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We have great pleasure in announcing that we have made arrangements with Dr. GEORGE LUNGE, Professor of Technological Chemistry in the University of Zürich, for a series of articles on subjects relating to industrial chemistry. Dr. LUNGE, as is well known, is one of the most eminent authorities living on these subjects, and anything from his pen is of great value.

We shall publish the first article of this series, entitled "Progress in Heating Processes and the Manufacture of Heavy Chemicals in 1890," in our next issue. As its title indicates, this is a review of the advances made in certain branches of industrial chemistry in the United States, England and on the Continent during the past year. It is an article of great interest.

### THE ELMORE PROCESS FOR MAKING COPPER TUBES.

In our issue of March 21st we called attention to the schemes of the Elmore Copper Depositing Company, which is engaged in exploiting the Elmore patents, covering a process for the manufacture of copper tubes in England and on the Continent, and referred to certain doubts concerning the quality of the tubes made, and as to the financial methods of the

company. In another column we print a communication from Mr. Alexander Watt, who will be recognized as perhaps the highest authority upon the science of electro-metallurgy, which strongly supports the position which we took.

The more we investigate this matter the more convinced do we become of the need of warning American investors to whom the Elmore schemes may be presented that there are very serious doubts about the validity of the patents on any essential features of the process, and still greater doubts as to the value of the process itself. The leading mover in the Elmore company appears to be Baron GRANT, who is known on both sides of the Atlantic as the promoter of many disastrous and some very discreditable schemes. That the Elmore Copper Depositing Company is being used as a means of a gigantic stock-jobbing scheme, there can be no possible doubt.

### THE PROPOSED WORLD'S FAIR MINE.

One of the many schemes proposed for the World's Fair at Chicago, is the exhibition "mine" to be opened in the exposition grounds. The plan is to sink a large shaft to a depth of 500 feet, and at that level drive a system of drifts, radially, in which ore from all the important mining districts from the Rocky Mountain states is to be placed, as nearly as possible in the same manner in which found in the mines whence it came.

It was reported a fortnight ago that this scheme had been abandoned, but this was incorrect, as an attempt to secure the necessary capital is now being made in Utah and Colorado. Aside from the consideration of the undertaking as an investment, mining men are being urged to subscribe for the benefit which it will bring the mining industry in their various districts by the exhibition of their ores.

The scheme is in some particulars a novel one, and, if carried out, will be likely to attract much attention, as did the artificial coal mine at the last French Exposition. Whether it is likely to pay or not is a question which we do not feel competent to decide. It will certainly be an extensive and expensive undertaking, involving the outlay of a large amount of money to open the underground workings in such a manner that there may be a free circulation of visitors, without the possibility of crowding and blockades.

Aside from the financial aspect of the scheme, however, it is hard to conceive how it can work any benefit to the mining industry in general, or any district in particular. It would be impossible to arrange the ore in any manner which would do more than simply show the ignorant that it comes out of the ground, and, from the limited space that would be available, such an exhibit would necessarily be imperfect. The "mine" would have to be opened and fitted in such a manner, for the convenience of casual visitors, that it would be impossible even to illustrate what a mine really is like, or how operations, underground, are conducted.

The whole thing, if carried out, will be a burlesque on mining. An exhibition of ores, minerals, maps, photographs and models of mines, and mining machinery above ground, which there will certainly be at the World's Fair, and which, we hope, will be full and complete, will be far more instructive, than any artificial mine could possibly be.

### TECHNICAL WRITING.

One of the results of technical education in this country, which is rightly held to be of greater and greater importance every year, is the sending forth of a class of young men to manage our mines, mills, smelters, and workshops who are not only trained to appreciate and take advantage of technical literature, but also to make it. In this way the polytechnic schools are rendering not the least of their important services to the engineering and metallurgical professions.

In many branches of these professions the American practice easily leads the world, but the men to whose study and experience the progress has been due, have not, generally, been trained to write concerning their work, and our technical literature has been sadly deficient.

Within recent years there has been an increase in the number of those who have acquired facility of expression and the taste for writing, and they have, little by little, published accounts of their work, so that gradually we are accumulating a mining and metallurgical literature which promises to be superior in all departments to that of any other country, as it already is in several specialties.

The benefits of recording professional experience are by no means confined to the industry and profession in general, but they equally promote the personal interests of the writer. There is no better way in which a young engineer may make himself known in his profession and the industry in which it is practiced, than by writing about his work in some high-class periodical devoted to his subjects. This experience has often been acknowledged by engineers who have attained eminence in their profession, and whose advice carries such weight that it should be appreciated.

We have occasionally been told, however, by certain engineers that they consider it a most foolish thing to publish an article stating the results

of their study or experience, in which they might give away valuable information without any return. Never were men more mistaken than those who use this argument. Even from a pecuniary point of view, there is no way in which a man of ability and experience can use his information to such great advantage to himself as in this way letting the world know that he is an authority on the subject of which he writes, for this brings him professional reputation of far greater value than anything he can make by keeping the knowledge to himself. No business man would lose such an opportunity of advertising himself.

THE ENGINEERING AND MINING JOURNAL has been the medium through which many professional reputations and fortunes have been made, and one of its missions is the creation of an American technical literature that will make the whole world recognize the pre-eminence of American practice in the departments of engineering which it represents.

THE PRODUCTION AND CONSUMPTION OF COPPER IN 1890.

We are indebted to the courtesy of Messrs. HENRY R. MERTON & Co. for advance sheets of their statistics of the copper production of the whole world in 1890, which we are thus enabled to publish here on the same day they are published in London.

According to these statistics the world's production of fine copper in 1890 amounted to 270,485 tons of 2,240 pounds each. The product of foreign countries was 154,160 tons, and that of the United States 116,325 tons, or 43 per cent. of the world's supply. Messrs MERTON & Co. have, of course, adopted the statistics of the United States production of copper collected by the ENGINEERING AND MINING JOURNAL, and published in this journal, January 3d, and as revised on January 17th, 1891; it is surprising, however, that no credit is given on the table to the ENGINEERING AND MINING JOURNAL for this information. The total increase in the world's production of copper over 1889 came from the United States. In 1889 the total output was 261,650 tons, of which 105,774 tons, or slightly more than 40 per cent., were from the United States. Chili was the only foreign copper producer that made any considerable increase in 1890. This increase amounted to nearly 2,000 tons more than in 1889, though still not equal to its output in 1888.

According to Messrs. Merton & Co.'s figures, the "visible supply" of copper in Europe declined during the year 1890 from 98,847 to 65,340 tons, or 33,507 tons; on the other hand, our own stocks increased from 29,018 tons to 35,268 gross tons, or 6,250 tons, as shown in the ENGINEERING AND MINING JOURNAL, January 3d, 1891. The decrease in stocks on both sides of the Atlantic was, consequently, 27,257 tons, which, added to the total production of 190, gives 297,742 tons as the total consumption of copper in the world during the past year. A further analysis of these statistics brings out important facts. At the end of 1886 the visible supply of the metal in Europe was 61,741 tons; at the end of 1890 it was 65,340 tons, the increase thus being 3,599 tons. The stocks in the United States at the end of 1886 were about 17,857 tons; at the end of 1890, 35,268 tons, an increase of 17,411 tons. The increase of stocks from January 1st, 1887, to January 1st, 1891, was, therefore, 21,010 tons. The world's production in 1887, was 223,078 tons; in 1888, 258,026 tons; in 1889, 261,650 tons; and 1890, 270,485 tons. Deducting the excess of stocks we arrive at a figure of consumption for this period of four years of 992,229 tons, or an annual average of 248,057 tons. Thus the consumption of copper during 1890 was apparently 49,685 tons in excess of the average consumption of the past four years, so great and so rapid has been the demand for this indispensable metal.

The rapidly increasing rate of consumption of copper during the past few years has been mainly due to the wide application of electricity in the arts and industries. We have no measure of the amount of copper consumed for this purpose, but it is probably now one of the largest fields for the utilization of the metal.

Although the increase in stocks during this period of four years has been so large in aggregate, relatively it has been of comparatively little consequence. The stock of copper at the beginning of 1887 represented about 17 weeks' supply at the rate of consumption that year; the stocks on January 1st, 1891, were less than a 18 weeks' supply at the rate of consumption of 1890.

According to the figures given by Mr. JAMES DOUGLAS, in his paper on the "Copper Resources of the United States," read at the New York meeting of the American Institute of Mining Engineers, September, 1890, the per capita increase in copper consumption in this country since 1850 has been as follows:

Year.	Population.	Consumption in tons of 2,000 pounds.	Consumption per capita.
1850.....	23,191,876	6,710	0.350
1860.....	31,443,321	7,116	0.465
1870.....	38,558,371	12,322	0.603
1880.....	50,155,703	26,799	1.006
1889.....	61,000,000	84,400	2.736

This, while the consumption per capita increased about 100 per cent in the thirty years from 1850 to 1880, it increased, in round numbers, 175 per cent. in nine years of the electrical decade. The decline between 1850

and 1860 is attributable chiefly to the introduction of iron ships, and the disuse of copper for sheathing ship's bottoms.

As for the future, the conclusion to be drawn from these statistics is that the position of copper is secure. The extraordinary demand from the electrical manufacturing companies which has grown so amazingly during the past decade, is likely to continue at an equally rapidly increasing rate during the present, as electricity for illuminating purposes, and particularly for the transmission of power, becomes applied to a greater extent. At the same time, the demand for copper from the brass-founders and metal workers will probably experience its regular and natural growth so long as the price of the metal is not prohibitive. Experience has shown that any price over 15 cents materially restricts the consumption of copper for this purpose, when above that figure other metals taking its place.

The general business depression prevailing in this country at the present time is undoubtedly affecting consumption temporarily, and, with the large production of our mines going on, the indications now are that our stocks will not suffer any decrease this year, notwithstanding the comparatively low price which bids fair to prevail.

PRINCIPAL COPPER SUPPLIES OF THE WORLD.

(In English tons of fine copper.)

Compiled by HENRY R. MERTON & Co, London.

	1890.	1889.	1888.	1887.	1886.	1885.	1884.	1883.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Algiers.....	120	160	70	150	110	250	260	760
Argentine Republic..	150	190	150	170	180	233	159	293
Australia.....	7,500	8,300	7,450	7,700	9,700	11,400	14,100	*12,000
Austria.....	1,210	1,225	1,010	883	733	585	670	*500
Bolivia.....	500	*1,200	1,470	*1,300	*1,100	*1,500	*1,500	1,680
Canada.....	3,050	2,500	*2,250	1,450	1,560	1,200	1,000	1,055
Chili.....	26,120	24,250	31,240	29,150	35,025	38,500	41,648	41,099
Cape of Good Hope—								
Cape Copper Co....	5,000	5,600	5,800	5,950	5,390	5,000	5,000	5,000
Namaqua Cop. Co..	1,450	2,100	1,700	1,300	625	450	.....	.....
England.....	1,000	905	1,456	889	1,471	2,733	3,350	2,620
Germany—								
Mansfeld.....	15,800	15,503	13,380	13,025	12,595	12,450	12,582	12,643
Other German.....	2,000	1,850	*1,850	*1,850	*1,870	*2,800	*2,200	*2,000
Hungary.....	300	300	858	531	366	600	600	790
Italy.....	3,000	*3,500	3,500	2,500	2,100	*2,000	*2,000	*1,600
Japan.....	15,000	15,000	11,600	*11,000	*12,000	*10,000	*10,000	*7,600
Mexico—								
Boleo Co.....	3,450	3,280	2,566	1,950	.....	.....	.....	.....
Other Mexican.....	875	500	20	100	250	375	291	489
Newfoundland—								
Bets Cove.....	735	1,115	1,300	1,180	1,125	778	668	1,053
Tilt Cove.....	1,000	1,500	750	125	.....	.....	.....	.....
Norway—								
Vigsnæs.....	925	1,007	1,020	1,150	1,920	2,180	2,390	2,340
Other Norwegian..	*150	350	300	275	350	380	392	322
Peru.....	150	275	250	50	75	229	302	335
Russia.....	4,800	4,070	4,700	5,000	4,875	5,100	4,700	4,400
Sweden.....	*806	830	1,036	905	520	775	662	732
Spain and Portugal—								
Rio Tinto.....	*30,000	29,500	28,500	28,500	24,700	23,484	21,564	20,472
Tharsis.....	*11,000	*11,000	*11,000	*11,000	*11,000	*11,500	*10,800	*9,800
Mason & Barry.....	*5,600	*5,250	*7,000	*7,000	*7,000	*7,000	*7,500	*8,000
Sevilla.....	810	1,350	1,709	2,300	2,135	1,800	2,000	2,026
Portuguesa.....	*1,200	1,200	1,250	*856	1,258	1,665	*2,300	2,337
Other mines.....	*4,425	*6,500	*7,000	4,050	3,560	2,424	2,251	1,952
United States—								
Lake Superior.....	44,450	38,769	38,650	33,530	35,590	32,210	30,925	26,650
Montana.....	49,560	46,518	43,703	35,225	25,720	30,270	19,255	11,010
Arizona.....	15,945	14,419	14,062	8,035	6,983	10,135	11,553	10,660
Other States.....	6,370	6,068	5,295	2,519	1,510	1,435	2,585	3,250
Venezuela—								
New Quebrada.....	5,640	5,563	4,000	2,900	3,708	4,111	4,600	4,018
Total.....	270,485	261,650	258,026	223,078	217,086	225,592	220,249	199,406
Average prices—								
Chili bars.....	£54 1	£49 10 6	£82 7 6	£42 3	£40 6	£44 1 6	£54 15 6	£63 8 9
G. M. B.'s.....			76					

\* Those marked with an asterisk are estimated.

BOOKS RECEIVED.

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

*Boyd's Map of the Mineral Resources and Railway Facilities of Southwest Virginia.* By C. R. Boyd, C. E. and Geologist, Wytheville, Virginia. 1891. Price, on cloth, pocket form, \$5.

*Steam, Its Generation and Use, with Catalogue of the Manufactures of the Babcock & Wilcox Co.* Illustrated. 152 pages, 23d edition. New York and Glasgow, 1891.

*The Engineer's Sketch-book of Mechanical Movements, Devices, Appliances, Contrivances and Details Employed in the Design and Construction of Machinery for Every Purpose.* Classified and arranged for reference for the use of engineers, mechanical draughtsmen, managers, mechanics, inventors, patent agents and all engaged in the mechanical arts. With nearly two thousand illustrations, descriptive notes and memoranda. By Thomas Walter Barber, Engineer. Second edition. 243 pages. Published by E. & F. N. Spon, London and New York. 1891. Price, \$3.00.

*The Steam Engine.* By Daniel Kinnear Clark, C. E., M. I. M. E. With an introduction by R. H. Thurston. 1,560 pages, 1,300 diagrams, and folding plates drawn to scale. Published by Blackie & Son, Ltd., London, Glasgow, Edinburgh and Dublin. 1890. Price \$12; four volumes, cloth, \$16.

## 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 Precipitation of Gold From Chloride Solutions.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: In your issue of March 21st, Mr. Werner Langguth talks about a "simultaneous" action of copper sulphide and chlorine in decomposing water. I think it very doubtful if he has ever proved the existence of any such "simultaneous" action as he describes. He tells us the well-known fact that gold chloride will decompose in aqueous solution, by standing and exposure to light, forming metallic gold and HCL. What connection this can have with the problem in discussion is hard to tell, as the solution was not allowed to stand, nor was any access of light permitted. I would simply remind Mr. Langguth that the precipitation is practically instantaneous, and just as effective in total darkness as in broadest daylight. So far as the action in the chlorination barrel is concerned, I based my argument in my previous letter (ENGINEERING AND MINING JOURNAL, March 7th) on the fact that, if water was being decomposed during the precipitation, it was decomposed by the action of the chlorine alone, and not by any "simultaneous" action; and, if chlorine had the power of decomposing water in the one case, it surely would have the same effect in the other, which I still claim.

Mr. Langguth then proceeds to end the argument by quoting Mr. Aaron in his article on the "Hydro-metallurgy of Gold." I read Mr. Aaron's article about four weeks after it was published, and in my first or second communication, I gave Mr. Aaron the credit of having first mentioned CuS as a precipitant for gold; but at the time of reading the article, I felt very doubtful about the condition of the precipitated gold, and accordingly made some tests, with the results as before stated.

In regard to gold being redissolved, Mr. J. E. Rothwell is quoted with the following: "As CuS is replaced with gold on the filtering medium, there is a point where there is not sufficient of it to continue precipitation at the ordinary rate of running through. Then the solution immediately exerts its solvent action, and dissolves the finely divided metallic precipitate that has been formed, and carries it off." This is contrary to all my experience, and I do not think any such solvent action could take place in the absence of chlorine. In my first attempts with CuS, I had an experience similar to the first part of the statement, viz: "As CuS is replaced with gold on the filtering medium, there is a point where there is not sufficient of it to continue precipitation at the ordinary rate of running through." Then part of the gold fails to be precipitated, and the solution, of course, carries it off.

Mr. Langguth says: "The thorough mixing of a precipitate, such as copper sulphide, with a solution in a large tank, is a very difficult task; the more it is stirred, the finer divided will be the precipitate and the longer the time required for it to settle." This statement is simply ridiculous. Any laborer who has ever handled solutions will at once tell him that the more the solution is stirred the quicker the precipitate will settle.

So far as detecting the gold in a copper solution is concerned, I stated my results in my first article. The heaviest copper ore treated had nearly 3% soluble copper in the solution. Not the slightest difficulty was found in detecting the faintest trace of gold by using proper precautions. Such an ore would be entirely inapplicable to the H<sub>2</sub>S process, and FeSO<sub>4</sub> would land a great part of our gold in the scrap-iron tanks, as Mr. Butters has so ably shown us. Where no copper is present in the ore, that rendered soluble in the precipitation by CuS is merely proportionate to the amount of gold present, or if used as a chlorine destroyer instead of So<sub>2</sub>, which is quite possible, when applied to the tanks of solution, it would of course take more CuS, according to the amount of free chlorine present. But when used merely to precipitate the gold, the quantity dissolved would be so small that in an ore not richer than that treated at the Golden Reward Chlorination Works, it is doubtful if the dissolved copper could be detected by anything short of a chemical test.

April 7, 1891.

L. D. GODSHALL,

Supt. Holden Smelting and Milling Company, Aspen, Colo.

## Hirsh's Aluminum Process.

J. M. Hirsh, of Chicago, who has achieved notoriety in connection with the manufacture of aluminum and to whose schemes the ENGINEERING AND MINING JOURNAL has more than once referred, has written a letter, which was printed in the Chicago Herald of March 28th, defending himself and describing anew what he claims to be able to accomplish. His statements in general are but a repetition of those which he has made before. Among other things, however, he says that he can plate with aluminum and "deposit from a solution as readily as copper can be deposited, although all chemists everywhere have pronounced this statement as fraudulent." One of them, in the ENGINEERING AND MINING JOURNAL, some time ago made this statement. When last in New York I sought him out, he persisted in his opinion and quoted the latest authorities in his favor. After two weeks' delay he analyzed a deposit of aluminum made by me and wrote a letter, the original being at your disposition, and a portion of which reads as follows:

The deposited substance was of a dazzling white color and was extremely thin. Had I been asked to express an opinion about it, without further examination, I should have said that it was silver-plated by an electrolytic process. In accordance with your wish, however, I made a qualitative analysis of the deposited metal and found that it is, as stated by you, aluminum. I am at your disposal to witness experiments, until I know exactly what I am talking about and know exactly how I am to fight the battle that I know must follow my publication. It seems to me that there is no room for half measures. I will do anything you say, without making a fool of myself, which I know you would not wish for a moment.

Yours truly

FRANCIS WYATT, Ph. D.

Concerning this statement the following letter from Dr. Wyatt explains itself.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR:—On my return to the city from a somewhat protracted stay in the South my attention was called to a letter on the subject of aluminum, written by Mr. J. M. Hirsh, and published in the Chicago Herald of the 28th ult. In this communication Mr. J. M. Hirsh has had the temerity to

use my name as a quasi-endorsement of his alleged invention. I therefore beg that in justice to myself and those connected with me, you will permit me to state what I know of this gentleman. At the beginning of last December my friend and client Mr. Adolph Hirsh (of the well-known firm of Heller, Hirsh & Co.) requested permission to introduce to me his brother, J. M. Hirsh, of Chicago, who desired to obtain my assistance in refuting certain charges brought against him by the ENGINEERING AND MINING JOURNAL in relation to his process for manufacturing aluminum from clay.

At our first interview the inventor exposed his grievances at great length, but, as it appeared to me, skillfully abstained from making any definite allusion to his theories or methods! While giving him to understand that I had no confidence in him, and that I entirely shared the opinions expressed in the ENGINEERING AND MINING JOURNAL, I informed him that, if he were ready to perform, in any laboratory, and in my presence, certain experiments sufficiently comprehensive to satisfy me of the genuineness of his discovery, I would use my influence to convince you and the public that the judgment passed upon him had been hasty and ill-considered.

Mr. J. M. Hirsh expressed his entire willingness to make such a demonstration, and promised to attend at my laboratory on an early date, bringing with him all the necessary materials.

After the lapse of a few days he favored me with a call—not to perform the required experiments but—to renew his statement of grievances and extend his verbose protestations. During this second conversation I again signally failed in my attempt to elicit from him a solitary fact in support of his position. I closed the interview, I remember, by remarking that, for the sake of Mr. Adolph Hirsh, I would do anything in my power to assist him, but that I would utter no syllable in his behalf until he had convinced me of his bona fides.

He did not visit or communicate with me again until about December 12th or 13th, when he called and handed me an ordinary brass faucet plated with a white metal, and requested me to subject the coating to analysis. In reply to questions, he explained that the brass had been treated by his new process, and that the object of the analysis was to prove the presence of aluminum.

I impressed upon him that such an analysis would in no wise influence my opinion or change my previous attitude; that if I made the test he asked for, it would be done as a matter of courtesy, and that it would not be charged for or treated as a matter of business.

This being understood, I communicated the result of the qualitative analysis, not to Mr. J. M. Hirsh, but to his brother Adolph, in my letter of December 19th, 1890, as follows:

"MY DEAR MR. HIRSH: Your brother was good enough to leave with me a part of a brass faucet upon which some metallic substance had been deposited. The deposited substance was of a dazzling white color, and was extremely thin! Had I been asked to express an opinion about it, without further examination, I should have said that it was silver-plated by an electrolytic process! In accordance with your brother's wish, however, I yesterday made a qualitative analysis of the deposited metal, and find that it is—as stated by him—aluminum. I am entirely at your brother's disposal to witness and report upon any experiments he may desire to make in my presence, but, as I told him in the plainest possible language, I will not put myself on record until I know exactly what I am talking about and exactly how I am to fight the battles that I know must follow my publication. It seems to me that there is no room for half measures! I will do anything you say without making a fool of myself, which I know you would not wish for a moment.

Yours truly,

FRANCIS WYATT."

Since writing the above, I have had no communication of any kind with Mr. J. M. Hirsh. How my letter came into his possession, it is impossible for me to say; but you will perceive that he has had the indelicacy to garble it considerably in order to make it suit his purposes. Under these circumstances, it behooves me to categorically and emphatically assert that I am in absolute ignorance of the nature of his processes or inventions; and the fact of his descending to falsify and distort a confidential document, neither addressed to him nor intended for his perusal, justifies me in thus exposing his character. Should he persist in taking further liberties with my name, I will adopt the necessary legal measures to protect myself from the effect of his prevarications.

FRANCIS WYATT.

24 PARK PLACE, New York.

## The Elmore Copper Depositing Company's Schemes.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: According to a statement made by an Elmore shareholder, in the Financial Times of the 2d inst., "it is very probable that the American patents will shortly be sold privately in America for a large sum entirely in cash." If such should really turn out to be the case, it will be "marvellous in our eyes," on this side of the Atlantic, since the so-called "Elmore process" has by no means been proved to be a commercial success; indeed, the opinions of persons who understand the electro-deposition of metals thoroughly seem to be of an adverse character. It should be well borne in mind that the floating of one company after another—a mere system of financiering—is no proof of the practical success of a process. Persons unacquainted with the electro deposition of metals may be led to believe, by the plausible statements of prospectuses, that in the manufacture of copper tubes by the aid of a burnishing tool passing over the surface of the mandril while the copper deposition is taking place, there is secured an advantage in the character of the tubes thus formed which renders them superior in every respect to the ordinary drawn tubes. There are, however, certain drawbacks connected with the burnishing of the copper during electro-deposition of the metal which must not be overlooked, and it may ultimately be found—as I believe it will be found—that a tube formed by the Elmore method will, when subjected to the necessary heat of a boiler, gradually give way and prove, in the end, a weaker tube than one manufactured in the ordinary way—that is, a drawn tube.

The exfoliation of the burnished tubes, referred to in your article on the Elmore process in the issue of the ENGINEERING AND MINING JOURNAL, March 21, is a defect that must permeate the whole of the tube throughout, and when subjected to the temperature it would necessarily have to contend against, such a tube, I believe, would eventually disintegrate—from want of cohesion—and become rotten. It may not be generally known, but it is important that it should be, that metals deposited by electrolysis do not adhere well, if at all, to their kind; thus electro-deposited gold will not adhere to gold, silver to silver, nickel to nickel, nor copper to copper, and so on. If, therefore, while copper is

being deposited upon an iron mandril—whether it be subjected to the action of a burnisher or not—the operation becomes suspended, even for a moment—say while some trifling repair to gearing takes place—and started afresh after the momentary delay, the metal deposited thereafter becomes a distinctly *separate layer* (even though the tube has been immersed in the liquid the whole time, and not exposed to the air) which the action of the burnisher will not only *not* prevent, but will actually aid in loosening or stripping from the underlying surface. This fact alone will account for the exfoliation of the copper in the Elmore tubes.

There is another point in this connection to which I will direct attention, which is this: Electro-metallic deposits will not adhere to polished or burnished surfaces—a fact which I have proved in an hundred ways; indeed, thin sheets of electro-deposited metal may be readily obtained by coating polished metallic surfaces and stripping off the deposited film. If electro deposits will not adhere to bright metallic surfaces—and of this there can be no doubt whatever—then the action of the burnisher under a pressure of from 3 to 13 pounds, as in the Elmore process, must have a positively injurious effect upon the cohesion of the metal, and copper tubes prepared in this way must ultimately come to grief when heated, and the tensile strength be considerably weakened. There has been a great deal of fuss made about the agate burnisher “laying down the fibres of the metal,” but since the metal deposits in a crystalline, and not a fibrous state, this theory of the burnisher’s function is absolutely without warrant.

In the description of the Elmore depositing process given in your journal, March 21st, it is stated that “the tank shed in which the copper is deposited and the tubes are produced, measures 200 feet in length and 40 feet in width, and contains 60 tanks, each about 12 feet long. . . . The output of this room is from four to six tons of finished tubes per week of 168 hours.” Now, considering that the Elmore scheme has cost the public so far over £1,200,000, “the output” of four to six tons—say five as an average per week—cannot be deemed a very promising outlook for the investors; indeed it may be looked upon as an experimental show rather than a commercial manufacture. It is true that the English company, or “parent company,” as it is termed, has been well looked after, in which the French company generously assisted to the tune of £83,500 in cash, besides premiums on the issue of 66,750 shares, amounting to £33,375, making £116,875, besides £66,500 in shares; and it is equally true, I believe, that the Austro-Hungarian bantling paid the Foreign & Colonial Company £50,000 in cash and £37,500 in premiums, making £87,500, besides £50,000 shares. But for all this enormous amount of money passing through the hands of the promoters of these schemes, what have we in the shape of *real* business to indicate that the process is anything but a gigantic sham? An “output of four to six tons of copper tubes per week”!

It may not be known, on your side of the water, that Elmore originally professed to produce his copper tubes from “rough copper or matte”—that was an essential part of his “invention”—at a cost of £25 per ton, the cost of ordinary drawn tubes at that time (1885) being £59 per ton. He is now using Chili bars, the market price of which, here, is about £52. After deducting cost of manufacture, interest on capital, management, wages, an enormous amount of fuel for driving dynamos, etc., what margin of profit can be left on an “output of from four to six tons of tubes per week”? It is all very well to run a “show” establishment in a distant part of England *while other companies are being floated* in different parts of the world, but where is the prospect of a *bona fide* manufacturing industry arising out of all this vast draining of the public purse? The last company formed must assuredly fall to pieces after it has handed over to the promoters the purchase money for a series of patents which may, for aught that is known at present, be absolutely worthless, so far as the quality of the tube is concerned or the rate at which they can be produced. It is said that Elmore deposits one-eighth inch of copper on each mandril per week, so that, assuming the tubes to be not less than one-half inch in thickness when finished, it must take *four weeks* for the completion of each tube, during which time vast expenses will be running on, as also interest on capital accruing. Those who would invest in this enterprise should certainly think twice—at least.

LONDON, April 3d, 1891.

ALEXANDER WATT.

#### LIXIVIATION—AN EXPLANATION OF SOME OBSCURE POINTS.

Written for the *Engineering and Mining Journal* by C. H. Aaron.

I have heretofore said (*Mining and Scientific Press*, May 25th, 1889) that silver and copper are precipitated from the hyposulphite solution by precipitated zinc sulphide. I have since proved that a hyposulphite solution of zinc is a perfect non-solvent of silver chloride. It is known that zinc is precipitated from its hyposulphite solution as insoluble zinc carbonate by an alkali carbonate. These three facts may furnish the explanation of some things that have heretofore not been explained.

Silver leachers, outside of the Russell process, agree that only in exceptional cases, or as the result of bad management or accident, is it necessary to reinforce their hyposulphite solution; in the ordinary course the waste is compensated by the hyposulphite which the precipitant always contains. But I have, in one of my articles, mentioned an instance in which, according to my information, a well-known and skilful metallurgist once found his leaching solution “demoralized,” and had to either throw it away and make a new one or strengthen it by an addition of sodium thiosulphate (“hyposulphite”).

This seemed surprising, and whether the gentleman himself understood it or not, the cause was never made known, so far as I am aware. I propose to show how it might have occurred, and may occur in other cases.

The ore treated contained a rather large percentage of zinc; it also contained lead. As the ore coming from the mine became more refractory, from the increasing proportion of galena and blende, it increasingly clung to the walls of the roasting cylinders till at last it was necessary to stop the furnaces at intervals of a few weeks and remove the crust, which was from 4 to 8 inches thick, and so hard as to require the use of a pick. For lack of better means, the crust, which was always well roasted, was broken, by hand hammers, to pieces from egg-size down to dust, placed in the vats and treated in the regular way. But, owing to the hard and lumpy condition of the stuff, and to its containing more than a due pro-

portion of soluble zinc salts, the preparatory washing was imperfect and the subsequent silver leaching extracted the soluble zinc which the washing had failed to remove. This I suppose to have been the case, as I know it was when I had charge of the same works later. The zinc, of course, existed in the silver solution as zinc-hypo sulphite, being transformed by double decomposition from the sulphate or chloride in the leaching tubs.

Now, the workmen in the mill are usually instructed to discontinue the addition of polysulphide as soon as it ceases to give a *dark-colored* precipitate, and, as zinc sulphide is white, it is easy to see that the silver and copper will be precipitated, but the zinc will not, for, although some zinc, when much is present, will be seen as white sulphide when the polysulphide is added, as I have observed to be the case, yet, so long as any silver or copper remains dissolved, the white zinc sulphide immediately re-dissolves, silver or copper sulphide taking its place. This phenomenon was very puzzling to my workmen when leaching “crust.”

Thus the zinc hyposulphite accumulates in the leaching solution, displacing an equivalent of sodium hyposulphite (or calcium hyposulphite), and, as zinc hyposulphite is non-solvent to silver chloride, the stock solution becomes “demoralized” and inefficient. Now for the remedy, and at the same time, a probable explanation of another leaching puzzle.

In the original work of the late Guido Küstel on this subject, “Roasting Gold and Silver Ores,” the author speaks of the stock solution becoming deteriorated, and affirms that it may be regenerated by causing it to pass through a bed of wood-ashes placed on top of the ore in the leach tub. This statement has been commented on with some appearance of impatience and discredit, by Mr. Stetefeldt in one of his articles, if not in his book. But if, as is very likely, Mr. Küstel had been working on ore containing zinc, it is now easy to see how, in consequence of imperfect roasting of the ore, perhaps caused by lumps formed in the furnace, the solvent power of his solution may have become impaired by the accumulation of zinc hyposulphite in it, with a corresponding loss of sodium hyposulphite, and how, by passing the liquid through a layer of wood-ashes, the zinc was precipitated as carbonate, and a great measure of efficiency was restored to the solution by the replacement of zinc hyposulphite by potassium hyposulphite.

There is nothing to prove that Mr. Küstel himself understood the *rationale* of his method, as he offers no explanation, and it seems that sodium carbonate would have been better than ashes, because, according to Mr. Stetefeldt’s investigations, sodium hypo sulphite is a much better solvent than potassium hypo sulphite, the ratio being as 100 to 70. However, as zinc hyposulphite is a non-solvent, the potassium salt would be a great improvement on that.

At all events, the facts stated show that it is very desirable to avoid any accumulation of zinc in the stock solution, and, if, for any reason, this is not done by the thorough washing of the ore before lixiviation, it is not necessary to precipitate the zinc as sulphide together with the silver, as it may be more conveniently removed by adding sodium carbonate to the solution before lixiviating, and in case of need Mr. Küstel’s simple method will answer the purpose fairly.

There is still room for a good practical and theoretical treatise on “the lixiviation of silver ores with hyposulphite solutions.” Let us hope that some able writer will soon try to give us the truth, the whole truth, and nothing but the truth, so far as is known, and that he will not scorn the contributions of other writers, or, especially, of workers, however humble or obscure.

**The Proctor Tower.**—The Proctor steel tower at the World’s Columbian Exposition, says the *Engineering News*, is to be 1,155 feet in height, and will resemble the Eiffel tower in its general appearance. It will be hexagonal in plan, instead of square, however, and will have a larger base and start at a smaller angle with the vertical than the Eiffel tower. The designer of the tower is David A. Proctor; the architects are Holabird & Roche, and the engineer is Corydon T. Purdy, all of Chicago. The contract for erection has been let to the Geo. A. Fuller Company. The steel, of which 7,500 tons will be required, will be furnished by Carnegie, Phipps & Co. The total cost of the tower is estimated at \$3,000,000.

**Rights Under Unrecorded Lease.**—The holders of an unrecorded oil lease, in possession, who have made valuable improvements on the land, can successfully defend ejectment by the holder of a subsequent lease, taken and recorded before the first lessees went into possession and began operations on the land, unless the subsequent lessee acquired his title in good faith and without knowledge of their rights. The second lessee, whose law partner, on being consulted by the lessor, drew up the second lease, with knowledge of all the facts, for the express purpose of defeating the title of the holders of the prior unrecorded lease, is chargeable with notice of the facts brought to his partner’s knowledge during such consultation, and takes subject to the title of the first lessees. Where the first lease contains no clause of forfeiture, and provides a penalty of \$40 per annum for delay on the part of the first lessees in beginning the work, neither the lessor nor the subsequent lessee, who stands in his shoes, can recover possession of the premises on account of such delay by the first lessees.—*Thompson v. Christie, Supreme Court of Pennsylvania, 20 At. Rep. 934.*

**Zirconia as a Substitute for Lime in the Oxyhydrogen Light.**—Now that compressed oxygen is cheap, and zirconia a fairly common article of commerce, says W. Kochs in *Dingler’s Polytechnische Journal*, 278, page 235, many applications of a zirconia light, working with ordinary coal gas, are feasible. Linnemann has devised a burner, improved by Wolz, of Bonn, which is well adapted for this purpose. The zirconia used should be as pure as possible, and made in the form of cylinders  $2 \times 0.8$  centimeters, which yielded a light of 40 to 50 candle power when heated with 30 litres of oxygen and 30 litres of coal gas per hour. When a comparison of the light emitted by gas burned under different conditions is made, using an amyl acetate lamp as a standard, it is found that 30 litres of gas per hour, simply burnt as it issues from a circular opening, give only one candle power. The use of 30 litres of oxygen instead of air, and the introduction of a cylinder of zirconia increases the light therefore some forty-fold without augmenting the heat evolved in the least. The color of the light is comparable with that of the electric arc. The zirconia light as thus arranged readily lends itself to spectroscopic, photomicrographic, and medical use.

## NOTES ON THE BRITISH ALKALI TRADE.\*—I.

Written for the Engineering and Mining Journal.

## THE MANUFACTURE OF SULPHURIC ACID.

(Concluded from p. 443.)

The foundations for chambers must be safe; to insure this, great care is necessary at first: if this point is not fully attended to, subsidence of the ground, after erection of the chambers, may cause great inconvenience and loss, by the chamber bottoms getting out of level. The chamber pillars stand upon sandstone blocks or brick foundations; these should go down to the solid rock if practicable, otherwise pile-driving is resorted to. In some cases the whole space under the chamber is asphalted or laid with concrete.

Nowadays cast-iron columns of an H section, or sometimes of a circular section are generally employed; formerly wooden pillars were often used; and formed a cheap, though not very durable, means of support. Side-walls of stone or brick were also used to support the chambers in some works; but in this case, unless plenty of windows were built, the space under the chambers was dark. Moreover, occasional leakage of acid may cause much damage to walls or pillars of brickwork, so that the chief form of pillar used now is one of cast-iron. A bracket of iron is cast to each side of the pillar and receives a strut. These struts help to support the weight of the chamber between the cast iron pillars. Wooden sleepers or beams, of 12 inches  $\times$  12 inches for large chambers, or 12 inches  $\times$  9 inches on edge for smaller, rest horizontally on the cast-iron pillars. Over the sleepers, and at right angles to them, wooden joists of 11 inches  $\times$  3 inches or 9 inches  $\times$  3 inches are laid on edge, at distances of 1 foot 3 inches from center to center. Upon these joists, deals 1 inch or 1½ inches thick are laid, forming the chamber floor. A sufficient number of the cross joists, say every fourth one, should project 5 or 6 feet to allow for the passage around the chambers, on each side. In erecting the columns and laying the beams and floor great care must, obviously, be taken to get the floor level.

Now, the wooden frame to support the lead chamber must be built. Sole-trees of 6 inches by 6 inches, or 7 inches by 6 inches (with flat side down), are laid for the ends and sides; the soles overlap and are jointed to each other at each corner of the chamber. Into these the bottoms of the corner-posts are mortised, and along the sides and ends, at distances of 3 to 4 feet apart, the uprights are placed; these vary in sectional area in different works from 7 inches by 5 inches for strong chambers, to 6 inches by 2½ inches for lighter ones, though other sizes are occasionally used. Along the top of the frame lie the crown-trees of the same size as the soles, and these, like the soles, overlap at the ends, and a strong joint is thus made; into them, also, the uprights are mortised. It is necessary to build the frame with a slope from side to side, so as to drain off the water which would otherwise collect on the chamber roof. The slope varies from 6 inches to 12 inches, or, in other words, the chamber is built 6 to 12 inches higher at one side than the other. A spout is laid along the lower side of each chamber to catch the water, and thus prevent it running down the side of the chamber and diluting the acid.

Later on, I shall speak of the necessity for a large space for the chamber reactions; here I shall only say that sulphuric acid chambers vary in size from about 210 feet long by 27 feet wide by 20 feet high, down to 60 feet long by 20 feet wide by 16 feet high; the writer has heard of even smaller chambers, and such may still exist in some of the small superphosphate and other works making acid in the country districts. The wooden frame having been erected, the next step is the construction of the leaden chamber. Sheets of lead of suitable weight and length are obtained as wide as 7 feet 9 inches. These are joined by the oxyhydrogen blowpipe; the lead for the sides being joined first on a temporary table inside the chamber. The weight of lead used varies according to the requirements of the acid manufacturer or the opinion of his manager; but seven pound lead is none too heavy for the sides, top and bottom of chambers which are to make acid constantly for many years. Sheet lead of five pounds per square foot is, however, considered strong enough by some managers, and chambers of this quality have, with fair treatment, served for ten years, and in some cases the end chambers have had a duration of nearly twenty years. When seven pound lead is used, a duration of six to ten years should be expected for the working chambers, and twice (in some cases even three times) that period for the end (weak) chambers of the series. The ends of chambers are often made of heavier lead than that used in other parts; thus lead of seven pounds or nine pounds per square foot is used for the ends, where the rest of the chambers have been made of five pound and seven pound lead respectively.

The oxyhydrogen blowpipe and the plumbers' air-pump and "machine" are illustrated in Fig. 1, which is a drawing of an improved form, made by Mr. J. Cortin, of Mushroom, Newcastle-on-Tyne.† The upper chamber A of the air-pump is filled with water, which, by its pressure, forces out air from the lower chamber B to the burner; the dotted pipe C is the connecting pipe, and, by means of the air-pump D, the water can be forced back into the reservoir A. Into the upper vessel of the "plumber's-machine," marked G, dilute sulphuric acid is poured, and finds its way out, as required, at the bottom of H, in which hydrogen is generated from zinc introduced by the hand-hole I. At K are seen the taps for regulating the supply of air and hydrogen, respectively, and L is the burner. It pays to use the best spelter in these "machines," as freedom from arsenic is an important point; if this is not borne in mind, the plumbers are sometimes overcome by the poisonous fumes of arseniuretted hydrogen. The burner has a fine nozzle; the flame obtained is pointed and very hot; lead can be easily melted by it, and two adjacent sheets are joined by scraping the edges clean, allowing one to slightly overlap the other and playing on the junction so as to melt both sides into one whole. Strips of lead are used in place of solder, the latter having been found less durable than the chamber lead. When two or three widths of lead have been burned together for the sides on the table or "sheet-board," as it is technically termed, the next step is to burn "straps" of lead to the upper surface, which, on being raised into position, becomes the outside of the chamber. These straps are now generally nailed to cross-rails, the latter being mortised into the uprights.

In the space of this article I have not room to describe all the details of

chamber construction, and it must suffice for me to say that the chamber roof is next put together, two or three sheets at a time, on a temporary scaffold, which moves on wooden rollers inside the chamber. The size of this scaffold is in height and width equal to that of the chamber; in length, equal to three sheets of lead (each of 7 feet 9 inches in width). Straps are burned to the upper side of the chamber top and are nailed to the cross-joists, the weight of the latter being borne by the crown-trees. Last of all, the chamber bottom is constructed; its shape resembles a huge, shallow, rectangular tank; the lead of its side is carried over the edge of a 1½-inch deal, (called the "skirting-board" or "upstand") and nailed thereto. The lead of the chamber sides falls within the upstand, or saucer; and, as this lead expands a few inches, on starting work, space must be allowed for this at the bottom. The depth of the upstand, or chamber bottom, varies from 1 foot 2 inches to 2 feet, according to the quantity of acid to be made or held.

I must now deal, briefly, with the main chemical reaction which takes place in sulphuric acid making, and describe the towers used for recovering the costly oxides of nitrogen.

Firstly, in the burners, pyrites (consisting essentially of ferric sulphide) is roasted with excess of air; burnt ore, consisting chiefly of ferric oxide, is withdrawn from the burners, whilst sulphur dioxide, excess of air, and a little sulphur trioxide (formed already at this stage) pass into the Glover tower, on their way to the chambers. Leaving the description of the Glover tower and its function, for a while, I must now consider the reactions in the chamber; about these reactions, I may remark there is still much unknown, though many valuable researches have been conducted and various hypotheses advanced. Into the chamber, sulphur dioxide, steam, nitric peroxide (or tetroxide) and excess of air, with residual nitrogen, are sent. The following reaction may be taken as the main one in the chambers:  $\text{SO}_2 + \text{H}_2\text{O} + \text{NO}_2 = \text{H}_2\text{SO}_4 + \text{NO}$ ; and the nitric acid is again peroxidised by the excess of air as follows:  $\text{NO} + \text{O} = \text{NO}_2$ .

There is always a certain loss of nitre in the process, probably by a portion of the nitrogen oxides being reduced to the state of nitrous oxide, ( $\text{N}_2\text{O}$ ) or even to nitrogen, neither of which can be absorbed (for re-use) by sulphuric acid. The conversion of sulphur dioxide into sulphuric acid is a very slow action, and here we cannot do better than quote an extract from a lecture by Dr. F. Hurter: "According to the amount of nitrogen compounds present, the time for the complete conversion of the sulphurous acid varies from two to five hours, and if you recollect that one ton of pyrites requires in round numbers 200,000 cubic feet of air, you will readily perceive that an enormous space is necessary to store the gas of one ton for, say, three hours. A works, for instance, burning 100 tons of pyrites per day, would require 2,500,000 cubic feet of chamber space." In the writer's experience, the chamber space allowed in large modern works varies from 15 to 22 cubic feet per pound of sulphur charged per 24 hours.

Nitrate of soda, I have said, costs about £9 per ton. In works, where no attempt is made to recover the oxides of nitrogen, the nitre used per 100 of sulphur charged varies from 9½ to 15. In modern works, however, where Gay Lussac and Glover towers are in use, the greater part of these oxides of nitrogen are absorbed by cold strong sulphuric acid in the Gay Lussac and evolved again, ready for use, in the Glover tower, so that, in these cases, the nitre consumed is only from 1 to 3 per 100 of sulphur charged. It is evident, therefore, that a great saving can be effected by use of towers, even in comparatively small works, not only by the economy of nitre, but by the quantity of acid gases escaping into the atmosphere being reduced.‡

Thus, in well-managed works there is no difficulty in controlling the process, so that the escaping gases shall not contain more than 1 to 1½ grains of total acids, calculated as  $\text{SO}_3$ , per cubic foot. From last year's annual "Report of the Chief Inspector of Alkali, etc., Works," we learn that the average escape of acid gases from sulphuric acid chambers in the whole of England has been, in 1887, 1.50; 1888, 1.49; 1889, 1.37 grains  $\text{SO}_3$  per cubic foot. Section 8 of the Alkali Act of 1881 requires that not more than 4 grains of total acids, calculated as  $\text{SO}_3$ , shall be evolved per cubic foot of gases escaping from sulphuric acid works. Another great advantage of the use of towers is the economy of chamber space; from a given set of chambers a much higher yield of sulphuric acid can be got with use of towers than without.

The absorption of nitrous fumes by strong vitriol was proposed in 1827 by the celebrated French chemist, Gay Lussac, who used a coke-tower for this purpose. His invention was not worked in actual practice, however, until 1842, at Chauny, near St. Gabain, in France. In fact, forty years after Gay Lussac's invention the majority of sulphuric acid makers had no means at work for the recovery of their nitrous gases; many who had tried the coke-tower had abandoned it. The slow adoption of the absorbing column was due to the expense of concentrating vitriol for use therein, as acid of at least 1.7 specific gravity (= 140° Twaddell) is required to absorb the nitrous fumes. In the Alkali Act Report of 1861 we find it stated that "the Gay Lussac column is seldom in use, as with nitrate of soda at £12 a ton it does not pay."

It was after Glover invented his denitrating tower, in 1859, that the Gay Lussac absorbing column became a practical and economical invention.

The first tower was erected by Mr. John Glover, at Washington Chemical Works, in the county of Durham, in 1859. This tower was built of fire-bricks, and packed with a network of thin fire-tiles. It proved the correctness of the principle, and, after a duration of a year and a half, a lead tower was built at the same works. In the same year a second tower was built of lead at Wallsend-on-Tyne, where Mr. Glover was starting works of his own; this tower worked for two or three years, and in 1864 a third lead tower was erected, which in essential points was the Glover tower of the present day. (See Lunge's "Sulphuric Acid and Alkali," Vol. I., 421.) The invention was not patented, and Mr. Glover, with great liberality, showed it to anyone who felt interested in the matter. From about 1868 to 1870 the Glover, along with the Gay Lussac, tower came into general use in most of the large works on the Tyne, in Lancashire

‡ The Manufacture of Sulphuric Acid, etc., delivered at Widnes, 1882.

§ By the use of the Glover and Gay Lussac towers, the consumption of nitre, which formerly amounted to about 90 lbs. per ton of acid made, has been reduced to about 15 lbs., and, in addition, the yield of acid has been greatly increased, whilst all the acid is obtained of sufficient strength without the help of concentrating pans. (See Brit. Assoc. Handbook to Industries, J. W. Stuart's report, 1889, Newcastle.)

and elsewhere in England. Later on, after a paper written by Dr. Lunge, in *Dinglers' Journal*, about the year 1871, the Glover tower was adopted by German manufacturers. The functions of the Glover tower are three-fold: (1st) To concentrate the weak chamber acid from about 120° to between 140° and 150° Twaddell; (2d) to denitrate the nitrous vitriol from the Gay Lussac column, so that the nitrogen oxides may again perform their function in the chambers; (3d) to cool the burner gases before entering the first chamber of the series, by these gases (in ascending the tower) coming in contact with the acids trickling down the tower in a finely divided state.

The concentration of sulphuric acid in the Glover tower was formerly thought to be due to evaporation solely; experiments carried out by Mr. Vorster at Messrs. Muspratts' works, Widnes, show, however, that the evaporative power of the Glover is only low.

The percentage of moisture in the gas leaving the Glover tower was 4.7, whereas the gas entering this tower contains about 2% moisture on an average. We are therefore forced to the conclusion that the Glover tower concentrates the acid by formation of  $H_2SO_4$  and partly only by evaporation of water. Vorster also found that a diminution in the amount of sulphurous acid, contained in the gas took place in passing through this tower. The inlet gases contained 8%; but the outlet gases, leaving the Glover, only 7% sulphurous acid. This when calculated on the original volume of gas, shows that 10% of the sulphurous acid has been converted into sulphuric acid and dissolved in the weaker acid. This is not the only way to account for the concentration of acid; it is well known that burner gases contain a considerable quantity of sulphur trioxide, as well as sulphur dioxide, and Professor Lunge, as the result of several experiments, states that 6% of the sulphur contained in the gases examined was in the state of sulphur trioxide. It is therefore possible that 16% to 20% of the whole of the sulphuric acid produced in the system is made in the Glover tower. This in itself would account for a concentration of the acid from 120 to 138° Twaddell. (See Lecture by Dr. F. Hurter, *loc. cit.*, pp. 19-20.)

The strong acid from the Glover tower is now ready for use in the decomposing furnace, or, when cooled, may be forced up to the cistern above the Gay Lussac column, there to be used for absorbing the oxides of nitrogen in the exit gases from the last chamber.

To return to the Glover tower, the denitration of the nitrous vitriol therein is effected by a twofold means: firstly, by dilution with the weak chamber acid, which is run down the tower along with the nitrous vitriol (from the Gay Lussac)—and here I must mention the fact that the nitrogen oxides, which are soluble in cold, strong sulphuric acid, are evolved on dilution of that acid; secondly, the hot gases from the burner, passing up the Glover tower, come in contact with the acid, and these, by raising the temperature, also tend to drive off the oxides of nitrogen. The same action is beneficial, in a converse way, to the burner gas, as it is cooled by the continuous stream of acid from a temperature of 500° to 600° Fahr., entering the Glover, down to 120° to 150° Fahr., entering the first chamber.

I must now proceed to describe the construction of the Glover tower; the same description will hold good for the construction of the Gay Lussac column, the only differences of note being:

First, in the packing, large pieces of hard oven coke are used for the latter, whereas the Glover is always packed with flints above the pigeon-holed fire-bricks; second, in many works absorbing columns are found circular, in sectional area, instead of oblong or square.

The nature of the ground on which the tower is to be erected must first be carefully examined; where the subsoil is of a shifting nature, pile-driving is necessary. The foundation is then built of stone or brickwork, a strong semi-circular arch is sprung from the side pillars, and the whole is then braced with rails and tie-rods of wrought iron. Pitch pine is the best timber to use for the four upright pillars, or corner-posts, which should be 10½ to 12 inches square, according to the weight to be carried. The corner posts, in the newer forms of Glover tower, generally rest on the foundation, which is built a little wider than formerly, to allow of this.

The posts also stand back 6 or 7 inches from the corner of the tower: this allows a wider saucer to be made, and cross-beams of 10 inches by 6 inches, laid on edge, pass between the tower and posts, and are securely bolted to the latter. The chief advantage of this form is that, as the towers begin to wear, a leak near the corner can be more easily detected and repaired; and, if any leakage of acid should occur from the corners, the posts are not acted on and rotted as on the old plan.

To the cross-beams, or joists, the lead sides of the tower are suspended by straps of lead, burned to the side lead and nailed to the beams. The size of the Glover tower is proportioned to the weight of sulphur burned in it; 560 cubic feet of tower space per ton of sulphur per day is about the average factor in modern works.

Glover towers vary in size from 24 feet × 6 feet × 6 feet to 30 feet × 12 feet × 10 feet. The saucer at the bottom is formed of extra strong sheet lead (35 to 50 pounds per square foot), turned up on all sides to a depth of 12 to 15 inches. For the sides and top of a Glover tower 14-pound lead is commonly used. The arch at the bottom, which bears the weight of the packing, is constructed by starting from the tower floor with a fire-brick lining, 2 feet 3 inches thick on either side.

From 3 to 4½ feet from the bottom, four arches of 2 feet 2 inches to 2 feet 9 inches radius (according to size of tower), are sprung parallel to each other; between these arches spaces are left for the passage of gas and acid. Above the arches two or three courses of large fire-clay slabs are laid on edge, and above these four or five courses of large fire-bricks, with pigeon-hole spaces. From the level of the arch-top the side wall is continued at a thickness of 1 foot 6 inches to a height of 5 or 6 feet, where it is thinned down, on the inside of the wall, to 1 foot 2 inches; this continues up to a height of 8 feet more, when it is again thinned to the length of one brick, or 9 inches, at which thickness the lining is continued up to the top of the tower.

A dense, acid-resisting brick is generally considered essential for the arches and lining of the Glover tower; there is, however, at least one case on record where a tower was lined with common red bricks, and these were found, after three years' constant work, to be perfect and unacted on.

The space inside the tower, from the top course of pigeon-holed fire-bricks to within a foot of the exit-pipe, is packed with flints which have been freed from chalk, etc., by immersion in dilute hydrochloric acid.

Formerly coke was used for packing the upper part of the tower; but this has now been given up almost everywhere, as there have been cases of fire arising from its use. The chamber acid and nitrous vitriol are pumped up by means of acid eggs (to be described shortly) to their respective lead-lined cisterns, from which they flow into an acid-distributing apparatus. From this apparatus, about two dozen lead pipes distribute the mixed acid over the area of the top of the tower. The apparatus is so constructed that a similar flow along each pipe is obtained. On the upper surface of the flint packing fire-clay slabs are laid, so that the acids, falling on these, are made to splash before trickling through the coke.

The accompanying drawing (Fig. 2) gives a section of a Glover tower, 28 × 10 × 10 feet, with the principal parts lettered: AA are the wooden corner posts; BB, the cross beams, to which the lead is strapped; at CC the saucer is shown; DD is the fire-brick lining; E, the arch supporting packing; FF show the pigeon-holed fire-bricks; G, the flint packing; H, the inlet pipe for burner-gas; J shows one of the cisterns for acid, and K, the acid-distributing box. All the more important dimensions are given on the drawing.

The functions of the Gay Lussac tower have already been referred to in connection with those of the Glover; there are two points, however, to which we must draw attention. First, by Gay Lussac's invention at least two-thirds of the oxides of nitrogen (which previously escaped through the chimney) are absorbed by the cold, strong sulphuric acid in his absorbing column. Secondly, this absorption enables much more work to be given to the last chamber of the series, and a greater excess of nitrous gases to be used, than was the case before the introduction of towers. In this way a much greater yield of acid can be got from a given set of chambers, or, to put it differently, by the use of a Gay Lussac tower a smaller chamber space is required to make a given quantity of acid. Lunge gives this saving in chamber space as varying from a fourth to a third where a proper Gay Lussac is employed. This economy in chamber space means a saving in lead and other materials of construction; the weight of lead required for towers being small in proportion to that needed for chambers.

The tendency in recent years has been to construct Gay Lussac towers of much greater dimensions than formerly, as an increased saving of nitre is effected by the use of this greater absorbing space.

An absorbing column, erected about the year 1887, at the Weston works of the Runcorn Soap and Alkali Company, was 21 feet in diameter and 70 feet high. One at the Globe Alkali Company's works, at St. Helens, is 20 feet in diameter and 60 feet high. Another, erected in 1887, at the Jarrold Chemical Company's Friars' Goose Works, is 45 feet by 20 feet by 15 feet.

Of the last-named the following results are of interest. The average escape of total acids (calculated as  $SO_3$ ), before its erection, was 1.70 grains per cubic foot; since the new tower commenced work this has been reduced to .65. The consumption of nitre per cent. of sulphur charged has also been reduced from 1.74 to 1.03; that is, about 40%. In the case of absorbing columns of such wide area, two or three arches are built at the bottom, with passages running parallel to each other (instead of a single arched passage), to bear the weight of the packing.

I know that most laymen find difficulties in tracing the course of the gases in the sulphuric acid process; the diagram Fig. 3 will help to elucidate the matter, the arrows indicating the course, in plan, from the burners to the chimney.

In this diagram, I have taken a case where the exit gas from the last chamber has to pass through the two Gay Lussac towers; in many modern works, one tower only, of sufficiently large dimensions, is used. A third case which I cannot commend, is seen in some works, where the gas is divided, one half passing up the first absorbing tower, the other half up the second.

The connections between the chambers and towers are made by lead pipes, circular in section; to keep these to their proper shape, they are bound around at intervals by wooden staves, surrounded by wrought-iron hoops, (fastened by bolt and nut), otherwise they fall out of shape. The sketch (after Lunge), Fig. 4, illustrates a portion of a connecting pipe. These pipes are carried by a wooden framework, where their length renders this necessary.

I have not mentioned the steam-pipes; these are let into the end of each chamber, so that the jet of steam shall help to force the gases along the chamber in the direction that they are desired to travel. A cock with a graduated scale of gun metal, over which an indicator (at end of key) projects, is generally used now for chambers.

The key with index attachment may be carried by the foreman who has charge of the process, and the steam may thus be regulated to a nicety at intervals during the day. These improved index cocks are made by J. Cortin, of Mushroom Quay, Newcastle-on-Tyne, whose prices are:

Gun-metal cock for steam chambers.....	¾-in.	1-in.
Index handles for " " .....	8s. 6d.	11s.
	5s. 6d.	7s.

Reference to the smaller apparatus, such as drip-pipes, sight-windows, etc., must of necessity be brief in this article. As to the drops, in some works a leaden tray is placed within the chamber at a convenient height; from the bottom of this tray a pipe leads the condensed acid to the outside of the chamber, and, under the mouth of this pipe, a leaden shelf is erected, on which a jug, or lead hydrometer jar, stands. By noting the rate at which these drops of acid fall, their strength, and nitrosity (by testing as described below), a most useful guide is given to the control of the chamber process. In some works these trays drain the acid which condenses on the side of the chamber. This acid is weaker than that condensing in the interior, no doubt because the comparatively cool leaden sides condense the steam; it is better, therefore, to have the tray clear of the side drainage.

In many works a leaden funnel, with tube leading from the bottom, is used; in others, a proper rain gauge, having a funnel of some known area, say one square foot, collects the drops which fall into it. Again, in many large works, the drips are only taken by small lead pipes, which convey, from the large connecting pipes, the acid as it condenses in their vicinity. The rain gauge is, undoubtedly, the most scientific plan; but the various methods described are all useful, chiefly as relative guides; thus a foreman, by whatever apparatus his drips are collected, sees, by observations at frequent intervals, the gain or loss of Twaddell, and turns on or takes off steam accordingly. The rate of condensation within the

chamber may also be judged by the number of drops per minute, or fraction of a minute.

The amount of nitre can be judged, approximately, by pouring water into a jug, half filled with the acid, when the dilution, and consequent heating of the acid, causes evolution of red fumes; or the nitric oxide may be measured, volumetrically, by the use of a nitrometer.

The nitrometer is such a very useful apparatus that I must give a short description of it. Invented by Crum, improved by Davis, and, later, by Lunge, it was the last of these who gave the appropriate name "nitrometer" to the instrument. A drawing of Professor Lunge's form of nitrometer, which may be worked with less than two pounds of mercury, is given herewith (Fig. 5.)

The tube A has graduations of 50 cc. (each cc. being divided into tenths), numbered from the three-way tap D downwards. It is placed

above that in A by one-seventh of the height of acid in A. Allow to stand for a quarter of an hour for factory, or one hour for exact work to cool; then read the volume of gas: this may be reduced to normal temperature and pressure, by calculation, or by the useful tables given by Prof. Lunge in the appendix to his third volume "Sulphuric Acid and Alkali." Each cc at 0°C. and 760 mm. = 1.343 mg. NO = 3.805 mg. NaNO<sub>2</sub>; and each cc. NO (when working on 1 cc. of acid), represents very closely 1 oz. NaNO<sub>2</sub> per pound of acid. After reading off, it is advisable to open the cock and see if the levelling has been correct; if not, a correction of volume is made, according to whether the pressure of mercury has been too great or too small, the change indicating the difference to be added or deducted respectively. Messrs. Mawson & Swan are the English makers for Dr. Lunge, and their price, with stand complete, is £1 10s.

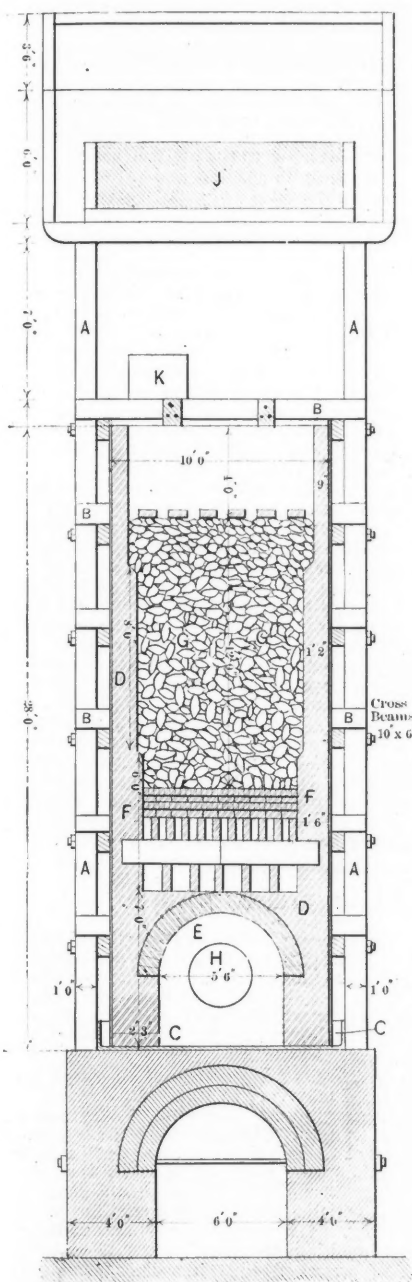


FIG. 2.

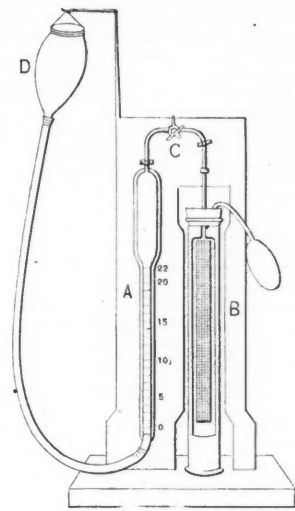


FIG. 7.

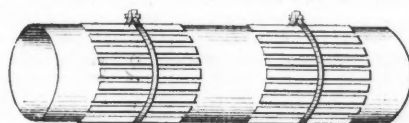


FIG. 4.

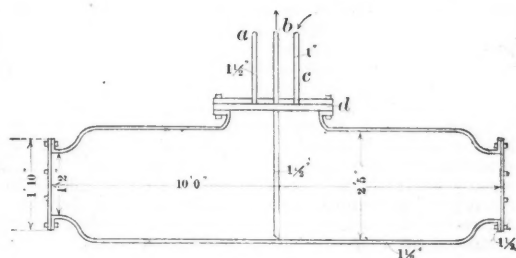


FIG. 6.

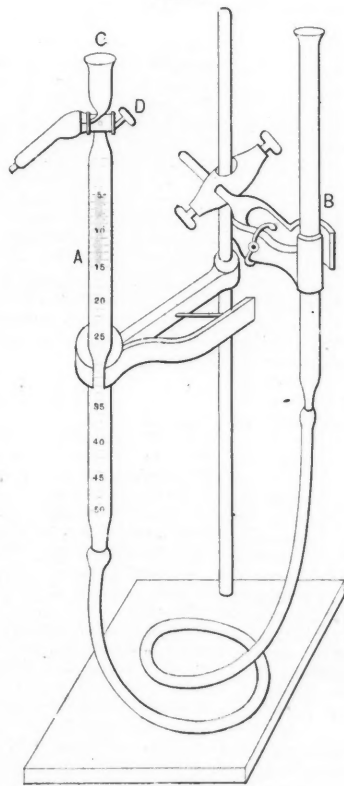


FIG. 5.

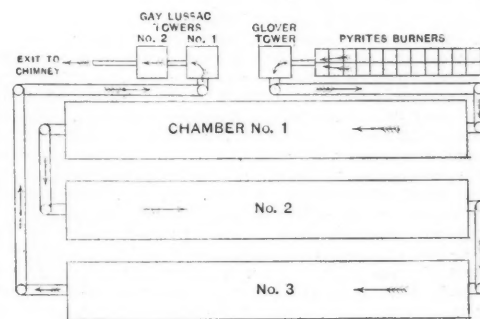


FIG. 3.

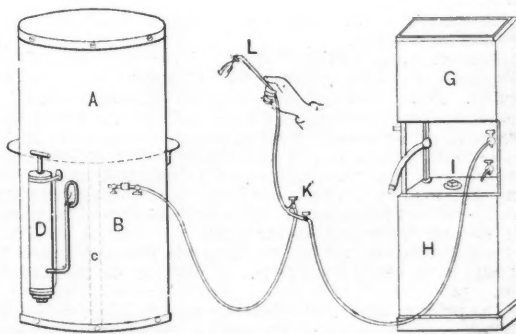


FIG. 1.

in a spring clamp, which can be opened instantaneously, and is connected with B by a piece of india-rubber tubing wired on.

B is raised till its lower end is a shade above the level of D, mercury is poured into B till the tube A is filled, and as soon as the first drop passes through D into the cup C, the tap is turned, so as to run off the mercury, by the tube at back. The tube B is slightly lowered in its clamp, and one cc. of the nitrous vitriol, or whatever acid is to be tested, is blown into the cup C from an accurate pipette. Turn the tap D carefully, so as to run the bulk of the acid into A; now rinse the cup with two or three cc. pure sulphuric acid, which is also run into A, taking care not to admit any air, before shutting off by the tap. The nitrometer tube A is now taken out of its clamp and shaken vigorously for about two minutes; the evolution of gas is hastened by inclining the tube almost to the horizontal, and raising again quickly. During the agitation all nitrogen acids are reduced to the state of nitric oxide (N<sub>2</sub>O) by contact with the mercury. Place A in its clamp and adjust the tube B so that the upper surface of the mercury in it shall be

Glass window-panes, let into the chamber side, are most useful auxiliaries for observing the color of the gases inside the chamber.

In the center of the chamber roof a circular lute-hole is burned; over this hole a bell-jar of strong glass, fitted with a knob to allow of lifting, is placed. In the chamber side, at about 5 feet from the floor, and exactly opposite the skylight, a glass pane is let into the frame, in the lead, for its reception. The size of these panes is about 12 by 7 or 8 inches. The color of the gases in the first chamber of the series is always pale, and the condensation of acid fumes so copious as to prevent seeing far into it; on the other hand, in the last chamber (before which most of the sulphuric acid has been condensed), the excess of nitrous gases and of oxygen should give vapors of a rich reddish-brown color. Under these conditions, and with a sufficient supply of steam, very little sulphur dioxide will escape by the chimney.

Man-holes, with movable covers, are placed in the chamber-side, about 6 to 12 inches above the upstand; these are used for obtaining samples of acid from the chamber itself by means of a lead ladle. Some works

have a small man-hole for trying the blow-out or suction, by removing the lid, in addition to the larger hole; or this observation may be made by lifting the bell-jar on the roof.

The strong acid flowing from the Glover tower is hot, having a temperature of 260° to 300° F.; before pumping this to the absorbing column it must be cooled to 60° to 90° F. The cooling apparatus most commonly used is made of double lead spouts, open at the top. The outer spouts contain water, flowing in one direction, whilst the acid is run along the inner spout in a contrary direction. The fact that an opposite flow is requisite, prevents the spouts being of great length, though a very slight fall is sufficient. A number of these spouts, say 12 to 20 pairs, may, however, be laid parallel in the same set of coolers. These open spouts have the advantage of being easily cleaned, and this is important, as a deposit of iron oxide settles out here, especially where pyrites "smalls" are used.

Another cooling arrangement, used now in several works as an improvement on the open spouts, was invented by Mr. T. W. Stuart, of Hebburn-on-Tyne. A trough, 20 feet long  $\times$  4 feet wide  $\times$  2 feet deep, is recommended for a weekly make of 100 tons of acid. The trough is lined with lead, and, about a foot from each end, has lead partitions; the hot acid is run in by a pipe to one of these end partitions, and makes its way through a series of a score of  $\frac{1}{4}$ -inch lead pipes, which take it through the central tank to the other end. The main tank in the center is supplied with a continuous flow of cold water, which is run into the bottom, the overflow pipe, for the heated water, being at the other end, a few inches from the top. The lead pipes have other pipes leading up from them, about half way along the water-chest; these project above the surface of the water to tap any gas or air, and may be used for blowing down in case of stoppage. It is advised to empty, clean and examine this apparatus every three weeks, and to test the run-off water daily with an indicator (litmus or methyl orange), for leakage of acid through the pipes.

The cold strong acid is run to a lead-lined cistern, which supplies the cast-iron acid egg (Fig. 6). When the egg has been filled with acid through the  $\frac{1}{4}$ -inch pipe *a*, a valve is closed, and compressed air, from an air-blowing engine, is admitted by the 1-inch pipe *c*. The pressure of air forces the acid through the  $\frac{1}{4}$ -inch delivery pipe *b* to the top of the Gay Lussac tower, or wherever desired. The principle of this blowing apparatus is precisely similar to that of the wash-bottle used by the chemist in his laboratory. These cast-iron eggs are acted upon very slightly by chamber acid of 120° Twad., or nitrous vitriol; less still by strong acid which has been through the Glover. Many eggs are in use now which have had a duration of fifteen to twenty years in various works and are still in good condition. The form shown with a manhole at each end is most convenient for cleaning, and is easier cast than the old soda-water bottle shape. A thick washer of india-rubber, *d*, is used for making a tight joint at the upper man-hole.

The regulation of the air admitted by the burners is an important matter. An excess of air is necessary, as we have already pointed out, but if too great an excess be used the yield of acid is reduced, from the fact that chamber space is being taken up by useless air to the exclusion of SO<sub>2</sub>, etc. From 5% to 8% of oxygen in the exit gases from the Gay Lussac column may be considered an average quantity. The most convenient apparatus for the volumetric testing of oxygen in chamber gases is that designed, we believe, by Orsat, Fig. 7. *A* is a gas-burette, holding 100 cc. from the three-way tap *C* to the zero mark; the narrower portion of this burette has graduations for 22 cc., each cc. being again divided into tenths. *B* is a glass jar, in which is suspended a glass bell; a roll of copper gauze is placed within the bell. A glass capillary tube connects *B* and *A* via the three-way tap with each other, or with the atmosphere. *D* is a glass reservoir charged with water and connected with the gas-burette by an india-rubber tube. A solution of ammonia-copper chloride is used in the jar *B* for absorbing the oxygen. It is made of two parts of a saturated solution of ammonium chloride and one part of strong liquid ammonia, the jar being about two-thirds filled with the solution, which quickly acts on the copper, yielding the characteristic deep-blue color. When a sample of gas is to be tested it may be drawn in a suitable glass aspirator and brought to the apparatus. By turning the tap so as to connect *A* and *B*, then lowering the globe *D*, the absorbing liquid is drawn up to a mark as near to the tap as possible.

Shut off *B*, then raise *D* so as to drive out the air from the burette *A*. Connect the nozzle, above *C*, by an india-rubber tube, with the gas to be tested. Draw and expel a first 100 cc., to get rid of air in connecting tubes; measure the second 100 cc. carefully, holding the surface of the water in *D* to the same level as that of the zero mark; now turn the tap, so as to connect *A* and *B*, send the gas over into the bell of *B*, by raising the reservoir *D*; chase back and forward three or four times till the reading (obtained on drawing the blue liquid to the known point, shutting off and levelling) is constant. This reading shows the percentage of oxygen by volume in the gaseous mixture. An apparatus should first be checked by estimating the volume of oxygen in the atmosphere, which, of course, should be about 20.8 per cent. The price of this apparatus is about £1 18s.

The price of labor, in sulphuric acid making, varies in different works. Burner-men make about 26s. to 30s. per week, and as a rule work 12 hour shifts. Where men are employed to shovel and wheel the burnt ore from the burner bottoms they make from 20s. to 24s. per week. Stated per ton of pyrites charged, the cost of labor at burners (including potting of nitre and wheeling away of burnt ore) is from 1s. 6d. to 1s. 10d. In the case of special shelf-burners for "smalls," like the Maetra, etc., the item of labor is nearly doubled; though, as a set-off, the ore is more thoroughly burned, and this form of pyrites in many cases costs less than the "stone." Tower men, having charge of the pumping and running of acids at the Glover and Gay-Lussac, make 28s. to 32s. per week.

Sulphuric acid has a great number of uses. By far the greatest proportion of that made in Britain is consumed by Leblanc alkali manufacturers in the decomposition of salt for the manufacture of hydrochloric acid and sulphate of soda. Next come the chemical manure makers, who use large quantities annually for treating native phosphates to obtain therefrom superphosphate, dissolved bones, etc.

In gas-works and paraffine-shale works large quantities are used in the manufacture of sulphate of ammonia; in the year 1889, the amount of this salt produced in the United Kingdom was 133,604 tons. Other applications are for liberating carbonic acid gas in the preparation of aerated waters, in the manufacture of nitric and other acids, for

preparing sulphates, such as barium sulphate, calcium sulphate (pearl-hardening), copper sulphate, magnesium sulphate, etc. In galvanizing, sulphuric acid is used as a "pickle." For the manufacture of potassium bichromate an increasing quantity is consumed. A large amount of sulphuric acid is rectified by means of platinum apparatus, for those applications, such as the manufacture of nitro-glycerine and indigo, and the distillation of whiskey, requiring the most concentrated forms. We have not dealt with the rectifying of vitriol as not coming strictly within the space of this article, which is confined to the alkali trade.

From the last Inspector's Report. I find that the number of sulphuric acid works in Great Britain and Ireland were 221 in 1888, and 217 in 1889.

It has been said that the civilization of a country could be gauged by the amount of sulphuric acid consumed therein; though it is unfair to judge a nation's progress by any one product, there is undoubtedly some truth in the dictum, for soap, paper, glass, calico, light (by gas, oil or candles), even food itself, are brought within the reach of millions of our fellow-men, more or less directly, by this great branch of industry.

#### SEVEN CENTURIES OF TIN PRODUCTION IN CORNWALL.

A paper on this subject was read on March 26th by Mr. J. H. Collins, F. G. S., before the Mining Association and Institute of Cornwall. It is well known that the tin of Cornwall was an article of Phœnician commerce for many centuries, and was carried to the eastern shores of the Mediterranean, and thence, according to Arrian and Pliny, as far as India. Mr. Collins states that these mines had been worked for over 2,000 years certainly, and probably for more than 4,000 years. Prior to the twelfth century, however, but little information of a statistical character is in existence.

For five centuries from A. D. 1200 the tin producers of Cornwall and Devon paid a tax on their output; from this datum Mr. Collins estimates the amount of metal produced. In the thirteenth century, thus, the product of tin (calculated for black tin) was at an average rate of 486 tons per annum; in the fourteenth, 828 tons; fifteenth, 732 tons; sixteenth, 809 tons; seventeenth, 1,800 tons; eighteenth, 3,938 tons; nineteenth, 8,795. The total quantity of black tin produced for this period of seven centuries is estimated at 1,738,800 tons. The average annual production of black tin in the two counties in the nineteenth century, by decades, is estimated as follows. Decade ending 1809, 4,294 tons; 1819, 4,650; 1829, 6,344; 1839, 5,840; 1849, 8,912; 1859, 9,535; 1869, 12,585; 1879, 13,513; 1889, 13,480.

With regard to the reasons for the remarkable increase in production at certain times, Mr. Collins states that the sudden advance most noticeable is that of the latter part of the fourteenth century, which does not, however, seem to have been maintained. It seems likely that it was occasioned by the great demand for bell metal from which to cast the innumerable church bells required at the period when a great number of churches were built. Good bell metal contains about 20% of tin, and the quantity required at that period must have been enormous. A second period of especially rapid advance—the latter part of the eighteenth century—is that of the common use of bronze for artillery, and the third marks the commencement of what may be called the "tinned metals" period. The Balnoon, Botallac, Wheal Reath, Ding Dong, Balleswidden, Great Work, Wheal Vor, Polgooth, Charlestown United, Beam, Bunny and Carclaze mines were all worked before the sixteenth century, and several of them, among which were probably the Wheal Vor and Polgooth, were as much as 50 fathoms deep at that time. The great source of tin for the first four centuries from 1200 was undoubtedly, however, the alluvial deposits. At the present time the stream works proper yield less than 1% of the total production.

#### WEIGHT AS A TEST OF STRENGTH IN TIMBER.

Mr. B. E. Fernow, chief of the Forestry Division, Department of Agriculture, Washington, D. C., states that the weight of wood depends on its fiber, and that varies with the amount of air, water, resin and pigment contained in its cells. If weight depended on fiber itself, its specific weight would depend on the proportions of cell wall to cell space—pure wood fiber, whether in light wood, such as poplar, or heavy wood, such as oak, being about the same.

The presence of water, air, etc., in fiber depends on such varying conditions that the same kind of wood may vary in weight, and even in the same stick be irregular, according to its seasoning. Weight is consequently not a stable basis for strength. Strength really depends on the quality, form and arrangements of the cell elements, and upon its structure and grain, and since the grain on the cross cut, that is, the appearance and number of annual rings for a given area, is much more readily ascertained than the weight, which is changeable according to methods and conditions of seasoning, it is a much more reliable criterion of quality, and especially of cross-breaking strength.

The greater the proportion of strong fiber to the light and loose cell elements on a given area, the heavier and stronger the wood, other conditions being equal. These fibers are shown on a cross cut of oak or pine by the darker color, and in general their denser structure is at once apparent. In these woods the fibers are found crowded together on the outer part of the annual ring, which is known as "summer wood;" while the cells with a thin wall are mostly found in the inner part of the ring, known as "spring wood." All things being equal, the wood containing a larger amount of "summer" in proportion to "spring" wood must be heavier and probably stronger also. Hence the experience that coarse-grained, broad-ringed oak is heavier and presumably stronger. There are, however, exceptions to this, as in forests where of two oaks one is broad-ringed and another narrow-ringed wood, in which a moist subsoil has contributed to open pores and looser cells. It is then necessary, in judging oak timber, to rely, not on the weight alone, but on the grain together with the weight, the same rule being probably operative in most other kinds of timber.

The new Russian customs tariff, which is to go into effect in July of the current year, will be particularly severe on all chemical products. The duties on all goods of this class will be greatly advanced,



## REPRESENTATIVE MEN IN THE MINING INDUSTRY.

Samuel Franklia Emmons.

Samuel Franklin Emmons was born March 29th, 1841, at Boston, Mass., where his family has resided since 1640. His great grandfather, Samuel Franklin, after whom he was named, was first cousin and most intimate friend of Benjamin Franklin.

Mr. Emmons graduated at Harvard College in 1861, and went to Europe in June of that year to pursue his professional studies, there being at that time no mining schools in the United States. On the application of the United States Minister at Paris he was admitted to the *École Impériale des Mines* in 1862, where, during two years, he followed the same courses, and passed the same examinations as the French government engineers, being rated first among foreign students in the final examinations.

In the summer of 1864 he went to Freiberg, Saxony, taking the practical course in the mines during the summer months and following the lectures and laboratory work of the *Bergakademie* during the ensuing year; and afterward studying various European mining districts until the summer of 1866, when he returned to America.

He spent eight months visiting the mining regions of the United States, and in May, 1867, went to California with Clarence King as volunteer assistant geologist on the United States geological exploration of the 40th parallel. This was the first government exploration which was conducted under scientific, instead of military, management. At that time the Pacific railroads were just started, that on the east having reached half way across the plains, and that on the west half way up the western slope of the Sierra Nevada; of the intermediate region the greater part

was kept a profound secret even to those who invested in the company formed to work it. At the close of the field season, chance gave Mr. Emmons such slight hints as to the region where the diamonds were supposed to exist, that his intimate knowledge of the country enabled him to locate it within the area surveyed by him in 1871. He reported this to Mr. King, who revisited the ground with him and Mr. Wilson, and the result of their study was the discovery that a most gigantic and ingenious fraud had been perpetrated, which Mr. King promptly exposed.

In the autumn of 1877 Mr. Emmons, having completed his government work, went to Cheyenne, Wyo., and engaged in the cattle business, in which he was still engaged when, in 1879, he was appointed geologist of the newly organized U. S. Geological Survey, of which Clarence King was first director. In pursuance of the policy adopted by Mr. King, of making economic geology the most prominent feature of the survey, Mr. Emmons was given charge of the mining geology of the Rocky Mountain division, George F. Becker being assigned to that of the Pacific division, and, as a commencement of this work, was directed to make a survey of the newly opened Leadville region. The necessary topographical basis of this work was performed by Mr. A. D. Wilson during the autumn of 1879, but the geological field work was not commenced until December.

The study of the Leadville district proved unusually complicated and difficult, and the field work lasted until the spring of 1881. During this time he also had charge of the collection of statistics of the precious metals in the Rocky Mountain region for the tenth census, and, in connection with Mr. G. F. Becker, published volume XIII. (Precious Metals) of its reports. An abstract of the results of the Leadville work was prepared during the autumn of 1881, and published early in 1882 in the annual report of the director of the survey, but for various reasons the final



SAMUEL FRANKLIN EMMONS.

was practically a *terra incognita*. Mr. King's plan was to make a topographical and geological survey of the region to be opened up by these railroads, covering a mountainous belt over one hundred miles wide and about a thousand miles long. In spite of natural obstacles this plan was successfully carried out, though it was ten years before the results, filling seven government quartos with two large atlases, were finally published. Immediate attention was, however, given to direct economic results, and the volume on "Mining Industries," largely occupied by a geological description of the famous Comstock lode, was completed in 1869. To this, Mr. Emmons contributed with other members of the survey, and it was while engaged in preparing the underground maps for this work, at Virginia City, in the winter of 1867-8, that he received his official appointment on the survey. In March, 1868, Mr. Emmons had charge of an expedition to Mono Lake for the purpose of studying the thermal and recent volcano phenomena in its vicinity. During the following summer he headed a party making a survey of central and eastern Nevada and western Utah; in 1869 he made a study of the desert ranges of the Salt Lake valley, and of the great Wahsatch range, which at that time was declared by the Mormons to be absolutely barren of mineral wealth.

In 1870, owing to the late date at which the appropriations were passed by Congress, no field work was done in the interior region, but a study was commenced of the extinct volcanoes of the Pacific coast. In October of this year, Mr. Emmons, with A. D. Wilson, topographer, spent three weeks on the slopes of Mount Rainier, the highest and most inaccessible of these peaks, which, up to that year, has never been ascended, and made a survey of the eastern half of the mountain, including its summit, but were driven away by snow before the entire circuit had been completed.

In 1871 and 1872 he surveyed the Uinta Mountains, the Green River basin and the Park range of the Rocky Mountains. During the summer of the latter year the whole West was violently excited over an alleged discovery of diamond deposits of fabulous richness, the location of which

publication of the monograph and atlas on the "Geology and Mining Industry of Leadville" was not accomplished until 1886.

It is by his work at Leadville that Mr. Emmons has achieved his greatest distinction. His study of the geology of that district was masterly, and has proved of the greatest practical use, as well as a valuable contribution to the scientific knowledge of ore deposits. It has been largely through this report, and the studies that local engineers were able to base upon it, that the ore deposits of Leadville have been so thoroughly prospected. His conclusions have been proved by subsequent developments to have been, in the main, remarkably correct. No geologist could wish a better or more honest testimonial than the estimation in which his work is held by all classes of mining men in the district, from the leading mine manager to the humblest prospector. Withal, "Emmons' report" has been a constantly sought book of reference, whose worth has been proved by results.

The policy of the survey suffered some change under the directorship of Major Powell, who succeeded Mr. King, and Mr. Emmons was not able to carry out the plans outlined by the latter of having a succession of such monographic studies of the mining districts of the West, rapidly following each other, carried out by a corps of assistants under his direction. He has, however, devoted the means at his disposal to his chosen study, the application of geology to the development of the mineral resources of the country, and has contributed a number of articles of practical utility in this direction to various scientific periodicals. Among these may be mentioned "The Genesis of Certain Ore-Deposits," "Notes on the Geology of Butte, Montana," "Structural Relations of Ore-Deposits," and "Notes on the Gold Deposits of Montgomery County, Maryland," in the *Trans. Am. Inst. Mining Engineers*, and "Notes on Some Colorado Deposits," "On the Origin of Fissure Veins," "Preliminary Notes on the Geology of Aspen, Colorado," in the *Proceedings of the Colorado Scientific Society*. These papers have been of great practical value in the conduct of mining operations in the districts which they describe, and have been extensively reprinted in the mining reviews of the world.

In 1874 Mr. Emmons was elected Fellow of the Geological Society of London. In 1877 he became a member of the A. I. M. E., of which he has been twice vice-president. He was one of the organizers and first president of the Colorado Scientific Society, an original Fellow of the Geological Society of America, and many other scientific societies.

The branch office of the Geological Survey established by him in Denver, under the directorship of Mr. King, was, during its continuance, of great benefit to the mining community of the West, and did much toward disseminating a correct knowledge of the geology of ore deposits, and correcting popular errors in regard to them. Its discontinuance by the orders of the director in 1888 called out strong remonstrance from the Chamber of Commerce of that city, and from the mining community throughout the state.

Mr. Emmons has now in preparation geological reports upon the Silver Cliff and Ten Mile mining districts, the Denver Basin and the Elk Mountain region of Colorado, and also a review of the geology of the Leadville district, in the light of mine developments made in the last ten years.

Mr. Emmons has, by his work and study, won the highest rank in the field of economic geology, and there is no other geologist in this country who occupies a more important position in relation to the mining industry.

**DARBY'S RECARBURIZING PROCESS.**

Written for the Engineering and Mining Journal by Henry M. Howe.

This process is now in use at a large American steel-works, for recarburizing both Bessemer and open-hearth steel. The procedure differs in detail somewhat from that at Brymbo, where Mr. Darby developed his process, and where the molten decarburized metal is poured through a funnel which holds lumps of gas-carbon on a perforated fire-clay filter. At the American works dry crushed Connellsville coke, in paper bags, each of which holds about 50 pounds, is thrown into the casting ladle along with the decarburized metal from the open-hearth furnace or Bessemer converter, the first bag being thrown in as soon as the bottom of the ladle is well covered with metal. In case of Bessemer metal I understand that a little ferro-manganese is added to the thoroughly blown metal in the converter before pouring it into the ladle.

The results tabulated below show a very remarkable degree of accuracy in recarburizing. Twenty-four cases of recarburizing open-hearth metal are given, the carbon-content aimed at being either from 0.15% to 0.17%, a range of 0.03%; or from 0.28% to 0.31%, a range of 0.04%. The carbon contained lay, in 15 out of 24 cases, within this narrow range; in four of the remaining cases only 0.01% outside it; and in only one case as much as 0.04% outside it.

RECARBURIZING BESSEMER METAL WITH COKE; DARBY'S PROCESS.

No.	Blow	Weight ingots and scrap.	Carbon in steel by analysis.	Weight of ferro-manganese.	C. in blown metal plus ferro-manganese.	Carbon taken up by the steel from the coke.	Weight of coke of 87° C.	Carbon in coke added.
No.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
1	24,927	12,400	.90%	115	.10%	.80% = 99 lbs.	235	204
2	24,921	12,600	.90	115	.10	.80% = 101 lbs.	235	204
3	24,915	11,300	.90	115	.10	.80% = 90 lbs.	220	191
4	53	13,300	.42	120	.10	.32% = 43 lbs.	100	87
5	77	13,400	.52	110	.10	.42% = 56 lbs.	120	104
6	1,094	13,000	.45	120	.10	.35% = 45 lbs.	100	87
7	2,452	12,100	.65	120	.10	.55% = 66 lbs.	160	139

RECARBURIZING OPEN-HEARTH METAL WITH COKE BY DARBY'S PROCESS. Each charge weighs about 22 tons.

HEAT NUMBER.	Per cent. carbon ordered.	Tap,ed on.	Carbon obtained.	Amount of dust used. Lbs.
'010066	15-17	'09	'16	50
'010068	15-17	'08	'12	50
'014058	28-31	'09	'29	250
'010070	15-17	'10	'17	50
'010041	28-31	'10	'27	250
'010072	15-17	'08	'17	80
'014069	28-31	'10	'29	250
'010073	15-17	'09½	'17	50
'014061	28-31	'07½	'28	250
'013119	15-17	'10	'16	50
'016043	28-31	'10½	'26	250
'012035	15-17	'09	'15	50
'010074	15-17	'10	'16	50
'014062	28-31	'12	'34	250
'016044	15-17	'10	'17	50
'012036	15-17	'08½	'18	50
'010075	15-17	'09	'15	50
'013121	15-17	'08½	'18	50
'014063	28-31	'11½	'31	250
'016045	15-17	'10	'19	50
'012037	15-17	'08½	'16	50
'016076	15-17	'08	'16	50
'014064	28-31	'12	'35	250
'013122	15-17	'10	'18	50

The results given for Bessemer practice, though fewer, are hardly less striking. The carbon in the resulting steel varied, according to the weight of coke added, from 0.45% to 0.90%. In cases 1, 2, and 3 the same carbon-content appears to have been sought; at least the ratio of coke-dust to charge was almost the same in these three cases, and the resulting steel had exactly the same carbon-content, viz., 0.90%. In case 6 the ratio of coke-dust plus ferro-manganese to metal was but slightly higher than in case 4; and the resulting carbon-content of the steel was just about correspondingly higher in 6 than in 4, viz., 0.45% against 0.42%.

These results leave little to be desired as regards accuracy. The addition of coke-dust causes a violent reaction and a large flame, but the steel does not boil in an objectionable manner if the coke-dust be well dried.

Anthracite has been tried, with fair results. The chief objection to its use is that, in grinding, much of it is reduced to a fine powder, some of which may be blown out of the ladle by the reaction.

Only about half the carbon of the coke appears to be absorbed, while at Brymbo about 85% of the gas-carbon used is taken up. The difference

may well be due to the better opportunity for absorption, the more extended contact between metal and carbon in the Brymbo than in the American practice.

In previous letters (July 5th, 1890, page 70, and January 17th, 1891, page 86, ENGINEERING AND MINING JOURNAL) I have given data concerning this process, and concerning experiments performed by Mr. R. A. Hadfield, which showed conclusively that molten iron absorbs carbon greedily, and so rapidly that it is as good as certain that their union is direct. A correspondent of the ENGINEERING AND MINING JOURNAL has interposed *a priori* objections which I do not fully understand, but which, so far as I do understand them, appear to me wholly fallacious. But, as he appealed to the practice at the American works using Darby's process to prove that molten iron and carbon do not combine directly, he will doubtless now be satisfied that their direct union is an accomplished fact. He would explain away the apparent direct combination of molten iron with the carbon of graphite by saying that graphite is itself, or at least contains, a large proportion of iron carbide. But, as the carbon absorbed from the graphite equaled about half the weight of graphite, in order that this explanation should hold, it would be necessary that the graphite should contain at least 50% of carbon in the condition of iron carbide, which is manifestly untrue. Indeed, I am surprised that one so well informed as I believe your correspondent to be, should believe that graphite contains any large proportion of iron carbide. I should have been somewhat surprised even had he only stated that it contained a very little iron carbide. It is true that graphite was formerly thought to be an iron carbide; but this was long ago.

Dana's mineralogy (edition of 1877, p. 24) calls graphite "pure carbon, with often a little oxyd of iron mechanically mixed. Scheele (1779) and some later chemists made the iron essential, and the species a carhuret of iron. Vanuxem in 1825" "showed that the iron was an oxyd, and unessential." Then follow analyses, one of which has 94.03% of carbon and 0.36% of iron, as oxide; another 98.56% carbon, 1.34% hydrogen and 0.20% ash, = 100.10; Regnault.

Watt's Dictionary of Chemistry, I, p. 758, says, "Graphite was formerly regarded as a carbide of iron, but the iron is now known to be merely in a state of mixture." BOSTON, April 7, 1891.

**Birth and Growth of the American Patent System.**—In 1790, three patents were granted; in 1890, the number was 26,292, said Chas. E. Mitchell, Commissioner of Patents, in a paper read at the Centennial Celebration of the American Patent System. In 1790, the receipts of the Patent Office were about \$15; in 1890, they were \$1,340,372.60. In 1790, the work could only have required the infrequent services of a single clerk; in 1890, the number of employes, including the examining, clerical and laboring force, was 590 men and women. The Centennial Exposition at Philadelphia unquestionably had a most important bearing upon the patent system throughout the world. Sir William Thomson, after his return to England from visiting the Philadelphia exposition, made a report to the British government, in which he gave it as his opinion that the unprecedented progress of the United States in the arts and sciences was to be traced in large measure to our patent system. Instead, therefore, of abolishing the patent laws in England as had been advocated, in 1883 a new act was passed upon a more liberal basis. Germany has also revised its patent law. In all these changes the American system has been imitated.

**Improved Powder for Naval Guns.**—The Dupont Powder Works have been able to make considerable improvement in the brown pneumatic powders for high-power naval guns, and the latest delivery of powder for eight-inch guns has shown results which, it is said, far excel any hitherto attained with similar powder, either in this country or abroad. In a recent test at the Naval Ordnance Proving-Ground, in an eight-inch breech-loading rifle of 35 calibers length, it gave to the projectile an initial velocity of 2,130 feet per second, with a pressure in the powder chamber of only 14.8 tons per square inch. This, of course, increases the power of the gun, which is designed to give an initial velocity of 2,080 feet, with a chamber pressure of 15 tons. The improvements in the powder have been such as to give it greater uniformity of combustion, so that the speed of the projectile is more gradually accelerated throughout the length of the gun until it leaves the muzzle with a higher velocity than could be attained with the older powder. At the same time the strain on the gun itself is diminished and more evenly distributed throughout the whole mass of metal, decreasing the danger of bursting and increasing the life of the gun. While greater initial velocities than this have been attained abroad in a few instances, they have been at the expense of great increases in the chamber pressures, subjecting the metal to undue strain, and shortening the lives of the guns.

**The Analysis of Dynamite.**—In the estimation of moisture in dynamite, says F. Scheiding in *Zeitschrift für angewandte Chemie*, 1890, p. 614, the sample must be dried over sulphuric acid at the ordinary temperature, as nitroglycerine volatilises between 40° and 50° C. For the same reason, when the nitroglycerine has been extracted with ether, after the latter has been evaporated, the residue must also be dried at the ordinary temperature in the same manner. Should the dynamite be suspected to contain, besides nitroglycerine, another body soluble in ether, then the nitrate nitrogen, and possibly the total nitrogen, will require to be determined, the latter by Dumas' method. The former can be estimated in a Lunge nitrometer, but the Schulze-Tiemann process is preferable. In the analysis of gelatine dynamite the first solvent to be used is ether; this destroys the gelatine then the saltpetre is extracted with water, and after drying the residue, the collodion cotton is dissolved out by acetic acid. Should it be necessary to estimate the amount of gun-cotton present, then the acetic ether extraction must be preceded by treatment with "ether alcohol," as the acetic ether dissolves both nitrocelluloses. The aqueous extract may also contain soda; it should therefore be made up to a known volume and in different portions should be determined: Firstly, the total dry residue; secondly, the alkalinity by titration; and thirdly, the nitrate nitrogen by Schulze-Tiemann's process. To collect the evolved nitrogen dioxide a burette devised by the author is employed. The presence of heavy spar in gelatine dynamite is to be regarded as adulteration, but in dynamite its presence is necessary when good kieselsuhr is used in order to impart the required softness to the dynamite.

OFFICIAL REPORTS.

Brotherton Iron Mining Company.

The following is an abstract of the report of the directors of the Brotherton Iron Mining Company for the year 1890. The mine was operated through three shafts, and 92,985 tons of ore were hoisted. There were 517 tons of ore on hand at the mine, January 1st, 1890, and 80,487 tons were shipped during the year. On January 1st, 1891, there were 13,015 tons of ore at the mine and 23,787 tons, unsold, at Cleveland, Ohio. Of the ore shipped, 63,788 tons went to Cleveland, 15,002 tons to the Illinois Steel Company, and 1,697 tons to the Chicago Furnace Company. On the ore which went to Cleveland the company paid Lake freight of \$1.16 per ton and railway freight of 70 cents; total, \$1.86.

The total cost of mining was \$156,713.94, of which \$10,071.38 was for additions to equipment. The balance of expenditures was divided as follows: Supplies, \$5,901.78; expense, \$4,613.12; general mining, \$93,332.74; explosives, \$2,592.25; fuel, \$13,564.79; timbering, \$21,921.05; taxes, \$4,716.83. The average cost of mining was \$1.577 per ton of ore. The company employed an average of 183 men, 22 on the surface and 161 underground.

The average analysis of the ore (63,788 tons) shipped to Cleveland was:

are being made to open the 6th. The mine is now in shape, according to the superintendent, to make an output of 150,000 tons of ore per annum.

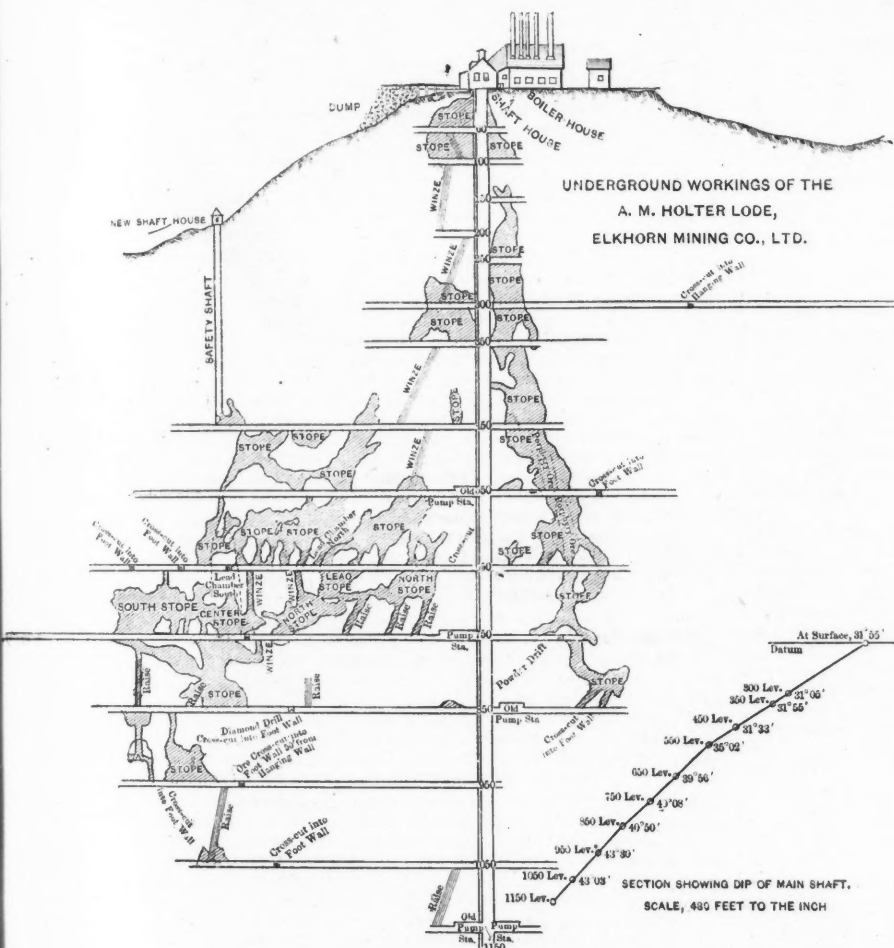
[The example of the Brotherton Iron Mining Company in publishing the report of its directors is one which might well be followed by other Gogebic mines, including the Norrie.—Ed. E. & M. J.]

Elkhorn Mining Company.

The following is an abstract of the official report of this company for its first financial year, beginning February 25th and ending December 31st, 1890. During these 10 months the company produced 9,163 tons of mill ore, which yielded \$386,717, equal to \$41.71 per ton, and 1,065 tons of smelting ore, from which was realized \$89,185; an average of \$83.76 per ton, net.

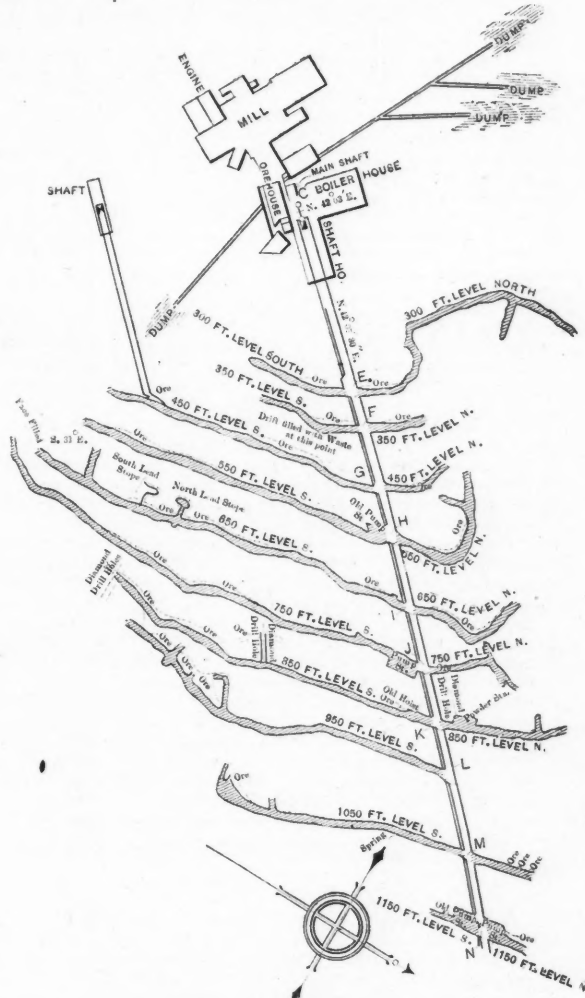
The cost of mining was \$9.79 per ton; milling, \$8.73 per ton; total, \$18.52. There was a profit of £54,567 from the 10 months work, of which £40,360 was distributed to the shareholders in three dividends, and a balance of £14,206 carried forward.

The stamp mill ran steadily throughout the year. The amount of ore crushed was 9,163 tons; amount of salt used, 990 tons; average assay of ore, 45.5 ounces silver; average assay of tailing, six ounces; percentage



LONGITUDINAL SECTION.

Scale 240 feet = 1 inch.



PLAN.

Scale 240 feet = 1 inch.

Iron, 63.40%; silica, 6.36%; phosphorus, .087%; lime, .44%; alumina, 1.74%; magnesia, .37%; manganese, .644%; sulphur, .029%; organic and volatile matter, 1.34%.

The company paid royalty on the various sales of ore, according to price received, as follows. Ore shipped to Illinois Steel Company, \$.334; Chicago Furnace Company, \$.368; Jefferson Iron Works, \$.48; Junction Iron Company, \$.48; ore shipped to Cleveland and unsold, \$.413.

According to the treasurer's report the financial condition of the company was as follows.

RECEIPTS.		DISBURSEMENTS.	
Cash balance January 1st, 1890	\$3,308.18	Royalty	\$32,239.39
From sales agents, 1890	183,923.58	Interest, exchange, and attorney's fees	372.90
	\$187,231.76	Mining expenses	153,728.71
		Cash balance	890.76
			187,231.76

The assets included 8,454 tons ore at Lake Erie ports, sold at \$6 per ton, \$50,727.50; 23,787 tons, unsold, at \$5.75, \$151,132; 13,015 tons at mine, at \$3, \$39,045; cash, \$1,376.67; due from furnace companies, \$19,909.09. The liabilities were: Due sales agents for advances, \$18,777.39; bills for mining supplies, \$4,081.55; payroll for December, \$10,818.08; royalty, \$12,796.92; sales agents' commissions, \$6,032.20; taxes, \$2,496.81; surplus, in ore, \$238,573.91.

The condition of the mine was excellent. The ore deposit had been opened to a depth of 300 feet and on the 5th level (250-foot) for a length of 1,700 feet, of which between 1,200 and 1,300 feet shows No. 1 ore. Each of the three shafts is down 50 feet below the 5th level, and preparations

silver saved, 86.83; gross product: silver, 366,336 ounces; gold, 170.64 ounces; ore crushed per stamp per day, 1,395 tons.

The cost of milling per ton of ore was divided as follows:

	Cents.		Cents.		Cents.
Superintendence	47.80	Assayer (proportion)	09.78	Illuminants	01.24
Engineer	26.41	Storekeeper	05.59	Quicksilver	29.56
Crusher	19.74	Repairs	05.32	Salt	173.22
Dryermen	19.95	Mechanics (proportion)	27.54	Fuel	165.70
Battery men	25.85	Millwright	06.64	Freights	11.80
Roaster men	23.24	Teams and laborers	32.18	Castings	48.33
Cooling-floor men	19.25	Watchman	09.99	Other supplies	15.14
Carmen	37.52	Tailings, storage	01.71	General expense	37.17
Amalgamators	25.39	Office (proportion)	08.25		
Pan helper-laborer	02.49	Chemicals	10.64	Total	873.01
Melter	01.30	Lubricants	05.79		

Capt. Plummer, the manager at the mine, describes the workings, which we illustrate in the accompanying engraving, as follows. The chief points at which work was done in the mine were the 850-foot, 950-foot, 1,050-foot, and 1,150-foot levels. All work was done below the 650-foot level, and principally south of the shaft. From the surface to the 650-foot level the vein was comparatively narrow, being on an average 6 feet 6 inches wide.

Near the center of the ore chute at this level (south of shaft) bands of rich sulphide and carbonate of lead were found forming part of the vein; isolated patches of the same minerals were also discovered imbedded in the footwall, being hidden from view by false or secondary walls in the vein; and it is probable also that segregated portions of the vein still remain behind the apparent footwall that have not been broken into.

Below the 650-foot level the vein widens, the segregated branches of lead ore drop into it, the isolated bodies unite and assume a definite shape and form part of the vein proper.

From this point downward there is a gradual widening of the vein to the 950-foot level. In some places the bounding footwall (or limestone side of the fissure) has not been satisfactorily determined. Between the 650-foot and 750-foot levels the vein averages 13 feet wide; between the 750-foot and 850-foot levels, 20 feet wide; below the 850-foot level the vein widens to an average of 25 feet, and at the 950-foot level, in places it measures 30 feet, and the true walls of the fissure are 50 feet apart. At the 1,050-foot level the developments are limited, but as far as can be seen the ore body is fully as large as at the 950-foot level.

The widening of the fissure has developed traits in the vein not observable in the upper workings; at the 850-foot and 950-foot levels the vein curves or swings in its longitudinal course. These curvatures prevent the full extent of the ore bodies from being seen at all times during the progress of the levels. The hanging wall of the fissure (slate shale) is of a hard, unchangeable character and regular in its course.

In addition to the vein or ore body which occupies or fills the fissure, there are bunches or large masses of wall rock, locally called sand rock. This is the original limestone which forms the footwall of the fissure from which its calcareous and soluble ingredients have been washed out. These masses of sand rock are irregular in shape and size. Occasionally they are very large. The ore forms around and about them, and is generally of a superior grade.

The lead section of the vein, which is an important factor in its product, passes down through the heart of the ore body, in zones of varying thickness. It is found in various forms, such as detached portions of rich galena, cavities filled with sand carbonates, galena and carbonates mixed, and sections permeated with carbonates. The amount of lead is apparently increasing with depth. At the 1,050 level the developments as far as they have gone show a larger quantity than at any other level. The lengths of the lead sections measure from 20 feet to 100 feet, and the width from 1½ feet to 6 feet in their various zones.

The Elkhorn Mining Company, Limited, was organized in February, 1890, and purchased the A. M. Holter mine from the Elkhorn Mining Company, an American corporation, for £165,000.

#### Central Mining Company.

The annual report of the directors of the Central Mining Company, for 1890, furnishes data for the following abstract: The production of mineral was 919½ tons, yielding 1,413,391 pounds of refined copper, sold for \$211,236.76. To this sum is added \$5,235.49 interest money, making the total receipts, \$216,472.25. The costs are summarized as follows: Working expenses of mine, \$167,311.15; smelting freight, etc., \$26,553.77; total, \$193,864.92; a net profit of \$22,607.33. Adding to this \$188,386.55, the net surplus from 1889, there was a surplus on hand, December 31st, 1890, of \$210,993.88, out of which a dividend was paid of \$20,000. The assets, exclusive of the real estate and mine plant, are \$240,399.43 (less the dividend of \$20,000); the liabilities were \$29,405.55.

The average yield of mineral per fathom of ground broken was 503 pounds; of ingot 386 pounds. The shaft sinking aggregated 112½ feet at an average cost of \$28.12; drifts and crosscuts 2,692½ feet at an average cost of \$7.80; stopping on vein 2,956¼ sup. fathoms, average cost \$13.08. No. 2 shaft has been sunk from the 30th to the 31st level. In that distance the old vein, which has shifted 230 feet to the west, was encountered. A winze, 250 feet south of No. 2 shaft on the 30th level, is down 30 feet and is producing good copper. Drifting has been carried on at the 29th, 30th and 31st levels. The crosscut, east toward the north-western vein, has been extended 804 feet, making a total from No. 4 shaft of 1,752 feet. When 1,240 feet in an 8 inch vein was cut, at a further distance of 420 feet, a second vein 1½ feet wide, supposed to be the north-western, was intersected; as was expected, the rock is poor. A drift is being run south on each of these deposits.

#### DETERMINATION OF TITANIUM IN ORES.\*

By W. A. Noyes.

The methods commonly in use for the decomposition of minerals containing titanium are not very satisfactory. Fusion with potassium or sodium pyrosulphate is tedious, and the decomposition is frequently very incomplete. Solution in a mixture of hydrofluoric acid and sulphuric acids is sometimes easily affected, but it must be followed by evaporation to remove the hydrofluoric acid, and subsequent dilution rarely gives a clear solution. These difficulties have led me to seek for some modification which would give better results. The following method I find to work well in the cases to which it has been applied.

For a quantitative determination by Weller's method† take 0.1 gramme of the finely powdered mineral and mix it in a platinum crucible with 0.2 grammes sodium fluoride, also finely powdered. Add 3 grammes of sodium pyrosulphate without mixing. Then fuse carefully, holding the burner in the hand. Heat gently till the effervescence ceases and copious fumes of sulphuric acid are evolved. This takes only two or three minutes. When cold, the mass in the crucible is dissolved in 15 to 20 cc. of cold water and the solution filtered. The filtrate and washings need not exceed 30 cc. If a residue remains, it can be treated again by the same method, after burning the filter, but the amount of titanium found by a second fusion is usually very small.

To the solution, 1 cc. of hydrogen peroxide and a few cc. of dilute sulphuric acid are added, and the color obtained is compared with that of solutions containing known amounts of titanium. For a standard solution, titanic oxide is dissolved in hot concentrated sulphuric acid and the solution diluted till 1 cc. contains 1 mg. of TiO₂. In diluting, it is best to use dilute sulphuric acid at first, to prevent the precipitation of titanic oxide.

I cannot entirely confirm Weller's statement that the colors produced are not affected by small amounts of iron. I find that even 2 mg. of ferric oxide in the form of sulphate has a very decided effect on the tints produced, especially when the amount of titanium is small. It is advisable, therefore, to add to the comparison tubes an amount of ferric

sulphate corresponding approximately to that in the solution which is tested. A solution of iron ammonium alum answers well for this purpose, and all that is necessary is to match the color of the solution of the mineral before adding hydrogen peroxide to it. If this is done, titanium can be readily determined in the presence of very considerable amounts of iron. Thus, 0.02 mg. of titanic oxide can be detected in 30 cc. of water in the presence of 0.1 gm. of ferric oxide in the form of sulphate. This would correspond to 0.02% for 0.1 gm. of a mineral.

A qualitative test for titanium can be made in five minutes, as follows: Mix a little of the powdered ore with sodium fluoride, add sodium pyrosulphate, and fuse as above. Cool by dipping the crucible in cold water. Add two or three cc. of dilute sulphuric acid and 10 cc. of water. Dissolve by boiling. Divide the solution in two portions, and to one add a few drops of hydrogen peroxide. A comparison with the solution to which no hydrogen peroxide has been added will show at once whether titanium is present or not.

It seems possible that, by the method of decomposition described, some of the titanium might volatilize as titanium fluoride. To determine whether an appreciable error would arise from this source, 0.1 gm. of titanic oxide was fused with sodium fluoride and sodium pyrosulphate. When cold the fused mass was dissolved in water and the solution made up to 100 cc. One cc. of the solution in 30 cc. of water gave the same tint with hydrogen peroxide as 1 cc. of the standard solution. Determinations based on a comparison of tints cannot be made very accurate, but they are especially valuable for the determination of small quantities of elements, and for most cases where titanium requires determination, the method which is given above is amply accurate.

The method which is here given works excellently with magnetite and with other iron ores.

**Mintage in New South Wales in 1890.**—The Melbourne *Age* says, that the annual returns of the Sydney Mint show, that during 1890, there were 804,123 ounces of gold coined, as compared with 900,745 ounces for 1889, the value being £2,943,675, as against £3,340,473. The gold coin and bullion issued was valued at £9,923,476, as against £3,322,750 in the previous year. The new silver coin issued was valued at £35,175, as against £22,374. The worn silver withdrawn was valued at £2,855, as against £3,300 in the previous year.

**Liability of Bank for Refusal to Pay Check.**—A check drawn on funds in a bank is an appropriation of the amount of the check in favor of the holder thereof, in effect an assignment of the amount of the check; and the holder, upon refusal of the bank to pay the same, where such funds have not been drawn out before its presentation, may bring an action thereon against the bank in his own name. There is an implied promise on the part of a bank when receiving deposits to pay them out on the checks of the depositor to any person in whose favor he may draw the same, and the checkholder is thus subrogated to the rights of the depositor in so much of the deposits as the check may call for, which cannot, after notice to the bank, be withdrawn by the drawer.—*Fonner v. Smith, Supreme Court of Nebraska, 47 N. W. Rep. 632.*

**Scolecite, from a Canadian Locality.**—This interesting mineral has recently been found at Black Lake, Megantic County, Quebec, in one of the granite dykes which are so abundant in the serpentine of that locality, by Mr. Matthew Penhale, superintendent of the Scottish-Canadian Asbestos Company. It occurs in transparent, glassy needles filling minute veins, and in masses of gray, white and colorless radiating fibres. Before the blowpipe its conduct is highly characteristic, the heated portion quickly curving up in worm-like forms. A portion analyzed by Mr. J. T. Donald, gave the following result: Silica, 46.24%; alumina, 26.03%; lime, 14.09%; water, 13.88%. This scolecite from Black Lake is of considerable interest, being, it is believed, the first zeolite found in the dykes cutting the serpentine of the eastern townships, and also because, so far as can be learned, it had not hitherto been known to occur in Canada.

**The Mount Morgan Mine, Australia.**—The famous auriferous deposit at Mount Morgan, Queensland, consists chiefly of siliceous iron ore, occurring in a slate formation. The reef is 600 feet long, 300 feet wide, and of unknown depth. Mr. R. H. Jack, F. G. S., colonial geologist, attributes its origin to the action of thermal mineral water, holding gold, iron, manganese, etc., in solution, issuing from fissures in the metamorphic siliceous rocks of which the mountain is composed. These altered rocks have iron pyrites more or less disseminated through their mass, and are traversed by porphyritic dykes. There are several similar deposits in different parts of the mountain, within a distance of a half mile, some of which are considered promising, although none has been opened yet to any considerable extent.

#### 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, APRIL 14th, 1891.
- 450,132. Metallic Railroad Tie. Ira L. Blakeslee, Kirkwood, N. Y.
- 450,142. Sheet-metal Pipe. John M. Davidson and William H. Flender, Allegheny, Pa.; said Flender Assignor to said Davidson and G. W. Reep, same place.
- 450,145. Railroad Tie. Elias Dietrich, Rochester, N. Y.
- 450,202. Injector. John Trix, Detroit, Mich., Assignor to the American Injector Company, same place.
- 450,236. Ore Mill. Charles S. Jones, Redding, Cal.
- 450,239. Boiler-cleaning Compound. Edward J. Hoffman, Sioux City, Ia., Assignor to the Electric Carbon Manufacturing Company, same place.
- 450,253. Ammoniated Phosphate. Jacob Reese, Pittsburg, Pa.
- 450,305. Combination Tie Plate and Rail Clip. Charles C. Wrenshall, Anniston, Ala.
- 450,330. Making Rolled-metal Rods or Bars. Preston T. Large and John W. Thomas, Chicago, Ill.
- 450,360. Table for Conveying and Cooling Metal Plates. Henry Aiken, Pittsburg, Pa.
- 450,374. Compound Engine. Albert J. Pitkin, Schenectady, N. Y.
- 450,397, 450,398, 450,399, 450,400, 450,401, 450,402, 450,403. Method of Treating the Cylinders of Steam Engines. Emily A. Corliss, Providence, R. I., administratrix of George H. Corliss, deceased.
- 450,488. Crushing and Pulverizing Machine. William H. Howland, Bergen Field, N. J.
- 450,498. Metallic Railroad Tie. Ellison Saunders, Austin, Tex.
- 450,517. Apparatus for Cooling and Lubricating the Working Parts of Pumps. Charles G. Mayer, New York, N. Y.
- 450,521. Sand Molding Machine. Theodor Mistelski, Allegheny, Pa.
- 450,531. Phosphatic Fertilizer. Jacob Reese, Philadelphia, Pa.
- 450,601. Metallic Railroad Tie. Hiram D. Dasher, Middletown, Pa.

\* From the *Journal of Analytical and Applied Chemistry*, January, 1891.  
† *Ber. d. chem. Ges.* 15, 2592.

## PERSONALS.

Mr. John B. Farish, M. E., of Denver, Colo., is making a short visit to this city.

Will Mr. Enoch Keyyon, formerly of this city, please send us his present address?

Mr. J. W. Edwards, of Pueblo, Colo., has removed to Rico, Colo., where he proposes to open an assay office and ore-buying agency.

Mr. L. D. Goodshall, M. S., Ph. D., has been appointed superintendent of the Holden Smelting & Milling Company, of Aspen, Colo.

A subscriber writes for the address of Mr. E. G. Gaertner, formerly of Puntarenas, Costa Rica, C. A. Can any of our readers furnish it?

Mr. R. A. Parker, mining engineer, of Marquette, Mich., a gentleman prominently identified with a number of Lake Superior iron mining properties, is in the city.

Mr. J. D. Long, an iron and steel broker, of Pittsburgh, Pa., has taken the position as manager and treasurer of the Keystone Manufacturing and Supply Company, New York City.

Mr. Amos E. Woodward, assistant geologist, in charge of the chemical and mineralogical work of the Geological Survey of Missouri, has resigned in order to accept a position as assayer and chemist with a smelting company in Montana.

Mr. Thomas C. King, who has recently been in charge of two large coke furnaces in Ohio, has succeeded Mr. Stephen N. Noble as superintendent of the Clifton Iron Company's furnace at Ironaton, Ala. Mr. Noble resigned his position in order to go into business at Anniston, Ala.

The calendar of the University of Michigan for the year 1890-91, which we have just received, is a volume of 255 pages. It contains the usual information that is included in a university year-book, but is particularly noticeable for the excellent manner in which it is edited.

We are pleased to receive the first issue of the *Mining News*, of Seattle, Wash., which takes the field as representative of the mining interests of the Pacific Northwest. The ore deposits of that section of the country are of vast extent, and the *Mining News* can do much to assist in their development. We wish it a prosperous career.

Mr. Charles R. Keys, of Des Moines, Ia., has been appointed paleontologist of the Geological Survey of Missouri. Mr. Keys is now at Johns Hopkins University, Baltimore, engaged in an advanced course of study, and will enter his new position in May. Mr. M. C. Shelton has been appointed to the position of aid in the Survey.

Prof. David Maxson Greene, who has been director of the Rensselaer Polytechnic Institute since 1878, has notified the Board of Trustees of his intention to resign soon, signifying his intention thus early in order that the vacancy may be properly filled. Mr. Greene will probably devote himself solely to his practice as consulting civil engineer in the future.

Mr. Robert Grimshaw, general editor of the Trades Department of Funk & Wagnall's Standard Dictionary, being desirous of making as complete as possible his list of mechanical and industrial terms, requests manufacturers of machinery and tools having important parts not found on those of other makers, or the names of which are not yet in general use to send the name, definition and use of each such part to him at 115 Bible House, New York City.

Mr. Rawlinson T. Bayliss, managing director, and Mr. G. H. Robinson, general superintendent, of the Montana Company, Limited, of Marysville, Montana, have resigned their positions on account of impaired health. They have formed a partnership as consulting, civil, and mining engineers, and will open offices in London and Helena, but have not entirely severed their connection with the company. Mr. Bayliss will reside in London and continue on the board of directors, making an annual visit to the mines, while Mr. Robinson, residing in Helena, will continue to exercise general supervision over the property.

## OBITUARY.

James Hillman, United States Inspector of Boilers, died at San Francisco, Cal., on the 15th inst.

Julius S. Taylor, Ph. D., a well-known geologist, died at Kankakee, Ill., on the 11th inst., at the age of 84 years.

Captain Clinton E. Terry, who has been superintendent of the Consolidated Coal Companies in Hoboken since 1870, died on the 14th inst., aged 64 years.

James Buckton Mackintosh, chemist of the Consolidated Gas Company, of New York, died of pneumonia at his home in Hoboken, N. J., on the 15th inst., at the age of 34 years. He was a valued contributor of the *ENGINEERING AND MINING JOURNAL*. He was a member of the American Institute of Mining Engineers, and author of a num-

ber of papers on methods of analytical chemistry, published in their transactions.

Arthur Macy, manager and superintendent of the Standard Consolidated Mining Company, of Bodie, Cal., died at San Rafael, Cal., on the 14th inst. He was the son of Josiah G. Macy, of Nantucket, Mass., a graduate of the Columbia School of Mines, and formerly superintendent of the Silver King Mining Company. We shall publish a photograph and more extended obituary notice of the deceased in a subsequent issue.

Thomas W. Burchinell, receiver of the Land Office at Leadville, Colo., died of pneumonia on the 31st ult., after an illness of only two days. Mr. Burchinell went to Fairplay, Colo., from Indiana County, Pa., in 1878, and a year later to Leadville, where he prospected with varying success for a number of years. He was appointed assistant in the office of the County Clerk of Lake County in 1882, and receiver of the Land Office in 1887. He was a well known and popular man throughout Colorado.

Coll Deane, one of the most prominent mining speculators on the Pacific Coast and an ex-President of the San Francisco Stock Exchange, died at his residence in San Francisco recently. He was born in 1834 in County Mayo, Ireland, and came to this country when 17 years of age. In 1855 he went to the Pacific Coast and participated in the deprivations and disappointment of the gold seekers in that region. In 1863 he was secretary of the Wide West Mining Company, which position he filled until he was appointed superintendent of the Refugia Mining Company in Mexico. Joining the San Francisco Stock Exchange in 1867, the deceased was later called upon to act as president of the organization, succeeding Mr. Jas. R. Keene. From that date to this he has been connected with the mining business, and has experienced all the changes of fortune which overtake the sanguine speculator. He was at the time largely interested in the Black Hills, and the leading spirit in the development of the Father De Smet. During the stock deal which followed the discovery of the bonanza on the Comstock he accumulated a large fortune, and he leaves considerable property. He was a bitter opponent of the Comstock "mill ring," whose manipulations he vigorously denounced.

## INDUSTRIAL NOTES.

The Valentine Furnace Company has leased the plant of the Chester Iron Furnace at Bellefonte, Pa., with a view for its operation.

The Steubenville Iron & Steel Company, of Steubenville, O., has been granted a decree by the Courts at Pittsburgh, Pa., for the dissolution of the company.

The Detroit and Lake Superior Copper Manufacturing Company and the Tamarack-Osceola Copper Manufacturing Company, both of Michigan, according to report, are to be consolidated, and negotiations for that purpose are now pending.

The Trinidad Rolling Mills and Iron Co.'s works at Trinidad, Colo., have been leased to Ralph J. Wick, of Youngstown, O. This gentleman has also secured an option on the property of the lease for \$26,900, which runs during the life.

The Oil Well Supply Company, Limited, of Pittsburgh, Pa., has purchased the Continental Tube Works and the Elba Iron Works. The consideration was \$375,000. It is reported that 35 additional furnaces will be erected and a new plate furnace be constructed.

The Schultz Bridge & Iron Company, of Pittsburgh, Pa., has applied for a charter. The incorporators are Henry W. Oliver, of the Oliver Iron & Steel Company, Albert L. Schultz, William R. Thompson, Philip W. Herweg, Thomas S. Bigelow, all of Pittsburgh. The new corporation will succeed to the business of the Iron City Bridge Works.

A board of engineer officers of the Navy has been ordered by Secretary Tracy to witness a series of experiments or tests of the relative evaporative qualities of ribbed boiler and stray tubes at the works of Samuel L. Moore, Sons & Co., Elizabethport, N. J., where two of the new vessels for the Navy are being built. These tests are now being carried on.

Messrs. E. T. Copeland & Co., of New York have received an order from the government of Venezuela, S. A., for four revenue cutters or gunboats. Two are to be 75 feet long and 14 feet beam, and two 65 feet long and 12 feet beam. The vessels are to be equipped with triple expansion engines and Worthington water-tube boilers. They are to be schooner-rigged and handsome and fast.

Messrs. James Macbeth & Co., 128 Maiden Lane, New York City, have just issued a pamphlet on "Rock Blasting by Electricity," together with an illustrated catalogue of Victor electric platinum fuses, electric blasting machines, etc., which can be had upon application. The pamphlet is generously illustrated, and contains much valuable information concerning rock blasting by electricity.

The Magnolia Anti-Friction Metal Company, of New York, we are officially advised, has received in the last few days from London copy of a diploma for gold medal, awarded to it by the International Electrical Exhibition, held at Edinburgh, Scotland, in the last part of 1890. This metal was awarded for a special anti-friction metal for bearings of dynamos and other high-speed machinery. The company has received also fac-simile of a beautiful gold metal given to it by the Edinburgh Exposition.

The Columbia Iron and Steel Company, of Uniontown, Pa., will probably resume operations at once. A party of local and Pittsburgh capitalists has raised \$85,000, necessary to purchase the \$102,000 of the first-mortgage bonds of the company owned by Boggs & Buhl, of Pittsburgh. The most pressing creditors will be paid and a five-year extension secured on the others. The Pennsylvania Construction Company, though closely allied to the Columbia, will not be affected by the reorganization of the latter, but will be sold by the sheriff on the 18th inst.

The B. F. Sturtevant Company, of Boston, Mass., has removed its Chicago branch house to new and larger quarters at 15 South Canal street, Chicago, where an entire new building furnishes ample accommodations for the large stock of blowers, exhausters, heating and drying apparatus, portable forges and steam engines. This branch will remain under the energetic control of Foss & Noble, and will form the headquarters for the trade of the Middle and Western States. The stock will be greatly increased in order to provide for immediate shipment in all cases, and a corps of experienced engineers will be maintained to estimate upon and install plants for heating, ventilating, drying, etc.

The Thomson-Houston Electric Company held its annual meeting this week at Middletown, Conn. The following directors were elected: Henry A. Peavey, Charles A. Coffin, Joseph N. Smith, Benjamin F. Spinney, Charles H. Newhall, T. Jefferson Coolidge, Jr., S. Endicott Peabody, Elihu Thompson and Frederick P. Fish. The shares voted were 276,739. The by-laws were amended so as to permit the election of three vice-presidents instead of one. Messrs. C. D. Tibbet and S. J. Hollis were chosen auditors. The annual report for the year ended February 1st, 1891, says that during the fiscal year many American and English shareholders have been added to the list. The assets are given as \$18,509,106.70; the liabilities at the same figure. Included in the liabilities are a surplus February 1st, 1890, of \$1,685,415.92, also the profits of the year as \$3,091,883.67 plus premiums on common stock of \$1,500,000, or \$4,591,883.67 minus \$254,765.88, the dividends paid on common stock, making a total of \$4,337,117.79.

## SOUTHERN INDUSTRIAL NOTES.

(From our Special Correspondent.)

The Georgia-Alabama Investment & Development Company has issued a 30-page pamphlet descriptive of its enterprises. This company owns the greater part of Tallapoosa, Ga.; it has just paid a semi-annual dividend amounting to 3% on its capital stock, which is \$4,500,000.

The Mary Pratt Furnace Company's property in Alabama will be sold at public auction by the receiver, June 2d, 1891. The purchaser will have to pay one-fourth cash and the balance in instalments in six, twelve and eighteen months.

The Roanoke Granite Company has been incorporated at Roanoke, Va., with a capital stock of \$35,000 and privilege of increasing to \$50,000. The following officers have been elected: T. T. Fishburne, president; W. J. Furgerson, vice-president, and J. G. Kuykendall, secretary.

The stock-holders of the Bessemer Improvement Company held their fourth annual meeting at the offices of the company in Bessemer, Ala., on Thursday, April 2d. The old board of directors was re-elected without change. Subsequently the directors met and re-elected the old officers as follows: H. F. De Bardeleben, president; Wm. Berney, vice-president and general manager, and H. M. McNutt, secretary and treasurer. The report of the general manager showed that during the past year the company had donated to the new pipe works \$96,000 in money and 80 acres of land, thereby securing the biggest plant of the sort in the South. Two blocks of land were given to the Alabama Pipe Works, giving employment to 100 men. Two lots were donated to the Bessemer Street Railroad. The Bessemer water-works have been organized and constructed, the stock belonging to the land company. Since the last meeting 3,524 shares of the capital stock on hand have been bought in and have been canceled. The total receipts in cash during the year were \$143,453.10. The total disbursements have been \$110,537.29, which includes \$79,891.70 loaned on interest on several thousand dollars invested in buildings. The total assets outside of the land are \$1,006,214.94, which includes \$466,073.19 of land notes and interest, \$186,100 loan notes and interest, \$32,917.81 cash, \$249,300 stock in the water-works, besides other real property. The total liabilities outside of the capital stock are comprehended in one item, the \$96,000 donated to the Howard-Harrison pipe-works.

### 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.

Any manufacturer or dealer wishing to communicate with the parties whose wants are given in this column can obtain their addresses from 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 American 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.

These services are rendered gratuitously in the interest of the 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.

2,175. Machinery for weaving and making wire goods, such as poultry wire, woven wire for fencing, sand screen wire, and window screen wire. Pennsylvania.

2,176. Two miles of old rails 40 to 50 pounds per yard, in good order, for one mile of track, with spikes, etc., for same; price f. o. b. Morgan Line Steamers, New York or New Orleans. Louisiana.

2,177. Bark and flour mill plant. Maryland.

2,178. A five-ton ice machine complete. Texas.

2,179. Iron roofing, ceiling, metal shingles and sliding door hangers. Virginia.

2,180. Iron and wire fences and lawn seats. Virginia.

2,181. Windmills and water elevators. Virginia.

2,182. Water-pipe. Virginia.

2,183. About 500 feet 8-inch well casing. Georgia.

2,184. A first-class brick machine. North Carolina.

2,185. Steam drill, channeling bar, boiler, engine, saws, etc. Tennessee.

2,186. Derricks and material for limekilns and cement works. Tennessee.

2,187. An axe-handle and spoke lathe. Georgia.

2,188. A hot air engine to pump 2,000 gallons per hour. Georgia.

2,189. All sizes of wrought iron pipe from 1/2 to 3 inches, about 5,000 feet in all, and a lot of 14-inch cast-iron pipe in 8 feet lengths or longer. Georgia.

2,190. Machinery for grinding mica. Georgia.

2,191. A complete plant for mining, hauling and lighting, including the following machinery: A 100 horse power generator, a 50 horse power locomotive, coal cutters with a capacity of 500 tons per day, and all appurtenances necessary to make a complete installation. Length of line, 3,000 feet. Kentucky.

2,192. Complete machinery for a flouring mill of a capacity (10 to 20 barrels of flour in 24 hours), on the roller plan, with a water wheel for motor. New Mexico.

2,193. Machinery for water-works. Texas.

2,194. A 14 to 16-inch engine lathe, a 20-inch drill press, a 24-inch shaper, and other similar tools. West Virginia.

2,195. T rails, fish bars, spikes and 6 switches for 2 1/2 miles standard gage dummy line, 1 passenger car, 4 flat cars, capacity 17,500 pounds each; 1 dummy engine, with capacity for drawing two cars, loaded with 12,500 pounds each, over a grade of 3 1/2 feet in 100 feet, the shortest curve on a radius of 83 feet. Submit itemized estimates, with lowest prices for all necessary materials, delivered on board of cars at Gaffney City. South Carolina.

2,196. Electric light plant. Texas.

2,197. Ice factory machinery. Texas.

2,198. Shafting, belting, etc. West Virginia.

2,199. Machinery for a 40-barrel power flour mill for meal, etc. Virginia.

2,200. A 15 horse power boiler. Alabama.

2,201. A 50-saw gin and feeder power press. Georgia.

2,202. A detached engine and portable boiler, 15 horse power, for a hoop factory, with all the fixtures, viz., pump or inspirator, heater and pipes, to connect boiler and engine, etc. Tennessee.

2,203. Samples and prices of bleached and unbleached cotton, Augusta and Toledo plaids, Canton flannel, suspenders, blue denizen of all qualities, twill cotton, hosiery, duck, celluloid collars and cuffs, ticks, J. & P. Coats' spool cotton, singlets, shirtings, Merrimack shirtings, and other cotton goods manufactured in America. West Indies.

2,204. Veneer machinery, scoring machinery, etc. North Carolina.

2,205. Engine, boiler and a complete plant for the manufacture of furniture. West Virginia.

#### AMERICAN GOODS WANTED ABROAD.

2,165. Tile machinery. Australia.

2,166. Coal-cutting machinery. Australia.

2,167. Excelsior machinery. Australia.

2,168. Cotton oil presses and machinery. Australia.

2,169. Sheep-clipping machinery. Australia.

2,170. Machinery, forges, hammers, dies, etc., for making hoes, shovels, picks and other agricultural tools; also for bolts, nails and wire. South America.

#### GENERAL MINING NEWS.

TENNESSEE COAL AND IRON AND RAILROAD COMPANY.—Mr. T. T. Hillman is reported to have talked to the Birmingham *Age-Herald* as follows, concerning the affairs of this company:

"The showing made in the recent reports of the officers of this company was very gratifying. The property is in excellent condition and making money. All fixed charges, including the sinking fund, have been more than met, and the bonded debt thus continues to steadily diminish."

"The majority of the stock is held in New York, and nine out of the 15 directors live there. The executive head and financial management will be centered in New York, and hereafter all meetings of the directors will likely be held there."

"An English syndicate proposed some time ago to give \$2,500,000 for the property of the company embraced in the Tennessee division. President Platt gave them an option at that price, subject to the ratification of the stockholders. The stockholders will act upon the proposition at a special meeting which is to be held May 7th at Tracy City. I am satisfied that a considerable majority of the stockholders is opposed to the sale."

"The subject of a steel plant at Ensley City was suggested. The company owns \$5,000,000 of the \$10,000,000 capital stock of the Ensley City Land Company. The proposition is to utilize this \$5,000,000 capital stock, to which would be added \$500,000 in subscriptions. The matter will come up at a later date."

The directors of this company have organized by the election of the following board of officers: Thomas C. Platt, president; N. Baxter, first vice-president; T. F. Hillman, of Birmingham, second vice-president; A. M. Shook, third vice-president and general manager, and James Bowron, secretary and treasurer.

#### ARIZONA.

##### YAVAPAI COUNTY.

CATOCTIN SILVER MINING COMPANY, LIMITED.—This company has been organized in London with a capital of £25,000, in shares of £1 each, to purchase certain silver mines near Prescott, in accordance with an agreement expressed to be made with the Lynn Creek Gold & Land Company, Limited.

CONGRESS MINING COMPANY.—At present there is a force of about 25 men at work on this property. On the arrival of superintendent Murphy, it is said, the 40-stamp mill will be started and over 100 men are to be put to work.

QUARTZ MOUNTAIN.—Work has been resumed on this group of mines, which formerly was the property of Dan O'Boyle. A Mr. Taylor, who is said to be representing a Kansas City syndicate, is in charge, and has let several contracts for sinking and drifting.

TIGER.—The work of remodeling the machinery and retimbering the shafts still goes on. A force of twenty men are at present employed under the superintendency of Harvey Helm. It is expected that the mill will be started inside of 30 days.

#### CALIFORNIA.

##### AMADOR COUNTY.

(From an Occasional Correspondent.)

HECTOR MINING COMPANY.—This company's mine, adjoining the Belmont property on the south, is looking very well. A 5,000-foot pipe line is being laid, and it is probable that the 40 stamp mill will be in running order before long.

WILDMAN.—This property is situated 2,000 feet south of the Belmont mine, and is now considered among the good mines of the district. The 10-stamp mill has been increased to a 30-stamp, and has been running steadily for some time past.

##### HUMBOLDT COUNTY.

TRINITY RIVER TUNNEL AND MINING COMPANY.—This company has just fitted up its hydraulic mine on Taylor Flat, and is now ready to open its property at both ends. A 2,000-foot string of pipe, with every modern improvement, has just been finished, will have a head of 350 feet, and in the mine is connected to two large giants and two heavy cast-iron hydraulic gates, so that the water can be turned from one giant to the other, or turned off entirely at a moment's notice.

##### MONO COUNTY.

(From our Special Correspondent.)

SAN FRANCISCO, April 9.

BULWER CONSOLIDATED MINING COMPANY.—At the annual meeting of this company held on the 8th inst. 68,000 shares were voted, the following officers and trustees being elected: Monroe Thompson, President; C. H. Fish, Resident Vice-President; H. L. Shippy, Vice-President, New York; H. Zadic, E. B. Holmes, W. S. Wood, and J. E. Jacobs, Trustees. L. Osborn was reappointed Secretary and J. W. Kelly, Superintendent at the mine

The Bodie mill ran 38 days on Bulwer ore, crushing 649 tons, the bullion yield of which was \$20,601.93. The secretary reported cash on hand amounting to \$11,031.

LAKEVIEW AND JACKSON MINING COMPANIES.—These companies, operating in the Homer District, have been consolidated. R. T. Pierce is the superintendent of the consolidation. The lode for which they have been cross-cutting in the Lakeview has recently been struck, and assays \$200 to the ton in gold. The company has bonded the Esh mill site and water right, and is likely to put up a mill this summer.

#### NEVADA COUNTY.

IDAHO.—The new ledge recently struck in the 1,800 level continues to hold out well, and recently some very rich rock is reported to have been extracted from the same. The new hoisting plant on the Maslin shaft is completed and active development work has commenced.

NORTH BANNER CONSOLIDATED TUNNEL COMPANY.—The annual meeting of this company was held recently at Grass Valley. Five directors, to serve for the ensuing year, were elected, as follows: Geo. Fletcher, John F. Kidder, E. H. Brown, A. Matteson and W. E. Brown, of San Francisco; Geo. Fletcher as president and manager; John F. Kidder, vice-president; E. H. Brown, treasurer; Thomas J. Michell, secretary. The mine is looking better than it has for some time. The ledge is showing strong and is of high grade. A station is being cut for the 400 level. The footwall ledge is 3 1/2 feet wide, and there is a strong ledge coming in from above, which carries good ore. The vein is well defined on either side of the shaft and able to furnish more quartz than can be crushed in the 10 stamp mill now on the ground. For the coming month the output promises to be larger than during any preceding month since operations began.

#### SAN BERNARDINO COUNTY.

(From our Special Correspondent.)

SAN JACINTO ESTATE.—Private advices from Cajalco furnish further details of the work being done by this company in its test and reverberatory furnace which has a capacity of about eight tons per day. The unselected ore yielded 10% of metallic tin. The furnace started up on its second run on the 7th inst. The Cajalco mine alone is said to be able now to give a daily output of 100 tons of ore, and when the large mill and reduction works are completed, early in June, probably, there will be plenty of ore to keep them going. The capacity of the new mill and works will be 200 tons per day.

#### COLORADO.

Mineral surveys approved by the United States Surveyor General during the week ending April 11th, 1891: Sur. No. 6,704, Lead Dist., Leadville, Name of claim, Ballard, Chicago and Hidden Treasure; 6,880, Leadville, Cryptogram; 6,811, Leadville, Morning Star; 6,856, Durango, Andalusia; 6,413, Del Norte, Electric Placer; 6,841, Durango, Lilly; 6,556, Central City, Comstock, Comstock Extension and Safe; 6,881, Leadville, Quartzite, Safe Deposit and Slaughter House; 6,836, Central City, Lee; amended survey, 3,868, Leadville, Champion.

#### CHAFFEE COUNTY.

SEDALIA MINING COMPANY.—This company has decided to erect a smelting plant at the mine, and arrangements to that effect have already been made. The new works will have capacity of reducing 35 tons of ore, daily. The Sedalia mine is the largest copper producer in Colorado at the present time. Its ore has been shipped east hitherto.

#### EL PASO COUNTY.

HOME MINING COMPANY.—A discovery of cryolite was recently made in the property of this company on St. Peter's dome, near Colorado Springs. In a tunnel driven 80 feet into the mountain a vein of quartz with a band of cryolite from 3 feet to 5 feet in width is reported to have been cut. The country rock is granite, and the quartz vein material is thickly studded with bright crystals of zircon. The vein has not yet been sufficiently opened to determine whether the deposit of cryolite is a large one. A two-ton sample of the mineral is to be sent to the Pittsburgh Reduction Company for a furnace test. Cryolite was first found at Pike's Peak by Messrs. Whitman Cross and W. F. Hillebrand in 1833, but only in small masses occurring as a subordinate constituent in veins of quartz and feldspar. This, however, is said to be the only place in the United States where it has been discovered. Cryolite, which has a variety of uses, among them the manufacture of aluminum, is imported into this country in considerable quantity from the west coast of Greenland.

#### GILPIN COUNTY.

RUNNING LODGE MINING COMPANY.—The control of this company has passed into the hands of a St. Louis syndicate. At a special meeting of the shareholders in Denver, on the 10th inst., the following officers were elected: H. W. Blanke, Jr., St. Louis, president; W. H. Garland, St. Louis, vice-president; J. K. Robinson, Denver, treasurer and manager; Chas. J. Freudenstein, Denver, secretary. These gentlemen, with G. W. Toland and Horace Humphrey, constitute the board of directors. The Running Lodge is said to have produced over \$500,000 since its discovery, and is now

paying bi-monthly dividends of \$5,000 each. The working force at the mine is to be increased, and the mine will be worked energetically under the new management.

## LAKE COUNTY.

**ADAMS MINING COMPANY.**—It is reported that this company will be able to pay another dividend this month. The debts of the company have been provided for, and the board of directors has authorized the calling in of the bonds in May. Everything at the mine is progressing most favorably. The value of the ore is steadily improving, and for the whole month of March will average over \$60 per ton, while the output of sulphide ore, which was about 30 tons per day during that month, will probably be increased very materially the present month. The work in the Discovery shaft is progressing favorably, a large pumping station being placed at the 510-foot level. Work of sinking deeper will be resumed shortly, and when the ore is reached through this shaft the product of the mine will be still further increased.

**CHRYSOLITE SILVER MINING COMPANY.**—The old boarding-house at the amalgamating mill in California Gulch was totally destroyed by fire on the 3d inst. Loss said to be \$7,000, and insurance \$2,000.

**DUNKIN MINING COMPANY.**—This company has discontinued all work on its own account in the mine in Leadville, and has given leases on the portions of the ground which it has been operating.

**MIKADO MINING AND SMELTING COMPANY.**—This company is making an output of 25 tons of ore per day. The mine is now being worked under the tribute system. The stopes are reported to be looking well.

## OURAY COUNTY.

**AMERICAN & NETTIE MINING COMPANY.**—Superintendent Bunce reports that the prospects in the mines are improving. A drift from the American tunnel level, run to cut below the upper workings, has cut a small streak of ore, assaying 50 ounces silver and 4.4 ounces gold, which seems to widen as it is followed. Other parts of the mines are looking better, and it is expected that a larger output will be made this month than for some time past.

**CARBONATE KING.**—It is reported that this mine, located near Ironton, and owned by Messrs. Lewis White and D. C. Hartwell, of Ouray, has been sold to James McKay, of Pittsburg, Pa., for \$40,000. It is expected that the property will be extensively worked this season.

**VIRGINIUS MINING & MILLING COMPANY.**—It is reported that this company will soon increase its working force to 200 men, and resume shipments at its regular rates. The Revenue tunnel is being driven into Mt. Sneffles, to cut the Virginus and other veins at depths varying from 1,000 to 2,000 feet, and is now in 2,000 feet. If this tunnel were driven through the mountain it would connect with the Sheridan tunnel, in Marshall basin, being four miles in length and passing 3,000 feet under the crest of the mountain.

## PITKIN COUNTY.

It is reported that arrangements are being made for the construction of an electric tramway, from Aspen up Castle Creek, to Ashcroft, a distance of fifteen miles. The Tam O'Shanter and Monte zuma mines, in which large bodies of lead ore, of too low grade in silver to be shipped under present circumstances, are exposed, are located at Ashcroft. Ex-Gov. Tabor owns a controlling interest in these mines, and is said to be in the proposed tramway enterprise.

## SAN MIGUEL COUNTY.

**SHERIDAN MINING COMPANY.**—A force of about 140 men is at present employed by this company, and the regular large output of ore is being made. The vein has been cut and proved good by the big crosscut tunnel, thus settling the question of its continuance to a great depth. The mill tramway will soon be completed, and shipments of ore by jack-train done away with. This mine was located in 1876 and purchased by the present company in 1883. The company is capitalized at \$300,000, divided into 3,000 shares of \$100 each. It has paid \$225,000 in dividends, \$85,000 of which were paid in 1890.

## GEORGIA.

## LUMPKIN COUNTY.

(From Our Special Correspondent.)

**CAPPS.**—Mr. A. W. Train, of Ft. Payne, Ala., and others have purchased this property from Capt. H. D. Ingersoll, for which negotiations had been in progress for some time. The property has a good reputation and its owner disposed of it only because his entire attention was needed to attend to the business affairs of the Hand Gold Mining Company, of which he is general manager.

**HAND GOLD MINING COMPANY.**—Capt. H. D. Ingersoll, the general manager of this company, is preparing to place a high-pressure Leffel wheel in the Ralston mill, of 20 stamps, which has been formerly run by steam. It is estimated that this will considerably reduce the operating expenses of this mill, as the Hand company owns the Hand ditch, the capacity of which is 1,200 inches, being more than is utilized by the company.

## IDAHO.

## KOOTENAI COUNTY.

**CALLAHAN MINING COMPANY.**—This company has been recently formed with a capital stock of \$500,000. The officers are: President, V. M. Massey; Vice-President, J. H. Stimmell; Secretary, W. B. Wilcox; Treasurer, N. G. Snow, and General Manager, A. B. Railton. It is the intention to work the Spokane No. 1, on Goose Mountain, near Callahan Creek, in the Upper Kootenai district. It is a 12-foot ledge, and is said to show 4½ feet of solid ore, which assays 70 ounces silver, 45% lead, \$4 in gold and a small amount of copper. Report further says: "The mine is located ½ miles from the proposed line of the Great Northern Railroad, which has been definitely run through there."

**CLARK'S FORK MINING COMPANY.**—Mr. A. B. Railton, who is largely interested in this company, recently passed through Spokane Falls, and says that there are three ledges on the April Fool claim. Ledge No. 1 has an incline shaft of 45 feet. The ledge has a dip of 43 degrees and is eight feet wide. It assays 17 ounces in silver and 35% lead on the surface. Ledge No. 2 is now being worked. It is 17 feet wide on the surface and assays 16 ounces silver and 40% lead.

## SHOSHONE COUNTY.

**MORNING.**—James F. Wardner, representing the Great Falls and Helena smelting companies, James McNaught, and others are reported to have offered the sum of \$500,000 for this property, the amount to be paid in sums as follows: The first a cash payment of \$200,000. The sum of \$30,000 to be paid in eight months, and similar amounts to be paid in 10, 12, 15, and 18 months and the final payment of \$150,000 to be made in two years. This offer was at first refused by Mr. Hussey, but the proposition has since been accepted, and the parties are now said to be in New York City to consummate the sale. The purchasers agree to expend \$150,000 in the erection of a new mill, a tramway and other improvements, and they insure the deferred payments by security on the property, including the new works to be erected.

(From our Special Correspondent.)

**CŒUR D'ALENE SILVER-LEAD MINING COMPANY.**—Superintendent Patsy Clark has just returned from the mine and reports that in the lower workings the ore body has improved, both as to grade and quantity, with large reserves in sight. It is estimated that the new electric plant will reduce the cost of handling the product by a very considerable amount.

## INDIANA.

## COAL.

The bituminous operators of the state of Indiana have decided to resist the eight-hour day movement announced for May 1st, and refuse to pay for mining before the coal is screened. They have also decided that the wage schedule for the year beginning May 1st shall be on the basis prior to this year, that is five cents less for the summer months than for winter, and that the rate shall be 15 cents a ton less than that paid for block coal.

## KANSAS.

A special report shows that during the week ending April 11th the output of ore from the mining districts of Galena and Empire City was: Rough ore, pounds milled, 2,240,390; zinc ore, pounds sold, 640,000; lead ore, pounds sold, 74,280. Sales aggregated a total value of \$8,257.

## MICHIGAN.

## COPPER.

**ALLOUEZ MINING COMPANY.**—This company's mine did not make an output during the month of March, owing to the recent burning of its shaft-house. At the office of John Stanton, secretary and treasurer of the company, an ENGINEERING AND MINING JOURNAL reporter learned that the management expects to begin hoisting operations May 1st, at which time the mill will be started. A number of drills are at work in the mine, and a good reserve of rock has been accumulated.

**FRANKLIN MINING COMPANY.**—This company's annual meeting was held in Boston on the 15th inst. There were 23,113 out of a total of 40,000 shares represented. The old board of officers was re-elected as follows: President, H. J. Stevens; Treasurer, D. L. Demmon; Directors, H. J. Stevens, Reuben E. Demmon, D. L. Demmon, of Boston, S. M. Smith, of Detroit, and Johnson Vivian, of Hancock, Mich. An animated discussion took place as to whether the policy, pursued by the directors, of retaining the year's receipts for use in case of a resale of the Pewabic, and not paying a dividend, was advisable. The reasons for this policy were set forth by the president and treasurer.

The latest advices from the mine are to the effect that it is in operation. This implies that the Pewabic fire has not seriously interferred with its workings.

**PACIFIC MINING COMPANY.**—From New York parties who are interested in this property, we learn that the exploratory work which has been carried on during the last six or nine months under the superintendence of Capt. Wm. Tonkin has been suspended. A ten-foot drift was run 70 feet along the Atlantic vein. The showing made was so poor that it was decided to be useless to attempt to develop a mine. Capt. Tonkin is now in Detroit, and will soon take a trip to England.

**PEWABIC.**—At the office of the Quincy Mining Company an ENGINEERING AND MINING JOURNAL reporter learned that the fire in the Pewabic mine, which was reported in our issue of April 11th, started at the tenth or eleventh level near the No. 6 shaft. A drift which had been run from the Quincy, on the twenty-fourth level, into the Pewabic, for the purpose of draining the lower levels of the latter mine—its pumps are in bad shape—was closed up without difficulty, rendering the Quincy property secure from damage. The openings from the burning mine into the Franklin are so large and numerous that no attempt was made to close them. Smoke compelled a suspension of operations in the latter property. The fire is said to be raging on both the No. 6 and the man-engine shafts. No effort is being made to extinguish it. It is the opinion of the officers of the Quincy Mining Company that the flames will be confined to the Pewabic mine, that they will burn as long as there is anything to feed upon, or until the woodwork in the upper levels of the mine has been destroyed, and that the only great damage which will accrue to the owners of the property will be through the delay occasioned. Messrs. Mason & Smith have been advised by counsel that the parties having possession of the books and papers of the Pewabic Mining Company have refused to turn them over. The appeal of Alfred Marcus, praying that the sale be set aside, was to have been heard in Detroit last Saturday. Owing to the absence of the Court, a further adjournment was made to the 27th inst.

**TAMARACK MINING COMPANY.**—This mine produced 850 tons of mineral during March, against 760 tons in February and 590 tons in March, 1890. This makes 2,380 tons produced since January 1st, as against 1,670 tons in 1889.

**WOLVERINE MINING COMPANY.**—An ENGINEERING AND MINING JOURNAL reporter learned at the office of John Stanton, manager of this company, that the property is being systematically developed. Some excellent copper ground has been opened in the south end of the mine. As the lower openings of the Kearsarge prove the productiveness of the Wolverine's north end, the finding of copper rock in the south end is particularly gratifying. The mine equipment, including a head of Ball's stamps, has been put in condition to resume production on short notice. As soon as the copper market promises more satisfactory returns, the mill will be started. In the meantime, the present force will continue to open the mine.

## IRON.

## MENOMINEE RANGE.

**PENN IRON COMPANY.**—The Norway Current says the drift in No. 3 shaft at the East Vulcan struck the ore at a distance of 125 feet. A cross-cut toward the hanging is in the ore 20 feet, and no hanging yet in sight. At the seventh level of the new shaft the drifts in the ore have been extended east and west about 415 feet, and the ore still holds out. The shaft at Southeast Vulcan is again being sunk. At West Vulcan the new shaft is about 555 feet deep; the drift at the sixth level has again been started, and lacks but 30 feet of a connection with the cross-cut. The new compound Worthington pump is in place. The water in No. 2 skip shaft is again below the 6th level. At the Curry, the sump at the 5th level of No. 1 will be completed next week. The winzes from the 4th to the 5th level are going down at a fair rate but, one of them has struck rock and mixed ore at a depth of 65 feet. The west drift on the 4th level is in 250 feet from shaft and in ore. This brings the ore body at least 30 feet beyond the point reached in the level above. The stockpiles at these mines aggregated on April 1st about 75,000 tons. The drift from the bottom of the Briar Hill exploring shaft is in 178 feet, and air will be used in driving it as soon as pipes are laid.

## MISSOURI.

## JASPER COUNTY.

(From our Special Correspondent.)

## JOPLIN, April 12.

There was a slight decline in the price of zinc ore last week, it ruling at \$22.50 per ton. The price of lead also declined a point, and sold for \$23.75 per thousand. Following are the sales from the different camps:

Joplin mines, 1,450,570 pounds zinc ore and 184,000 lead; value, \$21,054.

Webb City mines, 726,000 pounds zinc ore and 67,450 lead; value, \$9,769.75.

Custerville mines, 1,413,320 pounds zinc ore and 46,530 lead; value, \$16,008.

Zincite mines, 413,800 pounds zinc ore and 1,730 lead; value, \$4,800.

Oronogo mines, 41,860 pounds zinc ore and 11,190 lead; value, \$738.65.

Lehigh mines, 57,910 pounds zinc ore; value, \$1,055.

Galena, Kan., mines, 660,980 pounds zinc ore and 93,780 lead; value, \$9,856.

District, total value \$63,281.40.

Aurora, Lawrence county, mines 100,000 pounds zinc ore, 360,000 pounds silicate and 175,000 pounds lead; value, \$10,250.

Lead and zinc belt, total value \$73,531.40.

The Oswego Mining Company is making arrangements to put in some heavy pumping machinery, so that it can operate the lower levels of its property. The lease of the Bay State Company on

20 acres of the Oswego land expires May 3d, after which date the Oswego Company will operate the mines, which are well developed on its own account. The Missouri Pacific Railway has just completed putting a spur track through the Davidson Mining Company's land, so as to furnish coal and ship out the ore. The Pearl Mining Company, which has been prospecting a tract of land three miles east of the city, has opened a fine vein of ore at a depth of 85 feet. The Great Western Land and Zinc Company was the first to open up this district less than one year ago, by striking a body of ore at a depth of 40 feet, on which it has been working and producing steadily. There are now a number of other shafts on the same land that are in ore and producing, and, in fact, there is no part of the Joplin mining district that seems to have any brighter future than the land in this vicinity.

## LAWRENCE COUNTY.

(From our Special Correspondent.)

## PEIRCE CITY, April 13.

The Business Men's Association of Peirce City is wide awake to the resources of this district, and has made arrangements with the firm of Hallbrough & Stealey, mining engineers, of Joplin, to prepare a map showing the location of Peirce City and its nondeveloped mineral land. It is proposed to call the attention of capitalists to the value of these lands, and to make Peirce City the center of a large mining district. The place is located in the center of a great lead and zinc belt, and, in passing over many of the well cultivated farms in this vicinity, it is found that the farmer, in tilling the rich alluvial soil, has plowed up many tons of silicate of zinc, and in digging his well would find large and small cubes of galena. The surface croppings are very plain. Among those now operating in the district are Messrs. Allen, Stark & Co., who are working an 80 acre tract of land about seven miles southeast of the city; they have sunk some 40 shafts on the land, which are showing up large bodies of zinc and zinc ore. About 10 miles south a ledge of zinc ore standing vertically, not less than 30 feet thick, has been found. There is every indication that this will be an important mining district with proper development.

## MONTANA.

## BEAVERHEAD COUNTY.

**POLARIS.**—A strike is said to have been made that promises to put all the others of the region in the shade. The men were running a drift from a winze in the lowest part of the mine, about twenty-seven feet from the 300, and uncovered a body of ore four feet thick which assays 365 ounces of silver to the ton. This mine is now working 10 men and keeps six teams busy hauling the ore produced. A bond, which was held by some eastern parties, expired on April 2d, but it is understood that the property has been sold and will be largely developed by a new company in the near future. Specifications and estimates on a ten stamp mill have been received from Fraser & Chalmers, of Chicago.

**VIPOND GROUP.**—The sale of the Mewanitoc Forrest and Gray Jockey claims, all of which are located in the Vipond mining district, has been practically settled. Mr. Blockmire, representing an Indianapolis syndicate, purchased the ground for \$60,000. The deal has been pending for several months, and according to an agreement, to which all interested were parties, the final settlement was to be made in Helena. The sale was arranged by Dr. Johnston, of Butte, and A. D. Churchill, of Helena. P. J. Donohue has purchased the old Lexington 10 stamp mill for the syndicate. The mill will be removed to the mines at once and put in running shape as soon as possible. A large force of men is already employed at the mines, which will be worked on as extensive a scale as possible. A. D. Churchill has accepted the management of the company, and will hereafter give his attention largely to its affairs.

## DEER LODGE COUNTY.

**HOPE MINING COMPANY.**—According to a report from the superintendent recently received in St. Louis, the drift started from raise No. 1, 230-foot level, and running in the direction of the ore body shows most encouraging indications, and the northeast drift from the top of No. 1 raise has more ore in the face, and the quality is improving. It is not unlikely that the mill which has been shut down for several months, will be started up again in the near future.

## GALLATIN COUNTY.

**HODGSON.**—This coal mine is located about eleven miles from Bozeman and has been worked for several years. There are three veins of good coal. The lower vein is much the best and has been worked most extensively. The tunnel is now in 500 feet and shows three feet of fine coal. The dip of the vein is about 38°. The coal is bituminous and is said to be unusually good for steam and coke. Nothing has been done as yet in the way of coke making owing to a want of capital. Only eight men are working on the property now and turn out a car of coal per day. The market for this coal has recently been extended by its introduction in Butte, where it is steadily gaining in popularity. The railroad and transportation facilities are at present so poor that the mining operations are quite limited.

## JEFFERSON COUNTY.

**CATARACT MINING COMPANY.**—About a year ago this company was organized, and the Boulder Chief Mining Company was merged into it, the stock of the new company being made assessable. Wm. Thompson, of Butte, was made president, and T. H. Clewell, secretary and treasurer. An assessment of one cent a share was levied and the money used to push work on the Boulder Chief. More recently another assessment of one cent a share was levied. The mine is in the Cataract district, about midway between Wickes and Basin. The shaft is now down 350 feet, and a strike of some importance is recently reported to have been made in the 250-foot level. After drifting about ten feet the first good-looking ore was struck, and this assayed about \$82. The last assay was made from ore taken from the drift when it was in about 60 feet, and returned \$380.29 in silver to the ton. The prospects for future returns seem much brighter than they were a little while since. The annual meeting will be held April 20th.

**ELKHORN MINING COMPANY, LIMITED.**—This company has just added to its equipment a new hoist and a Fraser & Chalmers' engine, 20x60 inch cylinder, with Nordberg's patent automatic cut-off governor, first motion, with piston valves, steam clutch, steam disk brakes and steam reverse. The drum will hold 2,000 feet of cable, thus enabling the company to sink to a greater depth than yet attained on this property.

**HIAWATHA MINING COMPANY.**—This mine, says the St. Louis *Republic*, continues to be one of the fickle goddesses of fortune which have thus far characterized every so-called mine of the Basin district. They show up veritable bonanzas near the surface, but with depth the promising showing grows dimly less and less, until the streak of silver-bearing substance peters out. The managers of the Hiawatha seem to feel confident of breaking the bad record of this district, and, judging from present indications, they will be successful. The new shaft is down to the 275-foot level, and cross-cutting is now in progress from that point. This new shaft is situated in a more convenient locality, and is 50 feet lower than the old one. Shipments of ore from the original workings are regularly made, and good returns are realized. The ledge averages all the way from one foot to four, with the same quality of ore across the face.

(From our Special Correspondent.)

**GREEN COPPER MINING COMPANY.**—A big copper property, which is situated near Radersburg, has been stocked with 300,000 shares of \$10 each. A large block of the stock has been placed in the treasury to be sold for development purposes. At a depth of 50 feet on the New Paymaster claim a cross-cut shows the lead to be 18 feet between walls. The ore consists of black oxide, red oxide, and copper glance, and smelts very readily, being free from sulphur and other refractory elements. The owners expect to put up hoisting works, and probably will build a smelter during the coming year. It is the intention to ship several cars of ore to the Kansas City Smelting & Refining Co.'s works for a test.

**RUBY.**—The owners of this property, situated in the Lowlands district about 17 miles from Butte, have given a bond for \$300,000 to eastern parties. They claim to have a vast body of free-milling ore high in both gold and silver, and in sufficient quantities to keep 50 stamps dropping continuously for some time to come. Last year the owners shipped 210 cars of ore, which returned \$98,000.

## SILVER BOW COUNTY.

**BLUE BIRD MINING COMPANY (LIMITED).**—Preparations are being made, it is said, to start the small experimental leaching plant which was completed some time ago, but has not been used heretofore on account of the recent litigation. The plant is reported as having a capacity of about 50 tons per day, which, in addition to the 80 stamps, will make the total reduction capacity of the works about 150 tons. This experiment will be watched with interest, as this is the first time that the Butte silver ores have been treated on so large a scale by this method.

(From our Special Correspondent.)

**ANACONDA MINING COMPANY.**—This company is taking advantage of the present shut-down, due to the trouble with the Montana Union Railroad, and has ordered some of the shafts on the mines comprising the Chambers syndicate sunk to the 1,000 level.

## NEVADA.

## STOREY COUNTY—COMSTOCK LODGE.

(From our Special Correspondent.)

The following is an itemized statement of the ore milled last week:

Mines.	Tons.	Assay value.	
		April 4.	March 28.
Con. Cal. & Virginia.....	1,575	\$34.60	\$32.40
Chollar.....	519	20.49	18.79
Overman.....	901	15.81	14.12
Savage.....	550	15.42	17.10
Yellow Jacket.....	295	18.00	18.00
Total.....	3,811		

**ANDES MINING COMPANY.**—An assessment of 30 cents per share, delinquent, May 8th, was levied on the stock of this company on the 6th inst. On the 1st of the month the company reported \$2,798.22 on hand.

**CHOLLAR MINING COMPANY.**—An assessment of 30 cents per share was levied by the directors on 1st inst. The company reported an indebtedness of \$54,139.39.

**CONSOLIDATED CALIFORNIA & VIRGINIA MINING COMPANY.**—The official return of ore worked and bullion produced by this company during March shows that there were worked at the Eureka mill 6,750 tons of ore, yielding bullion of the assay value of \$172,637.37, of which \$86,331.11 was gold and \$86,256.26 was silver. The average yield in bullion per ton was \$25.57, and the average assay of the battery samples for the month was \$33.27 per ton, showing a considerable increase in assays and product over the preceding month.

There was about \$60,000 carried over to March account, and there ought to be at least \$90,000 carried over to account of the current month. The Morgan mill has not yet been started, and various pretexts have been given for the delay; but it is now positively stated that within the next two weeks the Morgan stamps will be dropping on Consolidated California & Virginia ore.

**CROWN POINT MINING COMPANY.**—The Dow pumps have lowered the water from about 28 feet above the 1,500 level down to the caps of the 1,700-foot station timbers.

**HALE & NORCROSS MINING COMPANY.**—This company had an indebtedness on the 1st inst. of \$25,351.23, with \$55,243 due on assessment 98, yet uncollected.

**OVERMAN MINING COMPANY.**—Hitherto two cages have been run on one rope in the Overman shaft. A new reel is now being made to run four cages on two ropes and use the two compartments of the shaft. This change will double the hoisting capacity, and enough ore will be raised to keep the Brunswick mill running at its full capacity. During the month of March there were extracted from the mine (1,000 and 1,100 levels) 2,897 tons of ore. The car samples averaged \$15.72 per ton. There were shipped to the Brunswick mill 3,052 tons of ore. The battery assays averaged \$15.30 per ton. The mill worked a total of 2,600 tons of ore.

**UNION CONSOLIDATED MINING COMPANY.**—The new hoisting plant is running in first-rate order. Two new cages have been put in, and new indicators of novel pattern are attached directly to the sheaves of the gallow frame, instead of being attached to the hoisting machinery as heretofore. The new steel cars are capable of holding 1,500 pounds, and are of a new pattern also. A force of men are at work putting down a platform at the 900 level station, which level is to be the first to be opened.

**YELLOW JACKET MINING COMPANY.**—A commencement was made at the beginning of this week to ship about 90 tons of gold-bearing white rock daily to the Santiago mill, additional to the regular shipments to the Vivian mill.

## WHITE PINE COUNTY.

**OSCEOLA GRAVEL MINING COMPANY.**—A meeting of the stockholders of this company was held in Salt Lake City recently for the purpose of amending the by-laws so as to increase the number of trustees from five to nine, and for electing four more trustees. After making this amendment the election was proceeded with and the following persons were elected: Charles McDonald, Henry Kunhardt, Jr., and Wheaton B. Kunhardt, all of New York, and L. S. Hills, of Salt Lake City. The old board of trustees, who still hold, are George W. Maynard, Gustav E. Kissel and Charlton T. Lewis, all of New York, and Benjamin Hampton and John Sharp, Jr., of Salt Lake City.

## NEW MEXICO.

The building of the Silver City & Northern Railroad to Hanover gulch means an inevitable boom for that section, and will undoubtedly be an important factor in the development of its mineral resources. Hanover contains extensive deposits of copper, zinc, and iron, and operators are only awaiting the completion of the railroad to actively engage in mining operations. The construction of this road may mean the revival of operations at Santa Rita, and certainly will rejuvenate operations in Central district, which is rich in gold, silver, lead, and iron.

## GRANT COUNTY.

A strike of new placer ground is recently reported to have been made in Santa Domingo gulch by Robert Kirk. After stripping off about four feet of loam a four-foot vein of rich placer gravel was encountered. In four days Mr. Kirk, it is stated, with the assistance of one man, took out \$36 with a rocker.

**ALHAMBRA MINING COMPANY.**—This company is making extensive improvements at Black Hawk. The new double compartment shaft is being put down as rapidly as possible and a new wagon road is being built to the camp which will shorten the distance from Silver City to the mine six miles. A shipment of high-grade silver ore was recently made from the mine.

**JOHNNY BULL.**—A body of fine copper ore is said to have been developed in this mine at Stein's Pass. The 70-foot level shows 18 feet of ore, which runs 12% copper and about six ounces in silver per ton. The ore contains considerable black sulphide of copper, and there is some iron in the gangue, making it very desirable ore for smelting.

**PACIFIC GOLD MINING COMPANY.**—The force of men at work in the mine was increased by 20 on



the 1st inst., and it is expected that within a short time at least 75 miners will find employment underground in this property. These additions to the working force have been rendered necessary in order to keep 5 stamps in the mill going.

## SANTA FE COUNTY.

**SANTA FE COPPER COMPANY.**—An ENGINEERING AND MINING JOURNAL reporter in a recent interview with Lewisohn Bros. & Co., largely interested in this company, learned that the property had been given a trial run of a month, and that a gratifying showing had been made. The mine, as our readers are aware, has had many ups and downs during the past year. The present officials, upon taking the management, found a depleted exchequer and a general belief prevailed that the property was not what it had been represented. The fact that the stock is non-assessable did not, in the face of these conditions, afford encouragement. However, a few of the heavier stockholders advanced sufficient money to start and carry on operations on a moderate and economical scale. During the winter Superintendent McLaughlin was kept at work with a small force in opening the mine preparatory to production. On March 1st a concentrator, erected by the Fort Scott Foundry and Machine Company, of Fort Scott, Kan., was put in operation. The concentration of the ore has proved satisfactory. The run was little more than a test, in which about 40 tons a day were treated. It was demonstrated that the ore from the dumps could be raised from 2% to 10% and 11%. One of the results most highly prized is the retention in the concentrate of certain elements which act as a flux when the ore is smelted. The furnace has been running for the month, and with the following result, as reported by Wm. Kemp, the company's metallurgist: "During the month of March, we smelted 378.2 tons of ore from the old stock and 412.10 tons from the new stock and 100.93 tons of concentrates less 10% moisture, making a total of 881.10 tons. The ore averaged 7.70% copper. The new ore averaged 11.80% and concentrates 9.20%. 139.1 tons of coke, 61.56 tons of iron ore and 81.17 tons of limestone were consumed. The per cent. of coke was 15.20 on the copper ore smelted. This could have been considerably reduced had the furnace been smelting day and night shift. The consumption of both coke and iron ore was considerably reduced under the past smelting, and at the present writing we are using no iron as a flux. When smelting continuously the ore can be treated with 13.50% coke. Three days were lost on account of water jackets leaking. We produced 20 tons of flue dust during the month, which will be made into briquets at a cost of 75c. per ton, and resmelted. There has been considerable loss of copper in slags. To remedy this a stationary receiver has been erected on the Herreshoff plan. To get satisfactory results the furnace should run night and day. With the large furnaces running two shifts the smelting can be done for less than \$3.50 per ton." The matte runs from 60% to 63% copper, and is shipped to the New Jersey Refining Works for treatment. The output during the month was about 150,000 pounds of fine copper. The latest advices from the mine are that a 2-foot body of ore, which makes great promise, has been struck in the north end of the property. The work of development and production will be continued. A meeting of the leading stockholders will be held in Boston this week to discuss the progress made, and devise means to enlarge the equipment, and in other ways place the property on a permanent working basis.

At a meeting of the directors of this company held in Boston on the 15th, Geo. H. Ball was elected a director, vice Wm. A. Haskell, deceased.

## NORTH CAROLINA.

## ROWAN COUNTY.

**NEW GOLD HILL COMPANY, LIMITED.**—The Secretary states that he has received a report from a member of the Board of Directors, who recently visited the mines, whose conclusions, briefly summarized, are as follows: Large quantities of ore are already in sight in the mine, but some system must be found to save the refractory gold. The existing machinery is in very fair order. The present system of management should be remodelled and improved. Also, that it may be two or three years yet before the Roanoke & Southern Railroad reaches Gold Hill (provided it is decided that the line should pass through there), and consequently, there is but little prospect of making remunerative sales of the company's lands for some time to come. The mine itself, he states, has great possibilities, and to all appearances the different levels are opening out great quantities of ore.

## OREGON.

## LINN COUNTY.

(From our Special Correspondent.)

SAN FRANCISCO, April 9.

The Santiam district is attracting so much attention just now that there is every likelihood of a "rush" taking place as soon as the snow gets off the ground. The following companies have organized and intend commencing active operations in the spring: The Red Belle Mining Company, Gold Mountain & Dry Gulch Company (placer), White Hill Mining Company, all of Salem; the Galena Mining Company, of Portland, and the Golden

City Mining Company, of Albany. The district is less than 30 miles square, but timber and water are both plentiful. Silver predominates in many of the veins, and in going down 50 to 75 feet the ledges appear well defined and wide, getting richer in silver intermixed with galena. The Santiam district was prospected about 25 years ago. Several mines produced well; but, the ore becoming more refractory with depth, operations were suspended.

**ALBANY MILL AND MINING COMPANY.**—This company commenced work last year on five of its twelve claims. A small stamp mill was erected and kept at work late into the fall. At 150 feet in the tunnel of the Bonanza mine, 150 feet from the surface, a rich strike was made, particulars of which have already appeared in the ENGINEERING AND MINING JOURNAL. The ledge is about 6 feet wide with well-defined walls, and in the center there are 18 to 24 inches of gold-bearing quartz that is extremely rich. The superintendent has ceased taking out ore, considering it safer in the ledge than on the dump. Meantime a 20-stamp mill, with other machinery, and also a saw-mill, are ready to be shipped to the mine as soon as the snow melts.

## PENNSYLVANIA.

## COAL.

The Senate Judiciary General Committee has acted negatively on Davis' bill putting a tax of one cent on coal mined in the state.

**PHILADELPHIA AND READING COAL AND IRON COMPANY.**—A contract has been let to sink the new slope at Pine Forest colliery on the Diamond seam. This colliery is owned by this company and is now working the Buck Mountain, Primrose and Orchard seams. The new slope will greatly increase the output.

## OIL.

The Chief of the Bureau of Statistics reports the total values of the exports of mineral oils from the United States for the month of March, 1891, and during the nine months ending March 31st, 1891, as compared with similar exports during periods of the preceding year as follows: March, 1891, \$3,400,130; March, 1890, \$2,895,651; nine months ending March 31st, 1891, \$39,833,646; nine months ending March 31st, 1890, \$33,331,062.

## SOUTH DAKOTA.

## CLARK COUNTY.

**KEYSTONE CHLORINATION AND MINING COMPANY.**—These works, built by J. G. Keith, and successfully operated on a small scale, some time since passed into the hands of a stock company with ample capital to enlarge to any desired capacity. The incorporators and stockholders are J. G. Keith, W. F. Smith, W. B. Cameron, C. B. Kennedy, Madison, S. D.; W. E. and J. H. Herron, Kingsley, Iowa. The capitalization is \$500,000, shares \$100 each. The name of the corporation is the Keystone Chlorination and Mining Company. The men comprising the corporation own the Hermit Mining Company and a large majority of the Rainbow stock. It was the intention to run the plant wholly on Hermit and Rainbow ores for the first few months and as an enlargement of the plant to 40 tons capacity was contemplated, Messrs. Keith and Cameron have been in the east purchasing the necessary machinery, consisting of a Gates combination crusher and pulverizer, with a revolving 10 mesh screen, a Howell-White roaster, 27 feet long, 62 inches in diameter at the fire end, and 52 at the receiving end, and two chlorination barrels of five tons capacity each. The first shipment of the machinery was to have been made April 1st, and will be followed on April 15th and 23d by other articles as they are ready. It is the intention of the company to push matters in order to have the plant in operation on or before May 15th.

## LAWRENCE COUNTY.

**ALBE MINING COMPANY.**—The ore from this company's mine continues improving in grade, and it is supposed that the drift running out from the 140-foot level is in a large body of the same character as that which is being taken out of the present working level. The ground of this company lies in the direction or strike of the large bodies of ore that commence in the east end of the Iron Hill property, and appear to extend westerly through and beyond the Albe, Jefferson, and Geyser companies' claims. In the opposite direction, "easterly," toward the old Liberty claims, the limestone in which the great ore bodies of the Iron Hill are found, pinches out to nothing, and is replaced by the denuded upper or fourth quartzite.

**ANNA MINING COMPANY.**—This company continues at work developing its property on Spruce Gulch. The working tunnel has been run 350 feet, and at its face a shaft has been commenced, which will be continued down 100 feet. The ore carries a large per cent of iron pyrites, and is considered valuable for pyritic smelting. Near the top of the hill the company ran two tunnels, one 150, the other 168 feet in length. In these openings a large body of free-milling gold ore is in sight, samples of which milled a few years ago at Cassell's mill, of Central, returned \$6 per ton. The expense in hauling was too heavy an item to permit continuous work. Captain Smith, the largest stockholder in the company, is superintendent and manager, and all work is done under his direction. There

are several hundred tons of ore now on the dumps that will pay a handsome profit when the new D. & D. smelter is in operation.

**CHEYENNE.**—A recent assay made at the School of Mines on pyritous ore from this mine, in Deadwood gulch, shows its value to be \$68 in gold per ton. Tests made in Chicago gave returns of \$62.07 in gold, while a number of assays made at the D. & D. smelter assay office, gave an average of \$104.79. A quantity of ore and pulp has been forwarded to Boston and New York. The property is now owned by G. E. Marvin, of Delhi, N. Y., who has spent considerable money in bringing it to its present state of development.

**GOLDEN REWARD CHLORINATION WORKS.**—The clean-up for the last 15 days of March gave 568 ounces (\$11,400) pure gold and \$1,500 left still to be reduced. This was the result of treating 528 tons of ore and is satisfactory. The works were shut down for four days while the D. C. track was being laid to the mine, which, it is said, will reduce the cost of transportation \$1.50 per ton.

**HARTSHORN SILVER MINING COMPANY.**—The annual meeting of this company was held at Deadwood recently. The following board of directors was elected: Wm. A. Hugginson, James A. Beck, C. O. Kimball, A. D. Thomas and A. A. Dewey. Mr. Dewey is expected in Deadwood about April 24th, after which the board will organize and prepare for active work. It is said that with the advent of railroads and consequent cheap transportation of ores, the mine can be put on a paying basis.

**IRON HILL.**—A level has finally been driven in under the great eave and gone some distance into virgin ground. Seven feet of the workings are in high-grade lead ore, carbonate and galena, with the face of the tunnel still in the same rich material. The main workings running into this fine ore body were started some distance from the shaft on the 200 level. This work exposes the largest body of ore at present in sight in the mine, although a good deal is expected from the strike on the 300-foot level.

**POCAHONTAS.**—Several thousand dollars have been expended in running tunnels and sinking shafts on this property. The principal expenditure has been for tunneling. The main or working tunnel is nearly 300 feet in length, and at the point of furthest advancement into the hill some very rich gold ore is said to have been found. While it cannot be classed as "free," yet some rich free gold specimens have been taken out, but most occurs with rounded globules of a lustrous, soft, blackish-gray mineral, the composition of which has not yet been determined.

**SEABURY-CALKINS CONSOLIDATED MINING COMPANY.**—According to the superintendent's annual report, presented recently at the directors' meeting, during the years 1889 and 1890, commencing February 22d, 1889, and closing November 30th, 1890, there were about five men per day employed in the various shafts and other workings; 938 feet of shafts, drifts, winzes, etc., were either sunk or run, exposing an ore body varying in width from 5 to 30 feet, for a distance of 300 feet. This ore from samples, carefully taken, will average \$28 per ton in gold and silver, and also carries about 30% iron, which will probably greatly enhance its value for pyritic smelting. The amount of ore shipped during the period above mentioned was 444,596 pounds, from which \$4,678.09 was received. There also remains on the dump a quantity of ore which is estimated to be about 800 tons. Cost of labor, machinery and other expenses was \$44,671.91, and the receipts from assessments and sale of ore amounted to \$41,218.17, leaving the company with an indebtedness of \$4,165.79 and \$712.05 in cash on hand.

## TEXAS.

A dispatch from Antonio says that the Llano iron and coal fields were purchased on the 13th inst. by the Wakefield Syndicate, of Chicago. The cash consideration, it is stated, was \$500,000. The company was capitalized at a million. The ore beds are more than 60 miles from the nearest railway. The Southern Pacific road is building a branch line to the mines.

## UTAH.

## JUAB COUNTY.

**BULLION-BECK & CHAMPION MINING COMPANY.**—The miners of this company struck on the 4th inst. on account of the boarding-house trouble to which we referred last week, and 140 men are now out. Capt. Smith, manager of the company, states that it was charging only \$26 per month board, while other companies are charging \$30, and as it had greatly improved its boarding-house, both in fare and accommodations, there was no reason for the strike.

## VIRGINIA.

**VIRGINIA STEEL, IRON AND SLATE COMPANY.**—This company has been organized to develop the deposits of iron and manganese ore and fireclay in the extensive area which it has acquired in Albemarle, Buckingham, Fluvanna and Nelson counties. A town, called Logan City, is to be built on the James river, 91 miles above Richmond. Mr. F. R. Anderson, of Richmond, Va., is the president and general manager of the company, and Mr. Thos. P. Williams, of Lynchburg, the mining engineer.

WISE COUNTY.

**VIRGINIA COAL AND IRON COMPANY.**—At the recent annual meeting of this company, operating at Big Stone Gap, the following officers were elected: President, E. B. Leisenring; Vice-President and General Counsel, R. A. Ayres; Secretary, W. C. Kent; Treasurer, M. S. Kemmerer; General Manager, J. K. Taggart. Directors: John C. Ballitt, Samuel Dickson, M. S. Kemmerer, Dr. John S. Wentz, Daniel Bertsch, Robert H. Sayre, Samuel Thomas, A. W. Leisenring. Work on the company's coke plant is progressing. It is expected to put up 400 ovens, to be added to as occasion demands.

WASHINGTON.

OKANOGAN COUNTY.

A flume to Ruby, four miles long, and beginning at Salmon Creek, is now being constructed. This will have a fall of 300 feet and furnish about 1,000 horsepower, which will be utilized for electric lighting, running cars and also for driving a tunnel into Ruby hill. By running an adit about 4,000 feet long it is thought the ledge will be struck 1,850 feet below surface. It will doubtless take some time for an undertaking of this magnitude to realize. The edges are from 60 to 80 feet wide, and thus form a powerful incentive to attempt to work them on a large scale. Better means of transportation are sorely needed by this district. Salt, which is the great factor in the reduction of the ores, is so expensive that it is almost prohibitory.

**FOURTH OF JULY.**—This mine lies to the north of the Arlington, near the summit of Ruby Mountain, at an altitude of 4,300 feet. According to G. A. Bethune, state geologist, the "croppings show 10 feet of ore on the surface, with a pay streak of from 18 to 24 inches in width. The trend of the vein is north and south, dipping 25° to the eastward. The ore is a high-grade quartz, carrying silver sulphurets, and gray copper. Where the ore crops a 90-foot shaft has been sunk, several levels run, and two or three carloads of rich ore have been extracted and shipped to Montana for treatment, giving handsome returns. An assay from the pay streak showed \$870 in silver with a trace of gold. Average assays from the vein showed the ore to be worth over \$100 per ton. On the dump I measured about 150 tons of good-grade ore. The mine, which is the property of a Montana syndicate of capitalists, is supplied with a Lidgerwood hoisting plant of 30 horse power. At present a double compartment shaft is being sunk, 4 × 4½ and 6 × 4½ feet respectively, using 10 × 10 square timbers. Over 100 feet had been sunk when I last visited the property. The operations, I have ascertained, continue to be carried on with activity. The plant of the property comprises a large shafthouse, blacksmith shop, ore house and boarding house. Work is carried on systematically; and I consider the Fourth of July one of the best equipped properties in the state.

SPOKANE COUNTY.

**WESTERN CONSOLIDATED MINING COMPANY.**—Articles for incorporation of this company were recently filed. The company purposes to purchase and own mines and mining claims in the United States and Canada, and to acquire water rights; also to operate mills, concentrating, and reduction works. The principal place of business shall be the city of Spokane Falls. Capital stock is \$1,000,000; shares \$1 each. The incorporators are C. M. Parker, W. H. Lynch, J. B. Sargent, C. C. Maston, Donald Ross, N. A. Parent and W. E. Simpson.

STEVENS COUNTY.

**DAISY.**—This mine, situated in the Summit district, near Daisy post-office, is in a carbonate-ore deposit, and is in the heart of one of the richest mineral-producing districts of Stevens county. A 40-foot vein is shown at the surface, and a drift 250 feet long has been run through ore; a shaft has been sunk 63 feet, showing ore all the way. The state geologist's report shows the assay of this ore to be 30 ounces of silver, 25% iron, and 18% lead. There are said to be at least 30,000 tons of ore in sight. According to the latest reports this mine had been sold to a party of Eastern capitalists (see ENGINEERING AND MINING JOURNAL, February 14th, 1891).

WEST VIRGINIA.

COAL.

The United Mine Workers of this state, on the 15th inst., adopted a scale fixing 50 cents per ton for run of mine on B. & O.; Flat Top District, 43½ cents; Coal Valley, 50 cents; Kanawha Valley, 60 cents.

WYOMING.

ALBANY COUNTY.

(From Our Special Correspondent.)

**OTRAS MINING COMPANY.**—The mill of this company is producing about \$1,000 of gold bullion per week. In addition, the company is shipping a considerable amount of refractory ore to Denver.

CARBON COUNTY.

(From our Special Correspondent.)

**GOLD HILL INVESTMENT COMPANY.**—This company has been organized with the following incorporators: P. J. Quealy, Vice-President of the Rock Springs Coal Company; C. R. Kelsey, Superintendent of the Rock Springs Coal Company; A. Kendall, Cashier of the First National Bank of

Rock Springs; M. B. Dawson, Cashier of the Wyoming National Bank, of Laramie, and C. W. Wilkinson, Secretary of the Wyoming Investment Company, Laramie. The object of the company is to sell mines, negotiate loans, and do a general business in conveying and abstracts. The head office will be at Gold Hill, and branch offices at Rock Springs and Laramie.

FOREIGN MINING NEWS.

AUSTRALIA.

NEW SOUTH WALES.

The present position of the coal trade of South Wales would indicate that the summit of the trade cycle has been reached and that the descent has commenced. The value of coal in New South Wales has been as high as 15s. 6d. per ton, and it is commonly believed in the district, says the London *Financial News*, that the local colliery proprietors are making as much as 4s. to 5s. per ton clear profit on the sales. To-day the very best coal can be bought for 14s. 6d., and the demand is languid, although no such decrease has taken place as to lead to any fear of an immediate heavy drop. The reports of coal companies just issued show how large have been the profits of the South Wales collieries, one concern having made £96,000 clear profit upon a capital of £675,000 within eight months. It is the decision of ship-owners to lay up their vessels—nearly 300 steamers being now in idleness—which has caused more immediately the reduction in price, and no hope of advance is entertained, because the condition of the iron trade will throw upon the merchants the heavy quantities of steam coal hitherto consumed in the ironworks.

**BROKEN HILL PROPRIETARY COMPANY.**—The yield of this company's mines for January and February was as follows:

	Ore treated.	Lead.	Silver.
	Tons.	Tons.	Ounces.
Four weeks ending Jan. 29.	20,366	4,070	783,328
Feb. 26.	19,400	3,688	750,230

Since January 1st three dividends of £96,000 each have been declared. Arrangements are now being made to increase the plant in order to make a larger output possible.

QUEENSLAND.

**MOUNT MORGAN GOLD MINING COMPANY.**—During 1890 this company paid dividends to the amount of £700,000, which was 14s. per share. The par value of the latter is £1, (17s. 6d. being paid). All ore mined during the year was from the open cuts in the top of the mountain, scarcity of timber preventing working under ground. It is expected that this difficulty will be overcome this year, however. The company is now about to construct a railway from Kabra to the Mount.

CANADA.

PROVINCE OF ONTARIO.

The Commissioner of Crown lands announced recently in the Legislature that it is the intention of the government to establish shortly a bureau of mines under the control of mining directors.

**BADGER.**—Mr. H. N. Nichols is superintending operations at the Badger and Porcupine mines, and says he is making all necessary preparations for the season's work. The mill is not working at present owing to repairs and a general enlargement, which it is now undergoing. The want of water is also severely felt. It will probably be ready in time for the first thaw, when it will be put in full operation. A tramway between the Badger and Porcupine is also in course of construction. There are about 65 men at work in the mine at present. The mill at the Badger and Porcupine mines is being enlarged and its capacity generally increased.

(From an Occasional Correspondent.)

**LEDYARD.**—Some New York parties have leased the Ledyard iron mine, in Belmont township, county of Peterboro, and intend to build a railway to the mine from the Canadian Pacific Railway, which is about six miles distant. Analyses recently made of this ore show a large percentage of iron, very free from impurities, as follows:

	Metallic iron.	Phosphorus.	Sulphur.
No. 1 pit.	63.13%	.023%	.004%
" 2 "	68.33	.016	.037
" 3 "	69.85	.013	.012
" 3 "	70.326	.0056	.0023

No. 1 pit is about 175 feet north of No. 2, and No. 3 pit is about 200 feet east of No. 2, and over 300 feet from No. 1. The ore bed appears to extend more than 600 feet north and south, by over 400 feet in width, in some places. A diamond drill is now testing the property to show the depth of ore, with very encouraging results so far. In the first drill hole, which was started in solid rock, several layers of ore have been passed through, one being 15 feet thick, and at a depth of 75 feet the drill is now in ore.

MEXICO.

LOWER CALIFORNIA.

(From our Special Correspondent.)

Mr. George Box, an English gentleman who recently returned from this region, says that he found several very promising veins there. He went as far south as Muleje, crossing to the gulf side at Calamojue. The country is very sparsely settled,

though full of mineral. Mr. Box discovered and denounced several claims in the Calamojue district. The ore is a hard, flinty quartz carrying galena and lead carbonate, and about 30 ounces of silver per ton. It can readily be concentrated to a product worth over \$100 per ton. The veins are from two to six feet in width. Twelve miles from Mr. Box's camp the Cranz Bros. have some valuable property, on which they have a crushing and concentrating plant. The product is shipped to Denver, and it is stated that it carries upward of \$150 per ton.

MEETINGS.

Justice Mining Company, at the office of the company, room 28, Jacobson Building, Denver, Colo., May 11, at 10 o'clock.

Empire Gold and Silver Mill and Mining Company, at the office of the company, No. 325 Montgomery street, San Francisco, Cal., April 21, at 7:30 P. M.

DIVIDENDS.

Alice Mining Company, dividend No. 27 of .06½ cents per share, \$25,000, payable April 25th at the office of the company, in Butte, Mont.

Adams Mining Company, dividend No. 39 of five cents per share, \$7,500, payable April 30th.

Bates Hunter Mining Company, dividend No. 1 of .00½ per share, \$2,500, payable April 25th at the office of the company, Room 7, Patterson & Thomas Block, Denver, Colo.

Coeur d'Alene Silver Lead Mining Company, dividend No. 12 of four cents per share, \$20,000, payable April 28th at the office of Messrs. Hoge, Brownlee & Co.

Daly Mining Company, dividend No. 50 of 25c. per share, \$37,500, payable April 30th at the office of Messrs. Lounsbury & Co., Mills Building, No. 15 Broad street, New York City. Transfer-books close April 25th and reopen May 1st.

Homestake Mining Company, dividend No. 143 of ten cents per share, \$15,500, payable April 25th at the office of Messrs. Lounsbury & Co., Mills Building, No. 15 Broad street, New York City. Transfer-books close April 20th and reopen April 26th.

Mammoth Mining Company, dividend No. 31 of ten cents per share, \$40,000, payable April 20th at the office of the company, in Salt Lake City, Utah.

Mollie Gibson Consolidated Mining and Milling Company, dividend No. 2 of five cents per share, \$50,000, payable April 25th at the office of the company in Colorado Springs, Colo.

Ontario Silver Mining Company, dividend No. 179, of 50 cents per share, \$75,000, payable April 30th at the office of Messrs. Lounsbury & Co., Mills Building, No. 15 Broad street, New York City. Transfer-books close April 25th and reopen May 1st.

ASSESSMENTS.

COMPANY.	No.	When levied.	D't'd't in office.	Day of sale.	Amnt per share.
Alliance, Utah.....	12	Feb. 24	Mar. 31	Apr. 20	.10
Alpha, Nev.....	6	Mar. 14	Apr. 17	May 7	.25
Andes, Nev.....	37	Apr. 1	May 8	May 28	.30
Big Hole Placer, Ut.....	29	Mar. 10	Apr. 22	May 12	.01
Chollar, Nev.....	29	Apr. 3	May 12	June 2	.50
Cons. New York, Nev.....	5	Apr. 3	May 8	May 19	.15
Con. St. Gothard, Cal	2	Feb. 12	Mar. 31	Apr. 20	.15
C. smolpilton, Nev.....	6	Feb. 24	Apr. 7	Apr. 29	.10
Guscaran & Cal., C. A.....	4	Mar. 10	Apr. 15	May 4	5.00
Hale & Norcross, Nev	90	Mar. 17	Apr. 22	May 14	.50
Kentucky, Nev.....	1	Mar. 31	May 5	May 26	.20
Lady Washington.....	8	Mar. 3	Apr. 7	Apr. 28	.20
Mexican, Nev.....	42	Mar. 9	Apr. 14	May 5	.25
Nevada Queen, Nev	7	Mar. 4	Apr. 10	Apr. 30	.15
Silver King, Ariz.....	5	Feb. 21	Mar. 30	Apr. 28	.20
Teresa, Mex.....	3	Mar. 25	May 1	May 19	.10

MINING STOCKS.

For complete quotations of shares listed in New York, Boston, San Francisco, Baltimore, Denver, Kansas City, St. Louis, Pittsburg, Birmingham, Ala.; London and Paris, see pages 487 and 488.

NEW YORK, Friday Evening, April 17.

The mining stock market during the week under review was somewhat better than was promised at the last writing. The Comstocks, under western manipulation, have taken an upward stride. Values on the New York Exchange were quick to respond. The western markets are all reported active, and much loose eastern stock is being picked by Westerners. The transactions, though somewhat under those of weeks past, have taken a wide range, and show a pretty general inquiry. Values are being well maintained. It looks just as if affairs were being worked into shape to do a good spring business.

The sales for the week aggregated 70,960 shares, of which 23,200 shares were of dividend stocks. The sales for the corresponding week in 1890 were 142,050.

Of the Comstocks, Comstock Tunnel did not figure as conspicuously in the market this week as it has during the few weeks past. Its remains about where it was placed last Friday, namely 19c. and 20c. The bear movement in this stock is becoming more and more manifest. The company announces its readiness to pay on May 1st coupon No. 3 of its

bonds, the same being a semi-annual payment for two per cent. of the capital stock, amounting to \$33,150. The next payment will fall due on November 1st, 1891. In the face of this call and the new contracts with the mining companies, the marked decline of values which has been chronicled from week to week proves conclusively that there are other than natural agencies which effect the price of the stock. The sales aggregated 1,700 shares. The bonds were traded in on Wednesday only and to the extent of 10,500 shares. The quotation was 37% and 40%. There was no scrip brought out. Consolidated California and Virginia regained a little of its old activity. There were a great many small sales, aggregating 1,450 shares. Starting at \$12.25, the previous week's closing, the stock, upon favorable reports from the San Francisco Stock Exchange, rapidly rose until \$14 was reached yesterday. A reaction to \$13.75 occurred to-day. This morning's San Francisco quotation was \$14.16. Crown Point at \$2.50; Savage at \$2.85 and Alta at \$1.10; Gould & Curry at \$3.30, were in the market on Monday, each to the extent of 100 shares. Ophir opened on a small sale Saturday, at \$6.13, about the average of last week's closing. When next heard from on Wednesday it sold at \$8.75, receiving the same quotation the day following. There was no movement in the stock on the local exchange, and no demand for it. The use was brought about solely through western reports. Yellow Jacket was comparatively active at slightly reduced values. It opened on Saturday at \$2.80, sold up to \$3.15 on Wednesday, and closed yesterday at \$2.90 on 600 shares. Best & Belcher was hardly active enough to show the wide range of fluctuations manifest by its quotations. It opened on Saturday at \$6.53 and closed on Wednesday at \$8. Bullion maintained its rate of last week, closing at \$2.60. Chollar showed slightly increased values. It opened on Monday at \$2.85 and closed Thursday at \$2.35, as against \$2.90 of the week previous. Its sales aggregated 750 shares. Exchequer sold 120 shares on Wednesday. Its highest quotation last week was \$1.10. Julia was very quiet at 35c. and 36c., the same being slightly increased values. Mexican sold 200 shares at \$4 and \$4.25. Occidental, with a closing of \$1.20, opened the week on Tuesday at \$1.25, at which figure it closed to-day. Sales were moderately active. Potosi, which was quoted last on April 1st at \$4.30, sold as high as \$4.75 on Wednesday. The week's transactions involved 400 shares. Scorpion opened at 30c. as against the closing of 46c., recovered to and closed at 47c. on Wednesday. Union Consolidated, which sold last on March 19th at \$3.75, disposed of two lots consisting of 150 shares, at \$3.60 and \$4, the latter being the closing. Utah from \$1.20 of last week opened Monday at \$1.25, rose to \$1.35 and closed to \$1.30 on sales of 400 shares. Hale & Norcross, which closed at \$2.25 last week, did not enter the market until Wednesday when it sold at \$4. Yesterday it was quoted at \$4.25, ex-assessment. Sierra Nevada received a sale on Tuesday at \$3.35 as against \$3.50 April 3d. It rose to \$3.80 on Wednesday, reacting and closed at \$3.50; 300 shares changed hands.

The only copper stock in the market was Allouez which is to be credited with 100 share transaction on Wednesday at \$3.50. This is a little below its last week Boston quotation.

Of the Colorado stocks we note transactions in 400 shares of Aspen at \$5. The last sale of this stock was at \$5.50 on April 4th. The number of shares are greater than had appeared on the board this year. Chrysolite, after a week's absence, sold quite actively at 20@24c., the latter being the closing price; 1,100 shares were involved. In Leadville Consolidated transactions of 1,600 shares received a quotation of 11c. and 12c. Little Chief, from the closing of 33c., sold off on Tuesday at 31c., recovering and closing at 33c. to-day. One thousand four hundred shares of Robinson Consolidated were taken at 45c. This stock, which could be had for a song a few months ago, is being quietly gathered in by Western parties, who seem to know its value. Small Hopes sold 100 shares on Saturday at 85c., a repetition of its last week's history. American Flag sold 500 shares on Wednesday at 2c. Laerosse sold 300 shares to-day at 6c. The stock is a stranger in the market.

Of the California stocks we note a 100-sale transaction on Saturday in Bodie Consolidated at \$1.30 as against \$1.20 of March 29th. Astoria was quite active at 2c. during the week up to to-day, when it received the quotation of 4c. Last week it sold as low as 1c. Belmont was remarkably firm at 4c. and 43c.; sales aggregated 2,900 shares. Bulwer sold on Saturday at 14c., its last week's quotation. Plymouth remained firm at \$2 on very light sales. Brunswick held rigidly to the quotation of 10c. during the week, as against an average of 9c. during the previous week. It sold 2,000 shares. Middle Bar fluctuated between 2c. and 3c., closing at the latter figure; 7,400 shares were involved. Standards which received its last sale on March 24th at \$1.25, entered the market to-day at \$1.35.

There was started during the early part of the week a change movement to boom Caledonia. From a quotation of 75c. it rose to 85c., but slumped to 73c., the closing of to-day. The stock is all in strong hands, and as near as can be learned the mine has made a small output of bullion during the month of March. It is very hard work to obtain any data concerning the property, perhaps

for the reason that there is very little obtainable. There will be a meeting of the stockholders some time in June, and it is understood that an attempt will be made to place a control of the property in other hands. Just at the present time the brokers are selling short and waiting for an assessment. Father de Smet is another one of those Black Hill properties which stockholders would like to know more about. There is considerable inquiry after the stock, and it is being taken whenever offered at gradually increased prices. The last quotation of 400 shares was sold at 40c.

Horn Silver developed a gratifying strength during the week. It opened strong at \$3.35, and after an active career closed at \$3.50, the highest point reached in some time. A stray lot of Ontario, consisting of 10 shares, sold on Thursday at \$30.

Phoenix of Arizona, comparatively speaking, was remarkably quiet. It sold as low as 33c.; closed yesterday at 45c. The sales amounted to 1,200 shares.

Of the Idaho stocks, Castle Creek sold 1,000 shares at 1@2c.; Shoshone, 300 shares at 1c.; Holyoke, 300 shares at 3c.

El Cristo was moderately active at figures ranging from 40@50c. It sold 1,300 shares.

Mutual Smelting & Mining was more quiet than it was for some months. A single transaction occurred, consisting of 100 shares, which changed hands on Tuesday.

**Boston.** April 16.

(From our Special Correspondent.)

There has been a fairly active market in copper stocks the past week, but prices have tended toward a lower level. There is more disposition to sell than to buy, and there is nothing in the outlook at present to induce an active speculation. Calumet & Hecla declined to \$260, which is \$20 lower than sales made on the 31st ult.

Tamarack declined from \$157½, dividend \$4 on, to \$150 ex-dividend, a net decline of \$3½ for the week.

Boston & Montana has been quite active this week, considerable stock being pressed for sale, resulting in a decline from \$43¾ to \$41¼, with a rally to \$42.

Quincy has improved, selling up from \$102 to \$108½.

Osceola has held fairly well, although there have been quite large offerings of the stock. It sold early in the week at \$38½, and declined to \$36 for a small lot, with later sales at \$30½. Butte & Boston was steady at \$15¼@15½, a loss of only ¼ for the week.

Franklin has been more largely dealt in this week, and, although it declined to \$15½, has recovered and closes fairly steady at \$17.

Kearsarge and Centennial have both been inactive, with very little change in quotations.

Atlantic, in which there has been nothing doing the past two weeks, declined from \$17¼ to \$15½, with a closing sale at \$16.

Allouez is quite firm at \$3¼@3½.

National sold at \$3, and Huron at \$2½.

Santa Fe sold up to 60c., and Bonanza at the same figure.

Pontiac sold at 25c., and Arnold at 55c., assessment 25c. per share paid.

Silver stocks were in slightly better demand. There were sales of Dunkin at 65@67½c. Napa Quicksilver sold at \$3¾@4.

3 P. M.—The market since noon has been dull and prices but little changed. Boston & Montana was up to \$42½—a gain of a fraction.

By Telegraph.—Calumet & Hecla, \$260; Tamarack, \$145 bid; Quincy, \$105; Boston & Montana, \$42½; Osceola, \$30 bid; Franklin, \$16½ bid; Butte & Boston, \$13½; Kearsarge, \$14.

**San Francisco.** April 9.

(From our Special Correspondent.)

Last week the market was essentially a chipping one, and, in the absence of any large operators, the tendency of prices was to decline. This week, so far, it has become utterly demoralized under the severe hammering which certain of the leading stocks received at the hands of one or two prominent brokers. Rather curiously, this state of things immediately followed the reappearance in the city of John W. Mackay on his return from the East. The street has been clamoring for his presence, believing that he alone could bring stability and permanence to the market that for several weeks past has shown fairly healthy indications. Whether Mr. Mackay is in a measure responsible for the decline and irregularity in prices this week is uncertain, but certain of the old timers, having a lively recollection of what his appearance on Pine street meant, took the opportunity to short this market, and have consequently come out ahead on the deal. Notwithstanding the increased output of the mines, Consolidated California & Virginia sold down to \$12.50 last Saturday. There was no meeting of the board on Monday, on account of the funeral of one of its members. On Tuesday the price fluctuated, at no time selling higher than \$12.75, although the advance in the battery assays for the week amounted to \$2.20 per ton. Yesterday, at the opening session of the board, it was battered down to \$11, and later in the day sold for \$10.62½. Small margin-holders were forced to let go, and the sales in consequence were very large.

While the bonanza stock was selling so low,

Potosi developed unwonted strength and advanced from \$3.65 to \$4.25. This stock has for some time been a "back number," and, possessing no exceptional merit, has not been showing much activity. The present advance, however, served its purpose. The other stocks of the middle group responded to Potosi's advance, and finally the general market recovered from the general onslaught.

This morning Consolidated Virginia opened at \$12.25, closing at \$12.50; Ophir touched the \$6 point; Best & Belcher sold at \$6.75, an advance over yesterday's prices of 75 cents, and Overman at \$4.05, an advance of 40 cents.

The other Comstocks have followed the example of the leaders, and are also selling to-day at slight advances.

In the excitement of falling prices yesterday Baltimore, Consolidated Pacific, E. Best & Belcher, Iowa, North Gould & Curry and North Savage were shelved, and left severally alone, to be trotted out again, of course, when the market begins to boom again.

By Telegraph.—The quotations at 10 A. M. Friday the 17th inst., were as follows: Alta, \$1.15; Best & Belcher, \$7½; Belle Isle, 60c.; Bodie, \$1.20; Bulwer, 40c.; Consolidated California & Virginia, \$14½; Chollar, \$3.50; Crown Point, \$2.90; Commonwealth, 80c.; Eureka Consolidated, \$3.75; Gould & Curry, \$3.55; Hall & Norcross, \$3.55; Mexican, \$4.20; Mono, 65c.; Narazo, 25c.; North Belle Isle, 75c.; Nevada Queen, 40c.; Ophir, \$8½; Potosi, \$4.50; Savage, \$3.40; Sierra Nevada, \$3.75; Union Consolidated, \$4.20; Utah, \$1.25; Yellow Jacket, \$3.15.

**Denver.**

Prices and sales for the week ending April 11th, 1891:

Company.	Open.	H.	L.	Clos.	Sales.
Mines.	ing.			ing.	
Alleghany	12b	16	15	15	300
Amity	5¼	6¾	6	6¾	15,100
Bangkok C.-B.	69½	69½	68¾	68	15,400
Bates Hunter	64b	71	64	71	2,500
Brownlow	66¼b	67¾	67	67¾	1,900
Calliope	18¼b	19	17½	19	600
Cash	12b			12	
Clay County	105b	110	106	109	1,600
Leavenworth	194b			19	
Little Rule	106b	110	106	108	1,500
Matchless	275b			275	
May-Mazeppa	122b	122	122	121	900
Oro					
Pay Rock	63¼b	63½	63¼	63	5,000
Puzzler	66¼b	68¼	66¼	67	16,300
Reed National	70a				
Running Lode	19b	19¾	19¾	19¾	300
W. Hale					
Bal. Smuggler	111	111	107	110	1,200
Prospects					
Argonaut	16b	16	16	16	1,400
Big Indian	10b	10	10	69¾	500
Big Six	20	20	17¾	17¾	6,900
Century	26b			26	
Claudia J.	68¼	68¼	67¾	67¾	8,100
Nat. G. & Oil Co.	169¼b	17	15½	15	10,700
Diamond B.	65¼	69¾	65	69	133,400
Emmons	44¼	47	44¼	44¼	8,500
Golden Treas.	33b	35	32	33½	2,400
Ironclad	65¼b	66¾	65¼	65¼	30,900
John Jay	66b	10½	64	69½	64,100
Justice	13¾b	14	13½	13	200
Legal Tender	65¼	66¾	64¼	65¼	13,700
Morning Glimp					
Park Consolidated	18¼b			18b	
Potosi	68b	68¾	68¼	68¼	3,300
Rialto	100a	92	91	90	1,100
Total					347,600

\* Buyer 30. † Buyer 60. ‡ Seller 60. § Seller 30. a Asked b Bid.

**St. Louis.** April 15.

(From our Special Correspondent.)

The mining markets has been quite active this week, and the sales aggregate higher than usual. As customary, a few stocks monopolized both trades and prices. Prices continue to rise on all but a few stocks. The Mining Exchange experienced a surprise in the disappearance of its treasurer, Mr. Page McPherson, which has been noted in the daily papers. Mr. McPherson was a member of the firm of McPherson, Switzer & Co., which carries on a general brokerage business. He has been the treasurer of the Exchange since its organization. As regards his connection with the Exchange, he had in his possession \$2,000 in East St. Louis bonds and \$400 in cash, all of which disappeared with him. The Exchange holds his bond, issued by the Fidelity & Casualty Company, for \$1,000.

Granite Mountain still remains at \$25. The market opened at \$25.50 and has fluctuated all the week between that figure and \$25. There was no sale of stock during the week, the market remaining very quiet. The shipments for the week amounted to 45 bars, containing 39,750 ounces of silver and 112 ounces of gold.

Adams was active this week, and, in addition to several sales rose considerably in price. The market opened at \$1.75, was quoted on Friday at 1.77½. On Monday, when the 5c. dividend was declared, the stock struck a boom and went up rapidly to \$1.90. Tuesday found the stock still at \$1.90. To-day, however, the price has dropped to \$1.85 bid. During the week 600 shares were sold, of which 100 sold for \$1.75, 100 shares at \$1.85, and the remaining 400 shares brought \$1.90.

Little Albert was in good demand all week, and some 7,600 shares of stock were sold. Of this number 3,000 brought 10¼c., while of the remaining

4,600 shares most of it sold at 11c. The stock opened at 11c. and closes at 10c.

Montrose fell off slightly this week. The stock opened at 75c., but soon fell to 70c., then to 65c., recovered and rose to 68 $\frac{1}{2}$ c., and finally closed at 60c. Sales amounted to 1,000 shares, of which the greater part went at 70c.

Green is having a slight reaction from its recent boom, and the stock is again approaching a reasonable figure. The stock opened at \$1.20, with sales amounting to 2,100 shares. Friday, 400 shares sold at \$1.15. Saturday, 1,000 shares sold at \$1.12 $\frac{1}{2}$ . On Monday a strike was reported, and the stock rapidly rose to \$1.25, with 700 shares sold. This report was not confirmed at the office of the company, however, and on Tuesday the stock fell back to \$1.12 $\frac{1}{2}$ , with 1,200 shares sold. To-day the market is quoted at \$1.07 $\frac{1}{2}$ . At a meeting of the stockholders of the company a majority voted to sell the property to the French syndicate. Two-thirds of the total number of shares held were voted in its favor.

Elizabeth is coming back into favor again. The stock opened at \$1.32 $\frac{1}{2}$ , went up to \$1.55, then to \$1.60, to \$1.70; a reaction set in, however, and the stock fell to \$1.68 $\frac{1}{2}$ . Sales amounted to 2,300 shares.

Two thousand shares of Yuma were sold this week. The opening quotation on the stock was 75c.; 400 shares sold Friday at 78 $\frac{1}{2}$ c., and on Monday 1,600 shares sold at 85c. The market closes firm at 80c.

Central silver was dealt in less this week than it has been for some time. The stock opened at 2 $\frac{1}{2}$ c. and closes at 3c. During the latter part of the week 4,400 shares sold at from 4c. to 5c.

Bi-metallic had a sale of 10 shares at \$35; the stock closes at \$34.50.

American & Nettie rose from 17 $\frac{1}{2}$ c. to 22 $\frac{1}{2}$ c.; no sales.

**Salt Lake City.**

**PRICES AND SALES FOR THE WEEK ENDING APRIL 11, 1891.**

Name and Location of Company.	Open- ing.	High- est.	Low- est.	Clos- ing.	Sales.
Alice, Mont. ....	1.80	1.80	1.50	1.80	.....
Alliance, Utah. ....	.....	.....	.....	.....	.....
Anchor, Utah. ....	6.65	6.65	6.50	6.50	.....
Apex, Utah. ....	.10	.11	.10	.10 $\frac{1}{2}$	8,500
Barnes Sulphur, Utah	.01	.01 $\frac{1}{2}$	.01	.01	.....
Big Hole Placer, Mont	.07	.10	.04	.08	12,300
Centen'l Eureka, Utah	.....	.....	.....	.....	.....
Congo, Utah. ....	.22	.22	.20	.20	6,000
Crescent, Utah. ....	.33	.35	.29	.33	1,450
Daly, Utah. ....	18.75	18.75	18.50	18.63	.....
Glencoe, Utah. ....	4.20	4.20	3.00	4.20	100
Horn Silver, Utah. ....	3.00	3.20	2.50	3.15	800
Malad Con., Idaho. ....	.02	.03	.01	.02	21,500
Mammoth, Utah. ....	3.62	3.75	3.40	3.70	12,000
Northern Spy, Utah. ....	.....	.....	.....	.....	.....
Ontario, Utah. ....	.....	.....	.....	.....	.....
Stanley, Utah. ....	.15	.19	.12 $\frac{1}{2}$	.17 $\frac{1}{2}$	4,500
Utah S. & C. Co. ....	8.25	8.40	8.25	8.25	50
Utah Oil Co., Utah. ....	.....	.....	.....	.....	.....
Woodside, Utah. ....	.....	.....	.....	.....	.....
<b>Total sales. ....</b>					<b>56,400</b>

**PIPE LINE CERTIFICATES.**

(Specially reported by Messrs. Watson & Gibson.)

The petroleum market this week has been higher or Buckeye and lower for National Transit certificates. The former were strong to-day and some inquiry was made for them. They were quoted around 18 cents per barrel. One fact which may be significant, is that, while the stock of this Ohio oil increased 420,000 barrels in March, there was an increase in issued certificates, technically known as "Acceptances," of 7,000,000 barrels, as shown by the following statement:

February 28th:	March 31st:
Credit balances (book credits) in barrels. ....	Credit balances. ....
13,128,789	6,553,947
Acceptances. ....	Acceptances. ....
8,408,000	13,404,030
<b>Total stock. ....</b>	<b>Total stock. ....</b>
<b>21,537,789</b>	<b>21,957,947</b>

This conversion of book credits into negotiable certificates may easily mean that the owners of this Ohio oil are preparing for a movement in the market when they may deem speculative conditions favorable.

Ohio oil is relatively so much lower than Pennsylvania oil, and the quantity of it is so much greater (the Pennsylvania stock is 8,564,000 against 8,092,000 in December) that any speculation in petroleum would naturally run into the Ohio article.

**CONSOLIDATED STOCK AND PETROLEUM EXCHANGE.**

Opening.	Highest.	Lowest.	Closing.	Sales.	
April 11. ....	.....	.....	.....	.....	
13. ....	73	73	73	5,000	
14. ....	73	73	73	8,000	
15. ....	72 $\frac{3}{4}$	73	72 $\frac{3}{4}$	30,000	
16. ....	72	72	70 $\frac{1}{2}$	11,000	
17. ....	70	70 $\frac{1}{2}$	69 $\frac{3}{4}$	21,000	
<b>Total sales in barrels. ....</b>					<b>75,000</b>

**NEW YORK STOCK EXCHANGE.**

Opening.	Highest.	Lowest.	Closing.	Sales.	
April 11. ....	.....	.....	.....	.....	
13. ....	.....	.....	.....	.....	
14. ....	.....	.....	.....	.....	
15. ....	73	73	73	5,000	
16. ....	.....	.....	.....	.....	
17. ....	.....	.....	.....	.....	
<b>Total sales in barrels. ....</b>					<b>5,000</b>

**COAL TRADE REVIEW.**

NEW YORK, Friday Evening, April 17.

STATEMENT of shipments of anthracite coal (approximate) for the ten days ending April 11th, 1891, compared with corresponding period last year.

Regions.	Apr. 11, 1891.	Apr. 12, 1890.	Difference.
Wyoming Region, Tons	299,699	301,783	Dec. 2,084
Lehigh Region "	104,083	122,449	Dec. 18,366
Schuylkill Region "	190,355	179,415	Inc. 10,950
<b>Total. .... Tons</b>	<b>594,147</b>	<b>603,647</b>	<b>Dec. 9,500</b>
<b>Total for year to date</b>	<b>9,059,671</b>	<b>7,283,209</b>	<b>Inc. 1,773,462</b>

STATEMENT of anthracite coal shipments for month of March, 1891, compared with the corresponding period last year. Compiled from returns furnished by the mine operators:

Regions.	March, 1891.	March, 1890.	Difference.
Wyoming Region, Tons	1,306,210	1,056,477	Inc. 243,762
Lehigh Region. ....	389,331	434,966	Dec. 35,585
Schuylkill Region "	815,838	614,016	Inc. 201,821
<b>Total. ....</b>	<b>2,515,459</b>	<b>2,105,459</b>	<b>Inc. 409,998</b>

Regions.	For year 1891.	For year 1890.	Difference.
Wyoming Region, Tons	4,219,737	3,092,543	Inc. 1,127,194
Lehigh Region. ....	1,273,529	1,293,432	Dec. 12,903
Schuylkill Region "	2,538,355	1,855,516	Inc. 672,839
<b>Total. ....</b>	<b>8,031,621</b>	<b>6,244,491</b>	<b>Inc. 1,787,130</b>

The stock of coal on hand at tidewater shipping points, March 31st, 1891, was 781,587 tons; on February 28th, 1891, 841,682 tons; decrease, 57,095 tons.

**PRODUCTION OF BITUMINOUS COAL for week ending April 11th and year from January 1st: EASTERN AND NORTHERN SHIPMENTS.**

	Week.	Year.	1890.
Phila. & Erie R.R. ....	1,333	38,912	35,439
Cumberland, Md. ....	87,125	1,202,400	1,053,005
Barclay, Pa. ....	3,205	46,686	40,194
Broad Top, Pa. ....	7,178	167,826	156,939
Clearfield, Pa. ....	84,384	1,241,303	1,142,114
Allegheny, Pa. ....	29,371	393,012	414,352
Beach Creek, Pa. ....	39,173	651,763	541,992
Pocahontas Flat Top. ....	45,265	647,225	597,487
Kanawha, W. Va. ....	132,627	624,982	594,520
<b>Total. ....</b>	<b>330,963</b>	<b>5,019,009</b>	<b>4,486,702</b>

\* Estimated. Week ending April 7th.

**WESTERN SHIPMENTS.**

Pittsburg, Pa. ....	16,463	249,518	264,991
Westmoreland, Pa. ....	31,330	569,326	512,898
Monongahela, Pa. ....	8,153	152,700	63,405
<b>Total. ....</b>	<b>58,946</b>	<b>1,016,544</b>	<b>841,264</b>

Grand total. .... 389,909 6,035,553 5,377,966

PRODUCTION OF COKE on line of Pennsylvania R. R. for the week ending April 11th, 1891, and year from January 1st, in tons of 2,000 lbs.: Week, 35,483 tons; year, 843,595 tons; to corresponding date in 1890—1,665,277.

**Anthracite.**

The output for the week ending April 11th was 594,147 tons, a decrease of 9,500 tons over the corresponding period in 1890. The total production for the year to date is 9,059,671 tons, an increase over 1890 of 1,773,462 tons.

There has been developed during the week under review a much stronger feeling in the anthracite trade, a fact which has been manifest by an increased volume of business at circular prices. There is but one cause to which this improvement can be attributed, viz., a realization by the trade that the operators are in earnest on the subject of restricting production, and that restriction of the most radical kind is now, and has been for some time past, going on. The Lehigh Valley collieries have operated but two days this week. The Reading Coal and Iron Company has suspended indefinitely all operations at the Elmwood and Schuylkill collieries. Its other collieries will be worked four days each week. Other of the anthracite companies are taking an equally radical means towards restriction. Notwithstanding this, the market is far from being all that would be wished. While there is this improvement, the waiting policy is still manifest, although in a less degree than in previous weeks. The next meeting of the sales agents will be on the 21st, at which the May output and May prices will be fixed. The belief of the wholesale trade is that, if there be any change in the April circular, it will be an increase rather than a decrease.

The Coxe Bros. case is nearing an end. The Lehigh Valley Railroad Company, under the terms of the Inter-State Commerce act, cannot give one shipper the benefit of a reduction without making the same available to all. The law also requires the posting of notices of any proposed reduction three days before the same is to go into effect. The date fixed by the commission for a reduction in tolls is April 20th. Consequently, a

notice of the same should have been given to-day, or yesterday, if Sunday be reckoned as a holiday. At the time of writing, knowledge of such action has not reached the city, leaving the inference that the company, as stated in these columns two weeks ago, will not notice the matter unless compelled to do so by the courts.

The demand for steam sizes is very good, while the call for egg and broken is increasing. We quote the April circular, which is being rigidly maintained, f.o.b. net; Egg, \$3.50; broken, \$3.60; stove, \$3.75; chestnut, \$3.50.

**Bituminous.**

As told exclusively in the ENGINEERING AND MINING JOURNAL, the soft coal operators of the Clearfield region last week held a meeting with the sales agents of the line trade, which resulted in an agreement calculated to avoid competition in prices. During the period under review the Cumberland operators and their agents held a similar conference and with the same result. These agreements are designed to bear the same relation to the line trade as does the Seaboard Association's agreement to the coastwise trade. Its terms are not generally known, further than that the price of coal has been fixed at \$1.10 at the mine. The 10 cents go as a commission when there is a middleman. When dealing direct with the consumer, the operator receives the benefit of this amount. The action of the operators in coming to an agreement along all lines of the trade shows that there are in existence a good feeling and a faith in one another, all of which speaks well for the future.

Trade, though very quiet, is improving. Contracts are being gathered in quite rapidly by some of the companies; others are not doing their usual spring business. About 15% of those which are being placed are for a much smaller tonnage than was taken last year. The supposition is that these buyers expect a decline in rates later on. This condition proves the buyer's belief in the present stability of rates.

Prices in the local market are the same as those last quoted, although very much stiffer, viz: \$3.15 f. o. b.; Amboys, \$3.40, alongside New York harbor.

Freights are up several points. We quote: Philadelphia to Boston, Salem and Portland, 90c; to Sound ports, 80c; Baltimore to Boston, Salem and Portland, \$1; to Sound ports, 85c.

The Connellsville strike which was inaugurated nine weeks ago is about over. The operators continue their inroads on the strikers' ranks, and one by one the different plants of the region are being started. The Frick company shipped 110 cars of coke on Thursday.

**NOTES OF THE WEEK.**

The National Steamship Line has applied for bids on 25,000 tons of soft coal.

The death of A. C. Clark, superintendent of the American Coal Company's mines, is reported. Mr. Parrett is his successor.

**Boston.** April 16.

(From our Special Correspondent.) Slowly but surely the anthracite coal market is improving in tone. The demand at present is not particularly good, but there is every indication of an early improvement. Agents claim that the curtailment is having the effect desired, and will undoubtedly relieve the market. As a general thing, coal held in the different hands is light, and it will not be long before they will be looking to replenish their meagre supplies. The price, which is only a trifle in advance of last year, is apparently all that serves to check the demand. This difference is almost offset by the low freights which are prevailing, so that it makes the actual cost of landing coal here this year about the same as it was last year. Agents are holding out for circular prices, but in most cases some little shading is being done. Stove offers at \$3.60, with but little movement for it.

The bituminous market continues to move in a monotonous way. The demand is comparatively small and is hardly what it was anticipated to be at this time. Contracts are being closed in a dragging sort of way and consequently do not give the best satisfaction. The prevailing figure is \$2.40 f. o. b., which is ten cents below the circular. Buyers are looking for more than this and in some cases are getting it. There really is not any spot inquiry.

Freights are holding easy. A large amount of coal is being moved, but an equally large number of vessels continue open to engagement. Buyers are of the opinion that another decline in rates is imminent. They reason that the inquiry for vessels for the ice carrying trade will be very small this year, and that coal freights must necessarily be low. From New York \$0 @ 55c. is quoted, from Philadelphia \$0 @ 90c., and from Baltimore \$1 @ \$1.10.

The retail demand is small and dealers are not anxious about the size of their stocks, which they think are ample for the present. The retail price is holding fairly well.

The receipts of coal at this port for the week ending April 11 were 94,427 tons of anthracite and 77,182 tons of bituminous, against 29,375 tons of anthracite and 8,591 tons of bituminous for the corresponding week last year. The total receipts thus far this year have been 344,173 tons of anthracite and 366,657 tons of bituminous, against 263,523 tons of anthracite and 251,764 tons of bituminous for the same time last year.

**Buffalo.** April 16.  
(From our Special Correspondent.)

Navigation opened at this port last Sunday. The propeller "Reynolds" left for Toledo. Since then several grain vessels have arrived from Toledo and Detroit, and a few vessels have left for Toledo with coal.

On Monday there was a large fleet of vessels chartered for coal at this port, nearly all being taken by one firm. The rates were as follows: 60 cents for Chicago, 50 cents for Milwaukee, 60 cents for Racine, 40 cents for Duluth and 40 cents for Toledo. The Detroit rate is fixed at 30 cents.

It is said that the amount of anhracite coal held over at ports named is as follows: Chicago, 185,000 tons; Milwaukee, 60,000 tons, and Duluth, 75,000 tons.

It is understood that the Grand Trunk coal contracts, in which our Buffalo dealers are interested, have not yet been awarded. "During the early part of the year," report says, "the company put in an extensive supply of coal on its old contracts, enough to keep the road going until next July. The figures at which coal was offered this year were so much higher than last year's that the company did not care to contract." The Buffalo market, on account of car service charges, is not heavily overstocked with bituminous coal, so that prices have not dropped to any extent, especially as the mines are all working on short time. Next month the Vanderbilt lines will be ready to make their yearly contracts, and this, it is expected, will stiffen the market.

The firm of W. H. Davis & Co., of this city wholesale coal dealers, has been dissolved. Mr. Davis will attend solely to his real estate interests, while Mr. O. W. Day, the junior partner, will take a short rest. Mr. Davis told a newspaper man yesterday, in speaking of the firm retiring from business, that "the outlook is too gloomy; and at best, for the next year or two, shippers and dealers will find but little profit."

The Welland canal, Canada, will open April 20th.

News comes this morning that a heavy north-east wind, with rain, opened the straits of Mackinaw yesterday, and that the passage to Lake Michigan is apparently unobstructed.

**Chicago.** April 15.  
(From our Special Correspondent.)

The coal business has been very quiet this week, and has been confined almost exclusively to the retail trade. Those owning docks are cleaning up and making repairs, in readiness to receive their next winter's stock. The railroad receipts were very light, in anticipation of trade decreasing very rapidly. Coke receipts are still very limited and have not increased any over last week, although a larger supply is now offered.

The new Chicago Coal Board is receiving considerable attention from our coal merchants, and the gentlemen at its head give a guarantee that it will be pushed to a successful issue. The organization is intended for and will be of especial benefit to those merchants who receive their coal over the railroads, and will be to them what the Board of Trade is to the grain trade. Great difficulty has been experienced by these merchants in anticipating their wants by the demurrage laws of the railroads. When a shipment arrives in this market the demand may have fallen off so that a ready sale cannot be effected. The demurrage charges of the railroads then compel the dealers to force the shipment on the market, which has an injurious effect on all prices. The plan is to bulletin all such coal and sell it in the Board, and thus avoid injuring regular prices. Open prices remain unchanged.

Prices of anthracite per ton of 2,000 pounds f. o. b. Chicago are: Lehigh lump, \$6.75; large egg, \$5; small egg, range, and chestnut, \$5.25. Retail prices per ton are: Large egg, \$6.25; small egg, range and chestnut, \$6.50.

Prices of bituminous per ton of 2,000 pounds f. o. b. Chicago are: Pittsburgh, \$3.25; Hocking Valley, \$3; Youghiogheny, \$3.40; Indiana block, \$2.30@2.50; Illinois block, \$2@2.20.

**Coke.**—Connellsville, 72-hour, per ton f. o. b. Chicago, \$5.05; crushed, \$5.40; Walston, \$5.20; New River, \$5.05.

**Pittsburg.** April 16.  
(From our Special Correspondent.)

**Coal.**—The market is firm and steady, with an active local demand. There are a large number of men at work in the various ports. The water in the Ohio has been at a stage ample for all purposes; coal has been shipped as fast as loaded to the Southern markets. Shipments for the first half of April were: Cincinnati, 1,581,000 bushels; Louisville, 2,889,000 bushels; total, 4,470,000 bushels. Prices unchanged.

**Connellsville Coke.**—Everything in regard to coke is unsettled. The coke strike will soon be a thing of the past. The coke men remain firm and refuse to have anything to say to the leaders of the strike. The coke scale has been fixed, and all work done will be in accordance with its terms; if the men chose to go to work they can do so. The number of ovens reported in blast exceeds 2,500, and is daily increasing; before the week closes 3,000 will be in operation. The production for the week was 21,280 tons; increase 8,161 tons. Shipments: Pittsburgh, 40 cars; west, 494; east, 174; total, 708.

There is no quoted price for coke; furnaces that have unfiled contracts must have a supply of coke about regard to cost.

**METAL MARKET.**

NEW YORK, Friday Evening, April 17.  
Prices of Silver Per Ounce Troy.

April	Sterling Exch'ge	London Price	N. Y. Cts.	April	Sterling Exch'ge	London Price	N. Y. Cts.
11	4.88	44 11-16	97 3/4	15	4.88	44 9-16	97 3/4
13	4.88	"	97 3/4	16	4.88	44 1/2	97 3/4
14	4.88	"	97 3/4	17	4.88	44 3/4	97 3/4

The bullion market is without features. The floating stock of silver is being gradually reduced by export demand, which, although not very active, is still absorbing considerable silver.

The United States Assay Office at New York reports the total receipts of silver for the week to be 121,000 ounces.

**Silver Bullion Certificates.**

April	H.	L.	Sales.
April 11	98	98	20,000
April 13	97 3/4	97 3/4	20,000
April 14	97 3/4	97 3/4	40,000
April 15	97 3/4	97 3/4	10,000
April 16	97 3/4	97 3/4	10,000
April 17	97 3/4	97 3/4	40,000

Total sales ..... 140,000

**Government Silver Purchases.**

The Treasury Department informs us that the amount of silver purchased by the Government during the past week was as follows:

April	Offered ounces.	Purchased ounces.	Average price.
13	960,030	242,100	97.99
15	1,083,000	483,000	97.73

WASHINGTON, D. C., April 17.—(By Telegraph)—The Treasury Department purchased 300,000 ounces of silver to-day.

**Domestic and Foreign Coin.**

The following are the latest market quotations for American and other coin:

	Bid.	Asked.
Trade dollars	76	79
Mexican dollars	76	77
Peruvian soles and Chilean pesos	73	75
English silver	4.86	4.88
Five francs	.94	.95
Victoria sovereigns	4.86	4.89
Twenty francs	3.86	3.88
Twenty marks	4.74	4.78
Spanish doubloons	15.55	15.70
Spanish 25 pesetas	4.80	4.85
Mexican doubloons	15.55	15.70
Mexican 20 pesos	19.50	19.90
Ten guilders	3.96	4.00
Bar silver	97 3/4	98

**Foreign Bank Statements.**

The governors of the Bank of England, at their weekly meeting on Thursday, advanced the minimum rate of discount from 3% to 3 1/4%. In the week the bank lost £610,000 bullion, but the proportion of reserve to liabilities was raised from 34.50% to 34.86%, against a rise from 43.90% to 45.30% in the corresponding week last year, when its discount rate was reduced from 3 3/4% to 3%. On the 16th inst. the bank gained £68,000 bullion on balance. The weekly statement of the Bank of France showed an increase in gold of 6,775,000 francs and a decrease in silver of 850,000 francs.

**Copper.**—We have to correct an error in our last report, of April 10, where we said that bids for round lots had been solicited at 13 1/4c; the price should have been 13 3/4c.

The market has been pretty much the same since Copper is freely obtainable from first hands at 13 3/4c, and we have not heard that any concessions have been made on this price. There is evidently little second-hand copper about, and the large companies, although not receiving orders for heavy quantities, still get in orders for fair amounts. It is anticipated that before long manufacturers and consumers who are known to have only light stocks will have to come freely into the market. Shipments from the Lakes by rail and water will soon be resumed, and this will bring the cost of copper down about 1/2c a pound, but whether the consumers will get the benefit of this saving or the companies reserve it for themselves it is impossible to say.

Arizona copper, pig, has been offered somewhat more freely of late and prices are easier, say 11 1/4 @ 11 3/4c, and this has also influenced Arizona ingot copper, which is now obtainable at from 12 1/2 to 13c. Casting copper has lost some of its firmness, and we have now to quote 11 1/4 @ 11 3/4c, according to quantities and brands. Consumption of this grade of copper appears to be quite satisfactory.

The Anaconda mine still remains closed, and it is not to be foreseen as yet when operations will be resumed.

The European market has been rather depressed, and values are slightly lower. No further sales of furnace material are reported, but prices for Chili bars have given way about 15s. for the week, closing for spot £51 5s. @ £51 7s. 6d., and for three months prompt, £51 10s. @ 51 12s. 6d. Our cable of to-day advises that the visible supply for this month, first half, has increased 1,200 tons. Small shipments of Chili bars have arrived in England without having been advised by cable, and it is estimated that about 500 tons monthly will be shipped from Chili. If these figures are correct it

means a diminution of about 2,000 tons monthly, and this, together with the closing down of the Anaconda mine, ought to tell on statistics very soon.

We quote: Tough copper, £53 15s. @ £54; best selected, £55 15s. @ £56; strong sheets, £60 @ £61; India sheets, £58 @ £58 10s.; yellow metal sheets, 5 1/2d.

The exports of copper during the past week were as follows:

To Hamburg—	Copper (old).	Lbs.	\$32
By S. S. Dama.....	10 bbis.	2,380	
" Dama.....	23 bars (bul.)	1,144	3,250
To Liverpool—	Copper Matte.	Lbs.	
By S. S. Holland.....	2,385 bags.	241,008	17,000
" City of Chicago.....	8,169 "	609,920	50,580
To Bordeaux—	Copper.	Lbs.	
By S. S. Chalean Lafitte	150 casks.	187,500	26,000
To Rotterdam—	Copper.	Lbs.	
By S. S. Werkendam...	90 casks.	112,500	15,700
" Werkendam...	382 casks.	109,855	15,380
To Havre—	Copper.	Lbs.	
By S. S. La Gascogne ..	90 casks.	112,500	15,750
" Gascogne.....	1,047 pckgs.	261,025	32,000

**Tin.**—Tin has had quite a break this week. Arrivals have been rather heavy lately, and, besides, the shipments advised from London and from the East to this country have been somewhat larger than anticipated, and this, with the flatter tendency of the market in London, weakened our market considerably. In the beginning of the week sales were made at 20c., and transactions have resulted at gradually declining prices, about 800 to 1,000 tons changing hands, and the closing prices are: Spot and April, 1970; May, 1970; June, 1975; July, 1975.

Shipments from the East to England from January 1st to April 15th have been 5,815 tons against 6,145 tons last year, and to the United States 3,445 tons against 1,205 tons.

In London the market has been weak, and sellers have come out freely for spot as well as future delivery, prices closing rather lower at £89 10s. @ £89 15s. for spot and £89 10s. @ £89 15s. for futures.

Advices from London state that the Welsh tin plate manufacturers will close their plants from July 1st to Aug. 1st.

**Lead.**—This metal has also shared in the general depression, and sales were made at 4 1/2c. and afterwards at 4 1/4c., in all about 1,000 tons changing hands. A new decision has been rendered by the Custom House appraisers on the valuation of lead in silver ores, which hitherto has been taken at 1c. below the price of pig lead ruling in New York. Satisfactory proof having been given the board that the above was unjust and did not allow for freight and smelting charges, a price of about 1 1/2c. below the price ruling in New York has now been adopted. This will allow larger quantities of Mexican silver ores to come into this market. Consumption so far has not been very good, and in some quarters production seems to have somewhat increased, though not to any great extent. The market closes flat at 4 1/4c.

In London Spanish lead is quoted at £12 12s. 6d., and English at £12 15s.

**Chicago Lead Market.**—Messrs. Everett & Post telegraph us as follows: "There has been little or no business to test values. The decline has been so rapid that consumers are afraid to take on lead even in the smallest quantities. Rumors of manipulation in the interest of lower prices render the situation more perplexing. The talk now is of 3.75c. or 3.50c. lead. The market closed entirely nominal at 4c.

**St. Louis Lead Market.**—The John Wahl Commission Company telegraphs us as follows: "Lead is weak and lower. Offerings are in excess of the demand, and buyers seeing the metal go their way are taking in supplies to meet immediate requirements only. On prompt delivery, common has sold as low as 3 3/4c."

**Spelter.**—This article also is dull, and freely offered at 5c. New York, and we hear that for a few cars \$4.95 was accepted. The market closes dull.

In London specials are quoted £23, and ordinary £22 15s.

**Antimony** is somewhat lower: Cookson's is obtainable at 17 @ 17 1/4c.; L. X. at 16c. and Hallett's at 15 1/2 @ 15 3/4c., but for forward delivery somewhat lower prices would undoubtedly be accepted.

From London the market is reported to be weak and prices are about £1 to £2 lower.

**Nickel.**—There is no change to report; the metal remains scarce and quotations are unchanged from 67 1/2 @ 70 c.

**Quicksilver.**—This market has been very quiet, the demand leaving much to be desired, and, as a consequence, values have shown a slight downward tendency. Sales here have been made at \$42 1/2 @ \$43, while for London we quote £8 2s. 6d.

**IRON MARKET REVIEW.**

NEW YORK, Friday Evening, April 17.

With the exception of the steel rail trade, the local iron market has been absolutely without new features during the past week, and business has been entirely of a routine character. Buyers have been in the market only to fill immediate wants, and evidently feel confident of their ability to secure all the iron that they need at any time in the immediate future, and possibly at lower prices. Still, although the supply of iron is ample, there is little pressing for sale, and prices are holding firm, with no reports of concessions being made.

It seems likely that the market will continue in this uninteresting condition for the next few

months. Any improvement in the general business situation of the country with the increased demand for iron consequent, which is the only thing that can help the market, will, of necessity, be gradual. On the other hand, the production of pig iron has been reduced to such extent that it is not likely that it exceeds consumption greatly at the present time, and if no more furnaces blow in, prices should remain about where they are now.

We do not look for any particular increase in the number of furnaces in blast during the next month, although such an opinion has been expressed. There are a few furnaces now which report good business and order-books full; but these are the exceptions which make certain brands of iron which are always in demand. In general, the profits of iron furnaces at present prices, under present conditions, are extremely small or none at all, and it would not seem that there was any reason for more to blow in until the situation of the market warrants an increase in production.

**American Pig Iron.**—The market has been inactive, and all business has been of hand to mouth character. There has been no change in prices. We quote: Northern, No. 1 X, \$17.50@18; No. 2 X, \$16.50@17; Southern, No. 1 X, \$17.50@18; No. 2 X, \$16.50@17. Sales of warrant iron have been reported in the South at very low figures, \$9.60 being the best bid for grey forge, Birmingham delivery.

**Spiegeleisen and Ferro-manganese.**—There has been very little doing in either spiegeleisen or ferro-manganese. Spiegeleisen, 20%, is quoted nominally at \$27.50@28.50; 80% ferro-manganese, \$63@64.

**Steel Rails.**—The placing of the Pennsylvania order for 30,000 tons of rails, which we noted last week, has evidently been the signal for other roads to come into the market, and this week there have been decidedly more activity and better feeling in consequence.

Quite a large number of orders have been placed, including one from the Erie for 4,000 tons; New York Central, 9,000 tons; Mohawk & Northern, 18,000 tons, and a number of others. It will be noted, however, that, with the exception of the Mohawk & Northern, none of these orders has been new business, and all would, ordinarily, have been placed two months ago, thus showing that the roads have been holding off to await developments in the market. Rolling mill companies are holding their selling price firmly at \$30 at the mills.

**Rail Fastenings.**—There has been little doing during the past week. Now that the railway companies have been in the market for rails, however, there is prospect of improvement in this branch of the trade. We quote prices: Spikes, \$2; angle plates, \$1.70@1.80; bolts and square nuts, \$2.65@2.75; hexagonal nuts, \$2.85; complete joint, iron and steel, according to weight.

**Tubes and Pipe.**—Business continues of the same routine character. We quote discounts on carload lots as follows: 47½% on butt, black; 40% on galvanized; 60% on lap, black; 47½% on lap, galvanized; boiler tubes, 50% on all sizes; casing, all sizes, 50%.

**Structural Iron and Steel.**—Business is extremely quiet and competition for orders is extraordinarily keen. We quote, nominally: Universal plates, \$2.15; bridge plates, \$2.10; angles, \$2.20; beams, \$3.10. These prices can undoubtedly be cut, however.

**Merchant Steel.**—The market continues about as last week. Prices remain unchanged, and we quote: Best English tool, 15c. net; American tool steel, 7@8c.; special grades, 13@20c.; crucible machinery steel, 5c.; crucible spring, 3¼c.; open-hearth machinery, 2.60c.; open-hearth spring, 2.60c.; tire steel, 2.60c.; toe calks, 2.60c.; first quality sheet, 10c.; second quality sheet, 8c.

**Old Rails.**—Old rails remain unchanged. There was a little spurt in the demand in the early part of the week, and prices hardened a little. They have since returned to their old rut, however. We quote \$22@23 for tees, and \$25 for doubles.

**Wrought Iron Scrap.**—The market is lifeless. We quote nominally \$20@22 at yards.

**Chicago.** April 15.

(From our Special Correspondent.)

The local market shows considerable improvement, especially in the volume of business done. Prices have not changed in the open market, but slight concessions on some large orders have brought dealers and buyers to an understanding, and have resulted in quite a large business in raw materials. No branch of the trade reports a worse condition, and many a material improvement.

**Pig Iron.**—Quite a large amount of business is reported this week in charcoal-iron at slight concessions in prices. The long inactivity in the grade of iron has compelled some of the furnaces to meet buyers' views, and, as a result, some large orders were placed. Sales reported will amount to nearly 7,000 tons. Coke-irons were also fairly active, and some good orders were placed for future delivery. Slight concessions are also admitted for these sales. Southern irons have been quiet, and but little business done. Prices have been adhered to, though an inclination has been manifest to meet buyers' views, and slight concessions have been considered.

Market quotations remain unchanged. Prices per gross ton f. o. b. Chicago are: Lake Superior charcoal, \$18@18.50; Lake Superior

coke, No. 1, \$15.50@16; No. 2, \$15@15.50; No. 3, \$14.50@15; Lake Superior Bessemer, \$17; Lake Superior Scotch, \$16.50@17; American Scotch, \$18.50@19; Southern coke, Foundry No. 1, \$16.25; No. 2, \$15.75; No. 3, \$15.25; Southern coke, soft, No. 1, \$15.75; No. 2, \$14.75; Ohio silveries, No. 1, \$18; No. 2, \$17; Ohio strong softeners, No. 1, \$18.25; No. 2, \$17.50; Tennessee Charcoal, No. 1, \$18; No. 2, \$17.50; Southern Standard Car Wheel, \$21@23.

**Structural Iron.**—The amount of business done has been very good. Beams have been especially active. Chicago representatives of Pittsburgh firms have secured contracts for a large office building here and for two in St. Louis.

Prices car lots f. o. b. Chicago are: Angles, \$2.20@2.25; tees, \$2.75@2.85; universal plates, \$2.35@2.45; sheared plates, \$2.40@2.50; beams and channels, \$3.20.

**Plates.**—The market remains unchanged. A fair amount of business is reported, though but very little better than for some weeks past.

Quotations remain unchanged: Steel sheets, 10 to 14, \$2.70@2.80; iron sheets, 10 to 14, \$2.60@2.70; tank iron or steel, \$2.50@2.70; shell iron or steel, \$3@3.25; fire-box steel, \$4.25@5.50; flange steel, \$3.25@3.40; boiler rivets, \$4.25.

**Merchant Steel.**—Only a fair amount of business is reported. Orders are for small quantities only. Prices remain unchanged at: Tool steel, \$6.75@7; tire steel, \$2.40@2.60; toe calk, \$2.60@2.75; Bessemer machinery, \$2.20@2.30; open-hearth machinery, \$2.60@2.75; open-hearth spring, \$2.75@3; crucible spring, \$3.75@4.

**Steel Rails.**—There is no change to be noted in steel rails. The South Chicago and Joliet works of the Illinois Steel Company are now running, and have a fair stock of orders on hand. The Bureau of Construction of the World's Fair are in the market for 1,300 tons of rails and other track supplies, for use in Jackson Park. Quotations remain unchanged at \$31.50@32.50 per ton f. o. b. Chicago. Splice bars at \$1.95@2, and spikes at \$2@2.10 per 100 pounds.

**Galvanized Sheet Iron.**—Demand continues very fair. The mills report to be running full capacity, but are not rushed as they were for some weeks past. Store trade has improved little over last week. Discounts are unchanged at 67% off on Juniata and 65% and 5% off on charcoal.

**Black Sheet Iron.**—No changes are to be noted in black sheet iron. Trade continues light. Quotations are \$2.85@3 for No. 27 f. o. b. Chicago for car lots.

**Bar Iron.**—The amount of business done is very light, indeed. Some inquiries are being received, but little business has resulted. Store trade is also reported to be very light. Local mills quote \$1.60@1.70, f. o. b. Chicago; and Valley mills, \$1.55@1.60 f. o. b. mills.

**Nails.**—The improvement noted last week continues. Inquiries for wire nails are quite brisk, and the outlook is for a big spring trade. Prices remain unchanged, but are quite firm.

Quotations are: Steel wire nails, \$2.20@2.25; steel cut nails, \$1.75@1.85 carloads f. o. b. Chicago.

**Scrap.**—A few transactions in scrap iron are reported, but in general the market is dull. Machine shops and railroads are offering but little scrap now, so that dealers with stocks on hand are holding a little more firmly to prices. Quotations per net ton f. o. b. Chicago are: No. 1 railroad, \$19; No. 1 forge, \$18.50; No. 1 mill, \$14.50; fish-plates, \$21; axles, \$24; horse shoes, \$19; pipes and flues, \$13; cast borings, \$8; wrought turnings, \$11; axle turnings, \$13; machinery castings, \$12; stove plates, \$8; mixed steel, \$11; coil steel, \$15.50; leaf steel, \$16.25; tires, \$17.

**Old Rails and Wheels.**—But little business is reported. Old iron rails are scarce and are a little higher in price. Quotations are: Old steel rails, \$13.50@17, according to length; old iron rails, \$23.50; old wheels, \$17.

**Cleveland.** April 15.

(From our Special Correspondent.)

The ore situation still remains very quiet. No sales to western furnaces have as yet been made of consequence, though it is reported that inquiries have been made this week for about 200,000 tons of hard "Bessemer" ores. It is not thought, however, that buyers' views have as yet been met.

The coke strike in the Connellsville region still continues, though it is thought that the resistance of the strikers is growing weaker. The strike, however, is by no means broken, and, until such time as some settlement of the difficulty is arrived at, Western furnacemen will scarcely be in the market for the purchase of ores.

Several sales of hard "non-Bessemer," in lots of 10,000 to 25,000 tons, have been made to Eastern parties, and there seems to be considerable disposition to buy in that direction.

Prices remain as last quoted:

Specular and Magnetic Ores.	
Bessemer	66@69; \$5.50@6.25
Non Bessemer	60@64; 4.25@ 5.25
"	66@68; 4.75@ 5.25
"	62@65; 4.00@ 4.75
"	50@60; 3.75@ 4.00
Soft Hematites Dried at 212°.	
Bessemer	62@65; \$4.50@4.75
Non-Bessemer	58@61; 4.00@ 4.25
"	55@63; 3.50@ 4.25

Above prices are for deliveries on docks at Lake Erie ports.

**Louisville.** April 11.

(Special Report by Hall Bros. & Co.)

It is difficult to describe the market correctly, as buyers and sellers are of different views. Sales from car loads to 1,000 tons have been made this week; 1,000 tons Grey Forge sold on a basis of \$10.25 cash at furnace; No. 2 foundry basis \$12.50, and 100 tons No. 1 foundry \$14.20 cash, furnace as basis; but as a whole the market remains unchanged. Foundries and mills all complain of dull trade. We quote current figures as last week:

**Hot Blast Foundry Irons.**—Southern coke, No. 1, \$14.25@14.50; No. 2, \$13.75@14; No. 3, \$13.25@13.50. Southern charcoal, No. 1, \$16.50@17; No. 2, \$16@16.50. Missouri charcoal, No. 1, \$17.50@18; No. 2, \$17@17.50.

**Forge Irons.**—Neutral coke, \$12.50@13; cold short, \$12.50@13; mottled, \$12@12.25.

**Car Wheel and Malleable Irons.**—Southern, standard brands, \$21@22; other brands, \$17.50@18. Lake Superior, \$21.50@22.50.

**Philadelphia.** April 16.

(From our Special Correspondent.)

**Pig Iron.**—Nothing has occurred in the crude iron trade, especially, to justify the anticipations that a good many makers have been entertaining, namely, that of improvement in April. The market is steady, and buying is limited to absolute requirements, which covers the whole case. Quotations for No. 1 are \$17.50 to \$18, though some brands of No. 1 have been sold at \$17.25 this week. No. 2 runs from \$16 to \$17, with moderate sales. Southern No. 2, \$15.75; Forge, \$14.50 for most brands that are selling.

**Muck Bars.**—Buyers continue to hammer down prices, but have not succeeded in getting them to where they want them. The lowest price for a large lot is \$26.50; some buyers now in the market expect to cover at 25 cents less.

**Slabs and Billets.**—Billets have been sold at \$27.75. Offers are in to-day for large lots at 25 to 50 cents less. Slabs are quoted at \$27.50; offer at \$27.

**Foreign Material.**—Small lots of ferro-manganese are selling at \$63@64.

**Merchant Iron.**—Orders for crude iron have been filled at \$1.60. Some mills got \$1.85 for small lots of refined. A very unsatisfactory condition of trade is reported at the bar mills all over this state.

**Skelp Iron.**—For grooved, \$1.65 has been offered; some makers are asking \$1.90 for sheared.

**Wrought Iron Pipe.**—Prices have gone down so low that two or three manufacturers have refused business, claiming that they would prefer to stop; there is a very irregular demand.

**Sheet Iron.**—An improved demand has set in for both light and heavy sheets, but the orders are all small, and manufacturers claim that buyers are looking for the same prices to be named on small lots as for large.

**Plate and Tank Iron.**—A good deal of irregularity is observable in the quotations for large orders, but the lowest card rates for ship and bridge plate are 2c. for iron. Something less would buy, but these figures are not given out. Flange is quoted at 2¼c. for steel.

**Structural Material.**—Enough business keeps dropping in to prevent an actual restriction of output, but manufacturers are not at all satisfied with what April has developed. It is still the intention, they learn, to prosecute a number of large undertakings in which structural iron will be wanted, but there is a general holding back.

**Steel Rails.**—Most of our news concerning steel rails comes from other markets. The action of the Pennsylvania Company has been followed by three or four other companies, we are told, but the details as to quantities and price are withheld. Bottom quotations are given at \$30 for large lots. There has been quite a flow of small orders within the past two or three days; \$30.50@31 are the prices named.

**Old Rails.**—Old rails are quoted at \$22.50.

**Scrap.**—Railroad scrap can be sold readily at \$22, but some parties here refuse to take less than \$22.75.

**Pittsburg.** April 16.

**Raw Iron and Steel.**—Trade during the past week has presented little that is either new or of particular importance; in fact, the situation may be termed a waiting one. Taking everything into consideration, the week's business shows up fairly well. Unless all signs fail, the great coke question is very near a settlement; each day sees more ovens being fired up, and more men going to work. Every one hopes that when the settlement is made it will extend for three years, so that business men may have a certainty that the question has been arranged for that length of time.

Holders of iron are anxious to close contracts for this year's consumption, and are offering to contract at \$1.50@1.75 per ton. Furnacemen are still holding off; it may be they are waiting for a settlement of the coke question, or the eight-hour affair that is announced for May 1st, or both. Last year the ore purchases for the year were closed several months before this time. A leading iron man remarked: "The coke strike has unquestionably saved the pig-iron trade from a serious disaster by causing an involuntary reduction in

the output of 40% within the past four or five months, as prices are to-day as low as when the strike was inaugurated on February 10th.

The Shenango and Mahoning Valley furnace men say: "Although matters have not progressed far enough to permit a definite statement to be made of the intentions of certain furnace companies, it is known that as soon as they have secured reductions now deemed certain on ores, coke and freight an aggressive policy will be inaugurated for the renewed control of northern markets."

Dealers in Pittsburg generally report an increased inquiry; sales of Bessemer are a shade below those of last week; Grey forge maintains prices; steel slabs and billets have declined; ferro-manganese advanced; muck bars are a shade lower; steel wire rods lower; spiegeleisen, advanced; skelp iron, unchanged; scrap material, demand fair and prices maintained; blooms and billets not so firm; new steel rails are firm.

**Coke Smelted Lake and Native Ores.**

3,000 Tons Bessemer, April	\$15.75 cash.
2,000 Tons Bessemer	15.75 cash.
2,000 Tons Bessemer	15.75 cash.
1,500 Tons Grey Forge, April, May	14.00 cash.
1,500 Tons Bessemer	15.70 cash.
1,500 Tons Bessemer	15.80 cash.
1,000 Tons Bessemer, city furnace	16.00 cash.
1,000 Tons No. 1 Mill	14.20 cash.
500 Tons Grey Forge	14.00 cash.
500 Tons Grey Forge	14.00 cash.
500 Tons Grey Forge	13.85 cash.
200 Tons No. 2 Foundry	15.00 cash.
100 Tons White	13.75 cash.
100 Tons No. 2 Foundry, all ore	15.50 cash.
100 Tons Mill Iron, No. 1	14.30 cash.
100 Tons Silvery	16.00 cash.

**Charcoal.**

150 Tons No. 2 Foundry	22.00 cash.
100 Tons No. 2 Foundry	21.50 cash.
100 Tons Cold Blast	26.00 cash.
100 Tons Warm Blast, Southern	22.00 cash.
60 Tons Cold Blast	26.00 cash.

**Muck Bar.**

1,100 Tons Neutral	26.25 cash.
500 Tons Neutral	26.50 cash.
500 Tons Neutral, May	26.50 cash.
400 Tons Neutral	26.25 cash.

**Steel Slabs and Billets.**

1,000 Tons Billets, City Furnace	26.00 cash.
750 Tons Billets and Slabs	25.50 cash.
500 Tons Billets	25.25 cash.
500 Tons Billets	25.00 cash.

**Steel Wire Rods.**

500 Tons American fives	36.50 cash.
100 Tons American fives	36.00 cash.

**Ferro-Manganese.**

75 Tons 80%, New York	64.50 cash.
50 Tons 80%, Pittsburg	66.50 cash.

**Rail and Billet Ends.**

300 Tons Billet Ends, May	17.00 cash.
225 Tons Billet Ends, May	17.25 cash.

**Skelp Iron.**

900 Tons Wide Grooved	1.67 1/2 4 m.
150 Tons Sheared Iron	1.85 4 m.
120 Tons Narrow Grooved	1.65 4 m.

**Old Iron and Steel Rails.**

240 Tons Old Steel Rails	18.00 cash.
300 Tons Old Iron Rails	24.50 cash.

**Scrap Material.**

200 Tons No. 1 W. Scrap, Net	21.00 cash.
150 Tons Iron Axles, Extra, Net	28.00 cash.
100 Tons No. 1 W. Scrap, Net	20.75 cash.
100 Tons No. 1 W. Scrap, Valley Furn., Net	21.00 cash.
100 Tons Machinery Cast Scrap, Gross	15.00 cash.
100 Tons Iron Axles, Net	26.50 cash.
100 Tons Soft Steel, Gross	17.50 cash.
100 Tons Wrought Turnings, Net	14.50 cash.
100 Tons Cast Scrap, Gross	14.00 cash.

**CHEMICALS AND MINERALS.**

**NEW YORK, Friday Evening, April 17.**

The demand for heavy chemicals during the week has been very small, and as the arrivals have continued as heretofore dealers who have been holding for better prices have in some cases been forced to realize, but even with the inducements thus offered the aggregate of sales has been very small. The policy of most consumers has been to hold off and supply nothing but immediate wants. It is an undeniable fact that so far this method has proved most advantageous to them. Sellers have offered to make long contracts at five points off from current prices, but their overtures have met with no response.

The late spring has been thought by some to have its influence upon the market, as orders which usually have been placed in March have not come in until very recently. Considerable complaint is being made in the trade concerning the unfair railroad discrimination which, it is said, is being made between New York and Boston in Western shipments. Freight from New York to Chicago are, under the most favorable circumstances, 6 cents per hundred higher than from Boston. This differential is due to the influence of the Canadian Pacific.

Stocks of sal soda and bleach continue very large, while 48% alkali has passed largely into second hands. The brinstone market for future shipments is experiencing a more than ordinarily rapid reaction. The bankers in Sicily seem to have realized that any long-continued high price, like the one we have recently experienced here, would so materially curtail consumption as to make a continuation of it inadvisable. Whatever the cause, it is certain the market is very much easier.

Caustic soda, 60%.—The arrivals remain partly unplaced, and as a consequence the spot market is

a little weaker. Demand has been very small, and even for future shipments contracts have been made in only a limited way. Spot can be had easily for 3.30c.; future delivery is held at from 3.37 1/2 c. to 3.40c. @ 70% 74%.—This market has not had to suffer from too large arrivals; in fact, no great difficulty was encountered in placing most of what came in. Spot is now held at 3.07 1/2 @ 3.10c. Business for future delivery has also been fairly active, although the demands are much above our quotations for spot. Nothing could probably be had under 3.12 1/2 c. 77%.—The generally sold-up condition which has characterized this market for some time back continues at this writing. Recent arrivals were almost entirely sold beforehand, and business is virtually restricted to contracting for future delivery; 3.10c. is named as lowest figure at which any business could be done.

Alkali, 48%.—With quite large arrivals this market is well sold up to date. Spot is quite scarce, and, as the demand continues to have no room for complaint, dealers are well satisfied with the prices they are getting. We quote 1.62 1/2 @ 1.70c., according to brand, lot, etc. For shipments, demands are somewhat less. High-test is in very good stock, and some sharp competition reduced prices to rather below any we have experienced for some time. Spot lots changed hands at 1.45 @ 1.50c. Contracts for shipments were made at 1.47 1/2 @ 1.52c., and some special brands in small lots changed hands at 1.55 @ 1.60c.

Caustic Soda Ash, 48%.—The condition of the market may be laconically expressed by saying that there is nothing here and nothing doing.

Carbonated Soda Ash, 48%.—The arrivals have been quite free; and as the consumption has temporarily been very much decreased, the market is a little weaker than at the time of our last report. It has changed hands freely at 1.55 @ 1.57 1/2 c. High-test has been quite extensively contracted for in future shipments, but the spot market is languishing a little under decreased demand. We quote 1.52 1/2 @ 1.57 1/2 c.

Sal soda.—Free arrivals have continued through most of the week, and, as the demand remains very small, inducements have been liberally made to buyers to save additional expense of holding. Sales have been made at as low as 95c. The market for future shipments is not quite so demoralized; we quote 1.02 1/2 @ 1.05c. Domestic makers continue to realize freely at 1.00 @ 1.05c.

Bleaching Powder.—The demand continues very small, and, as most dealers are well stocked, former prices have been shaded. Some sales have been made at as low as 1.65c. We quote 1.65 @ 1.67 1/2 c.

Acids.—The business of the week has been very small, and leaves the market weaker than at the time of our last report, though no change has been made in the demands of manufacturers. Muratic and nitric continue to meet with a steady consumptive demand. Nothing further has developed with reference to the proposed meeting of manufacturers.

We quote acid per 100 pounds in New York and vicinity: Acetic, \$1.55 @ \$2; muriatic, 18", \$80c. @ \$1; muriatic, 20", 90c. @ \$1.10; muriatic, 22", \$1 @ \$1.20; nitric, 40", could probably not be touched for less than \$4.50 and from that upward, according to quantity, etc.; nitric, 42", \$5 @ \$5.25; sulphuric, 60" \$1 @ \$1.25; sulphuric, 66", \$1.12 1/2 @ \$1.75.

Fertilizers.—The most characteristic feature of this market is its tightness. An all-around scarcity of spot has added very materially to the firmness of our last quotations. Ammoniacal materials particularly have met with a demand it has been found almost impossible to fill. Several steamers are expected here shortly, which will do a good deal toward relieving this difficulty, but as a matter of fact charters from abroad are very scarce. The ring in Hamburg has its hold on all available vessels, and freights have experienced a rise, within sixty days, from 6s. to 12s. 6d., and even at this figure room is not to be had. Muriate, sulphate, double manure salt and kainit are all very scarce.

Charleston phosphate rock continues to be held steadily at from \$7.25 to \$7.50 per ton f. o. b. Charleston, and Peace River phosphate is sold at about the same figure. Ground rock is selling at from \$8 to \$11.50. Sulphate of Ammonia—Gas liquor has been in great request and is very scarce. Sales of both spot and for future delivery have been made at from \$3.25 @ \$3.30.

Bone sulphate has changed hands freely, and at this writing is nearly as scarce as gas liquor. It could probably not be had under 3.20 @ 3.25c. The high-grade blood market is almost bare, and leaves this article very firm. Dealers are asking from 2.05c. to 2.10c.; for low grade, which has also passed freely into second hands, 10c. less is being asked.

Azotine in very small stock continues to be held at from 2.05 to 2.10c. Bone meal is steady at \$22.50 @ \$23. Sulphate of potash is only in second hands on the spot, and shipments nearby are selling at from 2.07 1/2 to 2.12 1/2 c. Double manure salts are in the same position. As regards the spot market we quote 3.10 @ 3.12 1/2 c.

Brimstone.—A very palpable weakness has recently developed in this market and values are declining with more rapidity than was generally expected, when the baking which has so long sustained it was removed. Spot continues at this writing to be very scarce, and dealers are asking as high as \$35 @ \$36. Large

quantities seem, however, to be on the way. Nearby is quoted at \$34 @ \$35, and May-June shipments as low as \$30 @ \$31. 3ds are selling from 50c. to \$1.00 less.

Muriate of Potash.—Arrivals have been a little freer than heretofore, but by no means sufficiently so to relieve the stringency, which has made it possible to sell muriate at \$2.50. The general scarcity of all potash salts, and the difficulty in getting charters from abroad have all been important factors in producing this condition of affairs, and no positive remedy has as yet been found. The agents of the European manufacturers report that over 4,000 tons are awaiting shipment in Hamburg, but that, owing to the extremely heavy sugar shipments to this country, some time will elapse before any very large quantities will be under way. The arrivals at the various ports amounted to about 700 tons, and sales aggregating 300 tons have been made.

Nitrate of Soda.—Nothing new that has had any effect on this market has come to hand. Spot is selling at 2.25c. and contracts to arrive are made at from 2.20 to 2.25c., while nothing is done for shipment. Some difference of opinion exists on the street as to whether certain claims that some vessels got away from Pisagna have any foundation or not.

**Liverpool. April 8.**

(Special Correspondence by J. P. Brunner & Co.)

There is a moderate amount of passing in heavy chemicals, and, although the volume of trade is not large, prices generally are well maintained. Soda ash is not active, but, as makers are well sold, there is no disposition to shade prices. We quote nominal prices as follows: Caustic ash, 48%, £5 2d. 6d.; 58%, £6 4s., net cash. Carbonate ash, 48%, £5 7s. 6d.; 58%, £6 10s., net cash. For special brands a premium is asked.

Soda crystals are moving off at £37s. 7d. @ £31 10s. per ton, less 2 1/2%.

Caustic soda is meeting with more inquiry than other lines of heavy chemicals, and prices are steady as follows: 60%, £9 15s.; 70%, £11; 74%, £12; 76%, £13 and upward, all net cash. Some special brands are held for a premium on these figures. A reduction of 5s. per ton is made for contracts over 6 months, or to the end of the year, also for special large lines prompt delivery.

Bleaching powder is slow of sale, but, as there are no second-hand lots, hardwood is firmly held for £7 per ton net cash.

Chlorate of potash is rather weaker, and, although 5 1/2 d. per lb., less 5%, is still a nominal quotation, we think, with an order in hand, this figure might be shaded for fair lines.

Bicarbonate of soda is easier at £6 15s. @ £7 per ton for one cwt. kegs, according to brand and quantity, with usual allowances for larger packages.

Sulphate of ammonia is rather scarce on the spot, and is quoted at £11 3s. 9d. @ £11 5s. per ton for good grey, 24% in single bags, and £11 12s. 6d. @ £11 15s. per ton for 25% in double bags, f. o. b. Liverpool.

**BUILDING MATERIAL MARKET.**

**NEW YORK, Friday Evening, April 17.**

A large demand for bricks has done much toward decreasing stocks, and values now show an upward tendency, which is very satisfactory to dealers. The arrivals have been much restricted, and not much is reported on the way, so that this upward movement is quite general.

Bricks.—Haverstraws have gained several points, and are now selling for \$6.25 @ \$6.75. Better grade of Jerseys and Keyport command from \$4.50 @ \$5.50 per M., and pale find ready purchasers at \$2.25 @ \$2.50.

Lime.—Producers have for some time back been using discretion in shipments to market, and no further downward movement has therefore been experienced. Rockland finishing is selling at \$1 and common at 10c. less. As a matter of fact quite a large number of kilns are out yet, and will probably not be started until the demand becomes much more imperative than at present. With care some lots which do not rank strictly as Rockland might doubtless be obtained at less than our quotations.

Cement.—The demand for some of the inferior domestic grades has been satisfactory, but Portland is languishing under very keen competition. There are two or three new houses in the market this year, and as a consequence some of the oldest concerns have stepped temporarily into the background, as they desire to do business a little more conservatively. Best grade Portland is held at about \$2.60, and from that down, according to grade. Doubtless a careful buyer could shade these figures, as the regular trade has hardly commenced and dealers are anxious to get clear of winter stocks.

**NOTES OF THE WEEK.**

Representatives of B. F. Walton, brick manufacturer, in Trenton, N. J., yesterday announced a willingness to compromise with their men, offering to pay \$2.75 per day, where the men demand \$3 and the Manufacturers' Union fixed on \$2.50 as the schedule. This is the first break on the part of the manufacturers, and it is thought will lead to a settlement of the strike.

DIVIDEND-PAYING MINES.

NON-DIVIDEND PAYING MINES.

NAME AND LOCATION OF COMPANY.	CAPITAL STOCK.	SHARES.		ASSESSMENTS.		DIVIDENDS.		NAME AND LOCATION OF COMPANY.	CAPITAL STOCK.	SHARES.		ASSESSMENTS.	
		No.	Par	Total levied.	Date and amount of last.	Total paid.	Date & amount of last.			No.	Par	Total levied.	Date and amt of last.
1 Adams, S. L. C. Colo.	\$1,500,000	150,000	\$10			\$570,000	April 1891 .05	1 Allegheny, s. Colo.	\$500,000	\$500,000	\$10		
2 Alice, s. Mont.	100,000	400,000	25			920,000	April 1891 .064	2 Alliance, Utah	100,000	100,000	\$120,000	Feb. 1891 .20	
3 Alma & Nel Wood, C. Idaho	30,000	30,000	10			60,000	Jan. 1889 .50	3 Allouez, Mich.	2,000,000	80,000	25	737,000	Jan. 1890 .70
4 Amador, o. Cal.	1,250,000	250,000	5			31,300	Nov. 1889 .124	4 American, g. s. Nev.	500,000	250,000	100	112,500	Sept. 1890 .25
5 American Belle, s. Colo.	2,000,000	400,000	5			50,000	April 1891 .124	5 Alta, s. Nev.	10,080,000	100,800	10	3,359,500	Sept. 1890 .50
6 American & Nettie, g. s. Colo.	300,000	300,000	10			150,000	Nov. 1889 .10	6 American Flag, s. Colo.	1,250,000	125,000	10	800,000	June 1887 .50
7 Amy & Silversmiths, Mont.	341,419	341,419	25			247,550	Aug. 1887 .124	7 Amity, s. Colo.	250,000	250,000	10		
8 Atlantic, c. Mich.	1,000,000	1,000,000	25	\$280,000	April 1875 \$1.00	700,000	Feb. 1891 .10	8 Ancher, Utah	3,000,000	150,000	20	410,000	June 1890 .30
9 Argenta, s. Nev.	1,000,000	1,000,000	25	355,000	July 1887 .10	40,000	Nov. 1889 .20	9 Arago, s. Cal.	500,000	500,000	10		
10 Asben Mfg. & S. s. Colo.	2,000,000	200,000	10			640,000	April 1891 .10	10 Astoria, g. Cal.	200,000	100,000	2		
11 Aurora, l. Mich.	2,000,000	100,000	20			255,000	Mar. 1891 .100	11 Barcelona, g. Nev.	5,000,000	200,000	25		
12 Badger, s. Ont.	250,000	50,000	5			37,500	Mar. 1890 .25	12 Bates-Hunter, Colo.	1,000,000	1,000,000	1		
13 Bangkok Cora-Bells, Colo.	600,000	100,000	100	190,000	Dec. 1889 .15	44,510	Ang. 1890 .50	13 Bechtel Con., g. Cal.	10,000,000	100,000	100	175,500	Jan. 1889 .10
14 Belle Isle, s. Nev.	10,000,000	100,000	100	2,978,000	Feb. 1891 .50	320,000	Dec. 1879 .25	14 Belmont, s. Cal.	2,000,000	500,000	1		
15 Belcher, o. Nev.	10,400,000	104,000	100	120,000	Dec. 1889 .25	15,397,000	April 1876 .100	15 Belmont, s. Nev.	5,000,000	50,000	100	735,000	April 1886 .10
16 Belcher, Idaho, s. L. Idaho	1,250,000	125,000	10			200,000	Jan. 1890 .10	16 Best & Belcher, g. s. Nev.	10,080,000	100,800	100	2,279,275	Aug. 1890 .25
17 Bi-Metallic, s. Mont.	5,000,000	200,000	25			500,000	Mar. 1891 .35	17 Big Pittsburg, s. L. Colo.	20,000,000	200,000	130		
18 Bodie Con., g. l. Cal.	10,000,000	100,000	100	500,000	June 1890 .25	1,002,572	April 1885 .50	18 Bullion, g. s. Nev.	2,000,000	300,000	10		
19 Boston & Mont., g. Mont.	2,500,000	250,000	25			520,000	Nov. 1888 .15	19 Boston Con., g. Colo.	100,000	100,000	10	170,000	Nov. 1888 .25
20 Boston & Mont., c. s. Mont.	2,500,000	100,000	25			1,700,000	Feb. 1891 .100	20 Bremen, s. N. M.	5,000,000	500,000	10		
21 Brece, l. Colo.	5,000,000	200,000	25			2,300	Feb. 1890 .01	21 Brownlow, s. Colo.	250,000	250,000	1		
22 Brooklyn Lead, S. L. Utah	50,000	50,000	10			127,000	July 1887 .05	22 Brunswick, g. Cal.	2,000,000	400,000	5		
23 Bullion Beck, C. S. Utah	10,000,000	100,000	100	150,000	Aug. 1889 .25	175,000	Jan. 1884 .10	23 Bullion, g. s. Nev.	10,000,000	100,000	100	2,790,000	Dec. 1889 .25
24 Bulwer, c. g. Mont.	2,500,000	250,000	25			150,000	Oct. 1883 .0678	24 Butte & Boston, g. Mont.	5,000,000	200,000	10		
25 Bunker Hill & S. L. Idaho	3,000,000	300,000	10			150,000	Oct. 1883 .0678	25 Calaveras, g. Cal.	500,000	500,000	1		
26 Caledonia, o. Dak.	10,000,000	100,000	100	505,000	May 1885 .15	192,000	Oct. 1880 .08	26 Carls, o. Wyo.	500,000	100,000	5		
27 Calliope, s. Colo.	1,000,000	100,000	10			140,000	Jan. 1891 .064	27 Carrapano, g. s. L. C. Ven.	200,000	100,000	2		
28 Callumet & Hecla, c. Mich.	2,500,000	100,000	100	1,300,000		35,246,330	April 1889 .10	28 Carleton Mfg. & C. Co., g. Cal.	2,500,000	250,000	10		
29 Carlisle, s. N. M.	1,000,000	200,000	5			170,000	Dec. 1888 .25	29 Cherokee, g. Colo.	1,500,000	150,000	1		
30 Catalpa, s. L. I. Utah	3,000,000	300,000	10			270,000	May 1884 .10	30 Chollar, s. Nev.	11,200,000	112,000	10	1,540,000	Nov. 1889 .50
31 Centen'l-Eureka, s. L. Utah	1,500,000	300,000	50			217,500	Mar. 1891 .50	31 Cleaveland, T. Dak.	1,000,000	500,000	2		
32 Central, c. Mich.	500,000	200,000	25	100,000	Oct. 1861 .65	1,970,000	Feb. 1891 .100	32 Colchis, N. M.	500,000	50,000	10		
33 Chrysolite, s. L. Colo.	10,000,000	100,000	100	325,800	May 1890 .75	199,680	April 1889 .10	33 Con. Silver, g. Nev.	1,625,000	325,000	5		
34 Clay Con., g. s. L. Colo.	2,000,000	200,000	50			21,000	Mar. 1891 .02	34 Constock, g. s. Nev.	10,000,000	100,000	10	85,000	Mar. 1887 .15
35 Clairmont, s. L. Idaho	5,000,000	500,000	10			250,000	April 1891 .04	35 Con. Imperial, g. s. Nev.	5,000,000	50,000	100	1,875,000	July 1890 .05
36 Clear Lake, s. L. Colo.	2,750,000	275,000	10			406,250	Ang. 1889 .05	36 Con. New York, Nev.	5,000,000	100,000	50	73,000	Nov. 1890 .15
37 Commonwealth, s. Nev.	10,000,000	100,000	100	170,000	Nov. 1888 .50	20,000	Nov. 1889 .20	37 Con. Pacific, g. Cal.	6,000,000	60,000	100	198,000	June 1890 .10
38 Confidence, s. L. Nev.	2,500,000	250,000	25			3,466,800	April 1890 .25	38 Crescent, s. L. Colo.	3,000,000	300,000	10		
39 Cons. Cal. & S. s. Nev.	1,000,000	216,000	100	108,000	Jan. 1885 .20	4,587,500	Dec. 1884 .25	39 Crocker, s. Ariz.	10,000,000	100,000	100	150,000	June 1890 .15
40 Contention, s. Ariz.	12,500,000	250,000	50			210,000	Feb. 1889 .50	40 Crowell, g. N. C.	500,000	500,000	1		
41 Cop. Queen Con., c. Ariz.	1,400,000	140,000	10			481,000	Feb. 1891 .46	41 Dahlonega, g. Ga.	2,500,000	250,000	1		
42 Cortez, s. Nev.	1,500,000	300,000	45			199,680	April 1889 .10	42 Dalton, g. s. Colo.	1,500,000	300,000	10		
43 Crescent, s. L. g. Utah	15,000,000	100,000	100	2,425,000	Sept. 1889 .50	11,588,000	Jan. 1875 .20	43 Decker, g. Colo.	5,000,000	500,000	10		
44 Crown Point, g. s. L. Idaho	10,000,000	100,000	100			75,000	Nov. 1889 .03	44 Denver City, s. L. Colo.	5,000,000	500,000	10		
45 Cumberland, L. S. Mont.	5,000,000	500,000	20			1,912,500	April 1891 .25	45 Denver Gold, g. Colo.	300,000	60,000	5		
46 Daly, s. L. Utah	150,000	150,000	20			20,000	Nov. 1889 .05	46 Dickens, s. N. M.	2,000,000	400,000	5		
47 Dead Creek, s. g. Idaho	1,000,000	200,000	5			61,300	Nov. 1887 .10	47 Dismal, g. s. Wyo.	500,000	400,000	2		
48 Deardwood Terra, g. Dak.	200,000	200,000	25			240,300	Oct. 1890 .10	48 Dixon, g. s. Nev.	2,000,000	200,000	10		
49 Derby B. Gray, g. Cal.	10,000,000	100,000	100	90,000	Dec. 1881 .10	390,000	Oct. 1889 .05	49 Eastern Dev. Co., Lt. N. S.	1,500,000	150,000	10	960,000	Mar. 1886 1.00
50 Dunbar, s. L. Colo.	5,000,000	200,000	25			6,000	Nov. 1888 .03	50 El Dorado, g. s. U. S. C.	1,000,000	500,000	2		
51 Dunstone, g. s. L. Mont.	1,000,000	200,000	5			20,000	Nov. 1887 .10	51 El Talamo, g. U. S. C.	1,000,000	500,000	2		
52 Eclipse, L. S. Colo.	100,000	100,000	1			524,875	Dec. 1889 .25	52 Empire, s. Utah	10,000,000	100,000	100		
53 Elkhorn, g. s. Mont.	500,000	100,000	5			70,500	Oct. 1887 .374	53 Empire, s. Utah	10,000,000	100,000	100		
54 Empire, L. S. Colo.	500,000	100,000	5			40,000	May 1888 .100	54 Eureka Tunnel, s. L. Nev.	10,000,000	100,000	100		
55 Enterprise, s. Nev.	100,000	100,000	10			4,992,500	Oct. 1890 .25	55 Ezechuer, Nev.	10,000,000	100,000	100	865,000	July 1890 .25
56 Eureka Con., g. s. L. Colo.	5,000,000	500,000	100	350,000	June 1889 .50	1,450,000	Dec. 1889 .25	56 Foundry & Mfg. Co., g. Nev.	10,000,000	100,000	100	81,500	May 1890 .25
57 Evening Star, s. L. Colo.	500,000	500,000	10			1,125,000	Feb. 1890 .20	57 Gold Cnp. s. Colo.	500,000	500,000	25		
58 Father de Smet, g. Dak.	10,000,000	100,000	100	300,000	Nov. 1871 .100	960,000	Jan. 1890 .20	58 Golden Era, s. Mont.	2,000,000	200,000	10		
59 Franklin, g. s. Colo.	5,000,000	200,000	25			90,000	April 1888 .124	59 Grand Bell, c. Tex.	12,000,000	120,000	10		
60 Freeland, g. s. Colo.	5,000,000	200,000	25			3,826,800	Oct. 1870 .100	60 Grand Bell, c. Tex.	12,000,000	120,000	10		
61 Gardfield L. g. s. Nev.	500,000	100,000	10			24,000	Oct. 1889 .02	61 Grand Duke, Colo.	800,000	80,000	10		
62 Gould & Curry, g. s. Nev.	10,000,000	100,000	100	3,985,800	Sept. 1890 .25	212,000	Nov. 1881 .074	62 Great Remance, g. U. S. C.	1,000,000	500,000	2		
63 Grand Prize, s. L. Idaho	10,000,000	100,000	100	785,000	Jan. 1890 .30	1,922,000	Aug. 1888 .50	63 Gregory Con., Mont.	3,000,000	300,000	10		
64 Granite, s. g. s. L. Idaho	500,000	500,000	10			1,635,000	Jan. 1889 .10	64 Handy, L. S. g. Cal.	1,000,000	100,000	10		
65 Granite Mountain, s. Mont.	10,000,000	400,000	25			28,400	Oct. 1889 .02	65 Harter Con., g. Cal.	1,000,000	100,000	10	25,000	Oct. 1890 .05
66 Green Mountain, g. Cal.	1,250,000	125,000	10			610,000	Sept. 1882 .30	66 Hector Cent. & Tr., s. g. Ariz.	10,000,000	100,000	10		
67 Hale & Norcross, g. s. Nev.	11,200,000	112,000	50	5,142,800	April 1890 .50	4,668,750	Mar. 1891 .10	67 Hector, g. Cal.	1,500,000	300,000	5	45,000	Jan. 1889 .15
68 Hecla Con., s. g. L. C. Nev.	1,500,000	300,000	50			125,000	Sept. 1887 .05	68 Highland, c. Mich.	300,000	25,000	20		
69 Hel's Mfg. & Red, g. s. L. Colo.	650,000	65,000	10			420,000	Feb. 1888 .25	69 Highland, c. Mich.	300,000	25,000	20		
70 Holmes, s. Nev.	10,000,000	100,000	100	370,000	May 1890 .25	4,668,750	Mar. 1891 .10	70 Hirtens, s. Colo.	2,000,000	200,000	10		
71 Homestake, g. Nev.	12,500,000	125,000	100			247,000	Dec. 1889 .046	71 Hiron, c. Mich.	1,0				



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

Main table of New York Mining Stocks Quotations, listing company names, dates (April 11-17), and sales figures for dividend-paying and non-dividend-paying mines.

\* Ex dividend. † Dealt at in the New York Stock Ex. Unlisted securities. ‡ Assessment paid. § Assessment unpaid. ¶ Dividend shares sold, 23,261. Non-dividend shares sold, 47,700. Total New York, 70,960.

BOSTON MINING STOCK QUOTATIONS.

Table of Boston Mining Stock Quotations, listing company names, dates (April 10-16), and sales figures.

+ Ex Dividend. Boston: Dividend shares sold, 11,335. Non-dividend shares sold, 7,230. Total Boston, 18,565.

COAL STOCKS.

Table of Coal Stocks, listing company names, par value of shares, and prices for various dates from April 11 to April 17.

\*\* Sales in New York, 5,570; in Philadelphia 1,419.5. Total sales, 106,116.

San Francisco Mining Stock Quotations.

Table of San Francisco Mining Stock Quotations, listing company names and closing quotations for dates April 10 to April 16.

STOCK MARKET QUOTATIONS.

Baltimore, Md.

Table with columns: COMPANY, Bid, Asked. Lists various coal and mining companies like Atlantic Coal, Big Vein Coal, etc.

Prices bid and asked, lowest and highest, during the week ending April 16.

Birmingham, Ala. April 16.

Table with columns: COMPANY, Bid, Asked. Lists companies like Ala. Coal & I. Co., Bessemer Land, etc.

Pittsburg, Pa. April 16.

Table with columns: COMPANY, B, A, Closing. Lists companies like Allegheny Gas Co., Mansfield C. & C. Co., etc.

St. Louis, April 15.

Table with columns: COMPANY, H, L. Lists companies like Adams, American & Nettie, etc.

Table with columns: Name, Price. Lists items like Mickey Breen, Mountain Key, Nettle, etc.

Trust Stocks. April 17.

The following closing quotations are reported to-day by C. I. Hudson & Co., members of New York Stock Exchange:

Trust Receipts.

Table with columns: Name, Sales, Price. Lists items like American Cotton Oil, National Lead, etc.

Foreign Quotations.

Table with columns: COMPANY, Highest, Lowest. Lists companies from London and Paris like Almada, Amador, etc.

Paris, April 2.

Table with columns: Name, Price. Lists items like Belmez, Spain, Callao, Venez., etc.

CURRENT PRICES.

Those quotations are for wholesale lots in New York. CHEMICALS AND MINERALS. Acid-Acetic, No. 8, pure, 1,040, etc.

Table with columns: Name, Price. Lists various chemicals and minerals like Chlorate, Carb, Caustic, etc.

THE RARER METALS.

Table with columns: Name, Price. Lists rare metals like Aluminum, Arsenic, Barium, etc.

BUILDING MATERIAL.

Table with columns: Name, Price. Lists building materials like Bricks, Croton, Wilmington, etc.

Table with columns: Name, Price. Lists various oils, acids, and other materials like Absolute, Ammoniated, Aqua Ammonia, etc.