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DEMAND FOR SULPHUR.

Sulphur, in the native but impure condition, is found on and near the surface of the Western States which the present war with Spain has brought into importance, as the price has advanced from $2.00 a ton to $35 and $45 a ton in New York for brimstone. The present rate of production is said to this fact, and in one instance has been taken advantage of to supply the local demand for sulphuric acid, for the manufacture of artificial fertilizers in Los Angeles. A deposit of native sulphur, located on the old Pio Pico Rancho, two miles west of Whittier on the road to Los Angeles, and about twelve miles from this city, is being opened. The deposit consists of a hill three feet in height, and extends east and north along the road to the Aliso Canyon, in rocks of cretaceous age. The present extent of the exposure shows the surface for a distance of 25 by 100 feet so far as exposed. As other deposits of sulphur have been found in the California coast range, they may be operated at present rates to compete with the imported article from Japan and the Gulf of Mexico. Although the demand on this coast is small, it is highly desirable that manufacturers of oil and acid for fertilizers should do all in their power to purchase supplies at home, as every new deposit opened means increased trade in the district, and indirectly to themselves, with a possible supply at lower cost.

LEASING MINERALS.

The parties advocating the government ownership of minerals, and those who are in favor of individual ownership have both to acknowledge that the leasing of minerals is a plan for working them which works well under both systems, and that the two plans of operating is that under government control the leasing is done by areas or mines, and may be classed as a wholesale branch, while under the individual proprietor mines and works are leased as a whole, and often subleases are let to the workmen. In the eastern states the system is largely practiced of leasing to miners as well as more recently in the west has the tribal system of the Cornish miner come to be in favor both with the employer and the miner. It allows of individual energy and ability to work, the fullest chance for expansion and gain. In contrast with the company account, or days' wages plan, where leasing is possible will the best results to both parties be obtained. Less supervision is required, and the miner becomes a partner in the interest he has in the mine. Whether in the wholesale or retail plan of leasing minerals, the good object is accomplished that in the event of one operator becoming incapacitated to work, a chance is given to a new party to operate the vacant ground. Under individual ownership this is not always the case, for the heirs are not always disposed to work the property, and resort is either made to leasing or sale. Hence it is that so many mineral properties in the United States are now operated under the lease system, so that government ownership has no hardship to the people of the country, but is either producing revenue, instead of adding to the wealth of those who have only inherited the property of the miner who is willing to work the minerals.

OBTAINING A PATENT.

It is generally supposed that the patentee of an article, process or new invention has a sure thing and a golden key to the success of the success he has been so fortunate as to be considered by the patent office in the first stage. To such an extent is this the case, that a patent has been applied, in the general feeble state, after a patent has been refused on account of the inventor being considered by the patent office in the first stage.

The last thing any government minister or department does is to protect him from infringement by makers of a similar article produced with slight changes. He has not obtained his patent, and cannot prosecute or stop such infringement of his rights. On this account, the most necessary invention which our inventive geniuses of the patent producing fraternity can originate at the present time is a new patent process for the complete destruction of our slow and unbusiness-like system of conducting the issue of patents in the United States patent office. As the last thing any government minister or department does is to reform in the civil service for the benefit of suffering humanity, and as we desire it for many of our most intelligent readers and patrons, we are compelled to call attention to the already over-worked officials of this branch of the public service to the valuable use the inventors of this country can put their inventive ability to, in perfecting a new process or machine for aiding and expediting the patent process. A reform in the civil service for the benefit of suffering humanity, and as we desire it for many of our most intelligent readers and patrons, we are compelled to call attention to the already over-worked officials of this branch of the public service to the valuable use the inventors of this country can put their inventive ability to, in perfecting a new process or machine for aiding and expediting the patent process.

INTERNATIONAL MINING CONGRESS.

As already noted in these columns, the first session of the International Mining Congress will assemble in Salt Lake City, Utah, on the 6th, 7th, 8th and 9th of this month. This organization is the result of the International Gold Mining Convention, held in Denver last year at similar dates. "The objects of the Convention are to be carried out by the development of the resources of the mining industry in North and South America, to bring together men and investors, to increase reciprocal trade among them, to discuss such questions as are naturally suggested by its objects; to co-operate with other mining and mining congresses and heary co-operation among various mining, commercial and labor bodies represented; and especially to take under consideration the importance of the creation, by Congress, of a department of Mines and Mining, thus securing a Cabinet Officer that represents an interest which affects more than one-third of the people of the United States." This Journal has on former occasions advocated the union of North and South American countries, in the interests of the large silver mining industry of the continent, which produces almost all the silver of the world, with the single exception of Australia, as the only solution of the problem for securing the just value of a metal of existing value in the form of co-operation of the poor of all nations cannot do without. If these countries make treaties to prohibit the export of silver in bars, or other form, except as approved by the government of a country at a fixed ratio, then will the people of Europe and Asia be forced to buy our silver at coin value, to supply their own demand. This aim is far realized subject comes strictly within the province of the International Mining Congress.

MINES AND QUARRIES.

The underground operation of extracting the metallic minerals is generally conducted by sinking shafts, and driving tunnels and adits, under cover of the surface ground or back of the vein, and as depth is attained so does the expense of mining increase. This feature in mining has only one exception, in the case where a mine is located on a high mountain side, and the inclined adit is conducted by overhead stopping, and where pumping is not necessary. In this instance, the cost of mining only increases with the length of haul along the levels of the mine. This increase is naturally considered the natural result of mining work, under all other circumstances than that mentioned. The mining of ores is a destructive proceeding, as its object is to break up the mineral, so as to admit of handling. In conducting quarrying operations or open work, which is the common manner of extracting the non-metallic minerals, the chief expense is at the time that the work, as surface soil and top rock, or decomposed material has to be removed. In consequence of this, the operation of quarrying is almost always conducted with the expense as depth is reached. The deeper the work goes, the more costly and from climatic change is the material to be quarried, and consequently of more value. Quarrying operations of the destructive class are the most complete and require less skill, while that of the constructive order are the class which require the material to be kept whole, which is the most difficult, as in quarrying slate rock, marble and building stone, and are best operated with large capital and on an extensive
scale. In both kinds of quarrying, the expense decreases with depth, and if they are to striking different places, the operation of mines in a southern and mild climate this feature is not more noticeable than in the frozen northern regions. Hence it is of course to be expected, that the activity of gallic mines, offers profits in excess of mining the precious metals, when the all-important question of marketing the product is of easy solution.

THE NEW REVENUE BOND BILL.

This bill has been passed by both branches of Congress and has received the signature of the President. It is a law of tripartite features: one enlarges internal taxes, another provides for the issuance and sale of bonds to produce the means for carrying on the war with Spain and the third relates to the money question, by authorizing the issuance of $130,000,000 of treasury certificates, to be put out as emergencies demand, and to be taken up at the discretion of the legislature, and that the silver bullion in the vaults of the treasury shall be coined at least at the rate of $1,500 per month.

The collection of a larger revenue, and the imposition of new taxes, will have some influence unfavorable to the development of industries, and will be something of a restraint upon commerce. It does not affect a single dollar of the financial system.

The issuance of the treasury certificates will increase the circulating medium. It leaves standing the rating of the treasury department that all our paper money is re-deemable with gold coin, except the silver certificates, which are specifically made re-deemable with silver coin.

The bonds authorized are not to be sold to a syndicate of bankers, unless there is failure to sell them by subscription and as a public loan. The law contemplates their sale in small denominations, that they may be widely distributed, and perhaps so used as to some extent perform the office of a circulating medium. Whether or not they can be so disposed of will shortly be determined. Bonds sold thus are usually treated in the hands of few holders. If the popular loan plan succeeds in this instance, it will be an entering wedge for the policy of having our own people become the holders of the public securities.

The silver coinage proposition is a slight concession to the silver sentiment of the country, and if the law is faithfully executed, in time the treasury will be relieved from the storage of a large quantity of bullion. The law will take some time, however, to coin it, if no more than $18,000,000 are coined annually, whether more shall be coined or not is left to the discretion of the secretary of the treasury. It is known that Mr. Gage is a believer in a limited volume of money, and that our circulating medium should be confined to gold coin, and national bank paper, redeemable with gold coin, with the quantity of subsidiary silver coins that convenience may require. Hence it is to be presumed that he does not see any more silver bullion than is compulsory by law.

The silver bullion on hand comprises seigniorage to the extent of $42,000,000, and were it all as promptly coined as possible, that sum would be added to our volume of circulating medium.

The bonds authorized are to be made payable in coin according to existing law and previous practices, and not in gold coin as Mr. Gage would have done.

The law will be irksome to our younger population who have not been accustomed to sweeping excises and to a horde of tax gatherers. To the older class, it will be a reminder of the civil war, and of the five or more supply of them it will revive an unpleasant reminiscence.

The measure is a compromise. The senate and house held widely divergent views, and for a time it was thought that the sides would be stubborn, but the presence of war forced both sides to make concessions. There was a necessity for more money to conduct the war, and yet the truth that cannot be granted the use of excises from taxation alone. One side wanted bonds as well as additional taxes, and the other was quite willing to grant more taxes, but in lieu of bonds wanted an issue of greenbacks, and all the silver bullion in the hands of the government speedily coined, that the country might have the benefit of the seigniorage which, as before stated, amounts to $42,000,000.

It now seems to the treasurers of the treasury, and to no good to the government or the people.

THE ELECTRO-CHEMICAL AND ELECTRO-METALLURGICAL INDUSTRIES OF EUROPE.

The Electrolytic Tin Industry.

The extraction of tin from its ores by electrolytic methods has not yet been attempted on an industrial scale, though several patents have been filed relating to apparatus and processes for effecting such extraction. The electrolytic tin industry in this country is based on the discovery of the tin from tin scrap, and to the production of pure tin from tin by an electrolytic refining process, similar to that used for copper.

The process is one of the operations for which electrolysis seems to have been specially designed, and one would expect in these modern days, when the profitable utilization of every means is consumed, to be considered a subject of primary importance, that any feasible process would meet with enormous success. This is however not the case. Many processes have been patented for the electrolytic treatment of tin scrap, and some of these are now working with successful results in Germany and France, but the number of such works is much more limited than one would have expected, and the difficulty of obtaining large quantities of the raw material at reasonable rates hampers the growth of the industry. Tin scrap contains from 3 to 9 per cent of tin, the average amount of tin present being 5 per cent. Thus in order to obtain one ton of tin from this scrap, even supposing the whole of the tin is recovered, 20 tons of scrap must be dealt with, and when the collection and delivery of the scrap at the electrolytic works costs $6 to $7 per ton (as in some cases) the recovery process is burdened with a very heavy charge. In other cases, however, the scrap can be collected and delivered for treatment at one-tenth of this cost, and in such places and especially in localities, where other manufacturers make to the production of tin quantitatively small, the electrolytic recovery processes have every chance of success. Three processes are at work, and these may now receive brief description.

In Germany, Borchers states that several firms are recovering tin from tin scrap by electrolytic methods, though he does not specify names or localities. It is interesting to note that much scrap is being shipped to Europe from Baltimore, and it is probable that many successful tables for tin works is drawn from this source. The firm of "Geissler & Cie, of Essen a. d. Ruhr" was the first in Germany to attempt the recovery of tin on a commercial scale.

No data have been published concerning the tin scrap, but it is most probably that patented by Gutensohn and further improved by Siemens & Halske, which consists of one of the works in Berlin is used, and the apparatus and process patented by Smith is stated to be used. The principle of both Gutensohn's and Smith's process is the same. The tin scrap is packed into baskets made of wooden laths holding each about 140 lbs, and is used as anode in a cell containing dilute sulphuric acid as the electrolyte, and plates of tin or copper as the cathode. According to Siemens & Halske, an EmP of 1.5 volts suffices to provide the necessary current density; and a current efficiency of 50 per cent is obtained.

The remainder of the current is lost, owing to the concurrent action upon the iron of the anode material.

In France the recovery of tin from tin scrap is effected by a process in which caustic soda solution is used as the electrolyte. The advantage of this process is that it is only on the tin, and the iron remains unattacked in the basket containing the anode material.

The disadvantages are that heat must be applied, and where a large quantity of tin is produced the tin on the anode is not lost, as in the case of electrolytic processes the use of caustic soda solution, containing a definite proportion of common salt.

In England, Smith's process is stated by Ahrens to be at work, and in 1856 a company was registered for operating the process patented by Claus. In this process tin scrap of an alloy of tin is used as an anode material in an electrolyte containing alkaline sulphides, Sodium sulpho-stannate is formed, or the corresponding potassium or ammonium salt, and the deposition of tin from this solution is easily effected. The iron remains undissolved, and as the electrolyte requires heating during the electrolysis, the process cannot be used.

The writer has written to Mr. Claus to inquire how this company is progressing, and he replies that plans are now completed for the battery, and it is to be used, and operations upon an industrial scale, and further work will be at work in England.

The only factory known to the writer in which raw tin is refined electrolytically is that of Messrs. B. Bolton & Sons, Churnet Bank, Staffordshire, England. The raw tin is cast into plates suitable and used as anodes, and is placed in electrolyzing vats containing dilute sulphuric acid. A high current density is employed, and a very rough crystalline deposit of tin is obtained at the cathode. The crystals can easily be detached, and are washed, dried and melted in order to prepare ingots of pure tin, which are used to coat
with tin some of the classes of telegraph wire prepared by this firm at their wire-drawing works in the same neighborhood.

The cost of the energy required to produce one ton of tin by this process can be easily calculated by means of the electro-chemical equivalent for tin, and the data already given. Take an ampère of 19 volts (for the sulphuric acid electrolyte, this would probably be reduced) and a current efficiency of 50 per cent., the KWH requirement to produce one metric ton of tin per 24 hours will be:

\[
\frac{1,000 \times 1,000 \times 1.9 \times 100}{100 \times 900 \times 50 \times 60 \times 24 \times 735 	imes 50} = 19.8
\]

Taking the cost of the KWH hour at $0.002, the cost of the electrical energy necessary to produce a metric ton of tin from tin scrap or tin alloy will be, 91.8 x 24 x 0.002 = $5.79.

It is thus apparent that if the raw material can be delivered at a reasonable cost at the works, the process can be conducted with some degree of success.

Others have been patented for the recovery of tin from tin scrap as for example that of Vornholt & Spitzer, a fusion process, and that of Borchers, in which an electrolyte containing sodium chloride is used, but this writer considers that these are being worked upon an industrial scale, and therefore a description of them cannot be included in this series of chapters.

The future of the electrolytic tin recovery processes will depend entirely upon the facilities offered for the collection of tin scrap at a low cost, and it is possible that the first in the future, when the collection and utilization of city refuse is placed upon a more scientific basis than is at present the case, the industry will develop into one of considerable importance.

† Concerning Chlorination.

VANCOUVER, May 30, 1898.


Sir,—I beg to call your attention to an error in the description of the process of forming gold, which appeared in your issue of the 16th May inst., namely, that "sulphuric acid and lime" must be used instead of the ore and water used, whereas, in reality, hydrochloric acid and lime are added.

I need hardly say that chlorine gas cannot be obtained from sulphuric acid and lime.

Yours faithfully,

I. O' Sullivan.

Chief Assayer and Chemist to the B. C. Agency, Ltd., Vancouver.

Mr. O'Sullivan was right when speaking of the question concerning the chlorination process, as described in May 19th issue: that sulphuric acid and lime cannot form chlorine gas, but if Mr. O'Sullivan will write out his chemical equation, concerning his advice as to making chlorine with hydrochloric acid and lime, he will find out that his mixture will be just as unsuccessful as the one above mentioned, in the reaction taking place will be:

\[
\text{Ca} + \text{HCl} + \text{CaCl}_2 + 2\text{H}_2\text{O}
\]

or, in other words, calcium chloride and water.

We will admit there was a typographical error made on page 610, and the sulphuric acid and chloro lime' instead of sulphuric acid and chloride of lime' are used, as it should have been.

We will also refer Mr. J. O. Sullivan to Henry Wurtz's article in The Mineral Indus-

try for 1896, annual Vol. V. The Hydro-Metallurgy of the Precious Metals, pages 312 and 313.

"Chlorination has, like amalgamation, been subjected by inventors and/projectors to a vast number of experiments, both alone and in conjunction with amalgamation. Chlorine has been used directly in the gas form—as first by Plattner,—under ordinary pressure and under elevated pressure, sometimes under pressure high enough to liquify it. (250 pounds per square inch) at ordinary temperatures; also in solution in water, and in liquids that make stronger solutions than water, also in very weak solutions such as are employable in open vats without sucking off the operatives. It has been employed after exhaustion of air from the ore. Instead of passing the gas through the ore, the ore has been passed through the gas. Many chlorinations, containing potential chlorine have been used. Indeed, one of the commonest of these in use was employed by the earliest investigators, Persy, who used this chlorination, i.e., a mixture of chlorine and common bleaching powder (chloride of lime) and muriatic acid (hydrochloric acid). With this Duflos reported good results, and Lange got better results than with the chlorination as proposed by Plattner.

"In addition to the chlorinogenic mixtures already mentioned, there are others. The first patent of a chlorination process of zinc, which is of the form of zinc chloride with sulphuric acid, instead of hydrochloric acid. This gives a hypochlorous acid, which is a very strong chlorination. Subsequently, others have used the same hypochlorous acid and have freed it from the precipitate of gypsum, which must have embarrassed Specier. Mixtures of oxalic acid and bleaching salt have been claimed to present advantages, also mixtures of bleaching salt and ferric chloride.

"Both these latter are transportable in solid forms, and hence present conveniences."

THE BONDING AND LEASING SYSTEM.

Mining men in Southern California seem to have neglected the advantages that have resulted to other mining countries from bonding and leasing mining properties. It is true that bonding and leasing enthusiasm must be engendered in a certain district before this system can be fully put in practice, yet there are many properties scattered through the southern half of this state, owned by men who have a good thing and know they have it, but are unable to furnish the capital to properly develop their mines.

The plan of leasing new and undeveloped property should thrive in Randburg and other mining districts where the necessary faith in the country already exists, and particularly where the working miner as a lessee has facilities for the treatment and sale of his ore. Aspen and Cripple Creek are shining examples of what can be done with the leasing system, as hundreds of lessees who have made money in these places will bear evidence.

Among the capital prizes drawn by lesser lessees is the Moon Anchor mine, at Cripple Creek, where the lessees took out in one year $300,000, and brought an obscure mine into prominence as a bonanza. The Maroney mine on the Anachora Leland produced $25,000 in six months, and nearly a dozen sets of lessees on the Pike's Peak mine have become rich through leasing. It enables men of small means to get into a favored locality, and take a chance at the capital prizes that are usually reserved for men of large means, and at the same time develop the owner's mine without cost to him but profit.

To illustrate the system: "A" owns a mine in a favorable locality that is undeveloped. "B" is a miner, or a man of small means, who has been in the mine of his own. "A" and "B" agree that "B" shall lease the mine of "A" for the term of one year. "B" to work 60 shifts per month, to have the privilege of selecting and extracting, shipping ore therefrom, "B" paying to "A" as rent therefor either a straight or graduated royalty, running usually from ten to thirty per cent., after deducting mining or smelting and freight charges. Where a bond is given with the lease, an option to purchase is written out and usually accompanies the lease, in which it is agreed that if at any time, within the period of the life of the lease, "B" shall pay to "A" the sum agreed upon as the price of the mine, "A" will convey it to "B". The usual practice is for "A" to place a deed in escrow in some bank, under an agreement that if "B" pays the purchase price within the designated period, the deed shall be turned over to "B". Sometimes, the payments on the bond are partial; the amount paid is credited to the mine and the bond is payable in cash. "B" agrees to pay "A" $5,000 in thirty days, $10,000 in three months, $15,000 in six months, and the balance in one year. Sometimes mines are leased in blocks, and a dozen men or less may be working at the same time on the same claim.

I am aware that a great deal of leasing and bonding are being done in Randburg and vicinity, but not enough. Why should so many miners waste their time prospecting in the desert, where, if a mine is found, it will be impossible for the prospector with limited means to develop it and make a paying mine when he can with much more hope of success get a lease near a paying mine where, if he strikes pay ore, he will have railroad and milling facilities that will insure him success.

In two or three years from now, the business men of Los Angeles will awake to the fact that many rich mines have been opened up in the back country, have passed into other hands and are beyond their reach, because they did not reach out and take them when they could have been obtained. For three years after the discovery of gold in Cripple Creek, Denver capitalists could not be induced to invest a dollar in the mines, while the Colorado Springs people, having faith from the start, invested and reaped their reward.

Prosperity.

"Speaking from a mining and smelting standpoint, I find it a much sweeter word today than at any time since the depression, or great decline in silver, in June, 1893," said Simon Guggenheim, general manager of the Philadelphia Smelting and Refining Company. This is no apparent reason why the whole mining section should not continue to prosper, even though the price of metals is somewhat depressed.

"It is true that not many new camps of importance are being opened up, yet the mines that have been in existence for years are today making satisfactory profits, and there still exist many bonanzas, which show not only a large source of revenue to the owners, but give employment to many.

* The writer has recently learned that in some large towns old tin are being collected and sold for the manufacture of box clips. This method of utilization will, of course, tend to prevent the extension of the recovery processes.
MINERAL TESTING AND SAMPLING WORKS.

The new mineral testing and sampling plant of Heckelmann and McCann was inaugurated March 26th. A large number of prominent gentlemen of the City of Mexico, besides the students of the School of Mines were present at the ceremonies.

It is a well known fact that many mines are closed down for want of a knowledge of some economical method of treating them. In many cases mines are so situated that the ore will not pay for shipment, but would yield a handsome profit if the proper kind of mill were erected on the spot for treating the ore at the mine.

By having such ores thoroughly tested, in order to determine the system of treatment best suited to them, one can go to the expense of the erection of the mill with the certainty that a definite percentage of its value can be extracted.

In many cases a system of treatment has been inaugurated at a mine at great cost, which upon trial is found to be unsatisfactory and is abandoned. It may be that this treatment is unsuitable to the ore in question. In this case a preliminary test of the ore in some testing works would have shown this at a comparatively small expense and have saved the mine owner thousands of dollars.

It may be that this treatment, although suitable to the ore is not giving good results because of improper handling and were a series of tests to be made, a method might be found to overcome the obstacles, and have obtained a high percentage of extraction.

The general object of a Testing Works is to test any ore thoroughly, by all or any of the various methods of successful treatment, by which the precious metals are extracted from the ores in order to determine which method is best suited to the particular ore. These works are particularly useful to persons who are contemplating the erection of a mill at their mine, and desire to know what systems of treatment will yield them the best results.

They are also useful to those who have a mill of some kind in operation upon their property, and desire to ascertain whether a better extraction cannot be obtained by making some change in the existing methods of treatment, and that they are exceedingly useful to in order to determine exactly what percentage of extraction may be obtained from the ore tested.

Fig. 1 shows a general view of the exterior of the plant which is located in the heart of the Mexican republic a short distance from the City of Mexico, at a place called Noncales, on the line of the Mexican National Railroad. A siding passes the front of the building.

Fig. 2. A front view of the furnace for chloridizing and dead roasting is shown in this illustration. This plant consists of two reverberatory roasting furnaces, separate and distinct from each other. Each having its fire box and a hearth 5 x 10 with working doors.

Fig. 3. The Chlorination Plant consists of a series of lead lined boxes. Two for chlorination by the Platte process, the others, for precipitation and clean-up tanks. A nineteen inch Chlorine generator, and a Hydrogen generator.

Fig. 4 gives a general view of the interior, where experiments are made in the treatment of ores on a practical working scale by the systems of Plate Amalgamation, Concentration, Roasting, Pan Amalgamation, Lixiviation, Cyanide Chlorination.

Fig. 5. The Power Plant consists of an Iron Water Tank 8 x 6 x 8 with a capacity of 7000 gallons. A No. 22 Gardner low service tank pump. A Fraser & Chalmers 10 horse power tubular boiler. An Erie City Automatic cut off governor. Engine cylinder 10 x 12, giving a minimum of 31 horse power. No. 5 Gardner duplex boiler feed pump, and a No. 3 Standard feed water heater.

Fig. 6. Plate Amalgamation and Concentration. This plant consists of a Heady 2 Stamp Tripple discharge 800 b stamp Battery. Four Electro Silver Plated Copper plates (one ounce of silver to the square inch). A 5 foot Heady Triumph Concentrator, the necessary settling tanks, etc.

Fig. 7. View of the front of the Plant showing line of railroad over which the ore is transported to the very door of the establishment.

Fig. 8. This illustration shows the lixiviation and cyanide plant in operation in Messrs. Heckelmann and McCann's Sampling and Testing plant. It consists of two leaching tanks 6 diameter 2 deep. Two precipitation tanks 6 diameter and 4 deep. One solution stock tank 5 diameter and 7 deep. One precipitation tank 3 diameter and 6 deep, and one Johnson's Laboratory Filter Press.

Fig. 9 shows another view of the interior of the plant with the amalgamating plates and concentrator in the back ground to the left of the picture.

Figures 10 to 11 show the plant for Pan Amalgamation to work the tailings from the Amalgamating plates and Concentration. This plant is composed of a 30" Amalgamating Pan, a 6" settler, a 10" clean up Pan, an Amalgam safe and strainer, a 10" retort and a 16" bullion furnace. Settling tanks, etc.

The results depend very much upon the precision and care exercised in taking samples of the ore at different stages of the test. The sampling room has been fitted up with every convenience known to modern practice.

It has a cement floor 30x60 contains a 7"x8" Dodge Crusher; 12x12 gear box; a belt elevator 20 between centers; a revolving screen 3/4" round perforations; Fraser & Chalmers Sample grinder, Platform scales; sample finishing room, etc.
Fig. 5. POWER PLANT.

The difference between any department of this testing plant and a large mill operating under the same system, is not in the size, but only in the number of machines used in the mill, so that the conditions under which the tests are made are exactly the same as those in practice in larger establishments. The capacity of the Stamp battery Plates and Concentrator is, for instance from 6 to 8 tons per day, so that it can readily be seen that such tests are of real value, and that the results thereby obtained are the same as those obtained in large works.

In the tests made in the plate amalgamation and Concentration department of the works, it is necessary at times to crush the ore through several sizes of screens before one can state absolutely whether the system is suitable.

Fig. 7. VIEW OF THE FRONT OF THE PLANT SHOWING LINE OF RAILROAD.

or otherwise. Take for instance the case of an ore in which the mineral is disseminated throughout the gangue in very small particles. In such a case, if the ore were crushed through a course screen say 20 holes to the square inch in order to secure a large output for the mill, the gangue would probably still contain so many mineral particles that one might decide that the ore was neither a free milling nor a concentrating proposition, whereas if the same ore were crushed through a fine screen, say 80 holes to the square inch, the separation of the mineral particles from the gangue might be so complete that it might be a very fine proposition for free milling or concentration. On the other hand, it might be more economical to crush through a coarse screen to separate only a portion of the mineral constituents by Plate Amalgamation and Concentration, and work the tailing from these processes by some other process, such as Pan Amalgamation, Lixiviation, etc.

The above example shows that in a simple matter, of a variation in size of the screen used, the results of the test may be decisive for, or against a certain system so that it is often necessary to have a series of tests made in crushing with different size screens, to determine, which will give the best results. This being the case, how much more necessary is it to make a series of tests in every other department of Milling.

In Concentration the results of the tests are influenced by the size of the material, quantity of water used, inclination of the table, rapidity of the shake, etc.

When testing ores, the results are influenced by the temperature, length of time of the roast, amount of salt added, and time of adding the salt to the ore, and many other causes.

The results in Pan Amalgamation are determined by many factors, such as the fineness of the ore, the percentage of chlorination, temperature, time of operation, thickness of the pulp, quantity of chemicals used, etc.

The Lixiviation results vary according to the fineness of the pulp, the degree of chlorination, the temperature and strength of the Hyno solution.

In the Lixiviation process, similar factors may enter into consideration.

By the Plattner process of chlorinating gold ores many other factors have to be considered.

Fig. 8. LIXIVIATION AND CYANIDE PLANT.

and in each system the test may require a number of trials before obtaining the highest percentage of extraction.

Now, since it is desired that the results given out shall be of permanent and real benefit to their clients, Messrs. Heckelmann & Mc Cann are determined to give satisfaction. This can only be done by making patient and careful investigations, repeating each operation until the best results are obtained from them, so that these will be conclusive and trustworthy.

About $20,000 has been invested in the entire plant, which has a capacity of about 8 tons daily, beside the erection of a good solid building in the outskirts of the City of Mexico.

Poole Bros. Mining Directory and Reference Book of the United States, Canada and Mexico, contains a list of the Mining and Quarrying companies and operators, smelters, reduction and sampling works, blast furnaces, rolling mills, iron and steel works, giving location of same, names of officers, annual output, stamp mills, coke ovens, etc., with the railways, water routes and express companies to all points at which above interests are located, or nearest shipping point.

It also gives a list of mining, mechanical and electrical engineers, assayers, geologists, attorneys-at-law.

The Directory is an invaluable adjunct to any mining man's library.

One of the prettiest-covered catalogues we have beheld for some time is one issued by the Witte Iron Works Company, of Kansas City, Mo., builders of the Witte Gas and Gasoline Engines, descriptive of their engines. The utmost care is exercised in the testing of Witte Gas or Gasoline Engines. This firm has the facilities second to none in this respect, and keep every engine under full load for ten hours before finally letting it go.

Fig. 9. ANOTHER VIEW OF INTERIOR.

Fig. 10. PAN AMALGAMATION PLANT.

Fig. 11. PAN AMALGAMATION PLANT.
CORRESPONDENCE

CALIFORNIA.

Garlock Mining District.

There are about 60 claims being developed in this district. Adam's placer claim is showing up well. The Beecher claim is also a good property, having produced ore running $50 to $60 per ton. There is a tunnel in on the ledge for 600 feet.

Carpenter & Grady have a fine piece of property, which assays from $25 to $35 per ton in gold. Other mines in the Mesquite Gulch are silver-bearing, but not much developed.

All Silent Friend mine and its extension, owned by Geo. D. Vedder and Chas. Orphin assays about $20 per ton, and has a large quantity of good ore on the dump.

One of the most valuable group of mines in the entire range has been composed principally of the Bon Ton and Dodica mines, owned and operated by Dr. W. H. Wright. The ore is free milling.

There are some fine claims in the Mesquite Gulch that run very high in silver and gold.

There is also considerable dry washing carried on in this vicinity, and it is a profitable business.

There are now six mills at Garlock. Mr. Henry, of the Henry mill, expects to put in a cyanide process.

Mr. L. L. Porter, of the Porter Gold and Silver Extraction Co., representing Los Angeles capitalists, is also putting in one of their improved cyanide plants.

This year has been an exceptionally good one. The weather has been pleasant. The town is healthy and prosperous, and while there is no boom, this district is forging ahead, and there is an opening for investment here.

Miscellaneous Mining News.

ARIZONA.

John Francis, the well known mining and smelting man, returned last week to Tombstone from Middleranch, in Cochise county. He reports that camp enjoying a high degree of prosperity. A sixty ton smelter is at work and the results are such as to justify the belief that prosperity has come to the camp to stay.

Los Angeles parties have become interested in some of the properties adjoining the Mormon Cristo mines in Arizona. These properties are known as the Cosmos group. They have started with six men to develop them systematically. The gold belt in the same vicinity is also being prospected.

CALIFORNIA.

CALAVERAS COUNTY.

J. T. Armstrong of Los Angeles has bonded the Blazing mine in West Point district, Calaveras county, from the Barlow brothers, and will proceed to active development with a large force of men.

INYO COUNTY.

A mammoth gold ledge, forty feet wide, the ore giving an average assay of $8 per ton, has been found at Lone Pine, Inyo county, California. The ledge has been prospected for a distance of 5,000 feet, while the surface indications show that it is probably about a mile in length. The Inyo Mining Company has struck a rich body of copper ore on the 700 foot level, and will put in an additional plant for smelting the new ore. This mine is now yielding gold, silver, lead and copper.

KERN COUNTY.

It is reported that a new Electric Smelting Process is about to be erected near Garlock. The miners of that district will give it a most thorough test, and we hope it will prove a success.

Reports of a crusher and smelter being erected at Mohave continue to come in and assume a very plausible shape. With a smel- ter erected at Mohave, the mines of Southern California will make a showing for themselves.

The Eureka mill has been running some very rich ore for the past month, though it has come in small lots from various mines.

The value of the ore received may be judged when it is known that the little two-stamp mill has turned out more than $1,000,000 in bullion in the time mentioned.

The Ophir mill has just cleaned up on a run of about 100 tons of ore from the Bur- channel No. 1, but the amount we were unable to learn. It has already been demonstrated that the mine is a good one, and if the owners see fit to keep the results of their runs to themselves, it is no affair of the public, and the public should not expect to share the knowledge. There is entirely too great tendency to magnify the size of clean-ups in many cases, and we really admire the mine owner who has the good sense to keep his affairs to himself when the owner is a private individual and not a corporation. But when the corporate manager undertakes to keep the knowledge of what is going on from the stockholders, it is a different matter, and calls for an investigation. The Ophir mill is now engaged on another fifty tons of ore from the same mine, so it is to be presumed that the results of the last run were very satisfactory.—Miner.

NEVADA COUNTY.

The Empire mine near Grass Valley, which is one of the deepest worked mines of the county, is being rehabilitated. The old buildings which cover the hoisting works and milling plant are being torn down and replaced with modern and commodious buildings. In addition to improvements are to be made to the mill, which will reduce the expense of reducing ore. The concentrators are to be moved and placed upon a platform, and a room for drying the concentrates more rapidly will be made, mainly of glass. Two dams of considerable size will be made to hold the tailings, from the mill, which will be worked over by a scientific process.

RIVERSIDE COUNTY.

The Virginia Dale mining district will not be permitted to remain idle this summer. Water has been secured in the river, and with the erection of several mills to work the ores, incentive is offered to prospectors and owners to proceed diligently with their labor.

SAN DIEGO COUNTY.

C. W. Pauly, receiver of the Golden Cross mines at Hedges, has filed in the superior court his sixth monthly report. The clean-up on May 1 yielded $45,015.64 in gold bullion, 7,000 other sources, and the May report shows a loss of $45,647.21. There was paid out for the company $42,372.06, which included $11,500 paid to creditors. The company had $56,973.32 on deposit in the bank on April 30. The above clean-up was from 100 stamps. On the first of June, an additional forty stamps were put in, and will be run continually, making 140 stamps now dropping.

TUOLUMNE COUNTY.

For some time it has been rumored that a rich strike has been made in the Golden Treasure mine, owned principally by attorney Flack of Stockton. While the owners do not talk, it is known that in the 80-foot drift the miners grew rich, and the upper wall is approached, and it is not at all surprising that an exceedingly rich streak should be found near the hanging wall. Much money has been expended on this property, and the owners well deserve their good fortune.

COLORADO.

The season's work at Taylor Park was begun about the first of last month, and with 50 men employed are now engaged in sluicing and washing the dirt and gravel down to bedrock. The force of water will soon be increased to 75. The Taylor Park Company, of Gunnison, owns about 3,000 acres of good placer land, which is patented and now in shape to be developed rapidly and systemati- cally. The ground is very rich in gold, and the placers have been operated on and on for the last thirty years. In the past two years the company has spent at least $500,000 in constructing a long ditch and building flumes for the carrying of a large flow of water.

The Belman mine, on Pebble Mountain, near Idaho Springs, is receiving some attention from Mr. Depew and his friends, and negotiations are under way with Mr. Phil Mixsell for a right of way through the Mixsell Tunnel. The Belman has a large amount of development, and a vast quantity of mill dirt and ore is opened up, but the water excess has hitherto proved the great drawback. The right of way through the tunnel will develop down to 700 feet of depth, drain out all the water and open up ore for ten years to come without further depth.

Leadville Notes.

The lower Henrietta shaft, of the Maid of Erin Silver Mines Company continues to ship lead-carbonate ore, under the management of several sets of lessees.

The engineering corps of the Denver and Rio Grande Railroad are now surveying around the various shafts of the Ibex Mines and the flat in Idaho Park. It is reported that work will soon commence on the construction of the railroad to the mines.

The Yack Mining and Milling Company, working a large acreage through the Yack tunnel, are increasing their output daily. Five railroad cars are now sent out daily, beside considerable development work being kept under way. All mining is done at a minimum expense on these workings.
**MICHIGAN.**

**Copper.**

About 50 men are now working at the Arcadia mine, now under the control of N. F. Leopold. Two quarter sections of land adjoining the property were bought by Mr. Leopold recently.

At the Winona mine 30 men are busy. A new hoist, air compressor, etc., are to be put in soon.

The Wolverine mine now employs 320 men, as against 175 a year ago, and 21 power drills are used.

**MINNESOTA.**

Heavy rains at Virginia last Friday night did much damage to the Oliver and Ohio mines, as well as to the Town and Norman, in less degree. A large amount of ore, 6000 tons at some thousands of tons, was washed from the Ohio into the Oliver cut, and much earth was run over the ore in the mines. Several days were required for cleaning up the properties. At least 50 per cent of the Mahaska and Norman were both stripped, but mine by the milling process, so the loss was not so great.

**MISSOURI.**

**Joplin Ore Market.**

Better weather for mining operations could not be asked for than prevailed during last week at Joplin, Mo., and the output was an exceptionally good one. The price for top grade zinc ore remained steady at $27 per ton, but lower grades advanced from 50 cents to $1.00 per ton. Lead sold all the week at $21.75, but the condition of the pig lead market gives promise of an advance in local markets this week. About seventeen cars of lead brought $27 per ton, about seven cars of Joplin ore selling at that price, six cars from Scotts City and four from Belleview.

For the corresponding week last year, top grade zinc ore sold for $22.50, and lead opened the week at $20, closing at $23 per ton. The shipments for the week just closed beat last year's record by 2,555,970 lbs. of zinc and 79,660 lbs. of lead, and the value was greater by nearly fifty thousand dollars, the exact figures being $49,943. For the corresponding 21 weeks last year the zinc shipments were less than for this year by 21,068,910 lbs, but the lead shipments were greater by 1,880,900 lbs. The value of the shipments was less by the enormous sum of $713,120.

As compared with the previous week the shipments for the week show an increase of $17,370 for zinc and 163,760 lbs. of lead ore, and the value was greater by $14,174. Following is the turn-in by camps:

**WEB CITY.**

<table>
<thead>
<tr>
<th>Zinc</th>
<th>Lead</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center Creek</td>
<td>318,010</td>
</tr>
<tr>
<td>G. &amp; S. Co.</td>
<td>11,350</td>
</tr>
<tr>
<td>Lithcliff</td>
<td>9,190</td>
</tr>
<tr>
<td>Free Coinage</td>
<td>9,140</td>
</tr>
<tr>
<td>Columbia</td>
<td>8,433</td>
</tr>
<tr>
<td>Della S.</td>
<td>6,950</td>
</tr>
<tr>
<td>Pearl E.</td>
<td>6,800</td>
</tr>
<tr>
<td>Hough</td>
<td>6,400</td>
</tr>
<tr>
<td>Curtis &amp; Haymond</td>
<td>5,350</td>
</tr>
<tr>
<td>Noble</td>
<td>2,850</td>
</tr>
<tr>
<td>Total</td>
<td>372,310</td>
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Value, $5,020.00.

**ORENOGO.**

<table>
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<tr>
<th>Zinc</th>
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<tbody>
<tr>
<td>La Tosca</td>
<td>99,080</td>
</tr>
<tr>
<td>P. E.</td>
<td>98,000</td>
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<tr>
<td>Gaddis M. Co.</td>
<td>90,810</td>
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<tr>
<td>Aurora</td>
<td>122,710</td>
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<tr>
<td>Cass &amp; Co.</td>
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<td>Sunshine</td>
<td>14,810</td>
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<tr>
<td>Little Blanche</td>
<td>64,740</td>
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<tr>
<td>Maves</td>
<td>26,890</td>
</tr>
<tr>
<td>Hatton</td>
<td>11,400</td>
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<tr>
<td>Melbaugh</td>
<td>1,410</td>
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<tr>
<td>Sunrises</td>
<td>660</td>
</tr>
<tr>
<td>Total</td>
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Value, $7,792.00.

**CENTRAL CITY.**

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<tbody>
<tr>
<td>Grounds &amp; Irwin</td>
<td>554,050</td>
</tr>
<tr>
<td>Duenweg</td>
<td>278,820</td>
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<tr>
<td>Crown Point</td>
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<tr>
<td>Syndicate</td>
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<tr>
<td>Gem Co.</td>
<td>900</td>
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<td>Total</td>
<td>871,780</td>
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Value, $15,601.

**SCOTT'S CITY.**

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<tr>
<th>Zinc</th>
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<tbody>
<tr>
<td>Brumbeck</td>
<td>156,080</td>
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<tr>
<td>J. T. Davis</td>
<td>40,830</td>
</tr>
<tr>
<td>Riley Stevens</td>
<td>29,480</td>
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<td>Total</td>
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Value, $3,057.

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<td>Galena</td>
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<td>Value, $45,714.00</td>
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<tr>
<td>Heil's Neck</td>
<td>237,420</td>
</tr>
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<tr>
<td>Carthage</td>
<td>64,000</td>
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<td>Value, $4,832.00</td>
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<tr>
<td>Belleville</td>
<td>168,180</td>
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<td>District total</td>
<td>8,749,540</td>
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<td>Value, $1,02,646.00</td>
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<tr>
<td>District total</td>
<td>21 weeks 175,468,150</td>
</tr>
<tr>
<td>Value, $2,427,608.00</td>
<td></td>
</tr>
</tbody>
</table>

**MONTANA.**

The Smith & Miller, the Basin district, is doing considerable development work again, and a small mill may be built.

Nine & Miller, who have been working the Park mine under sublease from Brady Hanson, shipped a car of ore last week.

James J. Brooks and Dave Rehill have opened up some placer ground on Basin creek and expect to make a cleanup soon.

Several men were put to work on the Katie smelter at Basin last week to get things in shape to commence putting up the big iron structure. Several teams are also hauling the iron from the camps.

There are several tons of iron at the Snow Shoe, awaiting transportation. The teams now on the road are not sufficient to handle the product. The price being paid for hauling is $4.90 a ton.

A find of ore is reported from the Little Lottie claim, in Ohio Gulch, the property of Leptien & Reynolds. The prospect is present under bond to G. W. Walker, agent of the Northern Pacific at this place, who is sinking an incline shaft on the vein, now down about 25 feet.—Helena Independent.
NEVADA.

The smelter at Golconda was started June 14th. This and the concentrator adjoin. The last named has been in operation for several months.

The shipment of ore from Fred Weber’s Cat Creek mine, says the Hawthorne Bulletin, milled 342 per ton. It looks as though Fred will make some money out of his mine, and everybody will be glad of it, for he has been playing a losing game a long time. Charley Miller is now foreman of the mine.

NEW MEXICO.

Output of Hilleboro gold mines for the week ending Thursday, June 23d, 1898, as reported for The Advocate.

Tons
Wicks
K. K.
Richmond
Happy Jack
Snake Group
Opportunity
Sherman
Prosper
Bighty-five
Rex (silver lead).

Total

Total output since Jan. 1, 1898—3,739.

OREGON.

The Daisy mine, on Jump-off-Joe, is now under bond to J. G. Underwood et al. of San Francisco, and they have commenced work to pump the mine out. When it is developed, it is likely to make one of the best paying mines in Oregon.

The Ashland mine made a clean-up this week of 160 tons of ore—the third under the present management—and the result is stated to be highly satisfactory. They shipped on Monday a carload of concentrates to the Tacoma smelter.

R. Van Brunt of the Steam Beer mine says the next ditch will be completed next week, and will carry between 3,000 and 3,500 miners’ inches of water, which will enable the company to run their mine six to seven months every year.

Hickler & Barrey are having built at Tolo, Ore., a boat 30x70 feet to dredge the Rogue River. The Risdon Iron Works have the contract. The machinery consists of three engines, one driving an endless elevator of 36 buckets, each bucket of a capacity of 800 to 1,000 pounds of gravel, of a speed of 18 buckets per minute, handling from 200 to 3500 yards per day. One engine drives the buckets, one a centrifugal pump for washing the gravel, one an electric light plant. The machinery runs night and day.—Oregon Mining Journal.

SOUTH DAKOTA.

The Sunnyside mine, on Newton Forks, is showing good results as depth is reached on the vein.

The Union Hill Mining Company will soon proceed to survey all mineral locations belonging to the company for patent. It is reported on good authority that a large and valuable chute of ore was recently encountered in the Rau mine, on Square Creek.

The Holy Terror Company at Keystone is rapidly pushing a drift east from the 500-foot level, for the purpose of intersecting the Keystone veins.

In the Chicago, Two Bit and the Gold Hill Mining Company’s shafts, the water has of late become very troublesome, taxing the pumps to the utmost to keep it under control.—Black Hill Mining Review.

UTAH.

At the Ajax mine at Mammoth the shaft has now reached a depth of 475 feet, and the change in the condition of the ground gives fair indication of the near approach of ore.

Bronson Beck of Eureka paid its dividend of 10 cents per share, or $10,000 on June 15th. This carries the total dividends paid to date to $2,455,000. No new ore contract has been entered into, and pending this the property will ship no ore.

Continental-Eureka, one of the great mines of Eureka, reported shipments of ore running high in copper.

Four Aces mine of Silver City made a shipment of ore which netted $57.60 per ton. A very good grade of ore. The annual meeting of stockholders was held during the week and the old board of directors re-elected. The mine continues to improve.

The Dalton & Lark company, of Bingham, will commence the extraction of ore in another week and will probably continue on indefinitely.

The condition at the Ceyser-Maron mine of Mercure are reported as favorable, and the new superintendent is introducing new methods of economical nature. The mill is working 100 tons of ore daily and the batteries are working higher than for some time past.

The Grand Central mines of Mammoth, which have lately come into prominence, paid its first dividend of 12 1/2 cents per share, or $1,250, on the 15th of June. The company is making some phenomenal shipments, and the total for the month of June will probably reach $100,000.

Horn Silver is expected to pay its quarterly dividend of $20,000 July 1st.

The usual dividend of 5 cents per share will probably be declared on the 20th and payable on the 30th by the Mammoth company of Mammoth.

WASHINGTON.

Recent reports from the new Republican camp would indicate that it will soon begin to pay. In the mining world the greatest mining camp ever discovered is that embraced within the bounds of the Colville Indian reservation in Stevens county. It would seem that wherever the earth’s surface has been scratched, rich gold-bearing ore was uncovered in quantity that would satisfy the most avaricious. It would seem also that the camp had not been even slightly prospected yet. Even in the Republic, where development has been carried on for a year past, the owners do not yet know what they own except it is one of the big mines of the world.

The Republican is said to be a well-drilled as a wall has turned out to be the richest body of ore in the mine. From other sections of the camp comes the report that wherever a ledge is prospected, values have been found that indicate surely that “gold exists where you find it.”

The Republican mill has at last started up and is being adjusted to its work as rapidly as possible.

Parties returning from the mining counties of Stevens county say that Spokane men are met with on every trail and on every camp. Virtually, Spokane owns Stevens county.

FOREIGN MINING NEWS

BRITISH COLUMBIA.

Active development work is proceeding on the following closely connected mines of the Illicilewatt. Hoisting and pumping works are being erected in the Tangier, and a concentrator and tramway in the Waverley, while a narrow-gauge railroad will shortly connect both properties with the C. F. K. main line. The English stockholders in the owning companies ought therefore this season to learn fairly thoroughly the true value of the mines that have been so highly eulogized by the managing director, Mr. Grant Gowan.

It is stated that the Great Northern mines are being much better worked under the superintendence of the present manager, and that there is no reason to be rather less of the presence of troublesome amounts of zinc than previously supposed. It is therefore hoped for tangible results are long.

MEXICO.

San Luis Potosí.

The mines of this state for the last year produced precious metals to the value of $600,000, being $1,500,000 more than the product of the previous year.

Hidalgo.

La Peignera, of Real del Monte, has made a rich strike which has sent the stock of this company soaring skyward. It is thought that a large ore body will soon be blocked out which will cause the stock to go even higher.

La Reina, of the Real del Monte, is fulfilling the expectations of those who have held that this mine was a bananza.

 Zacatecas.

The new 20-stamp mill has just been completed by the Compania Industrial Mexicana of Chihuahua, for the famous San Luis del Oro gold mines. Mr. W. H. Armstrong, the well known mining man who was selected as referee, has gone to the property to examine the plant and report upon its status, with reference to the contract under which it was furnished, no doubt is entertained that his report will show that the machinery is equal to that made in the U. S. This property, in the opinion of all the best mining experts, has a brilliant future ahead of it. About 5,000 tons of good grade milling ore is ready on the surface to feed the mill, and there is ore enough in sight inside of the mine to insure dividends for the next generation.—Mexican Trader.

Batopilas has yielded $200,000 and Santa Bárbara y Chihuahua El Viejo, from 190 to 1900, nearly $1,000,000, and since then has continued to produce millions annually, until the work was stopped. Five years ago the work was recommenced in this lode, and in 1906 there were taken out of it 33,000 tons of metal for exportation. In 1897 100,000 tons were exported.—Enterprise.
The mining and transportation of ores

The June issue of "Mineral and Metallurgical Journal" contains the following interesting article on some of the methods practised in British Columbia and the conditions of Geography and climate, which necessitate them, written by Wm. M. Brewer of Victoria, B.C.

There are several interesting features connected with mining in British Columbia, and some of them are peculiar to this northern latitude. Climatic conditions must necessarily influence operations, and for reasons which I will explain later, the winter season is, at present, the best time for the miners in the Slocan and Kootenay districts. These districts are most extensively operated, and when the bulk of the ore is shipped.

Nature has provided highways for travel through this northern country, which have aided the development of the mountain districts to a wonderful extent. I refer to the occurrence of navigable lakes and rivers, by means of which prospectors have been able to explore a country that would otherwise be almost inaccessible, because of the mountain ranges and heavy timber. A reference to the map of the province readily demonstrates how useful have been these waterways in connecting the different districts, and how great an extent have the railroad Companies been assisted in opening up communication.

Leaving the Canadian Pacific Railway at Revelstoke, 370 miles east of Vancouver, you take a branch road 27 miles to Arrowhead, where the Columbia river enters. The upper Arrow lake, which extends nearly due north from that point, a distance of about 30 miles, and an average width, nearly uniformly maintained, of about two miles. From its southern extremity, after flowing a distance of 18 miles enters the lower Arrow lake. This has a length of 57 miles, but is not as wide as the upper lake. This entire system of waterways is navigated by stern-wheel steamers, which sail in connection with the trains on the Canadian Pacific main line. East from these lakes is the Slocan lake, which forms a link in the chain of communication between the lower and the upper Arrow lakes.

Upper Arrow lake, Sandon the main camp of the Slocan district, and Nelson the chief town in the West Kootenay, are situated on the east shore of the west arm of the Kootenay lake. The Kootenay lake forms a highway for travel through both the east and west Kootenay districts, as the main line extends about 30 miles in either direction, nothwithstanding to the point where the west arm empties itself.

To the westward from the Arrow lake occurs the Okanagan lake, which is connected with the Canadian Pacific main line by a branch from Sylva to Vernon. A railroad has been projected from Penticton at the southern end of this lake easterly through the Boundary mining district, to intersect the Trail Creek West and East Kootenay districts and connect with the Canadian Pacific main line at Dunmore in Assiniboia.

The territory encircled by these connecting highways comprises that mineral section of British Columbia which has produced the famous 1857, gold, silver, lead, and copper ores to the value of $6,025,999, and which in 1890 was practically a wilderness, and unexplored by the white man.

One of the most noticeable features connected with mining operations in these districts is the fact that the topography of the country is such as to render possible the working of mines by tunnels and drifts, instead of shafts, either vertical or incline, as is usually the custom. The large surface area, nearly 52 acres, which constitutes a quartz-lode location, permits such a method of working many claims which would be impossible under the regulations that where only about 20 acres is the maximum surface area permitted. In British Columbia a lode claim must be located 1,500 feet in length and 1,500 feet in width, with the corners forming right angles and no rights to follow the dip of the vein beyond the side lines as is the case in the United States. It will be readily seen that in a country it is comparatively easy to drift on a vein at several different levels within the side lines, even though the dip should not exceed 30 degrees. Also that facility enables such a method permits the miner owner to unwater his property by natural drainage flowing through the tunnels, instead of being compelled to install expensive pumping plants.

Another advantage gained is in being able to tram ore and waste through the tunnels instead of erecting a hoisting plant. A great saving is made in this respect by being relieved of the expense of sinking deep shafts, either vertical or inclined.

In the Silver King mine near Nelson, which I visited last March, I was able to work with tunnels very clearly demonstrated. The workings are 400 feet vertical depth, comprising four tunnels run from different levels; these are all connected by overhead stopping, and the ore mined from the higher levels drops to the lowest through chutes, whence it is discharged into the trams, and transported to the station of the aerial tramway. In an advantageous part is gained by affording an opportunity to do hand-underhand stopping and allowing the ore to fall down through an upraise to tram level.

There are but very few mines worked in this section by shafts and hoists at the present time, but, of course, as depth is attained, such a system will be found necessary, although, in many instances, it will be found that such methods are adapted about 800 feet, and sometimes deeper.

The question of transportation of the ore from the mines, has been a serious obstacle to overcome because the mountain slopes are steep. Now, the ore is hauled, usually to the smelting variety, being either silver, lead and copper, or gold and copper, has to be hauled to either the nearest railroad station or lake-dock, often five miles or more distant, for shipment to the smelter. The camps are comparatively new, consequently but very few wagon roads have been built, the miners contenting themselves with the opening up narrow pack trails of the switchback variety. By these they are enabled to pack the ore down the mountains in the summer, using mules or horses and loading from 300 to 300 pounds on an animal which is quite excessive.

The deep snow in the winter affords an opportunity to "rawhiding" the ore, by which means an animal can haul from one to one and one-half tons. This system of haulage is quite tried and is used in many countries where the snow is deep. The hide of a steer is used. This is spread out with the hair side down, the sacks of ore are piled on the hide, the legs being folded over the sacks and laced across with rawhide thongs, the tail and head also being fastened together. A log chain is passed around the load to act as a rough lock and check it from sliding too fast down the slippery trail. A single steer is fastened to the end-head of the hide, to which a horse is hitched. The trail is broken on such a grade as to compel the horse as it travels to pull a little, which, of course, steadies the load. In the rawhiding system consists of a sufficient number of animals to transport the daily output of the mine at one trip, there is one man to look after three or four animals and the animals travel on account of the soft snow. As is anywhere from six to twelve feet deep and sometimes even deeper, and as the snow is lighter than that along the mountain sides, of course a mis-step may be followed by the precipitation of animal and load hundreds of feet down the gulch below.

Because of the economy of this system of transportation when compared with packing, is the reason why the owners of mines in British Columbia prosecute work more actively during the winter than summer months.

During the spring usually all hauling is suspended because of the danger from slides, for when the accumulated snow on the sides of the mountains commences to melt, the whole mass may slide down the mountain side causing the entire mass to slip and, without warning, slide down carrying with it timber torn down by the roots, houses, or anything in its path.

Gradually aerial cable haulage is being adopted wherever practicable and there are already several of both the Hallidie and the Bleichert pattern in use. Some of these are of considerable length, that at the Silver King mine in Nelson are being 43 miles; one at the Payne mine at Sandon over 3,000 feet in length, besides one projected at the Scoo mine near Slocan, 4,993 feet in length, with a capacity of 750 feet of cable per minute.

At the Silver King the Hallidie pattern is used, and, although an elevation of 4,000 feet is gained in the 43 miles, the attempt was made to install the cable in one section, but afterwards was found necessary to erect a midway station, thus making two sections.

The length of the spans average about 400 feet, and the carrying capacity is about 300 to 350 pounds.

At the Fern gold mine near Nelson, the mouth of the main tunnel is about 1,200 feet vertically above the ore bins in the top story of the mill. A new track has been built on trestlework with a 52 per cent. grade to transport the ore from the mine. It was necessary because of deep snow to build these trestles about 12 feet above the surface of the mountain side, but it works splendidly. The loaded car pulling up the empty one, and making the trip in 5/6 minutes, the length of the track being about 2,500 feet, and capacity of tram about 3,000 pounds.

The methods of timbering usually practised in the Slocan and Kootenay districts in the stopes is to set stulls, and where necessary put in lagging; but at the Silver King mine the stopes are over 100 feet wide, and the vein dips about 45°. Square sets are used 8 feet 6 inches high, the timber being 12" x 12"; these are built to follow up the stope, and the ore taken out clean, the top surface being pulled up by the standard above. Whenever an opportunity presents itself through taking out waste rock, this is used to fill in, and the timbers are taken out to be laid again.

The system of laying up the stopes is an economical system, and the cost of timbering is high, but this is offset by mining the ore, and leaving no pillars, which is a most economical feature because the ore is high grade in silver, lead, and copper.
Copper Mining on Lake Superior.

The Calumet and Hecla Mining Company, proprietors of the richest copper mines on the face of the earth, employ upwards of five thousand workmen and pay wages to the enormous sum of $1,000,000. Its annual receipts average $4,000,000, from which dividends at the rate of $40 per share are annually paid on the capital stock. The company, since its organization in 1867, has paid about $57,000,000. The total receipts of the company to date amount to more than $85,000,000.

The belt of the Calumet conglomerate lies in township 66, north of range 33, west of the meridian of Michigan. Overlying the vein is a cupriferous amygdaloid rock, while its floor or footwall is composed of trap rock. The first original opening to discover the vein and determine its value was made in the latter part of August and the first ten days of September, 1864, under the direction of Mr. John Hubert. The report of the discovery of the Calumet conglomerate was made by Hon. Edwin J. Hubert, the original secretary of the Hubert Mining Company, on the 10th day of September, 1864. The first barrel of conglomerate was shipped away on September 11 of the same year, when it was sent to Boston parties to test the truth about the vein carrying 4 per cent copper.

The first active mining by the present company was begun in 1867, in which year the initial shipment of 768 tons of copper was made. From that year the product of the great mine kept on increasing, till now the annual shipment has reached the enormous weight of 6,580 tons of copper, in addition to 120,000 tons of iron. To illustrate the position which this company holds on the copper market, it may be mentioned that, of the 6,580 tons short tons of copper mined in the Lake during 1869, the Calumet and Hecla produced 3,220 short tons, or more than one half, and taking the combined product of all the Lake superior mines since 1860 up to the present year, we find that Calumet and Hecla has produced two thirds.

The conglomerate formation in northern Michigan, extending from Portage Lake northwardly to the Bay point, and thence across the great Lake Superior Copper Company is a conglomeration of pebbles in solid form, with an intermixture of pure native copper.

The method employed in mining this vein is as follows: The shafts proper, which reach to the bottom of the mine, are timbered from base to summit, pine timber being used clear through. Levels are uniformly ninety feet apart, which afford access to the different parts of the mine. Through these levels the copper rock is brought to the main shaft by tram cars, that switch to and from the different openings. At the intersection of each level there is a deep hole, which runs up and down the main shaft at a speed of 600 feet per minute. At the summit the skip rises to the top of the rock house, where the ore is automatically dumped into the ore crushers, thence into the ore cars, which is carried to the mills for treatment. The vein is punctured by diamond drills, the average depth of each hole being five feet.

In the Lake mines some seventy-five drills are operating and they blast twice a day. During the forty years of mining on the conglomerate bed, which averages 12 feet, has never lost its flexibility, while the thickness ranges from 15 to 25 feet. The width and thickness of the amygdaloid vein, however, is very uncertain. Sometimes they are found to measure 25 feet across, while at other times but a few inches. The conglomerate is a dull green in color, while the amygdaloid is a dirty gray.

The characters of both lodes are such that the most economical way to mine them is by slopes. By slope mining toward the vein and under it near the footwall, and working obliquely around it.

The Calumet and Hecla stamp mill, the largest of its kind, is situated at Lake Linden. There are practically two mills in one, of eleven balls each, and having a capacity of 6,000 tons conglomerate per day, thus being the largest stamp mill in the world.

The separation of the copper from the rock is effected by passing the stamped rock over a system of jigs, wherein the sand, by its less gravity, is floated off into a steady current of water, and the copper being the heavier, settles and falls through the sieves. One line of jigs succeeds another, over which the jigger, a man who has just passed through a previous set of sieves, is made to pass, and the sand which is sustained in the water is carried away by the current of water, leaving the sand of wheels and launders. The number of jigs and the velocity of the current are so regulated as to secure the desired separation, with very little loss of copper.

MINING LAW.

All questions and disputes concerning mining law, as addressed to the Journal, will be answered under this heading by F. M. SAWYER, mining attorney, and important court decisions or mining cases will also be given.

(i) I own a ranch of fifty acres, and leased the same to a partner, giving him the exclusive right to bore for oil and reserved the surface for farming purposes. If the boring was successful, he was to have a lease for five years, if not, at the end of six months the land was to revert back to me. Six months have already passed since he commenced work under the lease, and he has not been successful. He now claims he has one year in which to complete his work. What is my remedy, he has possession?

(Ans.)—Your remedy is by action of ejectment in the Chancery Court. You can put him off of the land. A case very similar to yours is found in the 63 Penn. State Reports, page 397.

(ii) I hold a bill of sale of an unpatented mining claim. Is it any good?

(Ans.)—You do not say what state your mining claim is located in. I assume it is in California. A bill of sale, not under seal, was held in case of Clark vs. McElvy et al., 13 Calif. 154, to be good to convey the interest of the vendor. If possession was given at the same time, I think there is no question about the fact.

The Supreme Court of Colorado has held that a verbal agreement of sale, accomplished by possession, is a good transfer of title of an unpatented mining claim.

The same question has been passed on in this state, in 46 Cal., 190. A mining deed is the proper conveyance for an unpatented claim.

(iii) It is noticed to a director of a mining company notice to the company sufficient to bind the company?

(Ans.)—Answering your question in the general way in which it is asked, I shall say no; but there may be circumstances under which notice to a director is notice to the company, as notice given to a director at a meeting of the board of directors will bind the company.

(iv) Can the president of a mining company foreclose a mortgage on the property of the company while he is president?

(Ans.)—Yes. The same as any other person.

(v) Can one who is not a citizen of the United States patent a mining claim?

(Ans.)—No. An alien cannot locate, own or patent an unpatented mining claim.

(vi) Is it true that the U. S. government to survey minerals?

(Ans.)—No, not for private parties. This is entirely an individual matter.

(vii) Does any one own a lode claim, and a conflicting claim has advertised to patent a portion of our lode. Only one of the owners of our claim is a resident of the state. I understand it is necessary to advertise the other claim. Can I do this, or must all the other owners join with me?

(Ans.)—You can file the adverse on behalf of yourself and co-owners.
THE MARKETS.

New York, June 22d, 1898.

The following are the Silver, Copper and Lead quotations for the last two weeks:

**W.P.R.**

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<tr>
<th>Date</th>
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<th>Copper, Cents per Pound</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>37.00</td>
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</tr>
<tr>
<td>9</td>
<td>37.00</td>
<td>10.50</td>
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<tr>
<td>10</td>
<td>37.00</td>
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<td>11</td>
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<td>18</td>
<td>37.00</td>
<td>10.50</td>
</tr>
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The market has lapsed into a quieter state. Orders are moderate, and the disposition is to buy at current rates only as necessities demand.

The United States Assay Office in New York reports the total receipts of silver at $37,500 in oz. for the two weeks ending June 18.

Copper.

The demand has continued rather poor and some of the producers evidently have been tired of waiting, with the result that rather lower prices have again been accepted for all descriptions of copper. While some of the larger Lake companies are still holding out for 12c. for electrolytic copper, we have reduced to 11.35c. or 11.45c. for cokes, wire bars or ingots, and 11.15c. or 11.25c. for cathodes.

**LEAD**

A very active business has been done at gradually rising prices. Very little lead could be obtained for either prompt or future shipment, and under the circumstances the market closed at its best with a very strong tendency at 30c. in New York. In the West also, sales were reported in St. Louis at 3.779c.

**NICKEL.**

The good consumption demand continues and the market is rather firm at 4c. 65c., St. Louis, and 4.75c., New York. Spot delivery is rather scarce, and refiners have not been very active in meeting their obligations.

**DIMENTION.**

Antimony continues strong, and we quote Cookson’s 93c., Hallet’s 90c., Star and Japanese, 94c.

**TIN.**

Business still continues on unchanged lines and no alteration in prices can be reported. We quote for New York ton lots 31.5c., and 34c. per lb. for smaller orders 35c. and 38c.

Prices in New York are, if anything, just slightly below the price at which tin can be landed on this side. We have to quote for both spot and future shipments 13c. 6d. per lb.

**PLATINUM.**

Prices are now quoted at $15 and $10 per oz. per New York. The London quotations are 40c. per oz. per New York. Supplies are not large and prices are firm. For chemist ware, best hampered metal, Messrs. Eimer & Amend of New York furnish the following quotations: In lots of 250, 45c. per kg. 25x, 50c. to 50 cents per kg.; in lots of 100 grams or more, 55c. per kg.; less than 100 grams, 58c. per kg.; unmixed platinum will be supplied in the same quantities at 2c. less per gram.

**POTASSIUM CYANIDE.**

Purified, 550 per cent., in cases of 12 lbs. at $2.10 per lb., and 20 and 50 lb. tins at an advance.

**QUICKSILVER.**

The New York quotation are at $34.00 per flake.

**POWDER.**

The market at San Francisco is firm with the current quotations.

The quotations are as follows: For Hercules No. 1, from 114c. to 117c., according to strength and quantity. No. 2, from 9c. to 11c., according to strength and quantity.

**CARBON.**

The coke market has been quite dull the past week, and entirely without features of interest.

**IN CARBON LOTS, ST. LOUIS.**

<table>
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<th>Type of Carbon</th>
<th>Price, Cents per lb.</th>
</tr>
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<tbody>
<tr>
<td>70</td>
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<td>75</td>
<td>3.75</td>
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<tr>
<td>80</td>
<td>4.00</td>
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</table>

**IN BORAX.**

The San Francisco market is firm with a good demand.

The market is quoted as follows: Refined, in canvas lots, in barrels, in lots of 100 lbs., 1.30c. per lb. in 25x, 1.35c. per lb. in 50x, Powdered, in canvas lots, 1.30c. per lb. in 25x, 1.35c. per lb. in 50x.

**THE MINOR METALS.**

Quotations are given below for New York delivery:

<table>
<thead>
<tr>
<th>Metal</th>
<th>Price, Cents per lb.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
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</tr>
<tr>
<td>Nickel</td>
<td>35c. 00</td>
</tr>
<tr>
<td>Copper</td>
<td>10c. 00</td>
</tr>
</tbody>
</table>

**SMITH & IRVING, (FORMERLY, W. T. SMITH & CO.)**

**Gold Refiners and Assayers.**

Our silver amalgam for replacing copper plates is being extensively used by millmen. It avoids the necessity of sending plates long distances to be replaced. For sale in small quantities, 1 oz. per ounce, a solution being made on all orders over 100 oz. Experience proves our silver amalgam will last longer than when the copper is electroplated.

Our Mr. Smith owned and operated booming, refining and chemical works in Providence, R. I., over 20 years.

128 N. Main Street
Los Angeles, Cal.

**BELTING**

Leather, * Cocoa, Rawhide, etc.

L. P. DEGEN, Manuf'r

Agent for Rubber Belting, Hose and Packing.

105 and 107 Mission Street, San Francisco, Cal.

**J. H. MASTERS, Manufacturer of and Dealer in**

Ore Sacks, Tents, Camp Furnishings
217 Commercial St., Los Angeles, Cal.

**Wm. T. SMITH**

**THE SAVINGS BANK**

**THINK OF THE SAVINGS**

**LEHIGH UNIVERSITY**

South Bethlehem, Pa.

THOMAS MESSINGER DROWN, LL.D., Pres.

Courses in Civil, Mechanical, Electrical and Mining Engineering, Metallurgy and Chemistry. Also Classical and Literary Courses. For further information and for Register, address The Secretary of Lehigh University, South Bethlehem, Pa.

LARGEST GASOLINE PUMPING PLANT IN THE WORLD.

The illustration shows the gigantic pumping plant recently built by the Hercules Gas Engine Works at the Parker Ranch, California. The 100,000-hp. Hercules engine, pumping 200,000 barrels of crude oil per day, is the largest gas engine in the world. Tours of inspection given. Prices: One 100-hp. engine costs $25,000; 1,000-hp. engine, $250,000. AVAILABLE FOR SALE.

**Hoskins' Patent Hydro-Carbon Blow-Pipe and Assy Furnaces**

No dust. No ashes. Cheap, effective, economical, portable and automatic. Send for circular.

Wm. HOSKINS, 81 South Clark St., Room 57, CHICAGO, ILL.

**SMITH & IRVING, (FORMERLY, W. T. SMITH & CO.)**

Gold Refiners and Assayers.

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105 and 107 Mission Street, San Francisco, Cal.

**PERFORATED SCREENS**

Steel Plate, Copper and Bronze

For all uses. Send for Catalogue.

A. J. BECKLEY & CO.

Works Garwood, N. J.

**H. M. MASTERS, Manufacturer of and Dealer in**

Ore Sacks, Tents, Camp Furnishings

217 Commercial St., Los Angeles, Calif.

**ADVISE IN THE JOURNAL**
Prices are per 100 lbs. in New York and vicinity in lots of 25 carboys or over. Quotations are as follows: Acetic acid, commercial, No. 1 at $1.40 per lb. 2nd, at $1.55 per lb.; Muriatic acid, 18 per cent., 1.1058@1.75; 20 per cent., 1.1058@1.75; 22 per cent., 1.1058@2.25, and according to make and quality. Nitric acid, 36%, $4.30@4.75; 38%, $4.75@5.25; 40%, $4.85@5.75; 42%, $4.65@6.00; Mixed acids, according to mixture. Sulphuric acid, 95 per cent., $1.10@1.25. Chamber acid, 50%, $1.50@2.00 per ton at factory. Blue Vitriol, 80%@4.125, according to grade and order.

**FINANCIAL NOTES.**

The statement of the United States Treasury, on Thursday, May 24th, shows a surplus of $7,062,500, 20 cents, and the Time Notes sold at $60,000, 60 cents.

**MURITE OF POTASH.**

We quote per 100 lbs., basis of delivery, as follows: New York and Boston, $1.78 per lb. for 50 lbs., $1.75 per lb. for 25 lbs., and $1.70 per lb. for 10 lbs., and $1.65 per lb. for 5 lbs. and less.

**KAINIT.**

Invoiced weights as taken at port of shipment per ton of 2,240 lbs. 

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Total sales for the year 1896, $96,711,295.

The preliminary statement of the Bureau of Statistics of the Treasury Department shows that exports of silver from the United States continued heavy in May, reaching a total of $110,235, 206, or $32,367,500 more than in May, 1897. The imports for the same period were $23,258,847. For the eleven months of the fiscal year from July 1st to May 31st, the statement is as follows.

**FINDOLYCE.**

Founding Machinery

- Iron and Brass Castings of all kinds
- Shovels and Dies
- Pulleys, Engines, Boilers, Stamps, Mills, etc.
- Machinists and Foundrymen

**Standard Iron Works.**

PHOENIX, ARIZONA

A.F. HUDSON, E.M.

Geologist and Mining Engineer,

Mines Examined and Reported on.

COLON, CALIFORNIA

A. A. WARE, ASSAYER AND ANALYTICAL CHEMIST

COLON, CALIFORNIA

Manufactured by the Western Nickel Smelting Co.

For Chlorination, Reduction and other purposes. Adam's and Nitric Acids, Blue Vitriol, Copperas Reduced Sulphate of Soda, etc.

Wade & Wade

Best and Oldest Establisment in Southern Cal.

1151-1/2 Main St., Los Angeles, Cal.

**THE JOHANNESBURG SAMPLING WORKS**

Purchasers of Gold, Silver, Copper and Lead Ores and Concentrates

Cash Returns Made Within Twenty-Four Hours after Receipt of Ore.

CHRIS. R. WORGE, MANGROI, Johannesburg, Cal.
## INCORPORATED MINES PAYING DIVIDENDS

### NAMES OF MINES

<table>
<thead>
<tr>
<th>Names of Mines</th>
<th>Location</th>
<th>No. of Shares</th>
<th>Capital Stock</th>
<th>Par Value</th>
<th>Amount of last Dividend</th>
<th>Date of last Dividend</th>
<th>Total Amount Paid in Dividends</th>
<th>Kind of Mineral Produced</th>
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S, Silver; G, Gold; L, Lead; C, Copper; Q, Quicksilver; I, Iron; B, Borax.
The Pulsometer Steam Pump

"THE MINER'S FRIEND"

Often Imitated—Never Equaled

Over 20,000 in Use

RECENT IMPORTANT IMPROVEMENTS

The Handles, Simplest and Most Efficient Steam Pump for General Mining, Quarrying, Railroad, Irrigation, Drainage, Coal Washing, Tank Filling and for Pumping Back Liquids heavily impregnated with slime. Mudly or gritty liquids handled without injury to the Pump.

AGENTS

PARK & LACY Co., A. M. HUTCHINSON & CO., MITCHELL & LEWIS & STUART Co.,

Catalogue on Application
Correspondence Solicited

Pulsometer Steam Pump Co.
132 Greenough Street, New York City

The Bleichert Wire Rope Tramway

And Other Systems of Aerial Transportation

Bleichert Tramway of the Selway Process Co. transporting rock

MANUFACTURED BY THE TRENTON IRON CO., TRENTON, N. J.
Engineers and Contractors, and manufacturers in North America for the Bleichert System. Also Wire Rope Equipments for Surface and Underground Hoisting, etc.

NEWTON J. BELL, Agent.
190 California St., San Francisco, Cal.

MINERALS WANTED +

Gold and Silver Quartz Specimens, Crystals, Opals, Turquoise, etc., etc. Buy in Any Quantities—Pay good prices—Cash

E. C. MOLLER,
538 EAST 86th STREET,
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THE LEVER RULING PEN

CLEANED WITHOUT ALTERING ADJUSTMENT

SEND FOR DESCRIPTIVE CIRCULAR.

THEO. ALTENBERGER & SONS, PHILADELPHIA

Caldwell Bros.

Tacoma and Seattle, Wash.

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MACHINERY & MINE SUPPLIES

We carry a Very Large and Complete Stock

It Will Pay You to Write Us for Quotations

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Dividend Paying and Investment Mining Stock

W. E. HUBBARD & CO.,
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Expense

In the operation of Mines is reduced by using our

Car Wheels.

Price and wearing qualities reduce the expense.

Globe Iron Works
STOCKTON, CAL.

[Write for Prices.]

UNION HARDWARE AND METAL CO.

DEALERS IN
Boiler Tubes, Iron Pipe and Fittings
RAILROAD, MILLING, MINING AND FOUNDRY SUPPLIES

14 and 216 N. Los Angeles Street
Los Angeles, Cal.

Assaying in all its Branches.

The Bi-Metallic Assay Office
and Chemical Laboratory

R. A. PEREZ, E. M., Manager

Formerly Chief Assayer in 211 Pass Smelting Works, 212 Pass, Tucson. Assistant Chemist
Consolidated Kansas City Smelting and Refining Co., Argentine, Kansas.

124 South Main Street
Los Angeles, Cal.

IMPERIAL
(Trade Mark)

BOILER COMPOUNDS

For the Prevention and Removal of Scale—In Steam Boilers.

EASTABLISHED 1876

INDISPENSABLE TO MINING AND MILL WORK.

IMPERIAL CHEMICAL CO.,

322 N. American Street

BUFF & BERGER

Mining Transits

With patent interchangeable auxiliary. Telescopic for use on top or side in vertical sighting.
Our friends are cautioned against infringements. Foreign or domestic attempts have been made of late to mislead the public.

11 Province Court
Boston, Mass.

Randsburg

Gold Fields

VIA
Santa Fe Route

Leave Los Angeles, 6:05 a.m.
Leave San Bernardino, 12:10 p.m.
Arrive Barstow, 3:55 a.m.
Leave Barstow, 6:00 p.m.
Arrive Kingman, 1:20 p.m.
Arrive Yuma, 4:45 p.m.
Arrive Phoenix, 7:00 p.m.
Arrive 1067, 7:30 p.m.

BUFF & BERGER

Mining Transits

With patent interchangeable auxiliary. Telescopic for use on top or side in vertical sighting.
Our friends are cautioned against infringements foreign or domestic attempts have been made of late to mislead the public.

11 Province Court
Boston, Mass.

HORACE F. BROWN, M. E.

PATENTS ON
Brown’s System of Mechanical Roasting
Pozzolanas, Complete Automatic Milling Process, RG.

1067 Manhattan Bldg.
CHICAGO

JOHN STEWART

MINING ENGINEER

Address—Mining and Metallurgical Journal
Los Angeles, Cal.

Examines and Reports on Mineral Properties
Ores! Ores! Ores!!

Gold, Silver and Lead Ores and Concentrates
Purchased at Reduced Rates for Treatment.

Selby Smelting and Lead Co.
416 Montgomery St., San Francisco
Consignment to Vallejo Junction, Cal.

W. O. ABBOTT, ASSAYER
ASSAYING IN ALL ITS BRANCHES
CHEMICAL DETERMINATIONS ACCURATELY MADE
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