

ENGINEERING and MINING JOURNAL.

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In our last issue, page 227, first column, 9th line from bottom of page, read, "we find our argument unaffected by it." The reader will then have the exact words which Dr. RAYMOND uttered, but which, in spite of him, and the proof-reader, and the printer, appeared without the significant negative prefix.

We are indebted to the editor of the *North Shore Miner* for an interesting diagram of Silver Islet, showing the location of the different bonanzas down to the 960-foot level. The *North Shore Miner* is devoted to the representation of the mining interests of the North Shore of Lake Superior.

We are pleased to notice that at the annual meeting of convocation of McGill University, held at Montreal on March 31st, for the conferring of degrees, the honorary degree of LL.D. was granted to ALFRED Q. C. SELWYN, F.R.S., Director of the Geological Survey of Canada. Mr. Chancellor DAY said :

"It has pleased the corporation of the University to grant to Alfred Q. C. Selwyn, F.R.S., Director of the Geological Survey of Canada, the honorary degree of Doctor of Laws. The eminence of Mr. Selwyn in geological science, and the ability with which he fills the highest scientific position in the gift of the Dominion government, entitle him to such recognition, more especially at this time, when the connection, so long existing, of the Geological Survey with Montreal, is about to be severed. In conferring this degree, we bear testimony to the cordial relations which have always obtained between the University and the Geological Survey in the promotion of science and education, and which we trust may continue as far as possible in the new position of the Survey at the seat of government."

OUR readers will find, in another column, a letter from Professor DU BOIS which, although not intended for publication, presents so clearly and fully his reply to our recent criticism upon RÖNTGEN'S *Thermodynamics*, translated by him, that we print it in order to give both sides fairly. The question as to the time when students should be introduced to the Calculus, and the extent to which it should be used in the teaching of physics, is, as Professor DU BOIS claims, mainly one of practical experience, and he is entitled to the full weight of his own experience as a teacher in settling this point. If we continue to differ with him, it is not because we can claim personal and practical familiarity with the subject equal to his. Yet, on the other hand, those who observe from the outside the tendency of educational methods may sometimes gain comprehensive

views which escape the constant daily worker. It has seemed to us that the use, by teachers and authors, of cumbrous mathematical means of avoiding the Calculus involves in the end a waste of time and labor, like that which is involved in teaching many arithmetical operations, only to have them discarded as soon as a student learns algebra. If the pupils of Professor DU BOIS, after reading and understanding VERDET'S lecture and RÖNTGEN'S treatise (skipping perhaps the Calculus, in small print), are going through ZEUNER and RANKINE, no doubt they will understand the subject by the time they are done. Our impression is, however, that many of them will not complete that thorough course, and will have been so demoralized with regard to the Calculus as never to get the benefit of it in later life. That this is a practical evil, proved in experience, most engineers of middle age will admit, frankly confessing that they are "rusty" in the Calculus, and that they envy those persons whom they occasionally meet who, by an early training in it and a constant use of it, have kept it bright and serviceable as a working tool. *

The *Daily Indicator* of April 6th contains the following paragraph :

"Some years ago, ROSSITER W. RAYMOND, through the aid of influential friends, obtained the office of United States Commissioner of Mines, and with the help of congressional appropriations made for the purpose, prepared annual reports of the progress of mining in the West, with such statistics of the same as could be obtained without too much trouble. The latter was generally obtained by deputies or by gratuitous correspondents. These annual reports were valuable to some extent, but would not have amounted to much if the work had depended entirely on the Commissioner. As it was, they were never issued until a year after date. The statistics were largely wide of the mark, or merely guesses, and although computed in greenbacks in many regions, have since been considered by RAYMOND as in coin values. As it was, the Commissioner has made something off of sales of duplicates of these governmental books which he has republished. Finally, the government would appropriate no more money, and Mr. RAYMOND never felt like undertaking the labor or expense of getting up annual statistics on his own risk and capital."

No doubt the *Indicator* will be willing to make the following slight corrections of its statements :

1. Dr. RAYMOND was tendered the office of Commissioner of Mining Statistics, without solicitation on his part, through the influence of the late J. ROSS BROWNE, with whom he had at the time a brief acquaintance.
2. His annual reports were delivered to Congress, as a rule, within four months after the end of the year to which they referred. The delay in printing them varied; but they were usually issued from the Public Printing-Office during the summer.
3. The statistics of the production were invariably given in coin values.
4. The Commissioner never has republished any of these governmental books, and from the sales of those which were republished by other parties he has never claimed or received any thing. Any citizen has a right to buy the sheets of public documents at the cost of the paper and printing, and this was done for several years by a publishing house in New York City, which paid the bills; and if it made any money by selling the books, it very properly pocketed it. Mr. RAYMOND may have transmitted their order to the Public Printer on some occasion, but does not remember even that much connection with it.
5. A cessation of the appropriation by Congress took place after Mr. RAYMOND had given a year's notice of his retirement from the work. *

A TRIBUTE TO CHEMISTRY.

A brilliant assembly of scientific men and representatives of iron and steel manufacture attended the banquet given on Friday of last week, at DELMONICO'S, in honor of Mr. SYDNEY GILCHRIST THOMAS, the young chemist, who has become suddenly but deservedly famous through his connection with the great invention of the "Basic process"—an improvement in the Bessemer process scarcely less important than the original invention of BESSEMER himself, since it enlarges indefinitely the field from which the material for cheap steel can be drawn. In response to a toast in his honor, Mr. THOMAS made a singularly graceful and felicitous speech, in the course of which he disclaimed exclusive credit for an invention in which the work of many predecessors and coadjutors had been utilized. He named Messrs. SNELUS, RILEY, GRUNER, GILCHRIST, RICHARDS, and others as having particularly co-operated in the more recent investigations of this subject, but confessed that the names of all who might be said to have contributed to the solution of the problem would be too numerous to mention. Mr. THOMAS and his present associates, however, undoubtedly carried to a practical success what so many have attempted in vain. The Bessemer Association of this country has purchased patents of THOMAS, SNELUS, and RILEY for a large sum; and no doubt at some of the Bessemer works the process will soon be in active use, as it has been for over a year with great success in England and in continental Europe.

One of the speakers at the recent banquet paid a striking tribute to the importance of scientific inquiry by tracing, with a few masterly strokes, the effect of the discovery, a quarter of a century ago,

by HENRY BESSEMER, a quiet and unknown chemist, of the method for the cheap production of steel in large quantities, which bears his name. To this invention is owing the immense extension of the use of steel, and particularly the great cheapening of railway transportation, which has made it possible for the vast and fertile prairies of our Western States to undersell in the British markets the grain and beef raised upon the soil of that country. The direct result of this competition has been the inability of the British farmer to pay the high rents demanded by the landlords; and the deep-seated troubles which now threaten the complete overthrow of the land system in Great Britain and Ireland, involving a social revolution of unprecedented magnitude, may thus be traced to the laboratory work of a chemist. But these evils will be but temporary, and the greater benefits which are to come in the future must also be placed, by the same reasoning, to the credit of science. Mr. THOMAS'S improvement of the Bessemer process is another step in the same direction, and establishes on safe and wide foundations an Age of Steel, which is to be the age also of a new civilization and a more equitable distribution of wealth. *

J. L. JERNEGAN.

A private letter from La Grange, Cal., imparts the distressing intelligence of the death by drowning of Mr. J. L. JERNEGAN, while attempting to ford the Tuolumne River, at that point, in his carriage, on the 11th of March. His body was recovered on the 19th, and buried at Oakland on the 21st.

Mr. JERNEGAN was one of the most active and promising young members of the Institute of Mining Engineers, and had contributed to its Transactions several papers indicating a high order of ability and a high degree of enthusiasm in the profession. His untimely death will be learned with sorrow, not only by his many personal friends and by his comrades, a large body of American graduates from the Freiberg school, but also by members of the Institute, and by all who feel the value of industrious, intelligent, and skillful laborers in the work of developing the mineral resources of this country. *

INDUSTRIAL ARBITRATION.

The twelfth annual report of the Massachusetts Bureau of Statistics of Labor contains an interesting summary of the history of industrial conciliation and arbitration in New York, Ohio, and Pennsylvania, contributed by Mr. J. D. WEEKS, of Pittsburg, who, as Pennsylvania State Commissioner, has thoroughly investigated the subject. His account includes the strikes, conferences, and settlements affecting the iron-working trades at Pittsburg, and the attempts at arbitration in the collieries of the anthracite regions, Pittsburg, and the Shenango Valley. These are very fully reported; there is also a sketch of arbitration in Ohio; and the paper closes with a striking account of the system in operation in the extensive cigar manufactory of STRAITON & STORM, New York City.

With the exception of the last-named instance, in which, however, success has not been tested by a period of falling prices and wages, arbitration must be confessed to have made an unsatisfactory record in this country, as compared with its results in England, France, and Belgium. Yet its failures are considered by Mr. WEEKS to have been due to causes not inherent in the principle itself, or in the normal conditions of American labor. Without pausing to inquire whether this is wholly true, we observe that the history of the subject here given shows two leading causes of failure, namely, lack of confidence and lack of honor; and the conclusion is forcibly suggested, that these are mutually connected. We do not now refer to the lack of confidence between capital and labor, of which so much is sentimentally said. It is curious that the failures of arbitration have been largely due to the lack of confidence and good faith among the members of each party. Thus the collapse of arbitration in the anthracite region, in September, 1871, was brought about by the strike of the employés of the Thomas Coal Company, who not only violated the agreement under which Judge ELWELL, as umpire, had fixed the rate of wages, but, in so doing, broke their own agreement with their comrades of the Workingmen's Benevolent Association, and defied the authority of that body, which opposed the strike. On the other hand, the Thomas Coal Company, in yielding to the demands of the strikers, acted in bad faith toward the Anthracite Board of Trade, and was expelled from that body in consequence; and this lack of loyalty on each side was so general that, after this one violation of the established agreement, the whole system went to pieces, like a Prince Rupert's drop when the tip is broken off. It was simply a temporary balance of high tensions, not the harmony of annealed adjustment and cohesion of molecules.

Again, the failure of arbitration in the coal mines of the Pittsburg region, in December, 1873, was due to the refusal of the miners to grant full authority to their own representatives. Mr. WEEKS puts the case very clearly, in these words:

"*** The miners' representatives did not come to the board with full powers, as the operators' representatives did, but were bound by the instructions

of the convention which appointed them. Failure is nearly if not quite inevitable under such circumstances. The very intent of arbitration is, that the arbitrators shall come to the arbitration prepared to hear the argument and facts, and decide in accordance with these, and not in accordance with the instructions of a body that has not heard the argument nor considered all the facts. It might perhaps be said that there was a reason back of this for the failure, and that was the suspicion of the miners that would not allow them to believe that their representatives would be honest and loyal to their best interests, and would not decide and accept the best result under the circumstances and in view of all the facts: this suspicion led the miners, in opposition to the spirit of the rules, to bind their representatives with instructions."

Under such conditions, arbitration is not arbitration at all, but merely a negotiation between agents.

Another error in this case, and also in that of the Shenango Valley, in the same year, was the omission to elect an umpire in advance. It is true, as Mr. WEEKS says, that umpires have often been chosen after the failure of a board of arbitration to come to an agreement; but he is obviously right in adding that it is best to choose the umpire in cool blood at the beginning, "and it is also best that he should be present at the meetings and discussions, so as to be able to decide promptly." The omission to appoint the final authority argues a lack of sincere intention to accept the results of the arbitration.

The same moral may be drawn from the history of arbitration in the coal mines in the Tuscarawas Valley, Ohio. The agreement of 1875 was almost immediately nullified by the action of the Crawford Coal Company and its miners. The latter demanded a check on the weighing of the coal—a right secured to them by the law; the company refused it, closed the mine, and, after asking in vain the support of other operators in its unjustifiable course, offered the miners an increase of wages in lieu of the right refused. This offer was eagerly accepted; the same advance was immediately demanded in all the mines of the valley; the authority of the Miners' Union, as well as the obligation of an honorable agreement, was repudiated; all the companies conceded the demands of the miners; and the miners believed their representatives to have betrayed them, in not securing better terms at the outset. A subsequent attempt, in 1877, to arbitrate the question of wages, failed by reason of this feeling. The miners bound their representatives with instructions until they became little more than messengers between a committee-room and a mass-meeting.

In all these cases, it is not so much the confidence between capital and labor as the mutual good faith among the representatives of each side, that is wanting. The same difficulty has attended all agreements among operators to restrict production or maintain prices. Whether wise or unwise, they usually break down because somebody violates the pledge, and all the rest instantly feel free to do the same.

The case of the cigar-factory of STRAITON & STORM is a remarkable one. Mr. WEEKS says this is, so far as he knows, the only board of arbitration now in existence in this country, and the only one that has survived attempts to settle a wages difference. It is composed of nine persons, of whom five are employés. The decision of the majority is binding. The board has existed since January, 1879, and has several times decided questions of wages, usually granting an advance not so large or so general as was requested. It is evident from the statements of both parties that the experiment has so far worked well. But it has not been subjected to severe strain. The following sentences, quoted from different parts of the letter of the firm to Mr. WEEKS, suggest important questions:

"It is necessary that those becoming parties to such a contract should be guided by an honesty of purpose and a keen sense of justice; and an ordinary amount of intelligence is requisite." * * * "It [such a board] can only be used where the employer possesses the necessary qualifications befitting a successful manufacturer, and where they are enabled to pay such wages as are generally paid throughout the trade for like work." * * * "True, it has not been as yet so severely tested as it may be at some future time, because during its existence there has been a general advance of labor, and it has simply been a question as to how much these advances were to be from time to time."

It appears from these hints that the wages are, after all, regulated by the practice of the trade outside; and that the system now working so smoothly in this establishment is scarcely more than the expression of a happy harmony between wise and prosperous employers and intelligent workmen. Such a spirit may express itself under any system; and without it, no system is likely to succeed.

Mr. CARROLL D. WRIGHT, Chief of the Massachusetts Bureau, draws from the report of Mr. WEEKS the conclusion that arbitration, based upon the principle of a sliding-scale of wages, adjusted to market prices, would be practicable, and should be adopted among the textile manufacturers of that State. The history we have reviewed can not be said to justify sanguine expectations in this direction; but it is not without encouragement to intelligent, sincere, and persevering effort. *

METALLURGY AT LEADVILLE.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: In your issue of March 12th, 1881, Dr. Malvern W. Iles published an article, headed "Chemical and Metallurgical Considerations on Lead Smelting," in which an analysis is given of a piece of slag from the works of Billing & Eilers.

The composition of the slag given shows to me conclusively, that the piece from which the analysis was made came from the top of our slag-dump, being either from a *blow-pot* or from slag saved for re-working, because it came down not in accordance with the calculation

made for its composition. The latter is probable, as the amount of CaO is not the percentage wanted.

In explanation of the last sentence, I must say the following:

The time when the lead in the crucible has risen so high that it must be tapped is conclusively indicated in all furnaces provided with Arent's lead-tap, by the fact that the lead in the well does not recede any more after tapping a pot of slag, and that, toward the end of filling the last pot, the blast blows through the slag-tap. In doing so, it blows out with the slag the thin layer of matte or speiss still remaining on top of the lead, and frequently small shots of hot lead, which become partly oxidized and enter the slag. Such a pot of slag contains invariably from one to two per cent more lead than the ordinary run of slag, which is immediately thrown over the dump as worthless. The *blow-pot*, on the other hand, is deposited on top of the slag-dump. When cooled, it is broken and again put through the furnace. As a certain small quantity of slag is always needed with the charge for mechanical reasons, especially when the same consists of fine "carbonate sand," we prefer to take for that purpose a slag from which we can extract something, instead of the worthless kind, which gives us no equivalent for the expense.

As Dr. Iles writes professedly in the interest of "students of metallurgy," I have taken the liberty of thus dispelling the idea, which might possibly gain a foothold with some of the readers of your JOURNAL, that the slag of which the analysis is given in the article quoted is a good one. It is not, and should not be imitated.

I may add here, that I consider a good lead slag only the one which fulfills the following conditions: It must not contain over $\frac{3}{4}$ per cent lead, and will, in that case, contain from a trace to 0.5 ounce silver, providing the silver in the charge is covered with at least 100 times its weight of lead; it must not have a density over 3.6; it must not permit any accretions whatever to be formed in the crucible on top of the lead, and therefore keep the lead red-hot; and it must finally prevent any creeping up of over-fire.

Although I have taken considerable pains during my career as a metallurgist to find various slag-compositions which could be made with the cheap fluxes ordinarily accessible, and which would fulfill the conditions enumerated above, I have not succeeded in finding more than two. But I must say that even these two do not allow as clean smelting with Leadville ores as they do, for instance, with those of Utah. At our works at Salt Lake City, it was a rare occurrence to find any lead or silver in the slag, which I made there of almost the same chemical composition that we use here. The only difference is, that here a few per cent of MnO enter the slag. Whether the too easy fusibility of the 2MnO , SiO_2 , and the consequent rising of the "smelting zone" (as encroaching on "the zone of reduction"), is the cause, I have not definitely settled.

Very respectfully,

A. EILERS.

LEADVILLE, COLO., March 24.

THE USE OF THE CALCULUS.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: In your issue of April 2d, occurs a criticism of my translation of Röntgen's *Thermodynamics*, for the general favorable tone of which I owe you thanks. I wish to call your attention, however, to one statement, and ask you to reconsider it in view of my explanation. I do not write this for publication, but, should you upon reflection feel that I am justified, would be pleased to have you say so.

I refer to the remark that, "as is usually the case, the subject is made more difficult by discussing it without the aid of the calculus."

I do not wish to discuss this as a general proposition, but simply to point out that there are exceptions—and this is one. It gives, in the first place, in my opinion, a wrong idea of the work, and just among the class of readers for whom the work is intended. This subject is not made more difficult for the beginner by discussing it without the aid of calculus. If it were so, my translation, at least, would never have seen the light.

Will you allow me to give my experience? We have here students sufficiently familiar with the calculus not to care to avoid it. I do not seek to avoid it in general myself. I agree with your opinion in the main. I think such a presentation as Zeuner's incomparably the best, for the properly prepared student. But right there lies the difficulty. The student needs more than a good knowledge of the calculus in order to be properly prepared. He needs to be familiar with the subject itself, up to a certain point, at least—with its ideas, its methods, and its problems. He can not use the best tools until he has an idea of what it is he wants to do. And right here has been the great trouble in teaching this subject satisfactorily. It has been very much like putting a student, entirely ignorant of all mechanical conceptions, having had no preparatory knowledge of mechanical principles of any kind, into say Bartlett's *Analytical Mechanics*. Such a book, I think you will agree with me, is valuable at the right time, but not before. I do not think you would deprecate the existence of all those preparatory text-books upon mechanics which put the student in a position to profit from the higher treatises.

Now, that is especially the case in the present instance. The calculus method, apart from the mathematics, is not a natural method. No one ever got hold of the subject by starting at that end. A student can not see the drift or purpose of the differential formulæ until he has gone blindly through the presentation to the end; and then, inverting the order and looking back, light at last breaks in on his darkness. We can not expect such study from our students; and if we did, we would not get it. Thus far, there has been no suitable preparatory work upon thermodynamics.

These are some of the reasons which have induced me to the present work. I have found it very satisfactory, and a great saving of time and "energy." A student having gone through this work, understanding it as he goes along, can take up Zeuner, and read with ease and profit, because understandingly. Then Rankine clears up the subject; and he meets no difficulty in any one's presentation. He knows and recognizes beforehand what they are driving at.

Now, when, with these views, I think and know I have done a good thing for teachers and students, and "have supplied a long-felt want," as the critics sometimes do not say, it is rather discouraging to find a critique from such an authoritative source entirely missing the point, and giving

the public the impression that they had better, after all, stick to the other works, as the present is, if any thing, more difficult—and that, too, on account of the very reason that makes it desirable!

After all, it is hardly fair to generalize upon such subjects. A text-book has in view a certain class of students, usually. With reference to that class it should be judged. From this point of view, the German authors you refer to so slightly may have some defense. They might perhaps say that there is no great lack among them of books which do not avoid the calculus, and that, therefore, when any one goes out of his way deliberately to avoid it, it would be only fair to consider whether he have not special reasons for so doing, and special experience in the teaching of both methods, which render his reasons worth consideration.

My experience has taught me the necessity of such a presentation, and while both myself and students know all the calculus you could desire us to, and are not unfamiliar with its applications to physical questions, we still find the work a "time-saving, labor-saving 'short cut.'" If you will take up Zeuner, and, putting yourself in the position of a student ignorant of the subject, try to see how the method of presentation would then strike you, you will, I think, admit that, though the calculus is a good tool to work with, it is not always the best tool to teach with.

Yours very respectfully,

A. J. DU BOIS.

NEW HAVEN, April 4, 1881.

P. S.—If there is any reason why "energy," including as it does "potential," is better than "living force" in such a subject, I have found no statement of it in your criticism. An author can, I presume, have his special predilections without being called upon to defend them at every opportunity. Such terms as I have introduced have been deliberately used, and will, I hope, soon cease to sound strange, and become as familiar as they are expressive. "Disgregation" is, I take it, as good English as French, is not translated from the German, and is used by English authors as well as others. It ought not to sound "strange."

THE SAN JUAN REGION, COLORADO.

Special Correspondence of the Engineering and Mining Journal.

THE ENGINEERING AND MINING JOURNAL has always been ready to say a good word for the San Juan region; but its information from that district has necessarily been restricted this winter, owing to the absence of both its contributors from Colorado. It becomes to me, therefore, somewhat of a duty to make public use of such gleanings as may interest your readers, from my business and friendly correspondence.

San Juan County has had less snow than last year; but avalanches have been perhaps more frequent, though but little destructive. If late snows do not come, the season will open quite early. Not a few who have wintered in the East have already returned. The Denver & Rio Grande Railroad has been vigorously pushed, and it will very soon be completed to Durango, from which point it will be quickly extended to Silverton. Meanwhile, comfortable coaches will daily cover the intervening distance. The upper Animas Valley, as far as Animas Forks, will be provided next season with as good facilities for travel as last year, or better. Freight transportation must become much cheaper and more easily procurable than ever before, while the increased facilities for ore-reduction will undoubtedly give better prices and enable lower grades to be profitably treated.

There has been much less than the usual amount of "wild-cat" organization of San Juan companies here in the East this season, though one or two have slipped in unnoticed with the large number of good incorporations. Boston capitalists, with characteristic forethought and judgment, sent out some competent investigators last season, and the result of their labors is now apparent in at least some of the new enterprises brought to public notice in that city. Still, I feel it necessary to warn investors that not every one of these schemes is worthy of full support. Good companies will not suffer from my hint that high capitalization and stock speculation have already injured the San Juan country more than the failure of any business enterprise. In fact, it may be truly said that there have been no failures in San Juan; for in every instance of disaster, the fault has been with manipulators in the East. The mines are still there, ready to justify all that was ever predicted by competent authority.

The production of this district last year was actually less, by the records, than in 1879; but the work performed, the development of the mines, and the ore taken out were much greater; for we were placed in circumstances such as can never again occur, which gave us no tempting market.

Silverton has received new impetus from the forming of companies to work the mines in Cement and Poughkeepsie and other gulches, and good reports have been received from reliable sources of the work done this winter upon the productive veins in the neighborhood.

Arrastra and Cunningham gulches are not behind, and all at Eureka are more than ever convinced of the great value of the local fissures. There is now a very strong probability of important additions to the working facilities at this point, by means of which a large amount of low-grade ore will be marketed at an early date. The Niagara Consolidated Company is making preparations for vigorous prosecution of development work upon its large bodies of rich ore, and there is now an assurance that it will take its place among the large dividend-payers.

Above Eureka, the new smelter near Burns's Gulch will have an opportunity to prove its worth ere the completion of the railroad and the competition at Durango give it the severest test of its ability to hold its own against such odds. It certainly has the best wishes of all in the upper valley at least, and its managers deserve well of the neighborhood for their energy and determination.

The Tom Moore Mining Company is one of the kind that reserves all its noise to the last; but one of these days its stockholders will be shouting for it in a body, because of the present economy of management and the dividends which this policy and the worth of the mines will eventually produce.

Animas Forks is flourishing, and the rich mines in the vicinity of Mineral Point, notably the Red Cloud, are behaving nobly, fully justifying the hope that has been placed in them.

I am not an authority upon Rico and Ouray in detail; but the true story that reaches me through letters and statements of the most trustworthy

character, as well as from Lake City and other more familiar localities, may be briefly indicated by an article in my own creed, namely, "I believe in Eureka, and in San Juan County;" but what I say of these, in general terms, applies equally to all parts of the great San Juan country, than which there is certainly no greater mineral territory in the world. The proofs will be forthcoming as the years roll by, and long after this generation shall have passed away.

61 BROADWAY, NEW YORK, March 31. THEODORE B. COMSTOCK.

GLOBE DISTRICT, ARIZONA.

Special Correspondence of the Engineering and Mining Journal.

A glance at the mining columns of Eastern papers gives evidence that interest in Arizona mines is increasing. We hear constantly of new enterprises, and we are also aware that much capital is passing our very doors to go into old Mexico. It is the fashion now to go south for mines, just as Colorado, a year ago, and other territories before that, had their "booms." However, no mining district should be dissatisfied with the investment of capital elsewhere; for every successful operation in the end helps others. Apart from considerations of the value of mines, the advantages and disadvantages of Arizona as a mining territory may be briefly summed up. The principal advantage is probably the absence of cold weather and of snow. Railroad facilities, in the past very poor and expensive, are rapidly increasing, and since the connection of the two roads, Arizona is easily accessible. The Atlantic & Pacific is rapidly opening the northern part of the territory, and a cross narrow-gauge to connect this with the Southern Pacific at Wilcox is contemplated. The completion of the Eastern route will result in the cheapening of supplies and freights which have been very high. The great disadvantages are, or have been, the inferior quality and scarcity of fuel, and the scarcity of water, although many districts are well supplied in both respects.

The Globe Mining District is of the latter class. Its distributing point is the town of Globe, situated in the valley of the Pinal Creek, about seven miles east of the Pinal Mountains, a small range about 7000 feet high. The population of the town is probably under 1500, and has a large business element, the town being well supplied with stores which carry good stocks of goods. Globe is about 120 miles by stage from either Wilcox or Cosa Grande, points on the Southern Pacific Railroad east and west of Tucson. Freight from the railroad is about two cents a pound. Globe is well supplied with water of good quality, obtained by sinking wells anywhere upon the creek bottom to a depth of from 15 to 30 feet. Although the creek only flows on the surface a part of the year, there is such a strong bed-rock current that digging can only be carried to a foot or two below water-level. The heavy snows which fall on the Pinals through the winter months are the source of the water supply. Rains are expected through February and March, and then again through July and August. We have been having weather like June, with a diversion in the way of a week of colder weather, with a few inches of snow, which rapidly disappeared.

The country for twenty miles around is tributary to Globe. Within the past year, a good deal of capital has been invested here, and not with the most satisfactory results. It is the old story of building mills for undeveloped mines. The mills are small, but make up in cost for their size, ten stamps being the maximum number. The Silver King mine, which is becoming famous, is only a little over twenty miles from here, and is said to be in a formation similar to that we have here. The Mack Morris, another steady producer, is about fifteen miles from here. Nearer by, there is not what could be called a developed mine that I have seen. A shaft a hundred feet deep constitutes in most cases the extent, so that any thing may be expected of the camp. In regard to mineral characteristics and formations, careful study and investigation only can do justice to the subject. In brief, it may be described in general as follows:

In the Pinal range, are granites and schists carrying iron and copper sulphurets in conformable veins, with considerable gold. Coming northwest a few miles, we have feldspathic granites of a porphyritic texture, gneiss and talcose schists in a comparatively limited area, and containing gold veins. These veins carry galena in nodules and segregations, copper and iron sulphurets, carbonates of lead and copper in the upper portions, and almost invariably wulfenite in tabular crystals and crusts. The lead carries some silver, and the free gold is very fine, and, so far, has not been successfully amalgamated on copper plates. In silver mills with pans, the free gold has been saved; but that in the sulphur still seems to remain in combination.

Coming still farther east, over a succession of rounded barren hills a thousand feet high, at Globe we have the beginning of a belt of syenitic granite, which has not been found productive of mineral. A half-mile of this and then comes a half-mile belt of trachyte; then a belt of so-called syenite, very dark in places, and resembling trap or diorite, but of such fine grain that a microscopic examination seems to be the only certain method of identification. This syenite formation is clearly eruptive in character, as may be seen from the mode of occurrence. It is capped in places by quartzites and quartzose slates dipping slightly to the southeast, and also by limestone, which near here seems very irregular in its occurrence. The surface seems much faulted and disturbed, so that the original position of the stratified rocks is difficult to determine. Among these different formations east of the trachyte belt, are found the greatest number of the mines. They seem to lie approximately in several parallel belts, and consist of several classes. The strike of the veins generally lies between south and southeast, and the reverse, and the dip between the perpendicular and 30 degrees. There are veins in fissures in the quartzite; in contacts between erupted syenite and quartzite; in contacts between syenite and trachyte and trachyte and limestone, and in the limestone itself; and also wholly in syenite. The veins in the quartzite are often copper-bearing, the ores generally being carbonates, oxides, and silicates, well proportioned for fluxing, but rather low grade for profitable working in this country. However, the dumps show that a good deal of good grade of ore can be obtained. The general impression here is, that all these copper-bearing veins will turn into silver as depth is attained—a proposition which needs proof. The syenite not only seems to break through the quartzite, but

to underlie it, and the best developed silver mines are said to lie wholly in the syenite. In some, native silver is common; and in others, argenteriferous gray copper and stromeyerite (sulphide of silver and copper) are present. True silver minerals are very common; horn-silver or argente horn-silver I have found in cubes and octahedrons, and from some mines have found specimens containing a perceptible amount of iodide of silver. Stephanite is also common. The lead-bearing silver ores I have found to occur principally in contacts; but lack of development renders it impossible to formulate at all in this respect. Coal of good quality has been discovered in large quantities about fifty miles south of here. It carries a high percentage of ash, as ascertained by analysis of a sample from the surface. It shows good coking qualities, yielding in a muffle a hard, gray, prismatic coke. The percentage of fixed carbon is about 60, and in external appearance it resembles closely the Eastern bituminous coals. The ash, though abundant, is nearly white. The value of such coal for metallurgical purposes can scarcely be estimated. Of course, railroads will be needed to make it available; but their surveyors are said to be already on the ground. Ex.

GLOBE, March 23.

THE SAN PEDRO AND CANON DEL AGUA LAND-GRANTS, NEW MEXICO.

The company owning these grants, and consisting mainly of Boston capitalists, was formed in January, 1880, and capitalized at \$10,000,000, in shares of \$25 each. We hope to present to our readers in the near future an illustrated and extended description of these properties, which cover a large area, and are reported to be exceedingly rich in minerals.

Previously to the Mexican war, by which the United States acquired possession of some of its richest mineral territory, the Spanish kings and Mexican governors used to cede to their favorites, and for purposes of colonization, large tracts of land rich in minerals, etc. At the close of the war, it was stipulated by a special provision in the treaty that the persons holding these grants should remain undisturbed, and that their claims should be sustained by the United States. A land-grant of this kind was made to an association of Mexicans in 1839, and another in 1844 to Jose Serafin Ramirez. These grants, known as the San Pedro and Cañon del Agua grants, are situated about 36 miles south of Santa Fé, New Mexico, and comprise from 30,000 to 40,000 acres, including in their limits the Tuerto, San Pedro, San Ysidro, and part of the Sandia Mountains, all rich in mineral deposits. In the course of time, the portion containing these grants became part of the United States territory, and, under the name of New Mexico, passed from the Mexican to our federal government. In 1866, the grant was confirmed by the United States government, and patent issued in 1875. Ramirez sold out undivided sections of this property from time to time, until it had been distributed throughout various parts of the country. In November last, an association of gentlemen in Boston, having at their head Mr. George William Ballou, set about collecting and purchasing these scattered sections, and again consolidating the property. This object was speedily accomplished, the whole property was bought for \$500,000, capitalized at \$10,000,000 in shares of \$25 each, and, in January following, the San Pedro Company was organized, with Mr. Ballou as president, and the development of the property energetically begun. Since that time, progress has been rapid and exceedingly successful, and this mining region is now far on the way toward complete utilization. The Atchison, Topeka & Santa Fé Railroad passes these grants within a distance of 10 or 12 miles.

The copper and gold mine is situated at an elevation of about 8000 feet on the western side of the Tuerto Mountain. The assayer states that assays taken from the entire length of the vein average 12-16 per cent copper, some of the ore running as high as 46 per cent, while assays from the gold ore returned from a trace up to \$30 per ton. During the past year, a flourishing community of about 200 people has been organized at San Pedro. Smelters and a stamp-mill have been built, the former now producing from two to three tons of copper daily, and the latter will be started in about sixty days.

A report of the operations of the company during the past year is embodied in the following, for which we are indebted to the Boston *Herald* of April 3d:

A new drift is now putting into the copper mine, to save hoisting, taking the ore at a lower angle, and effecting a saving of 33 per cent in the cost of mining. The gold-bearing vein in the copper mine is now nine feet thick, completely covering the copper, which is two feet thick in the vein. When this great copper mine was first worked, gold and copper were found mingled, the copper being in the largest proportion; but after 250 feet of the mine had been worked, the ores separated and became distinct veins of gold and copper. This mine was opened a year ago. The copper ore is now running about 30 per cent of copper, and is very rich.

Besides, water is now running into the town, through pipes two and a half miles from Cañon del Agua. The great aqueduct is all laid from the placer diggings of the company to the Sandia Mountains, a distance of about 14 miles; but by this source water is not yet received, as a connecting link of five miles is yet to be built, making union with Cañon las Huertas. A very important enterprise completed has been the building of freight roads from the property of the company to the Atchison, Topeka & Santa Fé Railroad, a distance of 20 miles. A telephone line has also been established between these points, but not over the same route, the telephone line being about two miles shorter than the road. These lines terminate at Bernalillo, on the Atchison, Topeka & Santa Fé road. The smelters are about one and a half miles from the big copper mine. A large coal bank has been opened, with 3½-foot vein, about six miles from the mine, and coal-pits for charcoal have been established, and are working. Bernalillo is about 40 miles from Albuquerque, and 60 miles from Santa Fé.

Progress in Steam Navigation.—The following facts are supplementary to the interesting statistics given in this department in the issue of March 26th: The Cunard steamer *Servia*, just launched, is 350 feet long, 52 feet wide, and 44 feet 9 inches deep; the measurement, 8500 tons. The engines are 10,500 horse-power. The cargo capacity is 6500 tons. The use of steel in her construction reduces her weight to some 620 tons less than that of an iron vessel of the same speed. The speed anticipated is 17½ knots an hour.

COPPER SMELTING—ITS HISTORY AND PROCESSES.

By Henry Hussey Vivian, M.P.

(Continued from page 231.)

I now come to the third and last system of calcining furnaces adapted to the manufacture of sulphuric acid from copper ore or regulus, namely, the "muffle calciner," which, in external appearance, is very much the same as an ordinary copper calciner of the old form; internally, however, it differs considerably, since the material under treatment is inclosed in a chamber of fire-brick, constructed by arching over the inner space in such a manner as to cause the products of combustion to pass over and under the ore-bed, and transmit the heat through the fire-brick. By this means, the sulphurous gases are obtained free from admixture with the coal gases, and no more atmospheric air is admitted than is necessary for the production of sulphurous acid and the oxidation of the iron, etc. I have no practical experience of muffle calciners, because I never thought well of them, owing to the expense of fuel consequent on working with transmitted heat, and the dilution of the sulphur gas when the door is taken down for stirring. The first difficulty is got over at Mr. Lambert's works by using a muffle calciner heated by the waste heat of the smelting-furnace; but when we consider the varying intensity of the heat given off at different periods of the ore-furnace charge, ranging from almost none at all at the period of skimming and charging up to the highest temperature during the melting process, I can not doubt that much irregularity must occur in the calcining process which must militate against the regular working of the chambers, especially when joined to the inrush of atmospheric air when the calciner doors are down for stirring. I have seen the muffle calciners at Mr. Lambert's, and have read his evidence and that of Mr. Fenwick Allen, the manager of Messrs. Newton Keates & Co.'s works in Lancashire, where, as well as at the St. Helen's works, muffle calciners are used, heated on the Siemens system. Unfortunately, neither of these gentlemen goes fully into the question of the profitable working of muffle calciners; but I think I am justified in saying that they do not appear in several respects to give results equal to the Gerstehöffer system. In Mr. Allen's answer to question 11,646 of the Noxious Vapors Commission, he says: "We diminish the escape by condensing the whole of the acids given off in the calcining process, and at the very outside it would be from 30 to 40 per cent of the total sulphur given off in our works." I should have been glad if Mr. Allen had been able to give the committee, as I did, an accurate debtor and creditor account of the whole of the sulphur which entered the works. Again, he was unable to inform the Commission (11,660) what the percentage of niter used at his works is; but he says generally (11,658) that the gases are very dilute, and that they require three times as much niter as in ordinary kilns; and he also says (11,657) that the sulphuric acid costs 5s. more than if made from pyrites bought and burnt in kilns. Mr. Lambert's evidence as to the results of muffle calciners is even less favorable. I think I have now pretty nearly exhausted the subject of calcination, and may proceed to smelt my ore.

In considering the question of melting the calcined ore, I think we ought, in the first instance, to pass in review the two systems of reverberatory and blast-furnace smelting—"South Wales against the world!" Each system has its advantages and disadvantages. Let us weigh them. The blast-furnace is slightly, very slightly in most places, more economical in the cost of fuel, and it undoubtedly, and in all cases, produces a cleaner slag; but its working is much more complicated, and it has a constant tendency to reduce the oxide of iron contained in the calcined ore into metallic iron, and thus to produce a mass of infusible matter at the bottom of the furnace, which, in no long period, causes the entire or partial destruction of the furnace, according to the arrangements made beforehand to extract it. Even in the best managed continental works, I have positive proof that these so called "iron sows" are produced; in fact, they are an almost unavoidable incident of melting calcined copper ores in blast-furnaces, especially high blast-furnaces, owing to the partial reduction of oxides of iron by the ascending carbonic oxide before it reaches the melting-point, where it would be able to combine with the silica, which we must assume has been provided for it. It has, I am aware, been proposed to get over this difficulty by taking off the gas a few feet above the melting-point; but no great success can have attended this, from the fact that "iron sows" are still produced in considerable quantities in the best managed continental works. Another great drawback to the use of the blast-furnace is, that it can only treat a comparatively rough mixture; much fine ore would soon cause it to "gob" or choke. The consequence is, that resort is had to slags to keep the furnace open, if rough ore can not be obtained, even if the slag does not require remelting. I know of a case in which thousands of tons of slag are thus uselessly melted. When lead ore is melted in blast-furnaces, it is possible to agglomerate it in the calciner so as to cause the furnace to "drive" well; but copper ore would require so high a temperature to agglomerate it, when sufficiently calcined, that it would be more economical to carry it a trifle farther and melt it in a reverberatory furnace at once. In blast-furnaces, for the above reasons, I doubt whether ores could be dealt with, as they arrive from all quarters of the globe, varying enormously in their constituents and characteristics. Nothing in reverberatory copper smelting needs greater care than the formation of a proper mixture for the ore-furnace; but the problem becomes vastly more complex if the ore-furnace be a blast-furnace.

I said that the blast-furnace uses less fuel than the reverberatory. Roughly, I believe, the case stands about as follows: A blast-furnace uses from 15 to 25 per cent of coke, calculated on the quantity of ore smelted, according to the nature of the ore and the furnace; take it at 20 per cent. A reverberatory uses, say 45 per cent of coal; but coke is about $2\frac{1}{2}$ times more costly than coal, therefore the expense of the blast-furnace would be as 50 to 45 of the reverberatory. If steam power is used for the blast, it makes the case of the blast-furnace so much worse, unless the waste gases can be utilized to generate steam; but if fuel has to be transported to a distance, although the freight on coke is more than on coal, the balance may slightly incline in favor of the blast-furnace.

I also said that a blast-furnace produces a cleaner slag than a reverberatory furnace. I believe that such is invariably the case, owing to the higher temperature at the melting-point, which causes the slag to be more fluid, and thus permits the heavy regulus to pass more easily

through the slag; the deep well of the blast-furnace also assists in the last-named effect. I estimate the difference between blast-furnace and reverberatory slags to be about one fourth per cent, equal in money to about 3s. per ton of ore. As to the item of wages, I can not speak positively, because so much must depend on the nature of the ore and the furnace; but in all cases with which I have had to do, the blast-furnace cost is in excess of the reverberatory. There is one other considerable disadvantage in smelting in a blast-furnace, namely, that from the same calcined ore a reverberatory furnace will produce a much richer regulus than a blast-furnace; the former is an oxidizing, the later a deoxidizing furnace. During the exposure of the ore on the bed of a reverberatory furnace, calcination goes on continuously, sulphur and the sulphuric acid partially formed in the previous calcination passing off. We found, on careful trial, that during the smelting of calcined ore in the ore reverberatory furnace, 13 per cent of the original contents of the ore in sulphur were driven off. I have no similar data as to what sulphur is driven off in the blast-furnace. The smoke issuing from blast-furnaces proves beyond doubt that some is sublimed; but from the deoxidizing condition of the furnace, all the sulphates must be reduced, some to sulphurous acid probably, and some to sulphide of copper. As a fact, blast-furnace regulus is always coarser than reverberatory regulus, which means that more expense has to be incurred in the subsequent processes.

The reverberatory furnace is a simple and easily worked furnace, forming no metallic bottoms until the copper stage is reached, and capable of dealing with all ores, as Ulrick Frosse found out three hundred years ago. Whether calcined ore is melted in blast or reverberatory furnaces, the same results ensue, namely, the earthy matters (chiefly silica) originally contained in the ore combine with the sesquioxide of iron to form a slag, while the sulphur, purposely left in the calcined ore, forms sulphides of iron and copper, which, being of greater specific gravity, sink through the slag, separating themselves more or less completely from it, according to the nature of the slag and the temperature at which it is melted. For this cause, the copper smelter must be careful so to combine his ores as, on the one hand, not to form too stiff or quartry quartz, a slag which hinders the operation of melting, and prevents the regulus from sinking freely through it; and on the other hand, too heavy a slag, which, while it may melt easily, is so nearly of the same specific gravity as the regulus as to cause the separation to be imperfect on that account. He must also be careful not to produce too rich a regulus, because the perfect separation of regulus and slag is next to impossible, and each prill of regulus which remains mechanically suspended in the slag carries with it more copper if rich than if poor. As I think I before said, we do not like to push our "coarse metal" or ore-furnace regulus beyond about 33 per cent of copper; it contains about 23 per cent of sulphur, and the remainder iron, arsenic, and other impurities, resulting from the original ore. I see Le Play gives "coarse metal" as containing 29.2 per cent sulphur. According to our experience, it does not usually contain more than 23 per cent. The ore-furnace slag consists chiefly of silicate of protoxide of iron and silica in suspension. Dr. Percy's concluding observations as to the reactions which take place in the ore-furnace are concise and clear; any one who desires to study them in detail can do so by referring to the 345th page of his work; indeed, the whole of the chemical changes which occur in copper smelting are set forth with admirable terseness and precision.

Before quitting ore-furnace slag, there is one point I should like to mention, which may be of practical value to copper smelters now and hereafter. Whatever loss of copper occurs in this slag arises from prills of metal which have not had time or were not sufficiently large to settle or fall through the slags while in the furnace, and are consequently skimmed out with the slag. These prills, to a very large extent, fall through the fluid mass after it is skimmed into the sand molds. It will always be found, if the slag is sufficiently fluid, that the bottom contains far more of these prills than any other portion of the slag. The practice is to drive these slags out on iron wheelbarrows and place them to cool in a courtyard; when cool, they are broken through, and the portions most prilled are returned to the ore-furnaces. Soon after I first interested myself with copper smelting, now thirty-seven years ago, I observed that the large irregular masses of slag which resulted contained visible prills of regulus in the lower three or four inches only, while a large proportion contained no visible prills, and were not worth the cost of re-smelting, except from their association with the richer portion. This led to much poor slag being melted and much rich slag being thrown away, from fear of increasing the bulk too greatly to go back. Upon one occasion, I saw a slag broken through, which contained a large cavity in the center and a thin plate of slag at the bottom, sides, and top. I at once sought the explanation, and found that the center of that slag (and almost all slags are the same), when driven out to the court, was still in a liquid state; that by some accident a corner had been broken off, and that the liquid center had run out, leaving a thin hard crust round the bottom, top, and sides. Here was exactly what I wanted, and since that day—now some five and thirty years ago—no more heavy masses of slag have been made at our works. I at once caused the slags then on the bank to be "tapped," by striking a hole with a pointed sledge into the center of the bottom end as they lay on edge, and then another at the top (or striking off a corner), when the fluid center ran out, and left me a thin plate at the bottom, completely separated from the rest. This is almost invariably so much prilled as to be worth remelting; if it is more than usually so, the "runner" is also tried and melted, and in stiff slags, metal is sometimes found in the "top," which is then also remelted. For some years, I caused an account to be kept as nearly as might be, of the metal saved by this system, and the result was so satisfactory that I felt justified in stealing the copper to make the Sketty Church bells, the copper in which, I may now confess, was never paid for: I took it as an honorarium for my little invention.

By this melting of calcined ore, whether in reverberatory or blast-furnaces, we have obtained two products: first, a regulus of copper, iron, and sulphur, which contains about 33 per cent copper and 23 per cent sulphur, and the remainder iron and other metals; and secondly, slag, which contains all the so-called earthy minerals originally present in the ore, with sufficient oxide of iron to combine with and fuse them. This slag is thrown away, and at once relieves the copper smelter of about two thirds of the bulk he has to treat. The regulus of 33 per cent copper with sulphur and iron remains to be dealt with.

Whether in South Wales or on the continent, or in far-off India and Japan, this regulus must be roasted or calcined, to drive off the equivalent of sulphur combined with the iron it contains, and to convert the latter into an oxide—Le Play says "sesquioxide." Abroad, this was burnt in heaps; here, it was first granulated by running it from the ore-furnace into deep pits, filled with water, after which it was calcined in our large reverberatory calciners for thirty-six hours, which time was found sufficient to drive off enough sulphur to afford oxygen for almost the whole of the iron present, leaving sulphur enough to combine with the whole of the copper, when melted, and to produce pure sulphide of copper, which we term "white metal," containing from 72 to 75 per cent of copper. These calciners contained each twelve tons, and were charged with four tons at the flue end every twelve hours, while four tons were withdrawn from the bridge end, nearest the fire; simultaneously, the center charge of four tons was moved to the bridge end, and the charge at the flue end, which had been working twelve hours, was moved to the center. Thus each charge of four tons remained in the furnace thirty-six hours, while the furnace got through four tons every twelve hours. That practice is now wholly abandoned in favor of the Gerstenhöffer before described. We now run the ore-furnace regulus into molds, grind it, and pass it through a ten or eleven-hole sieve, and then treat it in the Gerstenhöffer. We find that from ore-furnace metal thus treated we drive off nearly one half the sulphur in that process, leaving behind about 12 per cent of sulphur out of 23, still combined with the copper, or rather, perhaps, to be combined with it, to the exclusion of the iron in the metal furnace melting. We find it better not to push this calcination too far, because it is always wise to have rather too much sulphur present in the calcined metal, so as to be able, by the addition of ore containing copper in combination with oxygen, such as carbonates, oxides, and silicates, to hit the exact mark we desire in the metal or regulus produced in the metal furnaces. If it is to be roasted forward directly into copper, we produce "white metal;" but if to be put through the "best select" process, then the metal produced in the metal furnaces is kept slightly back; that is, below "white metal," the whole of the iron not being reduced; this metal is then roasted, or slowly melted down in the metal furnace, by which means an impure metallic copper bottom is produced, which contains many of the impurities with which the ore was originally contaminated, while the sulphide of copper floating above this metallic bottom and easily separated from it is comparatively free from impurities. This process is, however, incapable of so completely freeing copper from those impurities as to render it always fit for best brass purposes.

I must now return to the metal furnace melting, which with us is always effected in reverberatory furnaces. I believe they are now almost universally adopted for concentration in Germany and elsewhere on the continent as well as in America and Chili. I remember well when not one reverberatory copper furnace existed in Germany for copper smelting; the concentration of copper regulus and refining in blast-furnaces is now so thoroughly antiquated that I need scarcely notice it. As our calcined copper metal contains so much oxide of iron, it is necessary to add siliceous matter to form a suitable slag: ores rich in silica, and, if possible, containing copper in combination with oxygen, as before mentioned, are the most desirable for this purpose. The products of this second melting are "white metal," almost pure sulphide of copper of 73 to 75 per cent, and metal slag, which Le Play gives as 33.8 silica, 56 per cent protoxide of iron, and 2.9 per cent copper: this slag goes back to the first melting. "White metal" may be regarded as the standard product of our second melting. If a lower regulus is produced, an intermediate or second metal melting has to be gone through, involving extra cost; if the point of white metal is passed, a portion of the copper must become metallic, because there is no longer sulphur to combine with it. Now this metallic copper, thus prematurely produced upon a furnace bottom saturated with regulus, will take the place of the regulus, and in time convert the whole body of the furnace into the metallic state, causing a heavy and useless lock-up of copper in metal furnace bottoms, while an undesirable by-product is produced. If, however, it is desired to pass the regulus under treatment through the "best select" process, as before described, these inconveniences must be put up with, and are to some extent recouped by the improved quality of the copper produced from the regulus. The accurate arrangement of mixtures and calcination, so as to insure "white metal" as a standard product of the metal furnace, is the object which every good smelter seeks to obtain: and yet I well remember when that very product was unknown in the best German works. In 1845, when I went to Germany, with a view of carrying out the new silver process, I took with me pieces of "white metal," being convinced that that product was the right one to treat. I remember showing it to several of the leading men at Freiberg, who would not believe that it was a pure furnace product, so little was it then known. My old friend Ihle, then the rising young smelting official at Freiberg, who was struggling to get reverberatory furnaces introduced, it is true knew it well, for he had spent some time at the Hafod Works. I took the specimens on to the Mansfeld Copper-Works, where I found them working with 40 per cent instead of 75 per cent regulus in their silver extraction, whereby their costs were nearly doubled. The manager of that works was Herr Ziervogel, the inventor of the silver extraction process, which by his aid I afterward carried out at Hafod. He was one of the ablest metallurgists I ever met, and was the manager of the largest copper-works in Germany; yet at that time (1845) he was completely unacquainted with "white metal," never having concentrated copper regulus beyond 50 to 60 per cent. At first, he was incredulous as to our being able constantly to produce it, and he also doubted whether it would work in his silver process. I, however, insisted upon its being made the basis of our operations; and when he came to Hafod and worked with it, he soon saw I was right; yet when I visited the Gottesbelohnung Works, three years later, I found them still working with 40 per cent regulus, to their great loss and cost. I do not state this from memory, but from full notes made at the time, which are before me as I write. I mention this to show how far in advance of the rest of the world South Welsh copper smelting was when I first knew it nearly forty years ago.

I must now return to our regular copper smelting process. We have advanced to "white metal," pure (or nearly so) sulphide of copper of, say, 75 per cent—Le Play gives it as high as 77.4 per cent, with 0.7 iron, and 21 per cent sulphur. The next process is what we call "roasting," during

which the whole of the sulphur is expelled and the copper reduced to an impure metallic condition known as "blistered copper." Le Play's analysis gives it as 98.4 per cent copper, 0.7 iron; nickel, cobalt, manganese, tin, and arsenic, 0.7; sulphur, 0.2. It is very remarkable how completely the sulphur has been driven off. This "roasting" process is a very beautiful and delicate operation; and as I am not aware that any thoroughly good account of it exists, I think it will be interesting and instructive if I read a description of it by our Mr. William Morgan, who has for forty-seven years managed our Hafod Copper-Works with the utmost ability and intelligence:

COPPER ROASTER.

"The material operated on in these furnaces consists of white or pimpled metal from the metal furnace—regule from the selecting process, as well as the metallic bottoms from the same process. In the old method of smelting, for ordinary tough copper, no selecting process was adopted, but the metal just as it came from the metal furnace was used, as is now done, both for tough and best selected copper. The pigs of white metal from the metal furnace are broken into large lumps and introduced into the roasting-furnace by means of a paddle, and piled up as high as possible in the middle of the furnace. The temperature of the furnace is raised very gradually, so as to produce a very slow fusion, the melted metal falling down in drops, all the while subject to the oxidizing action of two streams of atmospheric air, introduced through two holes (plug-holes) at the back of the furnace one in either side of the bridge. After the whole has been melted down, the temperature is considerably raised (the air-holes being closed up for this purpose), and the surface of the melted metal freed by 'skimming' from it any slag floating on the face of the charge. The air-holes are then again opened, as is also the head of the fire-place, and the charge cooled down till quite 'set' or hard. During this operation, called 'setting,' the whole charge becomes a spongy mass, and swells to twice or thrice its original thickness when in a melting state. The theory of the roasting process is just this: When sulphide of copper in a melting state is exposed to the action of a current of atmospheric air, decomposition of the sulphide occurs and sulphurous acid gas and oxide of copper are the result. The thin film of oxide of copper produced on the surface is immediately acted on by the sulphide of copper with which it is in contact, and sulphurous acid and metallic copper are the result, the gas passing off through the chimney, the metallic copper from its greater specific gravity falling through the melting mass to the bottom of the furnace, where it is protected from further oxidation. In the production and reduction of the oxide of copper, dense volumes of sulphurous acid escape, and, as the reduction takes place mainly under the surface of the melted metal, the gas resulting from this reduction forces up the cooling metal, until the whole mass assumes the spongy consistency above referred to. When the whole charge has been thoroughly cooled down, so as to become black and hard, the temperature is again raised, but very slowly and gradually as at the first. The object both of the first slow melting and the subsequent remelting of the cooled and raised mass is the production of surface action. In this way, almost every portion is brought under the oxidizing influence of the atmosphere.

"Generally speaking, long before the whole of the charge has been remelted, the experienced workman finds, from the large production of oxide of copper, that it is necessary to cut off all further access of atmospheric air, to prevent the whole or a large portion of the charge from becoming oxidized. If the oxidizing process has been conducted first to the right point, it will be found, after the whole of the charge has been melted and the surface freed from slag (which is mainly silicate and aluminate of copper), that the copper when tapped into pigs and cooled has a smooth, blistered appearance, which appearance has given a name to the product of 'blistered' copper. This process occupies twenty-four hours, and the charge varies from two and a half to four tons of copper." This process is essentially South Welsh, although it is now of world-wide use.

The system of concentration from ore-furnace regulus to black copper varies somewhat in continental works; but it may be generally described as consisting of first burning the regulus repeatedly in heaps or in kilns, and then melting it in a blast-furnace, whereby a portion of the copper contents is obtained as black or impure copper of 90 to 95 per cent, with about three per cent iron and one per cent sulphur, while the remainder of the copper flows out as regulus varying from 51 to 61 per cent copper, 16 to 18 per cent iron, and 20 to 24 per cent sulphur. It will be observed that the blast-furnace, owing to its reducing action, produces at one and the same time black copper and regulus never exceeding 61 per cent, while the reverberatory furnace gives one pure product of 75 per cent, which is easily and cheaply reduced into copper of upward of 98 per cent. The superiority of our process over the other is now universally recognized; and our process has been substituted for the old continental system, I believe, in most works.

The same observation applies to the final process of refining. Here again, I think, I can not do better than read to you an admirable description of our refining process, written by Mr. William Morgan, who has been a practical refiner all his life, rather than attempt to write one myself.

(TO BE CONTINUED.)

PETROLEUM—ITS PRESENT SITUATION, AND THE OUTLOOK.

The condition of things in the producing region has somewhat changed since our last report, and, as we view it, for the better—at least, so far as better prospective market prices are concerned.

The production has shown a decline of a trifle over four thousand barrels per day. The older parts of the field are exhibiting unmistakable signs of weakness, and the only remaining "rich streak," which is known as the Moody tract, within the defined area, has, in the opinion of many of the operators, clearly had the "cream taken off of it."

While the shipments from the region have been exceedingly small and the runs into the pipe-lines have been exceedingly large, we are inclined to regard this, to a considerable extent, as artificial; and as an indication that the largest refining interest has thus used its control to make a weak market for crude, in order that that interest may acquire a larger owner-

ship of the crude stock. Such a course is made feasible by the ownership, by the refining interest, of the principal pipe-line in the region.

This being the duller season of the year for the refined trade—sandwiched as it is half-way between the closing of the home trade and the opening of the export trade—an excellent opportunity is now offered to, and to all appearances, embraced by the refining interest of absorbing excess stock of crude. As quite a large new refining capacity is about completed in different parts of the country, and as the railroads, as well as this new refining capacity, are likely to make competition for the coming season, it is obvious that a control of the crude stock will give to the interest holding such control a large command of the trade—a leverage with which that controlling refining interest may make profits for itself while unmaking profits for its antagonistic competitors. This can easily be done by making the crude market uncertain and speculative.

The visible stocks of refined in the several European ports have become so reduced as to be altogether inadequate, and we are advised, upon trustworthy authority, that the stocks distributed in the interior have decreased considerably, and are now very meager.

Estimating the trade of the present year by the past, we may predict that an average of fifty-five thousand barrels of crude per day, for the year, will be required to supply the demand; and should the production continue to decline at the present rate, we shall be drawing on our stocks before the end of the season.—*Stowell's Petroleum Reporter, March 19.*

PETROLEUM STATISTICS.

COMPARATIVE SYNOPSIS OF REPORTS FOR JANUARY AND FEBRUARY, 1881.

42 GALLONS=1 BARREL.	1881.			
	Jan. 31 days.	Feb. 28 days.	Increase in Jan.	Decrease in Jan.
Production for the month..... bbls	2,244,090	1,912,128	.....	331,962
Daily average..... "	72,390	68,326	.....	4,064
Stock at the wells..... "	1,992,470	1,931,787	.....	60,683
Iron tank stock..... "	18,118,433	19,176,216	1,057,783	.....
Total stock..... "	20,110,903	21,108,003	997,100	.....
Number of producing wells..... "	14,900	15,050	150	.....
" drilling wells..... "	383	420	37	.....
" " completed..... "	222	205	.....	17
" " dry holes..... "	6	9	.....	3
Aggregate daily production of new wells..... bbls	5,334	4,880	.....	454
Average daily production of new wells..... bbls	24	23 7-10	.....	3-10
Number of rigs building..... "	455	472	.....	17
Total shipments out of the region, bbls	1,061,917	.....	.....	.....

—*Stowell's Petroleum Reporter, March 19.*

MAINE MINING NEWS.

Special Correspondence of the Engineering and Mining Journal.

Maine has at last got a mine that is making weekly shipments of bullion. The Sullivan & Waukeag has made two shipments, and will probably make its third on the 5th inst. The first, of four bricks weighing 3750 ounces, was made March 23d; the second, four bricks weighing 3033 ounces, was made March 30th. The mill is running well, and there will probably be regular shipments hereafter. In the mine, the vein in the bottom of shaft No. 1, at a depth of 260 feet, shows a pay-streak of fine ore 4 feet wide.

At the Milton, in No. 1 shaft, the cross-cut is in 280 feet; and in shaft No. 2, the north cross-cut is in 130 feet, having just passed through a twenty-foot quartz vein containing some mineral. A cross-cut from No. 2 will soon be started to intersect No. 1, to assist in ventilating the mine. A large fan-blower has been added to the equipments, to furnish pure air for the levels.

At the Golden Circle, 100 tons of good ore are ready for shipment to Portland, where the company has a five-stamp mill nearly completed. The machinery, having arrived last week, is getting into position as rapidly as possible. The shaft is down about 90 feet, part of it being on an incline. The whole distance is in vein-matter, and shows a large quantity of rich quartz.

The Gouldsboro' is stoping handsome ore, and the mill is turning out two or three tons of concentrations daily.

At the Cherryfield, the galena continues to increase in quality and quantity.

At the Blue Hill, work is progressing on the smelting-furnaces, and the increased output of ore indicates steady work on the vein in the levels.

At the Douglas, a large amount of capital is laying out in constructing large and substantial smelting-works. The shaft is inclined, and has followed the vein, so that no waste rock has been taken out. There are about 200 feet of levels, from which is stoped ore in large quantities. About 1000 tons of this ore have already been roasted in the open air. The mill is idle.

At the Twin Lead, steam-works have been put in, and show an improvement over the horse-whim for hoisting from below 100 feet. The smelting-works at this mine are not as extensive as at the Douglass, but are much nearer completion, and will very soon produce some copper matte.

Until recently, our mines had been free from serious accidents. About three weeks ago, a miner in the bottom of Waukeag shaft was struck on the head by a plank which fell from one of the levels, from the effects of which he died the next day. A few days after, the foreman of the Revere mine, in Blue Hill, fell down the shaft, about 130 feet, escaping with a broken ankle. Last Saturday, at the Granger mine, in Blue Hill, by the accidental discharge of one of the cartridges, which failed to explode when the others were fired, three men were thrown part way up the shaft and fell badly mixed up with the rocks. However, all three are doing well, and there will probably be no unfavorable result.

ELLSWORTH, ME., April 4.

DOUGLASS.

PROGRESS IN SCIENCE AND THE ARTS.

Russian Iron-Making Plant.—A writer in *Dingler's Polytechnische Journal* for February states that the chief ores worked are magnetic, brown and red hematite, and spathose ores. The fuel generally used is charcoal. The furnaces are chiefly of very old form, built of stone or brick the interior rectangular, and the well round; they are generally cold-blast, and their height varies from 30 to 50 feet; in Central Russia, the average is 40 feet. All the systems of blast-heating are in force, and the blast-engines are various. In the old furnaces, single-cylinder vertical engines are generally used; the furnaces of newer construction have double-cylinder vertical engines, sometimes oscillating cylinder engines. A small number of furnaces in South Russia use coal.

The Relations between the Atomic Weights.—The hypothesis of Prout, according to which the atomic weights of the elements are exact multiples of the atomic weight of hydrogen = 1, was shattered long ago by the researches of Schützenberger. By means of careful investigations and the application of trustworthy methods, a series of atomic weights has been determined, on comparing which it would be in vain to search for a common factor. But there are certain relations between the atomic weights of the elements of one and the same group, as was pointed out by Dumas, and which have been more closely examined by Gerber. He finds for the monatomic elements the common factor .769; for the oxygen and magnesium group, as also for carbon, silicon, and certain other elements, the factor 1.995; for the nitrogen group, along with boron, bismuth, and gold, 1.559; and for the other metals, 1.245. These factors are purely empirical, without mutual relation, and in themselves of no value. Whether the detection of such numerical relations will be of real service to chemical research must, says the *Chemiker-Zeitung*, the authority for the above fact, remain undecided.

Periodic Movements of the Ground.—The *Chemical News* gives from the *Comptes Rendus* of the Académie des Sciences, the observations of P. Plantamour on the movements of the ground from October 1st, 1879, to September 30th, 1880. The most remarkable feature is the sinking manifested on the eastern side from the end of November, 1879, to the end of January, 1880, which is much greater than might be expected from the absolute cold of December, only -15°. A rise of temperature is always accompanied with an elevation of the ground level, and a fall of the thermometer is marked by a subsidence.

Styrian Forestry.—Mr. Samuel Noble, of Anniston, Ala., read a paper on this subject at the annual meeting of the United States Association of Charcoal Iron Workers, at Harrisburg, October 21st last. The forests of Styria are mostly spruce pine, the wood being as soft and light as the white pine of our Northern States. The trees do not grow very tall, but put out a large number of branches to within five or six feet of the ground. The simple yet perfect and easy system by which the forests are preserved and extended is worthy of study and imitation here, where the evils arising from the destruction of our forests are more and more apparent every year. The timber is cut against the wind; that is, the heavy fall winds that uproot the trees and scatter the mast from the cones, which open in October. A strip is cut, not exceeding 200 meters in width, and any length required; it is then left until the winds have blown the mast from the standing forests over it: when the new plants have sprung up, another strip is cut, and so on. By cutting against the wind, the line of trees is protected from the frequent and heavy storms. Cutting at once a large tract renders it difficult to obtain a second growth; the soil, exposed to the sun and high winds, becomes dry, and the fallen mast perishes on account of the absence of moisture and nourishment. If pine be the timber cut, the second growth is generally pine; but if beech should be scattered among the pines, the second growth would be beech. When a beech forest is cut, and birch follows as a second growth, it is necessary, in order to obtain beech, to plant in the shade under other trees. Mr. Noble describes the gardens, located at points convenient to the forests where the trees are to be set out. At the end of the third year, a perfect miniature tree, twelve inches high, is obtained, which is taken up and planted where the second growth is not thick enough, or in the production of new forests. The laws against firing forests are very stringent—ten years' penal servitude. It is regarded as a greater crime than burning buildings. All the population is dependent, directly or indirectly, on the forest for a living; nearly 80,000 persons being dependent on forges, blast-furnaces, and other iron works, which are, in the absence of mineral coal, worked with charcoal as fuel. Where the game and timber are not likely to be disturbed by the surrounding population, one forester can protect 2000 acres, cut out, take up, and transplant the under-growth. Mr. Noble then contrasts our very great natural advantages over Styria in perpetuating our forests, and recommends special legislation to prevent our timber lands from becoming barren wastes, affecting the climate, the soil, the water-courses and springs, and the health of the whole country. Mr. Noble's paper, and the address which preceded it, by Prof. Franklin B. Hough, United States Commissioner of Forestry, on "The Importance of giving Timely Attention to the Growth of Woodlands for the Manufacture of Charcoal for Metallurgical Purposes," called forth a long and animated discussion from the members of the Association, recorded in their *Journal* for January, 1881, which we heartily commend to our readers.

New Railroad Construction.—The *Railroad Gazette* of April 1st reports 40 miles of new railroad, making 541 miles this year, against 795 miles reported at the corresponding time in 1880, 298 miles in 1879, 226 miles in 1878, and 165 miles in 1877.

The California & Nevada Railroad has been incorporated for the purpose of constructing a narrow-gauge road from San Francisco to the Nevada State line at or near Dexter Wells, a distance of about 250 miles. The Carson & Colorado Railroad is now completed to a point 88 miles from the Mound House, its starting-point in Nevada.

AMERICAN STEAMSHIP COMPANY.—This company is controlled by the Pennsylvania Railroad Company, and runs a line of steamships between Philadelphia and Liverpool. Its report for 1880 shows gross earnings \$42,984; working expenses, \$730,759; net earnings, \$212,235.

GENERAL MINING NEWS.

ARIZONA.

Our Arizona exchanges have the following notes:
ARIZONA QUEEN.—The work of development is pushed vigorously. Three shifts are busily employed sinking a well-timbered shaft on the vein, now down thirty-five feet. Another shaft will be started in a few days to be sunk 200 feet, at which depth the two shafts will be connected. At present, some very rich ore is hoisted, and although the ledge is not large, it has good walls, and the close proximity to the great producing mines of the camp makes it valuable property.

MYERS DISTRICT.

From a letter written to the *Citizen* we condense the following: Some very heavy mining sales have been made recently to Eastern capitalists, and great activity prevails throughout the district. The Mineral Bed Company is placing its mine in condition for extracting ore. The main shaft is timbering and roads are building. The Morning Star is sinking a shaft; the vein is 5½ feet in width, and the ore is said to carry a black sulphuret of silver. Westward is worked on an incline shaft; the vein is said to be 12 feet wide. On the 200-foot level in the Gunsight very important developments have been made, two veins coming together, and forming a large, strong, rich body of ore; the shaft is all in ore. The extent of this ore-body we can not tell until a cross drift is run. Silver Girt North has sunk a shaft 60 feet.

TOMBSTONE DISTRICT.

SULPHURET.—The Tombstone *Epitaph* has the following: On the 22d of March, a heavy flow of water, about a thousand gallons per hour, was encountered in this mine while sinking the main shaft at a point 20 feet below the 500-foot level.

TOMBSTONE MINING AND MILLING CO.—The east incline in the Good Enough advanced 40 feet during the past week, making its total length 325 feet—all in ore. The drift east from the new shaft of the Tough Nut, 200 level, is in 15 feet of ore. The north drift, same shaft, cut 12 feet of good ore, 46 feet from the shaft, and the face is now in porphyry. The new superintendent, Prof. John A. Church, arrived at the mines April 1st.

CALIFORNIA.

THE BODIE DISTRICT.

The *Free Press* of the 29th ult. epitomizes as follows:
 Bodie Consolidated is drifting south, on the Fortuna vein, from the bottom of the south winze from the sixth incline level (the deepest point yet reached in the mine), in very rich ore, which is of great importance, as going to show that that vein grows even richer as it descends. Jupiter also appears to be making an important development in the south drift from east cross-cut No. 2, 600-foot level, giving assays well up in the hundreds. Concordia shows continued improvement in the north drift on the large east vein, and the south drift on the west vein is still giving high assays. Consolidated Pacific is making a fine showing by its north drift in Pacific lode No. 2, 500-foot level. Standard's west cross-cut, on the 1000-foot level, is still in favorable ground, and all the stopes in the mine are looking well. Tioga is still driving the east cross-cut, 982-foot level, and now in ground indicating the proximity of an ore vein. The north drift, 300-foot level of Boston Consolidated shows the ore-vein on that level to be increasing in width and holding its good grade. Syndicate is stoping and milling ore and shipping bullion. Sinking has been temporarily suspended in South Bulwer, in order to prepare the foundation for the new hoisting-engine, which is daily expected. Godsbaw is still sinking, and the Lent and Red Cloud shafts are being steadily pushed downward. Addenda is making some repairs in the shaft, where the ground is swollen somewhat, and will soon resume drifting to the northward. The north drift in the Stonewall ledge, 400-foot level, of Bulwer Consolidated, is in two feet of ore. The Standard's new and powerful hoisting-engine is being put in position, and will be ready for steam within two or three weeks, and it is expected that as soon as it is ready a large additional force of miners will be put on to rapidly open up the lower levels. Work on the foundations for the powerful pumping machinery at the Lent shaft is progressing rapidly, all the machinery being now on the ground. The Noonday mill will start up again this (Tuesday) morning, with a new 350-horse-power Harris-Corliss engine and ten additional stamps, making forty in all—the largest mill in this section of the country. Pipe has been laid and water for both mill and mine will be drawn from the Red Cloud shaft. Both of the Noonday mines are looking well.

COLORADO.

CLEAR CREEK COUNTY.

LEADVILLE & PENNSYLVANIA.—The *Georgetown Courier* reports that work was resumed on this company's property on the 28th ult. A fifty-foot contract has been let to drive the cross-cut tunnel ahead, which is now in about 120 feet, and it is expected that the Hall lode will be cut before the contract is completed.

LUCERNE.—Still sinking the east shaft. A vein of mineral was found in the west level, but apparently on top of an ore-chimney, which can only be reached by deeper explorations. This is being done.

RED ELEPHANT.—There are about 60 lessees at work in this company's mines, and many of them are in excellent pay.

CUSTER COUNTY.

BULL-DOMINGO.—The *Silver Cliff Gazette* says: The suspension of work in the stopes, ending for the present ore extraction from the Bull-Domingo, and the closing down of the company's concentrating mill in consequence, have been the sensation of the week. Orders were received on the 20th from the principal office in New York to pursue this course, and on the succeeding day the working force was cut down one half, by the discharge of about 80 men. Two reasons are assigned for the adoption of this unlooked-for policy, both of which are apparently valid. One is the accumulation of some 500 tons of concentrates at the mill, owing to the lack of wagon transportation, the necessity for which is about to disappear with the completion of the railroad, which will be opened for traffic in two or three weeks; and the other, that the work of development has not been kept sufficiently in advance of ore extraction to insure a continuation of the mine's regular output. That this last is true was made known to the *Gazette* some weeks ago by Superintendent Callahan, with the intimation that a less force would soon be employed in the stopes, while that engaged in the work of development would be increased. That the ore in the second level is exhausted, is not in any sense true. The writer of this is cognizant of the fact that two full stopes above the 250 level have not been touched, each of which is estimated to contain from 1500 to 2000 tons of ore, while there is still a large quantity above the 150 level in the old superficial workings. At a recent visit to the mine, an ore-body of great promise had been uncovered on the foot-wall at about the level where that heretofore worked next the hanging-wall was proved to carry a less average value than at any point above. In the main shaft and winzes, fifty-five men are now employed, and in a few weeks, at most, the old standard of production will be resumed.

LAKE COUNTY.

Speaking of the present condition and the future outlook of Leadville mines,

the *Leadville Herald* says: The mines have never been in a more favorable condition than they are to-day. Ore is not created in mines to supply the demand, and when worked out are exhausted. This is evident to all, and a number of properties which some time ago were prominent are now falling behind in ore production. That which, however, gives the present promise is the fact that the territory producing ore has been largely increased and new discoveries have been made in so many localities that, while some properties have become exhausted, others are coming to the front and the production of ore is not lessened. The east side of Fryer Hill has proved the richest section yet discovered about Leadville, the Robert E. Lee, Matchless, Big Pittsburg, and others having yielded ore that finds no equal from any other part of this section of country. The strike in the Big Pittsburg has had no equal except that in the Lee. New discoveries are making on the south and west sides of Fryer Hill, which show the ore-body continuous in that direction. Crossing Dry Stray Horse, the Surprise claim of the Hibernia, the Denver City, and other recent developments, prove that entire section of value equal to Fryer Hill. On the north side of Carbonate Hill, the greatest improvement has been made in the past few weeks. The north part of the Morning Star consolidation is the richest part of the territory of this extensive property. The Henriette, which for many months was worked at a loss, has reached and developed one of the finest ore-bodies ever developed, and is now among the most productive mines of Leadville. Over Carbonate Hill there is little change, and the mines give greater promise, and have more ore exposed, than ever before in the past. On Iron Hill, the Silver Wave has doubled its previous output and shows large ore-reserves, while the Iron is shipping two hundred tons of ore a day, and the Silver Cord doing fully as well as ever before. The outlook is a favorable one, and the territory tributary to Leadville is vastly increased over what it was a year ago. The smelters are well supplied with ore, the bullion production is not decreased, and instead of retrograding the prospects are certainly flattering.

LEADVILLE PAY-ROLLS.—The *Leadville Democrat* says: The Little Pittsburg pay-roll numbers 195 names, and the amount paid was \$17,540. The Chrysolite contains about 250 names, and the amount paid for wages is \$25,000. The Little Chief employed during the past month about 90 men, and the labor account is \$6700. The Dunkin's roll contains the names of 80 miners, and the checks drawn for labor aggregate \$6200. The Amic has about 20 miners, and pays \$2500. The Big Pittsburg has averaged about 45 men for the month, and \$3500 is required to settle their demands. The mine will employ more men in the future. The Matchless has the smallest, considering the amount of ore produced. The roll shows only twenty-four men, and a labor account of \$2700. The Hibernia reports thirty-one names, and disbursements to the tune of \$3000. The Robert E. Lee employs one hundred and ten men, and yesterday made out checks for \$3000. The Little Silver mine has in its employ forty men, who draw every month \$3700. Besides this, there are five prospect properties that employ about thirty-two men and pay \$3000 per month in the aggregate. This shows a total number of 1018 men employed on Fryer Hill, in various capacities, who draw every month \$82,340.

BREECE.—The Breece Iron mine is producing and shipping 50 tons of ore a day to the Colorado Iron-Works at Pueblo, and will shortly commence shipping 100 tons per day. In addition to this, an average of 20 tons per day is being consumed by the local smelters. A contract has been made with the Robinson management to furnish the smelter of the company at Robinson camp the iron necessary for the smelter.

CHRYSOLITE.—This mine has for the present discontinued ore-shippments.

IRON.—The Rock and Dome mines, belonging to the Iron Silver Mining Company, and located on the south side of California Gulch, are now producing about 70 tons of ore per day.

The *Leadville Democrat* says: Several months ago, the main incline in the Rock mine encountered a lime roll, at the depth of 250 feet. A prospect-drift was then driven over the lime in contact, in order to define the roll or upward wave. This was found to pitch down again, and meet the line of the incline 250 feet distant. The incline was then driven ahead again, and recently emerged from the lime and struck a five-foot body of good ore in about twenty feet of vein-matter. The strike was made but a short time ago, and the territory contiguous has not been explored in order to ascertain the ore-body, nevertheless the new developments are of great importance. The incline is now 500 feet in length, and cross-cuts will be commenced near the face, in mineral, in a few days. The present product of the mine comes principally from the first and the second levels south, which are in an immense ore-chute passing over into the Dome claim. The Dome mine is also producing considerable ore, and is looking very well. A drift starting to the northward, 500 feet from the mouth of the incline, has just effected a connection with the first level of the Rock mine. The distance between the two inclines is over 500 feet. Hereafter the bulk of the ore mined in the Dome will be hoisted through the Rock incline, where there is a good hoister, ore-house, and other facilities for handling ore cheaper than at the Dome, where the hoisting is done by a whim, and no surface improvements exist.

LA PLATA.—From the same source we learn that the Oro La Plata, the property of the La Plata Mining and Smelting Company, located just below the Rock mine, is shipping from 30 to 40 tons of ore per day. The mineral shipped from this mine runs exceedingly high in lead, and is a most desirable smelting ore. Recently, a 70-foot winze was sunk from the end of the tunnel, which is 800 feet long, and a fine body of sand carbonates discovered. The new strike is several hundred feet from the other ore-bodies in the mine, and a drift is now running to connect with the Rustin shaft, where a hoister is stationed, and the ore can be more economically hoisted to the tunnel level.

LEADVILLE CONSOLIDATED.—Says the *Herald*: In the sixth level north from the main incline on the Carbonate mine of the Leadville Company, the drift has been extended into Little Giant ground, which was recently purchased by the Leadville Company. The fifth level is also driving toward the line. A good ore-body shows in the face of the sixth level, and ore is also found between the third and fourth levels.

ROBERT E. LEE.—According to the *Democrat*, this mine has largely increased its production within the past week, and they are now double what they were a fortnight ago. The drift running eastward under the sampling-mill has disclosed some very fine hard carbonates and flint, running very high in chlorides. The south branch of this drift is also showing up increased bodies of five hundred ounce sand. A drift driving to the northwestward a considerable distance beyond the old workings has proved a success, and gives indications of encountering the extensive rich streak of horn-silver. The new shaft is pushed forward with all possible haste, and it will now be only a short time before ore can be hoisted through this new opening.

IDAHO.

The *New York World* of the 4th inst. contains an interesting letter from a Bonanza City correspondent, descriptive of the Salmon River region. We quote from it as follows: The Yankee Fork District occupies the center of the Salmon River country. The most notable discoveries are on Norton Hill, Mount Este, and Custer Mountain, three landmarks embraced in an area of only about as many miles square. The formation is porphyry, and the ores almost universally either free gold or sulphurets of silver. Several prominent mines combine these two classes of ore in about equal portions. Norton Hill was first to attract general attention. The discovery was unmolesated until in June, 1876, when Mr. Norton obtained a hand-mortar, devoted daylight to stripping the surface of the vein, and his evenings to pounding out selected quartz, and in just thirty days started out with \$11,500 worth of bullion thus obtained to pay his debts. Two men then took out ore for three months, which was shipped to Salt Lake City

and Europe at an expense of from \$200 to \$300 per ton for freight, and realized a net profit of \$15,000. All the ore thus shipped paid over \$1000 per ton net. The following season (1877), development of the mine was commenced in earnest. A tunnel has now progressed 400 feet, 360 of which is on a solid ore-body averaging 3 feet in width and the walls being 4 1/2 feet apart. The vein runs nearly east and west, and is nearly vertical. In 1878, an arrastra, consisting of one pan and settler and two beds, was erected. From August 25th to the middle of November, the arrastra with two men in charge ground out \$32,000. In 1879, the arrastra was operated five months, and produced \$40,000; last year, the production was about the same; and the total yield of the mines up to December has been about \$125,000. Eight men have been employed at the mine regularly winter and summer for nearly three years, and have accumulated an average of 3000 tons, assaying \$60 per ton, and below the slow-going and wasteful arrastra is a pile of tailings of 300 tons, assaying \$80 per ton. By roasting the ores, this neat fortune, which has in three seasons run through the arrastra, will some time be saved. The bullion turned out is half silver and half gold. A second tunnel or level, 120 feet below the first, follows the vein 580 feet, showing the ore-body to be a little larger than on the upper level, and the product contains more silver, while it is also more refractory. A winze connects the two mines. While at the mine, I was shown an open cut on the vein 50 feet long and 10 feet deep, from which \$40,000 was taken. To secure the product above noted, stoping has been done only on the first level, and the greater portion of the ore-chimney above that level still remains intact.

Only a mile from Norton Hill is Mount Custer, which holds in its embrace at least one ore-body whose prodigious extent and marvelous richness know no precedent. The General Custer mine is situated about three thousand feet above Yankee Fork River. It was discovered in September, 1876. The ore-body is exposed about 600 feet along the mountain-side, and is from 100 to 200 feet wide. It is a mountain of quartz, whether it is found to "go down" or not, and there is much difference of opinion as to its character—whether it is a fissure, simply a displaced "blow-out," or a slide from some still larger deposit. Up to 1879, when Messrs. Hagin & Tevis, of San Francisco, bought it at a valuation of something like \$400,000, a cut 30 x 40 feet in the face of the vein or deposit had yielded \$250,000 worth of ore. The shipments have returned from \$700 to \$1200 per ton. During my visit, miners were swarming over the vast ore-face like bees about a honey-comb, blasting, prying, and rolling down the quartz. Twenty per cent of the assay value of the ore is gold, the balance silver. The ores are to be treated in a twenty-stamp mill, to be connected with the mines by 3000 feet of tramway. The ore is roasted, and the treatment is that familiar to all mining men as the dry-crushing process. It will have a capacity of twenty tons per day. A tunnel designed to strike the deposit at great depth has been started into the mountain several hundred feet below the outcrop.

Several locations bearing much low and some high-grade ore have been made on the course of the Custer vein, giving rise to the theory that it extends on eastward at least two miles from the point of discovery. They all carry very much the same character of rock as the Custer, but not in such large quantities. The Unknown, adjoining the Custer, furnished \$100,000 worth of ore in 1878, out of a very small cut. The Mooler arrastra, near by, ground out \$10,000 from its ores the past summer. By the way, this little arrastra, only a few removes from a hand-mortar, and not nearly as good as a two-stamp mill, turned out \$40,000 in gold and silver bullion in the summer months of 1879, and \$80,000 during the past summer.

As an instance of what a moderate amount of capital backed by good judgment will do in distant lands like this, I will tell the experience of the Bay Horse Mining and Smelting Company, an Omaha organization, operating three miles west of Salmon River, on Bay Horse Creek. The smelter consists simply of one water-jacket furnace, a five-stamp battery, and a Blake crusher, the whole run by a Leffel turbine-wheel of 35 or 40 horse-power. It was completed and fixed up about October 1st last year, at a total cost of \$35,000. The first thirty days' run the smelter produced base or lead bullion to the amount of \$100,000, and those who should know say that the company's profit on the month's work paid for the entire outlay on smelter and running expenses. The smelter was only operated until December 1st, cold weather interfering with the water-power and with getting ore and charcoal down from the neighboring mountain. The smelter has a capacity of twenty-five tons of ore daily, and the product is from three to four tons of base bullion, worth from \$800 to \$1000 per ton. This summer it will probably operate six or seven months, with a result averaging nearly as above noted.

Eighteen miles south of the Bay Horse smelter, in the heart of Kinnikinnick District, another Omaha company, the Salmon River Mining and Smelting Company, has just completed works of about the same capacity as those described above, but of a much more substantial and improved pattern.

MONTANA.

From our Montana exchanges we condense the following:

ALTA-MONTANA.—It is stated that this company has ordered two 75 horse-power Babcock & Wilcox boilers, five more stamps, three amalgamating pans, one more cylinder, one large revolving drier, and one Blake crusher. A deep tunnel is to be run on the Alta-Montana mine that will strike the ore-body at a depth of 700 feet.

BONANZA CHIEF.—This mine is now opened to a depth of 114 feet on its incline. The drift southward is in 45 feet, its entire width of 9 feet being in solid ore. At a distance of 75 feet from the incline, a cross-cut will be made in the drift, when the distance between walls will be known.

MOULTON.—The dropping of the three-compartment shaft is somewhat slower work than heretofore, as the rock is harder. The shaft has now reached a depth of 260 feet. There is no sign of water in the shaft yet. The double-cylinder hoisting-engines are in position. They are powerful machines, and finished off in beautiful style. A large force of machinists and workmen is engaged in putting the machinery in place. The foundation is ready to receive the three 75 horse-power water-tube boilers. Four Ingersoll drills arrived a few days ago. These drills are said to be the largest ever brought to Montana, and as soon as possible will be employed in sinking the main shaft.

NEVADA.

THE COMSTOCK LODGE.

The summary of the Gold Hill News for the week ending March 30th is as follows: The rise from the 2300 level of Sierra Nevada struck the station prepared on the 1700 level squarely. This station is 40 feet from the main shaft on that level, and the drift leading to it is undergoing an enlargement. Aside from this, there is nothing new in the mine. Utah is running south on the 2150 level. There is some likely ground in that direction, and from this lateral drift it can be prospected. The joint Union-Sierra Nevada winze from the 2500 level has yet 5 feet to sink before its engine can be placed. After this is done, it will be pushed to the 2700 level rapidly. The Union shaft will gain 10 feet of additional depth this week. Considering the ground, the size of the shaft, and the water, this is good work. It will not be long now before more will be known of the favorable ground into which the G. & C. and B. & B. shaft plunged before sinking there was stopped to rig the pumps in double line up to the Suro Tunnel level. The peculiarity of this formation is, that it assays better than it looks. Savage is cross-cutting on the 2000 level, and is getting kindly quartz mixed with clay. It is a more promising formation than that in which the other cross-cuts on this level were run, and carries fine iron pyrites—a good indication. It only remains to chamber a tank station and put the tank in it on the 1600 level before the hydraulic pumps of the C. N. S. shaft will be ready for a trial. As the Hale & Nor-

cross pumps are running, there is a prospect that the C. N. S. shaft may now be used for the hoisting necessary to excavate the station above mentioned. Both the Suro Tunnel and the Jacket are hard at work in completing their connecting drift and in getting in the drain-boxes, so that the pumps of the latter may be set in motion. The cool air flowing through this connecting drift is of great benefit to the tunnel drift, which was before a sort of "slough of despond" in places, and enables better work to be done in putting in the drain. Every thing along the lode, in fact, has a much better outlook than it had last week, and this is, doubtless, what has strengthened the market.

NORTH CAROLINA.

The main shaft of the Bullion gold mine, near Salisbury, N. C., is 100 feet deep, and there are six other shafts on the vein, varying from 30 to 55 feet in depth. From the main shaft, several levels have been run, at different depths, for the purpose of testing. The vein (a fissure) varies in width from 6 inches to 15 feet, and its ores are valued at from \$10 to \$30 per ton. A new mill-house is now building in which there is a new 10-stamp mill and a new 35 horse-power engine and boiler. The hoisting of ore will be resumed at once, and the mill will be started in about a week. There are 500 or 600 tons of ore on the dump.

PROPOSALS AND SALES.

For the benefit of many of our readers, we compile weekly such proposals and solicitations for contracts, etc., as may be of interest. The table indicates the character of proposals wanted, the full name and address of parties soliciting, and the latest date at which they will be received:

Erection of a new Erick School Building at Portchester; for particulars address Board of Education, Portchester, N. Y.	
Building a Ground Chimney 150 feet high, 15 feet diameter, at Bergen Point, N. J. Full plans and specifications can be seen at the works of the Oxford Nickel and Copper Company, at Constable's Hook, Bergen Point, N. J.; also at 292 Pearl st., New York.	
For Grading, Curbing, Guttering, Paving, and Construction of Cross-Walks on East Market street, from the old western boundary of Middlebury Township to the west line of Water street. The entire length of said improvement is in what is now known as the Sixth Ward of Akron City. The work proposed for including curbing, gutter-stone, corner blocks, paving, and crossings, shall consist of the kind known as Medina sandstone. No proposal will be accepted unless on a blank furnished by the City Civil Engineer, City Clerk's Office, Akron, O.	April 9, 1881.
Building a Sewer through the Village of Hull, according to plans and specifications made by Clement Herschel; Board of Health, Hull, Mass.	" 11, "
Transportation of Military Supplies in the Department of Texas during the fiscal year commencing July 1st, 1881, and ending July 30th, 1882. Blank proposals, form of contract, and printed circulars, stating the estimated quantities of supplies to be transported, and giving full information as to the manner of bidding, conditions to be observed by bidders, and terms of contract and payment, will be furnished on application to the offices of the Quartermasters at Fort Brown, Texas, New Orleans, La., and St. Louis, Mo.; Benjamin C. Card, Chief Quartermaster, San Antonio, Texas.	" 12, "
Building Five Stables at new Track of Coney Island Jockey Club, Sheepshead Bay; stables must be completed June 8th. For particulars and information apply at the Club office, corner Twenty-seventh street and Madison avenue, New York City.	" 14, "
For Making, Constructing, and Building, Alterations in and Additions to the Retreat Building at the Lunatic Asylum on Blackwell's Island; Office of the Department of Public Charities and Corrections, No. 66 Third ave., New York City.	" 15, "
Furnishing Slatting and Tinning required for the Alterations and Additions to be made to the Retreat Building at the Lunatic Asylum on Blackwell's Island; Office of the Department of Public Charities and Corrections, No. 66 Third avenue, New York City.	" 15, "
Improving Channels at Oswego Harbor, N. Y.; at Waddington Harbor, N. Y.; at Wilson Harbor, N. Y.; at Great Sodus Harbor, N. Y.; at Little Sodus Harbor, N. Y.; U. S. Engineer's Office, Oswego, N. Y.	" 25, "
Dredging in the Cape Fear River below Wilmington, N. C.; William P. Craighill, Lieutenant-Colonel of Engineers, U. S. Engineer's Office, 70 Saratoga street, Baltimore, Md.	" 26, "
Furnishing all the Postage-Stamps which the Post-Office Department may require for Public and Official Use during a period of four years, commencing on the 1st day of July, 1881. Blank forms of bids, with full specifications, will be furnished upon application to the Third Assistant Postmaster-General, Washington, D. C.; Thomas L. James, Postmaster-General, Post Office Department, Washington, D. C.	" 27, "
Furnishing and Delivering all the Cut Granite required for two Winding Stairways in the North Wing of the Building for State, War, and Navy Departments in this City; Office of Building for State, War, and Navy Departments, Washington, D. C.	" 28, "
Erection of a Monument to mark the Birthplace of George Washington; Department of State, Washington, D. C.	May 1, "
Furnishing Postal Cards for and during a period of four years, commencing on the 1st day of July, 1881. Blank forms of bids, with samples and full specifications, will be furnished upon application to the Third Assistant Postmaster-General, Washington, D. C.; Thomas L. James, Postmaster-General, Washington, D. C.	" 4, "
Raising, Cleaning, Painting, Replacing, and keeping in their proper positions all the Buoys now in the following localities, and such others as may be authorized, for one year from the 1st day of July next: Hudson River, between Albany and Troy; Hudson River, between New York and Albany; Lake Champlain; Pawtucket River; Fire Island Inlet, New York; New Inlet, south side of Long Island, N. Y.; Jones Inlet, south side of Long Island, N. Y.; Cable Island Inlet, south side of Long Island, N. Y.; Office of Lighthouse Inspector Third District, at Tompkinsville, N. Y.	" 11, "
Monument to be Erected in Rome for late Victor Emanuel II., First King of Italy; President of the Royal Commission, Cairo, and the Secretary of the Royal Commission, etc., Rome, Italy.	Sept. 21, "

ASSAY DEPARTMENT OF THE ENGINEERING AND MINING JOURNAL.

This department is opened for the benefit of miners, prospectors, and others interested in minerals.

Replies will be made in these columns, and without charge, to questions asked regarding the nature and commercial value of minerals, and of samples sent.

Assays determining the actual composition and value of ores will be made at the following rates. All assays are made with the utmost care by the most experienced and competent assayers:

Assay for gold.....	\$3.50	Assay for copper.....	\$3.00	Assay for iron.....	\$4.00
" silver.....	3.00	" lead (wet).....	3.00	" nickel and	
" gold and silver 5.00		" zinc.....	5.00	" cobalt.....	10.00

The amount should invariably accompany the order, and expressage or postage must always be prepaid.

Communications, samples, etc., to be addressed to
ENGINEERING AND MINING JOURNAL, 27 Park Place, New York
(P. O. Box 4404).

FINANCIAL.

Gold and Silver Stocks.

NEW YORK, Friday Evening, April 8.

There has been a fair business in mining stocks during the past week, without any particular features.

Alice has been a trifle weak, with sales of 800 shares at \$7.63@7.50. Amie has been quiet and irregular, the sales amounting to 17,400 shares at 46@50c. Basick only records 25 shares at \$10. Belle Isle has been weak, with sales of 500 shares at 60@45c. Bodie has been quiet and weak; the sales aggregate 410 shares at \$6.98@5.98. California has been more active than of late, and very weak; the sales amount to 4900 shares at \$1.45@1. Caribou records but 100 shares at \$2.50. Chrysolite has had a moderate business at irregular prices, the sales aggregating 7506 shares at \$5.75@6.38@6. Climax has been quiet and irregular, but strong at the close; the sales amount to 10,750 shares at 58@68c. Consolidated Virginia has been active and quite weak; the sales aggregate 12,530 shares at \$2.25@1.85. Copper Knob only records 2000 shares at 5c., and Deadwood 100 shares at \$10. Dunkin has had a liberal business at steady prices, the sales aggregating 14,275 shares at \$1.50@1.78. Eureka has been irregular but strong, with sales of 285 shares at \$25@27½. The sales of Findley amount to 9300 shares at 32@29c. Glass-Pendery has been quite active but a little weak; the sales amount to 8900 shares at \$2.20@1.95@2. Gold Stripe, with a business of 1635 shares, has been steady at \$3@3.10. Grand Prize has had a moderate business at about steady prices; the sales aggregate 1050 shares at 55@45c. Great Eastern has been quiet and steady, with sales of 5800 shares at 27@25c. Green Mountain has had a moderate business at strong prices, the sales amounting to 1600 shares at \$6.63@6.88. Hibernia continues to do an enormous business, the total amount of sales this week reaching 180,797 shares. The price has been irregular but strong, starting at \$1, reaching \$1.40, and closing at \$1.20. It is said that the mine looks well, but we have no authentic information to that effect. The sales of Homestake amount to 30 shares at \$26½@27. Horn-Silver has been dealt in to the extent of 250 shares at \$9@9.75. Hukill has been quite active, irregular, and strong, the sales amounting to 18,395 shares at 91c.@1.25@1.15. Independence has been moderately active at irregular prices; the sales amount to 4150 shares at 30@37@28c. Indian Queen records sales of 1200 shares at \$2.50. Leadville has been quite active and strong, the sales aggregating 22,555 shares at \$1@1.30. Little Chief has had an active business at very irregular but strong prices; the sales aggregate 26,150 shares at \$1.10@1.60@1.30. Little Pittsburg has had a moderate business at strong prices, the sales amounting to 2300 shares at \$3@3.65@3.40. Moose, with a liberal business, has been about steady, the sales aggregating 21,550 shares at \$1.60@1.45. Navajo has been active but irregular and weak; the sales amount to 20,800 shares at \$1.05@1.35@87c. Northern Belle records sales of 100 shares at \$14.75; North Belle Isle, 700 shares at 32@33c.; and Ontario, 150 shares at \$36½@36¾. Plumas has been dealt in to the extent of 500 shares at \$1.70@1.60. Rising Sun has been quiet and irregular, with sales of 1800 shares at \$3.10@2.95. Robinson Consolidated has been fairly dealt in at weak prices, the sales amounting to 2115 shares at \$9@9.25. Sierra Nevada has been strong, the sales aggregating 510 shares at \$7.50@9.13. The sales of Spring Valley amount to 200 shares at \$2.90. Standard has had a liberal business, but has been somewhat weak; the sales aggregate 1725 shares at \$25½@23½@24½. Starr-Grove has been steady, with sales of 1000 shares, at \$6.13@6.25. Stormont has been strong, with sales of 2100 shares at \$2¼@2½. Cedar Tree has been fairly dealt in at strong prices, the sales aggregating 2800 shares at \$2.15@2.40.

Alta-Montana has been irregular but strong, with sales of 2800 shares at \$2.05@2.20. American Flag has been dealt in to the extent of 5300 shares at 30@27c. The sales of Bald Mountain amount to 36,100 shares at 6@8c. Barcelona has been quiet and strong with sales of 2700 shares at \$1.10@1.65. Bechtel Consolidated records sales of 975 shares at 55@60c. Big Pittsburg has been moderately active at weak prices; the sales amount to 10,205 shares at \$3.90@3@3.20. Black Jack has been

dealt in to the extent of 1400 shares at \$1.30@1.25. Bonanza Chief records sales of 200 shares at 30@29c. Boston Consolidated has had a moderate business at irregular prices; the sales aggregate 9300 shares at 46@55@51c. Boulder Consolidated, with sales of 5400 shares, has been irregular, the price ranging from 85@77@80c. Buckeye records sales of 6000 shares at 18@17c. Bull-Domingo has been irregular and a little weak, the sales aggregating 6340 shares at \$2.40@2.10. Bulwer has been dealt in to the extent of 1890 shares at \$2.25@2.05@2.10, and Bye and Bye 1500 shares at 15@25c. Calaveras has been moderately active and steady, with sales of 12,000 shares at 22@20c. Caledonia (B. H.) records sales of 400 shares at \$1.70@1.95; and Carbonate Hill, 3000 shares at 16@20c. Catskill has been quiet and steady, with sales of 2600 shares at \$6.50@6.75. Central Arizona only records sales of 250 shares at \$5@4½. Cherokee has been moderately active at weak prices, the sales amounting to 12,000 shares at \$2@1.75. Cheyenne has been active and very irregular, the sales aggregating 13,800 shares at 80@70@83@76c. Consolidated Imperial has been quiet and steady, with sales of 3300 shares at 17@15c. Consolidated Pacific has been irregular, the sales amounting to 900 shares at 72@89c. The sales of Consolidated Pay Rock aggregate 600 shares at \$1.60@1.55. Dahlonega has been dealt in to the extent of 4100 shares at 8@7c. Dardanelles has had a liberal business at strong prices; the sales amount to 3300 shares at \$7.13@7.88. Dunderberg has been irregular, with sales of 1300 shares at 60@50@57c. Durango has been quiet and steady, the sales aggregating 7000 shares at 15c. Gold Placer records sales of 1000 shares at 43c. Goodshaw has been quiet and weak, the sales amounting to 2200 shares at 75@65c. Granville has been dealt in to the extent of 10,900 shares at 5@3c. Hortense has been quite active and irregular with sales of 28,700 shares at 56@65@54c. Iron Silver has been quiet and irregular, the sales aggregating 900 shares at \$3.85@3.70@3.80. Lacrosse records sales of 1200 shares at 30@27c. Legal Tender has had an active business at irregular but strong prices; the sales amount to 17,400 shares at \$2.60@2.85. Lucerne has been steady, with sales of 7000 shares at 12@13c. Mariposa Preferred has been quiet and weak, the sales amounting to 500 shares at \$6@5.50. Mariposa Common has been active and strong, with sales of 4780 shares at \$4@5@4.75. Mineral Creek has been very liberally dealt in at quite strong prices; the sales aggregate 22,700 shares at 73@98@87c. Miner Boy has had a fair business at about steady prices; the sales amount to 5200 shares at \$1.75@1.60. Moose Silver records sales of 300 shares at \$1.75. North Standard has been active and weak, with sales of 6900 shares at 19@15c. The Quicksilver stocks have been quite active and strong, Preferred recording sales of 7500 shares at \$63@68, and Common, 12,360 shares at \$15¼@20. Rappahannock records sales of 3000 shares at 13@11c. Red Elephant has had a fair business at strong prices; the sales amount to 7800 shares at 23@30c. Silver Cliff has had an active business at irregular but strong prices; the sales aggregate 23,180 shares at \$4.75@6.50@5. Silver Nugget has been very active and irregular. The price at one time jumped from 23@50c. and then went back again to 12c.; it closed at 24c.; the sales aggregated 129,525 shares. Silver Nugget, new stock, was liberally dealt in at prices a little weak; the sales amount to 15,200 shares at 57@50c. South Bulwer records sales of 4300 shares at 9@15c. Sutro Tunnel has been actively dealt in at irregular but weak prices; the sales aggregate 7465 shares at \$1.75@1.50. Tioga records sales of 200 shares at 45c.; and Tip Top, 50 shares at \$4. Tuscarora has been weak, with sales of 3900 shares at 14@10c. Unadilla has been dealt in to the extent of 7800 shares at 14@13c. Union Consolidated has been quiet and strong, the sales aggregating 420 shares at \$8.25@9.25. Vandewater has been liberally dealt in at irregular but strong prices; the sales amount to 17,200 shares at 49@58@53c. Willshire has been moderately active at strong prices; the sales aggregate 1250 shares at \$1.45@1.55. South Hite, new stock, records sales of 900 shares at 65@59c.; and Allouez, 200 shares at \$3.

UNLISTED QUOTATIONS.

Mr. L. V. Deforest, No. 70 Broadway, under date of April 8th, 3 P.M., reports the current quotations of unlisted stocks as follows:

	Bid.	Offer'd		Bid.	Offer'd
Barcelona.....	\$1.50	\$1.55	Patagonia.....	.....	\$0.75
Breece.....	1.45	1.60	Plata Verde.....	.....	2.50
Bald Mountain..	.06	.07	Rico.....	.....	.50
Carbonate Hill..	.15	.25	Rocker.....	\$0.25	.35
Con. Arizona....	.75	.85	Sacramento....	.....	.25
Empire of Cal..	1.75	.....	Santa Cruz.....	.....	.75
Empire, Utah... 2.00	2.25	.....	Sir Rodr'k Dhu..	.....	.25
Freeland.....	2.50	.....	Stormont.....	2.50	.....
Grand View.....	.....	.65	Silver Nugget,	.....	.....
Glass-Pendery.. 2.00	2.05	.....	new.....	.50	.55
Highland Chief. 5.00	8.00	.....	Silver Nugget,	.....	.....
Julian.....	1.75	.....	old.....	.30	.40
Lowland Chief..	.25	.....	State Line, Nos.	.....	.....
Mack Morris....	4.00	.....	1 and 4.....	1.40	1.50
May Flower....	.40	.....	State Line, Nos.	.....	.....
Native Silver... .50	.....	.....	2 and 3.....	5.75	6.00
New Philadel... .75	.....	.....	Starr-Grove....	6.25	.....
North Hite.....	.75	.....	Trinity.....	.....	1.50
O. K. & Winne- bago.....	1.00	.....	Vandewater G..	.57	.55

Secretary McCoy, of the Vandewater Gold Mining Company, states that enough funds have been raised to pay off all indebtedness and retire \$50,000 debenture bonds, and development operations will commence at once.

The *Evening Post* says that the little Hukill mine is, according to the report of a geologist, in a failing condition, and unable to produce more than sufficient to pay its debts for some time to come.

A dispatch from Salt Lake says: Work is steadily advancing on the large reduction-works of the Horn-Silver Company. A change of superintendents is talked of. It is rumored that A. G. Campbell, one of the original owners, will assume the management.

The *Evening Post* says: Glowing accounts of the condition and prospects of what are known as the State Line mines, of Nevada, are being furnished to the press of this city by parties interested in disposing of stock in these mines. The managers and the method of manipulation are the same as those of Little Pittsburg and Chrysolite.

The miners in the employ of the Martin White Company, says the *Ward Reflex*, have for some time past been working for \$3 a day and one share of stock, the company having the right to substitute coin for stock at any time, after first giving a month's notice. The majority of the miners have become dissatisfied with the arrangement, and a few days ago demanded \$4 a day. The demand has been referred to the directors.

At the annual meeting of the Telegraph Consolidated Mining Company, of Pinal County, Ariz., held in this city, Messrs. James Head, Vernon Seaman, Theodore Williams, William F. Clewell, and Robert B. Floyd Jones were elected directors for the ensuing year. At a subsequent meeting of the directors, Hon. James F. Casey was elected President; C. C. Murphy, Vice-President; and Lindley F. Seaman, Secretary and Treasurer.

A dispatch to the Mining Associated Press from Denver, Colo., says: A conflict of jurisdiction has arisen between the county judges of Summit and Lake counties in reference to the administration of the Robinson estate. The present administrators were appointed by the Lake County judge. The county judge of Summit County, where the mines are situated, has now appointed Dr. F. H. Sutherland administrator, who has given bond, with J. Y. Marshall and others as bondsmen. The appointment will tend to complicate matters, and, unless a compromise is entered into, the conflict will go into the courts for settlement.

The following dispatch dated to-day has been received from Silver Cliff, Colo.:

The new mill of the Silver Cliff Company was connected with the water-works on Tuesday, and immediately put to work. It is now in full working order, but it is impossible to state accurately the amount of ore crushed in so short a time, as the bins were all full of ore to start on. To-day, the whole mill has been at work, the stamps dropping 95 times per minute, and considerably more ore had been crushed than yesterday. The mill can probably crush 100 tons daily. The stamps now have six inches drop, which can be increased if necessary. The motion of the pulp in the pans and settlers is pronounced of a most favorable character to facilitate amalgamation. The mill is undoubtedly a success, and the only point to be determined is the extent of it.

The *Graphic* of the 7th inst. says:

Last Saturday, Judge Lawrence, of the Supreme Court granted an injunction restraining the merging of the Silver Nugget Mining and Mining Company, known as the old company, into the new company. The proceedings are based upon the complaint of Henry Watts, an old stockholder, who, upon the affidavits of Josiah Fletcher and Charles R. Callahan to the effect that the old company would not issue new stock upon the presentation of the original stock for that purpose, and that they contemplated other illegal acts, obtained

GENERAL MINING STOCKS.

Dividend-Paying Mines.

Table with columns: NAME AND LOCATION OF COMPANY, Feet on Vein, Capital Stock, SHARES (No., Par Val, Total levied to date, Date and amount per share of last), DIVIDENDS (Total paid to date, Last Dividend), HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE (April 2, April 4, April 5, April 6, April 7, April 8), and SALES.

Non-Dividend-Paying Mines

Table with columns: NAME AND LOCATION OF COMPANY, Feet on Vein, Capital Stock, SHARES (No., Par Val, Total levied to date, Date and amount per share of last), DIVIDENDS (Total paid to date, Last Dividend), HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE (April 2, April 4, April 5, April 6, April 7, April 8), and SALES.

Q. Gold. Silver. s. I. Lead. & Copper. *Non-Assessable. †The Deadwood mine paid in dividends, previous to the consolidation, \$275,000. Total shares sold during the week, 918, 573

the injunction. An officer of the company said yesterday that the action was simply a vexatious suit, and that nothing illegal could be proved against the old or new company. If, said the officer, this consolidation had not been attempted, the property of the old company would have been sold by the sheriff long ago. We propose to work the mine thoroughly, and there appears little doubt but what all debts can be paid within a short time. The debt is about \$100,000, and the \$30,000 to be received from the reorganization will be applied to mining operations only. The product from the mine promises returns at the rate of from \$10,000 to \$20,000 monthly. Argument will be heard to-day before Judge Lawrence, and we anticipate a speedy dissolution of his order.

OFFICIAL LETTERS.

Alice.—A telegram from the superintendent, dated Butte, April 7th, says:

The 700 level is looking well; body of ore is increasing in width; drift now in ore, which assays an average of \$100 per ton.

The present output of this mine is over 80 tons per day.

Allied.—The president telegraphs from the mines: Have two feet solid 50-ounce ore in old level of the Emily; have run on it 20 feet, and it is continuous and permanent. Superintendent says it promises to be one of the largest chimneys yet struck.

An order has been given to increase the daily capacity of the concentrating mill from fifty to eighty-five tons, and it is understood that this will not delay the completion of the mill as provided in the original contract. It is expected that the mill will be shipped this month.

Barcelona.—The superintendent telegraphs, April 7th:

Ore in south level improving; chamber nearly finished for machinery; sinking winze in rich ore.

Big Pittsburg.—The superintendent, under date of April 3d and 5th, says:

Ore-shipments amount to 20 tons of medium third-class since last settlement, and I have \$10,000 worth of mineral in the ore-house. Am breaking 5 to 8 tons daily. Am running drifts along Hibernia line, north and south from uprise yet. Best quality is in north drift. No pay-ore from west uprise yet. Contractor has stopped work on new Lent shaft on account of water: am putting machinery on, and will resume the work as soon as possible. Governor Tabor has bought the Jackson, which covers same ground as Daisy and Emma. I shall start a shaft near that discovery next week. Have reached north end line, and will start west along north line to-morrow, on a splendid face of mineral 8 feet high. Have to work with extreme care on account of bad roof. Will move engine to Lent shaft to-morrow.

Bull-Domingo.—The general management has ordered the suspension of all work, except continuing the sinking of the shaft. Sixty men have been discharged, and production stopped at the mine, and the concentrating mill closed down. The causes assigned by the company are, first, that it desires to push the main shaft down to a depth of 500 feet as quickly as possible, to explore the ore-body; second, the cost of transportation of ore to the smelter is greater than the company feels justified in paying until the completion of the railroad to Silver Cliff, which will occur during the present month. The company has 500 tons of first-class ore on hand, which will be held until the railroad is completed.

Chrysolite.—LEADVILLE, COLO., April 6.—The fire in the Chrysolite workings, near the New Discovery line, broke out again at two A.M. to-day. All the men have been withdrawn from New Discovery. Boilers are being put on No. 3 Discovery and No. 1 Chrysolite.

The president of this company stated to a *Tribune* reporter yesterday that the fire will not affect the Chrysolite mine, as the outbreak is in an old and abandoned part of the mine, which has no connection with the present workings. It is generally believed, however, by those best acquainted with the situation, that the outbreak was caused by the opening of the old and abandoned Chrysolite No. 1 shaft, connecting with the overheated drifts which have been closed for more than three months. This shaft was opened in order to obtain the needed ventilation in the present workings of the New Discovery ground of the Little Pittsburg.

Father de Smet.—Superintendent reports for week ending March 15th: Ore extracted from first level, 1376 tons; from second level, 500 tons; and from third level, 60 tons; ore milled for same week, 1960 tons. The work on the mine for same period was as follows: Lower tunnel connecting Eureka with McGinty winze advanced 11 feet; rise from middle chamber, first level to surface, advanced 9 feet, in good ore. About one half of ore worked at present comes from main face open cut, one quarter from Golden Gate open cut, and one quarter from McGinty chamber.

Grand Central (Arizona).—A dispatch says: The mine is well developed to the 400 level, and the amount of ore in sight is large. The mill is running, and regular shipments of bullion are made.

Hibernia.—A dispatch to the *Tribune*, dated Leadville, Colo., April 4th, says:

Reports regarding Hibernia have been vague, but favorable, for the past two weeks. This has been owing to Big Pittsburg on the west and Matchless on the north, both having developed immense bodies of very rich ore to the line. A drift in Hibernia driven toward this ore-body from the south yesterday struck some rich ore, which, being 40 feet above previous workings, had not been discovered before. Between the developments already made there is a large tract, and the ore at this level is also likely to extend to the southwest, where a great extent of territory exists. The ore-face is 10 to 15 feet thick, showing average assays of over 600 ounces per ton. The mine has been breaking ore to-day, and will begin shipping to-morrow. There is much excitement here over the strike.

Hukill.—The superintendent telegraphs, April 6th: Found ore north side of cross-course, third level, which will undoubtedly connect middle and north ore-chutes.

Indian Queen.—A letter from the superintendent, bearing date March 22d, says:

The mill is running steadily, every thing working satisfactorily, and the mine yielding more ore than we are reducing. The Carson RR. will be completed to a point 50 miles north of the mill by April 1st.

Gold Stripe.—The president telegraphs from the mine announcing the strike a few days ago of a valuable ledge giving 200 feet of backs, and a rich chimney of ore, that add largely to the value and available resources of the mine, and that the mine never looked better. The new sulphuret ledge is promising well.

Little Chief.—The general manager reports under date of April 6th:

The Chrysolite fire has started up again enough to annoy us with gas through new connection drifts run from shaft to our west line. The majority of my force will be laid off tonight. Chrysolite and Discovery are preparing to force steam into the burning district. I shall do nothing at present except to prepare for filling shaft there with wet earth from surface should fire get beyond control. This will cut off communication; but still I shall not do it until necessary, as I have some mineral there.

Fanny Barret.—The executive committee of the North American Mining and Developing Company has just received a report from the confidential agent sent to Colorado several weeks ago, to measure the amount of ore on the dump and exposed in the Fanny Barret mine, and to have average assays made, in order that they might decide whether the company would be justified in building a smelter at an early day. The agent reports 800 tons of ore in the sheds and 7000 tons exposed in the mine, beyond all question. Average assays of ore taken indiscriminately from various points of the 600 feet of drifts at different levels yielded \$273.41, without taking into account the amount of lead, which is large. The company has resolved to proceed at once with the erection of a smelter.

Silver Cliff.—A general press dispatch dated Silver Cliff, Colo., April 7th, says:

The new mill of the Silver Cliff Company was connected with the water-works Tuesday, and immediately put to work; it is now in full working order, but it is impossible to state accurately the amount of ore crushed in so short a time, as the bins were all full of ore to start on. To-day the whole mill has been at work, the stamps dropping 95 times per minute, and considerably more ore has been crushed than yesterday. It will take days, perhaps weeks, to determine just what the mill can do, but it seems certain that it can crush 100 tons daily. The stamps now have but six inches drop, which can be increased if necessary. The motion of the pulp in the pans and settlers is pronounced as of a most favorable character to facilitate amalgamation. The mill is undoubtedly a success, and the only point to be determined is the extent of it.

Unadilla.—At the recent annual meeting of this company 283,000 shares were represented. The following officers were elected: President, J. M. Nixon; Vice-President, A. H. Allen; Treasurer, J. F. Scott; and Secretary, W. Whitlock. The superintendent's report was received, showing a total of 550 feet sunk and drifted since June, at an average of \$11.20 to the foot, besides an almost equal amount of old workings retimbered and put into good shape. Shipments of ore have commenced, 11 tons having been sent to the mill. In addition, there are now on the dump 4 tons quartz (assays \$200 and upward to the ton), 3 tons first-class ore (assays \$90 to \$100 per ton), and 20 tons concentrating ore, worth about \$30 to the ton—about \$2000 worth of ore. Monthly expense, \$550; no expense in New York. Treasurer's report shows balance cash \$1130, and treasury stock 150,000 shares; no debts.

DIVIDENDS.

The Indian Queen Mining and Milling Company has declared its regular monthly dividend (No. 11), and has increased the rate to 2½ per cent per month on the par value of its capital stock. The dividend will be payable April 19th, 1881, at the office of the company, No. 7 Exchange place, Boston, Mass. Books close April 15th, and reopen on the 20th.

The Ontario Silver Mining Company announces its sixty-sixth dividend of 50 cents per share, making a total of \$75,000 for the month of March, or \$3,500,000

since the first dividend was declared. The present dividend is payable by Wells, Fargo & Co., on the 15th inst. Transfers close on the 9th.

The Standard Consolidated has declared its regular monthly dividend of 75 cents per share, payable April 12th, at the agency of the Bank of Nevada. Transfer-books close April 5th, and reopen on April 13th.

The Alice Gold and Silver Mining Company, of Montana, has declared its second monthly dividend of 10 cents per share, payable at the Farmers' Loan and Trust Company, April 15th. Transfer-books close on April 11th, and reopen on April 16th.

SAN FRANCISCO MINING STOCK QUOTATIONS.

Daily Range of Prices for the Week.

NAME OF COMPANY	CLOSING QUOTATIONS.							Open- ing. April 8.
	April 1.	April 2.	April 4.	April 5.	April 6.	April 7.		
Alpha.....	3	3¼	3¼	3	2¾	3	3	
Alta.....	1½	2½	2½	2¾	2¾	2¾	3½	
Argenta.....								
Bechtel.....	10-32					9-16		
Belcher.....	2	2	2	2	2	2	2¼	
Belle Isle.....								
Belvidere.....								
Best & Bel.....	9	9		8¾	8½	9	9	
Bodie.....	6¾	6¾	6	6	6	6	6	
Bullion.....	1½	1½	1½	1½	1½	1½	1½	
Bulwer.....	1½	1½						
California.....	1½	1½	1½	1	1	1	1	
Chollar.....	1½	2¼	2¼	2¼	2¼	2¼	2½	
Con. Imp.....								
Con. Pacific.....						29-32		
Con. Va.....	2½	2½	2½	2	2	2	2	
Crown Pint.....	1½	1½	1½	1½	1½	1½	1½	
Eureka Con.....	25	25	25	25½	26	27	27	
Exchequer.....	1¼	1½	1½	1½	1½	1½	1½	
Goodshaw.....								
Gould & Cur.....	5	5	4½	4½	4½	5½	5½	
Grand Prize.....	½	½	½	½	½	½	½	
Hale & Nor.....	4½	4½	4	3¾	3¾	4	4	
Mar. White.....							3-32	
Mexican.....	5	5½	5¼	5½	5½	5½	5½	
Mono.....	13-16	1	1				13-16	
North Belle.....	14	14	14	14½	14½	15	15	
Noonday.....	1¾	1¾						
Ophir.....	4	4¼	4					
Oro.....	13-16		20-32	20-32	27-32	27-32		
Oregonian.....	1½	1½	1½	1½	1½	1½	1½	
Potosi.....	2½	2½	2½	2½	2½	2½	2½	
Savage.....	2¼	2½	2½	2½	2½	2½	2½	
Scorpion.....	1¼	1¼	1¼	1¼	1¼	1¼	1¼	
Sierra Nev.....	7½	8¼	8¼	8¼	8¼	9½	9½	
Silver King.....	24	24	24	24½		24½		
So. Bulwer.....	7-16							
Tioga.....								
Tip Top.....		4¾	4¼	4¼			4¼	
Tuscarora.....								
Union Con.....	6¾	7¼	7	7¼	7	8½	8½	
Wales.....				1½	1½	1½	1½	
Yel. Jacket.....	3¾	3¾	3¼	3¼	3¼	3¾	3¾	

REVIEW OF THE SAN FRANCISCO MARKET.

The San Francisco market shows quite an improvement, which is fairly distributed throughout the list. Union Consolidated closed yesterday at 88½, with sales on this market to-day at 91¼; this is an advance of 25 per cent in the market value of this stock for the week. Sierra Nevada has advanced correspondingly. The new hydraulic pumps are said to work very well so far, and are now successfully draining the Chollar, Hale & Norcross, and Gould & Curry mines. The south branch of the Sutro Tunnel having been opened to connect the Yellow Jacket shaft, the drain-boxes have been completed and the pumps at the mine are now throwing water into the Sutro Tunnel. A dispatch dated San Francisco, April 6th, says:

The annual meeting of stockholders of the Sutro Tunnel Company was held here to-day. The following trustees were elected: Charles W. Brush, President; William Irvine, Vice-President; F. F. Lowe, David Cohn, Hugh Marshall, William Johns, and Joseph Aron; the Treasurer, Lazar Freres; Secretary, Pelham W. Ames, and Superintendent C. C. Thomas. The superintendent in his report states that 2149 feet were made on the north, and 1903 feet on the south lateral tunnel during the year. He refers to the low-grade ores still remaining in different mines on the Comstock lode which can be worked at a profit, which, he says, would afford opportunities for developing new bodies of ore. He recommends prospecting along the line of the Brunswick lode, which is traceable on the surface by well-defined croppings for a distance of two and a half miles, and has never been prospected at the depth of the tunnel level. From two small drifts on that lode, from the main tunnel ore was taken assaying from \$10 to \$30 per ton. Ore from this lode, now being extracted near the surface, is paying an average of \$12.93 per ton. The tunnel is now in order to develop this lode at a minimum expense. He also recommends continuing the main tunnel into Mount Davidson by a prospecting-drift 2000 or 3000 feet in length, as, in his opinion, the indications of ore near the surface of Mount Davidson warrant further explorations in that direction.

Eureka Consolidated exhibits exceptional strength, closing yesterday at \$27 per share. The *Evening Post* says:

The Eureka Consolidated is strong, and the mine continues to pay monthly dividends of 50 cents per share. The California element no longer controls or exerts any influence upon the stock exchanges. The methods introduced by it were neither acceptable nor successful, and the money acquired by them has been lost. The majority of the California operators are, to use Nevada slang, "busted," and many have gone home.

Philadelphia.

THE NATIONAL MINING EXCHANGE.

The following list of mines are now called at this Exchange, which has hardly yet got fairly under way. Hereafter we hope to give a full weekly resumé of the list. We append the closing quotations of the Board for the 7th inst :

Table with columns: Name of Company, Location, Bid, Asked. Lists various mining companies like Western, Tombstone, Orion, etc.

*Prices April 6th.

Copper and Silver Stocks.

Reported by C. H. Smith, 15 Congress street, Boston, Stock Broker and Member of the Boston Mining and Stock Exchanges.

Boston, April 6. To-morrow being a close holiday in Boston, our report of the market for the past week is made up to this evening. The copper stocks, after being very much depressed in the early dealings, have shown more activity, and there is a decided change in the tone of the whole market; buyers are more numerous and stocks are sought for at the present low prices, which has caused an advance along the whole line.

We are inclined to believe that we shall have a lively market for the next two months, and those who were fortunate to buy stocks recently will realize handsome profits. The silver stocks are also in better demand, and prices show an advance generally over last week.

Calumet & Hecla declined from \$240 to \$239; but a good demand for it has advanced the price to \$245, at which it sold this afternoon and was in demand at that price.

A sale of 10 shares of Central is reported at \$32, a decline of \$2.

Copper Falls declined from \$123 1/4 (last sale, March 15th) to \$8, from which it rallied to \$10, and closed \$10 bid. Franklin was forced down to \$11 1/2, but has again advanced to \$13, and closed \$13 1/4 bid.

Pewabic steady and in demand at \$16 1/4 @ \$17. Quincy declined on the 2d to \$31 1/4, since which it has advanced to \$34, and closes strong at \$34 @ \$34 1/4.

Osceola sold at \$3 3/4 @ \$3.5, ex dividend \$1.50 per share. Atlantic declined to \$12, but is again strong at \$12 1/4 bid. Allouez declined from \$3 to \$2 1/2, and later sold at \$2 1/4.

In the low-priced stocks, there is but little doing as yet; but if the market continues active, we look for a sharp rise in the speculative list.

Phoenix sold at \$2 1/4. Blue Hill, \$4 1/2 @ \$4 1/4. Star, \$1 1/4. Douglass, \$3 3/4 @ \$3 1/4. National, \$3 1/4. Ridge, \$4 @ \$4 1-16. Huron, \$4. Concord, \$1.

In silver stocks, Catalpa has been very active, with sales of about 9500 shares at \$2 1/4 @ \$2 3/4; closing in demand at \$2 1-16 bid.

Crecent, the companion of Catalpa, sold at \$1 13-16 @ \$1 1/4. Contentment sold at \$2 1/4. Harshaw advanced from \$10 1/4 @ \$11 1/2, at which it was offered.

Silver Islet declined from \$27 @ \$25, with a disposition to force sales. Duncan sold at \$3 1/4. Sullivan & Waukeag declined from \$6 1/4 (20th ult.) to \$5 1/2, but later was better at \$5 1/4 @ \$5 3/4.

Pine Tree declined from \$2 3/4 to \$2 1/4. Bonanza Development steady at \$3. Empire, 95c. At the Mining Exchange, there has been a fair amount of activity in the leading specialties.

Empire declined from \$1.07 @ 90c., but subsequently rallied to \$1, closing at 95c. bid. Dunkin has recovered from the late decline to \$1.70 regular, and \$1.80, buyer 30. Milton has also been more active, and has advanced from \$1 @ \$1.35.

3 P.M.—The market for mining stocks closes up strong, with a much better feeling throughout the list.

Coal Stocks.

NEW YORK, Friday Evening, April 8.

A very fair business has been done in these stocks during the past week, the combined sales in this market and in Philadelphia amounting to 438,869 shares. Prices ruled fairly steady throughout the week, but show at the close considerable weakness. Delaware, Lackawanna & Western has been sold to the extent of 136,212 shares at \$123 @ \$119 1/2. Delaware & Hudson records sales of only 18,200 shares at \$112 1/2 @ \$110 1/2. New Jersey Central has had sales of 91,115 shares at \$102 1/2 @ \$99 @ \$102. Of Reading, but 15,400 shares have been sold in this market, at \$63 @ \$65 1/2 @ \$62 1/2. In the Philadelphia market, Pennsylvania R.R. has been an important feature, selling on Saturday last at \$66 1/2, yesterday at \$69 1/2, and is quoted to-day at \$68 1/2; the sales for the week amount to 117,702.

A Philadelphia paper says that there is a rumor

COAL STOCKS.

Table with columns: NAME OF COMPANY, Capital Stock, Shares, Par Val, Last Dividend, Rate per Ann., Quotations of New York stocks, SALES. Lists companies like Am. Coal Co., Col. C. & L., Ches. & C. RR, etc.

*Of the sales of this stock, 15,736 shares were sold at the Philadelphia Stock Exchange, and 15,400 shares at the New York Stock Exchange. Total Sales..... 438,869.

BOSTON MINING STOCKS.

Table with columns: NAME OF COMPANY, Shares, Par, April 1, April 2, April 4, April 5, April 6, April 7, SALES. Lists companies like Acton Con., Adrie Con. a. s., Allouez, c., etc.

* 2 13-16 + 1 13-16 + 2 11-16 c. Copper. s. Silver.

current that Mr. Gowen will, at a public meeting next week, resign the presidency of the Philadelphia & Reading Company. Although the fact that the decision of the court in the matter of the validity of the late election of officers is expected to be adverse to Mr. Gowen gives this report an appearance of plausibility, it is undoubtedly a mere speculative rumor, as Mr. Gowen has said that he would not retire from the road until its financial regeneration has been attained. He thinks that the success of the deferred bonds has already provided the money necessary for the payment of the floating debt, and the new five percent mortgage consols, of the success of which there can no longer be any doubt, will reduce the fixed charges of the company sufficiently to open the way to dividends in the near future; and when this result is obtained, but not before, he will relinquish a post which nothing but an imperative sense of duty has for some time induced him to retain.

The receivers of the Reading announce that they will buy the April interest and coupons of several divisional coal land mortgage bonds of the Coal and Iron Company, as follows: Swatara tract, 6 per cent per annum; Houtz, Meyer, and Kinnear, 5 per cent; Salem Coal Company, 4 per cent; agreeing that the principal and subsequent accruing interest on the said bonds shall retain priority of lien over the coupons and interest so purchased.

The jury in the suit of A. L. Mumper & Co. against the Lehigh and Wilkes-Barre Coal Company returned to court on the 7th inst. with a verdict in favor of the plaintiffs for \$12,163.49.

San Francisco.—Quotations of San Francisco gas stocks, April 1st, were 71 1/4 for San Francisco Gas-Light Company, and 33 for Oakland Gas-Light Company.

Gas Stocks.

NEW YORK, Friday Evening, April 8.

The market for these stocks is much better than for the past few weeks, and prices are considerably stronger. Auction sales are reported as follows: 50 shares of Manhattan at \$176 1/2 @ \$176 3/4; 40 shares of New York at \$97; 36 shares of Harlem at \$68; and 10 shares of Westchester Gas-Light Company at \$60. The Gas Commission has referred the bids of the gas companies for lighting the public lamps to the Public Works Commissioner, with instructions to see the representatives of the companies and endeavor to secure a reduction in the prices asked for gas.

The following list of companies in New York and vicinity is corrected weekly by GEORGE H. PRENTISS, Broker and Dealer in Gas Stocks, No. 19 Broad street, New York. Quotations are based on the equivalent of \$100.

COMPANIES IN NEW YORK AND VICINITY.	Capital Stock.	Par.	DIVIDENDS.		QUOTATIONS.		
			Rate per ann.	Am. of last.	Date of last.	Bid.	As'd.
Mutual, N. Y.	5,000,000	\$100	6	1 1/2	April '81	68	72
" Bonds.	900,000	1,000	6	3 1/2	Aug. '80	100	105
N. York	4,000,000	100	8	4	Nov. '80	96	98
Metrop.	2,500,000	100	10	1 1/2	Feb. '81	130	135
" Certifs.	1,000,000	100	7	3 1/2	Feb. '81	100	105
Harlem	1,850,000	50	3	3	Feb. '81	45	70
Manhat.	4,000,000	50	5	5	Feb. '81	175	178
Brooklyn, Bkln.	2,000,000	50	5	5	Nov. '80	112	114
Nassau	1,000,000	25	2	2 1/2	Jan. '80	45	50
" Certifs.	700,000	1,000	7	3 1/2	Nov. '80	90	95
People's	1,000,000	10	3	3 1/2	Jan. '78	25	30
" Ist m. Bonds	400,000	100	6	3 1/2	Nov. '80	101	104
" Bonds.	100,000	100	8	3	Jan. '81	75	135
Metrop.	1,000,000	100	5	2 1/2	Jan. '81	58	60
W'msb'g	1,000,000	50	2	2	Jan. '81	60	65
" Bonds.	1,000,000	1,000	6	3	Oct. '80	101	104
Citizens	1,200,000	20	2 1/2	2 1/2	Aug. '80	40	48
" Bonds.	1,315,000	1,000	3	3	Oct. '80	100	105
J. C. N. J.	750,000	20	7 1/2	7 1/2	Jan. '81	150	155
Municipal, N. Y.	2,000,000	100	5	5	April '81	150	155
" Bonds.	750,000	100	7	3 1/2	Nov. '80	105	110
Fifth Municipal.	1,500,000	100	100				55

BULLION MARKET.

NEW YORK, Friday Evening, April 8.

The market is dull and weak, abroad and here, in view of the unwillingness of England to participate unreservedly in the proceedings of the International Silver Congress about to convene in Paris, and the consequent probability that nothing of a practical character toward bettering the status of silver will be achieved by said Congress. Lower prices appear to be more than probable.

DAILY RANGE OF SILVER IN LONDON AND NEW YORK, PER OZ.

DATE.	London		N. Y.	
	Pence.	Cents.	Pence.	Cents.
April 2...	52 3/4	112 1/2	April 6, 5 1/4	112
April 4...	52 1/16	112 3/4	April 7, 5 1/4 @ 5 1/4	112
April 5...	52	112 1/2	April 8, 5 1/4 @ 5 1/4	112

BULLION PRODUCTION FOR 1881.

We give below a statement showing the latest bullion shipments. These are officially obtained from the companies, where that is possible; and where official statements can not be procured, we take the latest shipments published in those papers nearest to the mines reported. The table gives the amount shipped for the week up to the date given, as well as the aggregate shipments to such date, from the first of January, 1881.

The shipments of silver bullion are valued at \$1.29-29 per ounce, Troy; gold at the standard \$20.67 per ounce, Troy. The actual value of the silver in the following

table is therefore subject to a discount, depending on the market price of silver. The price of silver being now about \$1.12 per ounce, the following figures, where they relate to silver bullion, should be diminished by about 13 1/2 per cent to arrive at actual value:

MINES.	States.	For the week.	Month of April.	Year from Jan. 1st, 1881.
Alice	Mont.			\$286,450
Barbee & Walker	Utah			81,155
Belmont	Mont.			15,270
Bodie	Cal.	\$7,000	\$7,000	103,339
Bodie Dis. Banks, etc.	Cal.			19,138
Bos. & Colo. S. W'ks.	Cal.			253,000
California	Cal.	29,940	29,940	63,776
Caribou	Cal.			43,617
Christy	Utah	12,300	12,300	128,656
Concordia	Cal.			2,234
Connor	Utah			28,375
Contention	Ariz.	31,570	31,570	411,075
Con. Virginia	Neu.	29,000	29,000	114,000
Crismon-Mammoth	Utah			15,254
Custer	Idaho			103,618
Deadwood-Terra	Dak.			70,000
Derbic	Cal.			39,657
Dexter Mill	Cal.			11,000
Elkhorn Mill	Dak.			5,000
Eureka Con.	Neu.	33,260	33,260	410,583
Exchange Silver	"			44,400
Ferry Bullion	Utah			7,210
Fresno Enterprise	Cal.			9,600
Frisco M. and S. Co.	Utah			55,698
Germania	"			172,419
Grand Central Mill	Ariz.			10,000
Grand Prize	Neu.	6,960	6,960	73,339
Hale & Norcross	Ariz.			33,090
Head Center	Ariz.			12,830
Hermosa Mill	Cal.			12,000
Homestake	Dak.			103,000
Horn-Silver	Utah			233,572
Idaho	Cal.			51,000
Independence	Neu.			14,000
Indian Queen	"			26,156
Iron Silver	Cal.			171,717
Jocusta	Mex.			82,000
Lexington	Mont.			7,000
Little Chief	Cal.			63,314
Mack Morris	Ariz.			136,897
Mingo	Utah			4,554
Morgan	"			24,173
Hermosa Mill	Cal.			12,000
Mount Potosi	Neu.	8,450	8,450	59,830
Navajo	Neu.	5,000	5,000	57,981
Nevada Silver Ore	Utah			11,875
Noonday	Cal.			90,193
Northern Belle	Neu.	29,850	29,850	338,737
Oneida	Cal.			6,684
Ontario	Utah			584,194
Ophir	Neu.			5,170
Pascoe	Utah			3,450
Rebellion Ore	"			3,700
Richmond	Neu.			397,691
Sierra Nevada	Mont.	50,600	50,600	67,375
Silver Bow	Ariz.			51,342
Silver King	Ariz.	20,600	20,600	145,398
Sullivan	Maine			5,000
Standard	Cal.	33,600	33,600	656,040
Star	Neu.	4,400	4,400	35,613
Stormont	Utah			77,249
Syndicate	Cal.			21,273
Tintic M. and M. Co.	Utah			34,269
Tip Top	Ariz.			147,900
Tombstone M. & M. Co.	Neu.			213,196
Union Con.	Neu.			43,100
Wood River	Idaho			6,450

CALIFORNIA.

San Francisco Copper Mining Company.—From one of our exchanges we learn that the present product of this company's copper mine, at Spenceville, is 35 tons of cement copper per month, and will remain about the same for three or four months, when the product will be increased. Before the caving of the mine, when the ore was raised through a shaft, the cost of mining it per ton was from 75 cents to \$1 and over, but now it is taken out at 65 cents per ton. Since the opening of the pit, 3000 tons of ore have been raised. The amount of ore at present exposed will supply the works for a considerable time to come, and when the resources of the first level are exhausted, the second or 100-foot level, which has been partially opened, can be reached in the same manner, by open workings.

A clean-up of twenty loads of rich quartz from the McDonald & Mullen claim, in Nevada County, has been made at Sothern's mill, which yielded \$5140, or \$257 per load. A lot of 9 1/2 tons of quartz was recently crushed at Keith's mill, several tons yielding an average of over \$30 per ton.

COLORADO.

Breece Iron Mine.—A recent report states that this mine will begin furnishing 100 tons of ore per day to the Bessemer Steel-Works at Pueblo, and the same amount from and after the first of May, as called for under their contract with the Colorado Coal and Iron Company. The contract allows the latter company to call on the Breece for 200 tons per day, which will probably be done after the works at Pueblo are fairly in operation.

Bull Domingo.—Teams are employed in hauling ore to the concentrator, where about two thousand tons will be in readiness when the railroad is completed, and the mill resumes operations.

East Argentine District.—Recent reports from this district state that it has been the scene of active development all winter, and will begin to produce heavily as soon as the district is opened to wagon traffic. Eight tons of ore packed down on jacks and milled in Georgetown recently returned \$1400, all silver.

Freeland.—It is reported that this company has shipped two car-loads of concentrations, of the assay value of \$60 per ton.

Hukill.—The Indicator says: This mine produced \$133,476.18 assay value in 1880, and not \$193,000 as claimed by Clear Creek papers.

Leadville Output for March.—The bullion shipments from the smelters at Leadville for the month of March are reported at \$3,067,820.

The Leadville Circular of April 2d gives the following

table of the approximate daily output of the leading mines of the camp at the present time:

Mines.	Tons.	Mines.	Tons.
Miner Boy	12	Evening Star	50
Florence	8	Dunkin	15
Little Silver	12	Robert E. Lee	40
Little Pittsburg	35	Silver Wave	100
Little Chief	15	Crescent	5
Iron Mine	200	Highland Chief	30
Silver Cord	10	Comstock	5
Catalpa	15	Matchless	15
Little Ella	20	Hibernia	5
Oro La Plata	45	Big Pittsburg	10
Morning Star	35	Dyer	6
Argentine	15	Others, say altogether	30
Half-Way House	20	Etna	20
Robert Emmet	10	Agassiz	5
Carbonate Hill	3		
Henriette	50	Total, tons	841

Leadville-Ore-Shipments.—The ore-shipments from the following mines for the month of March were as follows:

Mines.	Tons of ore.
Dunkin	1,188
Little Pittsburg	1,146
Robert E. Lee	1,211

Miner Boy.—The superintendent reports that four bricks of gold bullion were recently shipped, weighing 1188 ounces.

Oro La Plata.—This mine, which is the property of the La Plata Mining and Smelting Company, is shipping from 30 to 40 tons of ore per day. The mineral shipped from this mine runs exceedingly high in lead, and is a most desirable smelting ore.

Silver Wave.—The average shipments have lately reached \$85 per day.

DAKOTA.

Caledonia.—The superintendent reports that for the week ending March 26th, 1208 tons of ore were shipped to the mill.

IDAHO.

General Custer.—Fifty bars of bullion, weighing 79,740 ounces, arrived during the week in this city, being the product of 40 days—February 11th to March 22d inclusive. This bullion contained \$17,290 gold and 77,773 ounces of fine silver; a total value of \$103,618 in gold.

MONTANA.

Alta-Montana.—A recent report states that this company received from the mine during the month of February 378 tons of ore, which carried 112 ounces of silver per ton and 47 per cent of lead.

Bonanza Chief.—It is stated that the free-milling gold quartz of this mine yields about \$10.50 per ton in the stamp-mill.

Helena.—During the week ending March 27th, bullion from the following mines has been sent to the U. S. Assay Office at Helena:

Mine	Assay value
Albion	\$2,250
Alta-Montana	3,000
Belmont	5,500
Bonanza Chief	4,300
Gloster	2,250
Total	\$17,300

NEVADA.

Charonnet.—A clean-up of from 50 1/2 tons of ore from this mine (Canada Hill) was recently made at the Pioneer mill. The result, it is stated, was about \$3000 in free gold and nearly \$1000 worth of sulphures.

Comstock Mines.—The Gold Hill News publishes the following for the week ending March 28th:

Mine	Tons of ore raised.	Assay value per ton.
California	423	\$21.30
Con. Virginia	339	33.43
Sierra Nevada	292	.....

Exchange Silver.—It is reported that this mine continues to ship weekly about \$1300 worth of bullion.

Crown Point.—It is reported that from forty to forty-five tons low-grade ore are now daily taken from the upper levels of this mine.

UTAH.

Ontario.—The managers report the bullion shipments for the month of March to have consisted of 174 bars, weighing 226,067.50 ounces, which had an assay value of \$230,238.84 in silver.

Park City Smelter.—Bullion shipped from this smelter for the week ending March 26th: 441 bars, weighing 44,174 pounds.

Salt Lake City.—The bullion shipments from Salt Lake City for the week ending March 30th amounted to \$118,469.75.

MISCELLANEOUS.

Bullion Receipts from the Mines to New York.—The bullion received from the mines at the various offices in this city during the week ending with yesterday, as compiled from various sources, amounts to \$240,908.18, as against \$299,068.91, reported in our last.

The Gold Flood.—We take the following from the Daily Commercial Bulletin:

The importations of specie and bullion at this port during the week ending April 1st were \$3,229,107, consisting of \$3,086,552 in gold, and \$142,555 in silver, as against a total of \$5,281 for the week ending April 3d, last year. The importations since the 1st of January and since the 1st of August compare as follows with the movement during the corresponding periods last year:

	Since January 1.		Since August 1.	
	1881.	1880.	1880-81.	1879-80.
Gold	\$13,033,070	\$1,144,018	\$81,312,038	\$70,171,990
Silver	936,060	1,499,151	3,407,411	4,476,665

Total \$13,969,130 \$2,643,169 \$84,719,449 \$80,648,655

It will be observed that thus far in the present calendar year we have received over five times as much specie from Europe as last year, the gold receipts being about twelve times as large as a year ago.

The steamships Algeria and Maine, which arrived at this city on the 1st inst. from Europe, brought \$778,425 and \$619,094 respectively in gold and silver bars.

London, April 2.—The Westphalia takes out the sum of \$84,400 in specie.

The amount of bullion withdrawn from the Bank of England on balance was £174,000, of which \$144,000 was for shipment to this country.

The City of Chester brought on the 2d inst. \$250,000 in gold bars from Europe.

LONDON, April 5.—The Standard, in its financial column, states that £40,000 in gold, principally from private sources in Holland and Russia, was obtained yesterday for shipment to the United States.

The steamship Vandalia, which arrived at this city yesterday from Europe, brought \$599,800 in marks.

The steamship Adriatic delivered \$1,285,250 English gold on the 7th inst.

The steamship Wieland, which arrived at this city yesterday from Europe, brought \$607,068 in gold.

The weekly statement of the Bank of France shows a decrease of gold to the amount of 1,700,000 francs, and a decrease of silver to the amount of 7,150,000 francs, making a decrease of 8,850,000 francs.

Gold Coin in the Bank of England.—LONDON, April 6.—The London Morning Post says that the quantity of gold coin in the Bank of England at present is greater than for many years, and amounts to £15,500,000, or nearly \$80,000,000.

Gold Coin in the United States Treasury.—WASHINGTON, April 7.—There are \$140,000,000 of gold coin and bullion in the treasury to-day—more than has been gathered together in one place in the history of the government.

The March Mint Coinage.—The following is a statement of the coinage executed at the United States mints during the month of March, 1881:

Denomination.	Number of Pieces.	Value.
Double-eagles.....	24,000	\$480,000
Eagles.....	692,758	6,927,560
Half-eagles.....	664,480	3,322,400
Three dollars.....	10	30
Dollars.....	20	20
Total gold.....	1,381,266	\$10,730,010
Dollars.....	2,299,500	2,299,500
Half-dollars.....	500	250
Quarter-dollars.....	500	125
Dimes.....	500	50
Total silver.....	2,301,000	\$2,299,925
Five cents.....	1,400	70
Three cents.....	1,400	42
Cents.....	2,811,400	28,114
Total base.....	2,814,200	\$28,226
Grand total.....	6,496,466	\$13,058,161

Mexican Mint Coinage.—The Two Republics, published in the City of Mexico, states that the sum of \$24,554,369 was coined by the Mexican mints during the past fiscal year.

The Monetary Conference.—ROME, April 3.—In the Chamber of Deputies yesterday, Signor Magliani, Minister of Finance, in making the budget statement, said, the budget of 1881 showed a surplus of 15,000,000 lire. Italy would take part in the Monetary Conference, and he hoped arrangements would be agreed to which would obtain for silver the widest possible market on the same terms as gold.

LONDON, April 7.—Sir Charles Dilke, Under Foreign Secretary, replying to the Right Hon. J. G. Hubbard, Conservative, said that England was unable to consent to discuss the principles of bi-metallicism, and had, therefore, declined to participate in the Monetary Conference. The India government will send a delegate, who, however, will not participate in the discussion. Lord Hartington, Secretary for India, will consider any proposal which may be brought forward. The question of any other colonies being represented in the conference is under consideration.

PARIS, April 7.—In the Senate, M. Magnin, Minister of Finances, replying to a question of M. de Parien, declared that France, the United States, the Netherlands, Italy, and Spain agree upon the principle of the double standard. Bi-metallicism was making progress in Germany. Public opinion in Belgium was in favor of it, and the chambers of commerce in England had made declaration in a similar sense. The adhesion of England might still be hoped for, and that would remove all obstacles. The object of the conference would be to establish international monetary regulations. France would support bi-metallicism. M. Parien drew attention to the fact that France pays in gold and is paid in silver, whence arises continuous loss. M. Buffet urged that no silver coins be struck without consulting the legislature. M. Magnin promised to consult Parliament in case the convention relative to the coinage of silver should have to be modified.

Exports of Gold and Silver from New York.

Week ending April 21.....	\$221,259.00
Corresponding week last year.....	44,685.00
Since Jan. 1st this year.....	3,168,569.00
Corresponding period last year.....	3,010,212.00

Gold Interest Paid Out by the Treasury.

Week ending April 21.....	\$3,542,715.20
Corresponding week last year.....	1,328,763.82
Since Jan. 1st this year.....	15,390,657.63
Corresponding period last year.....	17,713,658.88

The Treasury Department purchased on the 8th inst. 120,000 ounces of fine silver bullion, to be delivered at the San Francisco and New Orleans mints. Among the offers received was one from London of a large amount. The bid, being too high, was rejected.

METALS.

NEW YORK, Friday Evening, April 8.

The general condition of the metal market is very inanimate, and dullness rules supreme. The unprecedentedly severe winter has no doubt had its effect in various ways, and with the approaching opening of navigation an improvement may set in.

We have been accumulating some interesting facts on copper mining and smelting in Arizona and New Mexico, which we hope soon to be in a position to publish.

In regard to the falling off of West Coast produce, we extract from a reliable source, dated Valparaiso, December 27th, the following: You will observe that production has been pretty equal for a long time. The falling off this year is due more to the absence of laborers employed in the army than any thing else.

Copper is very flat, with no sales of any importance. Consumers are waiting for the opening of navigation before entering into any contracts for large lines. We quote Lake dull at 19c., and there are rather sellers than buyers of Baltimore at 18½c.

Our English advices by mail include March 25th.

March 21st. A few parcels g. o. bs. sold at £60½ cash, net at quotations. There is little disposition to sell or buy.

March 22d. Business dull, nearly all transactions being for "net money." G. o. bs. sold at £60½ cash.

March 23d. Chili Bars steady and values about the same as yesterday. Small trade in g. o. bs. at £60½ cash.

March 24th. Chili Bars a shade firmer, g. o. bs. selling at £60½@£61.

March 25th. The quotations are nominally £60½@£61, with scarcely any metal on sale, even at the top figure, while purchasers seem indifferent to business, unless they can satisfy their requirements at the lower rate. In best brands, 50 tons sold £62½ cash. Wallaroo is still held for £72; Burra for £67; English Tough, £64@£65; Select, £66@£68; India Sheets, £69@£71; Y metal sheets, 5½@5¾d. 7 lb.

Tin.—In this metal there is some vitality; sales amounting to from 400 to 450 tons have been effected during the week at from 20c. up to 20½c. for spot stuff and to arrive. A little more is being asked for Australian than for Straits, in consequence of a scarcity in the former.

We quote Straits, 20½c.; Billiton and Australian, 20½@20¾c.; L. & F., 20½@20¾c.; English refined, 20½@20¾c., with business at the higher figure.

By cable, London quotes £88 5s. @£88 10s. for spot stuff, and £89 10s. for futures, with a strong market; Singapore, \$27½, exchange, 3s. 10d.

We have received the following from Edward P. White, metal broker, 55 Fulton street, under date April 2d.:

STATISTICS OF TIN.

March 1st 1881:	Tons.
Stock in all hands, New York, Boston, and Philadelphia.....	3,375
Imported during March, Straits and Malacca, into Boston.....	100
Imported during March, Straits and Malacca, New York.....	120
Imported during March, Australian, into New York.....	40
Imported during March, L. & F., into New York Banca.....	20
	10
	290
Consumption:	3,665
During March.....	800
Total Spot Stock.....	2,865
Afloat to date, ex Dec. and Feb., per sail.....	230
Ex January, February and March, steam shipments.....	665
	895
Total in all hands, spot and afloat.....	3,760

Early in March, it was generally expected that favorable spring weather would help to restore transportation to its usual regularity, after our protracted winter; in this, however, the general expectations were not realized, heavy snow-storms, followed by extensive floods, having, in many large sections, seriously interrupted communications.

During the first fortnight, about 250 tons of Straits Tin sold at from 19½@19¾c. prompt cash. Shipments from the East during the first half of March having been cable as only 200 tons, the demand quickened, and both dealers and consumers had to pay from 19½@20¼c., the sales amounting to about 350 to 400 tons. For floating parcels, 20c. was freely bid throughout the month, but very little could be secured thereat, as importers generally were holding the small quantity available at from 20½@20¾c., which would about cover cost of importation from the East, according to the latest cable advices.

Our arrivals of all sorts during March have been below 300 tons, and the present floating quantity to the United States, per steam and sail, due during April and May, can hardly exceed 600 tons.

Herewith are figures of importations and floating supplies, into and toward our ports, during the first quarter of the present, as compared with the same of the last year.

1881.	
Arrivals in New York and Boston, January 1st to April 1st:	Tons.
Straits and Malacca.....	1,985
Australian.....	122
L. & F. and Refined.....	50
Banca and Billiton.....	13
Total.....	2,170
Afloat on April 1st, 1881:	Tons.
Straits and Malacca.....	895
Australian.....	Unknown
Billiton.....	Nil.
Total.....	895
1880.	
Arrivals in New York and Boston, January 1st to April 1st:	Tons.
Straits and Malacca.....	2,750
Australian.....	395
L. & F. and Refined.....	435
Banca and Billiton.....	910
Total.....	4,490

Afloat on April 1st, 1880:

Straits and Malacca.....	Tons.
Australian.....	2,720
Billiton.....	400
	305
Total.....	3,425

Our English advices by mail include March 25th.

March 21st. Saturday and to-day have shown a slight improvement in values, and prices have risen about 6d. per cwt.; at the close, there were buyers at 87½s. sharp cash, 88s. with usual 14 days prompt, sellers asking 3d. per cwt. more.

March 22d. Rates show a tendency to improve, and sellers are scarce. Cash metal 87½@88s., and 1s. per cwt. was given for the call of 25 tons, all the year at 95s.

March 23d. The recent improvement is maintained, and prices are even a shade higher, with sales at 88@88½s., either sharp cash or usual 14 days.

March 24th. Values of this metal show further improvement, and sales amounted to about 125 tons at 88@89½s. sharp cash, 88½@89½s. 14 days prompt; closing buyers 89½s. latter terms, and sellers at that price for immediate payment.

Tin Plates.—These remain strong with a very fair business for consumption. Stocks here are light, and in England they have been materially reduced by the decrease in production through strikes, and the closing of some of the works. It is estimated that the production is reduced some 20 to 25 per cent. An advance of fully 1s. 6d. per box from the lowest prices has been maintained, and for future delivery another 6d. per box is asked, which, in some instances, has been conceded. We have no alteration to note in our prices of last week. We quote per box as follows: Charcoal tins, Melyn grade, ½ cross, \$6¼@6½; Allaway grade, \$5½@6. Charcoal Roofing, Dean grade, \$5½ for 14 x 20, and \$11@11½ for 20 x 28; Allaway grade, \$5½@5½ for 14 x 20, and \$10½@10½ for 20 x 28. Coke Roofing, B. V. grade, \$5 for 14 x 20, and \$10 for 20 x 28. Coke tins, A. B. grade, IC, \$5½@5½; B. V. grade, \$5@5.05; ICW, \$4½ for 14 x 20.

Messrs. Robert Crooks & Co., of Liverpool, under date of March 24th, say of tin and terne plates:

While any thing offered at late rates is quickly picked up, buyers are not in any degree responding to the advance, and transactions, therefore, are few. For any sizes that require to be made, a stiff increase is asked, and, during the past week, has been obtained in some instances. Stock lots can still here and there be met with at very little over bottom figures.

Pig-Lead.—This market is fairly active, but we hear of no sales of any importance; the closing asking price is 4'80@4'87½c., but business has been done below these figures.

The Age of Steel, under date of St. Louis, April 2d, says:

Business in pig-lead is remarkably dull. During the week, some fifteen car-loads changed hands at 4'375 c. which transaction was reported on open market; but it is thought that several sales had taken place at prices shaded from the above.

The shipments over the St. Louis & San Francisco Railroad for the week ending March 28th were 367 tons.

Spelter and Zinc.—We quote the former dull at 5@5½c., and the latter at 7c. The Age of Steel, under date of St. Louis, April 2d, says:

There is absolutely nothing doing in spelter, and previous quotations are unchanged and merely nominal.

Antimony.—For this there is very little demand, and prices are unchanged. We quote Cookson's at 14½c., and Hallett's and Johnson's at 14½c.

Quicksilver.—The San Francisco Commercial Herald under date March 31st says:

The spot market continues dull and sluggish. The asking price is 37½c. The shipment of 1000 flasks, recorded by us last week, per Undaunted for San Blas, was no doubt consigned by the shipper. Our latest London quotation is £6 5s. We are indebted to Messrs. Joseph Bennett Brothers, brokers, 22 and 23 Great Tower street, London, for the following statistics of imports and exports of quicksilver in the United Kingdom during the last ten years, with price on December 31st of each year:

Year.	Imports, Bn.	Bottles, about.	Exports, Bn.	Bottles, about.	Price per bottle.
1871.....	2,991,509	39,800	2,831,228	37,700	£10 10s 0d
1872.....	2,734,094	36,400	2,344,888	31,200	12 15s 0d
1873.....	2,391,704	31,800	2,162,438	28,800	19 00s 0d
1874.....	2,998,447	39,900	2,422,299	32,200	24 00s 0d
1875.....	3,194,059	42,500	2,443,397	32,500	10 10s 0d
1876.....	2,843,918	37,900	1,946,965	25,900	8 5s 0d
1877.....	3,093,961	47,900	2,261,446	30,100	7 5s 0d
1878.....	3,232,618	43,100	2,157,461	28,750	6 7s 6d
1879.....	3,979,682	53,000	2,153,263	28,700	6 10s 0d
1880.....	3,715,526	49,500	1,205,450	10,050	6 7s 6d

The small quantity of 16,050 bottles exported from England in 1880, against double the quantity exported in 1874, was probably caused by the consumers clearing out all their stocks at the low prices continued. The exports from England for the month of January last year were 96,547

STATISTICS OF COAL PRODUCTION.

Comparative statement of the production of anthracite coal for the week ending April 2d. and years from January 1st:

Table with columns: Tons of 2240 lbs., 1881 (Week, Year), 1880 (Week, Year). Rows include Wyoming Region, Lehigh Region, Schuylkill Region, Sullivan Region, and Total.

The above table does not include the amount of coal consumed and sold at the mines, which is about six per cent of the whole production.

Table showing coal production in 1876, 1877, 1878, 1879, and 1880.

Belvidere-Delaware Railroad Report for the week ending April 2d.

Table with columns: Week, 1881, 1880. Rows include Coal for shipment at Coal Port (Trenton), Coal for shipment at South Amboy, Coal for distribution, and Coal for company's use.

The increase in shipments of Cumberland Coal over the Cumberland Branch and Cumberland & Pennsylvania Railroad amounts to 18,754 tons, as compared with the corresponding period in 1880.

The Production of Bituminous Coal for the week ending March 26th was as follows:

Table with columns: Week, Year, 1881, 1880. Rows include Cumberland Region, Md., Barclay Region, Pa., Brown Top Region, Pa., Huntington & Broad Top RR., Clearfield Region, Pa., Snow Shoe, Tyrone and Clearfield, Allegheny Region, Pa., Pennsylvania RR., Pittsburgh Region Pa., West Penn RR., Southwest Penn. RR., Union & Westmoreland gas-coal, Pa. RR., and Pennsylvania RR.

Tracks under Control of the Pennsylvania Railroad.

Mr. William H. Brown, Engineer of the Maintenance of Way Department of the Pennsylvania Railroad, issued, under date of March 31st, a statement showing the length of tracks of the railroads owned, leased, operated, and controlled by the Pennsylvania Railroad Company on the 31st day of December, 1880.

Table with columns: Name of Line, Main track, Branches, Total track. Rows include United Railroads of N. J. Division, Pennsylvania Railroad Division, Frederick Division, Philadelphia & Erie Railroad Division, Northern Central Railroad lines, Baltimore & Potomac Railroad lines, West Jersey Railroad lines, Cumberland Valley Railroad lines, Allegheny Valley Railroad lines, and Total miles.

The large locomotive recently put on by the company between Philadelphia and New York is giving a good account of itself, both in reducing the time between the two cities and in increasing the size of the train drawn.

So great has been the progress made on the elevated road that the Pennsylvania Railroad Company expects to handle its freight from the depot, Fifteenth and Filbert streets, by the 15th of next month.

The Carnegie Consolidation.

The Pittsburg Dispatch says that the following abstracts of his several documents filed of record in the matter of the consolidation of the vast Carnegie interests will doubtless be regarded with some interest by our readers: Deed made April 1st, 1831, between the Edgar Thomson

Steel Company, limited, a limited partnership association of the State of Pennsylvania and Thomas M. Carnegie. David A. Stewart, John W. Vandervort of Pittsburg, Henry Phipps, Jr., of Allegheny, Andrew Carnegie, and Gardner F. McCandless, of New York, composing the company, and Carnegie Brothers & Co., limited, a limited partnership association of this State.

This indenture, in consideration of \$2,500,000, conveys 106 acres and 7519 of an acre of land in Wilkins township, on the line of the Pennsylvania Railroad, and extending across to Robert McKinney's stone quarry, excepting thereout two tracts, the first containing 1867 8/10 square feet, the second containing 13,780,811 square feet, and having erected thereon buildings and fixtures commonly known as the Edgar Thomson Steel-Works.

Also all the land and coal underlying five tracts of land located in Unity township, Westmoreland County, in the region of Loyalhanna Creek, containing in all 437 acres and five perches, subject, however, to a mortgage for \$72,000, and some other rights in the grantors.

Also the right to all the ore and to enter and raise, take away and wash all iron ore underlying the surface of a tract of land situated in Patton township, Centre County, containing 314 acres, 136 perches, known as the River Hill or Bank tract; also the right of way for wagons, etc.

Also another ore tract in Patton township, Centre County, containing 116 acres, 104 perches.

Also a piece of land in Wilkins township, Allegheny County, being the same conveyed by Robert McKinney and wife to the Edgar Thomson Steel Company.

Also the Centre Furnace lands, in Patton township, Centre County, containing 25 acres, 158 perches, with iron ore and mineral rights.

Also another tract in Patton township, near the Centre Furnace lands, containing 133 acres and 12 perches. The first parcel of real estate as above is subject to a mortgage, secured by 504 bonds of \$1000 each, payable in gold. Two hundred of these bonds are now in possession of the Safe Deposit Company.

The total amount due April 1st on these bonds is \$176,636.76. This is the property on which the Edgar Thomson Steel-Works are located.

Deed made April 1st, between Andrew Carnegie, of New York; Thomas M. Carnegie, of Pittsburg; Henry Phipps, Jr., of Allegheny, and Carnegie Brothers & Co., limited, in consideration of \$120,000, conveying four fifths of a certain tract of land situate on Brush Creek, adjoining Pennsylvania Railroad, in North Huntingdon township, Westmoreland County, containing 20 acres, 35 perches.

Also, another tract similarly located, containing 14 acres 15 3/4 perches. On this property there are erected 200 coke-ovens and some buildings.

Deed made April 1st, between the same parties as above for the consideration of \$630,000, conveying a leasehold estate.

Deed made April 1st, between the same parties for the consideration of \$750,000, conveying the Lucy Furnace Company property, in the Eighteenth ward, subject to a mortgage of \$160,000.

Four parcels of land in the Fifteenth ward.

The articles of incorporation state that the new firm is composed of the following persons: Andrew Carnegie, of New York City; Thomas M. Carnegie, of Pittsburg; Henry Phipps, of Allegheny; David A. Stewart, of Pittsburg; John Scott, of Pittsburg; John W. Vandervort, of Pittsburg; and Gardner F. McCandless, of New York. The capital stock is \$5,000,000, contributed and paid as follows:

Four million dollars to be paid in property described, the sum of 1,000,000 to be paid in cash in four monthly installments of \$250,000 each, the first installment to be paid May 1st, 1881.

The stock is subscribed as follows: Andrew Carnegie gets \$2,727,977.95; Thomas M. Carnegie, \$878,091.65; Henry Phipps gets the same; David A. Stewart gets \$175,318.75; John Scott, the same; Gardner F. McCandless, \$105,191.21; John W. Vandervort gets \$50,000. The character of the business is for the manufacture and sale of all kinds of iron and steel in every branch. The location includes the steel-works and blast-furnace in Wilkins township; Union and Pittsburg iron mills; the Lucy Furnace; the Monastery Coke-Works, Westmoreland County; the Larimer coke-ovens in Huntingdon township, Westmoreland County; the ore-mines in Patton township, Centre County. The duration of the partnership will be twenty years, and the principal office at Bessemer station, Pennsylvania Railroad. The officers are Thomas M. Carnegie, Chairman; David A. Stewart, Secretary and Treasurer; Thomas M. Carnegie, Andrew Carnegie, Henry Phipps, Jr., John Scott, and David A. Stewart, Managers.

The Baltimore & Ohio Railroad and the Oil Regions.

The Petroleum World says that an enterprise of more than ordinary importance in its relation to the producing interest is at present under consideration by the Baltimore & Ohio Railroad Company, the object of which is to establish a connection with Buffalo and the lakes. We are credibly informed and our notices are corroborated by subsequent statements in the press of Baltimore and Philadelphia, that a preliminary step has already been taken in this direction, by the purchase of several short lines in Allegheny and Westmoreland counties, which, with the construction of one or two inexpensive connecting links, will give the Baltimore & Ohio free entry into Pittsburg. From this point, it is projected to establish an outlet through the valley of the Allegheny to the lake region, and so compete with the Pennsylvania for the carrying trade in coal, petroleum, and other products of this region. The way is opened for this movement by the recent consolidation of the E., T. and B., with several smaller lines in this part of the State under the title of the Buffalo, Pittsburg, and Western, and the contemplated extension of the main line from Brocton to Buffalo. Negotiations are already in progress between the Baltimore & Ohio and the Buffalo, Pittsburg & Western, the result of which, it is believed, will be an alliance such as will give the first-named company its long-sought outlet to the lakes.

The consummation of this enterprise would be an inestimable benefit to the oil region. It would give the producing interests the benefits of open competition between the Baltimore & Ohio and Pennsylvania Central, and precipitate an active and healthy rivalry for the carrying trade. When the Standard Oil Ring organized its disastrous conspiracy against the petroleum interest and began its outrageous crimes against independent operators, the Baltimore & Ohio was the only one of the great trunk lines with courage enough to refuse to be a party to them; and the only line which withstood the advances of the ring and remained true to itself throughout the wholesale corruption which followed. The Erie, the New York Central, the Atlantic & Great Western, the Pennsylvania, each in turn was

seduced, made an accomplice in the conspiracy, and converted into an engine for crushing and destroying the producing interest. The Baltimore & Ohio, of all the great transportation companies, stood firm through that carnival of monopoly oppression, and, while it lacked facilities for rendering any considerable relief to the oil region, its manly resistance to the advances of the corruptionists earned for it the lasting gratitude of the entire petroleum trade. President Garrett made repeated efforts to break up the outrageous compact between the Standard and the railroads, and on more than one occasion proved himself a thorough friend of the producing interest. His road may have yielded now and then to the pressure of the combination, but it was always under protest and against the policy and the principles of the president.

The extension of this company's lines into the oil region would be a happy thing for all branches of trade. It would give producers another direct outlet to the seaboard, and effectually debar the Standard from repeating the wrongs it committed a few years ago. We have reason to believe the monopoly is endeavoring to form a combination with the railroads, and so perpetuate its power, as it only can perpetuate it, by a restoration of rebates and discriminations in freights. Whether this effort succeeds or not, depends very much upon the ability of the Standard to corrupt the railroad officials and prevent the Baltimore & Ohio from pushing its lines to the lakes. We do not believe the efforts in this direction will be successful. The re-election of President Roberts of the Pennsylvania, and the upright policy which has characterized Garrett's management of the Baltimore & Ohio are assurances of fair treatment for all classes and no surrender to the monopolists.

It is doubtful if a better fate than combination with the Baltimore & Ohio could befall the Buffalo, Pittsburg & Western. The road is already in excellent condition, and with the enormous trade which such a consolidation would bring it, we might fairly expect to see it speedily become one of the most prosperous lines in the State.

FREIGHTS.

Coastwise Freights.

Per ton of 2240 lbs.

Representing the latest actual charters to April 8th, 1881.

Table with columns: Ports, From Philadelphia, From Baltimore, From Elizabethport, Port Johnson, South Amboy, Hoboken, and Weehawken. Rows include Alexandria, Annapolis, Augusta, Baltimore, Bangor, Bath, Me., Beverly, Boston, Mass., Bristol, Bridgeport, Conn., Brooklyn, Cambridge, Mass., Cambridgeport, Charlestown, Chelsea, City Point, Com. Pt., Mass., E. Boston, East Cambridge, E. Greenwich, R. I., Fall River, Fredericksburg, Va., Galveston, 3.50, Georgetown, D. C., Gloucester, Hartford, Hackensack, Hudson, Lynn, Marblehead, Medford, Millville, Milton, Newark, N. J., New Bedford, Newburyport, New Haven, New London, Newbern, Newport, New York, .90, Norfolk, Va., Norwich, Norwalk, Conn., Pawtucket, Philadelphia, Portland, Va., Portsmouth, Va., Portsmouth, N.H., Providence, Quincy Point, Richmond, Va., .85@.90, Rockland, Rockport, Roxbury, Sag Harbor, Salem, Mass., Saugus, Savannah, Somerset, Staten Island, Trenton, Troy, Wareham, Washington, .85, Weymouth, Williamsbz, N.Y., Wilmington, Del., Wilmington, N.C.

* And discharging. † And discharging and towing. ‡ 3c. per bridge extra. § Alongside. ¶ And towing up and down. †† And towing. ** Below bridge.



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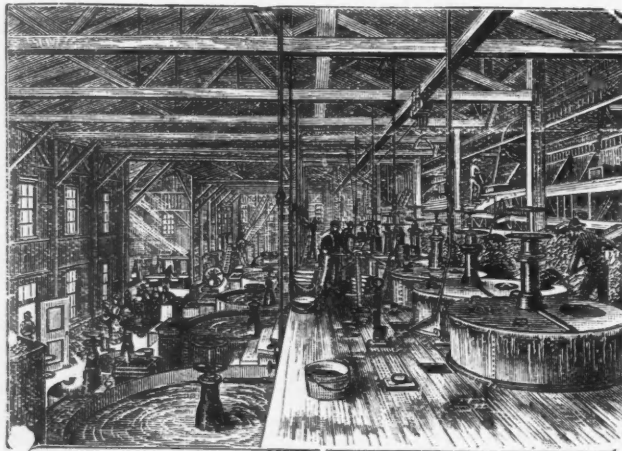
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SPECIAL NOTICES.

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In the heart of the city, consisting of 65,000 square feet of land, with buildings thereon, namely, large machine shop, large foundry, erecting shop, blacksmith shop, pattern shop, building for storing patterns, etc., etc. The buildings can be adapted to almost any manufacturing purposes. Apply to

THE GEORGE PLACE MACHINERY AGENCY
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IMPORTER AND COMMISSION MERCHANT,
105 John Street, NEW YORK.

SUPERIOR ROCK-DRILL STEEL.

This Drill Steel is used exclusively on St. Gothard Tunnel, and in the Austrian Government Mines, and is sold cheaper than anything in the market.

IMPORTANT.—DO YOU WANT YOUR ARTICLES SOLD? Proprietors of patented or other specialties wishing them sold on royalties by thorough solicitation in New York and vicinity, and sales guaranteed, Address,

UNITED STATES PATENT AND PROMOTING CO.,
Room 32, 157 Broadway, New York

AUCTION SALE.—THE REDWOOD LEAD-MINING AND SMELTING COMPANY will sell at public auction, at the inn known as "Ladue's Stone Hotel," situate in the village of Redwood, in the town of Alexandria, Jefferson County, State of New York, on Wednesday, May 4th, 1881, at 12 o'clock noon, all the mineral and mineral rights of said company, the same being located in the towns of Alexandria and Theresa, in said county, and acquired by deed executed to said company by James H. Morrow and Mary J., his wife, dated May 4th, 1865; recorded in the clerk's office of said county in book 159 of deeds, page 561, etc., on the 23d day of May, 1865.

By order of the Board of Trustees of said Company.
RICHARD HECKSCHER,
LOUIS B. WRIGHT, } Committee.
H. B. SHEPARD.

OFFICE OF THE COMPANY, 63 WILLIAM STREET, NEW YORK, April 4, 1881.

A YOUNG MAN DESIRING TO LEARN practical mining would like to connect himself with a mine in Colorado as superintendent's assistant, ultimately buying an interest if desired.

Address C. C., MINING JOURNAL, New York.

SPECIAL NOTICES.

RARE OPPORTUNITY FOR SAFE INVESTMENT.

A THOROUGHLY DEVELOPED MINE, with unusual advantages for working, showing immense bodies of very high-grade ore in the stopes, which has already yielded large returns, with much water and timber rights, in a rich mineral region, is offered at much less than its determined value. It will be placed only in the hands of capitalists able and willing to continue its working in a business-like manner, without stock speculation. For further information, address THEO. B. COMSTOCK (formerly Professor of Geology in the Cornell University), 61 Broadway, Room 35, New York City.

METALLURGIST WANTED.

A metallurgist is wanted to take charge of the Copper Works of the Orford Nickel and Copper Company at Phoenixville, Pa. One having some experience in the smelting of copper preferred. Address Box 3866, New York.

A THOROUGHLY EXPERIENCED CHEMIST, at present manager of a blast furnace, who has had many years experience in the management of blast furnace, charcoal furnace, foundry and puddle works, and understands fully the manufacturing of Speiseleisen, wishes to change his position.
Address R. S., MINING AND ENGINEERING JOURNAL.

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COPPER WORKS.

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Are constant purchasers of

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Also, ORES and MATTE bearing COPPER and SILVER; And have on hand for sale

INGOT AND CAKE COPPER

of unequalled purity and toughness.
OFFICE: NO. 57 SOUTH GAY ST., BALTIMORE, MD.
WORKS, AT CANTON,

DIVIDENDS.

OFFICE OF THE STARR-GROVE MINING COMPANY, No. 2 Nassau street, corner Wall street New York, March 16th, 1881.

DIVIDEND No. 5.

The Board of Trustees have this day declared the regular monthly dividend of \$20,000, being ONE PER CENT ON THE CAPITAL STOCK of the Company, or TEN CENTS PER SHARE, payable on the 31st inst., at this office. The transfer-books will be closed from the 25th to the 31st inclusive. JOHN R. BOWWELL, Secretary.
WM. S. CLARKE, President.

OFFICE OF THE TOMBSTONE MILL AND MINING COMPANY, 432 Walnut Street.

13TH DIVIDEND.

PHILADELPHIA, March 30, 1881.

The Executive Committee of the Board of Directors of this company have this day declared the regular MONTHLY DIVIDEND OF \$50,000;

being ten cents on each share of the capital stock of the company; payable on and after April 15th, at this office. Transfer-books closed from 10th to 15th inclusive.

GEORGE BURNHAM, President.

W. J. CHEYNEY, Secretary.

GLASS-PENDERY CONSOLIDATED MINING COMPANY, New York, March 26th, 1881.

The Trustees of this company have declared a

DIVIDEND OF TEN CENTS

per share, upon the capital stock, amounting to \$25,000, payable at the office of the company, Rooms 55, 57, Boreel Building, No. 115 Broadway, on the 8th of April. Books close April 4th, and reopen April 11th.

C. A. MANNERS, Secretary.

OFFICE OF THE ONTARIO SILVER MINING COMPANY, 18 Wall Street, New York, April 5th, 1881.

DIVIDEND NO. 66.

The regular monthly DIVIDEND OF FIFTY CENTS PER SHARE has been declared for March, payable at the office of the transfer agents, Wells, Fargo & Co., 65 Broadway, on the 15th inst.

Transfer-books close on the 9th inst.

H. B. PARSONS, Assistant Secretary.

NEW YORK, April 2, 1881.

THE STANDARD CONSOLIDATED MINING COMPANY to-day declared its regular monthly dividend of

SEVENTY-FIVE CENTS PER SHARE,

payable April 12th, 1881, at the agency of the Bank of Nevada, No. 62 Wall Street, New York.

Transfer-books close on April 5th and open on the 13th inst.

M. R. COOK, Vice-President.

THE INDIAN QUEEN MINING AND MILLING COMPANY.

DIVIDEND NOTICE.

A monthly dividend from the net earnings of the mine for March (No. 11), of 2½ per cent upon the par value of the stock, will be paid April 19th, 1881, at the office of the company, No. 7 Exchange Place, Boston, Mass.

The transfer-books will close on the 15th inst. and reopen on the 20th inst. C. C. LANE, Secretary.

MICAH DYER, JR., Treasurer.

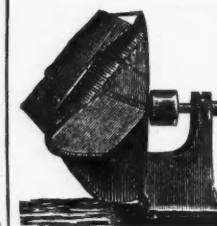
A LICE GOLD AND SILVER MINING COMPANY.

GENERAL OFFICE, Salt Lake City, Utah.
MINE AND WORKS, Walkerville, Montana.
NEW YORK OFFICE, 47 Broadway, New York.
This company has this day declared a monthly (2d) dividend of \$40,000, or ten cents per share, payable at the Farmers Loan and Trust Company, New York, on April 15th.

Transfer-books will close April 11th, and reopen April 16th, 1881. JOSEPH R. WALKER,

SALT LAKE CITY, April 1, 1881.

President.



PETRY & HECKING, ENGINEERS,

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Sole manufacturers of

PELZER'S PATENT MINE

VENTILATOR. Efficient, durable, cheap. For any quantities of air. Small sizes for hand-power. Up to 80 per cent useful effect. Now extensively used in Germany and Austria. Full particulars and illustrated price list free on application.

THE SHELL OF A BONANZA.

See the "Economist,"

Saturday, April 9th.