

THE ENGINEERING AND MINING JOURNAL



Entered at the Post-Office of New York, N. Y., as Second-Class Mail Matter.

VOL. LV. FEBRUARY 18. No. 7.

RICHARD P. ROTHWELL C. E., M. E., Editor.

ROSSITER W. RAYMOND, Ph. D., M. E., Special Contributor.

SOPHIA BRAEUNLICH, Business Manager.

THE SCIENTIFIC PUBLISHING CO., Publishers.

SUBSCRIPTION PRICE: For the United States, Mexico and Canada, \$5 per annum; \$2.50 for six months; all other countries in the Postal Union, \$7.

REMITTANCES should always be made by Bank Drafts, Post-Office Orders or Express Money Orders on New York, payable to THE SCIENTIFIC PUBLISHING CO. All payments must be made in advance.

NOTICE OF DISCONTINUANCE.—The ENGINEERING AND MINING JOURNAL is sent to subscribers until an explicit order for its discontinuance is received by us, and all payment of arrearages is made, as required by law. Papers returned are not notices of discontinuance.

THE SCIENTIFIC PUBLISHING COMPANY.

OFFICERS:

R. P. ROTHWELL, Pres. & Gen'l Mang.
SOPHIA BRAEUNLICH, SEC'Y & TREAS.

P. O. BOX 1833.

27 Park Place, New York.

Cable Address: "Rothwell, New York." Use A B C Code, Fourth Edition.

CONTENTS.

	Page.
The "Mineral Industry".....	145
Working Costs of Alaska-Treadwell Mine.....	145
Barrel Chlorination Process.....	145
The Cyanide Patents.....	145
The Cost of Producing Silver.....	146
Report on Fourth Anthracite Mining District.....	146
Books Received.....	146
Estimation of Barium in Ores.....H. Trachsler	147
Idaho Diamonds.....A. Raht	147
Proposed Smelter at Spokane.....	147
The Duty on Pig Lead.....E. A. Caswell	147
Will Steam and Compressed Air Work Together?..Matthew Penhale	147
The Maud S. Mine, Montana.....William Collins	147
Argentina.....Dr. A. Harpf	148
The Persistence of Ores in Lodes in Depth.....R. Stevenson	148
Decomposition of Tin Slags.....	148
* Mining and Preparing Borax.....	149
Peroxide of Sodium as a Bleaching Agent.....	149
Manufacture of Potash, Soda and Magnesia from Kainit.....	149
Lead Poisoning Among Glass Polishers.....	149
A Brief Golden Dream.....Dan De Quille	150
Lead and Zinc Mining Industry of Missouri and Kansas in 1892, J. R. Hollibaugh	150
* Fan with Electric Motor.....	151
The Mines of Sierra Mojada, Mexico.....Eugene O. Fechet	151
Petroleum in the Argentine Republic.....	152
Volumetric Determination of Sulphuric Acid.....	153
* Cutter's Mine Socket for Incandescent Lamps.....	153
Graduates of Mining Schools.....Prof. S. B. Christy	153
Persistence of Ores in Lodes in Depth—The Empire Lode, H. M. Beadle	154
Recent Decisions Affecting the Mining Industry.....	155
* The Cochrane Separator.....	155
Patents Granted.....	155
Notes—Russian Petroleum Syndicate, 148—Large Casting in India, 149—What is Electricity? 148—Pennsylvania Railroad Lines, 150—Fractures of Tires on German Railroads, 151—Mummy of a Cliff Dweller, 153—The Latest Armor Tests, 155.	
Personals—Obituary—Societies—Industrial Notes.....	156
Machinery and Supplies Wanted.....	167

* Illustrated.

MINING NEWS.	Washington..... 159	Buffalo..... 162	Rico..... 165
Alabama..... 157	Wyoming..... 159	Chicago..... 162	Baltimore..... 168
Arizona..... 157	FOREIGN.	Louisville..... 162	London..... 168
California..... 157	Br. Columbia... 160	Philadelphia... 163	Paris..... 168
Colorado..... 157	Great Britain... 160	Pittsburg..... 163	Pittsburg..... 165
Georgia..... 157	Low. California. 160	COAL.	Aspen..... 165
Idaho..... 157	Mexico..... 160	New York..... 163	St. Louis..... 168
Michigan..... 157	Nova Scotia... 160	Boston..... 164	Duluth..... 165
Missouri..... 158	ASSESSMENTS. 161	Buffalo..... 164	Denver..... 165
Minnesota..... 158	MINING STOCK	Chicago..... 164	
Montana..... 158	MARKETS:	Pittsburg..... 164	CHEMICALS AND
Nevada..... 158	New York..... 161	MINING STOCK	MINERALS... 164
New Mexico... 158	Boston..... 161	TABLES:	
Ohio..... 158	San Francisco. 161	New York.... 166	CURRENT PRICES:
Pennsylvania.. 158	MARKETS:	Boston..... 166	Chemicals... 165
South Dakota.. 159	METALS..... 161	San Francisco. 168	Minerals.... 165
Utah..... 159	IRON.....	Coal Stocks... 168	Rarer Metals. 165
Vermont..... 159	New York.... 162	Colo. Springs. 166	ADVT. INDEX... 19

THE "Mineral Industry," the annual statistical number of the ENGINEERING AND MINING JOURNAL, which is now in press, is a magnificent volume of about 700 pages, large octavo. Subscribers to the ENGINEERING AND MINING JOURNAL who desire to have this book bound in cloth should at once send their order to that effect inclosing, therefor 50 cents. This will avoid a delay in its delivery which the very large orders already received might otherwise occasion.

DURING the six months ended November 31st the working costs of the Alaska-Treadwell Mining Company were remarkably low. For 120,002 tons of ore mined and milled the total costs, including general charges and insurance and freight on bullion, amounted to \$158,323.95, or \$1.32 a ton. Mining, principally quarrying in benches in an open cut, costs 65 cents per ton; milling and concentration, 33 cents per ton; the chlorination of 2,703 tons of sulphurets, 19 cents per ton, or \$8.42 per ton of sulphurets, which is high when compared with barrel chlorination. General expenses at the mine amounted to eight cents per ton, and those in San Francisco to two cents per ton. The total of \$1.32 was made up by bullion freight and insurance charges amounting to five cents per ton.

While the company has an extremely large mill and is able to mine and mill ores in large quantities, this low cost of working, we believe, is unparalleled in the history of mining, at least for mining and milling hard quartz by stamps where labor is comparatively expensive. Results at the Spanish mine, Nevada County, California, found in the ENGINEERING AND MINING JOURNAL of May 5th, 1888, were more economical than at the Alaska-Treadwell, the costs for some months running below 60 cents per ton. But here the ore was soft and easily mined with cheap labor, while Huntington mills, which give excellent results on soft ore, were used in place of stamps. Altogether this record of the Alaska-Treadwell Mining Company is highly creditable to its economical management.

ON another page will be found a popular article by DAN DE QUILLE, recounting some of the difficulties met in treating the ores of Meadow Lake District, California. While we have heard that the failure of the camp as a whole was due rather to the absence of ores of a profitable grade than to an inability to work them, it is certain that these ores will not amalgamate properly, although attempts have been made from time to time with various devices and countless processes.

It seems possible to us, however, that these ores, which resemble greatly those of the Bald Mountain District of South Dakota, may be treated by barrel chlorination. Judging from a few specimens it is a silicious hematite. It is probable that in depth the ore will be found in an unoxidized condition, consisting mainly of pyrite. The average grade of the ore is stated to be above \$10 a ton. This would enable a company, if the vein is large and mining cheap, to make a profit even if the ore requires preliminary wasting. It is possible that at first this would not be required. We believe that there are many ores which can be advantageously treated by the chlorination process, without a previous roasting. Experiments have proven that a high percentage of the gold of ores which contain even a fair percentage of sulphurets can be extracted by barrel chlorination if an oxidizing agent such as nitre cake is used.

As a matter of fact, although the Plattner chlorination process had its first large application in this country in California, little is known there of the improvements which have been made in late years in barrel chlorination, notably at the Haile mine, South Carolina, and the Golden Reward works, South Dakota. The knowledge of this process is confined to the results obtained at the Bunker Hill mine, Amador City, and the Pollock plant in Nevada City. As a consequence, mining men have there maintained that the old-fashioned Plattner plant, with its effective but expensive roasting in reverberatory furnaces, is the best, notwithstanding the expense of working varies from \$9, under efficient management and favorable conditions, to \$13 per ton, against \$3 to \$5 per ton by barrel chlorination.

There are many ores in California which have been experimented with vainly, which, should they be of sufficient value, might be worked successfully by this process; notably such are the ores of Shasta County and portions of Calaveras and Tuolumne counties.

California should awaken to the fact that all the world is passing it in knowledge, and should endeavor to learn what is being done elsewhere before dismissing a problem as impossible to solve.

THE CYANIDE PATENTS.

The Attorney-General of the Transvaal has decided that the Mac Arthur-Forrest Company is not entitled to a monopoly of the use of cyanide in South Africa as the company had claimed. He gave his opinion, moreover, that no process in which cyanide is used in a different manner is an infringement on the Mac Arthur-Forrest patent. This decision was reached in an attempt by the Mac Arthur-Forrest Company to restrain the cyanide gold recovery syndicate from using the Malloy process. This process differs from the Mac Arthur-Forrest only in the method of precipitation. Instead of the fine zinc shavings, or filiform zinc as Messrs. MAC ARTHUR-FORREST prefer to call it, sodium amalgam is used.

This amalgam is formed electrolytically from a solution of carbonate of soda in contact with a bath of mercury. In precipitation the sodium combines with the cyanogen atoms of the molecule of auric cyanide, forming sodium cyanide, while the gold is instantly amalgamated. This auriferous amalgam is then strained, retorted and melted as in an amalgamation mill.

While we have no late information as to the efficiency of the process, on its face it would seem to have many advantages over the method of precipitating on finely divided zinc, as no prejudicial elements absorbing cyanogen are introduced into the solution, and the ultimate product is far easier to treat without loss. We understand that the company owning the Malloy patent is confident of a favorable decision in the English suit brought against it by the Mac Arthur-Forrest people. They claim that the Mac Arthur-Forrest patents are invalid, and that they have the fullest testimony to that effect.

This coincides with the opinion we have so often expressed that the Mac Arthur-Forrest patents were untenable, and could never live through the courts. The American purchasers of the Mac Arthur-Forrest patents have stated that they will bring suit promptly against any one using a cyanide process without authorization from them, but so far this announced contention has not been put into effect, although there is at least one mine at which cyanide is being used and no royalty is being paid. The Mac Arthur-Forrest people are undoubtedly aware of this instance of infringement if their patents are valid, but are doubtless reluctant to have a case brought to trial, as what we have long stated, that the process is unpatentable, would be clearly proved, and other companies which are now paying them \$1 a ton royalty would then stop doing so.

THE COST OF PRODUCING SILVER.

In a speech on the silver question delivered by Hon. JOHN R. McPHERSON, of New Jersey, in the United States Senate, January 9th, 1893, reference was made to the low cost of producing the metal, and a set of statistics prepared by IVAN C. MICHELS was inserted in the *Congressional Record* as an appendix to the Senator's speech. The data used by Mr. MICHELS were obtained from the report of the Eleventh Census on the production of gold and silver in the United States. From these figures it was made to appear that 1,817,036 ounces of silver were produced in Arizona in 1889 at an average cost of 52½ cents per ounce; in California, 1,065,036 ounces at no cost whatever; in Colorado, 18,416,861 ounces at 30½ cents; in Montana, 13,437,661 ounces at 41 cents; and in Utah, 6,966,933 ounces at 48 cents. Accordingly, the total for these five States, 41,703,527 ounces, was produced at an average cost of 37.3 cents per ounce. The total production of silver in the United States in 1889 was 51,354,851 ounces.

The fallacy of Mr. MICHELS' results is apparent upon their face, yet they were accepted by so shrewd a man as Senator McPHERSON, and by newspapers of such high standing as the *New York Times* and the *New York Evening Post*, both of which commented editorially upon the strikingly low cost of producing silver as thus illustrated. The position of the ENGINEERING AND MINING JOURNAL on the silver question is well known. We have been unwavering in our opposition to the free coinage heresy and have exposed repeatedly the perversion of statistics by its advocates. We object equally to misleading statements on the other side of the question as injurious to the cause we urge, and we condemn Mr. MICHELS' figures as erroneous and absolutely worthless.

The elements in their compilation were the gold, silver and lead products of each State and the expenditures as reported by the Census. From the expenditures were deducted the value of the gold produced (calculated at \$20 per ounce) and the value of the lead (calculated at \$60 per ton); the remainder divided by the ounces of silver produced was held to give the cost per ounce! In making this calculation it was, therefore, assumed that 1,029,987 ounces of gold (nearly 60 per cent. of the entire production of gold in the United States) and 100,847 tons of lead (55 per cent. of the whole product) were produced at no profit whatever. Of course this is rank nonsense. The outcome of Mr. MICHELS' computations is especially ridiculous in the case of California, where 608,936 ounces of gold, 1,065,036 ounces of silver and 53 tons of lead were said to have been produced at a cost of \$12,506,555. The value of the gold at \$20 per ounce was \$12,586,722; lead at \$60 per ton \$3,180; total, \$12,589,902. Mr. MICHELS proceeds thus: \$12,506,551 — \$12,589,902 = \$83,247—"net profits on gold; hence the 1,065,036 ounces of silver not costing anything to produce the same,"—a *reductio ad absurdum*.

One of the greatest difficulties in carrying out any investigation as to the cost of producing silver is the manner in which gold, silver, lead and copper are associated in nature, and the closeness with which the methods of winning these various metals are interwoven. Silver occurs in five ways:

(1.) Silver ores with little or no gold and no base metals, or not enough to make their extraction profitable. In Utah, Nevada, Arizona, Montana and Idaho these ores are for the most part reduced by amalgamation or lixiviation; in Colorado they are sold to the lead smelters.

(2.) Silver-gold ores, in which the gold is an important element of value, containing little or no base metals. This includes the great class of silicious or dry ores, which in Colorado are reduced by the lead smelters, and in other States generally by amalgamation or lixiviation.

(3.) Silver-lead ores, auriferous or non-auriferous. These ores are reduced entirely by the lead smelters.

(4.) Silver-copper ores, auriferous or non-auriferous, which are treated for the most part by the copper smelters.

(5.) Gold ores, containing a small amount of alloyed silver. A large amount of silver is derived from these ores, the unrefined gold of the world being seldom worth more than \$18 per ounce, on account of the alloyed silver which reduces its fineness.

In 1891 the Director of the Mint made like attempt to classify the silver product of the United States according to ores with the following result: Total product, 58,330,000 ounces: from quartz and milling ores (1, 2 and 5 in the above classification), 28,625,000 ounces, or 50 per cent.; from lead ores (3), 23,707,000 ounces, or 40 per cent.; from copper ores (4), 5,998,000 ounces, or 10 per cent. Although this division indicates roughly the relative importance of the several classes of silver ores, it tells nothing as to the manner in which the metal is won from them; an important matter, bearing directly upon the cost of production, for the solution of which there are no statistics. As matters of fact we know that all but a small part of the silicious ores of Colorado are reduced by the lead smelters of Leadville, Denver and Pueblo, which also buy less quantities of high grade dry ores from other States, while the lead smelters of Salt Lake City and Montana, as well as the copper smelters of the latter State, are all in the market for pyritous and silicious ores.

The production of gold, silver, lead and copper being so closely allied, the only fair way of estimating the cost of production for any mine, or group of mines, is obviously to charge each metal won with its proportionate share of the expense. If Mr. MICHELS' figures were recalculated in this manner the results would be found decidedly different from those he reported. For example, the 41,703,527 ounces of silver produced in the five States, together with 1,029,987 ounces of gold and 100,857 tons of lead, at a total expenditure of \$42,533,795 would be found to have cost 61 cents per ounce instead of 37.3 cents.

Mr. MICHELS made, however, more serious errors than those of computation. His data are so faulty as to invalidate any deductions whatever.

(1.) The gold and silver products taken are not those reported by the Eleventh Census in its final distribution of the totals by States.

(2.) The expenditures reported do not represent the total cost of production, including only the cost of mining and milling. In the cases of mines equipped with leaching or amalgamating mills the returns made to the Census give approximately the cost of producing unrefined bullion, but in the returns of mines selling their ores to the lead smelters the freight on ore and the cost of smelting were not reported.

It is therefore clearly impossible to make any reliable deductions as to the cost of producing silver from the statistics of the Eleventh Census, and no one familiar with the subject will believe for one moment that the result (61 cents) obtained by recalculating Mr. MICHELS' figures (which do not, by the way, take any account of the copper produced in conjunction with silver) represent even approximately the average cost of producing silver in Arizona, California, Colorado, Montana and Utah.

BOOKS RECEIVED.

In sending books for notice, will publishers, for their own sake and for that of book buyers, give the retail price? These notices do not supersede review in another page of the Journal.

The Financial Review (Annual) 1893. Published by Wm. B. Dana & Co., New York, 1893. Pages, 275. Price, \$2. Illustrated.

Electrical Experiments. By G. E. Bonney. Published by Whittaker & Co., New York and London, 1893. Pages, 252. Price, 75 cents. Illustrated.

How to Manage the Dynamo. By S. R. Bottone. Published by Macmillan & Co., New York and London, 1893. Pages, 61. Price, 60 cents. Illustrated.

Etude sur les Pertes de Charge de l'Air Comprimé et de Vapeur dans les Tuyaux de Conduites, par Ch. Ledoux (reprinted from the *Annales des Mines*), Paris, 1892.

Water Tower, Pumping and Power Station Designs.—The *Engineering Record's* prize designs suggested for Water Towers, Pumping and Power Stations. Published by the *Engineering Record*, New York, 1893.

CORRESPONDENCE.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested. All letters should be addressed to the MANAGING EDITOR. We do not hold ourselves responsible for the opinions expressed by correspondents.

The Estimation of Barium in Ores.

EDITOR ENGINEERING AND MINING JOURNAL:

Sir: Mr. Stuart Croasdale in this Journal, Vol. LV., No. 6, p. 130, describes a method for the estimation of barium in ores. I have had some experience with ferriferous lead ores from the Sierra Mojada, Mexico, which bears upon this matter. The results of my analyses are given below. One-half gram (0.50 gm.) was treated with concentrated hydrochloric acid for one hour at a temperature of 70-80° C., filtered and washed. The insoluble matter left was 45.0%, and contained 4.0% BaSO₄ and 41.0% SiO₂.

Another similar portion was taken and boiled with concentrated hydrochloric acid for 75 minutes, filtered and washed, and boiled again with concentrated hydrochloric acid for 15 minutes.

The insoluble matter left was 45.0%, and contained 2.0% BaSO₄ and 41.0% SiO₂.

Another ore gave when treated with concentrated hydrochloric acid for one hour at 70-80° C, insoluble matter 16.1%, which contained 4.8% BaSO₄, and 11.3% SiO₂. When boiled and treated as the boiled sample of the first ore, it gave insoluble matter 13.6%, which contained 2.2% BaSO₄ and 11.4% SiO₂.

It is evident, therefore, that boiling with HCl may give a result quite different from what would be obtained by treatment at 70-80° C. In the supplement to his treatise on quantitative analysis Fresenius says that by long boiling of BaSO₄ with concentrated HCl a part goes into solution, but I have not been able to find any special reference to the matter in other books on the subject.

As barium has to be slogged off in metallurgical operations the importance of ascertaining the correct amount present is obvious.

NEW YORK.

H. TRACHSLER.

Idaho Diamonds.

EDITOR ENGINEERING AND MINING JOURNAL:

Sir: Shortly after reading in your issue of January 7th, 1893, page 14, the interesting article on the Idaho diamond fields, I received from Mr. Louis R. Ruccau at Helena, Mont., two stones which he sent "to prove his assertion that the Idaho stones were true diamonds." These he claims to have found "in the apertures of former volcanoes" near Walters' Ferry on Snake River, Idaho.

Having but little confidence in the story of Idaho diamonds, I subjected these stones to every conceivable test. The smaller stone which showed curved crystal faces plainly, broke with perfect cleavage planes characteristic of diamond. The splinters burned, or rather disappeared slowly before the blow pipe, and in the bright red hot muffle, leaving a small quantity of very light ash. The larger stone, which weighs 0.6 carat, although by no means a perfect crystal, shows the octahedron shape quite distinctly; it scratches sapphire readily and cuts glass quite nicely; its specific gravity as determined with rather crude appliances is 3.67.

Both stones were somewhat opaque, and have a decided yellowish tinge, showing high lustre at the same time. After these tests I must pronounce the stones received from Mr. Ruccau true diamonds.

I am sorry not to be able to give more information about the occurrence, size, quality, and quantity of the stones.

PUEBLO, Colo., Feb. 11, 1893

A. RAHT.

(One or two Idaho stones have been received in this city which have all the characteristics of South African diamonds. Quite naturally, think the dealers, as in their opinion they were originally mined in Kimberley.—Ed. E. & M. J.)

Proposed Smelter at Spokane.

EDITOR ENGINEERING AND MINING JOURNAL:

Sir: Allow me to correct your impression that the necessary variety of ores in the vicinity of Spokane to make it a good point for the successful operation of a smelting plant does not exist.

It is true that the ores of the Coeur d'Alene are almost entirely silver-lead and concentrates, but in addition to these we have the ores of Montana, a goodly proportion of which are "dry ores." Okonogau County, in our own State, is almost entirely a dry ore belt. Stevens County has a fair proportion of silicious ores. Central Idaho has very little except acid ores.

British Columbia, on the north, has a large amount of ferruginous and basic ores, in the newly discovered district of the Slocan Kaslo basin. This last was entirely unknown eighteen months ago; to-day it has 17 different properties in operation. These mines all have from 3 to 10 ft. of carbonates and concentrating ore besides clean galena. The district is tributary to Spokane by the Spokane & Northern Railroad and also by the Kootenai River & Great Northern Railroad.

Contracts have already been let for the hauling of 3,500 tons of this ore from the mines to Kaslo this winter.

It is susceptible of proof that there is a sufficient quantity and variety of ores that are directly tributary to Spokane to make smelting a very profitable industry here. We are certainly as favorably situated for it as Omaha, Great Falls and Tacoma, and would not be under the necessity of going any farther away from home for a portion of our ores than is Denver, which needs nearly the entire product of the Coeur d'Alene to furnish the necessary fluxes for her "dry ores."

It is a fixed fact that if silver continues to decrease in value and the lead trust cannot be broken the Coeur d'Alene mines will shortly be closed down, or their ores will be smelted at Spokane, which would save the long haul on 50% of their product.

SPokane, Feb. 3, 1893.

REX.

The Duty on Pig-Lead.

EDITOR ENGINEERING AND MINING JOURNAL:

Sir: Your issue of February 11, page 121, gives a decision touching a duty on pig-lead, but as I understand it, ordinary pig-lead has only 1% impurity, and oftentimes less. In this case how could the duty on the gross weight or on the lead contents vary beyond a sum which would be expressed in mills, or even fractions of them? Does not the decision refer to lead bullion in bars? I think that the idea which strikes me will also occur to many others in the trade, and that some explanation of this apparently useless decision will have to be made.

NEW YORK, Feb. 11.

E. A. CASWELL.

[The term lead bullion in bars is not used in the Tariff Act under discussion. The decision of Judge Wilkinson relates to what some people might style lead bullion, but as this expression is not used in the tariff the question was to construe the act as it applied to the material in dispute. After submitting the matters to the opinion of those well qualified to decide the question, and finding that the material was known in and to the trade as "lead in pigs or bars," Judge Wilkinson held that it was dutiable at the rate of 2 cents per pound of gross weight. It does not affect the essence of the decision that "lead in pigs or bars" may, and for the most part does, contain other substances. Whatever may be in the lead is weighed as lead, and must be subject to the duty of 2 cents per pound. Lead ore, for instance, is dutiable at the rate of 1½ cents per pound of lead contained, and an assay must determine how much of this element is present.]

The fact that some importations of lead in pigs or bars are richer in lead than others does not bear upon this decision. If the importation should contain 90% lead and 10% of other substances, it would be assessed at the duty applicable to it if it really contained 99.99% of lead and 0.01% of other substances, provided that in both cases it was known to the trade as lead in pigs or bars.—Ed. E. & M. J.]

Will Steam and Compressed Air Work Together?

EDITOR ENGINEERING AND MINING JOURNAL:

Sir: Some ten years ago, when employed in the Sterling Iron mines at Lakeville, N. Y., after carefully examining the lake there, it was decided that the water power could be used to advantage. Accordingly, a turbine and an air compressor were put in, and the hand drilling was done away with. There was a surplus of power, and it was proposed to do the hoisting with air also, but about that time, in 1884, a dull season came on, and there was no work to be done, except to keep the mine free from water. This was done by a large pump taking steam from a boiler which had been put down in the mine to run a small hoisting engine. This made it necessary to send coal down into the mine, requiring considerable work and trouble. To avoid this I tried running the pump with compressed air, but found after a time that there was trouble caused by freezing at the exhaust. Several plans were tried, putting hot water over the exhaust when needed, and placing a stove near it; these answered when the pump was running slowly, but would not do for fast running. The boiler pipes were then connected with the air pipes by two valves, so that when the pump began to freeze the air could be shut off and steam turned on. I believed then that air and steam could be used in the same pipe, but met with no support; and at last tried the experiment on my own account, with entire success. From that time on the pump was worked with steam and air together, and the pipes were connected all over the mine.

At one time we were putting up a new stack and men were scarce. I simply ran compressed air into the boiler and then lifted the stack with a rope attached to the hoister.

In my present place I have run steam and compressed air in the drills together without trouble. I want to call attention to this, as there are many places where there is a water power, not enough to do all the work, it can still be used and the deficiency made up by a small boiler at a much less expense than if steam is relied on for all the work.

BLACK LAKE, MICH.

MATTHEW PENHALE.

The Maud S. Mine, Montana.

EDITOR ENGINEERING AND MINING JOURNAL:

Sir: The issue of the Journal for January 21st contained a letter in reference to the Maud S. mine, southeast of this city, written by W. F. Smith, of Pittsburg, and, as it has caused considerable criticism, I would ask you to publish the following statement of the Maud S. transaction:

Late in the fall of 1891 a gentleman from Pittsburg, named Anthony Barker, whose present address is 315 Wood street, Pittsburg, arrived in this city to look after some mining property. I had the pleasure of making his acquaintance, and he told me that one of the principal objects of his visit here was to examine the Maud S. mine for the purpose of placing it on the market if found of sufficient value.

Some time after I heard a good report of the Maud S. and, without consulting the owner, Dr. Whitford, I wrote to Mr. Barker, at the same time telling him that I could not give him any information from my own personal knowledge, but recommended him to write to Dr. Whitford. Correspondence was continued for quite a while between Mr. Barker and Dr. Whitford, and I have no hesitation in saying that there has never been one word of undue praise given the property by Dr. Whitford. There was no exaggeration made about the property; and with all due respect for Mr. Farish, and his knowledge of gold properties, I would say that the ore bodies are even better than reported, as has been proved by parties who are now working the property under lease. The most that has ever been claimed for the Maud S. property was that it was a good gold proposition that would require money to develop, and which the owner was willing to lease to any responsible party for that purpose on reasonable terms. And let me state that there was no sale attempted by Dr. Whitford at that time

whatever; it was nothing more than a lease, as the papers given to Mr. Barker will show. There was a bonus asked of \$6,000 for the purpose of buying some outstanding shares and paying some indebtedness. This was well known to the gentleman in Pittsburg, and he was perfectly satisfied. The parties had six months to investigate before any further payment would be made, and if satisfied then with the property they still had a further six months to make the final payment. Just as soon as Mr. Farish's unfavorable report was learned here, other parties asked for and obtained a lease on the property.

They are now sacking \$100 ore from a 22-in. vein. It is expected that a shipment will be made in a few weeks.

Mr. Smith asks: "Cannot some law be formulated and adopted by which to hold vendors of mining 'fakes' strictly responsible, even though they but try to dupe investors?" It is hard to see how any law can be passed that would prohibit a mine owner from placing a price on his property, any more than it would be to compel Mr. Robert Bonner, of New York, to sell his Maud S. for the price of a Montana cayuse. In fact, the only parties who might suffer from such a law would be the middlemen, who approach the capitalist for the purpose of making a sale, so as to get their commission and "whatever more they may have added to the owner's price."

BUTTE, MONT., Feb. 3, 1893.

WILLIAM COLLINS.

Argentine.

EDITOR ENGINEERING AND MINING JOURNAL:

Sir: The article in The Engineering and Mining Journal of April 23d, 1892, on Argentine I have only lately had opportunity to review. It is a very good translation of my article in the "Papier-Zeitung" (Berlin), 1891, No. 16, but there are two errors in it, which I shall rectify. It was said that "the undissolved metal is exhausted by boiling three times with fresh acid, when it is washed and dried."

The turnings of white metal do not have to be washed and dried before the exhaustion with acid has taken place, but they must first be boiled with acid (about three times) until the chief part of the tin has dissolved; then, only, must they be washed and dried, and may so be sold to chemical factories.

Again, it was said that "they (the wooden casks) are filled with water, and an iron basket well plated with tin and holding zinc scrap is suspended in each."

If it would be made in this way, the result would never be a clear tin sponge, but constantly mixed with crystals of tin. It is this which must be prevented.

Our practice was as follows: Old zinc, zinc wastings and zinc scraps were used for forming plates of about 30 cm. length, 20 cm. breadth, and 11.3 kilos. of weight. Each of these plates had a hole on the top, through which an iron S-formed hook entered. These hooks were well plated with tin, so as not to be acted upon by the tin solution, and were so hung on the upper edge of the wooden cask that only the zinc plate reached the liquid, while the hooks did not touch the solution. Then the zinc dissolved entirely in the solution and the tin separated itself as a sponge.

By this ordinary method the contact of zinc and tin in the solution is absolutely prevented. This must be done, as otherwise an electrical current is formed by the metals, which effects the formation of crystals on the tin electrode. If a complete zinc-tin element or a zinc-lead element is placed in the tin solution, both plates being separated by a wooden board, an electrical current is formed, and, finally, crystals and needles are formed on the tin or lead plate and clear sponge on the zinc plate. The crystals and sponge are entirely separated by the partition of wood.

My latest experiments have caused the following conclusions:

The only physical difference between crystals and sponge is the size. A chemical difference does not exist, for the composition of both is tin, with very small quantities of lead and antimony.

It is quite peculiar that the same substance fastens on both electrodes. This declares itself in the following ways:

1. By the influence of the electrical current the solution of tin decomposes itself so that the positive element (the tin) in the form of needles coats the negative electrode (the lead plate), while the negative element (the chlorine) goes to the zinc, where it forms zinc chloride.

2. At the same time the chemical decomposition of the tin solution by zinc takes place, the zinc dissolves as zinc chloride, and the tin will separate on the zinc, forming a sponge. The zinc decomposes also the free hydrochloric acid, displacing its hydrogen, the latter forming bubbles between the tin particles, forming good sponge.

LEOBEN, Austria, January, 1893.

DR. AUGUST HARPF.

The Persistence of Ores in Lodes in Depth.

EDITOR ENGINEERING AND MINING JOURNAL:

Sir: There are many theories as to the source of minerals in lodes, and there are many theories as to their origin. One mineralogist bases his theory on his limited experience in one district and one class of formation. The second bases his theory on a different formation, hence theories are about as plentiful as the different formations, and while each may be approximately correct for his special experience, it is a mistake to suppose that one theory will meet all cases. In my experience I have observed vein formation where I have believed the fissures to have been filled from above; also veins filled from below, and many where the action has been lateral. To discuss the subject properly, it would be necessary to take a special case. Professor Blake, in his article in the Engineering and Mining Journal, mentions the case of the Allison Rancho Gold Mine, Grass Valley, Cal. According to his theory that vein, being in granite, ought to be uniform in richness to an indefinite depth. Experience in working the mine, however, has shown this theory to be unreliable. The vein was rich near the surface, but became barren at 30 ft. in depth. Water was abundant near the surface, as the mine was in the bed of a creek. The rich portion of the vein seemed to be in the form of a chimney in a fissure, which might have an indefinite depth, but the quartz below

this is almost devoid of the precious metals. Again, Professor Blake mentions the old Amador Mine of Sutton Creek. This mine is on the mother lode of Amador County, where the gold bearing shoots appear to come up diagonally in the lode, so that if a shaft is sunk, following the normal pitch of the lode, the pay shoot of ore may not be struck for 500 or 600 ft., as was the case in the Hayward and Idaho mines, and at a depth of 1,300 or 1,400 ft. the pay shoot may have gone its diagonal pitch out of the property.

There is one peculiar fact in some lode formations which Professor Blake has not mentioned. In a mining district near Redding, Shasta County, Cal., called the Old Diggins, my attention was recently called to a peculiarity which has kept back the development of the mines of that district for twenty years.

The country rock is what is generally known as porphyry, in a belt about 3 miles wide, the quartz lodes running in a nearly north and south course, cutting the formation about 45°, and the pitch of the lodes are toward the east. The croppings, as a rule, are larger—4 ft. to 12 ft. wide—and rich in gold, with very little silver. The sulphurets contain iron, copper, tellurium, bismuth and gold and silver. Now these lodes have invariably pinched out in about 30 to 60 ft. in depth, leaving nothing but an irregular parting hardly visible. When this was reached the mine was abandoned, and so the district was gradually abandoned.

I was struck with this peculiarity of what we would call a fissure vein pinching out in 40 ft., and I secured a mine and began exploration in depth. About 25 ft. below the old shaft bottom we struck the ledge again. It came in like a thin edge of a wedge and opened to 3 ft. wide in a depth of 5 ft. The first 2 ft. of the ledge contained 20% iron sulphurets which, when concentrated, assayed \$1,500 per ton in gold. At a depth of 50 ft. below where the ledge came in the vein averages 4 ft. wide, the ore averaging \$30 per ton in gold. Where the lode was faulted, the sulphurets were abundant and exceedingly rich; whereas now the ledge is more uniform and regular.

SAN FRANCISCO, January 14, 1893.

ROBERT STEVENSON.

THE DECOMPOSITION OF TIN SLAGS.

Some time ago Mr. H. N. Warren, of Liverpool, England, recommended the addition of borax as a flux to the mixture of carbonates of potash and soda, used in decomposing silicious slags containing the oxides of tin and antimony. As this addition made the previous tedious operation become rapid and complete, it has been adopted very generally. Mr. Warren now writes to the "Chemical News" that it has been lately found that the oxides of tin and antimony thus prepared are by no means fixed when subjected to high temperatures in contact with alkalis, and states that in numerous instances the fumes collected by volatilization from the crucibles containing the substances, have been found to contain notable percentages of both tin and antimony. Mr. Warren has another, or "fluoride," method, of which we give a short description herewith:

A convenient portion of the slag in a fine state of division is placed in a platinum dish. Equal quantities of hydrochloric and hydrofluoric acids are added while the dish is exposed to gentle heat on a sand-bath for a few moments. The slag almost immediately dissolves, and the solution thus obtained is diluted to a known volume.

This solution is divided into two halves. One half is precipitated by the addition of sulphuretted hydrogen. The precipitated sulphides of tin and antimony thus obtained are, if necessary, purified by re-solution, and are then ignited and weighed as oxides.

The second half is rendered alkaline by the addition of ammonia, and a large excess of oxalic acid is added. On the introduction of sulphuretted hydrogen, as before, antimony sulphide alone falls down. This is ignited and weighed as oxide. From the weight of the mixed oxides already obtained, the antimony oxide is subtracted to obtain the amount of tin oxide.

By this method a complete separation and estimation of both metals can be performed in less than an hour. Over 300 samples of a like nature have been treated by Mr. Warren during the last year, and have been proved accurate within 0.2%.

Russian Petroleum Syndicate.—According to the "Gazette de la Bourse," of St. Petersburg, a new syndicate was formed in December last to control the Russian petroleum business. The new syndicate, at the head of which is the house of Rothschild, includes 135 producers of oil; the contract will extend for five years beginning January 1st, 1893.

A Large Casting in India.—The largest casting ever made in India was the anvil-block for a new steam-hammer, which was recently cast at the Jamalpur shops of the East Indian Ry. The block was cast close to the spot where it will be used, and weighs about 38 tons. The iron used was a mixture of Indian iron and imported (English) pig.

What is Electricity?—Mr. S. F. Walker, in discussing this question in an article in the London "Electrical Engineer," says: "As far as the writer is able to understand the matter now, electricity is simply the motion of the molecules of the different substances which are the subjects of electrical action, just as heat, light and sound are, and the only difference between these forces is the rate of the motion. The motion of sound, as we all know, is comparatively slow; that of heat and light is very rapid. That of electricity would appear to be somewhere between the slow motion of sound and the rapid motion of the heat waves, whose motion is slowest (that is, slower than that of light.) And it would appear that the wonderful adaptability which electricity shows for every kind of work is due entirely to the position which its rate of motion occupies in the scale of the energies. It would also appear that the reason this wonderful agent lay dormant for so many ages, and is even now only partially developed, is very largely, at any rate, because we have no sense which responds to the particular periods of vibration comprised within the electric range."

MINING AND PREPARING BORAX.

The work of mining the borate of lime does not differ essentially from that of procuring other minerals. The character of the material, however, is such as to require exceptionally heavy timbering, while the absence of water and fuel largely increases the cost. These items are more important by reason of the exceedingly low value of the ore, which necessitates economy at every step.

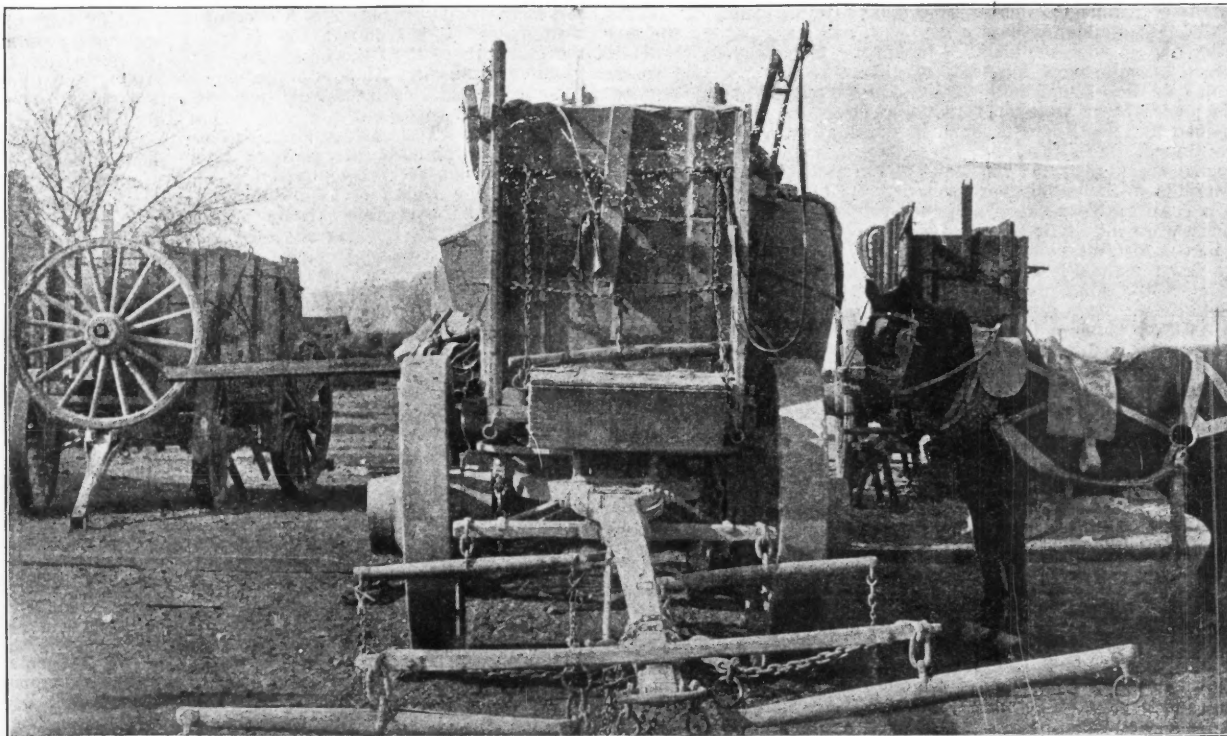
The distance of the Death Valley mines from the railroad is fatal to their present profitable working. The product of the mines must be hauled in wagons, in a way indicated by the illustration, which shows the teams ready to start. The Calico mine lies nearly 10 miles from the track, but the railroad transportation to a suitable point for manufacture involves a distance of nearly 400 miles.

The treatment of the crude borate consists in liberating the boracic acid from the lime and other impurities, and uniting it with soda to form the bi-borate of sodium, or borax proper. This necessitates a combination of mechanical and chemical operations not easily described in writing. For the handling and pulverizing of the ore, the best modern appliances are employed. When the heavily charged liquors are in the proper condition, they are drawn off into immense cooling and crystallizing tanks, where the crystal borax forms upon multitudes of steel rods suspended in the vats.

The ordinary borax, known as concentrated, is refined by successive crystallizations until it reaches the proper degree of purity. It is then passed through the dryers, or spread on the floors, and thence to the sacking and barreling rooms for shipment to market.

MANUFACTURE OF POTASH, SODA AND MAGNESIA FROM KAINIT.

In "Le Genie Civil," M. D. Lidersky describes the new process adopted by the Buckau Chemical Company, of Magdeburg, for producing pure potash, soda and magnesia from the kainit deposit of Stassfurt, Germany. Most of this kainit is sold as manure, and only a very little has been employed in the manufacture of potash, partly because so many useless bye-products were found, and partly because it was difficult to obtain a pure potash with the Leblanc process, which was the only one employed. The new process uses up all the bye-products, and besides potash it produces soda, calcined magnesia, crystallized sulphate of lime, hydrochloric acid and sulphuric acid. The average composition of the kainit used is $MgSO_4$ 16-18%; K_2SO_4 22-24%; $NaCl$ 30-4%. These salts are first converted uniformly into sulphate, by treatment with sulphuric acid. The hydrochloric acid produced is condensed. Concentrated milk of lime is then added to the boiling solution of sulphates to decompose the magnesium sulphate. The lime dissolves, but when left at rest for some days after slow cooling, the sulphate of lime separates out as a heavy crystalline powder covered with a lighter deposit of magnesia. The solution is then removed and the magnesia and sulphate of lime washed, separated, and collected in a filter press. The solution is then treated for the separation of the potassium and sodium salts. Barium sulphide is added with the resulting production of insoluble barium sulphate and solutions of the alkaline sulphides. The solution is boiled down to a strength of 20° B. and subjected to the action of pure carbonic acid gas obtained from the decomposition of alkaline bicarbonates. The sulphides are



BORAX LOADED WAGONS STARTING OUT—DEATH VALLEY, CAL.

The quantity of borate handled during 1892 reached a total of some 5,500 tons. The current output is in excess of this ratio.

PEROXIDE OF SODIUM AS A BLEACHING AGENT.

The Aluminum Company of London is placing peroxide of sodium on the market as a commercial bleaching agent. This company was started for the purpose of manufacturing aluminum by Castner's process, but on the introduction of the cheaper electric processes was obliged to turn its attention to other methods of making money. Among other things they found outlets for the metallic sodium used in their aluminum reduction process. Their latest use of sodium is to prepare sodium peroxide in a form suitable for bleaching. This compound has not hitherto been used commercially; in fact it is chiefly known on account of the ease with which it is formed in the attempt to produce an absolutely pure hydrate of soda. In preparing this compound commercially, metallic sodium is placed in a series of aluminum dishes which run on rails inside an iron tube. The interior of the tube is kept at a uniform temperature of 300° C. by exterior heating. Air, freed from moisture and carbonic acid, is fed into the tube at the end at which the aluminum vessels come out. The vessels are continuously removed as they come out, and are replaced by others newly filled with sodium at the other end. The amount of air and the speed of the line of vessels have to be arranged by experience. The air peroxidizes the sodium in its passage over the vessels, and when it is richest in oxygen, viz., at the end where the vessels come out, it acts on the sodium which is the most peroxidized, and so completes the oxidation.

decomposed; sulphuretted hydrogen is evolved, and bicarbonate of soda and potash formed. The sulphuretted hydrogen is burned and converted into sulphuric acid. The bicarbonate of soda is almost insoluble in the cold solution, and is separated by filtration. The potassium bicarbonate is obtained by boiling down the filtered liquid. The bicarbonates are calcined into neutral carbonates, and the carbonic acid gas driven off is employed in the decomposition of the alkaline sulphides.

LEAD POISONING AMONG GLASS POLISHERS.

At the town of Baccarat, in the East of France, a great glass-making center, there have been many cases of lead poisoning among the polishers of crystal glass. It is stated that at one works no fewer than 39 out of the 200 polishers have suffered from lead poisoning. In some cases repeated attacks have occurred in the same individual. One case ended in death and seventeen operatives were obliged to leave the business. The polishing is done with so-called "tin ashes," which consists of lead stannate, prepared by calcining three parts of lead with one of tin. The polishing is done wet, but a portion of the powder dries and forms a dust which is inhaled by the workmen. Of course, attempts were made to find some efficient substitute for "tin ashes." Metastannic acid, prepared by acting on granulated tin with strong nitric acid and a gentle heat, was first tried, but was found to be unsuitable alone. It was therefore mixed with half its weight of tin ashes, and this mixture has given satisfaction both as a polisher and on account of its freedom from danger. It contains only 20% of lead as compared with 61% in the tin ashes.

A BRIEF GOLDEN DREAM

Written for the Engineering and Mining Journal by Dan de Quille.

Following the discovery of silver in Nevada, and the grand excitement incident to the opening and development of the mines of the Comstock, were numerous minor excitements, as the Reese River, White Pine, Pioche and other mining "rushes." In all these interior camps of Nevada, however, good mines were opened, and for many years large amounts of gold and silver were annually extracted; therefore, the people who were attracted to them, found and enjoyed for a number of years a good degree of prosperity, if not the large fortunes they had anticipated. The most disastrous mining excitement ever participated in by the people of the Comstock was that of Meadow Lake, in 1865. The mines of Meadow Lake were discovered by a Virginia City man named Hartley. They are situated in the high Sierras, in Nevada County, Cal., where in winter the snow falls to a depth of from 10 to 20 ft. on the level. The mines being discovered by a Comstocker, men of the Comstock had the first information in regard to their richness, and began the rush, soon to be followed by the people of a number of California mining camps.

The mines of Meadow Lake district were of such a nature as to excite in the hearts of all the highest hopes of good fortune, and then dash from their lips the cup of happiness just when it seemed most firmly in their grasp. The veins of the district were all largely composed of iron. In the cappings, and to a considerable depth below the surface, the iron in the quartz had oxidized and decomposed, leaving the contained gold free. From the veins at the very surface, and even above the surface in places, one was able to pan out of the red oxidized material big prospects of free and glittering gold. In places men made eight and ten dollars a day with rockers, carrying the dirt they washed a considerable distance in sacks. Gold seemed abundant everywhere. There were hundreds of quartz veins, great and small, and in all gold was found in the decomposed material at the surface, while in places there were only rich pockets. As far as the veins were opened by means of cuts, inclines and shafts the favorable prospects continued.

Feeling secure as regarded the value of the mines, the people turned their attention to the building of dwellings and other structures, necessary to a comfortable residence in that snowy region in the winter. The mines were all right; nobody could doubt that; the main thing was to be comfortably housed before the big snows came.

Only a few remained in the camp the first winter. The next spring and summer—the good prospects continuing in the mines—the boom began in earnest. There was a grand rush from both Nevada and California. As if by magic a town of some 5,000 inhabitants appeared on the shore of the beautiful lake. There were stores and shops of all kinds, a theatre, stock exchange, daily newspaper and hotels, lodging houses, restaurants and saloons, almost without number. On the lake was a fleet of twenty sail boats; a brass band played nightly on the lake as the plaza; quartz mills were being erected and in the town new buildings were going up on all sides; everybody seemed on the high road to fortune. The summer weather in that elevated region was like early spring in the valleys. The grass was fresh and green in all the dells, and everywhere beautiful mountain flowers were blooming. Almost daily there were picnic parties or excursions upon the lake, while of nights there were music and dancing in a score of places about the town. Nowhere in the mountains was there to be found a more beautiful place than Meadow Lake, or a happier people than those who made the town their home.

But their happiness was brief. Ruin soon stared hundreds in the face. The decomposed surface material of the veins was soon worked out—almost as soon as the first mills were started—and below was found the solid, bright, unchanged iron. This iron held the gold in its grasp and could not be made to yield it up by any process of working that could be invented, though scores were tried. Down went the shares of all mines; down went the prices of buildings in the town and all property—down went everything far and near in that grandly beautiful mountain region.

At first houses and property could be sold for something, but soon people were obliged to desert the place, leaving behind homes upon which they had spent their last dollar. In one or two winters the roofs of the deserted buildings were crushed in by snow, and soon the whole town became a ruin. Only one man remained in the place, and that was Hartley, the discoverer of the mines. He is there to this day, and is now known as "Hermit Hartley." He has faith in the mines he found so many years ago, and manages in some way to dig a good deal of gold out of the iron-bound veins of the district. Hartley even winters alone in a house which is still standing in the old town. This is a strong, steep-roofed two-story building, and in winters so deep is the snow that he uses one of the windows of the upper story as a door. All his excursions abroad are made on Norwegian snow shoes.

Every year we hear of some man who has a process by means of which the ores of Meadow Lake can be made to yield up their gold, but we hear of no man's process proving a success. Some day a way of working the ore will be hit upon; then, perhaps, there will be seen on the shores of the lake a new town that will far surpass that which the old-time pioneers left behind them when the "iron entered their souls" and they fled the country.

Pennsylvania Railroad Lines.—According to the statement of Chief Engineer W. H. Brown, the Pennsylvania Railroad Company now operates 4,542 miles of road east of Pittsburg and Erie; of this 109 miles were built in 1892. On these lines there are 8,891 miles of track, an increase of 344 miles over last year. The lines west of Pittsburg and Erie include 3,437 miles of road, an increase of 25 miles. The total mileage is 7,979 miles of railroad, on which there are 2,033 miles of second, third and fourth tracks and 4,266 miles of sidings.

LEAD AND ZINC MINING INDUSTRY OF MISSOURI AND KANSAS IN 1892.

Written for the Engineering and Mining Journal by J. R. Hollibaugh.

This review is confined to an area in southwest Missouri and southeast Kansas, of about 60 miles from east to west, by 30 miles from north to south; or extending from Aurora, Mo., on the east, to Galena and Empire, Kan., on the west, the northern boundary beginning at Alba, Mo., the southern at Newtonia and Pioneer.

Twenty years ago no zinc ore had been mined from this area, and but little was known concerning the value or extent of its ore deposits. The exploration of the lead mines led to the opening up of what have proved to be the most extensive zinc ore deposits in the world, and have attracted the attention of capitalists of this country and of Europe. Up to three years ago the mines were worked in the most primitive manner, but great progress has been made in adopting improved machinery and modern methods of mining. The lead and zinc mining industry has built up such large and prosperous towns as Joplin, with a population of 18,000; Webb City, 8,000, and Cartersville, 6,000, with many others of less importance.

The market value of zinc ore on January 1st, 1892, was from \$23.50 to \$24 per ton of 2,000 lbs. at the mines, and, as there was only a small stock on hand at that time, the output of each week was taken promptly by the smelters. As the year advanced and the output increased, the price declined to \$21.50 to \$22.50 per ton, at which figures the large operators stocked their output, and then made sales of 300 to 500 ton lots. It was expected that European buyers would enter the market, but as satisfactory rates of transportation could not be arranged, not more than 3,000 tons of ore was shipped abroad during the year. The Empire Zinc Company shipped 50 tons of spelter to Europe, and it is believed that it will prove more profitable to ship the metal there than the ore. The following are a few of the more prominent mines: At Joplin the Granby Mining and Smelting Company is the oldest concern, and owns several hundred acres of mining land, which it leases out in mining lots of 200 x 200 ft. to miners on the royalty plan. The Oswego Mining Company owns 700 acres of mining land, within the corporate limits of Joplin, subdivided into mining lots many of which are leased out on royalty to miners and mining companies. The Guinn & Loyd mining lands of 400 acres have been closed down the greater part of the year, but have recently resumed operations. The Roaring Springs Land and Mining Company, the O'Keef mines and the Mahaska Mining Company, Ltd., are old and steady producers. South of these is a tract of 200 acres, Eagle Mines, owned and operated by the Empire Zinc Company, W. C. Wetherill, Manager; Pope Yateman, Superintendent, worked in a systematic manner; the underground surveys are posted every month. The same company owns 220 acres of land in the west end of the city, 80 acres of which is being worked as the Kohinoor Mines. Among the new mines in 1892 near Joplin, the most prominent is the Rex Mining and Smelting Company, with a capital of \$1,000,000, with 1,000 acres of land. Work was commenced in October, 1891, on this property, the Crossman Brothers & Porter Mining Company, which reached ore at 65 ft., the Stilwell Lead and Zinc Company, the American, the Gotham, the Bishop, the Columbian, the Jersey, the Heddens, the Crossman, the Rich Hill, St. Joseph and other companies leasing from one to five lots each, such as the McKee and McIntire, Bell Boy, Pemberton, Lucretia, Gregory, Royal, Victoria, Keller and Randall. There are now five ore dressing plants in operation representing a total cost of about \$35,000.

There are now about 50 producing shafts which give an output of 250 to 300 tons of zinc ore weekly. The American Mining Company, locally known as F. M. Sharp's mine, has made the important discovery of a large deposit of boulders of zinc ore. The development, second in importance is that of the Ruby Mining and Smelting Company. This company is now producing 50 tons weekly from its 80-acre tract.

The owners of this property, securing a lease of 40 acres in the south end of Joplin, have spent the past five months in development work. They now have five shafts in ore, and have completed a large concentrating mill. At what is locally known as the Tanyard and Gordon Hallon district, great progress has been made in opening up undeveloped lands, the most prominent of which is the Scotia mine, owned and operated by Col. H. H. Gregg. This property contains 80 acres. We are reliably informed that over 1,200 tons of zinc ore has been sold from this land during the year.

The old mines of the Webb City and Cartersville district, such as the Center Creek, the Sucker Flats, the Tracy, the Ashcraft, Reynolds and the Noble, have made a steady output throughout the year. The Cartersville portion of the district has made a rapid advance in output. This is due to the unimpaired output of the old mines and the opening of new properties. The output of the entire Webb City-Cartersville district has rarely fallen below \$35,000 weekly. Directly north of this is Oronogo, the oldest mining camp in Jasper County. Work in this camp has been revived during 1892, and development has opened up some large deposits of both lead and zinc ore. Seven miles north of this is the Alba. Here in the past years very little mining but surface work has been done, but during 1892 an ore dressing plant was built, and as a result the mines have made an average output of 40 tons weekly. South of this are the Pleasant Valley and Carthage mines. Here no particular improvement has occurred. About 25 miles southeast of Carthage is found the new camp of Wentworth, on the line between Newton and Lawrence counties. This place has been opened up during 1892, and makes a good showing. Twenty miles east of this is the prosperous and steady producing mining district of Aurora. According to shipments of ore from this place, the production of lead, zinc and silicate ore averaged nearly \$12,000 per week.

In the old Granby mining district, where mining for lead has been carried on by the Granby Mining and Smelting Company for almost 45 years, a considerable amount of development has been done by pro-

pectors and the Granby company. To the south and southeast the Granby company has drilled holes to a depth of 200 ft., and has discovered good deposits of zinc ore.

Galena, Cherokee County, Kan., is located at the extreme west of this lead and zinc mining belt, but, like all the other points, has maintained a steady output of both lead and zinc. The extremely heavy rains in the early part of the year almost drowned out the old mines on the south side, the Galena and the Bonanza's land. This greatly restricted the output at the beginning of the year, but in the end proved a benefit, as it caused the prospecting in new and undeveloped lands to the west and southwest. Development has proved these lands to be rich. A very large and modern zinc smelter has been built at Galena, and last week made its first shipment of spelter.

In 1891 the output was 28,368,408 lbs. of lead ore, and 274,751,857 lbs. of zinc ore; in 1892 this was increased to 48,252,890 lbs. of lead ore, and 312,800,000 lbs. of zinc ore. The figures for 1892 are estimated for the last two weeks of the year.

From the best information obtainable the stock of zinc ore in the hands of the mine operators ready for market was about 3,500 tons at the close of the year.

FAN WITH ELECTRIC MOTOR.

There are few purposes to which the electric motor can be applied to better advantage than in running fans for ventilation or blowing. A connection by wire with a power circuit does away with the necessity for engine, boiler, shafting, or belt, and places the fan under immediate control. The very high speed at which it is possible to

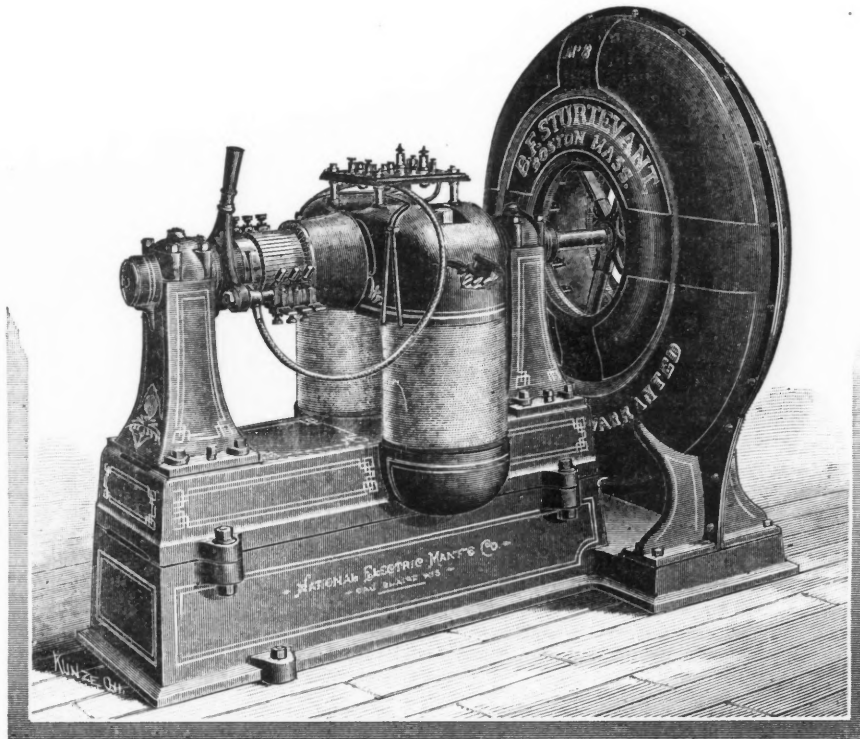
THE MINES OF SIERRA MOJADA, MEXICO.*

By Eugene O. Fehet.

The town or mining camp of Sierra Mojada is situated in the State of Coahuila, and is the present terminus of the Mexican Northern Railroad. The camp lies about 67 miles in an air line northeast of Escalon station, on the Mexican Central Railroad; but by the line of the Mexican Northern Railroad, which makes a detour to turn the mountain range, it is 78 miles. The Mexican International Railway has commenced construction upon a line from Monclova, on the main line, to Sierra Mojada. This line will have a total length of 155 miles, and will be rapidly pushed forward to completion. The Monterey & Mexican Gulf road will also construct a line to Sierra Mojada from Trevino station, the junction of the Mexican International Railway and the Monterey & Mexican Gulf. The British Mexican Railroad has completed the grading of the first 30 miles of a new line, which is to run from Jimenez, on the Mexican Central Railroad, to Sierra Mojada, and the rails for the entire line are purchased. Within a year there will certainly be two, and probably four, railroads entering Sierra Mojada and forming parts of the great trunk systems of Mexico, thus insuring most ample transportation facilities for the large daily ore output of the camp.

The history of the Sierra Mojada must necessarily be brief, as the first settlement was made less than 15 years ago, and there is an absence of the startling incidents characterizing the early history of mining camps in the United States.

Twenty years ago the section of country now comprising the mining district of Sierra Mojada was known only to the smugglers who sought



VENTILATING FAN WITH ELECTRIC MOTOR.

run them gives large capacity, so that a small fan occupying but little space can be used to ventilate buildings of considerable size. When run at proper speed they are noiseless and cause no inconvenience whatever. The fan can be set up in any position, without affecting the running of the motor, and for this reason it may be located to discharge in exactly the required direction, and connection easily made by pipe. In the dynamo rooms of electric light plants, they are naturally to be preferred to any other means of ventilation. They are admirably adapted for blowing forge, boiler or furnace fires of any description, for cold storage warehouses, planing mill exhausters, and, in fact, for any purpose where a large volume of air is to be handled with the least expenditure of power.

The illustration given shows a fan with electric motor, made by the National Electric Manufacturing Company, of Eau Claire, Wis., which is a neat and compact arrangement. These fans can be made either right or left hand, to discharge in any direction desired. Two of them recently furnished to the new shops of the Bucyrus Steam Shovel and Dredge Company, in South Milwaukee, have given complete satisfaction.

Fractures of Tires on German Railroads.—A report recently published shows that for a period of seven years, 1884-1890 inclusive, the average number of fractures of steel tires on the German railroads was 0:28 per 100. On locomotive wheels the average was 0:50 per 100; tender wheels, 0:65 per 100; passenger carriage wheels, 0:38 per 100. In 1890 there were 30 accidents resulting from the breakage of tires on the German lines. It is believed that many of the fractures are due to the fact that tires are kept in service too long, after they are worn down too thin for safety.

the remote solitudes of these mountains for the protection of their traffic. During the pursuit of a band of these smugglers in the year 1878 by customs guards, the discovery of silver-bearing ore was made by Nestor Ariola, a member of the pursuing party. The first "find" was made upon a hill called "La Blanca," which forms a buttress to the Sierra Mojada at the point of its highest elevation. This first discovery proved to be a small chamber, or pocket, and was soon exhausted. All of the present prominent and paying properties are located within a mile of this first "discovery" of the camp.

Owing to the low grade of the ore, the scarcity of water and the tedious and expensive methods of extracting the silver by the "hornos," or "adobe" furnace, there was little activity in mining until about the year 1876, when the Mexican Ore Company (an American organization with headquarters of company at El Paso, Tex.) commenced to export the ore to the United States. Since the first shipment there has been a steady increase to the present time, when the daily shipments aggregate 500 tons, of which about one-half is exported to the United States for reduction treatment, and the balance is shipped to the smelters at Monterey and San Luis Potosi.

The method of transportation prior to July, 1891, when the Mexican Northern Railroad was completed, was by mule teams, and for some years previous to the advent of the railroad there were from 8,000 to 10,000 mules engaged in this traffic. Now this number has been cut down to some 500, employed in hauling the ore from the mines to the railway. This latter number will be still more reduced as soon as the railway shall be completed directly to the mine dumps.

There are three mining zones in the municipality of Sierra Mojada, embracing 63,000 square metres and covering all the valuable territory

* Abstract of United States Consular Report.

now known in the district. The first concession for a mining zone was granted in the year 1888, the second in 1890, and the third in 1891. The granting of these mining zones has been a serious drawback, and has retarded the rapid development of the camp. The private and individual prospector is debarred from prospecting or locating a mining claim within the conceded zones. Hence, all claims have to be secured by purchase or lease from the concessionaires.

There are some 30 mines known to exist in the district, but only 11 are producing ores at the present writing. The output of the camp from the beginning up to October 1st, 1892, approximates 500,000 short tons and \$5,000 tons of silver-lead bullion, the product of the Esmeralda Smelting Company, the only smelter located at Sierra Mojada.

The inhabitants of the municipality of Sierra Mojada number about 8,000. Of this number the laborers engaged in mining and the industries consequent thereto aggregate about 40%.

The general conformation of the district is very simple. A valley commencing at the "Puerte de Oro" (Golden Gate), 13 miles east of the town of Sierra Mojada, runs nearly due west, with an average width of about 2 miles, and terminates about 8 miles west of Sierra Mojada camp in a cul-de-sac. The narrowest portion of the valley lies west of the town. This valley is bounded on the north by the Sierra Planchada and on the south by the Sierra Mojada range. Upon the northern slopes of the Sierra Mojada, all of the mineral deposits so far discovered in the district are located. The lowest point of the valley (at the town) has an altitude of 4,825 ft. above sea level. The mountain peaks, which are highest over the slopes where the largest mineral deposits have been found, attain an altitude of 2,500 ft. above the valley, or 7,325 ft. above sea level.

The general aspect of the mountains forming the Sierra Mojada range proper is very striking—along the summit a boldly scarp precipice of a general dull gray color alternating with yellowish patches of color, where fresh surfaces have become exposed by recent falls of rock. This precipice, or escarpment, carries about one-third of the total height of the mountain above the valley, and is consequently about 800 ft. in sheer height.

The face of the escarpment exhibits many prismatic columnar forms, a striking peculiarity of the limestone rocks of this region. Below the escarpment the hills are rounded into a series of deep alcoves and projecting buttresses, and are covered with sparse vegetation. East and west of the highest portion of the range, which is about three miles long, the mountains are much lower, the rounded hills extend to the summits, and the sharp lines of the escarpment have disappeared. The general appearance of the Sierra Planchada exhibits the same characteristics as that part of the Sierra Mojada last described.

The prevailing rock formation of the Sierra Mojada can be observed all over the eastern part of northern Mexico, mainly a magnesian limestone of considerable thickness (about 2,000 ft.), including some beds of calcareous sandstone and one horizon (near the bottom of the series) of calcareous conglomerate. Since this rock has been partially metamorphosed, to the almost entire extinction of fossils, its exact geologic age must be, to some extent, a matter of speculation. The fossils that have been found have been classified by Mexican paleontologists as cretaceous, and they have therefore assigned this formation to the Cretaceous period.

About one-third of the way up the foothills of the Sierra Mojada are several bodies of altered and decomposed lime rock impregnated with ferruginous matter, and containing silver and lead bearing minerals, disseminated in great quantities through this mass or collected together in chambers or chimneys as segregations from the impregnated deposits. These deposits extend at about the same altitude all along the north flank of the Sierra Mojada for a distance of about 4 miles, everywhere more or less metalliferous, and everywhere presenting the same dominant characteristics of composition, with, however, some variations of strike and dip. These bodies of mineral are much softer and more friable than the inclosing rocks, and, hence, have been eaten away more by erosion. The country rock has thus often been left projecting above and below; that below is deeply iron stained in many places, and hence the ore deposits present a distinct outcrop throughout their length.

The minerals found in these deposits are not numerous or varied. Silver occurs native and as chloride, bromide and sulphide, all in small and rare specimens, not to mention its combinations with lead. Copper is found as carbonate (azurite) and very little pyrite. Lead occurs as carbonate, sulphate and sulphide. Sulphur is found native in quite large masses, and is generally amorphous.

In the early discoveries it was the prevailing opinion that there was no true vein, as only slight traces of regularity of formation were noticed, and these traces were classified as mere attempts at parallelism. Later discoveries have proved that there are two distinct and fairly well defined veins. The copper found in this district is almost entirely confined to a distinct vein, having a dip of about 45° to the north, and carrying, in the western part of the known deposits, ores running from 60 to 200 ounces of silver per ton, the grade becoming lower to the eastern part. In the anticlinal contact dipping to the southeast the iron ore is limonite with pyrolusite and psilomelane without copper ores, and with lead carbonates carrying from 18 to 40 ounces of silver, and from 20 to 50% of lead per ton. Especially is this true in the eastern portion of the deposit; but in the western portion the lead decreases to from 10 to 20%, while the amount of silver increases slightly. In the western portion of the known ore deposits, the veins heretofore spoken of are more distinctly defined than in the eastern; but in all of the properties which are extensively worked the regularity of the deposit is such as to warrant the statement that two distinct veins exist throughout the known mineral zone, and their point of contact or apex is that portion generally lying nearest to the surface.

The metalliferous deposits are found with a covering or envelope of ferruginous clay and disintegrated, iron-stained limestone, sometimes impregnated with copper or lead. This mineral belt has been ex-

plored for about 3 miles from west to east, and it is the prevailing and concurrent opinion of all mining experts who have made a careful study of the characteristics of the district that the limits of the mineral belt will be extended beyond the present known lines.

The deposits are, as a whole, as might be anticipated, quite soft, and in many cases even loose. The lead carbonates are "sand," solid and massive. The latter layers are the most compact of all, but it is seldom necessary to use powder to extract the mineral.

In the early days of the camp no mechanical appliances of any kind were employed, except picks and crowbars; but now the mines are worked after the most approved methods with improved machinery.

I believe no mine has reached a greater depth than 550 ft., but the lateral workings of the San Salvador and Esmeralda mines are considerable. The San Salvador is the largest producer, having an ore body about 140 ft. wide, and lateral extent not known. The output of this mine is about 400 tons daily. Then follow, in the order of their tonnage output, Encantada, Esmeralda, San Jose, Vita Rica, La Fortuna, Volcan, and several smaller mines in process of development and with a nominal output. The average cost of mining and placing a ton of ore aboard the cars is about \$5.80 in Mexican silver.

The work of mining is done by contract, the miners earning from 75 cents to \$1.25 per day in Mexican silver, or, at the present rate of exchange, 48 to 80 cents per day in United States currency. The timbermen are mostly American or Cornish and receive from \$3.50 to \$4 in United States currency per day.

During the early exploitation of this camp the want of water was most severely felt, and during the prevalence of the long droughts the people were forced to seek other localities and temporarily abandon the camp. The serious drawback on continuous work has been partly overcome by the construction of large reservoirs to catch and store the rainfall which, in this section, is abundant generally in May, June and July and occasionally in February. The water thus secured is usually sufficient, with economy, for present needs. In cases of very prolonged droughts the railroads can now be relied upon to haul water to camp.

At the old pueblo of Sierra Mojada a small supply of water for domestic purposes can be had by sinking wells to a depth of from 30 to 60 ft. With the exception of these wells of limited capacity, no water has been found in the valley, and no determined effort has, I believe, been made to secure any; and hence the problem of water supply sufficient to meet the needs of a large mining center has yet to be solved, either by artesian wells or a more complete and extensive system of reservoirs.

The great deposits of lead carbonates that have made this camp so famous, are now so fully developed that conclusions as to the permanency of this district can be drawn from actual conditions of development work. The ore reserves now in sight are sufficient to insure a steady production for the next ten years, if not for a longer period. The possibilities of the extension of the eastern and western limits of the mineral bearing zone are great, and may become a chief factor in the future of this camp. The question of the continuance of the deposits as depth is attained is still open. The deepest workings have reached about 500 ft. below the surface. As a rule, at this depth massive iron ore replaces the limestone foot wall and the ore is of lower grade or ceases entirely. Many intelligent miners conversant with the geologic and mineralogic features of the district believe that when this iron bottom is pierced a second contact will be found more valuable than the first. It is also recognized as possible that the ores at the second contact will be refractory and will replace the valuable product that has made Sierra Mojada ores so desired by metallurgists.

An average analysis of lead ores of this camp will show about as follows: Lead, 30%; silver, 35 ounces; iron, 15%; silica, not to exceed 5%, and balance lime.

Prior to the present United States tariff the output of the entire district was exported to the United States, save the relatively small tonnage smelted directly at the camp by the Esmeralda furnace, the only one in camp. Under the former tariff Sierra Mojada ores entered the United States free of duty, as the silver component exceeded the lead in value. Under our present tariff silver-lead ores pay a duty of 1½ cents per pound upon the weight of the lead component, provided the value of the silver exceeds that of the lead; otherwise the duty is levied on gross tonnage at \$30 per ton. In consequence of this change of tariff, all ores exported from Mexico to the United States are either dry ores (silver) or silver-lead ores in which the value of silver exceeds that of the lead. Upon this last class the average duty (upon an average of 30% of lead to the ton, or 600 pounds) is \$9 per ton. The effect of the change in the tariff on Mexican ores has been to shut out ores high in lead and low in silver, and to cause export shipments to be graded to a higher silver average per ton. This results in a decreased tonnage exported to the United States, but at the same time in an increased value of ore.

It is estimated that the Sierra Mojada district will export to the United States during the present fiscal year (July 1, 1892, to June 30, 1893) upward of 70,000 tons of ore, upon which duties will approximate \$630,000.

PETROLEUM IN THE ARGENTINE REPUBLIC.

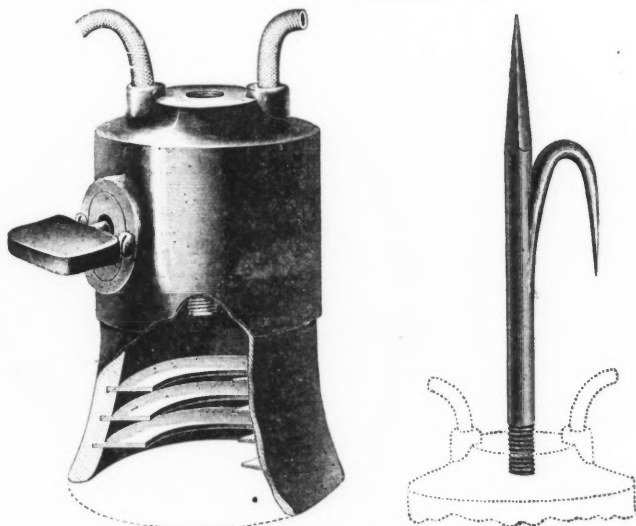
At Cachenta in the province of Mendoza in the Argentine a considerable petroleum industry has sprung up during the last two years. In this district there is a promise of great mineral wealth, but as yet it has been worked only in a desultory manner. There seems to be a future before the petroleum industry. Up to the present time three successful borings have been made and the total output since the first boring in April, 1890, has been 1,500 tons. The oil is conducted through pipes to the storage tanks at San Vincente. It finds a ready sale at the Rio Cuarto and Mendoza gas works and at the Argentine Great Western Railroad. This railroad has twelve locomotives which use the oil as fuel.

THE VOLUMETRIC DETERMINATION OF SULPHURIC ACID.

In the "Zeitschrift fur Analytische Chemie" Mr. Farnsteiner describes a new method of estimating small quantities of sulphuric acid in soda, common salt, potash, potassium, chloride and water. The solution to be tested is first slightly acidified with hydrochloric acid and heated almost to ebullition; then it is precipitated with a measured excess of a solution of barium chloride of known strength. After it has been heated for some time longer, ammonia free from carbonic acid is added until the reaction is faintly alkaline. Then the excess of barium chloride is precipitated by means of a measured volume of potassium chromate of known power of reaction. When cold the liquid, which then contains only a slight excess of potassium chromate, is transferred along with the precipitate into a suitable flask. The flask is filled up and well shaken up, and after the precipitate has subsided, half the liquid is filtered off. It is then mixed with potassium iodide and hydrochloric acid, either in a beaker or in a wide-necked flask capable of being closed with a glass stopper. After some minutes the eliminated iodine is determined with a solution of sodium thiosulphate. For the calculation, the strength of the solution of barium chloride must be exactly known; also the relation of the solution of chromate to the barium chloride and to the solution of sodium thiosulphate. This process does not give good results with large quantities of sulphuric acid as both the barium sulphate and the barium chromate carry down potassium chromate.

CUTTER'S MINE SOCKET FOR INCANDESCENT LAMPS.

It is unfortunately the case that some of the so-called waterproof sockets, which have been devised, do not meet the necessities of the case. While apparently shielding the works of the socket from dripping water, they do not prevent the moisture from creeping up on the lamp and short-circuiting the cap. The result is that the fuses are blown much too often, thus leaving the men in darkness unless they have other lamps at hand.



CUTTER'S MINE SOCKET FOR INCANDESCENT LAMPS.

These defects in the ordinary rubber, glass or porcelain sockets have been considered in developing the socket shown in the accompanying illustration. This has a well built interior (with porcelain insulations) protected by a casing of polished hard rubber. The leading-in wires are cemented into the shell, while the handle or key passes through a bushing which is made watertight by soft rubber washers. These prevent any moisture from entering the shell at the sides, so that the only danger is from the creeping of the water along the bulb of the lamp. To avoid this, the shell has a series of soft rubber rings which press against the bulb of the lamp when screwed into place and prevent any moisture from reaching the lamp base. It is said that such a socket can be used with safety in places where there is a steady dripping of water, and that it can be entirely immersed without any danger from short-circuits. When used in mines, it is furnished with a prong, as shown, so that it can be hooked in any convenient position.

This socket, which is shown in the accompanying illustration, is made by George Cutter, of Chicago. It has been furnished by him to several mines in northern Michigan, where it is now in successful use.

The Mummy of a Cliff Dweller.—Prof. Clement L. Webster, of Iowa, has returned from extended explorations of the ancient cliff dweller ruins of Mexico and New Mexico. He has made many valuable discoveries regarding these strange people, and has secured many relics from their ancient dwellings. His most important discovery, however, was that of a perfectly preserved mummy of a cliff dweller. It is that of a child apparently seven years old. It was discovered in a cliff dwelling on the Rio Gila in the Mogollon Mountains. The body is rather small compared with that of a modern child of the same age. The body is of a yellowish brown color, and is rather light in weight. Its arms are upraised near the sides of its head, its hands are clinched, and its legs somewhat drawn up. The body had been carefully wrapped in two varieties of coarse cloth, such as was made by the cliff dwellers everywhere in this region, then carefully bound on a peculiarly shaped board of cottonwood.

GRADUATES OF MINING SCHOOLS.

Written for the Engineering and Mining Journal by Prof. Samuel B. Christy.*

In a late series of articles on "The Engineering Schools of the United States," the editor of the "Engineering News," in the number for October 6th, 1892, takes occasion to criticise, as very ill advised, the courses of instruction of the American mining schools. These criticisms have been ably and forcibly answered by Professor Munroe, in the numbers of the same journal for November 3d and 24th. In commenting on Professor Munroe's last article, the editor "admits its abstract force," and adds, "Our opposite impressions were based only on a count of noses in 1890."

The editor bases his principal criticism on the small number of graduates from the mining schools, and, particularly, the small rate of increase in their numbers. Thus the number of graduates from all the engineering schools was:

	Mining Engineering.	Mechanical Engineering.	Civil Engineering.
1880.....	37	41	157
1892.....	48	445	371
Increase.....	1.3 times.	10.8 times.	2.2 times.

This would appear to be, at first sight, a very bad showing for the mining schools, particularly, as the writer adds, while the mining industry is growing enormously.

Now, according to the latest report of Major J. W. Powell, director of the U. S. Geological Survey, the exact figures are as follows:

	Year 1880.	Year 1891.	Increase.
Non-metallic mineral products.....	\$173,279,135	\$556,216,615	2.96 times.
Metallic products.....	190,039,865	302,377,922	1.60 "
Estimated value unspecified.....	6,000,000	10,000,000	1.66 "
Total.....	\$369,319,000	\$868,524,537	1.81 times.

In the light of these figures the increase, 1.3 times, in the number of graduates from the mining schools, appears remarkably close to the increase, 1.81 times, in the total value of the annual mineral product of the country for the corresponding decade. In fact, no one would have ventured to predict such a close agreement beforehand.

The increase in the number of graduates from the civil engineering schools is probably very nearly in proportion to the natural growth of the country, though there are some indications that the supply already begins to exceed the demand.

With regard to the enormous increase in the number of graduates from the schools of mechanical engineering, it is certain that a great part is due to a legitimate demand, although much is probably due to the excited state of the public mind on the subject of electrical engineering. No one can safely predict the outcome in that direction at present, though it is likely that many young men with great expectations are doomed to disappointment.

In order to get a clearer insight into the real facts bearing on this question, I have endeavored to ascertain the actual distribution of the wage-earning occupations in the entire country. Unfortunately the eleventh census is not yet in a shape to make its figures on the whole subject available. The tenth census—up to 1880—gives results as follows:

Agriculture.....	7,670,493	44.10%
Professional and personal.....	4,074,238	23.43%
Trade and transport.....	1,810,256	10.41%
Manufactures, mechanics and mining.....	3,337,112	22.06%
Total.....	17,392,099	100.00%

Unfortunately, the total number of persons engaged in the mining industry is nowhere clearly stated in this census. It gives the total number of "engineers (civil)" as 8,261, and takes no account whatever of either mining or mechanical engineers as such. It gives as the total number of "officials connected with manufactures and mining," 8,198. If, now, to get an outside estimate, if anything, in excess, we assume that 4,000 are in each case connected with mining, we shall have, as near as may be learned from this report, the following result:

Engineers, surveyors, etc [probably in excess].....	4,000	
Mining officials.....	4,000	
Chemists, assayers, metallurgists, etc.....	1,969	9,969
Stamp mill operatives.....	1,449	
Miners.....	234,238	
Quarrymen.....	15,169	250,846
Grand total for the United States.....		260,815

or just 1.50% of all the wage earners in the country.

Now, the number of openings from the engineering schools ought to bear some relation to the total number of persons engaged in the industries most nearly allied to their work. Civil engineers get most of their work from the class "Trade and Transport," which occupies 10.41% of the total wage-earners. The agricultural interests certainly offer some work in land surveying and irrigation work, but most of it is in the line of the civil engineers, and is done by them. Deducting 1.50% occupied with mining, manufactures and mechanics occupy 20.56%. Hence these occupations are numerically related as follows: Employed in mining, ratio, 1.00; in trade and transport, 6.94; in manufactures and mechanics, 13.71.

If now we compare the number of graduates from the different engineering schools for the year 1892, we shall find them related as follows: Graduates from mining schools for 1892, ratio, 1.00; from civil engineering schools, 7.73; from mechanical engineering schools, 9.27.

It would seem from these figures, unless the relative proportions of the wage-earning classes has essentially altered in the last ten years, since this census was taken, that the supply of civil engineers tended to exceed the demand, and that of mechanical engineers was still somewhat below it. It will not do to push such conclusions too far, but the comparison is certainly instructive in this connection.

Further, it must be remembered that students will hardly be expected to take a long and difficult engineering course to prepare for

* Professor of Mining and Metallurgy in the University of California.

the manual labor of the miner, for which, indeed, such training is unnecessary. They must have in view ultimately, the position of superintendent, manager, engineer or chemist for some mining or smelting company. The number of such positions was, in 1880, certainly less than 10,000, or 0.06% of all the wage-earners in the United States. For the same period there were of the total wage-earners in the country 0.37%, clergy; 0.368%, lawyers; 0.493%, physicians, or in all more than 21 times as many in the so-called learned professions as all the mining officials in the country. In fact, the former are almost as numerous as all the miners in the entire United States.

In order, however, to run this matter down to the end, I have compiled from the volume on "Mineral Industries" for the eleventh census, which has just appeared, the following statistics for the year 1889:

Wage Earners Connected with the Mineral Industry.—Employed in the office, 6,683*; foremen above and below ground, 15,828†; total, 22,511; mechanics, 45,217; miners, 244,022; laborers, 200,112; boys, 30,927; grand total, 542,789.

The questions naturally arise, What is the annual number of openings for the graduates of our mining schools in the United States? and what is the relation between the supply and the demand?

We have seen that in 1889 there were 6,683 persons engaged "in the office" and 15,828 engaged as foreman, or 22,511 in all engaged in the whole mining industry. Of this total number at least half were engaged in superintending the work of mechanics and laborers, or in clerical or other capacities connected with accounts; this would leave 11,255 officials connected with the proper work of the miner. To those who are familiar with mining work it must be evident that not over half of these would find the technical instruction of a mining school necessary for the proper performance of their duty, or we find say about 6,000 persons in the whole country who may be said to need a technical education for the proper performance of their mining duties.

As a corroboration of this estimate, the membership of the American Institute of Mining Engineers may be cited. The liberal basis on which membership of this society is founded insures a very large membership of those interested, as compared with other engineering societies. In 1891 it had 14 honorary members, 1,914 members, and 164 associates, or a total in the United States of 2,092. This is one-third of the number estimated above as the total for the whole country interested in the technical control of the mining industry proper.

Now an average age of 25 may be assumed as that at which a man would be fitted for a position of technical responsibility; at this age the natural life of a man is estimated to be 38 years; and if we assume an average working life of 30 years, we have as the average number of vacancies per year about 200.

It will be evident now that the number of graduates turned out by the mining schools in 1892, namely 48, is not so extremely out of proportion to the number of openings as has been assumed in all the discussion on this subject; more especially as all the mining schools give a partial education to fully three times the number who graduate. Making allowance for the number of all who are educated more or less by them, for those who do not choose to follow the profession, and for those who practice it in foreign countries, it must be evident that there are about four or five times as many openings as there are mining students to fill them. This is a condition of things which agrees very well with experience and shows why there is such a steady demand for the graduates from the best mining schools.

They are at present reasonably sure of good and remunerative positions; if in addition to the proper sort of training they have the peculiar temperament (including energy, facility for detail, and executive ability) essential for success in any branch of engineering, and especially in mining, where all a man's resources are put to the extreme test.

These qualities, though they may be cultivated, are largely a matter of inheritance, and if a man does not possess them he would do better not to attempt mining as a profession.

It must be evident to any candid mind that criticism of American mining schools, based on the number of their graduates, is without substantial foundation.

It may be said, however, if the demand for such graduates is limited, not involving more than a couple of hundred a year, why maintain these expensive schools?

The answer, on a mere commercial basis, is not far to reach. The annual actual money value of the product per capita of the labor of the principal producing industries for 1880 was as follows: Agricultural, \$289; manufactured, \$1,493. Deducting, say, one-third for value of raw material, we have a net increase of value, produced by labor of \$996. The value of mining product per capita was \$1,416. It is evident, therefore, that in spite of all the risks connected with mining, the value of the product per capita is greater than that produced as the result of any other industry. Counting the miners only, for 1880, the product per capita was \$2,407; and counting all engaged, including officers, mechanics, laborers and boys, it was \$1,082.

It must be plain, therefore, that anything which tends to produce a still further increase in the producing power of the miner, either in making productive large bodies of low grade ores, or in increasing the net profit of his labor, must be of vital importance to the entire community, more especially as the miner produces the raw material from which the whole web of modern civilization is woven.

It is idle to deny that the best American mining schools have an im-

* In making up the total number employed at the "office," there were a number of the smaller industries, in which this item was left blank in the returns; in these cases I have added half the number reported in each such case as foremen. These additions amount in all to 142. The statistics for the mineral industry for the eleventh Census show a remarkable improvement on those which preceded it for the special purpose of this inquiry. It does seem remarkable, however, that our census officials have never thought it necessary to ascertain definitely the actual number of mechanical, civil, mining and metallurgical engineers and chemists in the country. Their total number is less than that of the clergymen, lawyers and physicians, but their influence on the development of the physical resources of the country is probably greater than all these put together.

† About equally distributed above and below ground.

portant influence through their graduates in increasing the useful applications of geological, physical and chemical science and engineering art to the extraction of ores from the earth, and to their economic utilization. It is further true that the civil and mechanical engineer, as such, are not properly equipped to meet the problems as they actually present themselves to the mining engineer.

It must be admitted that there exist more mining schools than there is present need for. It would undoubtedly be better if their number was limited to perhaps half a dozen, whose equipment, endowment and location were such as could best serve the needs of the community in which they were placed. Natural selection will undoubtedly bring about this result, for a good mining school is an expensive article which no community will long maintain unless it is felt to be a necessity.

THE PERSISTENCE OF ORES IN LODES IN DEPTH—THE EMPIRE LODE.

Written for the Engineering and Mining Journal by H. M. Beadle.

Without making any claim to be an engineer, only claiming to have a theoretical knowledge of mining and the allied sciences, I send you a few words on the subject treated in the issue of January 7th, 1893.

While the theory of the mineralization of lodes by "lateral secretion" or the endosmotic flow of water may be generally accepted, I do not believe that the evidence so far justifies the conclusion arrived at. I have been inclined to be led in the matter of the mineralization of veins by the opinions of the late Prof. J. E. Clayton, one of the most original thinkers and careful investigators of the West, who had carefully studied the vein formations of the Rocky Mountains. His opinion was that fissure veins were mineralized by water being forced up from great depth by heat. In this water minerals had been dissolved, and in rising, they followed the more open parts of the veins, and in doing so dissolved the rock with which the fissure was filled, and on cooling the minerals held in solution were precipitated. In his report on the Drumlummon vein at Marysville, Mont., owned and worked by the Montana Company, Limited, he sustained his theory by such facts and arguments that it may be said that it was demonstrated to be true as to that vein.

In the lode formations at Butte, Mont., Mr. Blake thinks he sees evidence of "lateral secretion." He says that "at the greatest depths reached in the Butte granite there are signs of the alterations of granite contiguous to the lodes, and in some places there are evidences of active oxidation far below the usual horizon of the oxidized ores at and above the permanent water level." All this is true, and it is no doubt true that this action is due, as he says, to water, but it by no means follows that it is due to the "endosmotic flow" of water "through the invisible pores of rock inward to fissures." It probably proves that the water, flowing through the fissure from below, had penetrated the wall rock and left "evidences of active oxidation." Professor Clayton found that portions of the Drumlummon vein had been compressed so hard and tight by the weight of the hanging wall that no water could penetrate it, and that in those portions the walls were well defined, and the rock which filled the lode was of the same character as that of the walls, but where the condition of the vein was such as to permit the water to pass freely through it, not only were the rocks which were within the lode previous to its mineralization dissolved out and metal bearing quartz deposited in their places, but the walls themselves were attacked in many places and changed so that there was no defined wall. The same effect is seen in the walls of many Butte lodes. Is it not more probable that such effects were produced by the large quantity of water flowing through the veins, than by the necessarily small amount flowing "through the invisible pores of rock inward to fissures?"

Occasionally, however, lodes are seen that seem to have been mineralized in some way unknown and unconformably to any theory heretofore advanced. Such a lode is the Empire, owned by the Golden Leaf Company, of London, and located about a mile and a half west of Marysville, Mont.

The lode is in magnesian slate, which is the bedded rock of that region. About half a mile southwest of Marysville is the center of a granite intrusion about a mile square with dykes running south and northwest. On the north and west of this granite the slate has not been disturbed to any great extent, but on the east and south the slate is lifted until some of it is almost perpendicular. This slate is of great thickness; some claiming that its edges show up for a distance of nine miles east of Marysville. At the Empire lode, the slate is massive and is evidently of great thickness.

The strike of the Empire lode, which is believed to be a true fissure, is east and west, and its dip to the south. North of it, about 1,000 ft., is the Whippoorwill lode, and south about the same distance, across Coomb's gulch, is the Puritan. The Empire and Whippoorwill are gold lodes, but the Puritan, so far as explored, is richest in silver.

The Empire lode, or that part of it covered by the Smithville and Empire claims, is worked out to the 400 level, and the pay ore exhausted. There is a claim on the lode, east of the Empire, on which but little work has been done.

The vein is well worked on the surface and at the east seems to penetrate Belmont Mountain, a spur running north from the main chain of the Rockies. In the Smithville claim the lode gradually curves to the northwest, and at its furthest western development is small and of little importance. The distance between the walls is about 9 ft. on an average. The walls are well defined throughout. Two winzes have been sunk to the depth of 100 ft. each from the 400 level, one toward the east end of the Smithville and one on the Empire claim, and drifts were run east and west, but no ore that would pay to break was found. Many cracks and small crevices penetrated the walls, the greater number of which were filled with barren quartz, but a few very small ones were filled with rich ore, which would not, however, pay the expense of following them.

The quartz, even in the richest parts, was mixed with broken pieces of the slate wall rock. There were cracks through the quartz

itself, showing that, in all probability, the vein had been opened after the quartz had been deposited, and the cracks thus made were then filled with ore very rich in gold. No gold was found in the wall rock in the vein. The lode was mineralized to the greatest extent at the surface. Ore was found in the west end of the Empire and the east end of the Smithville, though there was no well defined shoot. Two ore-shoots were found in the Empire claim, one dipping east about 200 ft. long horizontally, and the other, the richer one, dipping west about 120 ft. long horizontally. The east end line of the smaller shoot and the west end line of the larger one met 1,000 ft. east of the west line of the Empire. It was at this point the eastern winze was sunk. Between the east end of the larger shoot and the west end of the smaller one on the surface was about 300 ft. of barren ground.

Two large masses of very rich ore were found in the Empire claim, between the 200 and 300 levels. They lay horizontally, the top of each about 30 ft. below the 200 level, and the bottom of each about 15 ft. above the 300 level. There was about 20 ft. of barren ground between them; the west one was about 80 ft. long, and the east one 10 ft. shorter. The character of the ore was the same as that in the other shoots, the richest portions being on the hanging wall. The vein matter all around these two shoots of ore was barren, and there was nothing to show from where the mineralizing agent which deposited the gold in these places came. These isolated bodies of ore lay in the east end of the Empire claim, the west end of the larger one being 1,300 ft. from the west line of the Empire.

This vein could not have been mineralized by lateral secretion, for so far no gold whatever has been found in the slate wall rock. While a few small cracks were found to have been mineralized along the 400 level, and in the winzes and drifts from them, it is not believed that they were sufficiently large, even if continuous, to have mineralized the large portions found above. The mountains here have been denuded a thousand or more feet, but if that portion of rock which lay above the present surface had been mineralized, it is very probable that the country rock at the present surface would have carried some gold also.

When that portion of the lode lying east of the Empire has been worked, it is possible some explanation of the manner in which it was mineralized may appear, but the lode at the east end of the Empire claim along the middle depths was barren.

The facts here given were obtained from Mr. Frank Longmaid, the efficient assistant manager of the Golden Leaf properties.

RECENT DECISIONS AFFECTING THE MINING INDUSTRY.

Eighth Circuit Court of Appeals of the United States.—Caldwell, Circuit Judge.

Mineral Case—Exclusion of Evidence of Apex—Charging Jury in Absence of Counsel—Construction of Patent—Lode Within Side-Lines as Against Junior Apex Discovery—Court Fixing Amount of Land Recovered.

1. Where, therefore, in an action of ejectment to recover possession of a mining lode the issue raised by the pleadings was whether the plaintiff was the owner and entitled to the possession of a lode having its apex within his claim after the same had passed under the side-lines of an adjoining mining claim of defendant: Held, that in support of the negative of that issue the defendant had the right to show that plaintiff's alleged vein, or lode, was not a separate vein, but simply one of numerous ore channels, which together formed one broad lode having its apex partly in plaintiff's claim and partly in defendant's claim; or, failing in that contention, that defendant had the right to show that both parties had the apex of independent veins, which in their descent became united underneath defendant's claim, and that the defendant was entitled to the vein from the point of junction downward, because it was the owner of the oldest patent; and, held, further, that as the action was in ejectment both of the defences might be allowed although they were inconsistent.

2. The trial court having taken a contrary view and having ruled that both defences were not permissible, and having refused to permit the jury to determine whether there were separate veins which in their descent became united underneath defendant's claim: Held, that the error was immaterial, for the reason that the evidence was insufficient to support a finding by the jury that there were separate veins, one of which had its apex within plaintiff's claim, and the other within the side-lines of the defendant's claim.

3. Sec. 2,322, R. S. U. S., conferring the right to follow a lode outside of side-lines of a location, when the apex at the lode lies within the boundaries of the location does not in terms, or by implication limit the exercise of that right, especially when mining claims are involved, to cases where the adjoining claims are held under junior locations or patents. *Pac. Coast Mining & Milling Co., 16, Fed. Rep. 348, and Amador-Medean Gold M. C. v. South Spring Hill Gold Mining Co., 36, Fed. Rep. 668, distinguished.*

4. Plaintiff's mining claim (Aliunde) adjoined the Colorado Central claim of defendant on the south. Defendant had discovered on the Colorado Central claim at least 600 ft. northeast of the disputed territory, in suit, a vein on which the Colorado Central location and patent apparently rested. This vein forked as it entered the disputed territory, and the apex or outcrop of one of the forks, viz.: of the fork on which the Aliunde location rested, had departed from the Colorado Central side-lines, and was within the Aliunde location, though, by reason of the dip, a portion of the fork of the vein was still underneath the Colorado Central claim. In view of this state of facts the trial judge was asked to instruct the jury in substance that the proprietor of the Aliunde claim was not entitled to recover his vein under the Colorado Central claim (the latter being under the oldest patent) if the jury believed the Aliunde lode "to be a part of the same lode as that on which the Colorado Central patent issued," which instruction

the trial court refused: Held, that if the vein on which the Colorado Central location rested became divided as it entered the disputed territory and the outcrop of one fork crossed into the Aliunde territory, then it followed that the Colorado Central claim had been laid rather obliquely to the course of the outcrop, in which case the defendant lost that fork of the vein that had passed outside of its side-lines, and that, so far as that fork was concerned the S. end of the line of the Colorado Central claim must be regarded as a line drawn through the point when the outcrop passed through its south side-line, and that, therefore, there was no error in the refusal of the instruction asked.

5. When in an action of ejectment for a mining lode, or vein, the complaint accurately describes the premises in dispute, and the jury find that plaintiff is "the owner in fee of the lode and premises described in the amended complaint and is entitled to the occupation and possession thereof" such verdict is sufficiently specific, and the objection that it does not define the boundaries of the disputed territory is untenable. *Case of the Colorado Central Mining Co. v. Turck. (Opinion of Thayer, Dist. Court I., Sept., 1893.)*

THE COCHRANE SEPARATOR.

The accompanying illustrations show the Cochrane Separator, Figs. 1 and 2 being sections on different lines, showing the vertical style of this device. The chief point is the angular baffle-plate, with its ribbed upper and lower faces; this is designed to receive the impact of a current of steam, either ascending or descending, and by it the separated particles are thrown to one side, away from the passage left for the purified steam. The pipe projecting upward in the separator is virtually a continuation of the main line and forms the receptacle or well for the separated particles (water, oil, grease, grit, etc.). The umbrella-shaped projection at the top of this pipe is designed to contract the mouth of the well so as to prevent interference with the contents thereof.

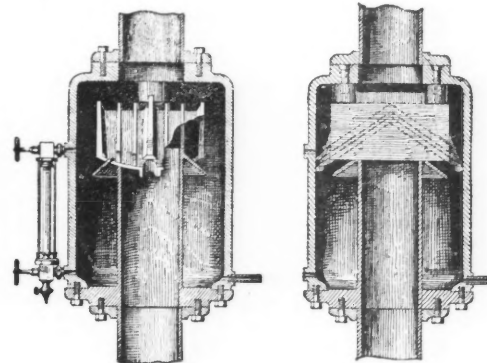


FIG. 1. FIG. 2. THE COCHRANE SEPARATOR.

This separator, which is reported as working very well in practice, is made by the Harrison Safety Boiler Works, Germantown Junction, Philadelphia.

The Latest Armor Tests.—A test of a new nickel-steel armor plate treated by the Harvey process was made at the Indian Head proving grounds on February 11th. The object was to determine the tests to be established for the 7,000 tons of armor for which contracts are soon to be let. The test was to include shots at low velocity to show whether the plate would break or crack, and at high velocity to test the resistance to penetration. The plate in this trial was 9 x 7 ft. in size and 14 in. thick, and was the thickest plate yet submitted to test. The arrangement of the gun from which the shots were fired and of the backing were the same as in previous tests. The first shot was fired with a charge which gave a velocity at the point of impact of 1,472 ft. per second. The projectile entered the plate about 5 in. and broke in fragments; no crack could be found in the plate. The second shot, with a velocity at the point of impact of 1,860 ft., entered the plate about 6½ in., and cracked it for a part of its length. The third shot had a velocity at impact of 1,960 ft., and the result was almost the same as with the second. The fourth projectile, with the high velocity of 2,060 ft., entered the plate about 10 in., cracking it in several directions, and breaking the backing. The tests were considered very satisfactory.

PATENTS GRANTED BY THE UNITED STATES PATENT OFFICE.

The following is a list of the patents relating to mining, metallurgy and kindred subjects issued by the United States Patent Office:

TUESDAY, FEBRUARY 14TH, 1893.

- 491,528. Horse Power. Emmett H. Condit, Outville, O.
- 491,535. Process of Manufacturing White Lead. Paul Bronner, Stuttgart, Germany.
- 491,638. Process of and Apparatus for Obtaining Metals from Their Ores. Samuel H. Cochran, Everett, Mass., Assignor to the Cochran Gold and Silver Releasing and Steam Generating Company, of Maine.
- 491,672. Ore Dressing Apparatus. Wilhelm J. Bartsch, Dresden, Germany.
- 491,676. Ore Amalgamator. Fred. O. Norton, Clinton, Ia.
- 491,699. Preparing Liquid Chlorine. Elisha B. Cutten, New York, N. Y.
- 491,700. Method of Electrolytically Producing Soda and Chlorine. Elisha B. Cutten, New York, N. Y.
- 491,701. Method of Electrolytically Producing Potassium Chlorate. Elisha B. Cutten, New York, N. Y.
- 491,704. Revolving Roasting Furnace. Christian Fellner, Bockenheim, Germany.
- 491,720. Apparatus for Galvanizing Iron. Gustave Retterer, Paris, France.
- 491,741. Apparatus for Volatilizing Ammonium Chloride. Ludwig Mund, Northwich, Scotland.
- 491,958. Bucket Dumping Apparatus. Frank B. Wineland, Breckenridge, Colo.

PERSONALS.

Mr. William H. Radford, mining engineer, has gone to Ecuador, South America, on professional business.

Mr. George H. Pegram, who succeeds Col. Eben C. Smeed as chief engineer of the Union Pacific, has been constructing engineer of the Utah & Northern and the Missouri Pacific; he was also with the Edge Moor Bridge Works for a time, and has recently had an office in St. Louis as a consulting engineer.

OBITUARY.

John F. Dunn died at Ocala, Fla., on the 12th inst. He was largely interested in the Florida phosphate industry, in which he was a pioneer.

John Inshaw, of Aston, England, died January 27th, being 86 years old. He was a contemporary of Stephenson, and claimed to be the inventor of the steam pressure gauge. Among his acknowledged inventions are twin-screw propellers and the injector for filling boilers.

Josephus Collett, who died at his residence in Terra Haute, Ind., February 13th, aged 68 years, was actively interested for many years in the development of Western Indiana. He built, about 1870, the Evansville, Terre Haute & Chicago road, which has since become part of the Chicago & Eastern Illinois line. He was interested in several coal properties in the Indiana district, and also in coal mining in the Hocking Valley, in Ohio, where he built the Sunday Creek branch of the Columbus & Hocking Valley road to give access to his mines. Mr. Collett was one of the richest men of his State.

John M. Robinson, who died in Baltimore, February 14th, was born in Philadelphia in 1835. He graduated from the Virginia Military Institute, and received a careful training as a civil engineer. During the war he served in the engineer corps of the Confederate Army. Later he held important positions on the Seaboard & Roanoke, the Raleigh & Gaston and the Richmond, Fredericksburg & Potomac roads, finally succeeding the late Moncure Robinson as president of those companies. Mr. Robinson was for many years actively employed, and did much to aid in the industrial development of the South, especially in the direction of railroads and coal mining.

William Holms Chambers Bartlett died at Youkers, N. Y., February 11th, aged 88. Mr. Bartlett was born on September 4th, 1804, and entered West Point in 1822. Four years later he graduated at the head of his class. In 1827 he was made assistant professor of engineering of that school, and in 1836 professor of natural and experimental philosophy. In 1871 he was retired from West Point, at his own request, and became actuary of the Mutual Life Insurance Company, which position he held until 1888. Professor Bartlett was the author of a number of scientific textbooks, the most important being "Treatise on Optics," "Synthetical Mechanics," "Analytical Mechanics" and "Spherical Astronomy."

William T. Carter, a prominent coal and iron operator, died at his home in Philadelphia, February 9th, of pneumonia. He was born in Cornwall, England, in 1827. Coming to this country in 1850, he entered the employ of his uncles, John and Richard Carter, who were pioneers in anthracite mining in the Schuylkill region. In 1861, from his earnings, he purchased the Coleraine collieries in Carbon County, and has since operated them with great energy and success. In 1867 he purchased ground on the Lehigh Valley Railroad, below Bethlehem, and started a town, giving it the name of Reddington. Here he erected two large blast furnaces and machine shops, which have been kept in constant operation. In 1860 he moved to Philadelphia and became identified with street railway enterprises and with many of the fiscal institutions of the city. He was a member of the American Iron and Steel Association. He was a steady worker and a careful man, and left a large estate.

SOCIETIES.

At the meeting of the Western Railway Club in Chicago, February 21st, Mr. G. W. Rhodes' paper on "Wheel Flanges," read at the January meeting, will be discussed; and a paper will be read by Mr. William Forsyth on "Tests of Locomotives in Heavy Express Passenger Service."

The Lake Superior Mining Association will hold its first annual meeting at Iron Mountain, Gogebic Range, Mich., on February 2d. This association is composed of the mining men generally on the Gogebic and Menominee ranges, and Mr. T. Park Channing was largely instrumental in its formation.

The American Society of Civil Engineers, at its meeting on February 1st, heard papers read by Mr. Robert Cartwright on the "Power House of

the Rochester Power Company," at the Genesee Falls, where 1,200 HP. is generated by two Heffel turbines; and by Mr. James Duane on the "Effect of Tuberculation on the Delivery of a 48-in. Water Main." Both papers were briefly discussed.

At the annual meeting of the Engineers' Club, of Philadelphia, on January 21st, the board of directors reported that the club had been duly chartered. It has now 457 members, of whom 276 are resident and 181 non-resident. The receipts for the year were \$6,377, the expenditures \$6,078 and the cash balance \$299. The following officers were declared elected: President, John Birkinbine; vice-president, James Christie; treasurer, F. Carpenter Smith; secretary, S. F. Rondinella; directors, Henry J. Hartley, John L. Gill, Jr., and W. B. Riegner. The club voted to approve the act establishing a forestry commission, and to recommend its passage.

At the recent meeting of the Civil Engineers' Club of Cleveland, Dr. John W. Langley, of Case School of Applied Science, read a paper on "Some Physical Properties of Steel as Related by Its Structure and Composition." He said: Steel is defined as a solution of several elements in iron, the principal elements being carbon, silicon, phosphorus and manganese. Limitations of the scope of the definition to "high steel" are given. Then follows an explanation of the terms combination and solution, and reasons given for considering steel to represent the latter rather than the former. The influence of the above four elements on the fusibility and hardness, the toughness and the disposition to crack, are given by a set of curves showing the relation between the property in question and the quantity of the added elements. The subject of the hardening and annealing of steel is then discussed, and the phenomenon of recalcification illustrated by graphical construction.

The regular monthly meeting of the Civil Engineers' Society of St. Paul was held February 6th. It was unanimously resolved that the United States senators and representatives in Congress for the State of Minnesota, also the chairmen of committees to which has been referred the bill appropriating \$40,000 for the continuance of the United States timber tests by the Forestry Division of the Agricultural Department be advised, by the president and secretary of this society, of the far-reaching benefits to the public and to the engineering profession which, in the judgment of this society, the passage of this bill would procure. A paper on "Railroad Building in Mexico" was read by Mr. W. H. Wood. At present nine-tenths of Mexican imports enter via Vera Cruz. This port has no docks. All traffic must be pieced out by lighters. The recent harbor improvements at Tampico and the proposed direct line of railway to that port from the City of Mexico will probably divert much traffic to the new route. Deep water, docks, climate, railway grades and facilities, will all be in favor of Tampico.

At the twenty-second annual meeting of the American Institute of Mining Engineers, to be held at Montreal, Can., beginning February 21st, the following Canadian societies will take part: Mining Society of Nova Scotia, the General Mining Association of the Province of Quebec, the Provincial Mining Association of Ontario, the Asbestos Club, the Canadian Society of Coal Engineers and other organizations. Besides reading some 23 papers, the Canadian engineers will discuss and probably pass the following resolutions: 1. The desirability of a compilation of the mining and metallurgical information which is scattered through the "Reports of the Geological Survey of Canada," and preserved in other documents, from the time of the compilation of Sir William Logan's "Summary of Reports" up to the formation of the Bureau of Statistics in the Survey. 2. The necessity of provincial bonus to develop the iron industry of Ontario, and possibly to create the manufacture of nickel-steel in that province. 3. The great need of a provincial museum in the interests of scientific and mining development in Ontario. 4. The desirability of the removal of the customs tariff on all coke used for smelting and metallurgical purposes in Ontario. 5. The necessity of enlarged and more secure housing of the magnificent collection of the geological and natural history survey of Canada at Ottawa. 6. A further extension of the period wherein the Dominion government admits free of duty all mining machinery of a class or kind not manufactured in Canada.

INDUSTRIAL NOTES.

The Roanoke Machine Works, Roanoke, Va., are building 560 coal cars for the Norfolk & Western Railroad.

The works of the New Jersey Steel and Iron Company, at Trenton, N. J., were compelled to shut down on the 11th inst. on account of a flood in the Delaware.

The American Bridge and Iron Works, Roanoke, Va., have a contract to furnish 1,500 tons of iron-work for the Mathison Alkali Works, at Saltsburg, Va.

Furnace E., of the Crane Iron Company, Catsasqua, Pa., has shut down, throwing out of employment a large number of men. It is said that another stack will shortly be blown out.

The Reading Rolling Mill Company, of Reading, Pa., on the 11th inst. posted a reduction of wages to take effect January 16th. Puddlers are reduced from \$3.50 to \$3 per ton, and the other hands 15%.

According to the "Grashdanin," the Russian committee has under consideration the question of authorizing the importation of 1,125,000 poods, equal to 20,200 tons, of unmanufactured pig and cast-iron free of duty.

The West Duluth furnace of the Minnesota Blast Furnace Company is running now on all Mesabi ore. The only trouble is due to the fineness of the ore, as some of it blows into the downtake, otherwise the furnace works well.

The smoke and fog question is being agitated by the London "Coal and Iron." The paper advocates the voluntary use of anthracite by public institutions and others, at the same time acknowledging that its compulsory use is impossible.

The E. P. Allis Company, of Milwaukee, is putting in new blowing engines at the Lucy furnaces, in Pittsburg. The steam cylinders are 42 x 60 in., and the air cylinders 84 x 60 in., the latter having positive inlet and outlet valves.

The Westinghouse Machine Company, in Pittsburg, has finished and tested the first of the six 1,000-HP. compound engines which it will send to the World's Fair. The engine is intended to run at 200 revolutions per minute, with 150 lbs. boiler pressure.

The Harrisburg Foundry and Machine Works, Harrisburg, Pa., have turned out much work lately, including some large engines for the Broadway Cable Road station, in New York. Two tandem compound engines have lately been sent to Porto Rico and two to Australia.

The Yale & Towne Manufacturing Company, Stamford, Conn., recently put up a 20-ton traveling crane in the shops of the Maryland Steel Company, at Sparrow's Point, Md. The bridge of this crane has 56 ft. span, and travels on tracks 25 ft. above the shop floor. There are three separate motors for hoisting, trolleying and moving the bridge. The crane is used for handling the parts of heavy marine engines.

At the annual meeting February 8th, the following directors were chosen for the Illinois Steel Company: H. H. Porter, A. J. Forbes Leith, Morgan Rotch, N. Williams, N. Thayer, Marshall Field, W. R. Stirling, Robert Forsyth, Francis Bartlett, Jay C. Morse and H. G. Smith. The directors elected Jay C. Morse president; W. R. Stirling first vice-president; H. G. Smith, second vice-president; J. C. Stirling, treasurer; H. A. Gray, secretary.

The Huntington Car and Wheel Works were sold at Huntington, Pa., on the 10th inst., at sheriff's sale on a mortgage against George W. Ditheridge, a former owner of the property. The property was bought in by the attorneys for the bondholders, secured by the mortgage. The sheriff's deed will be made to Percival Roberts and Charles Scott, of Philadelphia, and K. Allen Lovell, representing the Union Bank, of Huntington. The final bid was \$23,000, which covers the first mortgage.

Queen & Company, Philadelphia, have bought the sole right to manufacture and sell John T. Warden's automatic drawing table, which has, during the two years since its invention, found its way into many of the best drafting rooms in the country, and has met with general acceptance. This table can be used in a horizontal position or at an angle, and is adjustable for both height and angle. The straight-edge which takes the place of a T-square is kept always parallel by a very ingenious motion by which the strings used in other patterns of drawing table are dispensed with.

Arguments were heard by Judges Acheson and Buffington on the 13th inst., in the United States Circuit Court at Pittsburg, Pa., in the case of L. H. Bristol, of New Haven, Conn., and others against William M. and Walter Scranton and the Scranton Steel Company, of Scranton, Pa. The plaintiffs are stockholders in the company, and the suit is brought to compel the Scrantons to pay into the treasury of the company, to be distributed pro rata among all the stockholders, \$350,000 received by the Scrantons from the Lackawanna Iron and Coal Company as a bonus for effecting the consolidation of the two companies. The court has reserved its decision.

Bids were opened in the office of the Secretary of the Navy, at Washington, D. C., on the 15th inst., for 6,700 tons of nickel-steel and Harveyized steel armor for vessels now being constructed for the navy, in conformity with an act of Congress appropriating \$4,000,000 for the purpose. A number of prominent steel manufacturers were present, among them, Mr. H. C. Frick, of the Carnegie Steel Company. Contrary to expectation, there were two bidders only, the Carnegie Steel Company, of Pittsburg, and the Bethlehem Iron Works,

of Bethlehem, Pa. On account of the complicated nature of the bids submitted, it is impossible at this time to give a comparative statement of them. The prices asked for nickel-steel ranged from \$525 to \$650 per ton, according to the shape of the plate, and for Harveyized steel from \$575 to \$675 per ton. The lowest bids on the principal single exhibits were as follows: By the Bethlehem Company—On 13-in. turret plates of nickel-steel, \$212,043; Harveyized, \$335,282; on 12-in. turrets of nickel-steel, \$321,976; Harveyized, \$355,010; on 8-in. side armor or nickel-steel, \$337,351; Harveyized, \$371,711. By the Carnegie Steel Company—On 8-in. turret plates of nickel-steel, \$82,157; Harveyized, \$95,340.

The sub-committee of the House Naval Committee has investigated the causes of the delay in government contracts for armor plate. Representatives of the Carnegie company and the Bethlehem Iron and Steel Company appeared before the sub-committee and gave reasons why the work was not put out more quickly. The former company stated that the first order was not received until March 31st, 1891, and work on this and subsequent orders was at once begun. From June 30th until the last of October the mills were either fully stopped or only in partial operation on account of labor troubles. This, with the delay in getting new machinery, from the Whitworth company in England, and the necessity when it was received of replacing a portino of it, which was found inadequate, with other machinery, kept the work back. The representatives of the Bethlehem Iron and Steel Company stated that their first difficulty was in getting a site for the big hammer. The first delivery of armor plate was made in August, 1891, but owing to the novelty of the work, the full contract amount, 500 tons per month, could not be turned out. The company has ample facilities for forging over 300 tons a month, and expects to have all the forgings completed by December, 1893, but delay has been occasioned by the difficulty of fitting the armor to the shapes desired. Moreover, the difficulties of Harveyizing plates are not yet entirely overcome, and new troubles may yet arise.

It is announced that the negotiations for the consolidation of the two great companies manufacturing wood-working tools in Cincinnati—the Egan Company and J. A. Fay & Company—have been completed, after long negotiation, and the officers of the new J. A. Fay & Egan Company will take charge about March 1st. The directors of the new company, which will be the largest concern of its kind in the world, will be Thomas P. Egan, Frederick Danner; W. H. Doane, D. L. Lyon, David Jones, W. P. Anderson, Joseph Rawson, S. P. Egan and Edwin Ruthven. Thomas P. Egan will be president and the soul of the enterprise, as he has been of the old Egan company; Mr. Danner will be vice-president, S. P. Egan superintendent, and Mr. Ruthven secretary. These four officers are of the Egan company. The Egan company was formed about 1873, and started with a small factory, but the business grew so fast that frequent enlargements were needed. In 1880 the present stock company was organized, and gradually the works have grown to their present extent, employing over 800 men, and making an almost endless variety of machines, both for the home and foreign markets. The original J. A. Fay & Company started in Keene, N. H., in 1835, in a small shop; the Cincinnati establishment was begun as a branch in 1850, but grew under the management of Mr. W. H. Doane until it finally absorbed the original house. J. A. Fay & Company have done a large business abroad, and have exhibited at all the great international expositions, beginning at London in 1851, and receiving many prizes and testimonials.

The firm of H. K. Porter & Co., in Pittsburg, the well known builders of light locomotives, on February 14th issued to all their employees a circular announcing the distribution of profits for the year. This is the eighth year that they have made this voluntary distribution, which is based on the amount of wages paid and length of service, and which has proved a very successful system. In the circular the firm says: "We are especially gratified that the amount distributed is not decreased, as we supposed it would have to be. The conditions of business the past year have been very trying, and in many respects discouraging. Prices were less throughout the year than in 1891, and the output for the first six months was very small. But as soon as the demand increased, the output largely increased; and by your efficient co-operation, so soon as you had the opportunity to put it forth, we largely recovered the lost ground. This proves to us what we believed before, that practical co-operation is a positive benefit to every one of us, and that it pays us partly, if not fully, in the item of dollars and cents, to make this distribution. We have often said to you that it is only on this basis that we can hope to make such a distribution a permanent annual thing. But such reasonable return to us only makes us the more gratified to recognize your efficient and cheerful service, and to be able to give you this additional remuneration for your faithful labor. We hope that in receiving this sum, each one of you is conscious of having deserved it by having rendered the best service in his power; and that the money will be a positive good to each one; and to all dependent upon you."

MACHINERY AND SUPPLIES WANTED AT HOME AND ABROAD.

If any one wanting machinery or supplies of any kind will notify the Engineering and Mining Journal of what he needs, his "Want" will be published in this column and his address will be furnished to any one desiring to supply him.

Any one wishing to communicate with the parties whose wants are given in this column can obtain their address at this office.

No charge will be made for these services. We also offer our services to foreign correspondents who desire to purchase American goods, and shall be pleased to furnish them information concerning goods of any kind, and forward them catalogues and discounts of manufacturers in each line, thus enabling the purchaser to select the most suitable articles before ordering.

All these services are rendered gratuitously in the interest of our subscribers and advertisers; the proprietors of the Engineering and Mining Journal are not brokers or exporters, nor have they any pecuniary interest in buying or selling goods of any kind.

Goods Wanted at Home.

- 2,937. Planers. Ohio.
- 2,938. A good grist mill and corn crusher. Florida.
- 2,939. Saws. Ohio.
- 2,940. Coppered wire. Kentucky.
- 2,941. Bolting. Ohio.
- 2,942. Shafting. Ohio.
- 2,943. Pulleys. Ohio.
- 2,944. Veneer cutting machines, etc. Ohio.
- 2,945. A 12-HP. engine and boiler. Tennessee.
- 2,946. Burners, kilns or furnaces for making charcoal. Idaho.
- 2,947. An outfit for a canning factory. North Carolina.
- 2,948. Prices on a complete outfit of machinery for the manufacture of drain tile, including dry sheds and kiln. Tennessee.
- 2,949. Machinery for a 20-ton cotton oil mill plant. Texas.
- 2,950. A full outfit of machinery for scouring, carding and spinning wool; also for weaving a low class of trousers, cotton warp and woolen weft. North Carolina.
- 2,951. Prices and catalogues of rails, fastenings and rolling stock. Texas.
- 2,952. Chloride of calcium. Ohio.
- 2,953. Machinery for making coiled hoops, staves, spokes, handles and shuttle blocks. North Carolina.
- 2,954. A moss gin and press. Georgia.

GENERAL MINING NEWS.

ALABAMA.

Cherokee County.

A tract of 40 acres of brown ore bearing land adjoining the Baker Hill deposit, and known as the Carr brown ore bank, which has been in litigation for some years past, but in the peaceful possession of the Tecumseh Iron Company, was trespassed upon Saturday, January 28th, by one of the opposing litigants, who claims the bank as one of the heirs through marriage of an original owner. The property was transferred to the present Tecumseh Iron Company by General Warner, president of the Baker Hill Iron Company, and also by the older Tecumseh Iron Company. Active mining operations, though, have not been carried on for some time past on this particular tract, which has been the subject of litigation in a kind of three-cornered suit; being claimed by the Bank of Augusta, Ga., as a portion of the old Stonewall property, against which claimant the heirs represented by Kemp were also in litigation. During the controversy the possession of the property was not disturbed until on the date mentioned. The result was the arrest of Kemp and his workmen on a charge of trespass. Later the tools and property of Kemp were removed, and the tract of land was inclosed by a barb wire fence by order of the manager of the Tecumseh company.

ARIZONA.

(From our Special Correspondent.)

The mining assessments falling delinquent during the month of February amounted to \$20,000.

CALIFORNIA.

(From our Special Correspondent.)

The mining assessments falling delinquent during the month of February aggregate \$7,000.

Amador County.

Amador Gold Mine.—This property was sold by the sheriff on the 30th ult. on an execution issued on a judgment held by J. P. Darling. Mr. Darling bought the property in for the amount of his judgment, the amount of the judgment liens and the expenses making a total of \$7,027.22. This is subject to redemption within six months.

Dolores County.

Enterprise Mining Company.—This company, says the Rico "News," will shortly commence the erection of a large concentrating mill to handle the immense amount of low-grade ore blocked out in the Laura mine. When the mill is ready a large force of men will be put on the mine and large amounts of ore will be moved. The ore is opened up for a distance of 800 ft. The ore will be lowered through chutes to the level of the Group tunnel, through which it will be taken and dumped directly into the cars. The product, therefore, can be handled at a minimum cost.

Los Angeles County.

(From our Special Correspondent.)

The Southern California Smelting and Refining Company, Los Angeles.—The opposition manifested by the City Council has been overcome, and work has been commenced on the smelter that will start up early in April. The initial cost is estimated at \$53,000, the plant having a capacity of from 200 to 250 tons of ore per day, the arrangements being such that, if the necessity should arise, the capacity can, without much trouble or considerable cost, be materially increased. Much of the ore, it is expected, will be received from the States of Sonora, Chihuahua and Durango, in Mexico, via El Paso and Mazatlan, and at least 8,000 tons of ore per annum is reckoned on from this source. Owing to competitive railroad facilities, Arizona and New Mexico are also expected to furnish their quota of the general amount of ore handled. In the works coal will be used only for steam heating, New Mexico or English coke, which can be obtained for about \$8 per ton, being much cheaper and better adapted for the high-heating requirements of the smelting works.

Mendocino County.

(From our Special Correspondent.)

A new find of a rich vein of quicksilver has been made in the shaft of the mine belonging to a newly-formed corporation operating at Fort Brown, seven miles west of Ukiah. The value of the new development has not yet been fully ascertained.

Mono County.

(From our Special Correspondent.)

Standard Consolidated Mining Company, Bodie.—A bullion shipment valued at \$16,800 has been received at the San Francisco office.

Nevada County.

Brunswick Consolidated Gold Mining Company.—Mr. W. A. Hawley, superintendent of this company, writing from Grass Valley, under date of February 8th, says: "No development work has been done since my last letter, owing to the heavy storms which have filled the grounds with water. We have had to do considerable work in the drain tunnel, as it is of vital importance that the mine should be kept open. We have the ground well secured now, and will be able to keep the drifts on the 700-ft. level going steadily."

COLORADO.

The Creede & Gunnison Railroad has been located from Creede to the Amethyst mine, a distance of 12 miles, and work is to be begun as soon as the snow will permit. The line has 4% grades and 24° curves. Spurs to all the leading mines in the district are included in the plans.

Gunnison County.

Fairview.—A strike has been made at this mine at Pitkin. On the 6th level, at a depth of 600 ft., a 10-in. streak of silver glance was found which is reported to assay \$100 to the ton.

Lake County.

Catalpa Mining Company.—At the annual meeting of this company, held in New York during the past week, Messrs J. P. Whitney, B. C. Paddock, H. Bartling, C. P. Schumacher and John C. Watson were chosen trustees. The receipts and expenditures and trial balance are here given: Surplus, December 31st, 1891, \$41,651.60; product of 1,972 tons silver and iron ores, \$35,479.26; total, \$77,130.86; expenses, \$35,116.27; surplus December 31st, 1892, \$42,014.59. Assets—Mine and plant, \$3,020,777.82; general expenses, \$43,844.85; dividends, \$270,000; cash, \$15,648.70; loan to the Crescent Mining Company, \$27,417.09; total, \$3,377,688.46. Liabilities—Capital, \$3,000,000; mining account, \$377,688.46; total, \$3,377,688.46.

Crescent Mining Company.—At the annual meeting of this company held in New York during the past week Messrs J. P. Whitney, B. C. Paddock, H. Bartling, C. P. Schumacher and John C. Watson were chosen trustees. The receipts and expenditures and trial balance show: Product of 5,695 tons silver and iron ores, \$23,482.66; expenses, \$20,963.18; earnings, \$2,519.48; indebtedness December 31st, 1891, \$23,819.93; indebtedness December 31st, 1892, \$27,300.45; assets, mine and plant, \$3,003,775.41; mining account, \$2,110.33; general expenses, \$21,414.71; cash, \$116.64; total, \$3,027,417.09; liabilities, capital stock, \$3,000,000; loan from the Catalpa Mining Company, \$27,417.09; total, \$3,027,417.09.

Ibex Mining Company.—An injunction has been filed by Clarence J. Hersey against F. G. Richardson and the Ibex Mining Company. Hersey represents that in March, 1880, Richardson was the owner of a one-half interest in the Little Johnnie mine, and as he was not a resident of the State and desired to have his interests looked after, he agreed to pay Hersey 20% of his revenue from the mine to look after his interests, and Hersey kept his part of the agreement. Richardson later leased his share of the property to the Ibex Mining Company, which has since extracted large quantities of valuable mineral. Hersey alleges Richardson has received \$72,000 in royalties from the property and disposed of a portion of his interest, on all of which he, Hersey, claims a percentage.

Pueblo County.

Colorado Fuel Company.—On February 12th a slide occurred in the wall rock in one of the tunnels at the Orient mines of this company. Six men were killed and six injured. The mines are located

eight miles from Villa Grove, at the terminus of a spur of the Rio Grande road. They are among the best properties owned by the company. The product of the mine is shipped to Bessemer.

Saguache County.

A press dispatch from Denver says that it is now reported that the sale of the Amethyst mine, at Creede, together with the Hillside and Hidden Treasure, to a New York syndicate has been completed. Mr. Frank L. Roubush, who has been conducting the negotiations, returned from the East on the 11th inst. with the announcement that the deal had been made and the money paid over. The price paid was \$1,500,000.

Colorado Fuel and Iron Company.—A slide occurred in one of the tunnels of the Orient mine of this company on the 11th inst., killing six men and severely injuring as many more.

GEORGIA.

Carroll County.

I have again visited the vicinity I referred to in your issue November 26th, where my attention was called to the outcroppings of asbestos. Since my last visit the owner of the land has performed some prospect work, sinking on one vein of asbestos some 10 ft. The quality, although somewhat better at this depth than at the surface, is still rather inferior, the fibre short, and not possessing the strength of the Canadian, which is accounted for by the clay associated with it. At the depth referred to a blue variety of soapstone entirely free from grit was encountered. A drill test proved that this was about 30 in. thick, and below it the asbestos was again encountered, but as the rainy weather prevented work, I was unable to obtain any samples. The vein of asbestos is about 5 ft. wide, showing a tendency to increase towards the southwest, and apparently holding its width in the opposite direction. It lies between vertical walls of schist rock, and on the surface the outcropping would indicate that the vein was continuous for a distance of about 500 ft., with a general course northeast to southwest. In a ditch some 600 ft. northeast of the prospect hole, and in line with it, and on about the same level as where it is encountered in that hole I found the same variety of soapstone. Much interest is manifested in the neighborhood about the results of this prospect work.

Haralson County.

The Georgia-Alabama Investment and Development Company, of Tallapoosa, has not yet perfected any reorganization. The scheme proposed by Mr. Osgood, of Wakefield, Mass., has been abandoned, and Mr. Spencer, the manager of the old company, is endeavoring to reorganize on a new proposition of his own. He is at present in the East engaged in this business. The proposed railroad from Tallapoosa north to Stevenson, Alabama, on the Tennessee River, has also apparently been abandoned for the present. The Camille gold mine, near Tallapoosa, is being thoroughly prospected. The first workings on this were performed about 50 years ago, since which time it has been worked at irregular intervals. In November last some ore was taken out near the surface and shipped, but the results were never known. The bond expired about the time of the shipment of the ore, and although the holder attempted to negotiate for an extension, he was unsuccessful. Other parties with capital at once negotiated an option lease, and it is under that management work is now being prosecuted. It is proposed to run drifts and crosscuts on the ore body at levels about 25 ft. The old workings consist of a three-compartment incline shaft, going down to about 200 ft. below the surface. The coke furnace at Tallapoosa is not at present in blast. The powder mills are being rebuilt, and will be in working order in the near future. Work is being pushed on this industry as rapidly as the weather permits. Aside from this, the property of the land company is still in the hands of Receiver Norton, and the proposition of the old manager is anxiously awaited by the residents of the town, as well as the local stockholders.

IDAHO.

Coeur d'Alenes.

Black Bear.—The drifting of the tunnel being run to open up the 5th level is being seriously interfered with by the looseness of the ground. The tunnel is $4\frac{1}{2}$ ft. x 7 ft. in the clear and will cut the ore 550 ft. in. At present ore is being taken out of the 4th tunnel only, which is 800 ft. in; 45 men are stopping on the east drift. The mill contains 8 Hartz jigs, and has a daily capacity of 75 tons, producing 15 tons of concentrates containing 27 oz. of silver per ton and 60% lead.

Owyhee County.

(From our Special Correspondent.)

The Howe, Manhattan & Sopley Mines.—These groups of mines, situated in the Delamar district, have been sold to a syndicate of Milwaukee capitalists, headed by H. J. Millman. The purchase price is reported to have been \$350,000.

Black Jack Mining Company.—This company is drifting south from the main drift and also from the winze. No stopping is being done. A 200-ton ore house was put up during the early winter, and is now full.

Blaine Tunnel.—The tunnel is now in 2,400 ft. and

making about 7 ft. progress per day. The company is stopping in two different places in the tunnel, one on the Blaine ledge and one on the Trade Dollar ledge. The former is 90 ft. in length, the ledge is $2\frac{1}{2}$ ft. in width, from 4 to 10 ins. of which, on the footwall, assays \$160 per ton. The latter stope is 60 ft. in length, and the ledge is 2 ft. in width, about 6 ins. of which assays \$150. The ledge in the present face is 6 ft. wide. Something over 400 ft. farther will have to be run to cut the rich shoot of ore encountered in the upper workings of the Trade Dollar. Teams are now hauling ore from the Trade Dollar mine to the mill.

De Lamar Mining Company.—The new hoisting works, now completed, were constructed for the purpose of sinking a shaft to the mill tunnel level. This tunnel starts in just above the level of the ore house of the present mill and, when completed, will cut the vein series 472 ft. vertically below the Wahl tunnel, and 1,100 ft. under the summit. Eventually ore will be delivered at the mills by track in this tunnel, which will reach the first series of veins at a distance of 3,600 ft.

Ketchum Smelter.—This smelter is now working full time with 50 men.

MICHIGAN.

Gold.

Fire Centre Gold Mining Company.—All work has been stopped on the property of this company, owing to the shutting off of the water supply by the intense cold weather. It is not yet decided whether the company will again commence exploring work in the spring.

(From our Special Correspondent.)

Fire Center Gold mine has closed down. Work may be commenced in the spring.

Copper

Adventure Mining Company.—The annual meeting will be held in New York, March 2d. At the mine a few men are kept at work in drifting on the 2d level, where the vein on which this new part of the mine is being opened (the Knowlton vein) holds its own, and looks well for copper.

Arnold Mining Company.—The shaft is down 420 ft. The 3d level drift going west is said to be in good looking ground.

Atlantic Mining Company.—The January output amounted to 239 tons—1,760 lbs. of copper.

Calumet & Hecla Mining Company.—According to the Portage Lake "Gazette" the amygdaloid lode overlying the Osceola, which has been cut by a cross-cut at the 31st level, between No. 3 and 4 shafts is about 34 ft. wide on the pitch of the lode. In driving the cross-cut through this lode about 3 tons of barrel work were taken out. The stamp rock is of a clean character. There are several amygdaloid lodes between the Calumet & Hecla and the Osceola, but the one referred to is the lode overlying the Osceola, and has before been cut in the Tamarack, but has never been worked to any great extent. It is possible that this lode will yet prove to be productive.

Franklin Mining Company.—The January output amounted to 180 tons—485 lbs. of copper.

Knowlton.—This mine has been sold to Mr. Edmund Hendricks, of New York. The mine, consisting of 590 acres of land, was purchased at public sale for \$1,750. The proceedings were the winding up of the affairs of the corporation, according to the Outonogon "Herald." It is no doubt a move in the direction of consolidating several of the mines in Greenland township, which, in early days, produced copper in paying quantities, but which will not pay to work now unless adjoining territory can be secured.

Quincy Mining Company.—During January this company produced 700 tons—35 lbs. of copper.

Iron.

Erie Car Works, Limited.—The failure of this company, of Erie, Pa., has caused the Martel furnace, located at St. Ignace, to go out of blast. Executions exceeding \$100,000 have been levied upon the works and furnace. The furnace had a capacity of 25,000 tons of car wheel iron annually. Nothing is yet known as to the future operation of the plant.

(From our Special Correspondent.)

The Martel furnace, at St. Ignace, has gone out of blast owing to the failure of the owners, the Erie Car Works, of Erie, Pa. Ore used at this furnace came from here. Its specialty was car wheel iron.

Unwatering the Chapin and Hamilton mines has ceased because of a quarrel between the owners regarding the compressed air plant at Quinnesec Falls and its use. Some day big works in ore mining will be seen here.

A big cave-in at the Cleveland occurred recently, carrying down everything up to grass. No one was hurt by the disaster. Nearly the whole of Ishpeming, Mich., is undermined, and this sort of occurrences must be expected continually. Ishpeming is built wholly upon the hanging wall of an immense body of ore.

Local papers are already sneering at the Mesaba. This is one proof of its great ability to produce ore. A bad habit of papers on one range is to abuse the outlook of another range. This the local press here has done continually, but other ranges grow to greatness all the same.

Alex. Maitland has resigned his position of

superintendent of the Negaunee & Ishpeming electric car line, and Charles Merryweather is appointed. Both of these gentlemen are known as successful miners of ore.

Governor Rich, of Michigan, has just appointed Thomas B. Dunstan, of Hancock, a member of the Michigan Mining School Board. Mr. Dunstan is well known as largely connected with the copper mines of the upper peninsula. Houghton County furnishes a large number of students for the school. A committee of members of the State Legislature has recently visited the institution, and at once saw the need of larger accommodation for the scholars. A bill to enlarge the school is to be at once introduced.

The Fitch mine, which suspended last fall, is again to be exploited, James Curnow having secured it under contract. It is well equipped, and there is a good showing of ore, which will probably develop into something of value as more ground is opened up. The property belongs to the Cleveland-Cliffs Company.

There is some anxiety on the part of mine managers concerning the ability of the pumps to keep the mines unwatered, as the deep snows of winter melt this spring. Should they go off suddenly disastrous results are feared. The porous character of the overlying rocks to the ore bodies will readily admit a passage of all surface waters, and each spring brings along with it a time of suspense. The water soaking through also, as it thaws and freezes, damages and weakens the walls, and makes mining more dangerous.

Iron—Marquette Range.

Ames Iron Company.—At this property, located in the corporate limits of the city of Ishpeming, the shaft is now down to a depth of between 60 and 70 ft., and explorations are now following along the foot wall to the west, and on the trend of the vein. The latter has been proved, by cross-cutting to possess a thickness of 60 ft. The ore is of good quality, and thus far has been very clean.

Cleveland Incline.—On Saturday night, February 4th, a cave-in occurred from the surface at this mine. An area of ground 40×60 ft. dropped some 65 or 70 ft. into the mine. Within a short distance of the place where the earth sank were two dwellings occupied by families, but no one was hurt. The immediate cause of the cave-in was blasting done in the roof too near the surface. The contract for removing the pillars of ore and other ore that might be found there was given to W. J. Williams a few months ago, and he has since been working a force of between 30 and 40 men getting the ore out. The men were working at this point during the day, when they observed that sand kept falling continuously, so they apprehended that something was going to drop, and they removed to another part of the mine. On the north and east sides of the hole, extending 10 or 12 ft. from its edge, are several cracks which indicate that more of the ground will go down shortly.

Dexter Mining Company.—The company has sunk the shaft an additional 60 ft. since the 20th of last December. The mine is looking well, and could produce 30,000 tons of manganese ore this season, if there was a demand for that amount, says the "Iron Ore."

Foxdale Iron Company.—A stockholders' meeting was held at Ishpeming February 7th. Thomas Buzzo, R. Maxwell, M. B. Tontloff, M. Cassin, Ole Walseth, W. Vicary and C. R. Ely were elected directors, with Mr. Thomas Buzzo as president and manager.

Minnesota Mining Company.—The Minnesota mine case has been decided in favor of Mr. Jeffs, the plaintiff, for \$20,000, with interest at 7% since 1884. The facts connected with the case are these: The National Mining Company brought suit against the Minnesota Mining Company for damages, claiming that, owing to its negligence in not taking care of the water, it was allowed to flow into the National mine, to its damage and great expense. The case was stubbornly fought in court by both sides, and won by the National Mining Company, with heavy damages against the Minnesota company. To meet this Mr. Jeffs advanced the \$20,000 in cash, taking a mortgage on the property of the company. The case was tried in the higher court and reversed; meanwhile the parties controlling the National got control of the Minnesota property, and failed to pay back the money to Mr. Jeff to liquidate the mortgage. The National people set up claim of illegality of mortgage, etc., and since then have staved off by delay the payment of principle or interest of the mortgage; hence the present suit to foreclose the mortgage, with the result recorded above.

Iron—Menominee Range.

Chapin Iron Company.—There is a dispute between this company and the Hamilton-Ludington company over the power supplied by the hydraulic plant at Quinnesec. Under the former agreement the Chapin mine owned two-thirds of the power so supplied in the way of compressed air, and the Ludington mine possessed the remaining one-third. The Ludington has now been coupled with the Hamilton, and the Chapin company objects to their using the power, and the question will probably be referred to the courts. In the meantime the task of bailing the water from the Hamilton-Ludington has been stopped, and will probably not be revived until the disagreement has been satisfactorily settled.

The price of double manure salts as fixed by the syndicate is as follows: New York and Boston, \$1.12; Philadelphia, \$1.14; Charleston and Savannah, \$1.17...

Muriate of Potash.—There is a fair demand for this article. During the week, arrivals amounted to 50 tons; sales ex-store, 250 tons. Prices for 1893 are as follows: New York or Boston \$1.73; Philadelphia, \$1.80; Southern ports, \$1.83.

Kainit.—Arrivals this week amounted to 600 tons. Quotations are as follows: New York, Philadelphia and Boston, \$8.75 for foreign invoice weight and test, and \$9 for actual weight; Charleston, Savannah and Wilmington, \$9.50 for invoice weight and test, and \$9.75 for actual weight.

Nitrate of Soda.—The nitrate market is much easier this week owing to the arrival of two cargoes, which has relieved the stringency of supplies prevailing at the time of our last report. We quote this week: On the spot, \$2.25; December sailings, \$2.15; January, \$2.05; May forward to September, \$1.72 1/2 @ \$1.75.

Liverpool. Feb. 8. (Special Correspondence of Joseph P. Brunner & Co.) Heavy chemicals are in fair request, but no active business to report.

The principal feature is still chlorate of potash, which remains in a very strong position. Soda Ash.—There are a fair number of inquiries, and business has been done on "private terms," but it is rather difficult to give any reliable quotations. The nominal values may be quoted as follows: Caustic ash, 48%, £5@£5 5s. per ton; 57-58%, £5 15s. per ton. Carb. ash, 48%, £5@£5 5s. per ton; 58%, £5 7s. 6d. @ £5 15s. per ton. Ammonia ash, 58%, £5 2s. 6d. @ £5 7s. 6d. per ton—all net cash. For contracts over all 1893 manufacturers are prepared to make concessions.

Soda Crystals are dull at £3 2s. 6d. to £3 3s. 9d. per ton, less 5%.

Caustic Soda.—There is a moderate business passing, but quotations are very irregular, depending entirely upon quantity and export market. Values range for prompt delivery as follows: 60%, £8 10s. to £9 per ton; 70%, £9 10s. to £10 per ton; 74%, £10 10s. to £11 per ton; 76%, £12 to £12 5s. per ton—all net cash. For parcels under 10 tons 5% per ton extra is charged. A reduction will be made for contracts over the year.

Bleaching Powder although not active is very firm at £3 to £8 5s. per ton, net cash, for hardwood packages.

Chlorate of Potash continues in a strong position, and a further large business has been done. For February delivery 9d. per lb. has been freely paid and the market is now practically cleared for this month, although perhaps an odd lot might be picked up in second hands at 9d. to 9 1/2 d. per lb. For March 8 1/2 d. to 9d. is quoted, and 8 1/4 d. for April and May. For July and December 7 1/2 d. to 7 3/4 d. are nearest quotations.

Bicarb. Soda is steady at £6 15s. per ton, less 2 1/2 % for one cwt. kegs, with usual allowance for larger packages.

Sulphate of Ammonia is scarce, but not quite so strong, the nearest values being about £10 15s. to £10 16s. 3d. per ton for good grey, 24%, and £10 17s. 6d. to £11 per ton for 25%, both in double bags, less 2 1/2 % f. o. b. here.

Nitrate of Soda is a shade dearer at £9 17s. 6d. to £10 per ton, less 2 1/2 %, in double bags f. o. b. here.

Carb. Ammonia.—Lump, 2 1/4 d. per lb.; powder, 3 1/4 d. per lb.

CURRENT PRICES.

These quotations are for wholesale lots in New York unless otherwise specified.

Table listing various commodities and their prices, including Acid, Alcohol, Alum, Ammonia, Anthracite, Argon, Arsenic, Asbestos, Ashes, Asphaltum, Barium, Bauxite, Bichromate of Potash, Borax, Bromine, Cadmium, Calcium, China Clay, Chlorine, Chromic, Copper, Cyanide, Fluorspar, Glass, Gold, Iron, Lead, Litharge, Magnesia, Manganese, Mercuric Chloride, Molybdenum, Niobium, Nirosilicic, Palladium, Platinum, Potassium, Rhodium, Rubidium, Selenium, Strontium, Tantalum, Tellurium, Thallium, Titanium, Thorium, Tungsten, Uranium, Vanadium, Yttrium, Zirconium, and various salts and minerals.

Table listing various commodities and their prices, including Chloride and sodium, Oxide, Gypsum, Land Plaster, Iodine, Iridium, Iron-Nitrate, Kaolin, Kieserite, Lead, Litharge, Magnesia, Manganese, Mercuric Chloride, Marble Dust, Metallic Paint, Mineral, Naphtha, Nitre Cake, Ochre, Phosphorus, Platonic Chloride, Plumbago, Potassium, Potassium-Cyanide, Bromide, Chlorate, Carbonate, Caustic, Iodide, Nitrate, Prussiate, Pumice Stone, Pyrites, Quartz, Rotten Stone, Soapstone, Sodium, Stannate, Sulphur, Sulphuric Acid, Symplocos, Tale, Terra Alba, Tin, and Muriate.

Table listing various commodities and their prices, including Double or strong, Vermilion, Am. quicksilver, Chinese, Trieste, American, Zinc White, Antwerp, Paris, Red Seal, Muriate solution, Sulphate crystals, THE RARER METALS, Aluminum, Arsenic, Barium, Bismuth, Cadmium, Calcium, Cerium, Chromium, Cobalt, Didymium, Erbium, Gallium, Glucium, Indium, Iridium, Lanthanum, Lithium, Magnesium, Manganese, Molybdenum, Niobium, Nirosilicic, Palladium, Platinum, Potassium, Rhodium, Rubidium, Selenium, Strontium, Tantalum, Tellurium, Thallium, Titanium, Thorium, Tungsten, Uranium, Vanadium, Yttrium, Zirconium, and various salts and minerals.

Deuver.

Prices and sales for the week ending February 11th, 1893.

Table listing various commodities and their prices, including Anaconda, Bangkok-Cora Belle, Claudia J., Clay Co., Diamond B., Gold Rock, Justice, Puzzler, Tam O'Shanter, and Work.

Total sales..... 46,500

Helena, Mont.

(Special report by F. M. DAVIS.)

Prices highest and lowest for the week ending February 11th.

Table listing various commodities and their prices, including Bald Butte, Benton Group, Cumberland, Elizabeth, Florence, Helena & Victor, Iron Mountain, Poorman, and Whitlatch Union & MacIntyre.

Pittsburg, Pa. Feb. 15.

COMPANY.

Table listing various commodities and their prices, including B'ldgewater Gas Co., Cartiers Val Gas, Enterprise Mining Co., Hidalgo Mining Co., Luster Mining Co., Manufacturers' Gas, N. Y. & Cleve. G. D., Pennsylvania Gas, People's N. G. & P. Co., Philadelphia Co., Tuna Oil, and Wheeling Gas Co.

Duluth. Feb. 10.

LISTED STOCK.

Table listing various commodities and their prices, including Blwabk M. Iron Co., Cincinnati Iron Co., Clark Iron Co., Cosmopolitan Iron Co., Great Northern Min. Co., Kanawha Iron Co., Keystone Iron Co., Lake Superior Iron Co., Lincoln Iron Co., Little Mesaba Iron Co., Mountain Iron Co., Minneapolis Iron Co., Mesaba Moun. Iron Co., Shaw Iron Co., Security Land & Exp. Co., and Washington Iron Co.

UNLISTED STOCKS.

Table listing various commodities and their prices, including Allegheny Iron Co., Aurora Iron Co., Athens Iron Co., Buckeye Iron Co., Chandler Iron Co., Chicago Iron Co., Charlestoia Iron Co., Champlain Iron Co., Consolida Iron Co., Columbia Iron Co., Detroit Iron Co., Dayton Iron Co., Great Western Mining Co., Horton Mining Co., Homestead Iron Co., Imp. Iron Mt. Mining Co., Kentucky Iron Co., Kakina Iron Co., Lackawanna Iron Co., McCaskey Mining Co., McKenley Iron Co., Mesaba Chief Iron Co., Mesaba Iron Co., Myrna Iron Co., Northern Light Iron Co., New York Iron Co., New England Iron Co., Ohio Mining Co., Oneota Iron Co., Pennsylvania I. & S. Co., Rouchleau Iron Co., Republic Iron Co., Red Hematite Iron Co., Standard Ore Co., Towanda Iron Co., and Zenith Iron Co.

STOCK MARKET QUOTATIONS.

Table listing various commodities and their prices, including Aspen, Colo. Feb. 11, Bid. Asked, and Colorado Springs, Colo. Feb. 11, Bid. Asked.

NEW YORK MINING STOCK QUOTATIONS.

DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES.

Table with columns: NAME AND LOCATION OF COMPANY, Feb. 11, Feb. 13, Feb. 14, Feb. 15, Feb. 16, Feb. 17, SALES. Lists various mining companies and their stock prices.

Table with columns: NAME AND LOCATION OF COMPANY, Feb. 11, Feb. 13, Feb. 14, Feb. 15, Feb. 16, Feb. 17, SALES. Lists various mining companies and their stock prices.

*Ex-dividend. +Dealt in New York Stock Ex. Unlisted securities. †Assessment paid. ‡Assessment unpaid. Dividend shares sold, 4,633. Non-dividend shares sold, 26,420. Total shares sold, 31,053.

BOSTON MINING STOCK QUOTATIONS.

Table with columns: NAME OF COMPANY, Feb. 10, Feb. 11, Feb. 13, Feb. 14, Feb. 15, Feb. 16, SALES. Lists various mining companies and their stock prices.

Table with columns: NAME OF COMPANY, Feb. 10, Feb. 11, Feb. 13, Feb. 14, Feb. 15, Feb. 16, SALES. Lists various mining companies and their stock prices.

Dividend shares sold, 1,325. Non-dividend shares sold, 3,195. Total shares sold, 4,520.

DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES.

Table with columns: Name and Location of Company, Capital Stock, Shares (No., Par), Assessments (Total levied, Date and amount of last), Dividends (Total paid, Date and amount of last).

Table with columns: Name and Location of Company, Capital Stock, Shares (No., Par), Assessments (Total levied, Date and amount of last), Dividends (Total paid, Date and amount of last).

DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES.

Main table with columns for Name and Location of Company, Capital Stock, Shares, Assessments, Dividends, and Name and Location of Company, Capital Stock, Shares, Assessments. Includes entries for Dexter, Dunkin, Elkhorn, etc.

G. Gold, S. Silver, L. Lead, C. Copper, B. Borax. * Non-assessable. † This company, as the Western, up to December 10th, 1881, paid \$1,400,000. ‡ Non-assessable for three years. § The Deadwood previously paid \$275,000 in eleven dividends and the Terra \$75,000. Previous to the consolidation in August, 1884, the California had paid \$31,320,000 in dividends, and the Cons. Virginia \$42,300,000. ** Previous to the consolidation of the Copper Queen with the Atlanta, August, 1885, the Copper Queen had paid \$1,350,000 in dividends. †† This company paid \$190,000 before the reorganization in 1880. ‡‡ This company acquired the property of the Raymond & Fly Company which had paid \$3,075,000 in dividends. **** Previous to this company's acquiring Northern Bella, that mine declared \$2,400,000 in dividends against \$425,000 in assessments.

NEW YORK MINING STOCK QUOTATIONS. DIVIDEND-PAYING MINES. NON-DIVIDEND-PAYING MINES.

Main table of New York Mining Stock Quotations, listing various mining companies and their stock prices across multiple columns.

*Ex-dividend, +Dealt at in New York Stock Ex. †Unlisted securities. ‡Assessment paid. §Assessment unpaid. Dividend shares sold, 4,633 Non-dividend shares sold, 26,420. Total shares sold, 31,053.

BOSTON MINING STOCK QUOTATIONS.

Table of Boston Mining Stock Quotations, listing various mining companies and their stock prices.

Dividend shares sold, 1,325. Non-dividend shares sold, 3,195. Total shares sold, 4,520.

DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES.

Large table detailing mining companies, their capital stock, shares, assessments, and dividends, organized into two main sections: Dividend-paying and Non-dividend-paying.

DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES.

Main table with columns: Name and Location of Company, Capital Stock, Shares, Assessments, Dividends, Name and Location of Company, Capital Stock, Shares, Assessments. Lists various mining companies and their financial details.

G., Gold. S., Silver. L., Lead. C., Copper. B., Borax. * Non-assessable. † This company, as the Western, up to December 10th, 1881, paid \$1,400,000. ‡ Non-assessable for three years. § The Deadwood previously paid \$275,000 in eleven dividends and the Terra \$75,000. ¶ Previous to the consolidation in August, 1884, the California had paid \$31,320,000 in dividends, and the Cons. Virginia \$42,300,000. ** Previous to the consolidation of the Copper Queen with the Atlanta, August, 1885, the Copper Queen had paid \$1,350,000 in dividends. †† This company paid \$190,000 before the reorganization in 1880. ††† This company acquired the property of the Raymond & Fly Company which had paid \$3,075,000 in dividends. †††† Previous to this company's acquiring Northern Belle, that mine declared \$2,400,000 in dividends against \$425,000 in assessments.

COAL, RAILWAY AND OTHER STOCKS.

Table with columns: NAMES OF STOCKS, Feb. 11, Feb. 13, Feb. 14, Feb. 15, Feb. 16, Feb. 17, Sales. Lists various stock prices and sales figures.

COAL, RAILWAY AND OTHER STOCKS.

Table with columns: NAME OF STOCKS, Feb. 11, Feb. 13, Feb. 14, Feb. 15, Feb. 16, Feb. 17, SALES. Lists various stock prices and sales figures.

Total shares sold, 2,337,000

San Francisco, Cal.

Table with columns: NAMES OF STOCKS, Feb. 10, Feb. 11, Feb. 13, Feb. 14, Feb. 15, Feb. 16. Lists stock prices for San Francisco.

Foreign Quotations.

Table with columns: Highest, Lowest, Feb. 8. Lists foreign stock quotations including Alaska Treadwell, London, Paris, etc.

Baltimore, Md.

Table with columns: COMPANY, Bld., Feb. 16. Lists Baltimore stock prices.

St. Louis.

Table with columns: Adams, American & Nettie, Bi-Metallic, etc., Feb. 15. Lists St. Louis stock prices.