramway at the Hunter V., and work is being resumed at the Porto Rico mines. At the Mountain Consolidated, in the Slocan, an ore shoot has widened to 22 in., carrying high values in the gray copper and galena ore. The owners have already taken out a hundred sacks of ore, and the manager is at the coast purchasing machinery. A new 2-bucket tram will be built from No. 4 tunnel to connect with the main workings. A strike of ruby and antimonal silver is reported in a shoot exposed in No. 4.

Returns for the comptroller's office at Dawson of gold shipments from the Yukon this season place the value of the gold yield during May, June, July and August at \$6,957,133, as against \$8,058,797 during the corresponding period last year.

San Luis Potosi.

Sept. 29.

(From Our Special Correspondent.)

The State of Sonora has already eight smelting plants in operation and four more in process of construction.

From the Yaqui river the survey has been made for a 6-mile canal to the property of the Boston & Mexico Gold Placer Mining Company, where hydraulic mining will be done under the management of J. F. Bruslew. On the property of the Gold Treasure Company, old mines in the San José mountains, near Naco, which Arizona men have been developing for two years, a large body of free milling gold ore is reported opened up, and preparations are being made to install a 20-stamp mill. Part of the machinery is on the ground, and the rest on the way. The new hoisting plant for the Guerigo mines, 40 miles from Cananea, has been installed by manager J. P. Casey, and the sinking of the shaft will be continued. Work has been resumed on the Creston-Verde, Grand Consolidation and Bastillo mines near Prietas. The San Blas Mining Company, of North Adams, Mass., has been organized, with J. A. Singley as manager, to work the San Blas mines in the Altar district. The Soledad, near the Lucky Tiger, and owned by Bisbee, Ariz., people, is said to have been sold for \$600,000 Mexican, to Kansas City men, who are believed to be the owners of the Lucky Tiger. The Nogales Copper Company has made the second payment of \$50,000 on the Cerro Prieto group. Rich strikes are reported from the Soledad Mining Company property, in the Altar district, and in the Verde of the Colorado district. The Mina Grande, near Willard station of the Sonora Railroad, is reported in bonanza.

The Durango & San Acacio Mining Company has finished the railroad from the Mexican Central Railroad to its mines in the district of San Juan de Guadalupe. The large companies at Guadalupe y Calvo are figuring on a \$25,000 wagon road from a point on the Parral branch of the Mexican Central to Guadalupe y Calvo, a distance of some 30 miles. The San Fernando Mining Company is doing considerable development work in several parts of the State; and the American-Mexico Mining and Development Company is installing new machinery worth \$25,000 Mexican at its properties in Velardeña. At Guanaecvi the New Australia Mining Company has ordered a like amount of machinery. Wilson & Co., of Cincinnati, O., have offered \$30,000 gold for the Providencia, in Guanaecvi. New York people have purchased two properties of Hilario Losaya for \$300,000 gold. St. Louis men are endeavoring to get hold of the Reyes mines, near Papasquero. The second survey from Chalchihuites to Gutierrez station, on the Mexican Central Railroad, has been completed, and the International is preparing to make a survey from its station of Catalina, through Nomhre de Dios, 130 kilometers to Chalchihuites, and on 320 kilometers to Guadalajara with a 160-kilometer branch to Mazatlan.

In Chihuahua the owners of the Torreon smelter are said to have taken an option on the San Diego mines of Santa Barbara at \$50,000 Mexican. A. C. Aiken, of San Francisco, who recently bought the holdings of McDermott & O'Callahan and the Inglaterra y Anexas of Dale brothers, is believed to have purchased the Democrata, of Terrazas from C. A. Robinson.

Down in Guerrero some Americans have purchased Los Tres Aztecas, 42 pertenencias, about 12 miles from Naranjo station, on the Cuernavaca branch of the Mexican Central and three miles from Taxco, and a company has been organized by Dr. C. A. Young, of Mexico City, with a capital of \$300,000, Mexican, for working the properties. The three mines, known as Los Cerros Altos, Fortuna, and Candalaria, have been worked for the last century. The ore is lead carbonate, and the company anticipates putting in a smelter. A company is forming to buy and develop another lead carbonate property, known as La Maria, at Atzcala, on Rio Balsas, about 10 miles from Arroz station of the Cuernavaca branch of the Central. The Mina Grande, at San Nicolas del Oro, has again resumed operations. At Guerrero del Oro, where Wm. Nevin and associates have been working for the last four years with arrastras under the superintendence of J. W. Neale, a mill is contemplated. Two miles south of Nevin's work the San Jorge, adjoining La Corono of Governor Mora and others, is said to have exposed a rich silver vein. At Atlulaguas, of the Aldama district, near Naranjo, a blanket vein, rich in gold, silver, lead and copper, is reported discovered in the old mines of Golconda and California. A New York company is preparing to work on a large scale the quicksilver mines of La Cruz y Anexas, at Huizucoc, the deal having been concluded by J. G. Tucker.

Exchange on New York opened Monday at 217 and closed Saturday at 221.

Mining stocks remain in an almost lifeless condition, as for some weeks past, the few deals going as follows: Victoria, \$300; Aldebaran, \$115; Bessie, \$27; Dos Estrellas, \$2,100@2,500; Old Ahe, \$58; Luz de Borda, \$155; Santa Rosa, \$40; Progreso, \$55; Angustias, \$115; Providencia, Guanajuato, \$105; La Paz, Matchuala, \$715; Santa Gertrudis, \$82; San Rafael, \$730; Cinco Senores, \$170; Soledad, \$750; Sorpresa, \$380, and La Blanca, \$400.

London.

Sept. 26.

(From Our Special Correspondent.)

The report of the El Oro Mining and Railway Company for the year ended June 30 has been published, and it, together with the speeches of the directors at the meeting of shareholders, contains very full information as to the future of the mine. As you will be quoting it in full elsewhere, it is not necessary to go into details here. It may be noted, however, that £162,000 has been distributed in dividends during the year, bringing the total distribution to £464,000, while £69,000 is carried forward, chiefly to pay for the new 100-stamp mill that is in course of erection. Toward the end of last year it was found that large bodies of ore were being opened up that would be more profitable treated on a large scale, and after a consultation it was decided to double the number of stamps. The report contains many points of interest. In the first place, the estimation of ore is done in quite the right way. There is no mention of "ore in sight," but the ore hocked out and waiting for extraction was estimated at 543,890 tons on June 30. No attempt is made to estimate exactly the other ore that has been exposed in various parts of the mine because it has not been hocked out, but the judgment and experience of the mining engineers warrants the assumption of the existence of quite as much more as that already hocked out. Another interesting point is that the whole of the expense of the new plant is being paid for out of revenue, instead of by the issue of new capital, and in view of this allocation of profits it is not considered necessary to make any further provision at present for depreciation. Thirdly, there is no mining company that has so many experienced mining men on the board of direction. With Messrs. R. T. Bayliss, Hennen Jennings and Philip Foster on the board the directorate is particularly strong. This is a practical example of the principle laid down by THE ENGINEERING AND MINING JOURNAL, that the direction of mines should be conducted by people who have an intimate knowledge of the business in hand.

A few weeks ago it was hoped that the Associated Northern Blocks, Limited, had emerged from its period of mismanagement and that henceforth the company's affairs would be conducted in a way more acceptable to the shareholders. Last week I reported that the fight between Mr. Landau and his old fellow directors had by no means died down, but that both were still attempting to secure the control. The shareholders, who had asked Bewick, Moreing & Co. to become managers and Mr. Curle and Sir Bartle Frere to join the board, appear to have lost their influence again, and the followers of the two rival speculative camps are once more in the ascendant. Owing to the difficulties in the way of reconciliation, both Mr. Curle and Sir Bartle Frere have withdrawn their candidature for seats on the board, at any rate for a time. The committee of inspection is now at work, and the poll of shareholders on the resolutions moved by Mr. Landau will be taken in about a month. In the meantime chaos reigns supreme. With regard to Mr. Curle's candidature, there is much diverse opinion as to its expediency on public grounds. It was felt by some that the great value of his services to the public lay in the fact that he was quite unconnected with the management and direction of any particular mine, and that consequently his opinion had no suspicion of bias. On the other hand, it is granted that his knowledge of mines and how they should be worked would be of invaluable service on the board of directors of a mining company, and many hold that a few practical examples of constructive work of this character would have more eventual beneficial effect on company direction than any amount of outside criticism. However, at present Mr. Curle is not going on any board, so the question is only academic.

The first annual report of the Dunderland Iron Ore Company, Limited, which was formed a year ago to work the concentrating proposition in Norway by the Edison process has just been published. The concentrating plant is now in course of construction, and the railway and harbor works are being actively carried out. Some difficulty has been met with in opening up the mine (or quarry, as it really is), owing to the ground between the deposits and the railway approach, where a deep cutting is being made, having been found to be in the nature of a quicksand. This preliminary work of opening up the mine will occupy longer time than was originally estimated, but this is usually the case. The most difficult problem before the company, as I pointed out last year, is the manufacture of a satisfactory briquette that will stand the burden of the blast furnace. The original Edison briquette, which used pitch as a binder, has already been abandoned, and extensive experiments have been conducted on various systems of briquetting. The system which has given the best results consists of moistening the concentrates with 7 to 8 per cent of water and compressing by great power into briquettes 6 in. by 6 in. by 3 in. Afterwards these briquettes are placed in a gas-fired furnace and heated to 1,300 deg. C. The resulting briquette is said to be of ample strength and hardness, and also sufficiently porous. It



will be noted that there is no extraneous binding material, and that the cost of briquetting depends on the power used in compression and the amount of fuel used in firing. The ultimate success of this process will be looked forward to with considerable interest.

Sydney, N. S. W. Aug. 21.

(From Our Special Correspondent.)

**New South Wales.**—The gold production in New South Wales for July was 35,907 oz. fine, bringing the amount of gold won in New South Wales for the first seven months of this year up to 139,825 oz. fine.

Beach mining has taken a fresh lease of life in the Wardell district, where a payable lead has lately been struck.

Several good crushings have recently been obtained at Nerrigundah from over 1 oz. to nearly 4 oz. per ton. Some excitement has been caused in this district owing to several claims having struck rich gold ore going from 8 to 10 oz. per ton at Lonsdale creek.

The Australian Gold Recovery Company has an option over the heaps of tailings belonging to the Eleanor Company at Hillgrove, where about 100,000 tons are stacked, and is at present testing them.

The mine manager of the South Broken Hill Company recommends in the last half yearly report that the extraction and treatment plant be increased. The ore bodies continue to extend, though the ore extracted is of lower grade in lead. The ore extracted during the half-year averaged 15.96 per cent lead and 8.45 oz. silver.

For the past four weeks the Broken Hill Proprietary mine has maintained a weekly output of over 12,000 tons of ore. The ore-dressing mills worked practically full time. Construction of the new zinc plant is pushed.

**Queensland.**—A reverberatory furnace, having a capacity of 24 tons copper ore per 24 hours, has started work at Glassford creek.

The lower levels of the Mount Morgan mine are reported increasing in copper contents, much of the ore containing 2 per cent, as against 1 per cent in the upper levels.

The Queensland gold yield for July was 78,290 oz., as compared with 71,872 for the same period of last year. The results from the principal fields are:

District.	Yield, oz.	Dividends.
Charters Towers.....	34,603	£36,900
Gympie.....	16,412	26,283
Mount Morgan.....	8,751	12,500
Croyden.....	8,302	.....
Ravenswood.....	5,563	1,125

Auckland, N. Z. Sept. 9.

(From Our Special Correspondent.)

**Gold Exports.**—During July and August this colony exported 83,976 crude ozs. of gold, valued at £327,150 (\$1,635,750). The total export for the first eight months of the current year is 343,174 oz., valued at £1,304,971 (\$6,524,855). This is an increase in quantity of 28,111 oz. and in value of £93,711 over the corresponding portion of 1902.

**New Zealand Mineral Output.**—The annual statement of the Minister for Mines submitted to Parliament a few days ago contains but little of general interest. It states that the value of gold produced during 1902 was £1,951,533 (\$9,757,665), and of silver £71,875 (\$359,375). The output of other minerals, including coal and lignite, was 1,373,977 tons, representing a value of £1,198,214 (\$5,991,070). With reference to dredge mining, it is stated that on December 31 last there were 201 dredges working, 52 standing, 23 building, 14 under removal, and 2 wrecked, a total of 292, showing an increase of 18 for the year. The year's output of coal was 1,365,040 tons, or 125,354 tons more than during the previous year. With regard to the State coal mines, the report says that the preliminary works for opening up the collieries goes on vigorously at Seddonville, near Westport, and at Point Elizabeth, near Greymouth. Sixteen fatalities occurred in mines during the year. The inquiries of the Mines Department showed that mining, especially underground work, was being conducted on safe and careful lines.

The report refers also to the Government purchase of the Thames Hauraki Company's pumping plant, etc., the object of the purchase being stated to be to prevent the machinery from being sold piecemeal, so retarding deep-level mining in the Thames district and probably causing its abandonment for many years to come. The report intimates that the shaft and plant are now available for use on such terms and conditions as may be considered most desirable for the furtherance of deep sinking in the district.

**Reefton Gold-field.**—The returns of the Consolidated Gold-fields Company for July are: Progress mines, £8,730, from 4,672 tons; Golden Fleece, £2,214, from 1,130 tons; Wealth of Nations, £1,569, from 1,110 tons; total, £12,563 (\$62,815), from 7,012 tons.

**Waihi Grand Junction Company.**—The bore-hole has reached the foot-wall of the lode at a depth of 790 ft. from the chamber at the 500-ft. level. As the reef

was encountered at 458 ft., this gives a thickness of lode matter and interstitial country amounting to 332 ft. on the angle. The true thickness is of course unknown, but is supposed to exceed 100 ft. The published assays vary from £6 2s. 6d. (say \$30) to £14 10s. (say \$70) per ton, but it is understood that these are from the richer parts. The development is, however, admitted by all to be most important, showing the existence of payable ore at a depth of 1,200 ft. from surface, and that in an area outside the well-proved ground held by the Waihi company and known to contain no lodes within 400 ft. of the surface, owing to its being covered with andesitic and rhyolitic flows considerably younger than the reef-bearing country.

#### GENERAL MINING NEWS.

**Petroleum Prospecting.**—Drilling operations in eastern fields during September, according to the Oil City Derrick, were as follows: Pennsylvania completed 814 wells, 198 dry, with a production of 7,249 bbls.; Ohio completed 383 wells, 24 dry, with a production of 4,892 bbls.; West Virginia completed 207 wells, 61 dry, with a production of 3,878 bbls.; Indiana completed 337 wells, 32 dry, with a production of 4,878 bbls.; Kentucky completed 39 wells, 12 dry, with a production of 526 bbls. These operations show a net gain in production of about 154 bbls. over the August figures.

**United States Reduction and Refining Company.**—The annual report of this corporation for the fiscal year ending August 1, 1903, shows a gross income of \$1,036,373. Expenses were \$198,769. Dividends paid on the preferred stock amounted to \$236,784, dividends on the common \$236,752, interest on the bonds \$180,000. An addition of \$184,104 was made to the surplus fund.

#### ALABAMA.

The Alabama Legislature, which has just adjourned, passed an anti-hoycott bill which goes into effect 30 days from date. It prevents boycotting and regulates many of the claims of labor organizations.

#### ALASKA.

Yukon navigation is closing with a very large amount of freight en route to Dawson and other Yukon points from both the upper and lower river. Ice is reported forming on the White and Pelly rivers. Low water has seriously impeded navigation for six weeks past. Steamers have been able to carry only half cargoes, and several heavy draught steamers have been unable to navigate between White Horse and Dawson.

According to reports the mines about Circle City are now more prosperous than since the famous Klondike stampede in 1897. Hydraulic plants are in operation on some of the creeks and Circle City is again becoming a populated place.

Steps are being taken by the government to establish a 37-day mail service to Nome instead of a 70-day service via Dawson. The new route is from Resurrection bay, 150 miles north of Valdes. From that bay it is about 1,000 miles to Nome.

Freight for the Klondike is being piled up at White Horse and it is doubtful if it will all get through before the ice makes. The river is getting very low and transportation is difficult.

It is expected that the Tanana region will become a large producer next season. The dumps now being washed seem favorable for very good returns. Summer prospecting has included a region within a radius of 50 miles from Fairbank.

#### ARIZONA.

##### COCHISE COUNTY.

**Tombstone Consolidated Mines Company.**—This company is reported to be excavating for a pump with a capacity of 2,500,000 gal. per day to be installed at the 700-ft. level. The station is to be 85 ft. long and 35 ft. wide.

##### MOHAVE COUNTY.

(From Our Special Correspondent.)

**Lucky Boy.**—Work has been resumed on this claim at Chloride. Operations are confined, principally, to driving the south drift on the 350-ft. level where there is a small showing of fairly high grade ore. Fred Stull is superintendent.

**Metallic Accident.**—Good copper oxide ore is reported opened in this claim near Mineral park. The shaft is down 30 ft.

**Queen Bee.**—This mine at Niggerhead has lately shown a falling off in output. Three shifts are sinking the shaft.

**Sunrise.**—At this mine below Chloride, work is confined to drifting on the vein at 140 ft. depth. It is possible that a mill will be built soon.

**Tennessee.**—This mine, at Chloride, is resuming operations after a shut down since July 3. Work is to be continued on the 500-ft. level. H. N. Botsford is superintendent.

**Virginia.**—This mine, at Virginia camp in Weaver district, has been having trouble with its new mine, but the mill is working fine. Benj. Hastings is superintendent.

#### CALIFORNIA.

##### AMADOR COUNTY.

**Cooley.**—This mine, in Mt. Echo district, has been bonded by A. Schenck and men have been set at work to develop it.

**Defender.**—This mine, near Pine Grove, owned by F. B. Joyce, shows up an 8-ft. ledge of good ore. A 10-stamp mill is kept busy.

**Fremont Mining Company.**—At this property, Amador City, embracing the Gover claim, the new 60-stamp mill is practically completed. The ore feeders are being put in place and as soon as the concentrators are in the mill will be started. Arthur Goodall is manager.

##### BUTTE COUNTY.

**Cortez.**—A contract is to be let to extend the tunnel at this mine, at Enterprise, several hundred feet.

**Magalia.**—At this mine, on the Magalia ridge, the machinery has been removed and the pipe line taken up.

##### CALAVERAS COUNTY.

The dredger to work in the bed of the Calaveras river is under construction, 30 carpenters being at work on it. A hole 100 ft. square and 20 ft. deep has been excavated in the bed of the stream and a dam temporarily keeps out the water. The hull of the boat is being built in this hole.

**Boire.**—In this mine, at Railroad Flat, the gravel is cemented and requires to be milled to get the best results.

**Jones.**—The bottom of the channel in this mine, at Railroad Flat, has been reached by the tunnel.

**Lloyd.**—It is reported that gravel has been struck in this claim, at Central hill, near San Andreas. The big pumps are easily handling all the water.

**Royal.**—This mine, at Hodson, is now operating 120 stamps and doing well.

##### DEL NORTE COUNTY.

**Canthook Platinum and Gold Mining Company.**—This company has organized to develop mining ground on the south fork of Smith river, where considerable platinum is found with the gold sands. The directors are O. B. Lauff, Chas. Morosoli, John Murray, Walter Myers, J. O. Bagley, C. Suhr and S. O. Christensen.

##### EL DORADO COUNTY.

**El Dorado Copper Company.**—It is reported that this company will soon begin extensive development work on its mines near Georgetown.

**Noonday.**—Copper ore shipments are being made from this mine, near El Dorado, to the Peyton Chemical Company, of Alameda. A good force of men is developing the property.

**Phillips.**—This mine, near Josephine, has been bonded by Duffy & Vestal, who have leased the Daggert ditch, and preparations are being made for the winter run.

**Silva.**—J. A. Parker expects to begin work on this mine, Georgetown, shortly. He has bonded some 8,000 ft. of claims between Georgetown and Georgia Slide.

**Union.**—This mine, at El Dorado, A. Harpending owner, has shut down owing to a miners' strike. Some 52 men are out of employment. This is the largest producing mine in the county. The owner declares that he will not again employ union miners.

##### KERN COUNTY.

**Yellow Aster.**—According to a press despatch this mine is now employing 175 men, almost the full complement needed. The other mills in the vicinity of Randsburg are also in operation, excepting the Butte, which, it is said, will open again within a few weeks. Most of the former members of the Miners' Union have found employment elsewhere.

##### MADERA COUNTY.

**Jessie Belle Copper Company.**—This company, at Daulton, managed by Los Angeles men, has installed a concentration and reduction plant of 30 tons daily capacity, which has been started. Hoisting works, compressors, etc., have been provided.

##### MARIPOSA COUNTY.

**American Gold Eagle Company.**—This company was recently organized in New York and has bought and bonded several claims in Bull creek district, near Coulterville, and a force of men will soon be set at work. L. De Perhacs represents the company and is to bring Pennsylvania coal miners to work the mines. New and enlarged machinery is to be installed.

**Buzzard Roost.**—Marten & Stribling have made a strike in this old mine, on the Scofield ranch, near Granite Springs. Other properties in this vicinity were worked years ago, but high prices compelled



closing them down. The body of ore discovered in this mine recently may cause other claims near by to be reopened.

**Mount Gaines.**—This mine, at Hornitos, is to be reopened. It is owned by Geo. Crocker, of San Francisco, who operated it profitably a number of years.

## NEVADA COUNTY.

**W. J. Heisner,** of Heisner & Root, has some fine nuggets taken from the river bed claim on the Yuba river. Work on the claim will continue until the rains raise the water.

**Alta and Bingham.**—These properties, in Washington district, have been bonded by Chas. Cresswell and A. G. Harvey, of San Francisco. The claims have never been fully developed.

**Conlin.**—At this mine, Grass Valley, H. G. Brunner manager, a new mill is to be erected.

**Mento Gold Mining Company.**—This company, at Grass Valley, has made an application for permission to dissolve.

**Rock Creek Gravel Mining Company.**—John Caldwell and J. T. McCall, of Grass Valley, own 250 acres of land supposed to contain the north branch of the Harmony ridge gravel channel, and propose to open the channel, both by shaft and tunnel. A number of properties are consolidated in the holdings of the company and preliminary surveys are about to be made.

**Yuba.**—This mine, near Maybert, has been sold to Geo. W. Peer & Co., of San Francisco. The Mayflower mine is included in the purchase.

**Zeibright.**—At this time, Bear valley district, the ledge is 5 ft. wide and the ore runs about \$50. This is the best strike in that section of the county for years.

## SACRAMENTO COUNTY.

**Gray Wing Mining Company.**—This company, at Blue Ravine, above Folsom, which has been paying dividends since its formation, has shut down until the hoisting plant can be moved to a new shaft.

## SAN DIEGO COUNTY.

**Elevada.**—This mine, at Banner, is being worked by E. D. Jones and F. Harritt and good milling ore is being taken out.

**Poorman.**—A shaft is being run on this claim, between Julian and Cuyamaca, and which is supposed to be an extension of the Golden Chariot, a mine which at one time paid well, but which has been idle some years.

**Redman.**—At this mine, at Julian, owned by the Bailey brothers, the main tunnel is being driven ahead. The ore being taken out is quite rich. The mill is run by water power.

**Stonewall.**—This mine, at Cuyamaca, has suspended work for an indefinite time. The work of reopening it was commenced some months since. As soon as all debts are paid it is expected a resumption will take place.

## SHASTA COUNTY.

**Bully Hill Mining Company.**—This company, at Winthrop, has acquired by purchase the Idaho, Iowa and Columbia quartz mines in the same district. They were formerly owned by Alexson & Allen.

**Crown Deep.**—At this mine, Lower Springs district, James Hulme manager, 15 men are retimbering and stoping. They are shipping about 20 tons of ore daily to the smelters at Keswick.

**Detroit & California Dredging Company.**—This company has contracted for a new dredge, with a capacity of 6,000 yds. every 24 hours, to be used on Clear creek, near Horsetown. This dredge will be twice the capacity of the one recently destroyed by fire.

**Drinkwater Mining Company.**—This company, at Harrison gulch, is preparing to work its claims extensively and is shipping in machinery.

**Graham.**—This mine, near Copper City, has been bonded to the Bully Hill Smelting Company.

**Star of Hope.**—This mine, near Churntown, is being reopened by S. S. Stickley and C. Dale and ore is being shipped to the smelters, at Keswick.

## SIERRA COUNTY.

**Middle Yuba Mining Company.**—This company, owning La Mina del Diablo mine, near Sierra City, has applied to the California Debris Commission for permission to mine by hydraulic process, the tailings to run into a ravine which drains the Middle Yuba river. A debris dam is to be built.

**White Bear.**—From this mine, at Monte Cristo, Wm. J. Belher superintendent, very good gravel is being taken.

**Young America.**—T. Berg and Gilbert Raymond, of San Jose, Santa Clara county, have bonded this mine, at Forest City, and will shortly begin to advance the bed rock tunnel to tap the channel. The new tunnel has been under way some time. The mine is owned

by H. M. Bradbury, J. F. Owens, Charles Miller, Thos. Edward, John Henderson and others.

## SISKIYOU COUNTY.

**King Solomon.**—At this mine, W. H. Young superintendent, a contract has been let for several hundred feet more tunnel to open up new ground. Ore will be blocked out this winter. While the contract work is being done the company will stop its other work.

**Las Perlas.**—Hershey & Rankin have opened their pay shoot on this mine, at South Fork, and have the richest ore ever found in the mine.

**Tyrer.**—This mine, on the Klamath river, near Klamathon, owned by Tyrer & Co., is keeping its mill steadily running on good ore.

## SONOMA COUNTY.

**Socrates Quicksilver Mining Company.**—This company has bought the Mercury and eight other claims adjoining. A new 40-ton furnace is being built. The directors of the new company are Frank A. Huntington, Hugh Davey, W. H. Jordan, I. W. Nolin and D. Ward, of San Francisco.

## TUOLUMNE COUNTY.

**Black Hawk.**—This mine, near Soulsbyville, has been bonded by C. H. Glines and E. M. Cavanaugh.

**Doyle.**—Estey & Stanford have made second payment on the purchase of this mine, and it is expected work will shortly be resumed.

**Longfellow.**—The recent strike in this mine, at Big Oak Flat, seems to hold out well. Twenty men are at work.

**Mountain Bell.**—A company is being organized to work this mine, at Soulsbyville.

**Soulsby.**—The mill at this mine, Soulsbyville, Wm. Sharwood superintendent, is being run six hours daily. Considerable water is coming in and a new 8-in. pump has been installed.

## YUBA COUNTY.

Several more sales of land along the Yuba have been made at average prices of \$150 per acre, and the land is to be prospected by drill at once. On the O'Brien tract, now owned by W. P. Hammon, two large dredges will be put to work as soon as they are completed by the Western Engineering and Construction Company, of Chicago, which has the contracts.

## COLORADO.

## BOULDER COUNTY.

**Livingston.**—The last installment of \$25,000 due on this mine has been paid to Captain Alonzo Coan. The property is largely owned by Attica, N. Y., people. The mine was sold last year for \$65,000, and the full payments have been met. There is now said to be 8 ft. of ore in sight.

## DOLORES COUNTY.

(From Our Special Correspondent.)

**Emma.**—This property at Dunton is working at full capacity, and giving employment to about 100 men. The manager, Richard Keller, does not anticipate any trouble with the union.

## FREMONT COUNTY.

**Steel Canyon Mining Company.**—This company is reported to have three paying claims in their group and has installed a new 100-h. p. boiler and will soon have an air compressor working to furnish power for the drill.

## GILPIN COUNTY.

(From Our Special Correspondent.)

**Gilpin Ore Shipments.**—The shipments of smelting and crude ores, concentrates and tailings from Black Hawk station to the Denver smelters and to outside milling points for September were 226 cars, or 4,520 tons, a decrease from the previous month's shipments, attributed to ore being shipped to outside concentrators.

**Fortunate Gold Mining Company.**—This company has been incorporated with a capital stock of \$1,000,000 to operate the Fortunate and New Haven group of 10 claims in Lump gulch of the Central mining district. Stock is being placed in Hartford, Conn., and other New England points. New shaft buildings are to be erected on the two main claims, and each will be sunk 100 ft. deeper. The surface showings on the claims have been better than the average. E. W. Morse, of Gilpin, is manager.

**Town Topics Gold Mining Company.**—An air compressor has been installed at the East Notaway shaft for sinking. The shaft is down 580 ft. and may be sunk 300 ft. further. The usual force of leasers' is at work, and the mines are keeping up regular shipments of good grade smelting ores to the sampling works. M. D. Draper, of Central City, is superintendent.

**Viola Gold Mining and Development Company.**—In the 65-ft. level of the Silver lode, in the Russell district, a good ore body has been opened, the vein aver-

aging 4 ft. wide. A trial shipment to mills gave net results of about \$4 to the ton for the lot. The ores are heavy in iron and will be concentrated. Machinery will be purchased at once, a new building will be erected and the main shaft connected with the shipping lines of the Gilpin Tramway Company. Robert Hastie, Jr., Nevadaville, is manager.

**Wizard Gold Mining Company.**—Missourians are interested with Boulder, Colo., men in the large group of claims in the Central mining district, which have been partially developed by a 700-ft. tunnel in War Eagle hill. The property has been idle for nearly two years, but arrangements are under way for a resumption of operations, and the tunnel, it is reported, will be driven by air drills, there being a good compressor on the property.

## LAKE COUNTY—LEADVILLE.

(From Our Special Correspondent.)

**Leadville Ore Output.**—The production this week is 2,400 tons daily. The increased price in silver enables the handling of a considerable iron tonnage at a small profit. The continued shut down of the smelting plants at Denver and the curtailment of tonnage from Cripple Creek is sorely felt here, where the production could readily be increased 700 tons daily if there was a market. The zinc output holds up steadily.

**Belgian Frenchman Company.**—A good ore streak is being followed in the old Belgian workings and considerable new work planned.

**Blue Ribbon Leasing Company.**—This company, after putting down a shaft and drifting to get ore, has closed down temporarily.

**Chrysolite.**—Local men are working several of the shafts and making a good iron tonnage.

**Dyatt Combination.**—This includes the American Girl, the Colorado, the Atlantis and Columbine, 35 acres in all, lying south of Leadville, and opened through the lower tunnel of the Atlantis, which is showing good ores. There are two well defined shoots, the upper shoot opened 230 ft. from the surface and giving smelter returns running \$90 to \$180 a ton, and the lower shoot opened by a winze and giving returns of \$96 to \$658.

**Dunkin.**—Arrangements are being made to work the iron bodies above the water levels. Work will be done by lessees.

**Garbutt.**—This gold belt property owned by W. S. Cheesman, of Denver, is preparing for resumption. The shaft is down almost 500 ft.

**Great Hopes Mining Company.**—This company owns quite an area on Fryer hill, but has been unable to work its ore bodies, which are very low grade. Several shafts which show ore that can be mined at silver's present price are being worked.

**Grover Cleveland.**—The ore caught at 150 ft. in the new shaft has opened up nicely. Manager M. P. Murray is to put up a fine plant of machinery.

**Home Extension Mining Company.**—This Boston and eastern company's affairs are now tied up in court. The property is being worked, the court having appointed R. F. McLeod referee to examine and make a report of the hooks, etc., for the stockholders.

**Ibex Mining Company.**—About 7,500 tons of all classes of ore are being shipped. A great deal of new work is under way, including the cutting of a station at tunnel level No. 4, while a drift has been started 100 ft. above the tunnel and a good ore body opened up.

**Iron Silver Mining Company.**—In addition to its heavy tonnage from the old Moyer workings the company is pushing development and is arranging to resume work on the old Tucson which has large bodies of iron and some lead in sight. This shaft for years has only been worked by lessees.

**Matchless.**—Several sets of lessees are prospecting and developing this old mine. Some low grade iron is shipped.

**Reindeer Mining Company.**—This shaft, being sunk by the Campions on Rock hill to open up the territory west of the Rock and Dome fault, is down 250 ft. No water has yet been encountered.

**Valley Leasing and Mining Company.**—The new strike is improving in size. The cross-cut drift has cut through the vein, showing a width of 6 ft.

**Yak Mining and Tunnel Company.**—This company is shipping 2,000 tons a month. Repair work is being done in the old tunnel workings. A large body of ore has been discovered in the New Ibex No. 4 level, where it connects with the tunnel.

## SAN MIGUEL COUNTY.

(From Our Special Correspondent.)

There is no change in the labor situation in Telluride and vicinity, and it is not thought a settlement will be effected this winter. One thing seems assured, the mine managers will make no concessions and will



not attempt to start their mills on an 8-hour basis, but will hold out indefinitely.

Out of all the big reduction plants in the county the Carribean-Montezuma and the Ophir are the only ones operated, and it is not thought that these will meet with any more interference from the unions.

**Butterfly-Terrible.**—As a result of a committee from the miners union at Ophir demanding an 8-hour day for all mill employees, the mill has closed and will undergo repairs. While it is idle a battery of boilers and an engine will be put in, and during the winter, when water becomes scarce, steam will substitute for power. Excavating for the building will begin this week. The exhaust steam will be utilized for heating.

**Carribean-Montezuma.**—The manager of this company has granted millmen an 8-hour day, and the mill is running steadily. The property employs about 50 men. F. T. Axtell, Ophir, is manager.

**H. M. H.**—This group of claims in Bear creek basin, is owned and operated by a Calumet, Mich., company. A rich streak has been encountered on the H. M. H. lode, running from 2 to 10 oz. in gold. As yet the property is but a prospect, but a large force will push development work this winter. Lumber is being taken in and the necessary mine buildings will be erected. The company recently purchased a group of 11 claims, millsite and water right in Bridal Veil basin, on which they are pushing development. John Ekman, Telluride, is manager and principal owner.

**Ophir Consolidated.**—When a demand for an 8-hour day was made, the manager agreed to grant it, providing the union would make no further demands and would not attempt to dictate the number of men that should be employed. This was agreed to. The property is at Ophir loop, and is giving employment to over 100 men. Two hundred tons of ore are milled every 24 hours. Henry Buckley, Telluride, is manager.

**Special Sessions.**—On this group, located on Mt. Wilson, 18 miles southwest of Telluride, arrangements are under way for continuous work. A streak of ore struck is 3 to 5 ft. wide and carries from 2 to 6 oz. gold. The vein carries values from wall to wall. The group is operated by a Chicago company. E. L. Davis, who sold the famous Nellie mine several years ago, is manager.

#### SUMMIT COUNTY.

**Black Cloud.**—A large body of copper sulphide ore is reported opened on Tucker mountain, owned by George Quackenbush. The ore shoot is said to be about 14 ft. thick and to average about \$14 a ton.

**Cashier.**—At this property in Brown's gulch preparations are being made for a steady run during the winter. A new slimer is being installed. Besides the gold bullion output, the mill makes regular shipments of auriferous iron concentrates to the branch sampler of the Chamberlain-Dillingham Ore Purchasing Company at Breckenridge.

**Colorado King.**—A streak of rich silver ore has been struck in an open cut on this lode on Peak No. 10 of the Ten-Mile range by Eli Fletcher and associates, who are working under a lease. The property is owned by M. Clark, of Denver, and Eli Fletcher, of Breckenridge.

**Gold Dust.**—George W. Fair and W. E. Stouffer, who have a lease on this property in Dry gulch, are cleaning out the main tunnel. The mine was formerly a regular shipper of good grade gold-bearing iron sulphide ore.

**Iron Mask.**—This old mine is said to show big bodies of iron sulphide and has been leased to Denver men, who are placing a large plant of machinery on the property and expect soon to have the mine pumped out.

#### TELLER COUNTY.

**Streeter & Cripple Creek Gold Mining Company.**—This company, operating the Snowshoe claim, on Sheep mountain, near Gillett, is to erect a 50-ton cyanide plant. Men are now timbering the shaft from the 200-ft. level.

(From Our Special Correspondent.)

**Miners' Strike.**—The principal feature of the strike during the week has been the conflict between the civil and the military authorities. Several of the prisoners held by the military have been released on writs of habeas corpus issued by the district judge. G. E. Kennison, one of the officials of the union, was released from the military prison, turned over to the sheriff and released on bonds. During the week the editor and some of the office force of the *Victor Record*, the official organ of the Western Federation, were arrested by the militia, but soon afterward released. Information has been filed in the district court against generals Chase and Bell for false imprisonment, and capias have been issued from the district court for their arrest. These are in the hands of the sheriff, but so far no arrests have been made. The miners are gradually returning to work, and there are now about 1,100 men busy at the so-called unfair mines

and samplers. Among the mines at work are the El Paso, Stratton's Independence, Elkton and leases, Golden Cycle and leases, Ajax, some leases on Isabella, also the Strong, Vindicator, Abe Lincoln, Findley, Anchoria-Leland, C. K. & N., Old Gold, Gold Coin, Hull City Placer, Shurtloff, leases on Anaconda, Last Dollar. Several samplers, La Bella plant and the Economic mill, are busy. Some more mines are expected to start up soon. The Woods Investment Company on September 30 informed its men that it is a Mine Owners' Association, and will stand by that organization in opposing the Western Federation of Miners. As a result, all the men on the Gold Coin walked out, and later the employes at the Economic mill were called out. It was rumored that the Portland mine would come into the Mine Owners' Association, but this is denied by Mr. Burns. All the large properties now belong to the association, with the exception of the Portland, and the fight is between the Mine Owners' Association and the Western Federation. A number of men have come in from the outside, and more are coming. At present it looks as though there could be but one outcome of the strike—the overthrow of the Western Federation in this district. With the so-called unfair mines and the Portland and a number of small leases busy it is probable that the total number of men working is about half the number employed before the strike.

#### IDAHO.

##### BLAINE COUNTY.

**Carbonate Hill Mining Company.**—This property, near Galena, it is reported, is to receive machinery recently purchased, consisting of an air compressor and drills, water wheel and power plant.

**Croesus.**—This shaft is down 600 ft., and is to be sunk to the 1,000-ft. level with stations every 100 ft.

##### ELMORE COUNTY.

**Canton-Snake River Gold Dredging Company.**—The dredge of this company has been set up at Glenn's ferry, on the Snake river. It is 40 by 100 ft., equipped with a secret electrical process for saving the flour gold of the Snake river.

##### IDAHO COUNTY.

**American Eagle.**—This property, with a 10-stamp mill, is in operation day and night. Work has been started on a tunnel from the south end of the claim.

**Athens.**—N. Jerry, who purchased this property in June last and formed a company in New York, has purchased the McLaughlin group to add to the company's holdings. Recent development work on the Athens group on Red Hose creek has shown a vein 20 in. to 3½ ft. wide.

##### SHOSHONE COUNTY.

**Gold Hill.**—J. M. Jamieson and C. L. Mathews have secured a six months' option on the seven-eighths interest of James and William Leonard in this property at a reported price of \$300,000.

**North Franklin Mining Company.**—Work has commenced on this group of six claims adjoining the Morning mine, and a tunnel started near the Morning boarding house to open the vein nearly on a level with the Morning's lower working tunnel. It will give about 1,500 ft. depth.

#### INDIANA.

##### GRANT COUNTY.

(From Our Special Correspondent.)

The largest deal in the history of the Indiana oil fields was completed October 1, when the holdings of the American Window Glass Company, the American Oil and Gas Company and the National Oil Mining Company passed into the hands of Pittsburg men headed by William Elinn. The deal is said to call for \$2,000,000 in cash. It includes 35,000 or 40,000 acres of oil leases and a production of oil of 1,000 bbl. daily. The property lies in Grant, Delaware and Blackford counties. The company announces its intention to expend \$1,000,000 on improvements.

#### ILLINOIS.

##### SANGAMON COUNTY.

(From Our Special Correspondent.)

In spite of agreements to avoid strikes the miners at several mines in the Springfield district have been on strike since October 1 on account of failure on the part of operators to comply with a State law, recently enacted, providing that operators shall furnish wash houses for employes. Many of the operators believe this law to be unconstitutional, and now have it before the Attorney General with the request that he set it aside on that ground. If this cannot be done, then a test case will be carried into court. The law applies only to coal mines.

**Springfield Coal Mining Company.**—This company is going to erect a temporary structure tippie at its Black Diamond mine with straight bar screen, instead of shaker screens, for the fall and winter business.

#### KENTUCKY.

##### HOPKINS COUNTY.

**St. Bernard Mining Company.**—This company, of Earlington, has purchased from the Gordon Land Company several thousand acres of coal land.

#### MICHIGAN.

##### IRON—MARQUETTE RANGE.

**Cleveland-Cliffs Company.**—Instructions have been issued to reduce forces at the Ishpeming mines so that only day shifts will be worked at the Cliffs shafts, Cleveland Lake, Salisbury and "J" shaft. Altogether about 500 men will be laid off.

**Cundy.**—This mine, at Quinnesec, was closed on the last of September.

**East Champion.**—The Champion Iron Company, operating this mine, is making extensive improvements. Mining will be suspended until skips can be operated in the perpendicular shaft, which is down about 400 ft. The lower part of the shaft has been timbered, and the miners have started at the top. The shaft will take a double skiproad and a ladder way. It is perpendicular and in rock from top to bottom. Ground has been broken for a new engine house on the hill about 200 ft. south of the shaft. The present hoisting plant will be abandoned when the new machinery is ready, as it is not large enough to handle the skips. A tram railway is being put in from the main line of the Chicago & Northwestern Railway to the new engine house, to be used for hauling coal from the shed near the track.

**Negaunee.**—The shaft at this mine, abandoned last winter on account of its unsafe condition, is being repaired and will be placed in good condition. It can probably be made serviceable for some time.

**Volunteer.**—No ore has been shipped from this mine the entire summer, and about 200,000 tons are piled up about the shaft. The ore is siliceous and low grade. About 200 men are thrown out of employment by the recent shut-down.

##### IRON—MENOMINEE RANGE.

**Dunn.**—The new shaft has reached a depth of 500 ft. It is the intention to sink 300 ft. this winter, so as to have the property in the shipping ranks again next year for a good tonnage. Considerable ore is being taken out of the open pit.

**Oliver Mining Company.**—Work on the Gibson property of this company in the Crystal Falls district has produced a good body of ore. Water in the south drift drowned out the mine, and the company was on the point of throwing up the option when the visit of the officials resulted in an order to pump out the water and see if the inflow did not mean that ore was near. The new find is on the third level of the mine. A similar deposit was met with on the first level, but was lost on the second, as the ore seemed to take a roll away.

#### MINNESOTA.

##### IRON—VERMILION RANGE.

**Soudan.**—These iron mines of the Minnesota Iron Company, near Tower, are closed and 500 men have been laid off. The mines produce a hard hematite.

#### MONTANA.

##### BEAVERHEAD COUNTY.

**Ajax Gold Mining and Milling Company.**—This company of Dillon, A. J. Noyes, manager, is to add 10 stamps to the battery at its mill, and will also build an aerial tramway 4,000 ft. long.

##### DEER LODGE COUNTY.

**Black Diamond Coal Company.**—Work is pushed near Anaconda. About 365 ft. of tunnels and shafts have been driven.

**Southern Cross.**—A large force of carpenters is at work upon the new cyanide mill on this property in the Georgetown district, and it is thought the mill will be ready about November 1. All of the first-class ore is now shipped to the Anaconda smelters. The ore is a free-milling proposition, and the property is in charge of Lucien Eaves, of Helena.

(From Our Special Correspondent.)

**French Gulch Dredging Company.**—Judge Napton has issued a temporary restraining order in the case of Jacob Barnowsky against this company. The plaintiff claims title to the ground and is suing to recover \$105,000, alleged to be due for values taken from the ground by the company. The principal stockholders of the dredge company are the Marcus Daly estate and W. R. Allen, of Anaconda.

##### FLATHEAD COUNTY.

(From Our Special Correspondent.)

**Balchler.**—This property, in the West Fisher gold belt, has been sold to Michigan people for \$15,000. The seven claims of the group lie on Blacktail mountain, 35 miles from Libby. The formation is slate and the veins are flat. The values are in gold, practically free milling. The original bond on the prop-



erty called for \$30,000, but the holders of the option made a cash offer, which was accepted.

**Rochester Mining Company.**—This company, with headquarters in Salt Lake City, has taken a bond on the Huron group of claims in the West Fisher mining district. A. Brown, M. A. Shannahan, John Flave, of Libby, and E. J. Merrin, of Getaway, are the owners. The values are in gold.

## GRANITE COUNTY.

**Milwaukee Gold Exploration Company.**—This company of Philipsburg, G. H. Savage, manager, will soon add a 200-ton cyanide mill to its equipment.

## JEFFERSON COUNTY.

**Surprise.**—On this property, near Whitehall, a cyanide plant is said to be going up. The mine is owned by Cook & Shafer, and contains a large vein of low-grade gold ore.

## MADISON COUNTY.

(From Our Special Correspondent.)

**Green Campbell Consolidated Gold Mining Company.**—This company will operate the old Green Campbell gold mine at Silver Star. This was one of the early gold mines of the State and has a record of having produced nearly \$1,000,000. It has been idle 18 years. The capital stock of the company is \$1,000,000. The following were elected as directors: Albert D. Field, of Waterbury, Conn.; John McBarron, of Whitehall, Mont., and Thomas T. Baker, Edward B. Howell and William F. Davis, of Butte. It is learned the management has in view the building of a cyanide plant. The headquarters will be at Butte.

## SILVER BOW COUNTY.

**Boston & Maine.**—Judge Clancy has heard the arguments on the application of John MacGinnis for the appointment of a receiver for this company.

**West Stewart.**—The heavy machinery to be used in the hoisting engine at this mine is being placed upon the foundation. The work will likely take about three weeks. The machinery is colossal, and when in running order Senator Clark, who owns the mine, will have one of the finest hoisting plants in Butte.

## NORTH CAROLINA.

## JACKSON COUNTY.

**Carolina Copper Company.**—This company, with headquarters at Detroit, Mich., is contemplating putting in machinery at its property near Cullowhee, but so far has done nothing but hand work.

**Cullowhee Copper Company.**—This company, capitalized at \$100,000, has as officers D. D. Davis president, R. E. Bowen, treasurer, and Thomas A. Cox secretary. Its head office is at Cullowhee, and it has installed boilers, Sullivan air compressor and drills and a pump.

## OREGON.

## BAKER COUNTY.

**Basin.**—This group of mines, in the Bald mountain district, 10 miles above Sumpter, has been bonded for \$43,000 for a year. The owners were Joseph Jackley and others, and the purchasers are George G. Eitel and others. The group lies between the headwaters of McCully fork of Powder river and the head of Umpqua gulch.

**Comer Creek.**—P. Basche, of Baker city, and Sumpter, and O. D. Taylor have taken a working bond and lease on this old mine on Snake river, 10 miles below Huntington. They are making a test run of ore through the 35 stamp mill on the property. Thirty years ago the mine was operated with success.

## JOSEPHINE COUNTY.

**Oregon Belle.**—The New York and Western Mines Company is reported to have made a final payment on this mine, bonded last winter. The price is said to be \$30,000. The mine is located on Forest creek, and has been under development for several years.

## LANE COUNTY.

**Crystal Consolidated Mining Company.**—This company is installing a 50-h. p. boiler, engine and sawmill. An order has been placed with the Union Iron Works, of San Francisco, for a stamp mill. The company is also building a 7,500-ft. wagon road from the new Champion creek road to the Mountain Lion claim.

## MO'ROW COUNTY.

**Willow Creek.**—At tunnel No. 5 of this coal mine a force of 20 men is now employed day and night.

## UNION COUNTY.

**Cornucopia Mines Company.**—This company, capital \$5,000,000, was incorporated recently to purchase all the mines near Baker City, known as the Cornucopia mines. The incorporators are Charles M. King, Raymond M. Lowey and Richard E. Dwight, all of Jefferson City. The Cornucopia mine is equipped with a 20-stamp mill, concentrating tables, canvas tables, and generates power by water or steam. It has not

been operated since superintendent Dobler was killed in the avalanche last winter. Bernard McDonald, of Spokane, is now superintendent.

## PENNSYLVANIA.

## ANTHRACITE COAL.

**Bear Valley.**—A seam of coal from 5 to 7 ft. thick was struck in this new shaft, being sunk near Shamokin, now down 210 ft. The shaft will have 4 water hoists and 4 for coal.

**Erie Coal Company.**—The Schooley colliery at Exeter, abandoned some time ago by this company, is to be re-opened by a new shaft. The lower levels are flooded. The new shaft will be 587 ft. deep, while the old shaft will be used as an air shaft.

**Pettebone.**—This colliery of the Delaware, Lackawanna & Western Company near Wilkes-Barre is temporarily closed.

## BITUMINOUS COAL.

**Big Sandy Coal, Coke and Lumber Company.**—This company has been incorporated at Meyersdale to develop 3,000 acres of land in Fayette county as soon as the railroads build through that field. The officers of the corporation are: President, W. P. Meyers; vice-president, L. W. Weakland; secretary, Dr. W. T. McMillan; treasurer, J. H. Judy. The proposed extension of the Baltimore and Ohio Railroad will reach the property of the company.

**Brier Hill Coke Company.**—This company, sinking a shaft in Redstone township, Fayette county, is down 490 ft. and sinking at the rate of 93 ft. a month. The foundation for a 200-oven coke plant is being laid and the company expects to be making coke by the middle of December.

**Ellsworth Coal Company.**—This company has completed and fired its plant of 100 coke ovens in southern Washington county.

**Geneva Coke Company.**—This company has completed a 200-oven coke plant near New Geneva, Fayette county.

## SOUTH DAKOTA.

## CUSTER COUNTY.

(From Our Special Correspondent.)

**Glenwood Group.**—W. H. Walling has negotiated the sale of the property to De Wit Otis, of New York. Development is to begin October 10.

**Minnie May Mining Company.**—A contract for a new 10-stamp mill has been let. A saw-mill is cutting lumber on the ground. Work is soon to start in the shaft with steam hoist and air drills. Isaac Downing, of Custer, is in charge.

## LAWRENCE COUNTY.

**Goldstake Mining Company.**—These officers have been elected: O. U. Pryce, Deadwood, president; E. P. Mitchell, California, vice-president; C. F. Galloway, Columbus, O., secretary and treasurer. George W. Wilkins is mine superintendent. The company is to develop ground along False bottom and Elkhorn gulches. The capitalization is \$1,225,000.

**Homestake Mining Company.**—One hundred additional stamps are being added to the Amicus mill, formerly known as the Highland, and a larger engine is being installed. The new stamps are expected to be dropping before January 1, and the company will then have 1,000 stamps.

**Spearfish Gold Mining and Reduction Company.**—Two tanks are to be added at the cyanide mill, increasing the capacity from 250 to 300 tons per day. The company is depositing upwards of \$30,000 in gold bullion per month at the United States assay office in Deadwood. Plans for the mill addition are being formulated at a special meeting of directors at the main office in Colorado Springs, Colo.

## TENNESSEE.

At a recent meeting of miners and operators of eastern Tennessee and southeastern Kentucky an agreement was reached on the wage scale for the year beginning September 1. The men will be paid semi-monthly and all miners and laborers secure an increase of 7½ per cent over the Jellico scale of last year.

## MONTGOMERY COUNTY.

**Red River Iron Company.**—The Helen furnace, owned by this company, Graham McFarlane president, was ordered closed indefinitely about October 1 owing to the high price of coke and other material used in the production of iron. The furnace, located at Clarks-ville, employs 300 men.

## UTAH.

(From Our Special Correspondent.)

**Ore and Bullion Shipments.**—Salt Lake banks reported ore and bullion settlements during the month of September of \$1,912,112. The copper shipments from the independent smelters aggregated 2,786,513 lbs., the Utah Consolidated contributing 1,203,700,

United States, 852,530; Bingham Consolidated, 720,263.

## BOX ELDER COUNTY.

(From Our Special Correspondent.)

**Century Gold Mining Company.**—It is reported that this company will add 10 stamps to its mill early next year. P. W. Madsen, of Salt Lake City, is manager.

## JUAB COUNTY.

(From Our Special Correspondent.)

**Tintic Shipments.**—During September 499 cars of ore were shipped to the Salt Lake smelters, as follows: Centennial-Eureka, 112; Grand Central, 107; Lower Mammoth, 3; Eagle and Blue Bell, 3; Carisa, 10; Mammoth, 40; Victor Consolidated, 14; Black Jack, 15; Martha Washington, 6; Dragon, 55; Sunbeam, 2; Ajax, 2; Little Chief, 1; May Day, 2; Yankee Consolidated, 7; Tetro, 7; Uncle Sam Consolidated, 7; Rising Sun, 1; Star Consolidated, 6; Whiting & Company, 4; La Clede, 2; South Swansea, 4.

**Lucy L.**—Manager Frank L. Wilson has returned to Salt Lake. A vein 45 ft. wide is reported opened. The ore carries copper and gold, and is mostly low grade.

**Orient Mining Company.**—This company contemplates the erection of a mill early next year. Judge O. W. Powers, of Salt Lake, is manager.

**Uncle Sam Consolidated.**—The mill foundations are nearly completed. Equipment has begun to arrive.

## SALT LAKE COUNTY.

**American Smelting and Refining Company.**—The Murray plant, about 7 miles below Salt Lake City, is treating at present about double the quantity of lead ores treated in all the valley smelters 5 or 6 years ago. R. D. Rhoades, the superintendent, virtually since the beginning of construction, has overcome many difficulties, and the plant now handles about 1,000 tons of ore per day with 8 furnaces, its full capacity. Mr. Rhoades was with the Philadelphia smelter at Pueblo, and at the Arkansas Valley smelter in Leadville. Karl Eilers, connected with the metallurgical department at the general office in New York, lately visited the plant.

(From Our Special Correspondent.)

**Bingham Consolidated Smelter.**—Shipments of copper bullion during the week ending October 2 were three cars, 183,867 lbs.

**Butler-Liberal.**—This company is marketing 225 tons of high-grade ore and a large quantity of concentrates, from which manager A. L. Jacobs says the company will realize about \$10,000.

**Columbus Consolidated.**—Work is being pushed on the new electric power plant. A 15-drill air compressor has been ordered for the mine. A shipment of 40 tons of ore from a new strike in west drift from Columbus tunnel this week netted about \$3,000. Tony Jacobson, of Salt Lake, is manager.

**Utah Consolidated Smelter.**—Copper bullion shipments made during the week ending October 2 were six cars, 362,500 lbs.

**Utah Copper Company.**—The structural parts of the new 400-ton concentrator at Bingham are being raised. Development work in the mine has been resumed. A tunnel is being run to tap ore bodies lower down.

**United States Smelter.**—Copper bullion shipments for the week ending October 2 were four cars, 241,750 lbs.

## SUMMIT COUNTY.

(From Our Special Correspondent.)

**Daly-Judge Mining Company.**—The mine and mill are again in operation after a shut down of several weeks pending repairs in the Anchor tunnel. The mill is handling 300 tons of ore daily, but this is to be increased to 450 tons.

## UTAH COUNTY.

(From Our Special Correspondent.)

**Garden City Mining Company.**—This company has been incorporated with \$35,000 capital. The officers are Provo people. Jonathan Buckley is president, Samuel H. Buckley vice-president, John W. Buckley secretary and treasurer. Company's property is in Rock canyon, near Provo.

## WASHINGTON.

## OKANOGAN COUNTY.

(From Our Special Correspondent.)

The discovery of a 4-ft. vein of coal, similar to the Nicola valley district, is reported near Molson and the Okanogan river.

**Pinnacle.**—A tramway is being installed and preparation for shipping ore and more rapid development is under way.

**Ruby.**—Of two lots of ore shipped, 12 tons netted \$1,200 and 15 tons netted \$1,542 over cost of treatment at the Hall mines smelter, at Nelson, B. C. Another shipment, carrying over 200 oz. silver and about \$3 gold per ton, is in transit.



## WEST VIRGINIA.

(From an Occasional Correspondent.)

The operators of the New and Kanawha river districts, in joint session at Charleston, W. Va., on October 3, 95 mines being represented, adopted an offer to the Chesapeake & Ohio Railway Company as follows: "We, the undersigned operators of coal mines in the New river and Kanawha districts, along the line of your railroad, and its branches, desiring that you should acquire a line of railroad that will give a more direct and competitive outlet for our coal to the Great Lakes; and that you should also acquire a line of railroad that will give a direct and competitive outlet for our coal beyond the Ohio river, reaching into the markets of the west and northwest, in the event that you acquire said line of railroad to the Great Lakes, and to the west and northwest, and will give adequate transportation facilities and proper competitive freight rates; we hereby guarantee and agree to secure proper and suitable docks on the Great Lakes, and that within the second year after you acquire said lines of railroad we will ship west from our mines not less than 1,000,000 tons of coal over the line to the Great Lakes, and an additional tonnage over the present shipments of 1,500,000 tons of coal over the lines to the west and northwest, each of the undersigned guaranteeing and agreeing to ship its proportionate amount of the tonnage aforesaid, based on the present allotment of the mines."

## MINING STOCKS.

(Full quotations are given on pages 568 and 569.)

New York, Oct. 7.

The market is still heavy, though prices show some recovery. Realizing sales are fewer than in recent weeks, and the undercurrent of speculation tends toward an improvement. The feature this week has been United States Steel, which at a directors' meeting on Tuesday reduced the quarterly common dividend from 1 per cent to  $\frac{1}{2}$  per cent, which means a reduction in the payment of \$2,541,512. This is something more than half the reduction in the net earnings in the quarter ending September 30, which, by the way, are considerably less than a year ago, and is explained by the heavy falling off in orders for iron and steel. It is contended that the usual dividend could have been paid on the common shares, but the directors thought it better policy in view of the condition of business to provide for future contingencies by adding to the reserve fund. Dividends at the rate of 4 per cent. per annum had been paid for two years, and with the present quarterly declaration of  $\frac{1}{2}$  per cent the common shareholders will have received \$53,350,977. At a market value of \$17 the common stock yields more than 11 per cent annually, being based on the rate of 2 per cent on par of \$100. The usual quarterly dividend of  $1\frac{1}{4}$  per cent has been declared on the par value of the preferred stock, which at a market price of \$65 yields a fraction over 10 per cent per annum. Sales of steel shares this week have been smaller, but at better prices. The term of the preferred stock conversion syndicate has been extended to July 1, 1904, by mutual agreement.

The copper stocks on 'Change are pegged, it seems, around last week's average, and sales show liquidation. Amalgamated rose from \$38 $\frac{1}{2}$  to \$42 $\frac{3}{4}$ , and then reacted to \$37 $\frac{1}{2}$ , closing on Wednesday at \$38 $\frac{1}{2}$ . Anaconda gained from \$17.47 to \$17.75, but was invisible on Tuesday, and on Wednesday sold down to \$17.06.

On curb, brokers report a better feeling for the coppers, particularly in Tennessee, which advanced  $2\frac{1}{4}$  points to \$28.75. Greene Consolidated, of Mexico, moved to \$17 $\frac{1}{4}$ , but trading was limited. White Knob, of Idaho, has put on better form, rising from \$8 $\frac{7}{8}$  to \$11.

An odd lot of Ontario Silver, of Utah, brought \$5 per share.

More has been done in the Colorado gold list, but buying will necessarily continue on a small scale until the labor troubles there have been adjusted. Portland, of Cripple Creek, sold at \$1.25; Elkton at 46@44c., and El Paso at 58c., while Isabella continues in the dumps at 10c.

The Comstocks are burdened with assessments, 11 companies now collecting a total of \$108,400. Consolidated California & Virginia made a sale at \$1.30; Ophir, \$1.60; Best & Belcher, \$1.40@1.45; Mexican, \$1.10@1.05; Yellow Jacket, 49@47c. Silver Hill, the only dividend stock in Nevada sold in the East, was quoted at 60c.

Boston, Oct. 6.

(From Our Special Correspondent.)

In the local copper share market during the week price changes have been unimportant. Dealings were

confined pretty much to Amalgamated and to Copper Range Consolidated, particularly the latter, which has fluctuated between \$52.25@47, closing practically the same as a week ago at \$50.75. A list of the buyers and sellers of Copper Range clearly shows that the public is not doing the trading, as one house is credited with buying over 30,000 shares in the past few weeks. The sellers are well known traders. No further deals by Copper Range are now under way. About 85,000 shares of Trimountain stock have been turned in. Old Dominion touched \$6.25, its low record. The proposed plan of raising funds obviates the necessity of reorganizing and assessing, thus preventing some stockholders being frozen out. Utah has varied around \$24.25@26, closing at \$25.50. Considerable stock is reported transferred to the name of W. H. Tilford, who is one of the Executive Committee of the Standard Oil Company. Osceola touched \$51 during the week, but reacted to \$53.50 to-day. No sales of Tamarack were made during the week. United States is off a fraction to \$18. United States Coal and Oil is selling at \$10@9.75. The company is reported producing about 600 hbl. of oil per day and netting about \$12,000 per month. Coal production is not expected to start before next year. The starting of the Phoenix mill has been reflected by the stock. Bingham is a trifle higher at \$22.25. The Old Colony Company gives notice that the second installment of the \$1 assessment levied June 4 is payable October 19. Dominion Coal has advanced to \$71. Atlantic closed at \$7; Allouez, \$4.50; Centennial, \$16.37 $\frac{1}{2}$ ; Franklin, \$8; Granby Con., \$4; Mass, \$5; Wolverine, \$63; Winona, \$7; Mohawk, \$39.50; Dominion Iron & Steel, \$10.65 $\frac{1}{2}$ . Trading in all these shares has been extremely light.

Colorado Springs, Oct. 2.

(From Our Special Correspondent.)

The market has regained a portion of the strength it lost at the close of last week, but prices generally have remained about stationary. The water-level in a number of the heavy producers is being gradually lowered by the drainage tunnel, and as far as the properties themselves are concerned, they are perhaps now in better shape than ever before in the history of the Cripple Creek district. The miners' strike is still in force, but the different properties are being reopened with non-union miners, and by the close of another fortnight operations should have assumed their normal condition. A settlement of the labor troubles is almost certain to be followed by an advance in the prices of mining securities.

Acacia weakened slightly during the week, closing to-day at 6c. bid. C. K. & N. was a heavy trader at advanced prices during the first of the week, but slackened off to-day, selling at 18 $\frac{1}{2}$ c. Doctor-Jack Pot sold from 8 $\frac{1}{2}$ c., a week ago, to 9c. Elkton sold from 47 $\frac{1}{2}$ c., last week, to 49c., but weakened to-day and was offered at 48 $\frac{1}{4}$ c. El Paso scored the most substantial gain of the week, advancing from 56c. to 61c. Findley was stationary at 14 $\frac{1}{4}$ c. Gold Dollar Consolidated was weaker at 4 $\frac{1}{8}$ c. Isabella fluctuated considerably, selling from 11@10 $\frac{1}{2}$ c., and back to 11 $\frac{1}{4}$ c. Mollie Gibson was in evidence with a good gain, advancing from 5c. last week to 6 $\frac{3}{4}$ c. to-day. Moon Anchor maintained last week's quotation, selling at 11@11 $\frac{1}{2}$ c. all week. Portland was weak, with no trading of any moment.

Salt Lake City, Oct. 3.

(From Our Special Correspondent.)

The past week was a slow one for mining stocks, and the sales on the Salt Lake Stock and Mining Exchange totaled only 190,763 shares, valued at \$47,980.09. This would have been considered a poor day's business earlier in the year. Again, the greater part of the trading was in Tintic stocks, and with the exception of one or two non-producing mines prices ruled generally lower. Martha Washington stiffened some, while Tetro was on the decline all the week. Consolidated Mercur was beared considerably, and was carried down close to \$1. Yankee Consolidated ended at least 33 1-3 per cent lower than 10 days ago, being effected by the condition of the eastern markets and limited buying.

San Francisco, Sept. 29.

(From Our Special Correspondent.)

The Gold Hill and south end Comstock stocks showed declines, as there were too many offers to remove the impression that these are favorable investment securities. Then again, several new assessments had a depressing effect, and at the close the market shows signs of further weakness.

Consolidated California & Virginia brought \$1.37 $\frac{1}{2}$ @1.45; Ophir, \$1.60@1.70; Caledonia, 90@93c.; Mexican, \$1@1.10, and Union Consolidated, 67@72c.

On the Tonopah Exchange the lower-priced stocks attracted most attention, although something was also done in Montana-Tonopah at 98c.@\$1; Tonopah-Belmont, \$1.45, and Tonopah of Nevada, \$7.

Business on the oil exchange was dull, although prices were firm. Hanford was quoted at \$1.35@1.40; Home, \$1@1.05, and Sovereign, 40c.

## COAL TRADE REVIEW.

New York, Oct. 7.  
ANTHRACITE.

There has been very little change in anthracite trade conditions during the past week, what little change has taken place has probably been for the better—winter is a week nearer. The production at the collieries is being restricted, and the output for October will show a decided falling off from August figures. The various companies are restricting output in different ways according to the conditions that confront them, thus, the Lehigh Valley Coal Company, since the Lehigh Valley Railroad ships a larger proportion of independent coal than any other anthracite road, has adopted the policy of running its collieries but four days a week; this means that on two days neither the Lehigh Valley's collieries nor those of the independent operators receive any cars. Other companies, for instance, the Delaware & Hudson and Delaware & Lackawanna, are shutting down some collieries temporarily, and operating others part time. On the average all the collieries are now running from two-thirds to three-quarters' time. This condition has evidently had its effect on labor union officials, and the hearings of grievance before the Conciliation Committee are marked by a less aggressive spirit.

Trade in the Northwest is quiet. Receipts at the head of the lakes during September were not as heavy as during August, but were liberal. The action of the Pittsburg Steamship Company in competing for return cargoes of coal means that there will be full docks at all upper lake ports when navigation closes. In Chicago territory the market is still quiet. The receipts of anthracite coal by lake this season to date equal those of any like period for many years. The trade at points tributary to Chicago shows little change, though buying due to the recent coal weather has fallen off. In lower lake territory demand is rather light, and very little improvement is expected till the temperature falls. The break in lake freights insures sufficient coal going up the lakes from Buffalo to supply any possible demand this winter. Along the Atlantic seaboard there is possibly slightly more activity than a few weeks ago; in particular, the demand for steam sizes has improved. In the line trade independent operators have cut prices 25c. per ton and over. The coastwise movement of coal is so free that any dealer who wants coal can get pretty prompt delivery. The demand at points beyond Cape Cod is fair, retail buying in that territory having improved slightly. At New York most retailers have their yards full, and report a very light demand. Those consumers who could take advantage of discounts now have all the coal they want, and those who could not or would not, are not likely to buy until the weather gets colder.

## BITUMINOUS.

The Atlantic seaboard bituminous trade continues dull, and yet there are no signs of appreciable improvement in the near future. The opinion is expressed that, owing to the anthracite strike last year, and the resulting demand for coal at high prices, more mines were opened than are now needed to supply the market. As a result prices are now down to what, in some cases, must be about the cost of production. There is considerable discussion in the trade about demurrage charges on coal standing in cars at tide-water, and the railroads are believed to be contemplating some changes for the relief of shippers. Some sporadic labor troubles are reported at the mines, but the present condition of the market makes operators indifferent, and meanwhile the men are finding out that this is no time to strike.

Trade in the far East is very quiet. What orders come from that territory are for small lots, and new business is very scarce. Along Long Island sound trade is a little more active than in other consuming territories. At New York Harbor points the market is quiet. Ordinary grades of Clearfield are quoted at \$2.50 and \$2.60, f. o. b. New York Harbor shipping port. All-rail trade is a little quieter than it was. Transportation is prompt, coal running through in less than a week. Car supply at present up to all demands of consumers. In the coastwise vessel market vessels are in fair supply, while the demand is poor. We quote current rates from Philadelphia as follows:

Providence, New Bedford and Long Island, 60c.; Boston, Salem and Portsmouth, 75c.; Lynn, 90c.; Newburyport, Bangor and Gardiner, \$1, with towages to last port; Saco, \$1.10 and towages. Rates from the further lower ports are about the same as above.



## Birmingham.

Oct. 5.

*(From Our Special Correspondent.)*

The production of coal in Alabama shows little change. There is some complaint of car shortage, the movement of cotton, it is believed, now being felt. At Mine No. 3, of the Pratt Mines division of the Tennessee Coal, Iron and Railroad Company recently, over 1,600 tons of coal were gotten out in one day. The officers of the company have been giving the new electric haulage system much attention.

The Walker county mines, which have lost no time at all this year by labor troubles or any other reason, will make a fine showing for the year. At Horse creek, Cordova, Carbon hill, Pocohontas, Galloway and several other places the mines have lost no time, and quite a large amount of coal has been gotten out right along. Organizers of the United Mine Workers of America have been visiting the mining camps in Walker county since August, and have succeeded in starting several locals. There are labor troubles at the Montevallo and Virginia City mines, though the latter have non-union miners employed.

It is not believed that the curtailment of the iron production will materially affect the coal output.

There is no change in the coke situation. The production is still quite large, with a fair demand. The production for the year will show an increase over last year, notwithstanding the shut down during July.

## Chicago.

Oct. 5.

*(From Our Special Correspondent.)*

Conditions of the coal trade, both anthracite and bituminous are very good. There is a continuance of the revival from sluggishness in the anthracite business, that occurred with the cold wave of two weeks ago; both city and country trade is moving with fairly satisfactory briskness now. The receipts by lake continue heavy and the all-rail trade with the West is held back only by the transportation troubles, that all business is beginning to experience. Rail business, indeed, indicates that many dealers and householders throughout the upper Mississippi valley delayed placing substantial orders until the first intimation of cold weather appeared. The anthracite car price of \$6.50 Chicago for egg, nut, stove and chestnut, is apparently a fixture for the winter; realizing this, the retail trade and the public are again placing orders while they can be filled with certainty. There is no scarcity of any size of anthracite unless it be egg, which appears to be in greatest demand.

Bituminous sales of Indiana and Illinois are somewhat hampered by the lack of cars and motive power that is becoming greater every day. It is the usual fall congestion of traffic, but this year it bids fair to be worse upon the coal trade than ever before and those who have followed the trade predict great trouble as soon as cold weather shall appear. The Indiana roads are worst of all afflicted, to all appearances. There is also trouble with shipments of smokeless, on account of the transportation condition, but this does not affect the public of the coal trade generally half so seriously as the condition of the Indiana and Illinois lines. As a result, prices of western coals are advancing, quotations being as follows: Indiana and Illinois—lump, \$2.40@3; run-of-mine, \$2.25@2.40; block, \$3@3.30. Hocking is kept up nearly to the list prices of \$3.90 for lump and \$3.65 for run-of-mine; the demand for it is good and there is now a good adjustment of supply to demand, with little demurrage coal on track at any time. Smokeless is picking up, though still not so popular as last year at this time, it is said; it is quoted at \$4.30 for lump and egg, and \$3.90 for run-of-mine yet, but these prices are reported to be cut by as much as 50c. for desirable trade. Youghiogheny continues a good seller at a little higher price than previously—\$3.70@3.85; Pittsburg brings \$3.60@3.80. Cannel coal is down to \$5@5.50, and is selling well.

## Cleveland.

Oct. 8.

*(From Our Special Correspondent.)*

Coal.—Since the Steel Corporation vessels have been competing for the coal trade, shipments have been very heavy. Coal shipments for September broke all record, 713,976 tons of anthracite going forward, of which a fair proportion went to Chicago. Rates have been generally shaded 5c. and the market is not especially strong at that. It is the unusual movement in coal that has redeemed the lake trade this season. Were it not for that the year would be a bad one in lake shipping. There is now a surplus of boats in the coal trade, and for the first time in the history of the trade coal has gone forward in 6,000-ton steamers. Heretofore it was the small carrier which has invariably carried coal, owing to its adaptability to all docks; but since the Steel Corporation entered the trade its great steamers have somehow managed to wriggle to the coal docks. Of course this surplus of tonnage means that the season of navigation will end early and that probably by the middle of November the upper lake ports will have

all the coal they care to handle. Demand for domestic coal is fair and prices are unchanged.

## Pittsburg.

Oct. 6.

*(From Our Special Correspondent.)*

Coal.—There is nothing of special interest in the coal markets. Prices are firm and the demand continues good. The railroads are supplying a fair number of cars for the lake shipments, which are being rushed as rapidly as possible. While all contracts in the Northwest held by the Pittsburg Coal Company will not be filled, the shortage will not be as great as was anticipated. About 80 per cent of the railroad, and all of the river, coal mines were in operation yesterday and to-day.

Connellsville Coke.—Production is being curtailed and shipments have begun to fall off owing to the action of the blast furnace interests in deciding to close the furnaces for periods during the last quarter. The price of furnace coke remains firm, the minimum being \$2. For foundry coke \$2.75@3.00 is quoted. According to the last issue of the *Courier*, the H. C. Frick Coke Company has put out 1,298 ovens and the Rainey Company has closed several hundred. The production for the previous week is given at 215,126 tons, a decrease of about 37,000 tons compared with former week's production. The shipments aggregated 10,501 cars distributed as follows: To Pittsburg and river points, 3,808 cars; to points west of Pittsburg, 5,105 cars; to points east of Connellsville, 1,588 cars. This was a gain of 200 cars. The gain for the West was 400 cars, but the shipments to Pittsburg and the East were reduced.

## Foreign Coal Trade.

Oct. 7.

Messrs. Hull, Blyth & Co., of London and Cardiff, report that the Welsh coal market is very dull and inactive, with prices a shade easier. Quotations are: Best Welsh steam coal, \$3.72@3.78; seconds, \$3.66; thirds, \$3.48; dry coals, \$3.36; best Monmouthshire semi-bituminous, \$3.30; seconds, \$3.18; best small steam coal, \$2.10; seconds, \$1.92; other sorts, \$1.80.

The above prices for Cardiff coal are all f. o. b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f. o. h. Newport, exclusive of wharfage, but inclusive of export duty, and are for cash in 30 days, less 2½ per cent discount.

The outward freight market is steady, though rates have an upward tendency for some directions. Some rates quoted are: Genoa, \$1.20; Naples, \$1.20; St. Lucia, \$1.86; Las Palmas, \$1.44; St. Vincent, \$1.56; Rio Janeiro, \$2.52; Santos, \$2.88; Buenos Ayres, \$2.52.

## IRON TRADE REVIEW.

New York, Oct. 7.

The iron trade is evidently in a state of transition. Producers are beginning to recognize that prices and consumption are settling down to a lower basis. Pig iron makers are arranging to meet this condition by a general curtailment of production. In the central West over 80 per cent of the furnaces have placed the matter in the hands of a committee, and it is understood that there will be a reduction of approximately 20 per cent in the output for the balance of the year. This committee was to have met to make final arrangements on October 6, but the meeting has been postponed for a day or two, so that we are unable to report the result this week. In the South and East also there is a movement of a similar character to restrict production, which will probably follow the lead of the Pittsburg committee.

Trade in finished material is correspondingly quiet, and our local reports show only moderate transactions. While there is a considerable amount of business in structural material in sight for next year, much of which will have to be placed before long, the present trade is very quiet.

At a meeting of the directors of the United States Steel Corporation, held October 6, it was resolved to reduce the dividend on the common stock from 1 per cent to ½ per cent, and a declaration was made on that basis.

Following the custom of the United States Steel Corporation to issue regularly reports of its earnings, there was given out after the meeting a statement of the company's earnings for the quarter ended September 30. The net earnings of the company for the quarter ended September 30, the month of September being estimated, were \$32,302,821, as compared with \$36,642,308 for the previous quarter, and \$36,945,489 in the corresponding quarter last year. Since June, when the net earnings were \$12,992,780, they have dropped to \$9,000,000 (estimated) in September, and as a still more decided indication of the trend of the company's business, the unfilled orders on hand on October 1 were more than 1,100,000 tons under the total at the same date last year.

## Birmingham.

*(From Our Special Correspondent.)*

Representatives of southern furnaces met on October 2 and 3 for a general discussion of conditions. They recognized that there should be a curtailment of production, and it was resolved that the curtailment should approximate 25 per cent. Mr. W. H. Hassinger, vice-president of the Republic Iron and Steel Company; J. W. McQueen, second vice-president of the Sloss-Sheffield Steel and Iron Company, and another gentleman to be selected, were named as a committee to see to the matter. Each concern is to bear a share of the reduction. The curtailment will be for three months from date. The reduction of 50c. per ton on freight rates is of importance. A few weeks ago the reduction was refused by the railroad representatives at a meeting in Birmingham. The furnacemen appealed to the higher officials, and finally were awarded the reduction. At the recent meeting there was some discussion of a reduction in quotations in iron, but the reduced freight rates, it is firmly believed, will enable southern iron-makers to send their product to strong competing points.

The demand for iron has not been brisk, and shipments have not been very large recently. It is believed that with freight rates and production reduced considerable of the accumulation in the yards hereabouts will begin to move.

The production of iron in southern territory up to this time has been heavy and steady, and the accumulation of iron is said to exceed 150,000 tons. One company in this district announces that it has on hand 95,000 tons.

The Birmingham rolling mills, the largest rolling mills in the South, have resumed operations, a full force working except in the plate mill, fire bed and in the new forge. Nearly 900 men are now at work. The mills at Gate City and at Bessemer are in full operation.

The night force at the steel rail mill at Ensley has been laid off. Foundries and machine shops report trade a little quiet, but prospects good.

The following pig-iron quotations are given: No. 1, foundry, \$12.25; No. 2, \$11.75; No. 3, \$11.25; No. 4, \$10.75; gray forge, \$10@10.75; No. 1, soft, \$12.25; No. 2, \$11.75.

## Chicago.

Oct. 5.

*(From Our Special Correspondent.)*

Depression continues in the pig iron trade; sales for the last week have not been large individually or in the aggregate, and prices do not rise. The greater number of transactions in Southern are being made at about \$11 Birmingham, or \$15.35 Chicago, but 50c. less is reported for some of the larger sales. Local furnaces are faring better than Southern, in the general steadiness of Northern at \$16.50@17, but even at this price they cannot continue permanently to do business; there must be a reduction in the cost of production in some way. The best-informed men of the trade seem to think the present prices are going to stay, and that arrangements must be made by the producers of iron to get down to a rock foundation of production for next year—the sooner the better, they say.

That a restriction of the output of Southern will be a good thing is generally believed, but there is current a feeling that prices have been inflated and the drop to solid, lasting conditions has now come. With transportation troubles increasing daily there is a possibility of a rise due to difficulty of obtaining iron; but this may help the market by giving it a boost that will be followed by the increased buying that by the rule of human nature accompanies a rising market. Such a move may be more than temporary in its effect, for it is evident that foundrymen are not now buying up to their full needs or expectations. Yet no great increase in prices seems likely to occur, even with increased buying.

Coke is actively sold, and at \$5.50@5.75, the same as last week.

## Cleveland.

Oct. 8.

*(From Our Special Correspondent.)*

Iron Ore.—In its first tilt with labor the Steel Corporation has lost. The strike of the Masters' & Pilots' Association has a direct bearing upon the future of lake shipping and especially upon the ore trade. Its bearing upon the present state of the trade is a very poignant one to the independent vessel owner. Nothing could exceed the energy with which Mr. A. B. Wolvin, general manager of the Pittsburg Steamship Company (the lake end of the Steel Corporation) threw his boats back into commission as soon as he had settled his controversy with the Masters' & Pilots' Association. It might be well to review this situation a bit, since it is destined to have a most important influence in the future. The Pittsburg Steamship Company was formed by taking over



112 vessels which were owned by the Steel Corporation's underlying companies. It constituted a huge fleet without special cohesion, and the Steel Corporation is a vast body in which, to make things dovetail, a settled system must be observed. It was the introduction of this system that caused the trouble on the lakes. As a rule the master of a vessel employs the crew. With the Steel Corporation a shore superintendent was appointed whose duties were to supply the master with engineers, stewards and mates, thus limiting the master's authority. The engineers especially welcomed this change, and were jealous of any interference of the master with affairs of the ship below deck. Various clashes have occurred, but nothing serious; nevertheless the masters felt the shearing of their powers sensibly, and began to organize. All during the summer they enrolled masters and mates into the new Masters' & Pilots' Association until it embraced all deck officers save Capt. Rae, of the steamer *Clemson*, owned by the Provident Steamship Company, which, like the Pittsburgh Steamship Company, is managed by Mr. Wolvin. Rae and Wolvin are personal friends, and it is only just to Wolvin to say that he neither advised Rae to join or not to join the union. When the association realized the completeness of its organization, it demanded of Capt. Rae that he discharge his father, whom he was carrying as mate of the *Clemson*, and employ a union mate in his stead. He declined to do so. Then the mates began leaving the Pittsburgh Steamship Company ships as soon as they reached Lake Erie docks. Of course there was absolutely no justice in the mates leaving the ships of an entirely independent fleet, but the moral side of affairs is frequently overlooked by unions. The independent vessel owners approached Mr. Wolvin and represented that the time to fight the union had come. Thereupon as soon as a mate left his ship Mr. Wolvin ordered the vessel into winter quarters, and he expected that, if the issue was pressed, the independent owner would do likewise, as the movement of freight for the season had been pretty well covered. A day or two later Mr. Wolvin changed his plans and concluded to keep his barges in operation. They, of course, have no power of their own and he requested the independent owners to tow them. Several of the barges slipped out of port before the Masters' & Pilots' Association was aware of the change, but as soon as they discovered it they demanded of the independent owners that they decline to tow them, and threatened to leave their ships if they did not. Now the tying up of the steamers of the Steel Corporation for a few days had stiffened the freight market, and some of the independent owners began to perceive that the rate for ore was likely to go to \$1, provided the vessels of the Steel Corporation stayed out of the market. The prospect was very alluring, indeed, and some of them weakened in their support. They told Mr. Wolvin that they had contracts to care for. Wolvin lost no time in altering his plans. He had said all along that he could not win without the support of the independent vessel owners. He settled with the Masters' & Pilots' Association, discharged Capt. Rae, paid the mates for the time they were off and threw all his vessels into commission, with instructions to compete for cargoes wherever they could be found in either the ore, coal or grain trades, and to stay at it until the lakes froze over. Of course dollar ore has gone glimmering and the fall outlook for a fair freight rate is dubious. Many of the smaller vessels are now going to dock. Ore shipments to October 1 are about 1,000,000 tons below those for the corresponding period last year, which is indeed a very creditable showing, for the movement last year was enormous and far more than necessary. It is likely that the total movement of ore this year will be a trifle in excess of 25,000,000 tons, as against 27,500,000 tons last year. Rates are still 80c. from the head of the lakes, 70c. from Marquette and 60c. from Escanaba.

**Pig Iron.**—Some of the furnaces in this district are banked and others are banking. Prices, however, are not affected, as the business of the week has been largely on old orders. Sales are not large, but the market is not showing especial weakness. Foundry iron is being purchased in small lots. The ordinary Southern quotation is \$11.50, but undoubtedly better could be done on large orders. Southern Ohio is selling at \$14.50 at the furnace, while the ordinary quotation in the Valley, in small lots, is \$15. Quotations for Cleveland delivery follow: Bessemer, \$16.35 @ \$16.85; No. 1 strong foundry, \$16 @ \$16.25; No. 2 strong foundry, \$15.25 @ \$15.75; No. 3 foundry, \$15 @ \$15.25; Scotch No. 1, \$16 @ \$16.25; Scotch No. 2, \$15.25 @ \$15.75; gray forge, Valley furnace, \$13.75 @ \$14; Lake Superior charcoal, \$18 @ \$18.50.

**Finished Iron and Steel.**—Iron prices continue steady. A determined effort is being made to check the downward tendency of bar iron. There are rumors of sale of bar iron below 1.45c. at mill, but they cannot be verified. Buyers are leading a band-to-mouth existence and appear to expect a break. The price of steel bars is unchanged, 1.60c. for Bessemer and 1.70c. for open-hearth, Pittsburgh. No

cutting in the price of plates is traceable. Little business is being done in sheets. On sales made through jobbers the prices for the principal products are unchanged as follows: Galvanized sheets, mill sales, ear-load lots, Nos. 10 and 11, 2.60c.; Nos. 12 to 14, 2.70c.; Nos. 18 to 21, 3c.; Nos. 22 to 24, 3.20c.; Nos. 25 and 26, 3.55c.; No. 27, 3.80c.; No. 28, 4.05c.; No. 29, 4.45c.; No. 30, 4.95c. Galvanized sheets out of stock are quoted 75 and 5 off. For 3-16-in. black sheets and heavier, the quotation is 2.05c., Cleveland. Mill sales of black sheet to consumers are made on the following basis: No. 24, 2.65c. @ 2.75c.; No. 26, 2.75c. @ 2.85c.; No. 27, 2.85c. @ 2.95c.

**Old Material.**—The scrap market was additionally depressed this week by the temporary closing down of the Empire rolling mills. Plants which make scrap are generally in operation, and those that consume it are partly close, a circumstance which is responsible for the continued sagging in prices. The market is very listless indeed. Quotations, gross tons, Cleveland are: Old iron rails, \$18 @ \$19; old steel rails, over 6 ft., \$16 @ \$17; old steel rails, 6 ft. and under, \$15 @ \$16; railroad, \$14 @ \$14.25; heavy steel, \$13 @ \$13.50.

#### New York Oct. 7.

**Pig Iron.**—Buying is light and prices are no stronger. We quote: No. 1X foundry, \$17; No. 2X, \$15.50 @ \$16.25, while No. 2 plain can be had for 50c. less; gray forge, \$14.75. For Southern iron, on dock, quotations are: No. 1 foundry, \$15.50; No. 2, \$14.75; No. 3, \$14.25.

**Bar Iron and Steel.**—Prices for large lots on dock are: Refined bars, 1.55 @ 1.65c.; soft steel bars, 1.70 @ 1.80c.

**Plates.**—The local demand is light, and is for small lots for prompt delivery. The failure of a dry dock company is attributed to the rule or ruin policy of labor unions. Sheared plates are quoted as follows: Tank, 1/4-in. and heavier, 1.78 @ 1.83c.; flange, 195 @ 2.05c.; marine, 2.10 @ 2.15c.

**Structural Material.**—The outlook is still unsettled with little chance of any material improvement in the local market this year. For large lots at tidewater, nominal quotations continue 1.75 @ 2c. for beams, angles, ebannels and tees.

**Steel Rails.**—The quotations remain \$28 for standard sections, f. o. b. mills; light rails, \$33 @ \$36, according to weight. Relaying rails are \$28 @ \$33 for heavy sections and \$33 @ \$38 for light sections.

#### Philadelphia Oct. 7.

(From Our Special Correspondent.)

Our pig iron people are endeavoring to pick up some consolation from the fact that there are a good many large consumers of foundry iron, also forge and bessemer, whose supplies are nearly exhausted. Contracts are running out. They are hopeful that these consumers will see their way clear to become large buyers of iron in a short time rather than to continue the hand-to-mouth buying which has characterized the pig iron business in this market for such a long time. Of course the talk is about restriction of production. The actual business in pig iron since the last report has been unimportant, in fact discouraging. Pig iron buyers who have been seen, say they are not able to see any reason why they should depart from their old way of buying. Some of them do not believe that the restriction in output will amount to anything. Others believe that in the West, the restriction scheme will fall through, notwithstanding the latest announcements on that point. The actual melting of iron, outside of forge does not seem to have fallen off very much within this territory. During the past 48 hours, representatives of four or five of the big companies have been consulted as to supplies for the winter. The proposed reduction has at least induced consumers to take up the question of buying but as yet there have not indicated what course of conduct they are likely to pursue. Quotations may be given at \$17 @ \$17.50 for No. 1 X foundry; \$16 @ \$15.50 for No. 2X; \$15 for No. 2 plain; gray forge, \$15; basic, \$15; low phosphorus, \$21.50.

**Billets.**—Importers are straining every effort to make some business. The only business amounts to a few lots for quick delivery. The impression prevails among our larger consumers that something will happen to bring about a reduction, notwithstanding the very positive statements of makers to the contrary. Basic steel is quoted at \$28.

**Bars.**—Reports to-day from a number of interior bar mills from the Delaware to the Susquehanna, show on the whole, that the mills are just sufficiently anxious for business to keep prices turned in the wrong direction. The slight shadings which have been made apply altogether to where buyers are willing to place contracts for big lots. Some business of this kind has been done mostly in steel bars, and at something less than 1.75c., but how much is not to be known. Refined bars of well-known makes are selling at 1.60c. in a large way occasionally, and from that up to 2c. in a small way all the time.

**Sheets.**—The sheet makers feel a little droopy this week because so little business was transacted. The store sales are all light.

**Pipes.**—Merebant pipe is going into consumption at about the same rate as it has been and prices are firm on the small orders which are coming along. If there is any weakness it is in the smaller sizes, but it shows itself only when a large order is to be captured.

**Tubes.**—Tubes are strong and the recent action of the manufacturer has had the effect of dissipating any expectation of a general cut.

**Merchant Steel.**—Merchant steel is doing better in small lots but there is no business of moment in a large way.

**Plates.**—The only kind of plate that is attracting attention at present is boiler plate and that in small lots. The smaller concerns are all busy. The prices named on these small orders are quite satisfactory. In large lots tank steel is quoted at 1.80c. Locomotive fire-box 2c.

**Structural Material.**—The only difference over last week is that there is more inquiry but no business to speak of.

**Steel Rails.**—Light sections which bring from \$30 to \$34 have been sold in a small way.

**Old Rails.**—Old iron rails are quoted at \$18.50 and old steel rails at \$15.50.

**Scrap.**—Two or three large buyers have been scouring around to see what sort of bargains they could pick up in heavy scrap, but went home without buying, as \$15 was the best they could do for the kind they wanted. Some choice railroad scrap was bought at \$17.50.

#### Pittsburg Oct. 6.

(From Our Special Correspondent.)

Despite the apparently discouraging outlook, due to the depression in industrial stocks, there is every indication to-day of a bright future for the iron and steel trade. The decline in pig iron prices has been effectually checked by the almost unanimous action of the furnacemen of the country. General conditions, according to a number of local interests, already seem to be brighter. These improved conditions have been brought about by the decision to curtail the production of pig iron. An official announcement of what has been done in this respect as to the furnaces in the Pittsburgh and surrounding districts, known as the Central West, likely will be made tomorrow, as the committee is meeting here to-night. As told last week, a committee was appointed to arrange the details of the proposed shut-down of the furnaces. At the time this committee was named, 80 per cent of the blast furnace interests had been pledged to abide by the decision and during the week 3 per cent have been added. A strong effort is being made for a general shut-down movement, and from present indications it will be almost a complete success. While at this writing no official announcement has been made it is known that the committee has agreed upon a 25 per cent curtailment of pig iron production. According to reliable estimates, based on 83 per cent of the furnaces in the Central West complying with the suspension order, fully 600,000 tons of pig iron will be taken out of the market during the rest of the year. Information has been received here that the Eastern and Southern furnaces have decided upon a restriction of production. In the East the agreement was to cut production 20 per cent for the month of October, but it is believed this will be continued for the remaining two months of the year. If this is done, production in the East will be curtailed by over 100,000 tons. The report from the South is that an agreement has been made to restrict production 20 per cent for the rest of the year. This will cut it down nearly 100,000 tons. Altogether the curtailment will amount to fully 800,000 tons. The figures given last week were based on the original plan to restrict production by 33 1-3 per cent. The entire matter here is in charge of the committee, which is composed of representatives of the leading interests, and if the situation improves beyond expectations the closing order may be withdrawn before the end of the year.

In finished material the outlook seems much better than a week ago. All the wire mills are running to their full capacity and the pipe mills are crowded with orders for large sizes. It was learned that some independent pipe producers were shading prices on medium sizes, and a meeting was held here last week at which action was taken that put a stop to all shading. Prices are now firmer than for some time and all the mills are busy. The structural material market is stronger and some heavy orders are expected before long. The defeat of the disturbing element at the annual convention of the International Association of Bridge & Structural Iron Workers, which closed at Kansas City on Saturday night, it is believed, will prevent any serious labor troubles in that line for another year. The wage scale with the employers was agreed upon last May to run until De-







basic slag is enormous, and that the production from now until the end of 1904 will be insufficient to meet the demand.

exports of iron and steel the domestic market will again be stable.

The rally in the stock markets has brightened speculation a little, but buyers for investment are still small in number.

The statement of the New York banks, including the 56 banks represented in the Clearing House for the week ending October 3 gives the following totals, comparisons being made with the corresponding weeks of 1902 and 1901:

Table with columns for 1901, 1902, and 1903, listing various financial metrics like Loans and discounts, Deposits, Circulation, etc.

Changes for the week, this year, were decreases of \$4,144,600, in loans and discounts; \$4,130,800, in deposits; \$11,800, in circulation; \$607,400, in specie; \$1,057,100, in legal tenders and \$631,800 in surplus reserve.

The following table shows the specie holdings of the leading banks of the world at the latest dates covered by their reports.

Table showing Gold and Silver holdings for various countries including N.Y. Assoc., England, France, Germany, Spain, etc.

The returns of the Associated Banks of New York are of date October 3 and the others October 1, as reported by the Commercial and Financial Chronicle.

The silver market is fairly steady without special feature. India has not been buying largely, and consequently no further advice has been obtained.

The United States Assay Office in New York city reports receipts of 45,000 oz. silver for the week.

The Treasury Department purchased 75,000 oz. silver at an average of 59.90c. on October 1, and 285,000 oz. at 59.68c. on October 5, delivered at San Francisco.

Shipments of silver from London to the East for the year up to September 24 are reported by Messrs. Pixley & Abell's circular as follows:

Table showing silver shipments from London to India, China, and Straits for 1902 and 1903.

Receipts for the week, this year, were £43,500 in bar silver from New York, £1,500 from Chile and £27,000 from Australia; total, £72,000.

Indian exchange continues in strong demand, and council bills offered in London have sold at 16.03d. per rupee.

The coinage executed at the mints of the United States in September is reported by the Bureau of Statistics, Treasury Department, as below:

Table showing coinage statistics by denomination (Double eagles, Eagles, etc.) and value.

Table with columns for Phosphates, Per ton, and United Kingdom or European ports, listing prices for various phosphate types.

\*Fernandina, Tampa, Brunswick, Savannah or Port Inghls. †Mt. Pleasant. ‡On vessels, Ashley River.

Liverpool. Sept. 22.

(Special Report of Joseph P. Brunner & Co.)

Trade in heavy chemicals continues quiet, while fertilizers are rather stronger. Soda ash is firm. For tierces, nearest values are about as follows: Leblanc ash, 48 per cent, £5@£5 10s.

Sulphate of ammonia is better in tone, and £12 10s. @£12 15s. per ton, less 2 1/2 per cent, is now quoted by holders for good gray, 24@25 per cent. in double bags, f. o. b. here.

Nitrate of soda is in limited supply on spot and rather dearer at £10 2s. 6d.@£10 10s. per ton, less 2 1/2 per cent for double bags, f. o. b. here, as to quantity and quality.

METAL MARKET.

New York, Oct. 7.

Gold and Silver Exports and Imports,

At all United States Ports in August and Year.

Table showing Gold and Silver Exports and Imports for August and Year (1902 and 1903).

These exports and imports cover the totals from all United States ports. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Exports and Imports, New York.

For the week ending October 7, and for the years from January 1

Table showing Gold and Silver Exports and Imports for New York, including Total Excess, Exports or Imports.

The above statement includes Mexican and foreign silver in coin or bullion.

General business is quiet, and an undertone of uncertainty has been bred by the unsettled prices in the iron trade.

The coinage for the Philippines was as follows: 2,004,566 pesos; 566 50 centavos; 566 20c.; 566 10c.; 565 5c.; 565 1c., and 565 1/2c.; total, 2,007,959 pieces.

The Treasury Department's estimate of the amount and kinds of money in the United States on October 1 is as follows:

Table showing Treasury Department's estimate of money in the US on Oct 1, 1903, including Gold coin, Gold certificates, Silver dollars, etc.

Population of the United States October 1, 1903, estimated at 80,831,000; circulation per capita, \$29.75. For redemption of outstanding certificates an exact equivalent in amount of the appropriate kinds of money is held in the Treasury.

Prices of Foreign Coins.

Table showing prices of foreign coins like Mexican dollars, Peruvian soles, etc.

OTHER METALS.

Daily Prices of Metals in New York.

Table showing daily prices of metals in New York for Silver, Copper, and Spelter.

London quotations are per long ton (2,240 lbs.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars: the price of electrolytic cathodes is usually 0.25c. lower than these figures.

Copper.—During the week under review the market became more active, a fair volume of business passing. There has also been a very good inquiry from Europe.

For refined and manufactured sorts we quote: English tough, £58 15s.@£59 5s.; best selected, £60@£60 5s.; strong sheets, £67@£68; India sheets, £64@£65; yellow metal, 6 1/2@6 1/4 d.

Statistics for the second half of September show a decrease in the visible supplies of 500 tons.

Exports and imports of copper at New York, Philadelphia and Baltimore, in the week of October 6, and for the year to date, were in long tons:

Table showing copper exports and imports for various countries like Austria, Belgium, France, etc.

The movement either way is smaller than last week. Imports were from Mexico and Great Britain.



Tin.—The course of the market has been rather irregular. In spite of the increase of 1,000 tons in the visible supplies for the month of September, the upward movement which commenced last Wednesday continued and culminated on Monday, when 26 1/2 c. was paid for spot tin. Since then a re-action has set in, and at the close spot tin is quoted at 25 3/4 @ 26c.; October, 25 1/2 @ 25 3/4 c.; November, 25 1/4 @ 25 1/2 c.

The foreign market, which last week closed at £115 7s. 6d., opened on Monday at £117, declined on Tuesday to £115 and the closing quotations on Wednesday are cabled as £114 @ £114 2s. 6d. for spot and £114 2s. 6d. @ £114 5s. for three months prompt.

Lead—Is unchanged, with a fair demand. The closing quotations are \$4.27 1/2 @ \$4.32 1/2 St. Louis and \$4.35 @ \$4.40 New York.

The foreign market is firmer, Spanish lead being quoted at £11 3s. 9d @ £11 5s., and English lead £11 6s. 3d @ £11 7s. 6d.

Imports of lead into the United States, with re-exports of foreign metal, are reported as below by the Bureau of Statistics, Department of Commerce and Labor, for the eight months ending August 31; the figures are in short tons, of 2,000 lb.:

Table with 3 columns: 1902, 1903, Changes. Rows include Lead, metallic; Lead in ores and base bullion; Total imports; Re-exports; Balance.

Of the imports this year, 63,733 tons, or 88.9 per cent came from Mexico. The balance over re-exports, shown above, is not consumed here as a rule; most of it is retained in bond for future export. In addition to the re-exports given, there were 52 tons domestic lead shipped, as against 3,182 tons in 1902.

St. Louis Lead Market.—The John Wahl Commission Company telegraphs us as follows: Lead is dull, and is selling at 4.30c. for Missouri brands, and 4.32 1/2 c. for argentiferous.

Spanish Lead Market.—Messrs. Barrington & Holt, of Cartagena, write us under date of September 19 that the price of silver during the week has been 14.25 reales per oz. The exchange has gone down 37 centimos, to 34.03 pesetas to £1. The local quotation for pig lead on wharf has been 62.25 reales per qtl., which on above exchange is equivalent to £10 4s. 9d. per long ton, f. o. b. Cartagena. Exports of lead for the week were 70,400 kgs. desilverized to Marseilles.

Spelter.—Owing to a falling off in the demand, especially for galvanizing purposes, prices have given way further and the market closes dull at 5.40 @ 5.21 1/2 c., St. Louis, and 5.55 @ 5.60c., New York.

The closing quotations from Europe are cabled as £20 10s. for good ordinary brands and £20 15s. for specials.

Exports of spelter from the United States for the eight months ending August 31 were 1,174 short tons, as against 2,959 tons in 1902; a decrease of 1,785 tons. Exports of ore, chiefly to Belgium, amounted to 23,740 tons, which shows a falling off of 5,530 tons as compared with 1902. Imports of spelter were 276 tons, as against 457 tons last year.

St. Louis Spelter Market.—The John Wahl Commission Company telegraphs us as follows: Spelter is steady, the metal selling here at 5.45 @ 5.50c., according to brands and delivery.

Spanish Zinc Ore Market.—Messrs. Barrington & Holt, of Cartagena, write us under date of September 19 that the market is quiet, no sales of importance having been made in the Sierra during the past week. Exports were 6,701 tons blende and calamine to Antwerp.

Antimony—Is dull and unchanged: Cookson's 7 @ 7 1/4 c.; Hallett's 6 1/4 @ 6 3/4 c.; U. S. Star, 6 @ 6 1/4 c.; Italian and French, 6 @ 6 1/4 c.; Japanese, 5 1/2 @ 5 1/2 c.

Imports of antimony into the United States for the eight months ending August 31 are reported as below, in pounds:

Table with 3 columns: 1902, 1903, Changes. Rows include Metal and regulus; Ore.

The large increases this year are due chiefly to the heavier imports of ore from Japan and other countries.

Re-exports of foreign metal this year were 79,917 lb., which shows a considerable increase as compared with 1902.

Nickel.—The price is quoted by leading producers at 40 @ 47c. per lb. for large quantities down to ton

lots, according to size and terms of order. The price for smaller lots, according to quantity, runs as high as 60c. per lb.

Imports of nickel ore and matte into the United States in August amounted to 1,634 tons, making a total of 2,580 tons for July and August. Heretofore imports have not been enumerated in the monthly report of the Bureau of Statistics.

Platinum.—Demand continues very good, and prices are firm. While the quotation remains \$19 per oz., an advance in the price in the near future is considered quite probable.

Imports of platinum into the United States in the eight months ending August 31 were 6,166 lb., as against 5,077 lb. last year; showing an increase of 1,089 lb.

Quicksilver.—The New York price is unchanged at \$47.50 per flask for large lots, while a slightly higher figure quoted for small orders. The San Francisco quotations are \$45 @ \$46 per flask for domestic orders and \$42 @ \$43 for export. The London price is £8 7s. 6d. per flask, with the same quotation asked by second hands.

Exports of quicksilver from the United States in the eight months ending August 31 were 848,723 lb., as against 565,176 lb. in 1902; an increase of 283,547 lb. this year.

Minor Metals and Alloys.—Wholesale prices, f. o. b. works, are as follows:

Table listing prices for Aluminum, Ferro-Tungsten, Magnesium, Manganese, Nickel-alum, Bismuth, Chromium, Copper, Ferro-Molybde'm, Ferro-Titanium, N. Y., etc.

Variation in price depend on size of order.

Missouri Zinc Ore Market. Oct. 3. (From Our Special Correspondent.)

The highest price for zinc ore remains \$40 per ton, and the assay basis \$34 @ \$36 per ton of 60 per cent zinc. The usual purchases were made during the week, but several hundred tons purchased were not shipped, although there was no report of a car shortage. It was about this time a year ago when the smelters began letting zinc ore accumulate in the bins, and pursued that policy until the end of the year. It was rumored in Joplin to-day that the LaHarpe Spelter Company, which only started its new smelter at LaHarpe, Kan., during the past month, has sold out to the American Zinc, Lead and Smelting Company, a New York corporation owning large land and lease interests in the Joplin district. It has been rumored for some time that this company had been prospecting for gas in Kansas with a view to entering the smelting business, although a denial was issued from the New York office. The Girard Zinc Company, now erecting a smelter at Chanute, hopes to re-enter the market for ore before the end of November. There is talk of organizing another smelting company at Chanute, and there is an unconfirmed rumor that the Collinsville Zinc Company will build smelters at Caney, Kan. The purchasing agent of the United Zinc and Chemical Company, of Iola, has been out of the market for two weeks, and all of the buyers shipped less than their customary allotment this week.

Following are the shipments of zinc and lead concentrates from the various camps of the Joplin district for the week ending to-day and the year's totals to date, with values:

Table with 4 columns: Location, Zinc, lb., Lead, lb., Value. Lists locations like Joplin, Webb City, Galena-Empire, etc.

District totals..... 7,873,120 1,027,610 \$163,510
Forty weeks ..... 378,717,080 43,938,010 7,705,410
Zinc value, the week, \$134,855; 40 weeks, \$6,517,865; lead value, the week, \$28,655; 40 weeks, \$1,187,545.

Average Prices of Silver, per ounce Troy.

Table with 7 columns: Month, 1903 (London Pence, N. Y. Cents), 1902 (London Pence, N. Y. Cents), 1901 (London Pence, N. Y. Cents). Lists months from January to December.

The New York prices are per fine ounce; the London quotation is per standard ounce, .925 fine.

Average Prices of Copper.

Table with 6 columns: Month, New York (Electrolytic, Lake), London (Standard). Lists months from January to December.

New York prices are in cents, per pound; London prices in pounds sterling, per long ton of 2,240 lbs., standard copper. The prices for electrolytic copper are for cakes, ingots or wire bars; prices of cathodes are usually 0.25 cent lower.

Average Prices of Metals per lb., New York.

Table with 6 columns: Month, Tin, Lead, Spelter. Lists months from January to December.

NOTE.—The average price of spelter in St. Louis for the month of January, 1903, was 4.689c. per lb.; for February, 4.681c.; for March, 5.174c.; for April, 5.375c.; for May, 5.489c.; for June, 5.537c.; for July, 5.507c.; August, 5.55c.; September 5.514c.

DIVIDENDS.

Table with 5 columns: Name of company, Date, Per share, Total, Total to date. Lists companies like Alaska-Treadwell, Bunker Hill & Sulphur, etc.

ASSESSMENTS.

Table with 5 columns: Name of Company, Location, No., Delinq., Sale, Amt. Lists companies like Alaska, Bullion, Celestina, etc.



STOCK QUOTATIONS

NEW YORK.

Table of stock quotations for New York, listing companies and their share prices from Sept. 30 to Oct. 6.

COLORADO SPRINGS (By Telegraph).

Table of stock quotations for Colorado Springs, listing companies and their share prices from Oct. 5 to Oct. 6.

COLORADO SPRINGS, COLO.\*

Table of stock quotations for Colorado Springs, listing companies and their share prices from Sept. 25 to Oct. 2.

SAN FRANCISCO (By Telegraph).

Table of stock quotations for San Francisco, listing companies and their share prices from October 5 to October 6.

COAL, IRON AND INDUSTRIAL STOCKS.

Table of stock quotations for Coal, Iron and Industrial Stocks, listing companies and their share prices from Sept. 30 to Oct. 6.

†Ex-dividend. Total sales 434,337 shares.

BOSTON, MASS.

Table of stock quotations for Boston, Mass., listing companies and their share prices from Sept. 30 to Oct. 6.

†Ex Dividend. ‡Assessment Paid. Total sales, 85,838 shares.

SAN FRANCISCO.\*

Table of stock quotations for San Francisco, listing companies and their share prices from Sept. 25 to Oct. 1.

\*San Francisco and Tonopah Mg. Exchange.

Total sales 41,075 shares.



STOCK QUOTATIONS

MEXICO\*

Sept. 25

Table of stock quotations for Mexico, listing companies like Durango, Guanajuato, Guerrero, Hidalgo, and others with their share prices and dividends.

\*Values are in Mexican currency.

TORONTO, ONT.

Oct. 3

Table of stock quotations for Toronto, Ontario, listing companies like Black Tail, Cariboo, and others.

Total sales, 35.

SALT LAKE CITY\*

Oct. 3

Table of stock quotations for Salt Lake City, listing companies like Ajax, Butler Liberal, and others.

\*By our Special Correspondent. All mines are in Utah. Total sales, 157,032 shares.

PHILADELPHIA, PA \*

Table of stock quotations for Philadelphia, listing companies like Am. Alkali, Mich. Am. Cement, and others.

\*Reported by Townsend, Whelen & Co., 302 Walnut St., Philadelphia, Pa. Total sales 44,081

LONDON.

Sept. 25

Large table of stock quotations for London, listing companies from various countries like Alaska, Arizona, and others.

c.—Copper; d.—Diamonds. g.—Gold. l.—Lead. s.—Silver.

LONDON (By Cable.)\*

Table of stock quotations for London by cable, listing companies like Anaconda, British South Africa, and others.

\*Furnished by Wm. P. Bonbright & Co., 15 Wall St., New York.

PARIS.

Sept. 17

Table of stock quotations for Paris, listing companies like Alameda, Auuzin, and others.

ST. LOUIS, MO.\*

Sept. 26.

Table of stock quotations for St. Louis, Missouri, listing companies like Columbia Lead, Con. Coal, and others.

\*By our Special Correspondent.

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

(See also Market Reviews.)

Table with multiple columns listing various chemical and mineral products such as Abrasives, Barytes, Barium, Graphite, Potash, and various salts, along with their respective prices and units.

NOTE.—These quotations are for wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. Readers of the ENGINEERING AND MINING JOURNAL are requested to report any corrections needed, or to suggest additions which they may consider advisable.