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The Table of Contents will be found at the end of the reading matter, page 384. Advertising rates, page XI.

WE learn from our London contemporary *The Electrician*, that Mr. FERRANTI, the engineer of the London Electric Supply Corporation, whose plant we described in our issue of Nov. 10, 1888, has carried his experiments on high tension currents up to 100,000 volts, and that this difference of potential has failed to break down the insulation of the three-quarter inch of brown paper and ozokerite which separates the concentric conductors in the Ferranti main. The full demonstration of this fact will so enormously extend the applications of electrical transmission of power that the field becomes limitless, and every waterfall in the country will at once acquire an enormous value. In no other department of industry will the benefits and applications of such electric transmission be so great as in mining and metallurgy.

THE JAPANESE AS MINERS AND MACHINISTS.

The marvelous progress made in industrial and political development by Japan is one of the most important events in recent history. It is not merely that one of the oldest Oriental nations has broken the bonds which for centuries have bound the Eastern races, and has removed the obstructions which have shut them out with a veritable Chinese wall from the benefits of modern civilization, but it shows us that the Eastern nations are capable of acquiring Western civilization and arts with wonderful rapidity when once started on the new road. The Chinese, fully as intelligent as the Japs, have held back, distrustful of Western ways; but the example of their kinsmen, the Japs, and the enormous benefits accruing to Japan under the reign of Western civilization will soon awaken the Chinese, who will, before long, open wide the gates to Western ideas.

A correspondent writing us from British Columbia, where he has charge of coal mines, says:

"We have solved the difficulty (of high cost and uncertain labor) here by employing Japanese. I believe they are the coming race, their ingenuity and adaptability to our manners and customs are something marvelous. The great drawback to successful mining out here is the trouble with laborers, as everywhere else. We sent to Japan, hired the men there, gave a guarantee to the Government, and a better set of men never worked for me. They only arrived here on January 15th and most of them speak English entirely when conversing on mining matters with me, and you cannot ask them to do anything but they will try. We had five white engineers on my launch in three months, drunkenness, incivility or incompetency being the cause of their removal. The engineer I engaged for the winding engines took hold of her and has taught another of the men, and now I have nothing but Japs—engineers, carpenters, blacksmiths, miners, etc.—and I honestly believe the anxiety they save me will prolong my life several years."

This remarkable testimony from an engineer in charge of large works is very important and may set many of our other sorely perplexed managers thinking

THE METAL TIE QUESTION.

Our esteemed contemporary, the *Railroad Gazette*, seems to be living in the past, and on the 5th inst. replies to our kindly intentioned shaking up by becoming "mad," and waxing reckless in its statements about the metal railroad tie question, and as to the average width of ballast on a road-bed.

With regard to the question of the trial of metal ties on the Southern Pacific Railroad, we quoted from an interview with Mr. C. P. Huntington, and there was nothing in his statement implying that he proposed to put down 6000 miles of the ties within a year, and the *Gazette*, when it says the metal ties cost \$3.50 per tie, is as wild in its statement as in its other assertions, for the price of metal ties, we understand from some of the manufacturers, is about \$1.50, instead of \$3.50 per tie. We have the best authority for the statement that the Pennsylvania Railroad have decided to try a mile of Standard steel ties laid in their New York line, our esteemed, though somewhat belated, contemporary to the contrary notwithstanding.

In referring to the trial of steel ties on the Manhattan Elevated Railroad, which we stated to be in contemplation, the *Gazette* says that "no order has been given by the elevated management for steel ties, none is contemplated, and there is not the ghost of a chance of such a change." We cited the name of our authority and we are again authorized to say that the *Gazette's* statements are altogether unjustified and that our own are correct. It would be more courteous to its contemporaries, as well as more valuable to its readers, if the *Gazette* were to ascertain the facts before making such positive and unfounded contradictions.

If the *Gazette* editor will take the short trip from New York to Philadelphia over "the best road in the world" and "watch the track from the rear of the train" he will see exactly what we saw and illustrated, and no amount of printed contradiction or ill-temper at not knowing better can weigh against the story which the sun told in the photograph we published March 23d.

The metal tie will certainly be tried and we believe will, in time, perhaps in a very short time, be quite largely adopted. The world does move though our esteemed contemporary may stand still or be asleep.

THE SUPERINTENDENT OF THE ELEVENTH CENSUS.

Mr. ROBERT P. PORTER, editor of the *Press* of this city, has been appointed Superintendent of the Census. Mr. PORTER is a gentleman of great ability and a forcible writer, with experience in census work, having had charge of the department of valuation and taxation under General WALKER in preparing the census reports for 1880. Mr. PORTER is an ultra protectionist, and in the past, as we believe, has done the cause of protection not a little injury by the exaggerated opinions he has advocated.

It appears to be generally accepted by the newspapers that every act and report of the present administration is to be devoted to demonstrating the advantages of the highest scale of protective duties and that the important statistics to be collected by the Census Bureau are to be used, and if necessary distorted, to show the benefits of this policy.

These assumptions of the secular press are, we believe, as unfounded as they are unjust and insulting to President Harrison and the officers he is appointing, and while Mr. PORTER, in his past editorial work, has undoubtedly been a one-sided and bigoted partizan, in his appointment to this position he is, we are convinced, quite capable of appreciating the immense importance and value of absolutely undistorted truth in the compilation of statistical information, and he has the courage to perform so plain a duty as stating all the facts fairly and impartially without regard to the lessons they teach.

Responsibility generally makes men more conservative in their statements and actions, and as the responsible officer for collecting and publishing the statistics of the industrial growth and condition of this country, Mr. PORTER owes it to himself, to his country and to history to give the whole truth, without regard to its apparent teaching, and in the execution of this great work to divest himself, for the moment, of all partisanship and rise above the level of the politician into the higher atmosphere of the statistician. It would indeed be a disgraceful thing to have the important statistical information of the census report untruthful or the returns gartled, or such facts only collected as would apparently coincide with any pet theory or line of politics, and we are altogether unwilling to believe that Mr. PORTER can be induced to prostitute his office and great abilities to such an ignoble end. The place to discuss the theories and policies of protection and free trade is in the public press and not in official statistical documents. The collection of the mineral statistics for the census report should be confided to the Geological Survey, and naturally belongs in the division of mining statistics and technology of that bureau. The good work already performed in this division is an earnest of what we may expect should it be provided with the means necessary for the satisfactory accomplishment of this great work.

THE GOVERNMENT TIMBER SUITS AND THE PRESERVATION OF FORESTS.

The recent suits brought by the United States Government against various mining companies, notably the Silver King, in Arizona, and the Eureka & Richmond, in Nevada, for the recovery of the value of wood alleged to have been stolen from Government land, are another illustration of "How not to do it." The mining companies in question used the wood in their ordinary requirements, to enable them to carry out their pursuits, and paid a fair price for it too, though it is more than probable that none of the price came into the hands of the original owner, the Government.

In case of the Silver King the decision has been given in favor of the company, and now it remains for the other companies to prove that they were neither robbers nor willful receivers of stolen goods. The whole origin of the difficulty is the want of an efficient department of forestry. It must not be supposed that we are finding fault with the zealous and able chief of the division or his staff, but simply the whole matter of forestry is treated, for its importance, in far too trifling a manner. The annual appropriation is quite inadequate for the proper custody, conservation and promotion of our vast forestry interests. With proper supervision these Government suits against citizens pursuing their lawful avocations could have been avoided.

Instead of prosecuting innocent mine owners and trying to collect from them the millions of dollars claimed to have been due on timber stolen from Government land by the irresponsible parties who cut it and sold it to the mines, the Government should, through proper officers, collect its dues before the timber is removed. It is both unjust and a needless imperilment of a great industry to charge it with the losses due to the Government's own neglect of duty.

The efficient discharge of this duty should become a source of revenue to the Government here as it is in other countries.

Take, for instance, the result of the forest administration in Lower, or what was formerly called "British" Burmah. The topographical forest survey just completed has added twenty-one per cent to the areas under Government proprietorship, and an increased revenue of £23,394. The survey is on a scale of four inches and two inches to the mile. The increased area protected from forest fires was 137,986 acres. The gross forest revenue for the past year amounted to £221,890 and the expenditure to £103,269, compared with £199,867 and £107,593 respectively in the preceding year. This expenditure is for surveys, protection from fire, supervision of the lessees, plantations for renewals, &c.

The extent of the plantations for renewals of the forests as they are cut down or destroyed accidentally by fire, covers nearly 17,000 acres. The amount of timber extracted by thinning out the forest, (apparently they do not "clear,") was 42,331 tons of teak, and 98,529 tons of other kinds.

A recent report of the government of West Australia shows the importance attached by it to the forest resources of that colony, and the information on the subject is very interesting, as showing that Australia is not quite so bare of timber as has generally been supposed. It is also curious to note that the Egyptian Government in inviting tenders recently for 500,000 railway ties are more likely to allot the contract to treeless Australia than to Europe, though the latter country is so much nearer.

ARGENTINE FINANCE.

The interesting report of Consul BAKER, of Buenos Ayres, on Argentine progress, commerce and finance, recently issued, cannot have failed to attract the attention of those who are cultivating closer relations with South American countries. It is a record of wonderfully rapid progress and American-like development, and in the figures of immigration and increase in exports there is abundant promise for a continuance of the progress, and for ultimate, substantial prosperity, though at present the financial question is a serious difficulty for the rising Republic to grapple with. Mr. Consul BAKER sounds a note of warning, but we do not think the gravity or the proximity of the crisis has been fully realized here. That much of the prosperity in the Argentine Republic at the present time is more apparent than real is evident from the fact that this week gold has reached a premium of 65 per cent, and before the finances of the country can be placed once more on a sound footing, a great shrinkage of values must take place, and will necessarily bring at least a temporary set-back. The Argentine Government is more to blame for this depreciation of the currency than the commercial community, and there is no doubt the present Finance Minister realizes the danger and is prepared to take any steps he can to remedy the evil, but this we fear cannot be accomplished by any artificial means and a reaction is inevitable. The suspension of specie payments by the banks, which Congress sanctioned more than three years ago, has been allowed to continue without one serious effort on the part of the Government to place foreign commerce and internal trade on a normal footing again; in fact, the successive Finance Ministers have vied with each other in aggravating the situation by increasing instead of reducing the volume of inconvertible paper money. During 1867 \$20,000,000 were thus added,

and last year, under the new law for the creation of National Banks, a further amount of \$40,000,000 was put in circulation, so that inconvertible currency to the extent of more than \$180,000,000 is now in circulation for a population of about 3,000,000. The efforts on the part of the Government to counteract the natural result of its own measures are peculiar. It imports gold, the proceeds of loans in Europe far in excess of the payments it has to make in the country, while the balance of trade is heavily against the country, exceeding \$40,000,000 last year. The minister appears to think that the premium on gold arose from or was increased by speculation in gold futures, so he issued a decree forbidding time bargains in gold. No attention was paid to the decree, and notice was given that the Exchange would be closed by the Government, and as this threat produced equally little impression, the Exchange actually was closed by the police. It has since been reopened. Equally futile will be the proposed export duty on gold which is being discussed by the ministry.

The creation of industrial companies and land mortgage bonds, "cedulas," issued in enormous amounts by the various banks, is another unhealthy feature in the financial situation, the creations that secured quotation on the Buenos Ayres bourse having been, in 1886, \$75,419,200 in paper; in 1887, \$127,462,192 in paper and \$15,864,000 in gold; and in 1888 \$160,061,600 in paper and \$43,000,000 in gold. Now there is a fresh issue of \$50,000,000 more of these land mortgage bonds by the La Plata Mortgage Bank, so that altogether in little more than three years there have been placed on the market \$430,000,000 of these "cedulas," or a mortgage debt on land equal to about \$140 per head of the population, including women and children. These figures will give some idea of the gigantic speculation that is going on in the country. Immigration and, consequently, increased production for export, is the one redeeming feature. In 1886 the number of immigrants arriving was 93,116; in 1887, 137,426, and last year little short of 150,000, while the returns for last month show an arrival of 21,823. The shipping and trade of the country is upon a larger scale than ever before, but unfortunately for the chance of resumption of specie payments the imports grow still more rapidly. The number of steamers arriving at Buenos Ayres and Rosario last month was 78, and the amount collected in customs' duties \$4,988,000, a good showing for the Government, but representing a value of imports of about \$15,000,000, which is for one month an extravagant figure when compared with the population of the country.

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 Use of Cupric Chloride in Leaching Silver Ores and the Russell Process.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: In my article on the "Lixiviation of Argentiferous Zincblende and Galena Ore," recently published in the ENGINEERING AND MINING JOURNAL, I recommended to add to badly roasted charges during base-metal leaching some cupric chloride, by the action of which the chlorination of the silver is materially increased. Such an addition of cupric chloride will, as a matter of course, only then be of advantage if the ore itself does not contain any copper minerals. If it does contain sufficient copper, cupric chloride will be formed during chloridizing roasting, which in base-metal washing dissolves and acts on the silver in the same way. By recommending the use of cupric chloride, I neither imagined nor did I pretend to make known a new metallurgical discovery. The use of cupric chloride in solution as a chloridizer for silver is so old and well known that such a representation would be ridiculous. I was therefore much surprised to find in the JOURNAL of March 23d a communication from the Russell Process Company, in which it is claimed that E. H. Russell is the inventor or discoverer of this new process; at least it is stated that Mr. Russell's patent precisely covers the process described by me, and warns the readers from being misled by my remarks.

Professor Kerl in his Metallurgy, in speaking of the Patio process says: According to Karsten (in B. u. h. Z., 1852), by the action of sulphate of copper and salt cupric chloride is formed which gives part of its chlorine to the metallic and sulphuretted silver, converting the same into silver chloride. On another page in the chapter: "extraction of silver by dissolving and precipitating," which includes the different lixiviation processes, the same author says: To produce the chlorination of the silver in a wet way, Gurtl (B. u. h. Z., 1851) treats the ore in revolving barrels with a solution of cupric chloride and salt; Markus (B. u. h. Z., 1856) roasts with iron pyrite and steam in a muffle furnace, and treats the ore with a solution of salt and cupric chloride. It is well known that Patena, after a chloridizing roasting leaves the ore moist for some time in order to gain additional chlorination by the action of the base-metal chlorides. I, myself, made the observation that the base-metal solution of the Silver King ore, which consisted to a great extent of cupric chloride, while passing through the roasted ore in the vat, increased the chlorination of the silver 5.9 to 12.8 per cent, and published this fact in the ENGINEERING AND MINING JOURNAL, December 8th, 1883.

Now, in face of all these known facts, the Russell Process Company declares that the claims of Russell's patent precisely covers the process described by me, which is equal to a declaration that the use of cupric chloride in solution to produce or increase the chlorination of the silver in the ore is covered by a patent issued to E. H. Russell, April 24th, 1888. I fail, however, to see on what ground this assertion is made. In the

specifications it is clearly stated for what purpose Mr. Russell treats the ore with sulphate of copper before leaching with sodium hyposulphite, viz.: "As this solution sinks down through the charge, the sulphate of copper attacks and decomposes the hydrates of various elements which may exist in the ore, and which, as is well known, very materially interfere with and prevent the desired dissolving action of a hyposulphite leaching solution used to leach the ore. The sulphate neutralizes the injurious effect of caustic soda or lime, or the hydrates of other metals existing in the ore by the formation of hydrate of copper." The other seven compounds or salts of copper, amongst them the chloride, which Mr. Russell contemplates to use instead of the sulphate, can only then be included in his patent if used for the same purpose. If any of these salts is used for any other purpose than described and claimed in the specifications it surely does not interfere with Mr. Russell's patent. Now we do not find it stated in the specifications that Mr. Russell contemplates to use the cupric chloride for its property to convert metallic silver, and silver sulphide in presence of salt into silver chloride; if it were stated the patent would not have been granted. But it is just for this very

MICHEL EUGENE CHEVREUL.

Michel Eugène Chevreul, the distinguished French chemist, died on the 9th inst., at the age of 102 years. M. Chevreul was born at Angers in 1786, and became a teacher of chemistry at the Paris Museum in his twenty-fourth year, and three years later was already a distinguished professor of science at the "Lycée Charlemagne." Through the successive grades of chemical director of the Gobelins carpet factory (1824) and member of the Academy of Science (1826) he rose to be the successor of his old master, Vauquelin, in the Museum of Natural History in 1830. Nor was his literary activity during this period less amazing than his energy in scientific research. The years of Chevreul's working activity are even more phenomenal than those of his life. His first published investigation dates from 1806; his last contribution to the Academy of Sciences was made on May 22, 1883. Eighty-two years of work after reaching maturity is something for which no precedent probably exists. The honor of foreign membership of the Royal Society of London, generally comes to a scientific investigator



MICHEL EUGENE CHEVREUL.

property of the cupric chloride that I recommended its use, and the Russell patent, therefore, does not cover the process described by me, but covers something entirely different.

OTTOKAR HOFMANN.

ALAMEDA, Cal., April 8, 1889.

LIXIVIATION OF SILVER ORES.

The *Mining Industry*, of Denver, Colo., in reviewing Mr. Stetefeldt's book, says: "In no department of metallurgical work has there been so great an advance during late years as in the hydro-metallurgy of gold and silver. The methods which were in use in the West a dozen years ago, and which proved failures, or at least were not financial successes, are as antiquated as the stage coach. Most metallurgists had settled in their own minds that smelting was the best possible method of treating ore, and that the day of the silver mill and gold 'process' had passed forever. But such was not the case. Lixiviation has again come into use, with such excellent results attained, that under favorable surrounding conditions it can compete with smelting methods. Mr. C. A. Stetefeldt, in his book, has given a good and clear account of these late improvements, and it is particularly valuable for its descriptions of the chemistry of the process, in which older works are woefully deficient. It gives all the facts, apparently, which one engaged in milling ore by the process should know, unless it be some statistics relating to results which have been obtained."

Large Steel Shears.—Messrs. Bolckow, Vaughan & Co. are about to put down at their Eston steel works in England immense shears for the purpose of cutting 9 foot steel plates. The plant necessary for the shears will weigh nearly 350 tons. The demand which is growing for every large plates in the shipbuilding trade has necessitated this.

only after the meridian of life, as the reward of long and distinguished labors. Yet Chevreul has enjoyed it since John Quincy Adams was President of the United States.

His scientific work is so familiar to all interested in it that little need be said of it. His field might be called industrial and animal chemistry, and it was by his work as a pioneer in this field that he won his great reputation. Among a list of published works which would of themselves make an ample catalogue, it is necessary only to mention his profound and comprehensive work on "Animal Oils," which did so much for various branches of French industry, that the Société d'Encouragement pour l'Industrie Nationale subsequently awarded him a prize of 12,000 f., (\$2400). In 1864 he was made director of the museum, a post which he held for ten years, resigning it at last for reasons as honorable to his character as the unquestioned ability which he had shown in discharging its duties. In 1875 he received the grand cross of the Legion of Honor and was also the recipient of numerous foreign orders.

To the very last the overflowing vitality which was his most striking characteristic made itself wonderfully manifest. "It seemed," remarked one of his most intimate friends emphatically, "as if he could never die." Not only did his memory and brain power remain unimpaired almost to the very end, but his interest in passing events and public questions was as keen as ever. He rarely missed a meeting of the Academy of Sciences up to the age of a hundred, unless of late years, when kept at home by bad weather. He followed closely all the topics of the day and discussed them with all the fire and energy of a young man of 21. This was doubtless owing in no small degree to a habitual temperance, almost unique in a man of his gastronomic race. He was neither a drinker nor a smoker, and even in eating he scrupulously avoided the excesses of the epicures among whom he lived, saying jokingly that "a chemist knows too much about food to eat very freely of it."

THE EXTRACTION OF GOLD BY LIXIVIATION.

Written for the Engineering and Mining Journal by W. A. Wilson.

(Continued from page 346.)

Table IV. gives the results of some muffle roasting tests and leaching tests by the Russell process, made by Louis Falkenau, of San Francisco, on Occidental ore from Virginia City, Nevada. The ore assayed 13.37 ounces silver and 182 ounces or \$3.94 in gold. It was crushed through a screen of 6 meshes to the linear inch, and then sifted through 8, 16, 24 and 30 mesh screens and roasted without further crushing. The finest part, that which passed through a 30-mesh screen, contained three to thirteen times as much gold per ton as any of the other grades. This accounts, as shown further on, for the apparently large losses which sometimes took place in roasting this ore in a Stetefeldt furnace, as none of the roasted ore, except what fell in the shaft of the furnace, constituting the coarsest particles, was assayed or tested. The results in the table show that roasting in the muffle with sulphur alone for half an hour at a low heat ending with high, no loss of gold or silver took place; but there was no extraction of gold, and only 5 per cent to 36 per cent of the silver. With 2 per cent of salt and no sulphur for two hours at a low heat, there was a small loss of both gold and silver, and no extraction of gold and only 59 to 63 per cent of the silver. With 5 per cent salt and 2 per cent sulphur for 2½ hours at a low heat ending with high, there was some loss of gold and silver, nothing up to 50 per cent extraction of gold, and 66 per cent to 73 per cent of silver. With 10 per cent of salt and 3 per cent of sulphur for 2½ hours at a low heat ending with high, there was some loss of gold and silver, all the gold except a trace was extracted, and 90 per cent to 94 per cent of the silver. Under the same circumstances, but omitting the sulphur, there was the same extraction of gold, but only 76 per cent to 81 per cent of the silver. The addition of sulphur with 10 per cent of salt, therefore, increased the extraction of silver 13 per cent. Here, as in the case of other ores, the extraction of gold and silver, after roasting in the muffle with little or no salt, was only a small fraction of the extraction from the raw ore by raw leaching, or of that from the ore roasted without salt in the Stetefeldt.

TABLE IV.

EXTRACTION OF GOLD FROM OCCIDENTAL ORE. (TIME OF ROASTING, 30 MINUTES.)

Number of Roast.	Sifted through screen, per cent.	Remaining on screen, per cent.	Ounces silver per ton.	% Gold per ton.	Salt used, per cent.			Sulphur used, per cent.			Silver extracted, per cent.	Gold extracted, per cent.	Heat used.
					Salt used, per cent.	Sulphur used, per cent.	Silver extracted, per cent.	Sulphur used, per cent.	Silver extracted, per cent.	Silver extracted, per cent.			
1.	8	20	11.3	0.06	0	5	36	0	0	0	0	Low at first, high at last.	
2.					0	5	59	0	0	0	0	Low.	
3.					0	5	66	0	0	0	0	Low at first, high at last.	
4.					10	3	90	{	All but traces.	0	0	Low.	
5.					10	0	76	{	All but traces.	0	0	Low.	
6.	16	27.7	11.26	0.091	0	5	50	0	0	0	0	Low.	
7.					0	0	59	0	0	0	0	Low.	
8.					5	5	67	25	0	0	0	Low at first, high at last.	
9.					10	3	90	{	All but traces.	0	0	Low.	
10.					10	0	76	{	All but traces.	0	0	Low.	
11.	24	14.1	10.69	0.06	0	5	5.5	0	0	0	0	Low.	
12.					2	0	59	0	0	0	0	Low.	
13.					2	0	69	35	0	0	0	Low at first, high at last.	
14.					10	3	92	{	All but traces.	0	0	Low.	
15.					10	0	76	{	All but traces.	0	0	Low.	
16.	30	3.5	11.3	0.03	0	5	0	0	0	0	0	Low.	
17.					5	0	61	40	0	0	0	Low.	
18.					2	0	70	0	0	0	0	Low at first, high at last.	
19.					10	0	92.1	{	All but traces.	0	0	Low.	
20.					10	0	76.1	{	All but traces.	0	0	Low.	
21.	30	{ 34.7	19.8	0.401	0	5	16	0	0	0	0	Low.	
22.		through			2	0	63	0	0	0	0	Low.	
23.					4	2	40	50	0	0	0	Low at first, high at last.	
24.					10	3	94	{	All but traces.	0	0	Low.	
25.					10	0	81.1	{	All but traces.	0	0	Low.	

The coarseness of crushing made no difference in the amount of gold extracted, but for the various grades the average extraction of silver for all the tests was as follows:

For ore remaining on a No. 8 screen, average extraction, 65.4 per cent; for ore remaining on a No. 16 screen, average extraction, 68.5 per cent; for ore remaining on a No. 24 screen, average extraction, 60.3 per cent; for ore remaining on a No. 30 screen, average extraction, 59.8 per cent; for ore passing through a No. 30 screen, average extraction, 58.6 per cent.

The results given in Table IV. show that the ore chloridized and leached, even when coarsely crushed (between 8 and 8 mesh) to about 90 per cent of the silver and nearly all of the gold, when roasted with 10 per cent of salt and 3 per cent of sulphur.

Table V. gives in detail the comparative effects of roasting eight different ores with various percentages of salt, sulphur and matte, and with high and low heats for various lengths of time. In some cases the salt was added after an oxidizing roast, but the usual method was to mix it with the charge before roasting. The highest percentages obtained by leaching are given in the table. The ore of Baker City, Oregon, and of the Mary Murphy, Colorado, give the lowest results. But it will be noticed that of the eight ores tested the extraction and volatilization of gold together for the first four amount to over 90 per cent, while on the Baker City and Mary Murphy, the highest combined volatilization and extraction is for Columbia ore, 71.8 per cent; for the J. C. Young, 54.7 per cent, and for the Mary Murphy 34.3, so that the results in a Stetefeldt furnace would naturally be much higher for the first four than for the last three.

The highest extraction of gold from the various ores was obtained as follows:

Blanco, 12 per cent salt, with a low heat, gave the highest extraction with a medium loss.

Tybo (containing much zinc), 20 per cent salt and 2 per cent sulphur, with a low heat, gave the highest extraction, with a low loss.

Melrose "E." (tailings), 10 per cent of salt alone, with a high heat. The loss was small.

TABLE V.

ORE.	Per cent of salt.	Per cent of sulphur.	Amount of heat.	Time of roasting.	Loss in weight.	Per cent of silver extracted.	Per cent of gold extracted.	Per cent of silver volatilized.	Per cent of gold volatilized.	Per cent of matte.
Blanco.....	12	0	Low	1 ^h 20'	17.2	95.7	93.1	27.6	52.2	0
	12	0	High	1.15	17.2	95.0	90.0	23.3	48.4	0
	10	0	Medium	1.30	17.0	76.2	88.9	30.0	69.2	0
	10	0	"	0.55	16.0	91.6	88.9	12.7	38.3	0
	10	0	High	1.10	17.5	90.0	88.3	41.2	53.3	0
Tybo.....	10	0	Low	1.25	16.2	92.3	88.0	29.8	52.2	0
	5	0	"	1.00	16.0	34.7	87.6	3.5	38.1	0
	5	0	High	1.00	16.2	44.7	86.3	20.6	45.0	0
	20	2	Low	3.00	32.3	95.2	92.3	10.8	57.0	0
	16	0	High	2.40	35.5	93.3	91.4	23.6	70.0	0
	16	0	Low	3.00	33.7	93.1	91.2	34.1	58.9	4
	12	2	"	3.00	38.2	94.5	91.2	0.0	59.2	0
	20	0	"	2.50	38.5	93.7	88.8	26.3	58.1	0
	16	0	High	3.00	43.0	87.9	83.9	2.6	67.7	0
	16	0	Low	3.00	38.1	81.7	81.7	2.1	57.2	1
	Melrose "E".....	16	0	High	3.00	38.1	72.5	76.0	23.6	64.0	0
12		0	"	2.40	31.4	57.2	72.2	33.5	62.9	0
12		0	Low	3.00	30.1	69.2	71.0	0.0	54.8	0
10		0	High	0.55	21.9	92.9	91.7	....	58.3	0
10		0	Low	1.50	20.7	90.0	91.5	0.0	66.0	0
10		1	High	1.25	23.1	80.0	92.5	0.0	69.0	0
10		0	"	1.00	23.3	84.7	91.8	0.0	67.3	1
10		1	Low	2.15	20.5	89.9	90.7	0.0	57.6	0
10		0	"	2.00	21.1	90.9	90.0	0.0	69.0	1
10		0	"	0.30	12.5	93.3	86.5	0.0	27.0	0
Winnemucca.....	10	1	"	0.30	13.3	93.2	86.0	0.0	28.2	0
	10	2	"	0.35	14.7	92.4	86.0	6.5	29.8	0
	10	0	"	0.25	12.1	93.3	86.0	0.0	27.5	1
	10	0	"	0.45	12.5	93.2	86.0	0.0	27.0	2
	10	0	"	0.30	8.0	97.2	79.9	4.1	51.8	0
	10	0	"	0.30	9.4	94.4	76.0	4.5	52.4	0
Anaconda.....	10	0	"	0.30	9.3	87.5	75.9	2.3	48.4	0
	10	0	"	0.30	9.4	90.4	75.8	18.2	45.5	1
	10	1	"	0.35	11.4	95.5	73.0	0.0	46.1	0
	10	0	"	0.35	7.1	60.1	67.3	4.5	45.3	0
	2	0	"	0.35	6.0	56.2	67.3	44.0	55.3	0
	10	2	High	1.30	14.8	....	71.8	....	45.0	0
	10	0	"	1.15	13.5	....	69.3	....	55.0	2
Columbia.....	10	0	"	1.40	12.6	....	56.4	....	54.1	0
	10	0	Low	1.25	13.0	....	53.1	....	39.9	2
	10	0	"	1.30	11.5	....	47.5	....	42.0	2
	10	6	"	1.45	12.6	....	39.0	....	35.9	0
	10	2	"	1.40	12.9	....	35.7	....	35.9	0
	5	6	"	1.25	29.0	33.7	54.7	23.1	53.1	0
	5	0	"	1.25	22.6	44.7	54.1	21.3	54.1	4
J. C. Young.....	5	0	High	1.30	20.0	67.2	50.5	29.2	50.3	4
	5	0	Low	1.20	22.6	63.0	50.6	23.8	38.2	8
	10	0	"	1.30	27.0	88.7	50.5	38.4	50.6	0
	5	2	High	1.00	25.1	90.0	50.0	16.1	49.1	0
	5	4	Low	1.20	25.8	67.4	49.3	33.0	49.9	0
	5	6	High	1.30	25.8	59.1	46.0	25.1	37.2	0
	5	4	"	1.25	23.2	82.1	45.9	22.4	21.0	0
	5	2	"	1.00	28.4	91.0	44.5	8.9	23.3	0
	5	0	Low	1.20	20.0	76.8	44.8	24.2	33.8	8
	5	2	High	1.30	27.9	92.7	40.0	43.3	31.7	0
	Mary Murphy.....	5	2	High	1.25	20.0	86.4	28.4	0.0	1.0	0
6		0	Low	1.10	15.4	75.7	34.3	17.1	25.7	0
10		0	"	1.20	21.1	80.0	30.6	27.4	22.2	1
6		0	High	1.00	18.3	77.7	26.4	25.3	2.7	0
10		0	Low	1.15	21.3	76.0	17.4	20.0	17.1	0
10		1	High	1.10	23.6	72.6	14.0	15.7	0.0	0
10		1	Low	1.15	21.7	74.0	11.9	9.0	0.0	0
Winnemucca, 10 per cent salt, with low heat. The loss was medium. Anaconda, 6 per cent salt and low heat. The loss was very high. Columbia, 10 per cent salt with 2 per cent sulphur, at a high heat, yielded only 71.1 per cent, with a medium loss. J. C. Young, 5 per cent salt and 6 per cent sulphur, with a low heat, gives only 54.8 per cent extraction, with a high loss. Mary Murphy, 6 per cent salt and a low heat, yields only 34.3 per cent with the greatest loss. The "Columbia," "Young," and "Mary Murphy" ores contained a large percentage of zinc. As to the comparative effects of the use of sulphur and matte on the extraction and volatilization of gold: with matte, Blanco gives the greatest loss, with a medium extraction; Winnemucca, less extraction; Melrose, about the same loss and extraction as with sulphur; Anaconda, less loss and greater extraction; Columbia and J. C. Young, high extraction, but greatest loss. None of the above ores were roasted in the Stetefeldt furnace, as the amounts sent were insufficient.	5	0	Low	1.10	18.9	73.8	11.2	27.4	0.0	0
	5	0	Low	1.15	18.3	75.4	11.2	25.2	5.0	0
	5	0	High	1.10	19.3	78.5	7.8	22.1	5.0	0
	10	0	"	1.10	23.6	82.3	5.0	35.0	0.0	1

TABLE VI.

MUFFLE ROASTS ON ONTARIO, DALY, SARATOGA AND OCCIDENTAL ORES.

ORE.	Heat used.	Time of roasting.	Per cent of salt.		Loss in weight.	Per cent of silver extracted.	Per cent of gold extracted.	Per cent of silver volatilized.	Per cent of gold volatilized.
			Per cent of salt.	Per cent of matte.					
Ontario.....	Low.	1/2 hour	14	10	0	8.2	95.2	14.7	32.0
	High.	"	13	10	0	13.7	93.5	31.8	40.0
	Low.	1 "	"	"	0	7.9	95.1	12.2	33.4
Daly.....	High.	"	13	10	0	13.3	93.8	24.5	46.7
	Low.	"	13	10	0	15.9	90.9	24.5	35.4
	High.	"	11	10	0	11.0	85.8	20.5	45.4
Saratoga.....	High.	1 "	"	"	0	16.3	92.0	65.4	73.7
	Low.	1 "	"	"					

Comparison between the results of muffle and Stetefeldt furnace roasts have been obtained on Ontario, Daly, Occidental and Saratoga ores. Table VI. gives the results of muffle roasts on these four ores.

The results of roasting the same ores in the Stetefeldt furnace and of mill runs on the roasted ore will be found further on.

For the muffle roasts of Ontario and Daly ores the battery samples for the whole year were mixed together, and for the Saratoga ore the battery sample of 10 tons crushed in the mill. As the salt had already been mixed with these ores before the samples were taken, the percentages of salt used in the muffle were the same as used in the mill.

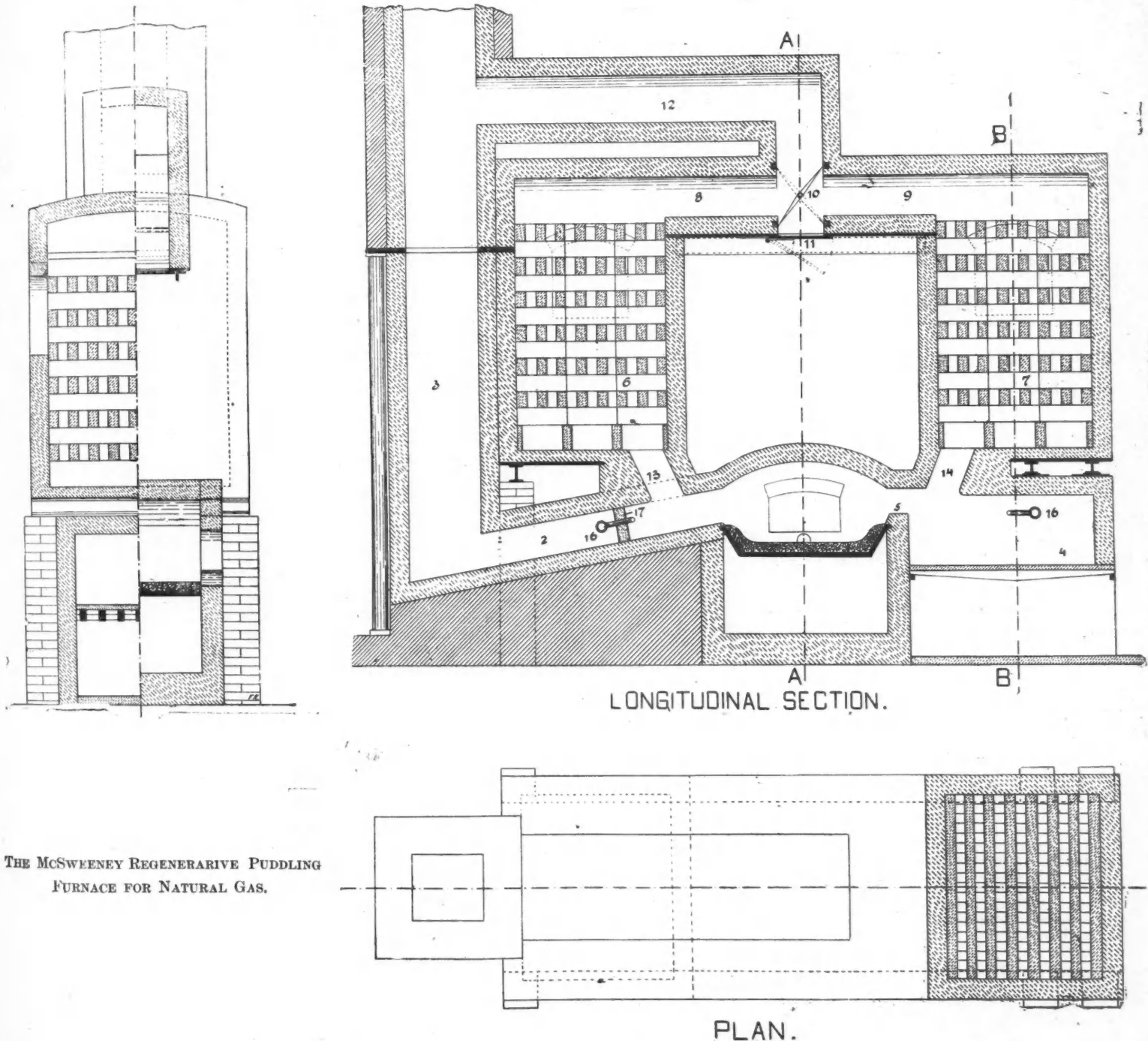
In the case of the Occidental ore, only those muffle roasts are given in which matte and salt were used, as no statistics were kept on the muffle roasts with salt alone or with sulphur.

The extractions of silver and gold given in table VI. are based on the

THE McSWEENEY REGENERATIVE PUDDLING FURNACE FOR NATURAL GAS.

Of all the furnaces in which natural gas is used for heating purposes, it is probable that the common puddling furnace is the most wasteful; at any rate, the subjoined table of experiments to determine the rate of consumption per ton of iron produced is very interesting, and the comparison of the results obtained with the same furnace slightly and cheaply modified, is very instructive. It will be seen that the modified furnace uses on an average *only about one-third* of the quantity of gas which is used by the common furnace. We thought this matter so important to manufacturers that we have procured a drawing of the furnace as modified, which we have had engraved, and now present to our readers.

The engraving represents a common puddling furnace, with new and



THE McSWEENEY REGENERATIVE PUDDLING FURNACE FOR NATURAL GAS.

roasted ore value, and not as in former table on the raw ore value. This change is necessary, as the object of the table is to compare the effects of muffle roasts with those in a Stetefeldt furnace, in which results based on raw ore value could not be obtained, except on Ontario and Daly ores, owing to the difficulty of regaining all the ore roasted from the dust chambers when only small lots of ten or more tons were treated.

The extraction of silver from all four ores after roasting in the muffle was greatest when a low heat had been used; and, with one exception (probably an error) the loss in silver was greatest at the high heat, and with three exceptions, was over twice as great at the high heat. Also, with only one exception, the loss in gold by volatilization was greatest when a high heat was used. Only the average extraction of gold from Ontario, Daly and Saratoga ores is given, as the amount of gold in these ores was so small that many silver buttons had to be combined in parting in order to obtain correct results.

(TO BE CONTINUED.)

useful improvements, designed by Mr. T. McSweeney, of the Philadelphia Company's experimental department, of which improvements the following is a description.

Although this device relates particularly to puddling and heating furnaces, it is also readily adaptable to other metallurgical furnaces designed for the combustion of solid fuel; and its object is to effect the application of the regenerative principle of heating, and the use of gaseous fuel in heating and puddling furnaces of the ordinary construction, without material delay or expense, and without involving such a radical change in the present form of this class of furnaces as would prevent them from being readily adapted to the use of solid fuel, if the same should at any time become necessary or desirable.

The furnace shown is of the usual form and construction heretofore used with solid fuel, having a hearth (1), connected at one end by a downwardly-inclined exit flue, (2) with a stack (3), and communicating at the other end by a throat or passage located above a bridge-wall (5), with a

combustion or fire-chamber (4), which is provided with a proper grate and fire-door. Regenerative chambers 6 and 7 are built above the combustion chamber and the neck of the furnace, respectively, said chambers being provided with the usual arrangement of checker work, as shown. The chambers 6 and 7 are connected by flues 8 and 9, respectively, with the valve chamber 10, which is provided with an air inlet 11, and is also connected with the stack 3 by a flue 12, said flue entering the stack at a point above the exit flue. The regenerative chambers are connected by short flues 13 and 14, with the combustion chamber 4 and the exit flue 2 at points near their entrance into the hearth 1.

Gas is introduced into the furnace by pipes or burners (16), so arranged in the combustion chamber (4), and exit flue (2), that the gas escaping from said burners will commingle with the hot air from the regenerative chambers. The exit flue (2), is closed at a point between the stack and the entrance of the flue (13), either by brick-work or a removable damper (17), and the grate bars are also covered in a suitable manner, thereby preventing any inflow of air to the hearth, except through the regenerative chambers.

In order to restore a furnace provided with the accessories above described to a condition fit for the use of solid fuel, it is only necessary to close the flues 13 and 14, which can be effected by means of brick-work or by a damper; and to remove the wall or damper (17), and the covering of the grate bars.

It will be seen that the addition of regenerative and gas-burning members to an ordinary furnace may be made without any material change in the furnace proper, and in such a manner as to render the use of solid fuel again practical whenever desired, by an expeditious and comparatively inexpensive change of flue openings and restoration of gate openings.

The accompanying table shows the results attained with this improved furnace, as compared with the several ordinary furnaces represented in the table by letters A, B, C, D, E, F and G; the improved furnaces being represented by the letters H, J and K.

These improvements have been patented, but the Philadelphia Company owns the right to use them in Allegheny county, and has offered the use of the devices to all its customers.

METER TESTS ON PUDDLING FURNACES.
By the Experimental Department of the Philadelphia Company.

DATE.	Style of furnace.	No. of heats.	Material.		Gas used per 2240 pounds of muck produced while actually working.	Gas used per 2240 pounds of muck produced through whole time.
			Charged pig.	Produced muck.		
March, 1888.	Common furnace, A.	55	27,500	27,065	34,109	.....
" "	" " " " " "	30	15,000	15,031	23,618	.....
" "	McSweeney's regenerative fce., I.	55	27,500	27,525	14,829	.....
" "	" " " " " "	55	27,500	27,125	13,529	19,079
Sept., " "	Common Furnace, B.	86	.....	42,130	30,900	53,650
April, " "	McSweeney's regenerative fce., J.	85	26,400	26,129	15,952	21,535
" "	" " " " " "	52	24,960	24,099	12,100	18,269
March, " "	Common Furnace, C.	55	28,375	28,725	.....	26,938
" "	McSweeney's regenerative fce., K.	55	28,375	28,130	13,719	.....
" "	" " " " " "	55	28,375	27,885	.....	14,746
" "	" " " " " "	55	28,375	27,930	.....	13,861
" 1887..	Common furnace, D.	50	25,000	24,325	38,996	53,850
" "	" " " " " "	27	20,250	20,765	24,450	35,216
" 1888.	" " " " " "	55	27,500	26,888	34,583	48,144
Dec., 1887.	" " " " " "	47	25,500	23,480	37,372	40,811

COPPER, SILVER, AND ZINC MINING IN SWEDEN.

FALU COPPER MINE.

This mine is situated in the neighborhood of the city of Falun, in the province of Dalarne, and is considered to be the oldest mine in the country, known to have been worked since the conversion of the country to Christianity. The oldest legal record existing in regard to mines is of the 16th of July in the year 1288, and states that Falu mine had been worked at those early days from ancient times. Here also the first mine map was made after surveys in the years 1624-1629 by Olof Hanson Svart, the first mine surveyor of Sweden.

The deposit, a very interesting one from a geological point of view, consists of several large lenticular masses of pyrites, bedded in quartzite and arranged in many parallel layers, with a width of 20 to 50 feet.

The center of the deposit is occupied by an immense mass of iron pyrites in the shape of an inverted cone, the pinnacle of which is found at a depth of 1160 feet. This cone of pyrites, inclosed in layers of talcose and mica schists, from 10 to 70 feet wide, is considered to be of secondary origin.

The percentage of copper in this cone of iron pyrites is not more than 2.5 to 3.0 per cent, while the adjoining quartzose copper pyrites average 4 to 6 per cent.

The mines were for centuries worked for copper, but after the rich discoveries of free gold some few years ago, this precious metal is now the most important product. The gold occurs in a grayish quartz together with copper pyrites often visible, but also finely impregnated in the pyrites, invisible to the naked eye.

From olden times to the commencement of the last century the mining was carried on by the means of fire, and the annual consumption of wood for this purpose arose to more than two millions of cubic feet. The mine was worked out in open chambers of large size, and immense timber buildings were used for supporting the walls. Great fires several times occurred, causing extensive cavings, so that the main body can now only be worked on the filling method. Timber must be used for supporting the stopes, but 50 to 75 per cent of it is saved and used again.

The gold chambers are mined in the same way, but the ground here is firm and undisturbed by cavings, and does not want any support. For saving the gold ore from falling into the filling, this latter is covered with a floor of planks, which is removed and used again when new filling is brought down.

The hoisting and pumping machinery is driven by water power, five

overshot wheels of 50 feet diameter being used for the purpose. The rock is hoisted in steel bucket with a speed of 200 feet a minute and the miners transported up and down by a cage provided with safety arrangements. The shafts are perpendicular.

The mine is the most extensive one in Sweden and the whole length of all the chambers and drifts is estimated to be between 35 and 40 miles.

SALA SILVER MINE.

Another old mine, worked on a large deposit of valuable mineral, is the Sala silver mine, situated in the Province of Vestmanland.

The ore is galena, yielding from 25 to 50 per cent lead and from 0.20 to 0.30 per cent silver.

The galena appears in lenses and pockets, bedded in limestone and arranged on four parallel layers. The length of the deposit is 1200 feet and the whole width 120 feet.

The mine is opened by five perpendicular shafts, some of which have reached a depth of 1100 feet. Sala mine is famous for its large open chambers and long winding galleries. In the mine many times extensive cavings have been repeated, and for this reason now the method of filling is introduced.

The Sala has this year passed into the hands of a new company, and it is said that the production will be considerably increased.

AMMEBERG ZINC MINES.

The Ammeberg zinc mines at the northern end of the Lake Vettern are of younger date, but none the less interesting. They are opened on a regular layer of zinc blende more than three miles in length and from 15 to 20 feet in width. The country rock is granulite gneiss, which, outside of the real ore, is often intersected with unworkable bands of zinc blende.

The best ore averages more than 40 per cent zinc, but the most part must be concentrated.

The mines, opened in the year 1857, are now equipped with the very best and most expensive hoisting and pumping machinery in the whole country.

Perhaps the most interesting feature at Ammeberg is the water power underground. The water from two lakes is brought into the mine through one of the shafts to the 50 meter level, where it, by powerful turbines, drives the hoisting and pumping machinery and passes out through the three-mile long tunnel, by which the different mines are connected.

The mines are exclusively worked by overhead stoping and filling. Ammeberg is owned by the Belgian Zinc Company, "La Vieille Montagne," and the ore is smelted in Belgium.

The annual shipments of concentrated and roasted ore average 45,000 tons.—Iron Ore.

GROWTH OF SUEZ CANAL TRAFFIC.

Now that the Nicaragua Canal is fast approaching a reality, the amount and development of the traffic through the Suez Canal is of increased interest to us. The following extracts from a paper read by Mr. Joseph Rabino, before the London Statistical Society last year, present a succinct history of the undertaking.

The total excavations were 2,249,000,000 cubic feet. The permanent population of the isthmus, which was 150 in 1859, is now 21,000, including 7000 Europeans, and not including Suez, but recently an Arab village, now a town of 11 000 inhabitants. The assets in 1870 were £18,211,444, in 1886 £22,917,565, the cost of construction and improvements to date being £20,234,985. The first year in which there were any profits was 1872, when they were £82,851. The high-water mark was reached in 1883, with profits amounting to £927,499. In 1887 they were £627,284, or less than any year since 1880. The surplus in 1870 was £5,873,234; at present £6,039,693. The receipts the first year in which the canal was opened for traffic were £754,532, of which £228,750 were from navigation dues. In 1883 they were £2,740,933, of which the tolls were £2,645,504, the total receipts up to the close of last year having been very nearly £25,000,000. The par value of the shares is 500 francs, and they have fluctuated from 165 in 1871 to 3550 in 1882, the average value in 1886 having been 2095. The shareholders receive 71 per cent of the profits, and got their first dividend of £30,153 in 1875. In 1883 their portion was £1,018,524, the largest yet paid. The total amount paid in dividends to the shareholders has been £6,132,740, or 7½ per cent yearly on their original outlay. They have also, in addition, a coupon bond. Singularly, the expenses for the years 1870 and 1886 were almost identically the same sum, being £754,532 in the former, and 754,567 in the latter year. The number of vessels passing through the canal has increased in sixteen years from 486, with a net tonnage of 436,609 to 3100, net tonnage 5,767,656. The tonnage dues were 9.95 francs the first year; in 1873 they were raised to 15.17 francs. In 1886 they were 9.49 francs. The largest amount of business was done in 1885, when the dues were lowest, 9.04 francs; 3624 vessels, 6,335,752 net tonnage, passing through. During eleven years 655,547 troops have been carried through the canal, another remarkable coincidence being that the number of English soldiers in 1885 was 43,813, of French 43,655, and in 1886, English, 31,161; French, 31,645. Of the 3100 vessels making the passage last year, nearly five-sixths were English; the French, Germans, and Dutch having the next largest numbers. The United States is classed among the 18 "all others."

To the foregoing we need only add that the year 1888 showed a large increase in receipts over the preceding year, and that the first quarter of 1889 again shows considerable increase over the corresponding period in 1888.

Since the opening of the canal its capacity has been doubled by the widening of narrow places and the use of the electric light for passage by night.

Sawdust Paper.—An important experiment has been tried successfully at Ottawa, Ont. A mill has been established which makes paper pulp out of sawdust. It is now using all the product of one mill. The paper made wholly from sawdust is said to form an admirable shathing that is fit for building after being tarred and dried. A better quality of paper is made by using one fourth waste paper. The plant cost \$15,000, and consists of American machinery with the exception of the grinders. The mill has a capacity for converting about 12,000 tons of sawdust into pulp annually.

THE INTER-STATE COMMERCE ACT.

We give herewith this most important law, reprinted from an official copy. The text printed in many of our exchanges having been taken from copies of the act before final amendments were adopted is erroneous in many respects.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the provisions of this act shall apply to any common carrier or carriers engaged in the transportation of passengers or property wholly by railroad, or partly by railroad and partly by water when both are used, under a common control, management, or arrangement, for a continuous carriage or shipment from one State or Territory of the United States, or the District of Columbia, to any other State or Territory of the United States, or the District of Columbia, or from any place in the United States to an adjacent foreign country, or from any place in the United States through a foreign country to any other place in the United States, and also to the transportation in like manner of property shipped from any place in the United States to a foreign country and carried from such place to a port of transshipment, or shipped from a foreign country to any place in the United States, and carried to such place from a port of entry either in the United States or an adjacent foreign country: *Provided, however,* That the provisions of this act shall not apply to the transportation of passengers or property, or to the receiving, delivering, storage, or handling of property, wholly within one State, and not shipped to or from a foreign country from or to any State or Territory as aforesaid.

The term "railroad" as used in this act shall include all bridges and ferries used or operated in connection with any railroad, and also all the road in use by any corporation operating a railroad, whether owned or operated under a contract, agreement, or lease; and the term "transportation" shall include all instrumentalities of shipment or carriage.

All charges made for any service rendered or to be rendered in the transportation of passengers or property as aforesaid, or in connection therewith, or for the receiving, delivering, storage, or handling of such property, shall be reasonable and just; and every unjust and unreasonable charge for such service is prohibited and declared to be unlawful.

SEC. 2. That if any common carrier subject to the provisions of this act shall, directly or indirectly, by any special rate, rebate, drawback, or other device, charge, demand, collect, or receive from any person or persons a greater or less compensation for any service rendered, or to be rendered, in the transportation of passengers or property, subject to the provisions of this act, than it charges, demands, collects, or receives from any other person or persons for doing for him or them a like and contemporaneous service in the transportation of a like kind of traffic under substantially similar circumstances and conditions, such common carrier shall be deemed guilty of unjust discrimination, which is hereby prohibited and declared to be unlawful.

SEC. 3. That it shall be unlawful for any common carrier subject to the provisions of this act to make or give any undue or unreasonable preference or advantage to any particular person, company, firm, corporation, or locality, or any particular description of traffic, in any respect whatsoever, or to subject any particular person, company, firm, corporation, or locality, or any particular description of traffic, to any undue or unreasonable prejudice or disadvantage in any respect whatsoever.

Every common carrier subject to the provisions of this act shall, according to their respective powers, afford all reasonable, proper and equal facilities for the interchange of traffic between their respective lines, and for the receiving, forwarding and delivering of passengers and property to and from their several lines and those connecting therewith, and shall not discriminate in their rates and charges between such connecting lines; but this shall not be construed as requiring any such common carrier to give the use of its tracks or terminal facilities to another carrier engaged in like business.

SEC. 4. That it shall be unlawful for any common carrier subject to the provisions of this act to charge or receive any greater compensation in the aggregate for the transportation of passengers or of like kind of property, under substantially similar circumstances and conditions, for a shorter than for a longer distance over the same line, in the same direction, the shorter being included within the longer distance; but this shall not be construed as authorizing any common carrier within the terms of this act to charge and receive as great compensation for a shorter as for a longer distance: *Provided, however,* That upon application to the Commission appointed under the provisions of this act, such common carrier may, in special cases, after investigation by the Commission, be authorized to charge less for longer than for shorter distances for the transportation of passengers or property; and the Commission may from time to time prescribe the extent to which such designated common carrier may be relieved from the operation of this section of this act.

SEC. 5. That it shall be unlawful for any common carrier subject to the provisions of this act to enter into any contract, agreement or combination with any other common carrier or carriers for the pooling of freights of different and competing railroads, or to divide between them the aggregate or net proceeds of the earnings of such railroads, or any portion thereof; and in any case of an agreement for the pooling of freights as aforesaid, each day of its continuance shall be deemed a separate offense.

SEC. 6. (*Amended.*) That every common carrier subject to the provisions of this act shall print and keep open to public inspection schedules showing the rates and fares and charges for the transportation of passengers and property which any such common carrier has established and which are in force at the time upon its route. The schedules printed as aforesaid by any such common carrier shall plainly state the places upon its railroad between which property and passengers will be carried, and shall contain the classification of freight in force, and shall also state separately the terminal charges and any rules or regulations which in any wise change, affect, or determine any part or the aggregate of such aforesaid rates and fares and charges. Such schedules shall be plainly printed in large type, and copies for the use of the public shall be posted in two public and conspicuous places, in every depot, station, or office of such carrier

where passengers or freight, respectively, are received for transportation, in such form that they shall be accessible to the public and can be conveniently inspected.

Any common carrier subject to the provisions of this act receiving freight in the United States to be carried through a foreign country to any place in the United States shall also in like manner print and keep open to public inspection, at every depot or office where such freight is received for shipment, schedules showing the through rates established and charged by such common carrier to all points in the United States beyond the foreign country to which it accepts freight for shipment; and any freight shipped from the United States through a foreign country into the United States, the through rate on which shall not have been made public as required by this act, shall, before it is admitted into the United States from said foreign country, be subject to customs duties as if said freight were of foreign production; and any law in conflict with this section is hereby repealed.

No advance shall be made in the rates, fares, and charges which have been established and published as aforesaid by any common carrier in compliance with the requirements of this section, except after ten days' public notice, which shall plainly state the changes proposed to be made in the schedule then in force, and the time when the increased rates, fares, or charges will go into effect; and the proposed changes shall be shown by printing new schedules, or shall be plainly indicated upon the schedules in force at the time and kept open to public inspection. Reductions in such published rates, fares, or charges shall only be made after three days' previous public notice, to be given in the same manner that notice of an advance in rates must be given.

And when any such common carrier shall have established and published rates, fares, and charges in compliance with the provisions of this section, it shall be unlawful for such common carrier to charge, demand, collect, or receive from any person or persons a greater or less compensation for the transportation of passengers or property, or for any services in connection therewith, than is specified in such published schedule of rates, fares, and charges as may at the time be in force.

Every common carrier subject to the provisions of this act shall file with the Commission hereinafter provided for copies of its schedules of rates, fares, and charges which have been established and published in compliance with the requirements of this section, and shall promptly notify said Commission of all changes made in the same. Every such common carrier shall also file with said Commission copies of all contracts, agreements, or arrangements with other common carriers in relation to any traffic affected by the provisions of this act to which it may be a party. And in cases where passengers and freight pass over continuous lines or routes operated by more than one common carrier, and the several common carriers operating such lines or routes establish joint tariffs of rates or fares or charges for such continuous lines or routes, copies of such joint tariffs shall also, in like manner, be filed with said Commission. Such joint rates, fares and charges on such continuous lines so filed as aforesaid shall be made public by such common carriers when directed by said Commission, in so far as may, in the judgment of the Commission, be deemed practicable; and said Commission shall from time to time prescribe the measure of publicity which shall be given to such rates, fares, and charges, or to such part of them as it may deem it practicable for such common carriers to publish, and the places in which they shall be published.

No advance shall be made in joint rates, fares, and charges, shown upon joint tariffs, except after ten days' notice to the Commission, which shall plainly state the changes proposed to be made in the schedule then in force, and the time when the increased rates, fares, or charges shall go into effect. No reduction shall be made in joint rates, fares, and charges, except after three days' notice, to be given to the Commission as is above provided in the case of an advance of joint rates. The Commission may make public such proposed advances, or such reductions, in such manner as may, in its judgment, be deemed practicable, and may prescribe from time to time the measure of publicity which common carriers shall give to advances or reductions in joint tariffs.

It shall be unlawful for any common carrier, party to any joint tariff, to charge, demand, collect, or receive from any person or persons a greater or less compensation for the transportation of persons or property, or for any services in connection therewith, between any points as to which a joint rate, fare, or charge is named thereon than is specified in the schedule filed with the Commission in force at the time.

The Commission may determine and prescribe the form in which the schedules required by this section to be kept open to public inspection shall be prepared and arranged, and may change the form from time to time as shall be found expedient.

If any such common carrier shall neglect or refuse to file or publish its schedules or tariffs of rates, fares, and charges as provided in this section, or any part of the same, such common carrier shall, in addition to other penalties herein prescribed, be subject to a writ of mandamus, to be issued by any circuit court of the United States in the judicial district wherein the principal office of said common carrier is situated, or wherein such offense may be committed, and if such common carrier be a foreign corporation in the judicial circuit wherein such common carrier accepts traffic and has an agent to perform such service, to compel compliance with the aforesaid provisions of this section; and such writ shall issue in the name of the people of the United States, at the relation of the Commissioners appointed under the provisions of this act; and the failure to comply with its requirements shall be punishable as and for a contempt; and the said Commissioners, as complainants, may also apply, in any such circuit court of the United States, for a writ of injunction against such common carrier, to restrain such common carrier from receiving or transporting property among the several States and Territories of the United States, or between the United States and adjacent foreign countries, or between ports of transshipment and of entry and the several States and Territories of the United States, as mentioned in the first section of this act, until such common carrier shall have complied with the aforesaid provisions of this section of this act.

SEC. 7. That it shall be unlawful for any common carrier subject to the provisions of this act to enter into any combination, contract, or agreement, expressed or implied, to prevent, by change of time

schedule, carriage in different cars, or by other means or devices, the carriage of freights from being continuous from the place of shipment to the place of destination; and no break of bulk, stoppage, or interruption made by such common carrier shall prevent the carriage of freights from being and being treated as one continuous carriage from the place of shipment to the place of destination, unless such break, stoppage, or interruption was made in good faith for some necessary purpose, and without any intent to avoid or unnecessarily interrupt such continuous carriage or to evade any of the provisions of this act.

SEC. 8. That in case any common carrier subject to the provisions of this act shall do, cause to be done, or permit to be done any act, matter, or thing in this act prohibited or declared to be unlawful, or shall omit to do any act, matter, or thing in this act required to be done, such common carrier shall be liable to the person or persons injured thereby for the full amount of damages sustained in consequence of any such violation of the provisions of this act, together with a reasonable counsel or attorney's fee, to be fixed by the court in every case of recovery, which attorney's fee shall be taxed and collected as part of the costs in the case.

SEC. 9. That any person or persons claiming to be damaged by any common carrier subject to the provisions of this act may either make complaint to the Commission as hereinafter provided for, or may bring suit in his or their own behalf for the recovery of the damages for which such common carrier may be liable under the provisions of this act, in any district or circuit court of the United States of competent jurisdiction; but such person or persons shall not have the right to pursue both of said remedies, and must in each case elect which one of the two methods of procedure herein provided for he or they will adopt. In any such action brought for the recovery of damages the court before which the same shall be pending may compel any director, officer, receiver, trustee or agent of the corporation or company defendant in such suit to attend, appear and testify in such case, and may compel the production of the books and papers of such corporation or company party to any such suit; the claim that any such testimony or evidence may tend to criminate the person giving such evidence shall not excuse such witness from testifying; but such evidence or testimony shall not be used against such person on the trial of any criminal proceeding.

SEC. 10. (*Amended*.) That any common carrier subject to the provisions of this act, or, whenever such common carrier is a corporation, any director or officer thereof, or any receiver, trustee, lessee, agent, or person, acting for or employed by such corporation, who alone or with any other corporation, company, person, or party, shall willfully do or cause to be done, or shall willingly suffer or permit to be done, any act, matter, or thing in this act prohibited or declared to be unlawful, or who shall aid or abet therein, or shall willfully omit or fail to do any act, matter, or thing in this act required to be done, or shall cause or willingly suffer or permit any act, matter, or thing so directed or required by this act to be done not to be so done, or shall aid or abet any such omission or failure, or shall be guilty of any infraction of this act, or shall aid or abet therein, shall be deemed guilty of a misdemeanor, and shall, upon conviction thereof in any district court of the United States within the jurisdiction of which such offense was committed, be subject to a fine of not to exceed five thousand dollars for each offense: *Provided*, That if the offense for which any person shall be convicted as aforesaid shall be an unlawful discrimination in rates, fares, or charges, for the transportation of passengers or property, such person shall, in addition to the fine hereinbefore provided for, be liable to imprisonment in the penitentiary for a term of not exceeding two years, or both such fine and imprisonment, in the discretion of the court.

Any common carrier subject to the provisions of this act, or, whenever such common carrier is a corporation, any officer or agent thereof, or any person acting for or employed by such corporation, who, by means of false billing, false classification, false weighing, or false report of weight, or by any other device or means, shall knowingly and willfully assist, or shall willingly suffer or permit, any person or persons to obtain transportation for property at less than the regular rates then established and in force on the line of transportation of such common carrier, shall be deemed guilty of a misdemeanor, and shall, upon conviction thereof in any court of the United States of competent jurisdiction within the district in which such offense was committed, be subject to a fine of not exceeding five thousand dollars, or imprisonment in the penitentiary for a term of not exceeding two years, or both, in the discretion of the court, for each offense.

Any person and any officer or agent of any corporation or company who shall deliver property for transportation to any common carrier, subject to the provisions of this act, or for whom as consignor or consignee any such carrier shall transport property, who shall knowingly and willfully, by false billing, false classification, false weighing, false representation of the contents of the package, or false report of weight, or by any other device or means, whether with or without the consent or connivance of the carrier, its agent or agents, obtain transportation for such property at less than the regular rates, then established and in force on the line of transportation, shall be deemed guilty of fraud, which is hereby declared to be a misdemeanor, and shall, upon conviction thereof in any court of the United States of competent jurisdiction within the district in which such offense was committed, be subject for each offense to a fine of not exceeding five thousand dollars or imprisonment in the penitentiary for a term of not exceeding two years, or both, in the discretion of the court.

If any such person, or any officer or agent of any such corporation or company, shall, by payment of money or other thing of value, solicitation, or otherwise, induce any common carrier subject to the provisions of this act, or any of its officers or agents, to discriminate unjustly in his, its, or their favor as against any other consignor or consignee in the transportation of property, or shall aid or abet any common carrier in any such unjust discrimination, such person or such officer or agent of such corporation or company shall be deemed guilty of a misdemeanor, and shall, upon conviction thereof in any court of the United States of competent jurisdiction within the district in which such offense was committed, be subject to a fine of not exceeding five thousand dollars, or imprisonment in the penitentiary for a term of not exceeding two years, or both, in the discretion of the court, for each offense; and such person, corporation, or company shall also, together with said common carrier, be liable, jointly or severally, in an action on the case to be

brought by any consignor or consignee discriminated against in any court of the United States of competent jurisdiction for all damages caused by or resulting therefrom.

SEC. 11. That a Commission is hereby created and established to be known as the Inter-State Commerce Commission, which shall be composed of five Commissioners, who shall be appointed by the President, by and with the advice and consent of the Senate. The Commissioners first appointed under this act shall continue in office for the term of two, three, four, five and six years, respectively, from the first day of January, anno Domini eighteen hundred and eighty-seven, the term of each to be designated by the President; but their successors shall be appointed for terms of six years, except that any person chosen to fill a vacancy shall be appointed only for the unexpired time of the Commissioner whom he shall succeed. Any Commissioner may be removed by the President for inefficiency, neglect of duty, or malfeasance in office. Not more than three of the Commissioners shall be appointed from the same political party. No person in the employ of or holding any official relation to any common carrier subject to the provisions of this act, or owning stock or bonds thereof, or who is in any manner pecuniarily interested therein, shall enter upon the duties of or hold such office. Said Commissioners shall not engage in any other business, vocation, or employment. No vacancy in the Commission shall impair the right of the remaining Commissioners to exercise all the power of the Commission.

(TO BE CONTINUED.)

Steel Pig.—At the Spanish Steel works, Sheffield, England, they are making a material which they call "steel pig," possessing some remarkable properties. The "gray steel" gives a tensile strength of 15 tons per square inch, that of the best cold-blast iron being 11 tons. Castings made from the new material are soft, tough, and quite free from blow-holes, and can be made from the raw pigs in any cupola with a good blast pressure. The analysis of "steel pig" is on an average as follows: Graphite, 2.00 per cent; combined carbon, 0.05 per cent; silicon, 1.25 per cent; manganese, 0.75 per cent; sulphur, 0.09 per cent; phosphorus, 0.08 per cent; iron, 95.33 per cent.

A Current Canal.—A new system of canal construction has been designed and recently patented by an Englishman. The object is to do away entirely with the necessity for steam or horse-power in canal traffic, and this end is sought to be obtained by the creation of a current of water strong enough to carry the boats along from point to point. Mr. Pickard has designed a double canal, at one end of which is a screw resembling the propeller of a steamship. This screw, which is worked by steam power, forces the current in one direction and causes it to return in the parallel division of the canal, the direction of the current being reversible at will. By this arrangement all loss of water is obviated, and the bed of the canal is kept clean. The current is, of course, confined to each separate level of canal, and when locks intervene another current has to be created.

Cost of Storage Battery Motive Power.—The following interesting figures have been published by the Julien Electric Traction Company as the actual results attained on the Fourth avenue surface road in running cars with storage batteries. A car can run in actual work 574 miles without recharging. During forty days that the car in question has been at work, neither batteries nor motors have required attention or expense for repair or renewals. The batteries of one car that had been running since September 3d, 1888, were examined on the 8th inst. for the first time, and are stated to be in as good condition as when put in. The cost of motive power is calculated at \$3.10 per car day of 60 miles. That is the cost of energy at 2 cents per H. P., at which it is offered to be supplied by the electric companies, and \$700 per annum for maintenance of batteries and motor.

A New Test for Copper Salts.—This is very simple, and extremely delicate; hence it will be found of great use in testing various ores, articles of food and drink, and pharmaceutical preparations suspected of containing minute quantities of copper. The only precaution needful is to see that the fluid to be examined is either neutral, or, at least, not strongly alkaline. A faintly acid reaction does not vitiate the result. The test re-agent is prepared by dissolving in (say) one and a half fluid ounces of neutral sulphite of sodium—three parts of a saturated solution mixed with one part of distilled water—about three drachms of pyrogallol, subsequently adding another half-ounce of the sulphite solution, and filtering the mixture. A few drops of this reagent gives a deep orange-red coloration in clear, dilute solutions of copper. If the latter metal be present in quantity represented by only one part of the sulphite of copper in three or four million parts of water, the reaction afforded is still quite distinct and characteristic.

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.

PATENTS GRANTED APRIL 16, 1889.

- 401,394. Charging Apparatus for Blast Furnaces. Ed Walsh, Jr., St. Louis, Mo.
 401,395. Blast Furnace. Edward Walsh, Jr., St. Louis, Mo.
 401,414. Process of Treating Magnetic Iron Ore. Gurdon Conkling, Glens Falls, N. Y.
 401,415. Magnetic Separator. Gurdon Conkling, Glens Falls, N. Y.
 401,457. Ore Concentrator. John H. Pemberton, Los Angeles, Cal.
 401,454. Water Wheel. Willis G. Dodd, San Francisco, Cal.
 401,521. Indicating Device for Charging Furnaces.
 401,533. Process of Making White Lead. John Baldwin, Chicago, Ill.
 401,655. Stone Sawing Machine. James W. Maloy, Marietta, Ga.
 401,688. Magnetic Ore Separator. Chandler C. Coats, Newark, N. J.
 401,691. Rolls for Rolling Three Flanged Slot Rails. Frederick Colley, Pa., assignor to the Johnson Steel Street Rail Company, of Kentucky.
 401,692. Rolls for Rolling Bulb Webbed Slot Rails. Frederick Colley, Johnstown, Pa., assignor to the Johnson Steel Street Rail Company, of Kentucky.
 401,693. Rolls for Rolling Z-Shaped Slot Rails. Frederick Colley, Johnstown Pa., assignor to the Johnson Steel Street Rail Company, of Kentucky.
 401,699. Process of Making Soda. Frederick H. Gossage, Widnes, County of Lancaster, England, assignor of one-half to Thomas Train Mathiesen, same place.

THE METALLURGY OF STEEL.*

By Henry M. Howe.

(Continued from page 351.)

4-5. I do not see that they offer any evidence that quenching and cold-working affect these properties alike. Indeed Barus and Strouhal, to whom they refer, state that the specific resistance is smaller in hard-drawn and greater in quenched wire than in soft wire.^a

6. As regards the coefficient of dilatation, my knowledge is so fragmentary that I can reach no safe conclusion. If we confine ourselves to comparing results obtained by the same observers, it seems that cold-working and quenching, while both increasing the coefficient, do so in a ratio so disproportionate to that of their effects on the other properties as to form a serious discrepancy. Thus the data of Lavoisier and Laplace indicate that quenching increases the coefficient thirty times as much as wire-drawing. On the other hand, Troughton assigns

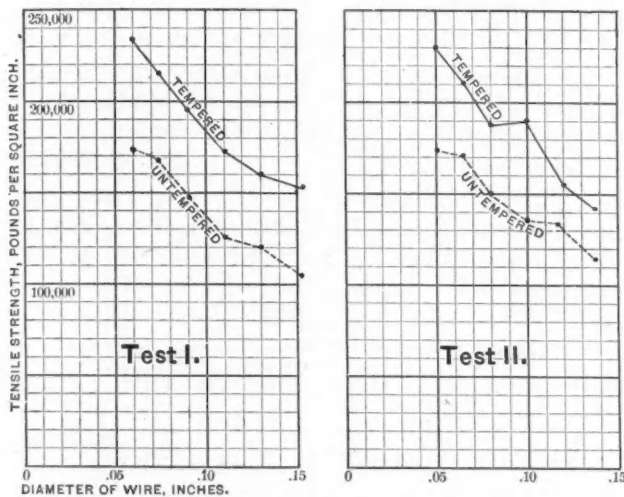


Fig. 100.—Tensile strength of wire after successive draughts. Spilsbury data. These curves represent the tensile strength of unannealed wire after each of several successive draughts. E. G. Spilsbury, private communication, June, 1888.

to the coefficient of iron wire a value which, compared with the results given below would indicate that the effect of cold-working exceeded that of quenching.

TABLE 109.—DILATATION. Length at 100° C. of a rod whose length at 0° C. is 1.

	Hard.	Soft.	Difference.
Steel, hard vs. annealed, Fizeau.....	1,001,322	1,001,101	(0 000)221
Steel, yellow-tempered vs. untempered, Lavoisier and Laplace.....	1,001,377	1,001,079	298
Iron, wire-drawn vs. soft, Idem.....	1,001,235	1,001,220	15
Iron, wire, Troughton.....	1,001,440		

7. Osmond and Werth find that cold-working increases the rapidity of corrosion of steel in dilute hydrochloric, nitric, sulphuric and acetic acids.^b Quenching, however, probably produces the opposite effect. Barus and Strouhal found that as hardened steel was tempered at successively higher temperatures, the rate at which it dissolved in hydrochloric acid continually increased, and that hardened steel was electro-negative to the same steel annealed, both in distilled water and in zinc sulphate.^c Further, Monroe found the hardened points of two cold-chisels long immersed in sea-water wholly uncorroded, their unhardened bodies being deeply pitted; and he learns of a similar phenomena in case of a hammer.^d

* Copyright by the Scientific Publishing Company, 1887.

^a Bull. 14, U. S. Geological Survey, p. 220.

^b Ann. Mines, 8th Ser., VIII., p. 46, 1886.

^c Am Journ. Sci., 3d Ser., XXXII., p. 276, 1886. "The rate at which solution takes place increases as temper continually decreases." "As hardness increases the hydro-electric position of steel moves continually in an electro-negative direction."

^d Journ. Franklin Inst., LXXXV., p. 309, 1883, Prof. C. E. Munroe, U. S. Naval Academy. In case of the chisels the corrosion was most marked at the junction of the hardened and unhardened parts: and the same was true in the experiments of Barus and Strouhal. In the case of the hammer it is possible that the difference in corrosion may have been due to the face being initially of a harder steel welded to softer metal.

Osmond and Werth, however, believe that hardening like cold-working increases the solubility, but apparently on quite insufficient ground. They rely on Gruner's finding in one case that hardened steel dissolved more rapidly in acidulated water than annealed steel, and on analogous results of their own experiments. It is probable that Gruner's result to which they refer is Number 40-1 of Table 44, p. 94, in which, unfortunately, *manganese steel was tried*.

Its behavior, of course, throws no light on that of carbon steel, since manganese steel does not undergo the very change in question, the change of hardness when quenched from a high temperature. Osmond and Werth do not give us their own results. Actually, Gruner's evidence appears to agree with that of Barus and Strouhal and that of Monroe: in sea-water Gruner found that hardened steel corroded less than the same steels annealed.

8. Both quenching and cold-working harden and strengthen steel, at the same time raising its elastic limit and making it brittle, usually without greatly affecting the modulus of elasticity. But the ratio of gain of one property to that of another on quenching is widely different from that on cold-working. Thus quenching increases the hardness enormously, the tensile strength relatively little: indeed it occasionally lowers the latter. Cold working even when doubling the tensile strength increases the hardness but little. A quenching which makes previously soft steel utterly unfileable may raise its tensile strength by less than 25%: while the unskilled hand can hardly detect with the file the hardening effect of a cold-working which may nearly double the tensile strength. As regards the ratio of increase of tensile strength to that of elastic limit the case is better, but there is still quite a discrepancy. In forty-nine cases in Tables 8, 9 and 10, pp. 18 to 20, the average increase of tensile strength on quenching is only about half as great as that of elastic limit: in 12 cases in Table 100 the average increase of tensile strength is nearly one third as great as that of elastic limit. These discrepancies may be explained away later: indeed, I think it likely that the former discrepancy is in large part due to difference in the intensity and distribution of internal stress.^e While then, the effects of quenching and of cold-working on these properties are not so hopelessly unlike as to disprove Osmond's theory, certainly they are not yet shown to be so like as to give it important support.

We have seen that the elevation of the elastic limit due to cold-working is increased by gentle heating (to 200° or 300°, § 270). Jarolimek, applying to steel springs hardened by quenching the same gentle heating which he had found to raise the elastic limit of like springs which had been distorted, *i. e.* cold-worked, found that it did not increase their elastic limit.^e Indeed, the general phenomena of tempering hardened steel would lead us to expect that reheating to 300° C. (572° F., a blue oxide tint) would lower the elastic limit (Table II., p. 22). Should further investigation confirm Jarolimek's results, this would constitute a serious difference between the effects of quenching and those of cold-working.

Further, the effect of quenching on tensile strength seems instantaneous: while cold-working, at least cold-stretching; does not seem to affect tensile strength at all immediately, the growth of tensile strength occurring gradually after the stretching has occurred.

^e Dinglers' Polytechnisches Journal, CCLV., p. 3, 1885.

The ninth point may be dismissed summarily. Not only are the strain-diagrams of soft iron often without jog, but we cannot even regard greater sharpness of bend at the elastic limit as a constant characteristic of non-cold-worked iron, distinguishing it from other materials, nor hence as an indication of allotropic change due to cold-working at the elastic limit. Doubtless on an average the bend is sharper for hot-rolled weld-iron than for cold-worked iron and other metals: but the reverse is probably often true. Thus Thurston gives cases in which the bend is apparently sharper in cold-rolled than in similar but hot-rolled iron.^a Again, we find many strain-diagrams for steel of carbon varying from 0.15 to 1.32% which are smooth at the elastic limit, together with strain-diagrams for copper with a sharp bend.

Osmond and Werth would distinguish highly carburized steel from ingot-iron by the smoothness of its strain diagram. Yet it is of the two probably the more influenced by cold-distortion, including that at the elastic limit, and should,—if this distortion acts through allotropic change, and if the jog results from this change,—show the greater jog^b

We have seen that this jog characterizes locust and hickory wood.^c

§ 274. RESEMBLANCE BETWEEN THE EFFECTS OF COLD-WORKING IRON AND THOSE OF COLD-WORKING OTHER METALS.—Time fails me for an exhaustive study: I can merely turn to the readily accessible data.

Under cold-work the other metals, like iron, become harder, stronger, more elastic and resilient, more brittle: their strain-diagrams undergo changes like those of iron: their moduli of elasticity, like that of iron, seem to be increased but little, judging from the elasticity-lines of interrupted-strain diagrams. Like that of iron the electric conductivity of some (*e. g.* platinum and German silver) is increased by cold-working, while that of others is lessened (*e. g.* gold, copper, silver, zinc): probably like that of iron the coefficient of dilation increases very slightly.^d

Cold-working condenses the metal by closing cavities, lightens it by some other immediate effect. In case of iron the lightening outweighs the condensation. To judge from published tables the reverse is in general true of the other metals. But the case is simpler if we consider the effect of annealing on the density of cold-worked metals, for here the closing of cavities is eliminated. The density of cold-worked iron is apparently increased by annealing: that of cold-drawn copper and brass seems to be very

^a Rept. on cold-rolled iron, private print, Plate VII., numbers 1104 A and 1105 A; Plate XVI., numbers 1,203 A, 1,204 A and 1,218.

^b Osmond and Werth state that this jog occurs in the strain-diagrams of absolutely all classes of weld and ingot-iron as distinguished from hard and hardened sorts, and they give us to understand that this is an essential characteristic of soft iron as distinguished from other materials in general. They seem to be wholly in error. Not to multiply cases needlessly, jog-less diagrams of ingot-iron sometimes quite soft, are given by the U. S. Test Board (Nos. 1091 B., 1060 D., and 1583, the former two with 0.23 and 0.24 of carbon, the latter with still less, judging from its tensile strength 54,760 lbs.); by Kirkaldy (Expts. on Fagersta steel, Series D., pl. I., No. 1054, with 0.15 of carbon), and by Gatewood (Rept. of U. S. Naval Advisory Board on Mild Steel, pl. XVIII., with 0.16 of carbon). Further, jogged diagrams of hard steel are given by the U. S. Test Board (Nos. 1053 A. and C., 1056 A., B. and C., and 1058 A. B. and C. with .973, .994 and .905% of carbon respectively. Further, many of the torsion-diagrams of tool-steel here show decided jogs.

^c *Mats. of Engineering*, II., p. 531. Thurston regards the jog as a sign of heterogeneousness.

^d The excess of the linear expansion between 0° and 100° C. for the harder over that for the softer state is as follows:

Iron, wire-drawn vs. soft Lavois. and Laplace.....	0.000,01459
Cold, standard, unannealed vs. annealed, idem.....	.3794
Brass wire vs. cast, Smeaton.....	.5500
Zinc, hammered vs. unstrated, Smeaton.....	.6900

It is not clear that the coefficients for the two states of brass are comparable, as the composition of this alloy varies widely.

slightly increased, judging from the following results obtained for me in Drown's laboratory.

Sp. gr. when annealed.....	Copper, 8.908	Brass, 8.508
Sp. gr. when unannealed.....	8.905	8.499
Difference.....	+ 0.003	+ 0.004

In the case of cold-rolled coin-silver my assistant obtained the following results, indicating that this alloy too is lightened by cold-rolling.

Sp. gr. when annealed.....	10.1716
Sp. gr. when unannealed.....	10.1674 (10.1676, 10.1672)
Difference.....	+ .0042

In three series of experiments O'Neill^e found that the cold-hammering lowered the density of copper. I here condense his results. The numbers in each of the first sets are the mean of ten results:

Uncompressed.....	8.879	8.898	8.885
The same pieces compressed.....	8.855	8.878	8.867
“ “ annealed.....	8.884a	8.896b	
Gain.....	+0.029	+0.018	

^a Annealed in red-hot sand and again cleaned.
^b Five of the same pieces annealed in a charcoal fire

It is true that Baudrimont found that the density of wires of iron, silver, copper and other metals was diminished by annealing: and that cold-rolling increased the density of the annealed copper and iron wires enormously, *e. g.* from 7.5361 to 7.7334.^f I can hardly credit his results. They indeed agree with the others here presented, in showing that the effect of cold working on iron is like in sign to its effect on other metals.

The points of similarity between the effects of cold-working iron on the one hand, and of hardening it and of cold-working the other metals on the other, are here summed up.

TABLE 110.—EFFECTS, ETC., OF COLD-WORKING IRON COMPARED WITH THOSE OF HARDENING IT AND OF COLD-WORKING OTHER METALS.

	Hardening iron, like or unlike cold-working iron.	Cold-working other metals, like or unlike cold-working iron.	
Effect on	Malleableness.....	Roughly like in kind, but very different in proportion among themselves.	Like in kind: not known how like in proportion.
	Tensile strength.....		
	Elastic limit.....		
	Modulus of elasticity.....		
	Hardness.....	Like (?)	Unlike for copper
	Evolution of heat during solution.....		
	Electric conductivity.....	Opposite	Like for some metals
	Heat-expansion.....		
	Chemical activity.....	Probably opposite	Like
	Density.....		
	Condition of carbon.....	Like	Like
	Structural condition.....		
Removal of effects by heating.....	Like in part	Probably like	
Apparent nature of processes.....			
Intensity of stress.....	Unlike	Identical	
	Unlike	Probably like	

Let each judge for himself the closeness of these resemblances. To me it seems that, while the resemblance between the effects of cold-working and those of quenching steel is striking at first sight, on examination it seems more apparent than real, and not so close that it may not well be accidental. On the whole it seems less complete than the resemblance between the effects of cold-working iron and those of cold-working the other metals, though unfortunately our data here are scanty. The former resemblance is at a disadvantage as regards electric conductivity; probably as regards the proportion between the gain of tensile strength, etc., and that of hardness; and probably as regards the progressive nature of the change in tensile strength and elastic limit.

(TO BE CONTINUED.)

NOTE.—The publishers of the ENGINEERING AND MINING JOURNAL will thank the readers of this article if they will promptly call attention to any inaccuracies they may observe in it.

^e *Manchester Phil Soc.*, II., p. 56, March 5th, 1861. Also *Percy, Fuel*, p. 287, 1861.

^f *Ann. Chim. Phys.*, 2d Ser., LX., p. 78, 1835.

Correction.—P. 349, first column, seventh line from bottom, for Fig. 91 read Fig. 100.

PERSONAL.

Mr. H. L. Van Nostrand, Mining Engineer, of Trinidad, Colo., has gone to Clifton, Arizona, on professional business.

Mr. W. C. Hendrie, Chairman of the Committee on Mining Securities of the Consolidated Stock and Petroleum Exchange, New York, is now in Denver on business in connection with his extensive mining interests.

Mr. Thomas H. White, Mining Engineer, has returned to Deadwood, Dakota, after several months' absence on professional business. While away Mr. White visited Southern California, Washington Territory and Mexico.

Mr. Charles August Trowbridge died at his home in this city on the 13th inst., aged seventy-one years. For the last fifteen years he has been largely interested in mining investments. Previous to this time he lived in Detroit, Mich., where he was a prominent merchant.

The National Water-Works Convention, in session in Louisville, Ky., this week, elected the following officers: J. H. Decker, of Salina, Kan., President; J. H. Diven, of Elmira, N. Y., Secretary and Treasurer. They decided to hold the next meeting in Chicago.

Mr. George F. Kunz sails for France the 20th inst., to represent Messrs. Tiffany & Co., of New York, at the Paris Exposition, and also to be acting special agent for the United States Exposition Committee, having in charge the government mineralogical and metallurgical exhibit.

Mr. R. Eames, Jr., Mining Engineer, who has had charge of the Carbon Iron Company's Cranston coal mines at Howard, R. I., and which have now been abandoned, has gone to Colorado on professional business. On his return he will go to Salisbury, N. C., where he will have the superintendency of a gold and copper mine about to be opened.

The mineralogical section of the Brooklyn Institute, Brooklyn, N. Y., has decided to purchase the Brooklyn minerals collected by Frederick Braun, and including one hundred or more varieties, and a subscription has been opened for that purpose. During the six months beginning with May the mineralogical section will make Saturday afternoon excursions to points of interest in and near Brooklyn and New York.

Mr. George F. Kunz has deposited his collection of meteorites (the finest private collection known) at the American Museum of Natural History, Seventy-seventh street and Eighth avenue. This collection contains more whole unique meteorites than any other collection. Notable are the Taney County, Mo., 197 pounds; Johnson County, Ark., 107½ pounds—the largest meteoric iron of the ten that have been seen to fall, and the only one not owned by a museum; also 100 others from 1/10 ounce to 110 pounds.

The National Society of Geologists, for the promotion of geological science, held a meeting in Washington this week to adopt a constitution and by-laws for the society, for which an act of incorporation will be obtained as soon as practicable. The officers of the organization as it now exists are: President, Prof. James Hall, of Albany, State Geologist of New York; First Vice-President, Prof. J. D. Dana, of New Haven, Conn.; Second Vice-President, Prof. Alexander Winchell, of Michigan University, at Ann Arbor; Secretary, Prof. John J. Stevenson, of the University of the City of New York; Treasurer, Prof. Henry S. Williams, of Cornell University.

The annual meeting of the National Academy of Sciences was held this week in Washington, D. C., and the following officers were elected: Professor Asa Hall, who has served six years as Home Secretary, was re-elected. The members of the council elected were: Professor George J. Brush, of New Haven, Conn.; General Francis A. Walker, Benjamin A. Gould, of Cambridge, Mass.; Professor Ira Remsen, of the Johns Hopkins University, Baltimore; General Montgomery Meigs and Professor Simon Newcomb. The Watson medal and \$100 in gold were awarded to Prof. Edward Schoenfeld, of the University of Bonn, Germany, for his astronomical researches and discoveries. This is the second Watson medal awarded, the first one having been presented to Dr. B. A. Gould, of Cambridge, Mass., for his labors during nearly forty years in promoting the progress of astronomical science.

About one hundred boiler manufacturers from all parts of the country, met at Pittsburg, Pa., on the 16th inst., and organized the American Boiler Manufacturers' Union. Following officers were elected: James Lapham, Pittsburg, President; Philip Roban, St. Louis, First Vice-President; A. T. Douthett, Pittsburg, Secretary, and Richard Hammond, Buffalo, Treasurer. The object of the organization, as set forth in the resolutions adopted, is to prevent the use of materials of an inferior quality, and Congress was asked to make it a criminal offense, punishable by imprisonment, to manufacture or sell iron or steel boilers of inferior quality, and a similar offense, punishable in like manner, for the manufacture of boilers, for any purpose, of an inferior quality not specified after the passage of such laws. The next meeting will be on October 16th.

INDUSTRIAL NOTES.

The Brooke Iron Company, at Birdsboro, has resumed work in the nail factory, which has been idle for two months.

Operations have been resumed at the steel mill of

the Pottsville Iron and Steel Company, at Pottsville, Pa., the labor difficulties having been settled.

We are informed by Messrs. Hunter & Willis that the Eddy Electric Manufacturing Company, of Windsor, Conn., has been unable to install \$9,000 worth of stationary motor plants, which they have sold in New York City, owing to the trouble caused by putting the wires underground.

The Amalgamated Association of Iron and Steel Workers will ask that all the iron mills be closed for two months during the hot summer, just as are the glass factories. This move has been decided upon by a majority of the lodges, and meets with general favor among the iron workers.

The Hersey, Mass., Meter Company, of Boston, reports that the case of the National Meter Company against the City of Yonkers, N. Y., as users, and Hersey Machine Company as manufacturers, has been decided by Judge Wallace, in the United States District Court, Southern Jurisdiction, New York, in favor of the Hersey Meter Company.

The Crane Iron Company, at Catasauqua, Pa., has made a reduction of 10 per cent in wages. The men have refused to accept the reduction, and the four furnaces in blast were banked on the 12th inst., preparatory to being blown out. A similar reduction has been made by the Catasauqua Manufacturing Company, and also by the Allentown Rolling Mills.

The United States Volta Electric Battery Company, has been organized at Portland, Me., with a capital stock of \$2,000,000, shares \$10 each. The officers are: President, Geo. L. Clark, Boston; treasurer, N. C. Woodworth, Chicopee, Mass.; directors, N. C. Woodworth, Samuel May, Jr., Chas. S. Clark, and the object will be to purchase, own, hold, sell and deal in letters patent on galvanic batteries.

The Southern stove manufacturers met in Chattanooga, Tenn., on the 17th inst., and formed an association subject to the National Stove Makers' Association. Prices were raised on the line of cheap cooking stoves; on all other lines prices remain about the same. J. W. Buttorff, of the Phillips-Buttorff Manufacturing Company, Nashville, was elected President, and George Pfingst, of Louisville, Secretary.

The Troy Steel and Iron Company, of Troy, N. Y., has completed an experiment in making soft steel with a modification of the Bessemer converter with a special lining, patented by C. W. Bildt, chief chemist for Washburn & Moen, of Worcester, Mass. The experiment is reported to have been a success. This quality of steel has heretofore been imported from Germany.

The new works of the Steubenville and Iron Steel Company at Alikanna, Ohio, which started about a week ago, are already stopped by a strike. An Amalgamated Association was started and chartered by some of the men and the scale was signed, but with a reservation which the men claimed would work to their disadvantage. There was also some difficulty as between the workmen of home and foreign puddlers.

The blast furnace, engines, and other property of the old Duluth Iron Company, Duluth, Minn., have been sold to satisfy a judgment of \$130,000. In 1883, Walter Mann, of St. Paul, the trustee of the property, purchased one hundred \$1000 shares of stock, and when the company stopped business a mortgage and trust and were executed to him to make good his interest in the concern. There were no bidders for the property before Messrs. Minn.

Assistant Secretary Tichenor has advised the Customs Collector at Suspension Bridge, New York, in regard to a dredge of domestic manufacture, which has been in use in foreign waters, that "improvements made to the vessel since it left the United States, in the form of a hoisting apparatus, are sufficient to deprive it of the privilege of free entry as a domestic manufacture returned in the same condition as exported, and that the dredge is therefore subject to duty as an entirety."

The Plymouth Rolling Mill Company, of Conshohocken, Pa., made an assignment for the benefit of creditors. The assignee placed the deed of assignment on record on the 13th inst. The concern is said to have been in straitened circumstances for five years, but it cannot be learned that any large claims were troubling them. Three or four suits have been instituted against the company within the last year, aggregating about \$3,000.

The company owns a rolling mill and a blast furnace in Conshohocken and a blast furnace in Norris-towa.

The Lehigh Zinc and Iron Company, of Bethlehem, Pa., has purchased the Joplin Zinc and Smelting Works and 2,140 acres of mining lands within a few miles of Joplin, Mo. A greater portion of the territory has already been developed and is ore producing. The aggregate price of the various properties is reported to have been about \$175,000. The company will at once enlarge the zinc smelting works and add a plant for manufacturing sheet zinc. To this enterprise the citizens contributed \$10,000, the company later agreeing that the plant shall have a capacity of producing 20,000 pounds of manufactured zinc a day and to cost not less than \$250,000.

The Rand Drill Company have issued a new catalogue, amply and well illustrated, and which for the information it contains should be in the hands of every engineer and contractor. It is a successful enlargement of the previous edition and constitutes a useful handbook upon everything connected with rockwork. It is impossible to enumerate all the points of interest covered, but we draw attention

to the improvements in the Little Giant Rock Drill not previously described. The stopping bar too, so useful where the tripod is not convenient, is worth examination. The mechanically opened valves both inlet and outlet, for air compressors is a decided advantage. For mountainous districts the sectional air compressor is a novelty, and should become popular. Water-power compressors come in for their share of attention, and the new water impulse compressor should effect considerable saving in power from its direct action and absence of connections. As for the section on useful information it is mostly original matter and in an acceptable form.

The Westinghouse Electric Company, through its lessee, the United States Electric Lighting Company, brought suit in the United States Circuit Court, New York, on the 18th inst., against the Manhattan Electric Light Company of New York City, which operates what is known as the Fort Wayne Jenney System, for infringement of a patent just granted to the United States Company for an improvement in the armatures of dynamo electric machines, made a number of years since by Edward Weston, of Newark, N. J. The invention was for the purpose of diminishing the intense heat produced in the early dynamos, but it was simultaneously claimed by Edison in 1882. After over six years contest in the Patent Office, the decision resulted in Weston's favor, and the Edison Electric Light Company secured a license for the use of the invention. While the patent was ungranted every manufacturer of dynamos in the country used Weston's invention. The suit against the Manhattan Company is the first of a series to enforce the claims of Weston and his assignees.

Our special correspondent sends us the following from Trinidad, Colo.: The works of the Trinidad Rolling Mill and Iron Company began operations on the 8th inst., and, after a few preliminary stoppages, seem to be well under way. The enterprise is mainly a home one, and one upon which the people hereabouts look with much favor. It is the first to begin active operations of several new industrial undertakings which are expected to test the question of Trinidad desirability as a location.

The works have a daily capacity of 25 tons of merchant iron. The machinery consists of a battery of four 125 horse-power boilers, feed-water heater and steam boiler and supply pumps, one 500 horse-power engine, operating an 18-inch puddle (or bar) train complete, a 300 horse-power engine with 12-inch roll train, two heating furnaces, large and small shears (with independent upright engines), cold saw, lathes, cranes and all other necessary appurtenances, the machinery, of the latest approved pattern, manufactured by the Lewis Foundry and Machine Company, of Pittsburg. The product will consist of square, flat, round, half-round, diamond and mine T rails.

The company started out with six months' orders on hand, the market furnished chiefly by the railroads centering here. Scrap-iron for two years is assured at \$12 per ton, delivered, which is said to be \$4 to \$6 less than same quality can be bought in Pittsburg.

In this connection the New Mexican Iron Company make a proposition to Trinidad for the location of an iron blast-furnace here. Pig-iron, it is estimated, can be produced at this point at a cost not exceeding \$9 per ton.

CONTRACTING NOTES.

Our list of machinery and supplies wanted will be found on page xvi. Manufacturers of machinery, engineers and contractors should also consult our directory of "Contracts Open" on the same page. This week, proposals are invited for the following new contracts: No. 1368, Sinking Iron Caisson in Artesian Well; No. 1369, Railway Construction and Operation; No. 1370, Construction of Water-Works; No. 1371, Supplying Water and Gas; No. 1372, Supplying Water Connection.

GENERAL MINING NEWS.

The scale conference of the Western Pennsylvania & Ohio Railroad coal miners and operators, who held a meeting in Pittsburg, adjourned on the 16th inst., after adopting a scale providing for a reduction of 2½ cents per ton on the present price. The scale committee was composed of eight operators and eight miners, four of each from Pennsylvania and the balance from Ohio. The Pennsylvania miners voted unanimously against the reduction, but the remaining 12 members of the committee voted in favor of it. If the action of the Pennsylvania members is sanctioned by the Pennsylvania miners a strike in the Pennsylvania mines is inevitable. The delegates say the great majority of railroad coal miners will object to the scale.

ALABAMA.

The Sheffield & Birmingham Coal, Iron and Railway Company has sold its railroad, extending from Sheffield to Jasper, 87 miles, to Alfred Parrish, Philadelphia. Mr. Parrish named the road "The Birmingham, Sheffield & Tennessee River Railway," of which road he is president, and by which name it will hereafter be known.

ALASKA.

ALASKA GOLD COMPANY.—This company, which operates the Bear's Nest group of mines on Douglas Island, has pushed development work and is now about ready, it is said, to commence the erection of a 120 stamp mill.

TAKON CONSOLIDATED MINING COMPANY.—This company, operating in Silver Bow Basin has started

up its ten stamp mill. The mill and mine are so situated that the ore can be mined and milled cheaply, and, it is stated, very low grade ore can be made to pay a profit.

ARIZONA.

GRAHAM COUNTY.

The Arizona Copper Company, of Clifton, and the Detroit Company, at Morenci, are each running but one furnace.

MOHAVE COUNTY.

ANTLER.—This mine, of the same character as the Copper World and in its immediate neighborhood, has been purchased by Messrs. Phelps, Dodge & Co. of New York.

COPPER WORLD.—This mine twelve miles, south of Yucca, is now owned by Messrs. Phelps, Dodge & Co., of New York. Considerable work has been done in running levels, sinking winzes, and like work, and it is said large bodies of ore have been uncovered. The ores are carbonate and sulphide, and are 35 per cent copper. The ore taken out in the workings is now being shipped to Copper Basin, near Prescott, to be used in matting other ores at the furnace there.

PIMA COUNTY.

PLOMA.—The final payment of \$10,000 has been made on these mines of the Tyndal District, sixty miles south of Tucson.

YELLOW JACKET.—It is reported that Messrs. Claffin & Co., of New York, have purchased this gold mine of Oro Blanco District, forty miles south of Tucson, for \$20,000.

CALIFORNIA.

AMADOR COUNTY.

[From our Special Correspondent.]

AMADOR, April 8.

This county is greatly in need of capital with which to develop its mines, and, if we can induce our eastern friends to visit and examine the undeveloped properties here I am sure they will be pleased with the outlook, and be ready to furnish all the capital necessary.

AMADOR.—At this gold mine, just beyond the Zeilic, the work of constructing a gallows frame at the main shaft and building a tramway some 2500 feet long to the mill, goes on, and it is thought everything will be ready to commence the milling of ore on or about June 1st.

They have one of the best mills in the county, and we all hope the ore may prove as good as they have reason to expect. The Astoria and Middle Bar mines are in about the condition they have been in for the past two years. The same may be said of the Hollywood. I presume the investors in those stocks think they can't lose much if they lose it all. Those stocks are like some other things, "the more a man has the poorer he is."

BUNKER HILL MINING AND MILLING COMPANY.—The company's mine is running a full force, keeping the 40 stamp mill in continuous motion. A representative of an English Company was here last month and made a very careful examination of the property, and has made his report. It is generally understood the examination proved very satisfactory. It is a large property, and I know of no mine on the lode that holds out greater inducements to an English company.

COSMOPOLITAN.—This mine, situated midway between the towns of Plymouth and Amador, continues to look well, and the work of developing is being pushed ahead as fast as possible, in order to be ready for the 30-stamp mill that will be built on that property this season. The contract for the building of the mill has been taken by Knight & Co., of Sutter Creek, which is a sure guarantee that the Cosmopolitan people will have a good mill. Mr. Crocker, a very wealthy paper manufacturer of Fitchburg, Mass., and one of the principal owners in the Cosmopolitan, has been here for the past few weeks, in consultation with Geo. Weymouth, the general manager of the property, and it is very evident the company intends to put the property in good shape by having the very best machinery for developing it. There is also a report that Mr. Crocker has bought several claims parallel with and west of the Cosmopolitan property, and will commence at once the work of developing them.

KEYSTONE.—This mine, also situated in Amador, is not looking quite as well as it did a few years ago. They are now running only 20 of the 40 stamps, but the president of the company was here last week and made a careful examination of the mine, and then expressed the opinion it would be but a short time before all the stamps would be in motion again. Probably improved concentrators will take the place of the old Hendy pan in the mill, which alone will save the company many dollars that have been running down the creek.

NEW LONDON.—This mine, in the Plymouth district, is looking well, and the work of prospecting goes on with great regularity. Common report says a 40 stamp mill will be built this season.

PLYMOUTH CONSOLIDATED MINING COMPANY.—Everything is getting in good running order, and the company is now able to keep 40 stamps in the Pacific mill running. A shipment of the bullion for last month's run has been made, and I understand it was quite satisfactory. There is no doubt but the Pacific portion of the mine contains quite a large amount of good pay ore, and the same will pay dividends for some time to come.

SOUTH SPRING HILL.—This mine, just south of the Keystone, continues to yield dividends to its stockholders. Its 30-stamp mill is running steadily.

TALISMAN.—This old mine, now in the hands of a new company, joining the South Spring Hill on the south, is now being opened out in good shape, and will soon be one of the paying mines of the county.

ZEILIC.—This mine, at Jackson, is one of the permanent institutions of that section. The company has been sinking the main shaft another 100 feet during the past few months, necessitating the stoppage of 20 of their 40 stamps. It will soon be running full again.

MONO COUNTY.

BULWER CONSOLIDATED MINING COMPANY.—This company has been enjoined from working that portion of ground in dispute with the Standard Consolidated Mining Company, pending a suit which the last named company has brought against the Bulwer Consolidated in the United States Circuit Court in San Francisco.

SIERRA COUNTY.

RED CHIEF GOLD MINING COMPANY.—President Chas. Roblee informs the ENGINEERING AND MINING JOURNAL that twenty stamps of the new mill are now dropping steadily, and it is hoped to have the remaining twenty stamps completed shortly. A sketch of the latest workings, on file at the New York office, shows that the present development of the property consists of a main tunnel, 293 feet in length, connected by a 155-feet upraise with No. 3 tunnel, which now covers a length of 125 feet, according to Mr. Roblee, all in ore. The latest reports from the mine state that the ore continues to run from \$8 to \$10 per ton.

COLORADO.

THE COLORADO GOLD AND SILVER EXTRACTION COMPANY, LIMITED (NEWBURY VAUTIN PATENTS).—The directors have resolved to issue £10,000 in £1 shares, with a cumulative preferential dividend of 10 per cent per annum, and an additional division of dividends, *pari passu*, with the ordinary shares after 10 per cent per annum has been paid thereon. The further capital is required for the erection of additional plant outside Denver, and the purchase of ore, etc.

GILPIN COUNTY.

GREGORY BOBTAIL MINING COMPANY.—Under and in pursuance of the terms of a certain indenture of mortgage or deed of trust made the 24th day of September, 1887, between the company and Walter Lambert, as trustee, all the property, estate, rights and franchises conveyed by said indenture of mortgage or deed of trust, will be sold at public auction at the Real Estate and Auction Rooms, Limited, No. 59 Liberty street, New York City, N. Y., at 12 o'clock noon, June 4th, 1889.

LAKE COUNTY.

ADAMS MINING COMPANY.—It is reported that this company has made a proposition to lease its property to the Maid of Erin mine, an adjoining productive mine well provided with hoisting and pumping machinery.

DINERO MINING AND MILLING COMPANY.—Arrangements are making to start up the mill.

DUNKIN MINING COMPANY.—This company has recently paid a state tax of \$1900, covering, it is believed, two years. The tax on the mines is a new one upon their output, and payment was opposed by the companies, which, however, were defeated in the legal contest, as mentioned in our issue of March 23d. After the payment of the dividend the company will have some \$27,000 at the Eastern office, besides several thousands in Leadville. General Manager Schumacher started East for a brief vacation April 16th.

IRON SILVER CONSOLIDATED MINING COMPANY.—It is stated that a concentrator is to be erected for the Moyer and Stevens shafts of this company. The old mill on Iron Hill is expected to start up next week. It has been shut down for some time, and when running used mud matter exclusively. It is expected hereafter that enough concentrating ore will be taken from the underground workings to keep the mill constantly employed.

ST. KEVIN MINING COMPANY.—The mill has been working under a heavy disadvantage throughout the winter, on account of a scarcity of water, but there is now plenty of it, and the mine can be conducted on a broader basis, inasmuch as the mill can dress 65 to 85 tons per day, the difference being in the nature of the ore.

OURAY COUNTY.

NEW GUSTON COMPANY, LIMITED.—The following circular has been sent to the shareholders: In September last the directors, having been impressed by Mr. Theodore E. Schwarz, Superintendent, of the prospective value to your company of the two adjoining claims, the Little Annie and Smuggler, secured a twelve months' working option upon these properties on very reasonable terms, and since that time have been developing the Little Annie by a cross-cut from the Guston third level to connect with the Annie shaft. The developments, so far, are considered most promising, and in the event of valuable ore bodies being discovered in either of these claims before September next, the Guston Company is in a position to secure them for the sum of about \$17,000, and thus nearly treble the present area of the Guston property; at the same time the Annie Shaft (now over 200 feet deep) will become available as a second working and ventilating shaft, and the general working facilities of your property be much improved. Mr. Schwarz, in reply to inquiries regarding the ore body existing in the Little Annie, writes as follows: "The ore occurrence is strong and well defined, with good body of quartz, showing a strong chimney in the adit level of Little Annie. It is low grade, as all these Red Mountain chimneys have

been at surface, but shows considerable copper—a good indication." GUSTON MINE.—Shareholders should carefully distinguish between the high grade argenticiferous copper ore upon which we are and have been working in the Guston mine since August 12th, and the low grade ore bodies which are also being worked in other parts of the mine.

Mr. Schwarz writes: Ore body in No. 1 level south, referred to in circular of 5th February last, promised well as another ore chimney of value in depth, and he thinks it is probably identical with the ore body from which we are now shipping \$45 to \$60 ore in No. 4 level south, which is a distinct and separate body of ore from the high grade shoot we have been working upon since August last, and from which the high grade ore has been and is being shipped.

RUBY TRUST MINING AND MILLING COMPANY.—It is stated that ten more stamps will be added to the mill shortly.

PITKIN COUNTY.

It is now stated definitely that Aspen and Tourtelotte Park are to be connected by a tramway covering a distance of about three miles. The projectors are J. B. Wheeler, of New York City, and David R. C. Brown, of Aspen. The wire-rope tramway will be a Bluchert improved system, built by the Trenton Iron Company, of New Jersey.

At present the shipment of ore from Tourtelotte Park and, with two exceptions, on Aspen Mountain, is suspended, teams being unable to get through a sea of mud.

COMPROMISE MINING COMPANY.—This company has decided on the construction of an independent tramway from the level of the city to its property on Aspen Mountain which will carry it a distance of over four thousand feet up Spar Gulch. This step has been contemplated for a long time as the transportation of its output by steam and wagon road has been very unsatisfactory. It is also stated that the project includes an ultimate extension of the line to Tourtelotte Park, this having been agreed upon at a recent meeting of the company.

JUSTICE MINING COMPANY.—Mr. William B. Harris, of Leadville, representing the purchasers, and Ruse & Richards, representing the grantors, have transferred 6800 shares of stock—a controlling interest—in this company to William Lawson, of Boston, to a syndicate including Edward R. Holden, of the Pueblo Smelting and Refining Company, William H. Bush, of the Windsor Hotel, Denver, and others. The price paid was \$30,000.

LAST DOLLAR.—A quarter interest in this mine has been sold by John A. Storm, of Denver, to George L. Brown, present manager of the property, for \$10,000.

SUMMIT COUNTY.

WARRIOR MARK.—This property, which has been worked for the last year by the German National Bank of Denver, under the superintendence of Mr. Wm. Peckham, has been closed down because of the difficulty of getting rid of the water. The main shaft is down about 600 feet and the mine is not equipped with pumping machinery sufficiently powerful, and the manager decided it cheaper to close down until about July 1st rather than put in the required machinery. It is stated that no financial incumbrance follows the temporary suspension.

DAKOTA.

LAWRENCE COUNTY.

CALEDONIA MINING COMPANY.—From a letter from Supt. T. L. Skinner, received this week by Messrs. Laidlaw & Co., of New York City, we take the following: "The winze from the 500-foot level is going down on a very good bunch of ore. Samples of ore average \$6. It is now down some 20 feet, but it is not good to judge of the ore by the winze. When we get further down, I will cross cut. The reason shipments have been low is that I have been working low grade ore and reserving our best ore." The production for the week ending April 1st was 1720 tons, which is an increase over preceding weeks. The winze above referred to is being sunk at the rate of from five to eight feet per week.

DEADWOOD CONSOLIDATED MINING AND MILLING COMPANY.—It has been decided to consolidate the Golden Reward Company with the Deadwood Reduction Works, by disorganizing the reduction works, reorganizing and incorporating a new company to be called the Deadwood Consolidated Mining and Milling Company. The new company will have a capital of \$3,000,000; shares, \$10 each. Of this number 187,500 shares will be issued in payment for Golden Reward, and 62,500 in cancellation of the stock of the old reduction works, leaving 50,000 shares of treasury stock, which will be sold at \$1 per share for a working capital. This essentially is asking \$1.20 per share for the consolidated stock to new subscribers, or the plant when completed representing at least 30 cents of the \$1.20, and leaving the Golden Reward selling on a basis of 90 cents. There are now 3,200 tons of Golden Reward ore on the dump at the reduction works. Hardly an opening has been made on the ore bodies contained in this mine. It is stated that Eastern parties, through Mr. Hickok, have agreed to take an interest to the extent of \$30,000 in the enterprise.

DEADWOOD TERRA MINING COMPANY.—The product for March was \$55,350 against \$63,061 for February. The cash balance in the treasury of the company increased from \$97,418 on February 1st, to \$122,332 on March 1st.

HOMESTAKE MINING COMPANY.—Messrs. Lounsbury & Co. advise us that the product of the Homestake mine for March was \$79,073, which is about the usual amount of the monthly product.

KEYSTONE CHLORINATION WORKS.—Mr. J. G. Keith and a few other citizens of Deadwood have decided to erect a chlorination plant of twelve tons capacity, in Ida Gray District, at Garden City. The Snider 20-stamp mill has been purchased, to which will be added the necessary machinery to make the plant complete. The gentlemen interested have several quartz claims in the vicinity, located last winter, upon which they have kept men at work ever since. The ore has been thoroughly tested, and there is now a large amount on the dump.

PENNINGTON COUNTY.

HARNEY PEAK TIN MINING, MILLING AND MANUFACTURING COMPANY.—As the representative of American mining interests and in view of the position taken by the ENGINEERING AND MINING JOURNAL on this subject, it is eminently proper that the JOURNAL should be the first American publication to print definite and authentic information concerning the final consummation of the much talked about Harney Peak Tin deal. A reporter for the ENGINEERING AND MINING JOURNAL this week found Mr. Chas. D. Deshler, the secretary of the Harney Peak Tin Mining, Milling and Manufacturing Company, at the newly opened offices of the company, No. 280 Broadway, New York City. Mr. Deshler in substance said: "Our capital stock is now \$15,000,000, divided into 150,000 shares. There are no preference shares of any kind. The company has offices at No. 5 Lothbury, London, E. C., and in this city. The board of directors is composed as follows:

"D. S. Appleton, Wm. Remsen, Louis May, Samuel Untermyer, George Ehret and Henry Clausen, Jr., the brewers, Jas. Flannagan, Jas Wilson and the following English capitalists: Lord Thurlow, Wm. Garnett, H. Seton-Karr, Edw. S. Baring-Gould, and John Taylor. The officers are Samuel Untermyer, President; Henry Clausen, Jr., Vice-President; Lewis May, Treasurer, and Chas. D. Deshler, Secretary. The property of the company is in Pennington and Custer counties, Dakota. It comprises over 300 lodes, which are included in a circle, having a circumference of thirty miles and distant from the center about seven or eight miles. This center is the famous Harney Peak, a granite mass, which rises to a height of 7,800 feet above sea level, and slopes gradually for a distance of about seven miles, finally disappearing in the foothills.

"It is an interesting fact that the tin deposits occur not in the native country rock, which is slate, nor in the granitic upshoot forming Harney Peak, but are invariably found at the point of contact of these rocks. Beginning at the extreme eastern point of the circle, we find the Etta group, the development of which has already been fully described in Prof. W. P. Blake's report, published in the ENGINEERING AND MINING JOURNAL, September 8th and November 29th, 1884, etc. Here we have a 200-ton mill. In this vicinity is also the Sarah group, which has been extensively developed and into which we will run a tunnel 300 feet. We have now a tramway between the Etta mine and mill which we propose to connect with the Sarah group, thus enabling both groups to send their ore direct to the mill. Continuing in a northwesterly direction and around the circle, there are the following groups of lodes: Bob Ingersoll, Legal Tender, Volunteer, Addie, February, Excelsior and Logan. The last four groups comprise a total of 70 lodes. The Addie and Excelsior have been well developed. We now come to the bulk of our richest property at Hill City and vicinity, which includes the following groups: Le Grand, Edna, Telegraph, No Name, Cassiterite, Mohawk, Campaign, Gertie, Delia, Cowboy and Coates. On the two last work is being vigorously prosecuted. At the Cowboy the shaft has reached a depth of 100 feet, and at 75 feet drifts have been run east and west. At the Coates there is a shaft of the same depth, with east and west drifts at sixty feet. In the Cowboy an eighteen to twenty inch vein has been encountered. At Hill City we propose to build immediately a 500-ton mill in four sections. The machinery for this mill has already been ordered from Fraser & Chalmers, of Chicago, and will cost over \$57,000. Should the production warrant it we will increase the capacity to 2000 tons. South of the Hill City deposits, and within six miles from Custer City are the following groups: Tin King, Little Whale, Tenderfoot, Darwin and Czar. If Professor Vincent so decides we will also build a mill here; otherwise the ore will be sent by tramway to the Hill City mill. This completes the circle. Water power is abundant and in the fertile valleys on the slopes of Harney Peak we have land in plenty for the thousands of men that may be required to thoroughly develop this extensive territory. Transportation facilities can be easily provided for. Already, we have entertained a proposition to build a narrow-gauge railway around the circle of our mines. In a year, we expect to spend not less than \$500,000 upon the property. We are now employing 200 men and this number will be almost immediately increased. As to the quality of the ore, there can be no better testimony than the assays made in England, which were sufficient to secure English capital to the amount of \$1,500,000.

"These assays were made on November 14th by Johnson & Matthey, Mr. Claudet, Assayer to the Bank of England, and Capt Davies, of the Dolcoath mine, and resulted in an average yield equivalent to 92 pounds of black tin, or 64 pounds of metallic tin per ton, taking 70 per cent as yield of metal. On December 6th, Thos. Bolitho & Sons also assayed a quantity of over eight tons from which was obtained over 7 cwt. of black tin (tin ore) equivalent to 94.6 pounds of

black tin per ton. This ore yielded 66 per cent of metal of refined quality, so that the out-turn of metal was 62.67 pounds per ton. This was not ore selected for its richness. Representatives of the English investors went to Dakota themselves, and selected any ore they chose. They sent to England 40 tons, and 10 tons of this was again selected by them for the final assay, as representing the average."

We sincerely hope that the expectations of Mr. Deshler may be realized. The ENGINEERING AND MINING JOURNAL has never disputed the existence of tin in Dakota, but has demanded some proof that tin in paying quantity existed there as a preliminary to the enormous capitalization. This proof is yet lacking, and since the ore sent to England was notoriously selected as the best to be gathered in Dakota, its yield is no measure of what will be found in regular working. In view of the \$15,000,000 capital of the present enterprise, it must be said that former strictures are still applicable.

Mr. Deshler says that it makes little difference to the stockholder whether the capital is five or ten millions, so long as his proportion remains the same. Mr. Deshler says that the English capitalists paid over 50 per cent per share for their stock, which would make the cash valuation of the property over \$7,500,000, a perfectly absurd figure for a lot of prospects. Of the new stock which has gone into American hands, Mr. Deshler says that it was paid for, but does not care to state at what figure it was purchased.

We see no reason in any of this official information to change the opinion we have already frequently expressed, that the property is as yet almost wholly undeveloped, and thus far no paying mine has been opened on it. As it stands, the capitalization and price at which the stock was sold are inflated far beyond any present or prospective value. As we have frequently observed, it is possible that paying deposits may be found, and we sincerely trust this may be the case, though, should it occur, it would in no way justify the selling of a property at from fifty to one hundred times its value.

A proof of the above was submitted to Mr. Deshler. The statement that the 40 tons sent to England "was notoriously selected as the best to be gathered in Dakota," he strenuously objects to.

GEORGIA.

HARALSON COUNTY.

CAMILLE GOLD MINING COMPANY.—We are officially advised by the company that it has contracted with the Rand Drill Company, of New York, for one 16 x 24 air compressor and four slugger drills, and also with the Griffith & Wedge Company, of Zanesville, Ohio, for one 9 x 12 double cylinder double independent drums hoisting engine. The machinery is to be delivered the 1st May, and will be erected at the company's mines near Tallapoosa. The company took the names of the Rand Drill Company and the Griffith & Wedge Company from the advertising pages of the ENGINEERING AND MINING JOURNAL.

IDAHO.

EGAN MINES.—Advices received in New York this week, for which we are indebted to the Daly Mining Company, of Utah, state that the Russell lixiviation process has been tried by J. W. Young, owner of the Egan group of mines at Mineral City on Snake River with marked success. Three separate tests were made, and the results showed that from 82 to 96 per cent of silver was saved, whereas only 70 per cent is usually recovered by amalgamation.

ALTURAS COUNTY.

PHILADELPHIA & IDAHO COMPANY.—This company finds it more profitable to operate its mines and ship the ore than to reduce at its Ketchum smelting plant. The North Star, on the East Fork of Wood River, turned out last year 2000 tons of concentrates, running 65 per cent lead and 65 ounces silver. At present, 35 men are employed. The tunnel is in 1500 feet, with a 150-foot shaft at the inner end, reaching a depth at that point of 1200 feet, and having two levels below of 500 and 600 feet, respectively. It has a first-class concentrator. About one half the value of ore shipped is in the form of concentrates. The company own the Silver Star in the Smoky country, which they are trying to develop so as to warrant doubling the capacity of their fine concentrating mill near the mine.

ROCKY BAR WIDE WEST GOLD, LIMITED.—During March there were mined and milled 425 tons quartz, producing 292 ounces bullion; estimated value, \$4400. The above return shows an average yield of 13 dwt. 18 gr. per ton of quartz.

KANSAS.

KINGMAN COUNTY.

A strike of rock-salt at Kingman at a depth of 675 feet is reported.

KENTUCKY.

BELL COUNTY.

PINE MOUNTAIN IRON AND COAL COMPANY.—This company will add 40 new ovens to their plant at Pine-tree.

MICHIGAN.

IRON MINES.

CHESHIRE.—This mine in Marquette County, which has been idle for two years, will again start up under the supervision of Capt. A. P. Wood.

LUDINGTON.—The management have decided to use a diamond drill at the east end of the mine, in the bottom, and work has been begun. At the old Ludington

the vein holds its usual size, and the usual product of from 800 to 1000 tons of first-class ore per month is being sent out. No. 5 shaft is nearly down to the 10th level, and "A" shaft has been completed to the 10th and the level cut out, and sinking again commenced.

MISSOURI.

JACKSON COUNTY.

Messrs. Miller, Darling & Co. have just finished a 435-foot shaft exposing a 24-inch seam of coal on their property six miles north of Kansas City. They are now erecting machinery, and expect to begin shipping coal shortly. This is supposed to be the same seam which is being worked at Leavenworth.

JASPER COUNTY.

The white lead works of Joplin are in full blast, with an encouraging outlook that they will continue running steadily, as the output of lead ore is increasing.

BURCH LEAD AND ZINC MINING COMPANY.—This company has just finished the erection of additional machinery and expects to have the capacity doubled in a short time. The mine is said to have quite a large amount of ore in sight that will pay well.

VICTOR LEAD AND ZINC COMPANY.—This company has been organized with a capital stock of \$50,000. The shareholders are as follows: G. B. Young, 50 shares; M. E. Arnold, 95 shares; M. F. Flanders, 25 shares; M. P. Welton, 25 shares; to carry on operations on the Connor land, near Webb City, where some zinc mines have already been developed.

WEBB CITY MINING COMPANY.—This company, which has a capital of \$55,000, shares \$5 each, has a promising piece of property in Jasper County. The company is reported to have \$4700 in the treasury, and is paying a monthly dividend of 2 per cent.

MONTANA.

DEER LODGE COUNTY.

BI-METALLIC MINING COMPANY.—This company is crushing 65 tons per day of medium grade ore.

SAN FRANCISCO CONSOLIDATED MINING COMPANY.—Messrs. Farrish & Lacombe, of Denver, have recently been examining the San Francisco mine, and will report to the St. Louis office as to the best manner of treating the same.

LEWIS & CLARKE COUNTY.

MONTANA COMPANY, LIMITED.—Official reports show that during March the total weight of ore crushed was 6483 tons; yield from the three mills, \$118,000; working expenses for the month, \$55,000. The estimated number of ounces contained in returns by assay being: gold, 3023 ounces; silver, 40,155 ounces.

MEAGHER COUNTY.

Hensley Bros. and Dr. J. P. Rhoads, of Castle, have incorporated a smelting company for the purpose of smelting custom ores at Castle. They have bought out the Cumberland smelter, and are making considerable improvements on the plant, and should the ore production justify it they will put in another large furnace; the ores of this camp are principally lead carbonates that require no concentrating or roasting, and as there is an abundance of fluxing material at hand, the ores of this camp can be smelted here to better advantage than to ship them out on account of the long distance to the railroad and high prices for wagon transportation, notwithstanding these valuable qualities as a flux for dry ores.

SILVER BOW COUNTY.

BOSTON & MONTANA CONSOLIDATED COPPER AND SILVER MINING COMPANY.—At a meeting of the directors on the 13th inst., Mr. Jere Abbott resigned his seat in the board of directors, and Mr. A. W. Spencer was elected in his place. A special meeting of the stockholders is to be called to authorize the issuing of a general mortgage of \$500,000, to provide the means for the company to build itself an adequate smelting plant, which they not only recommend, but deem absolutely necessary. They consider that the proceeds of these bonds and the profits of the mine will pay for the completion of the new smelting plant, and enable the company to pay dividends of at least \$4 per share per annum. The erection of the smelting plant will, it is estimated by the company, pay the cost of the entire works in less than two years.

NEVADA.

ELKO COUNTY.

[From our Special Correspondent.]

The Union Mill is crushing ore from Nevada Queen and North Belle Isle. Both mines are producing fair grade ore, carrying a good percentage of gold.

COMMONWEALTH MINING COMPANY.—This company has reserves of rich ore, and it still goes on opening up more ground, taking out only what is in the way. Why is it not milled and proceeds given to shareholders?

EYRIE.—This mine is improving every day, producing wonderful ore—silver chunks on which you can stamp the "eagle" after sawing it through—such specimens assaying over \$30,000 in gold and silver. The ore is shipped to Reno for reduction. Mr. Smith is now unwilling to sell.

FOUND TREASURE MINING COMPANY.—This company has resumed work, is showing good grade ore—some veins averaging \$1000 per ton—and would have been paying dividends but for the costly and unjust litigation into which the company was forced.

GRAND PRIZE MINING COMPANY.—There is good work being done in this mine under the able manage-

ment of Mr. J. Daugherty. It is expected to concentrate the ore, with much greater profit to the shareholders, than the last runs on the old mill proved to be.

NAVAJO MINING COMPANY.—This company is producing good ore, and there is plenty in sight of high grade, and yet the last few shipments of silver have been light, about \$8,000 a week. Navajo mill is closed for repairs.

TUSCARORA CONSOLIDATED MINING COMPANY.—The mine is closed down pending the erection of hoisting works. No ore has been milled up to date.

ESMERALDA COUNTY.

It is currently reported that Colonel W. J. Sutherland is negotiating for the purchase of the Holmes mine, Candelaria, and also for mining property belonging to J. H. Callison.

MOUNT DIABLO MINING COMPANY.—The total bullion production for March amounted to \$36,348.78.

STOREY COUNTY—COMSTOCK LODGE.

We condense the following from the Virginia City Chronicle: The project of exploring the ground west of the present workings of the Comstock lode on the Suro Tunnel level, which has been agitated at intervals for several years, is now assuming tangible shape. A meeting of superintendents will soon be held to discuss the matter and submit the result of their deliberations to the directors of the companies they represent. A well-known superintendent said to-day that the tunnel could be driven one mile west of its present face for the small sum of \$150,000, and that sum can be raised by an assessment of ten cents a share, levied by ten of the principal companies on the lode.

The surface croppings west of the main Comstock lode indicate the presence of several large veins, which have been cut through in driving adit tunnels, which penetrated those veins at a few hundred feet below the surface, and they showed marked improvement at that depth. A large amount of bullion was realized from ore extracted in driving the Cole tunnel, which has a length of 2000 feet and cut through a solid body of highly mineralized quartz nearly 100 feet in breadth.

The projectors of the scheme propose to start from the face of the main line of the Suro tunnel, in Savage ground, which is 1640 feet below the surface. When a point is reached under the peak of Mount Davidson the tunnel level will be nearly 3000 feet below the surface. This will drain any body of water that may be tapped in driving and explorations north and south of the tunnel line in following the veins cut, and operations can be prosecuted without fear of being flooded out.

The theory that nothing but a solid wall of syenite lies behind the foot-wall of the main Comstock lode has long been proved fallacious, as was also the theory that beyond the east clay of what was heretofore considered the hanging-wall of the main lode search for ore would prove futile. Several important ore developments have been made in Consolidated California & Virginia and one in Hale & Norcross in the past two years beyond what was formerly considered the east clay of the hanging-wall of the main lode. That far more important ore discoveries will be made in driving west of what is termed the foot-wall of the lode there is hope.

BEST & BELCHER MINING COMPANY.—The extraction of ore has now begun from the 300 and 350 levels. A new development is also reported in upraising above the 350 level.

CONSOLIDATED CALIFORNIA AND VIRGINIA MINING COMPANY.—The bullion statement for March shows that: total ore worked, 11,783 tons. Total bullion produced: Gold, \$152,300.95; silver, \$186,155.07; total, \$338,456.02. Average yield in bullion per ton: Gold, \$12.92; silver, \$15.79; total, \$28.72. Average assay value of the ore per ton, \$33.89.

CROWN POINT MINING COMPANY.—The bullion yield of this mine for March was \$45,600, with the clean-up for the month not included.

OCCIDENTAL CONSOLIDATED MINING COMPANY.—The assessment of 50 cents per share has been levied for the purpose of paying for the twenty-stamp mill which the company has contracted for, and which will be completed on or before July 1st of the present year. It is stated that it will be the last assessment on the stock of this company for a long time to come, as fully 40,000 tons of ore that will yield a good profit have already been mined, and await reduction.

SAVAGE MINING COMPANY.—The production for March amounted to \$28,588.02.

NEW MEXICO.

GRANT COUNTY.

AZTEC MINING COMPANY.—Mr. Einstein, of St. Louis, the President of the company, has just returned from a visit to the property. He states that the Bremen mill, notwithstanding its being out of repair, is turning out 100 to 180 ounces every week, and the company is piling up 200 tons of concentrates. The mine is being thoroughly developed. Contracts for the new mill have all been let, as already reported in our issue of the 6th inst. There has been a report that the company were in debt \$10,000 for their last month's pay roll, but this is denied. The force, however, has been reduced owing to the fact that so large a force was not required for the work now in hand.

RUBY SILVER MINING COMPANY.—This company, whose mines are located in Grant County, has just finished a 156-foot shaft on the property, which shows an increase in the size of the vein from an inch and a half near the surface to twenty inches in bottom of shaft. This ore is a ruby silver, and is rich. A car load which was shipped to the smelters at Socorro is reported to have run \$530 a ton for the first-class ore, and \$337.50 a ton for the second-class. The erection of a concentrating plant is contemplated. There is no stock of this company, which was incorporated at Kansas City, on the market at present.

SOCORRO COUNTY.

GRAPHIC MINING AND SMELTING COMPANY.—William T. Thornton and Valentine S. Shelby, of Santa Fe, have filed a bill in the Circuit Court at Chicago against Azem F. Hayes, Samuel W. Norton, Horace Hurlbert, George S. Chisholm and Thomas S. Hall to compel them to buy a number of bonds of this company. The complainants sold mines in the Magdalena mining district to the defendants for \$90,000, and as a part of the transaction, the defendants agreed to buy the bonds, and it is alleged they have never done so, and a specific performance is asked.

OHIO.

The Standard Oil Company has purchased a majority of the stock of the Ohio Oil Company. This gives them control of the Lima field. The Ohio Company is composed of an association of producers in this field. Their leases cover 15,000 acres, with a daily production of 5000 barrels of oil. A considerable portion of the territory is yet undeveloped. The price paid for the stock is said to range from 50 to 75 cents. The remaining stockholders of the Ohio Oil Company who did not sell out have been notified that if they wished to sell they could obtain \$70 per hundred for their stock, and they all sold their stock. The Union Oil Company has also sold territory to the Standard. It comprises leases on 1550 acres, with a daily production of 400 barrels. The price paid was \$27,000. The Standard Oil Company has a large force of men engaged in enlarging their refinery grounds at Lima, with the intention of making the Solar Works one of the greatest refineries in this country.

MERCER COUNTY.

Natural gas was turned into the pipes in Dayton, O., for the first time on the 18th inst. Extra pressure was put on at the wells in Mercer County, and the gas traveled through the pipes 48 miles to Dayton in 25 minutes.

PENNSYLVANIA.

The French Creek iron mine, in Warwick township, Chester County, was visited by a destructive fire on the 15th inst. which destroyed the boiler house, engine house and woodwork of the shaft, damaging the engine, boilers and valuable pumping machinery so that they are an entire wreck. The mine is 300 feet deep, operated by the E. & G. Brooke Iron Company, of Birdsboro. Two or three weeks ago the shaft was filled to the depth of 100 feet by a sudden and mysterious rush of waters, as from a subterranean lake, and the pumps were kept going night and day since.

FAIRMOUNT COAL AND IRON COMPANY.—This company is to be reorganized, and bondholders will have until the 30th of April and stockholders till the 31st of May in which to accept a plan. The company has a large property on the low grade division of the Allegheny Valley road, and was for some time controlled by the Western New York and Pennsylvania Railroad.

COAL.

ADAMS COKE OVEN COMPANY.—This company had a private exhibition of its new oven at Mansfield, and say it proved a complete success. The first charge of coke was drawn in ten minutes. T. H. Tomb, the Treasurer of the company, states the following: "The old system of drawing coke costs 65 cents per oven. We propose to draw it with a mule for 10 cents per oven. At present a stream of water is thrown into the oven, cooling the oven. A new charge of coal is then put in and becomes ignited from the heat of the oven. It requires two hours to light an oven. With the new process the bottom of the oven is movable and is worked by hydraulic pressure. The bottom of the oven is dropped while the coke is burning, and the coke is drawn out by a mule. The oven bed is then run back and fresh coal put in while the walls of the oven are red-hot. Thus the coking process is commenced as soon as the coal is put in, giving each oven a capacity of four heats per week, instead of three as at present."

FAIRMOUNT.—This colliery and breaker at Pittston, operated by H. W. Harris & Co., was levied upon by the sheriff on the 18th inst., upon an execution issued by S. B. Fenn, a hardware merchant. There are other claims against the company. Considerable money is said to be due employes.

PHILADELPHIA & READING COAL AND IRON COMPANY.—Work has been resumed at Indian Ridge Colliery, at Shenandoah, which is operated by this company, and which had been idle since January 26th.

NATURAL GAS.

PHILADELPHIA COMPANY.—This company has struck a large natural gas well near Belle Vernon, 26 miles from Pittsburg. It is said to be running off 40,000,000 feet a day, the pressure being 800 lbs. to the inch.

OIL.

Exports of refined, crude, and naphtha from the following ports, from January 1st to April 12th:

	1888.	1889.
	Gals.	Gals.
From Boston	837,043	491,586
Philadelphia	34,165,460	31,267,608
Baltimore	4,720	965,514
Perth Amboy	5,730,791	5,533,507
New York	112,065,813	97,620,061
Total exports	152,863,827	135,897,776

RHODE ISLAND.

The Carbon Iron Company, whose works are at Pittsburg, Pa., have ceased work at the Cranston coal mines, near Howard. The two frame buildings which were erected nearly three years ago, together with other property of the company, were sold at public auction last week. The Carbon Iron Company began active work on the mine in June, 1886. For a time they shipped all graphite to the company's works, where it was used in the manufacture of iron with

great success, but owing to the fact that other mineral products in Pennsylvania have been found to answer the purpose better and much cheaper, the company have concluded to abandon the Cranston mines, although they have a seven years' unexpired lease to run. Mr. Richard Eames, Jr., mining engineer, has had charge of the work since its inception in 1886.

TENNESSEE.

According to reports, a syndicate of capitalists from New York, New Orleans, Memphis and Atlanta has purchased 63,000 acres of land in Sequachee Valley, about thirty miles from Chattanooga, adjoining the city of South Pittsburg. The price for the property, which contains coal, iron and timber lands, is said to have been \$540,000.

UTAH.

BEAVER COUNTY.

HORN SILVER MINING COMPANY.—Reports from the superintendent are now received regularly at the New York office. For the week ending March 21st, 190 car loads were extracted from level No. 6. Considerable dead work is being done on the fourth, sixth, seventh and ninth levels. On the seventh level a southwest cross-cut is being driven, and on the ninth level the south drift is being extended. A force of men are also at work sinking and timbering shaft 5.

SUMMIT COUNTY.

In lieu of shipping silver bullion, arrangements have been made by the Marsac mill management to sell sulphides to the eastern refineries. This article is the result of treating the Daly ore by the Russell leaching or lixiviation process, and shipments will be made at regular periods hereafter. The product goes to market in double sacks. The first lot of two tons shipped contained about 12,000 ounces of fine silver, 10 ounces of gold and 28 per cent copper, and four and a half tons more are nearly ready for shipment. The last 1200 tons of ore worked in the leaching department of the Marsac mill yielded an average of over 91 per cent of the ore value.

UNION CONCENTRATING COMPANY.—This company has been organized with a capital stock of \$20,000, and all the stock has been subscribed by Park City and Salt Lake men. The contract for the erection and equipment of the works has been let to the Utah & Montana Machinery Company, whose headquarters are in Salt Lake, and A. M. Grant, manager of the Eagle Foundry and Machine Company, and Col. E. A. Wall, promoter of the crushing rolls, will have direct supervision of the construction and equipment work. The concentrator will be of 100 tons capacity daily, and it will be completed within sixty days. It will be situated in Empire Cañon, just below the water-works reservoirs, and will be within easy reach of all the principal mines that have concentrating ore on their dumps. Moreover, it will be a short down-hill pull from all the mines by making a road over each side of the gulch. A custom concentrator is something which has been a long-felt want in Park City. Ground was broken and work commenced on the construction of the new concentrator yesterday.

VIRGINIA.

IRON GATE LAND AND IMPROVEMENT COMPANY.—This company has been organized at Clifton Forge. Mr. Throppe, of Philadelphia, is President; J. Yost is Manager and Vice-President, and Mr. John D. Weeks, of Pittsburg, is one of the directors. The capital stock is \$100,000.

CHESTERFIELD COUNTY.

CHESTERFIELD COAL AND IRON MINING COMPANY.—Mr. W. B. Gay, of Boston, Mass., has purchased the property of this company at Midlothian, it is said, for \$30,000, and will develop the same.

WYOMING.

LARAMIE COUNTY.

FAIRVIEW.—Major Glafcke and W. C. Pollard, who have relocated, and who now own the Fairview lode, will transfer title to the claim to the Cheyenne Board of Trade on condition that the body push its development by sinking a shaft to a depth to be hereafter determined. Several thousand dollars have already been expended on the property. The shaft is down 100 feet, and a 10-foot vein with streaks of copper glance and native copper ore is said to be in sight, but capital is required to place the mine in shape for removing the ore to the dump.

FOREIGN MINING NEWS.

BRITISH COLUMBIA.

[From an Occasional Correspondent.]

The annual report of the Minister of Mines, which is never a voluminous nor interesting report of mineral production, has been recently published. The gold yield grows less yearly. It is thus estimated:

Gold exported by the banks for 1888.....\$513,943
By other unknown sources (assumed)..... 102,788

Total.....\$616,731

Miners employed consisted of 1,453 Chinese and 554 whites, about a yearly average number for last 20 years; average earnings only \$307 each.

Annually, new ideas crop up in the Provincial Parliament, new sources of development nursed and introduced officially, and bonuses offered for smelters, then quartz mining, and hydraulic, and last, but not the least, railway construction for facilitating transportation. A medley of ideas and log rolling interests periodically come before the Provincial Parliament as to the ways and means of developing the resources of the Province. Wonderful assays, and booming statements of untold wealth to be developed

are published year after year, but outside of coal mining the attempts are as ridiculous as they have proved useless so far, and the people only laugh at them, and feel a sort of contempt for the everlasting bogus press locals.

Assayers are plentiful, such as they are, all over the West; but, unless they show good results, they are not wanted. Developments in seven cases out of ten are badly done, and not prosecuted with vigor and ability. The prospects are very much hampered for want of better coasting and inland transportation.

Coal.—This is the only satisfactory mining enterprise in British Columbia, excepting in one case, that of the Vancouver Coal Company, of Nanaimo, B. C., which, by luck in the very high prices ruling for coal last year, has declared a half-yearly dividend of £1 per share 6th February last, the only dividend paid for seven years, and paid off the \$100,000 debt owing.

December 4th, 1888, at a meeting of the shareholders, the chairman said the profits for the half year were £20,858 on sales amounting to 84,728 tons. The diamond drill had been at work in No. 2 shaft, "Southfield Mine," and seven bores in number indicate good coal ranging from one to fourteen feet thick. In the Eastfield there are four holes or bores with coal from 6 to 9 feet; and in the Westfield there are three bores, but no coal yet found in this field. On Gabriola Island the bore has reached a depth of 2000 feet, and only shows shale. In the Harewood mine only a little coal has been found, but another bore is being made. The six months' output of the Southfield was 45,912 tons from No. 2 shaft, and 21,891 tons coal of excellent quality from No. 3 shaft.

Another newly incorporated company, under the same name and title, was registered in London, England, in January last, with a capital of £185,000, to take over as a going concern the existing Vancouver Coal Mining and Land Company (Limited), incorporated in 1862. The company, if fully subscribed, may realize sufficient capital to properly handle this colliery, which has been crippled and hampered for want of funds to develop it properly. But if the new company go on to operate mines at a depth of over 2000 feet and prosecute diamond drill boring on Gabriola Island and only just reach the upper coal measures at a depth of over 2000 feet, their resources will soon vanish in the attempt to operate deep collieries, with numerous faults as here presented, in very small areas on Vancouver Island, or any other in British Columbia.

Other owners have meanwhile realized enormously on their collieries in this location.

Total output for 1888 487,301 tons against 413,360 tons for 1887, showing an increase of 63,941 tons. Total exported to California in 1888 365,714 tons against 334,839 tons in 1887. Wages ruled the same as previous year, and Chinese were only employed on the surface. A reduction of 15 per cent in miners' wages has taken effect from the 15th of March last (owing to reduction in price of coal) in Washington Territory collieries, and the same may be adopted here soon. The "Third mine" at Reslyn, Kittitas County, W. T., has been closed and 200 colored miners recently consigned from the Eastern states have been discharged in consequence of accumulation of coal on hand, and foul air in the mine of the N. P. R. R. Co.

CANADA.

PROVINCE OF NOVA SCOTIA.

TERMINAL CITY COMPANY, LIMITED.—This company was chartered last year by the Nova Scotia Parliament for the purpose of improving lands on the Strait of Canso, which connects the Atlantic with the Gulf of St. Lawrence and separates Nova Scotia from Cape Breton Island. The property is but five miles from the eastern terminus of the Canadian Pacific, with which it is to be connected by rail. It is claimed that the charter is the most extensive and liberal ever granted by the Parliament of the province. The land has more than two miles of harbor frontage and a width of over three miles, and aggregates over 2500 acres on the Nova Scotia side of the Strait, and 1500 acres on the Cape Breton side, besides controlling over 8000 acres more to be purchased as soon as titles can be made satisfactory. It has 750 acres of coal area, on which five veins of bituminous coal crop out. The company proposes to push the development of this coal property to a producing point, lay out its land in lots, build the railroad connection, erect necessary buildings, etc. Its capital is \$5,000,000, shares \$10, 50,000 shares of which are to be offered to the public at \$2, in order to develop the property. The directors are Messrs. Samuel T. Tucker (president), Lorenzo K. Quimby (treasurer), Colonel Charles H. Lewis, George J. Quinsler, Andrew J. Whipple, William D. Lewis, and Isaac Emerson.

CENTRAL AMERICA.

According to reports a strong newspaper syndicate, composed of some of the leading dailies in America, has just been arranged by Mr. A. J. Miller, of Evansville, Ind., for the purpose of a scientific exploring expedition to the unfrequented portion of Central America. The expedition will consist of Mr. Miller as manager, Professor Thomas Darrab, naturalist and taxidermist; Professor J. Roy Brown, geologist and archaeologist, and William H. Venable, of Atlanta. They will be joined at Belize, British Honduras, by Dr. Thomas H. Ross, who precedes the expedition to make certain preliminary arrangements. The expedition will sail from New Orleans May 1, going to Northern Guatemala and the region of Lake Pepin, the ancient home of Mayas and Itzacs. Afterwards they will visit all of the five republics. The primary object of the expedition is to

explore those portions of Central America which have heretofore remained a terra incognita to the outside world. A special effort will be made to discover the source of the Rio Wanks in Honduras and determine its possibilities as a commercial highway. To this end they will receive the aid of the government of Honduras.

The expedition expects to complete its work in six months. This will be the second journey made by Mr. Miller through Central America.

NICARAGUA.

ESPERANZA MINING COMPANY.—This company has been organized under the laws of Colorado. The operations will be confined to Murra district, Department of Murra. The company purposes to work the mines known as the Esperanza, Mariposa, Siners and Aurora, and to handle concentrates and bullion from the same. The capital is fixed at \$200,000, shares \$10 each. The affairs of the company will be under the direction of five directors, who, for the first year, are Mr. Delapierre, J. H. White, C. P. Talbot, H. B. White and Thomas H. Bullick. The principal offices are to be located at Denver and New York City.

MEXICO.

SOMBRERETE MILL AND MINING COMPANY.—This company has just completed a new plant, of the maximum capacity of 100 tons of ore daily. The plant was especially constructed to employ the Russell process, Stetefeldt furnace, etc. The company is composed of New York capitalists. If the plant works to meet expectations the company will make a monthly output of \$60,000, on its present running rate of 50 tons per day.

SOUTH AMERICA.

REPUBLIC OF COLOMBIA.

EL CRISTO GOLD AND SILVER MINING COMPANY.—The second bullion shipment from the mine was received in New York on Monday last. The treasurer of the company informs us that it consisted of two lots, aggregating 386 sacks, and averaging 226 ounces silver per ton, and that regular shipments will now be made with every steamer.

DIVIDENDS.

The following dividends have been declared:

Boston & Montana Consolidated Copper and Silver Mining Company, of Montana, dividend of \$1 per share, or \$100,000, payable May 20th, to stockholders of record April 20th.

Daly Mining Company, of Utah, dividend No. 26, twenty-five cents per share, or \$37,500, payable April 29th, by Lounsbury & Co., 15 Broad street, New York City. Transfers close April 24th.

Homestake Mining Company, of Dakota, dividend No. 129, ten cents per share, or \$12,500, payable April 25th, by Lounsbury & Co., 15 Broad street, New York City. Transfers close April 20th.

Ontario Silver Mining Company, of Utah, dividend No. 155, fifty cents per share, or \$75,000, payable April 29th, by Lounsbury & Co., 15 Broad street, New York City. Transfers close April 24th.

Philadelphia (Natural Gas) Company of Pennsylvania, dividend No. 42, one per cent, or \$75,000, payable April 25th, at No. 820 Penn avenue, Pittsburg, Pa. Transfers close April 15th.

People's Natural Gas and Pipeage Company, quarterly dividend, two per cent, payable April 20th, at No. 127 Fourth avenue, Pittsburg, Pa.

Plumas Eureka Mining Company, of California, declared in London, on the 4th inst., a dividend of two shillings per share.

United Gas Improvement Company paid a dividend of four per cent, April 15th, in Philadelphia.

Ward Consolidated Mining Company, five cents per share, or \$10,000, payable May 2d, at No. 53 Broadway, New York City. Transfers close April 22d.

ASSESSMENTS.

COMPANY.	No.	When levied.	D't'ng't in office.	Day of Sale.	Amn't per share.
Big Hole Placer, Utah.....	...	Feb. 25	Apr. 8	May 6	.005
Bodie, Cal.....	10	Mar. 27	Apr. 13	June 4	.50
Crocker, Ariz.....	6	Feb. 25	Apr. 2	Apr. 24	.10
Diamond Queen, Dak.	1	Mar. 9	Apr. 10	Apr. 26	.001
Exchequer, Nev.....	27	Apr. 2	May 7	May 28	.25
Eureka Cons, Nev.....	11	Mar. 19	Apr. 27	May 20	.50
Grand Prize, Nev.....	20	Mar. 15	Apr. 20	May 13	.30
Gray Eagle, Cal.....	12	Mar. 19	Apr. 23	May 14	.05
Hector, Cal.....	1	Jan. 29	Mar. 14	Apr. 15	.15
Honorine, Utah.....	...	Apr. 2	May 2	June 1	.05
Lapanta, Nev.....	1	Feb. 28	Apr. 5	Apr. 26	.03
Mexican, Nev.....	37	Mar. 5	Apr. 10	Apr. 30	.25
Mono, Cal.....	27	Feb. 28	Apr. 2	May 8	.50
North Common-wealth, Nev.....	2	Apr. 4	May 8	May 30	.30
North Peer, Cal.....	5	Feb. 25	Apr. 1	Apr. 24	.05
Peerless, Ariz.....	12	Mar. 25	Apr. 26	May 21	.25
Ruby Hill Tunnel & Mg. Co., Nev.....	17	Mar. 12	Apr. 20	May 20	.01
San Francisco Cop- per.....	3	Mar. 18	Apr. 23	May 21	.10
Sierra Nevada, Nev.....	94	Mar. 5	Apr. 9	Apr. 29	.25
Taylor M. & M., Cal.....	17	Mar. 30	May 1	May 18	3.00
Yellow Jacket, Nev.....	46	Mar. 28	May 1	June 1	.50
Utah, Nev.....	6	Mar. 5	Apr. 10	Apr. 29	.25

* Delinquent day and day of sale postponed to dates given above.

† An additional .005c. a share is payable May 6th, delinquent May 8th and saleable June 10th.

MEETINGS.

Big Vein Coal Company of West Virginia, No. 21 South Gay street, Baltimore, Md., May 1st, at twelve o'clock noon. Thos. W. Hooper, Secretary.

Central Railroad Company of New Jersey, 119 Liberty street, New York City, May 10th, at twelve o'clock noon. Samuel Knox, Secretary.

Evening Star Mining Company, No. 53 Broadway, New York City, May 6th, at two o'clock p. m. J. Edwards, Assistant Secretary.

Grand View Mining and Smelting Company, at the office of the company, New York City, May 6th, at eleven o'clock a. m. C. F. Dean, Secretary.

Little Annie Gold Mining Company, No. 145 Broadway, New York City, May 3d, at twelve o'clock noon. T. E. Sloan, Secretary.

Morning Star Mining Company, No. 53 Broadway, New York City, May 6th, at two o'clock p. m.

Ouray Union Mining Company, No. 53 Broadway, New York City, May 6th, at two o'clock p. m.

Ward Consolidated Mining Company, No. 53 Broadway, New York City, May 6th, at two o'clock p. m.

MINING STOCKS.

New York.

THURSDAY EVENING, April 18.

We note this week a more liberal and frequent inquiry for the general list of stocks, and although owing to the holiday (Good Friday), a falling off in the aggregate transactions is shown, the tone of the market has been as good, if not better, than for some weeks past.

Ten million and twenty-five thousand dollars is now the total amount of dividends paid by the Ontario. With the exceptions of the California, Con. Virginia, Belcher and Crown Point on the Comstock, and of the "copper wonder," the Calumet & Hecla, this is the largest sum ever paid in dividends by an American mine. The price of the stock holds its own at \$35. The Daly Mining Company announces its usual monthly dividend of \$37,500. This stock can be purchased in this city at about \$19 per share. Horn-Silver is firm and active at from \$1.35 to \$1.45.

Homestake continues to decline. Sales are reported to-day at \$7.25. The rumor on "change" is that those who have formerly been the largest stockholders and are very close to the management, in anticipation of the reduction of the dividend to 10 cents this month, have been selling pretty freely of late. The transfer agents, however, who are certainly in a position to know whereof they speak, assert that the transfer books prove this statement to be absolutely false. The dividend of \$12,500 declared this week makes the total paid to date \$4,381,250.

Caledonia shows one sale at \$2.90. Sullivan Consolidated was active as usual, but showed a declining tendency, the price going from \$1.55 to \$1.25.

There is a quiet investment demand for Aspen stock. The price advanced on Saturday to \$11, and has since been steady at that figure. The sales amounted to 550 shares. Silver Cord, in which but little has been doing, shows a business of 5000 shares, at prices ranging from 86c. to 88c. Larosse was neglected at 9@10c. Denver City at 10c., Cashier at 4c. Small Hopes shows one transaction at 95c. Plutus a few at from \$1 to \$1.05. Little Chief at from 24 to 25c. Leadville at from 11 to 14c. Some 900 shares of Iron Silver sold at from \$3.15 to \$3.20. Chrysolite shows a sale at 26c.

The activity in San Francisco in the shares of the North End Comstock mines, Mexican, Union and Utah, has been more or less reflected here, and all of these stocks were in fair demand at prices which showed an upward tendency. Consolidated California & Virginia advanced \$1, from \$7.63 to \$8.63.

A very small business is being done in Suro Tunnel, the stock sold at 9c.@10c., and the Trust Certificates at 58c.@59c.

Very little is doing in the Tuscaroras. North Commonwealth shows a few transactions in the beginning of the week at from 90c. to \$1. Navajo was only dealt in to-day, when it brought from 90c. to 95c. North Belle Isle is quoted at \$2.45, and Belle Isle at 21c.

Eureka Consolidated is quiet at from \$1.05 to \$1.10. There was a higher tendency in Mutual, and the price advanced from \$1.10 to \$1.25.

Rappahannock continued at 7c., but one sale was made at 6c.

Silver King shows only two sales, one at 80c. and one at 75c.

The boom in United Copper continues and the price went from \$1.50 to \$2.25, some 1300 shares changing hands.

El Cristo has been firm at from \$1.60 to \$1.70. Some interest was displayed in Moulton, the price of which went from 17c. to 21c.

There is no interest in Bodie stocks, which at one time were the most active stocks on the list. Bodie Consolidated shows two transactions at \$1.05. Mono a few at from \$1.10 to \$1.15.

Quicksilver Preferred was dealt in at from \$39.38 to \$39.50.

Brunswick shows two transactions at 10c. Nothing is doing in Plymouth Consolidated.

The quotations of the different Amador stocks remain unchanged. Parties interested in the stocks should read the letter from Amador, published in our mining news columns.

A sale of Hector was made at 5c., assessment unpaid.

Boston. April 18.

[From our Special Correspondent.]

The market for copper stocks continues on the down grade and there is evidently a desire on the part of holders to get out, and very little inclination with the public to invest in the uncertainties attending the future. We are inclined to believe, however, that it is a good time to buy some of the sound stocks to lay away for a substantial advance, which may come sooner than expected. Prices are now lower in some cases than before the formation of the syndicate, and it would seem as if bottom prices had been reached. Calumet declined to \$202 to-day, which is \$8 lower than last week's closing.

Quincy sold at \$50, and later at \$49. Boston & Montana is the most active stock on the list, and on free selling early in the week touched \$28½, the lowest point; it rallied quickly, however, and sold up to \$32 again, but could not hold the advance, and declined to-day to \$29. The gossip to-day is that the proposed meeting of the stockholders to authorize the issue of \$500,000 7 per cent ten-year bonds, as recommended by the directors, will not be called before August.

One report here says the Boston & Montana is the only mine in the world to-day not dependent upon the market price of copper. Any serious decline in ingot in the near future, if it has to come, would be a benefit really to the company, as before the expiration of its letter of credit, now about 1½ years to run, the surplus stock of copper should be worked off, smaller mines closed up, and copper brought down to the basis of supply and demand. By this time its new smelter will be erected and the company be in position to produce at low cost.

Taking this view of the position, it would seem as if at anything under \$30 per share the stock was a good investment. Franklin has declined from \$10¼ to \$9¾, with rather a pressure to sell. The same may be said of Osceola, which was freely put on the market, and dropped from \$12 to \$9, with a closing rally to \$9½. Kearsarge was also heavy, and declined to \$5½@ \$5¼, with a small lot sold at \$5.

Tamarack sold down to \$105, a decline of \$5. Central sold at \$10. Allouez at \$1.25, assessment, 50c., paid; Pawabic, \$3.25, and National, \$2. There is but little trading in these stocks, for the reason there are no buyers, and any attempt to sell only depresses prices still further. Holders will have to be patient waiters until a more favorable outlook is presented. Santa Fe declined on pressure to sell the stock to 65c., and Bonanza to 80c.

Silver stocks are quiet. Dunkin declined at the Stock Exchange to 87½c., while at the Mining Exchange 90c. was the lowest price, and the stock in demand at that.

St. Louis. April 17.

[From Our Special Correspondent.]

The mining market during the past week has been quite an active one. Whilst there have been no very sharp fluctuations, the transactions have been rather heavy, and a marked disposition has been shown on the part of the public to take an active interest in several of the lower priced stocks. On the other hand, the higher priced securities have dragged along at a very slow rate, with a downward tendency. This has been particularly noticed in the case of Granite, which has been steadily offered down as low as \$48.50 seller 30 in 500 share lots. Taking into consideration the fact that the new mill has just started, and that increased dividends are probably a matter of only a few weeks, this decline seems rather remarkable, but is accounted for, however, in various ways: the more general impression being that these heavy offering are being made with the view of enabling some person to get hold of the stock at a low figure. Assuming that the monthly dividends will hereafter be at the rate of 75 cents a share, the stock at \$48.50 comes pretty near being a 20 per cent investment, and ought certainly to be a good purchase.

Frisco experienced a little soda-water bulge last week, and sold as high as 57½, although it subsequently declined to 46¼. The rest of the list is unchanged, closing as follows:

CLOSING PRICES.		
	Bid.	Asked.
Adams, Colo.....	\$.25	\$.27½
Anderson, Mont.....	.22½	.26¾
Aztec, N. Mex.....	.30	.31¼
Bi-Metallic, Mont.....	40.00	41.00
Black Oak, Cal.....	.45	.47½
Carriboo, Idaho.....	.15¼	.17½
Central Silver.....	.22½	.30
Concepcion, Mex.....	.12¾	.13
Dinero, Colo.....	.07½	.08
Golden Era, Mont.....	.14	.15
Golden King.....	.41¼	.45
Golden West.....	1.05	1.10
Granite Mountain, Mont.....	49.00	50.00
Hope, Mont.....	4.25	5.25
I. X. L., Colo.....	.07½	.08
Jumbo, Colo.....	.11	.15
Mary Foster, Colo.....	.02	.02½
Major Budd, Mont.....	.09	.09
Mexican Imp., Mex.....	.26¼	.27½
Mountain Key.....	1.70	1.75
Pat Murphy, Colo.....	.42¼	.45
Neath, Colo.....	.30	.31¼
Phillips, Colo.....	1.05	1.10
San Francisco, Mont.....	.46¼	.47½
Small Hopes, Colo.....	1.00	1.10
Silver Age, Colo.....	3.05	3.10
West Granite, Mont.....	1.05	1.10
Wire Patch.....	.30	.32½
Yuma, Ariz.....	.50	.51¼

San Francisco.

A dividend of \$150 has been declared by the San Francisco Stock and Exchange Board to each member.

Baltimore.

COMPANY.	Bid.	Asked.
Atlantic Coal.....	1.25	
Baltimore and North Carolina.....	.28@.29	.30@.35
Big Vein Coal.....	1.25@1.30	1.45@1.50
Conrad Hill.....	.05	.15
Consolidated Coal.....	.27	.27
George's Creek Coal.....		1.10
Lake Chrome.....	.08@.10	.16@.20
North State (Baltimore).....	.10@.20	.30
Ore Knob.....	.05@.08	.10
Silver Valley.....	.80@.90	.95@1.00

Highest and lowest bid and asked during week ending April 17th.

Auction Sales of Stocks.

Among the securities sold at public auction in New York this week, \$3,000 Helena Mining and Reduction Company six-per-cent bonds, due 1893, sold at 50; \$2,000 Hortense Mining Company six-per-cent bonds, due 1887, brought \$2 for the lot. Bonds of the Eureka Mining Company, of Tennessee, to the amount of \$1,000 and 100 shares of the stock of the same company were disposed of, together with a number of railway shares, for \$16 for the lot.

Pipe Line Certificates.

NEW YORK, Thursday Evening, April 18.

The time-honored but usually effectual "Lima Oil Scare" was repeated this week in an ultra sensational form, and as a consequence we find that the aggregate transactions for the five days on the two exchanges were 6,946,000 bbls., against a total of 2,251,000 bbls. last week, and prices have declined from 90c., the opening quotation on Monday, to 83½c., the lowest point reached to-day. Values held their own fairly well until Wednesday, when the bears played their leading card in the shape of a press dispatch, enumerating the purchases of the Standard Oil Company in the Ohio fields. This was followed by renewed statements that the Standard people had discovered a process by which Ohio oil can be deodorized and successfully used as an illuminant.

Furthermore, argued the bears, Bradford oil is deteriorating. "This is so much the case," said these authorities, "that fresh oil, particularly that from the White Sand districts in Pennsylvania, commands a premium of 25 cents over the prices ruling in the exchanges for certificate oil. It is a fact that the fresh Pennsylvania oil will be used to enrich Ohio oil, as it will introduce elements that will, by blending, facilitate refining processes, and it is understood that a pipe line connection is now being made between the Ohio and Pennsylvania fields." As Ohio oil sells at only 20 cents a barrel, if it really can be successfully refined, it is evident that the present disparity in price between the Ohio and the Pennsylvania article must sooner or later be equalized.

NEW YORK EXCHANGE.

	Opening.	Highest.	Lowest.	Closing.	Sales.
April 13.....	90½	90	90¼	90¼	78,000
15.....	90	90½	88½	88½	243,000
16.....	90½	90½	90	90	100,000
17.....	87¾	87¾	84¾	84¾	817,000
18.....	84¾	85½	83¼	84½	636,000
*19.....					

Total sales in barrels..... 1,874,000

CONSOLIDATED STOCK AND PETROLEUM EXCHANGE.

	Opening.	Highest.	Lowest.	Closing.	Sales.
April 13.....	90	90¼	89½	90¼	134,000
15.....	90½	90½	90	90½	114,000
16.....	90	90½	88¼	88¾	323,000
17.....	87½	87½	84½	84½	2,043,000
18.....	85	85¼	83¼	84¾	1,428,000
*19.....					

Total sales in barrels..... 4,072,000

* Holiday.

Electric Stocks.

The following closing quotations are reported to-day by J. Heron Crosman, New York City:

Stocks.	Par value.	Market price.
Daft.....	\$100	\$ 49 @ \$ 52
Consolidated.....	100	65
Edison.....	100	190 @ 193
" Illuminating.....	100	85 @ 90
Brush.....	100	32¼ @ 37¼
" Illuminating.....	100	80 @ 85
United States.....	100	50 @ 60
Westinghouse.....	100	50 @ 60
Thomson-Houston.....	50	60 @ 65
" Welding Co.....		85 @ 90
		365

It is stated that the Thomson-Houston Electric Company contemplates an issue of \$1,000,000 bonds under a \$2,000,000 mortgage, for the purpose of acquiring ready capital.

Trusts Stocks.

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

American Cotton Oil Certificates.....	\$56¼@56½
Sugar Refiners.....	89¼@90½
Distillers' & Cattle Feeders' Certificates.....	34 @ 35
Linseed Oil.....	39 @ 42
Natural Gas.....	35 @ 37
Standard Oil.....	167 @ 168¼
National Lead.....	22¼@22½

COAL TRADE REVIEW.

NEW YORK, Friday Evening, April 19.

Statistics.

PRODUCTION OF COKE on line of Pennsylvania R. R. for week ending April 13th and year from January 1st, in tons of 2000 lbs.: Week, 80,181 tons; year, 1,284,862 tons; to corresponding date in 1888, 1,111,344.

PRODUCTION OF COKE on line of West Virginia Central Railway for week ending April 13th and year from January 1st: Week, 144 tons; year, 2319 tons; to corresponding date in 1888, 2,555 tons.

PRODUCTION OF ANTHRACITE COAL for week ended April 13th, and year from January 1st.

	1889.		1888.	
	Week.	Year.	Week.	Year.
Tons of 2240 lbs.				
P. & Read, R.R. Co.....	88,301	1,529,183		1,179,354
Cent. R.R. of N. J.....	109,601	1,352,367		1,294,904
L. V. R.R. Co.....	92,753	1,703,411		1,372,903
D., L. & W. R.R. Co.....	59,464	1,021,499		1,968,017
D. & H. Canal Co.....	60,430	968,117		1,320,531
Penna R.R.....	587,499	1,467,636		1,216,466
Penna. Coal Co.....	15,044	216,958		417,349
N. Y., L. E. & W.....	20,000	331,628		247,493
Total.....	1,033,092	8,590,799		9,017,017

Decrease..... 426,218

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

Production for corresponding period:

1884.....	6,969,364	1886.....	8,746,619
1885.....	6,942,585	1887.....	9,259,705

PRODUCTION OF BITUMINOUS COAL for week ended April 13th, and year from January 1st.

	1889.		1888.	
	Week.	Year.	Week.	Year.
Tons of 2240 lbs.				
Phila. & Erie R.R.....	761	25,189		16,871
Cumberland, Md.....	54,215	810,803		937,626
Barclay, Pa.....	2,000	36,003		54,014
Broad Top, Pa.....	7,143	119,499		124,618
Clearfield, Pa.....	58,580	857,006		1,037,220
Allegheny, Pa.....	13,906	283,687		251,743
Beach Creek, Pa.....	19,858	388,472		473,156
Pocahontas Flat Top.....	25,414	429,996		407,215
Kanawha, W. Va.....	28,119	485,641		479,634
Total.....	209,936	3,436,296		3,782,097

WESTERN SHIPMENTS.

Pittsburg, Pa.....	10,560	173,076	209,142
Westmoreland, Pa.....	31,571	446,244	435,875
Monongahela, Pa.....	5,085	47,771	79,317
Total.....	47,216	667,091	724,334

Grand total..... 257,212 4,103,387 4,506,431

Anthracite.

The anthracite trade continues in the same condition as we have reported for some weeks past. There is very light demand and the supply, though greatly curtailed, is still in excess of the requirements. Prices here continue to be very heavily shaded by the individual operators and firmly held by the companies, but at distant points, such as in the West and in the East, there is not so much distinction between the companies and the individuals; both appear to be shading about equally. The Boston trade is not expected to improve much until after the 1st May, when the Boston coal dealers take stock of what is on hand, and upon this they pay the city tax. Stocks are large nearly everywhere. In Boston they amount to 461,359 tons on the 1st of the present month. This is nearly 300,000 tons more than at the corresponding period of last year. This proportion may hold throughout a number of the larger Western markets, and it accounts for the depressed condition of the trade in that portion of the country.

Bituminous.

There is somewhat greater activity in the bituminous trade this week, and we are reported from the East a number of quite large contracts, among which we note that some rather important ones have been taken by the Maryland Coal Company. If all the companies hold to their agreement and keep the prices up, we believe the Maryland Coal Company will regain a good deal of business, which the low prices made by some of its competitors last year took away. Cumberland coal has always stood at least as high as any other coal in this country, and higher than some which has been put on the market by very low figures during the last year or so. The conditions of the bituminous trade continue to be favorable, and there is noticeable but little of the demoralization which has shown itself in the anthracite trade.

BOSTON. April 18.

[From our Special Correspondent.]

The market for anthracite coal is a little more active, though still disappointingly slow. There is some cutting done by individual operators, and this a time when it pays the buyer to shop about as there are opportunities to pick up odd lots here and there at very low prices. The companies are as firm as ever, and point, as they can, to the strong statistical position of the market. The undercurrent of weakness is still noticeable, but it is no more so than heretofore.

Bituminous coal moves very quietly. The Amoskeag contract is believed to be taken by the Maryland Coal Company. Pocahontas people have had this contract for the last two years. S. D. Warren & Co. have bought about 20,000 tons of George's Creek coal, and E. S. Hamlin & Co., retailers, who do quite a jobbing business, have bought 20,000 tons of the Consolidation Company. These contracts are believed to be made at or very near pool price of \$2.60 f.o.b. There is no change in the pool situation; the cutting is done on freights, where it is done at all. The amount of all rail coal coming into New England is all the time increasing, and on this coal there is no pool stipulation. The gas companies are beginning to look about. The price asked for prime gas coals is \$4.15 along-side, below bridges. This was the price last season, but some of the shippers broke it to \$4 at least. It is said that the gas coal market is in better shape this year. A short time will prove whether it is or not.

Freights are rather firmer at all points. Baltimore rates continue strong, and the prevailing rates there suggest the belief that that port is losing its grip to

some extent. We hear 60@65c. as the minimum at New York, but 70@75c. are more common. At Philadelphia 90 cents rules, and \$1@1.05 at Baltimore, with 90 cents at Hampton Roads.

Retail trade is inactive at former figures. L. G. Burnham is away for his health. Receipts for the week are 28,724 tons anthracite, 20,346 tons bituminous; since January 1st, 236,198 tons anthracite and 252,315 tons bituminous.

BUFFALO. April 18.

[From our Special Correspondent.]

The principle of equalization will govern this letter to-day. Last week items were plenty, this week the reverse.

No changes worth noting in supply or demand in hard or soft coal.

Summer weather yesterday and to-day. The new anthracite coal tariff goes into effect on the 22d April, on the basis of \$2 to Chicago and \$2.50 to St. Louis, all rail.

Work has been commenced on the reconstruction of the government breakwater here. The appropriation will not allow of any extension this year.

It is officially stated that the project of building here the 5000 feet docks, mentioned in our last week's letter, will be a failure, for the reason that the bottom of the basin is rocky, with from 5 to 18 feet of water covering, involving expensive blasting, etc.

In answer to a telegram, the Superintendent of Public Works replied: "Expect to have canals of the State ready by May 1st. Would like to do all the bottoming possible before the opening." As usual this news is quite satisfactory to some shippers, and to others quite the contrary.

Two hundred tons of coal have been lying under the water near Port Colborne, on Lake Erie, Can., for over three years. The wrecked vessel, the "Honora Carr," in which the coal is stored, has been located in 60 feet of water. Efforts will be made to raise her and save the fuel.

Cleveland coal shippers are very sure that low freights will rule on the lakes this year, and say "that they could secure tonnage without trouble for blocks of 50,000 tons of coal for the head of Lake Superior at 45c. to October 1st, or 50c. for the whole season."

About 22,000 tons of coal have been cleared at Custom House thus far this season to Chicago, 800 tons to Racine, 1400 to West Superior and 5500 tons to Milwaukee. The nominal quotations to-day are 50c. to Chicago, Milwaukee, Kenosha and Port Arthur; and nominally 40c. to Duluth and Lake Superior ports. No shippers can be found who are willing to charter just now, they prefer to wait a while, say to May 1st. Vessel agents and owners are in a puzzled condition and are awaiting future developments with but little show of philosophy!

The ice on side our harbor is very much scattered, so that vessels can enter and depart with scarcely any trouble. The port list of arrivals and clearances show less than a dozen of the former and forty-five of the latter.

PITTSBURG. April 18.

[From our Special Correspondent.]

Coal.—The same old story, a dull and very unsatisfactory market, with nothing in sight to indicate any improvement. The Ohio River is in good boating order. April shipments to date exceed seven million bushels. Joseph Walter & Co., one of the largest firms, closed all their works, to remain closed until prices advance or lower mining rates are current.

PRICE OF COAL PER 100 BUSHELS = 7600 LBS.

First pool.....	\$4.75	Fourth pool.....	\$3.25
Second pool.....	4.50	Railroad coal.....	5.00@6.00
Third pool.....	3.90		

Connellsville Coke.—Prices are somewhat uncertain; production for the past three months shows a steady decline. Shipments continue to fluctuate, the daily average for March being in excess of February, though the production is the other way. There is very little hope of any improvement before fall, if then; a good deal will depend on the iron trade. Shipments for last week: Total, 5865; previous week, 5670. Daily average, 984 cars for March, against 917 cars for February.

Nominal rates at the ovens:
Furnace coke...\$1.10@1.15 | Crushed.....\$1.50
To dealers.....\$1.25 | Foundries.....1.40

Freight rates from the ovens to Pittsburgh, 70c. per ton; to the Mahoning and Chenango valleys, \$1.35; East St. Louis, \$3.50; Cleveland, \$2.80; Chicago, \$2.75.

METAL MARKETS.

NEW YORK, Friday Evening, April 19, 1889.

Prices of silver per ounce troy.

Ap ^l	Sterling Exch'g'e.	Lond'n Pence.	N. Y. Cts.	Ap ^l	Sterling Exch'g'e.	Lond'n Pence.	N. Y. Cts.
13	4.88½	42½	92½	17	4.88½	42 3-16	92½
15	4.88½	42½	92½	18	4.88½	42 3-16	92½
16	4.88½	42 3-16	92½	19			

*Holiday.

Silver steady without special feature. Council bills declined ½d. The United States Assay Office at New York reports total receipts of silver for the week, 75,000 ounces.

Foreign Bank Statements.—The governors of the Bank of England at their weekly meeting reduced the minimum rate of discount from 3 to 2½ per cent. During the week the bank lost \$265,000 bullion, and the proportion of its reserve to its liabilities was reduced from 41.70 per cent to 40.65, against an increase from 38½ to 40½ per cent in the same week of last year, when its rate for discount was 2 per cent. The weekly statement of the Bank of France shows an increase of 2,025,000 francs gold and an increase of 2,600,000 francs silver, and that of the Bank of Germany an increase of 20,137,000 marks specie.

Domestic and Foreign Coin.

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

	Bid.	Asked.
Trade dollars.....	.72	.73¼
Mexican dollars.....	.72½	.73¼
Peruvian soles and Chilean pesos.....	.72¼	.73¼
English silver.....	4.83	4.87
Five francs.....	.94	.95
Victoria sovereigns.....	4.86	4.88
Twenty francs.....	3.88	3.92
Twenty marks.....	4.74	4.80
Spanish doubloons.....	15.60	15.75
Spanish 25 pesetas.....	4.80	4.86
Mexican doubloons.....	15.55	15.70
Mexican 20 pesos.....	19.50	19.65
Ten guilders.....	3.96	4.00

Copper.—The general feeling regarding the position of the copper market is still one of uncertainty and distrust. That no arrangement has yet been arrived at by the parties interested in the Paris negotiations is very clear, and the suspense from day to day is a serious trouble both to producers and consumers. The producers, for the time being, are in the very difficult position of being unable to dispose of their copper under the conditions of the former contracts, as it must be patent to every body that under present circumstances the price of 16½c. is altogether unwarranted. Under the pressure of the necessities of the case the Lake companies have consequently been driven to make a further concession to the consumers, who were quite unable to pay any longer the 16½c. per pound fixed by the contracts, and they have therefore agreed that the copper now being delivered to them shall be invoiced at the price fixed by the next pool sale. This action on the part of the Lake companies is "highly" creditable to them, but it fails to meet the requirements of the manufacturers to the extent to which they consider themselves entitled, as the uncertainty regarding the price to be charged to them for the unmanufactured metal prevents them from making the calculations necessary to enable them to produce and dispose of the manufactured goods in a prudent, business-like manner.

It requires no argument to prove that an early change in this unsettled state of affairs is very desirable, while at the same time it appears that things must take their present course for some time longer.

No definite information has yet been received as to the progress of the negotiations in Paris, but everything tends to lead us to believe that a satisfactory arrangement will not be possible, and private cables already report that some of the large European mining companies are already in the market as sellers, although these reports are not yet authoritatively confirmed.

The shares in copper companies have lately been very depressed, both on the Boston and London stock exchanges, and considerably lower values for such securities have been universal.

On the London Metal Exchange the prices of G. M. B. copper, which closed at the end of last week at £38@£38 2s. 6d. spot, and £37 15s.@£38 three months, declined early in the present week to £37, and have since remained steady, closing yesterday at £36 17s. 6d.@£37 cash, and £37@£37 5s. three months. The increased depression in the market has led to consumers' orders falling off considerably, and altogether the market is reported as very irregular.

Messrs. Henry R. Merton & Co. cable that the statistics of visible supplies for the first half of April again show an increase of 1400 tons, and amount now to 126,300 tons.

The Paris correspondent of the London Statist says that the stock of copper taken over from the Comptoir d'Escompte as part security for the advance made it, is officially stated to amount to 90,000 tons; in addition to which 32,000 tons are pledged to Baron Hirsch for his advance.

The official liquidators of the Comptoir put the probable loss down as 72 million francs, i. e., 60 millions on copper and 12 millions on tin. They profess to hope for a rise in the raw metals, leaving all future contracts out of sight. The contracts with the mines are looked upon as illegal and void, but they quite overlook the fact that some of the American mines hold confirmed London bankers' credits against their future deliveries.

"Paris is just now sanguine, and nothing appears to shake this feeling; neither Panama Canal, nor Société des Métaux, nor Comptoir 'krach.' The country, it is argued, is rich, trade is brisk and profitable, and if a few people are ruined that does not mean the ruin of France, or that its financial elasticity is appreciably hampered. This is the exact position of the market, which does not require any further argument."

The liquidator of the Comptoir d'Escompte is in London negotiating for the cancelling of the contracts between the Comptoir d'Escompte and the English copper companies.

The London Times says the new Comptoir d'Escompte will be constructed on the lines of the old concern. The capital will be 40,000,000 francs, half

paid up and exclusively offered to old shareholders. There will also be 60,000 founders' shares, entitled to 30 per cent. of the profits, after 5 per cent is deducted for reserve. Liquidators will receive two-thirds as a contribution to former company, and remaining 20,000 will be handed to the syndicate with guarantees to subscribe for shares not taken by original shareholders.

The general impression gained from private advices received here is that the negotiations between the representatives of the copper producers are not progressing satisfactorily. Some reports say that Mr. Haggin wants too much. It looks at present doubtful if any general pool or combination will be effected, though it is not improbable the American producers may combine to regulate this market.

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

Copper matte.....	Lbs.			
To Liverpool—				
By S. S. Adriatic.....	Bbls.	108	112,492	\$8,750
			Lbs.	
To Hamburg—				
By S. S. Gilbert.....	Bbls.	126	164,800	\$10,000
	Bags	5		

Tin.—During the week in a declining market a very large business has been done, and both dealers and consumers have taken advantage of the opportunity to buy heavily at the lower values, both for spot and future delivery. The total quantity changing hands has amounted to about 350 to 400 tons, and the tone of the market at the close yesterday was much stronger. We quote: Spot, 20'85; May, 20'90; June, 20'90; July, 20'90.

In London values dropped early in the week to £91 12s. 6d.@£91 15s. for spot, but after that a better feeling set in, and the latest closing prices are £92 7s. 6d. to £92 15s. for spot, and 15s. more for 3 months prompt.

The deliveries for the present month are expected to be very heavy.

Lead.—The market has been dull, with a few sales for spot delivery at 3'65 to 3'67½, but consumers being well bought and evincing no great confidence in the future, will not buy except at low prices. Some sales have taken place for August at 3'75 and for September at 3'77½.

The St. Louis Market.—Messrs. John Wahl & Co. telegraph us to-day as follows: Business has been dull during the week, the market closing at 3'40c. for Common and 3'42½c. for Argentiniferous. Demand is extremely light, and prices are almost nominal.

The Chicago Market.—Messrs. Everett and Post, of Chicago, telegraph us to-day, as follows: Market closes quiet, 3'45c. bid, 3'47½c. asked. Sales will not aggregate 300 tons. Some buyers are anxious to buy but do not want to pay more than 3'45c.

Spelter is still dull and depressed, without any change in quotations since last week.

Antimony also unchanged.

IRON MARKET REVIEW.

NEW YORK, Friday Evening, April 19, 1889.

The iron trade throughout the country has made no favorable progress during the week; prices continue to decline in the West, and here they are only nominally maintained. As we have pointed out in recent numbers of the ENGINEERING AND MINING JOURNAL the prices at which Southern iron is sold in Cincinnati and Louisville are much lower than those claimed as its price here, after taking account of the difference in freight. There is nearly \$1 difference in favor of New York prices, so that when we are told that Southern Foundry is bringing \$18, we may receive it with considerable allowance. The same is true of some of the Northern brands. If the present condition of the iron market throughout the country should be maintained a little longer, it will probably be found that deliveries in New York of such brands as the Thomas Iron Company are not at all up to the contracts, and following his usual practice we may expect the president of that company to reduce his nominal prices. Foundries are likely to get their iron at lower figures than they are now paying, and this fact is so generally appreciated that it will bring about its own realization.

The iron ore market is in better condition than the crude iron market. Our Cleveland letter points out the state of affairs in the chief ore port of Lake Erie and gives the prices which are now ruling.

Mr. Swank's statistics, collected for the American Iron and Steel Association for the year 1888 and the first quarter of 1889, have been published. The general figures of the production of iron and steel were issued in a preliminary form some time ago, when they were published in this JOURNAL, but the final figures are now given. We shall make extracts from this report in our next issue; in the meantime it is sufficient to state the final figures. Pig-iron production in 1888, 7,268,507 tons of 2000 pounds; Bessemer ingots, 2,812,500 pounds; Bessemer rails, 1,552,631 tons; open-hearth steel ingots, 352,036 tons; open-hearth rails, 5261 tons; crucible steel ingots, 78,713 tons; rolled iron, except rails, 2,397,402 tons; iron rails, 14,252 tons; kegs of nails, of 100 pounds each, 6,493,591; pig scrap and ore blooms, 39,875 tons. This table shows that the production of pig iron was somewhat greater than in 1887, but there was a decrease in every other item on the list. As the stocks on hand are very low it is evident that the production went into consumption, largely for foundry purposes and in forms which are not included in the table we have above quoted.

Steel Rails.—We learn of a few contracts having been closed this week of which 1500 tons were for the Manhattan Elevated Railroad.

The Structural Iron trade continues fairly active, though with low prices. The spring trade has already set in, and we look for a good demand from this time on.

Bar and Sheet Iron continue unchanged in price under a very sluggish demand.

Almost every department of the iron trade suffers from the spring drowsiness, and needs something to liven it up and set the business circulating.

We continue our quotations, which will be found in our table of current prices in another page.

CLEVELAND. April 17.

[From our Special Correspondent.]

The iron ore trade has been marked by no especial features during the past week. The furnaces in Chicago and vicinity have about supplied their wants for this year; some charcoal furnaces have also bought, but most of these latter have yet to enter their orders.

Sales, however, are being made two to three months earlier than last year. In all probability the amount of ore on the docks at Lake Erie ports on May 1st will be from 250,000 to 300,000 tons less than on May 1st, 1888.

in price is less likely to occur. Below are present actual cash selling prices at Lake Erie ports:

Table listing prices for Extra low phosphorus speculans from Marquette County, Standard specular Bessemer, soft hematite Bessemer, and Standard soft hematite non-Bessemer.

LOUISVILLE. April 16.

[Special Report by Messrs. HALL BROTHERS & Co.]

There is nothing especially new to report about the market, which has been very irregular for several weeks past. Last week the business transacted might have been called large, but the volume of this week's business does not foot up so great.

Quotations which are for a cash basis f. o. b. cars at Louisville will be found in our weekly register of prices.

PITTSBURG. April 18.

[From our Special Correspondent.]

Raw Iron.—There is very little change to note since the date of our last report; prices, to say the least, have held their own, while no general improvement has taken place. There is less disposition to make concessions than there was a short time since.

as a matter of fact, there is only about one per cent difference between the two countries.

Coal and Coke Smelted Lake Ore.

Table listing prices for various sizes of Bessemer and Gray Forge iron, and No. 1 and No. 2 Foundry iron.

Coke, Native Ore.

Table listing prices for 500 Tons Gray Forge, 500 Tons Gray Forge, 50 Tons Silvery, and 50 Tons No. 2 Foundry.

Charcoal.

Table listing prices for 50 Tons No. 2 Foundry, 50 Tons No. 2 Foundry, and 50 Tons Cold Blast.

Muck Bar.

Table listing prices for 1000 Tons Neutral, April, 500 Tons Neutral, and 300 Tons Neutral.

Steel Billets and Slabs.

Table listing prices for 700 Tons Billets, 500 Tons Nail Slabs, and 700 Tons Billets.

Bloom Ends.

Table listing prices for 500 Tons Steel Bloom Ends and Ferro-Manganese.

Spiegel.

Table listing prices for 40 Tons 20 per cent and Old Iron Rails.

Old Iron Rails.

Table listing prices for 500 Tons American Tees, 400 Tons American Tees, and 350 Tons American Tees.

Skelp Iron.

Table listing prices for 700 Tons Sheared, Per 100 lbs., and 400 Tons Ground, Per 100 lbs.

Steel Wire Rods.

Table listing prices for 500 Tons American Fines.

PHILADELPHIA. April 19.

[From our Special Correspondent.]

Railroad building schemes are quite numerous, and the talk is that within the next sixty days an unusually large amount of business will be presented.

IMPORTS AND EXPORTS OF METALS AT NEW YORK APRIL 10 TO APRIL 13, 1889, AND FROM JANUARY 1.

Large table with multiple columns detailing imports and exports of metals like Spelter, Nickel, Pig Lead, Tin, Tin Plates, Steel Sheets, Billets, Forging, etc., including company names and quantities.

CURRENT PRICES.

These quotations are for wholesale lots in New York.

Table of current prices for various commodities including chemicals (Acetic, Sulphuric, Nitric), building materials (Bricks, Cement, Lime), and metals (Aluminum, Iron, Steel).

Table of current prices for various metals and alloys, including Vermillion, Scotch Pig, and Philadelphia Prices, listing items like Foundry No. 1, Bessemer Pig, and Steel Blooms.

Table of current prices for various metals and alloys, including Philadelphia Prices, Birmingham, Ala., and Pittsburgh, Pa., listing items like Foundry No. 1, Bessemer Pig, and Steel Blooms.

Table of current prices for various metals and alloys, including Philadelphia Prices, Birmingham, Ala., and Pittsburgh, Pa., listing items like Foundry No. 1, Bessemer Pig, and Steel Blooms.

DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES

Main table with columns: NAME AND LOCATION OF COMPANY, CAPITAL STOCK, SHARES, ASSESSMENTS, DIVIDENDS, and NAME AND LOCATION OF COMPANY, CAPITAL STOCK, SHARES, ASSESSMENTS. Rows list various mining companies and their financial details.

G. Gold, B. Silver, L. Lead, C. Copper. * Non-assessable. † This company, as the Western, up to Dec. 10th, 1881, paid \$1,403,000. ‡ Non-assessable for three years. § The Deadwood previously paid \$275,000 in eleven dividends, and the Terra \$75,000. Previous to the consolidation in Aug. 1884, the California had paid \$31,320,000 in dividends, and the Con. Virginia, \$22,500,000. ¶ Previous to the consolidation of the Copper Queen with the Atlanta, Aug., 1885, the Copper Queen had paid \$1,350,000 in dividends. †† 1,000,000.

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

Main table of New York Mining Stocks Quotations, listing various mining companies and their stock prices from April 13 to April 19, 1899. Includes columns for company name, location, and daily price movements.

*Ex dividend. †Dealt in at the New York Stock Ex. Unlisted securities. ‡Assessment unpaid. Dividend shares sold, 15,690. Non-dividend shares sold, 61,030. Total New York, 79,720. §Holiday

BOSTON MINING STOCK QUOTATIONS.

Table of Boston Mining Stock Quotations, listing various mining companies and their stock prices from April 12 to April 18, 1899.

Boston: Dividend shares sold, 13,701. Non-dividend shares sold, 7,955. Total Boston, 21,656.

COAL STOCKS.

Table of Coal Stocks, listing various coal companies and their stock prices from April 13 to April 19, 1899.

San Francisco Mining Stock Quotations.

Table of San Francisco Mining Stock Quotations, listing various mining companies and their closing stock prices from April 12 to April 18, 1899.

*Holiday. **Of the sales of this stock, 48,587 were in Philadelphia, and 127,325 in New York. Total sales, 222,256.

dicted. Production both South and North is a little in excess of consumption particularly in mills. Quite a number of Southern offers have been made during the past forty-eight hours. Makers think a good business will be done in view of this, but as Pennsylvania makers have offered special inducements in the way of time it will be a close pull.

Less business is being done in blooms although no works are short of business at present. Muck bars have not lowered in quotations although there are only a few orders in the mills. Buyers are coming down from large to small orders again.

The bar iron trade is all broken up. Several mills will likely shut down in part next Monday. Prices are weak, and there is no likelihood of improvement at present. Skelp iron is not under inquiry, and prices are weak. The dullness in the iron trade continues, and quotations rule down as low as 1.60c. at mill in some cases. Stocks are being reduced, and the foundation is being laid for a better condition.

The demand for wrought-iron pipes and tubes is improving every week. Sheet iron makers are also turning out more iron, and report a generally improved condition. The plate iron mills are booking more orders, but most of them are small.

Several heavy orders for structural iron have just been placed. Two transactions are going through today or to-morrow. The low quotations are bringing in a good deal of business that has been hanging back.

Old rails are extremely dull. Neither buyers nor sellers are making any effort. Very little business has been done in scrap since Monday. The dullness in the mills throughout the country is keeping the demand at a very low ebb.

CHEMICALS AND MINERALS.

NEW YORK, Friday Evening, April 19.

Heavy Chemicals.—Although this market is undeniably dull, there is an undercurrent of legitimate demand which, even if small, is sufficient to create considerable business. There is, however, little speculative buying, and prices are rather weak.

Caustic soda is nominally held at 2.20c. for all the higher tests; 2.17½c. would be accepted in most quarters. Sixty per cent is held at 2.37½@2.40c. In the absence of any cable advices to the contrary, it is presumed that the makers' association has not yet fixed upon a definite plan of restriction. Can report this week had it that a reduction of 30 per cent in the month's output had been decided upon. This, however, lacks confirmation. On the spot, the market certainly presents few encouraging features. Offerings are large against an indifferent demand.

Bleaching powder is again weaker. Transactions are reported at 1.60c. It is intimated that even 1.57½c. would be accepted. Supply on the spot at the moment is not large. The demand, however, is very light.

Carbonated soda ash, 48 per cent, continues in good demand at 1.22½@1.25c. This has been the most active article in this department for the past three months.

Caustic soda ash, 48 per cent, is quiet, also at 1.22½@1.25c. Refined alkali is moving very freely at unchanged quotations. Sal soda is dull.

Acids continue in fair demand, with prices unchanged and no features of special interest to report. Little animation is apparent in acetic. Nitric is rather quiet, and perhaps slightly easier on account of the declining tendency in nitrate of soda. Nitric, however, is already so low that manufacturers desperately resist any attempt to shade quotations. Oxalic is dull. Muriatic and sulphuric are both moving very freely, with apparently no more than the usual pressure to sell. Prices are steady, and surplus stocks have not been appreciably increased since our last report.

The Highlands Chemical Company informs the ENGINEERING AND MINING JOURNAL that its works, which were recently burned, are now running steadily. They claim to be making acetic and muriatic in sufficient quantities to fill all their old contracts, and expect to have their sulphuric plant completed in a few weeks.

Fertilizing Chemicals.—This market is still quiet. Prices are fairly steady at the following figures:

Azotine, \$2.60@2.65; dried blood (city), low grade, \$2.55@2.60 per unit; Western, high grade, \$2.65 per unit for ground material; tankage, high grade, \$26@26.50 per ton; low grade, \$23 per ton, as to quality. Fish scrap, \$25@26 per ton f.o.b. factory. Sulphate of ammonia, \$3.30@3.32½ per cwt.

Refuse bone-black, guaranteed 70 per cent phosphate, \$19.50 per ton. Dissolved bone-black is 95c. @ \$1 per unit for available phosphoric acid, and acid phosphate 80@85c. per unit for available phosphoric acid.

Steamed bones, unground, \$20; ground, \$25@26. Charleston rock, undried, \$5@5.25 per ton; kiln dried, \$6@6.25 per ton, both f.o.b. vessels at the mines. Charleston rock, ground, \$10.50 ex steamer at New York.

Muriate of Potash.—Arrivals for the week aggregate 450 tons. Prices are steady at 1.82½@1.85c. on spot and 1.90c. for shipment.

Double manure salts, basis 48 per cent, remains at 1.20c. spot and 1.15c. for shipment. High grade sulphate of potash, basis 90 per cent, is quiet at 2.40c. Kanit.—We hear of a few small lots in second hands offering as low as \$9.90. The official syndicate price continues at \$9.75 for shipment and \$10@11 from store.

Miscellaneous.—Nitrate of soda continues very weak. Quotations on the spot are 2.20c. while for arrivals we hear of offerings as low as 2c. There are

about 60,000 bags in store and afloat at New York. Deliveries during the fortnight ending last Monday aggregated 13,486 bags against arrivals of 18,949 bags. The European market continues phenomenally active. Exports from Chili to Europe up to April 1st amounted to 195,000 tons against 90,000 tons last year.

Brimstone is in light demand at \$20.25 for best unmixed seconds on the spot, \$19.50 for same to arrive, and \$19.00 for thirds.

The price lists of the Paris green manufacturers for the coming year were issued this week. As was expected, no change was made in the schedule prices of last year.

Acetate of lime is held at .95@1c. for brown and 1½@1½c. for brown.

The Duty on Potash Salts.—For five years or more, in fact ever since the act of March, 1883, importers of crude fertilizing material have been endeavoring to obtain a repeal of the duty now levied on all potash salts containing over thirty per cent of free potash. This act provided (paragraphs 503, 504, 505) that all potash salts intended expressly for manurial purposes should be admitted free of duty, but the benefits which this provision would have conferred not only upon fertilizer manufacturers, but upon the whole farming community have been lost owing to the reluctance of the Treasury officials to violate a ruling of that department of twenty years standing. Upon the incoming of the new administration, however, an appeal was made to Secretary Rusk, who investigated the matter and reported on April 6th in substance as follows: "The laws of the United States permit the importation of all substances, which are used exclusively for fertilizing purposes, free of duty. Under this law it would be possible to introduce all kinds of potash salts which are used for fertilizing purposes without the payment of duty of any kind. The Treasury officials, however, discovered that potash salts imported free of duty for fertilizing purposes were used for other purposes, and hence it was decided, by a ruling of the Treasury, on December 4th, 1869, that potash salts containing less than 50 per cent of potash, and which were of such a nature that they could not be profitably used for any other purpose, could be imported free of duty under Section 23 of the Act, March 2d, 1861; but in a letter from the Secretary of the Treasury to the Collector at Baltimore, August 2d, 1870, it is stated that: 'It has been found necessary to modify the said decision, and hereafter any so-styled manure salts, or fertilizers, containing over 30 per cent of free potash will be dutiable.' The officials of the Treasury have informed me that they will consider any recommendation I may make in regard to the matter. It appears, therefore, that it will be necessary for the manufacturers of fertilizers to give bond in some way to the Treasury that the potash salts imported shall be used exclusively for manurial purposes. I can readily see how some such arrangement will be of great advantage to our farmers since the importation of a high grade sulphate of potash salts, some of which contain as high as 90 per cent of pure sulphate, would secure a great saving in freights and enable our farmers to have a high grade of potash at considerably lower rates than they can get it at present. To further this matter, therefore, I have written to the Hon. Secretary of the Treasury, if compatible with the public interests, to allow the importation of high grade potash salts, if he can do so with the assurance that these materials will be used solely for fertilizing purposes."

A New York importer, when interviewed in regard to Secretary Rusk's letter, said: "It would be manifestly unfair to compel us to give bonds that all our importations shall be used in the manufacture of fertilizers, for when the goods leave our hands we can not control their use. It is a fact, however, that out of the ten or fifteen thousand tons of sulphate of potash imported last year scarcely two hundred tons were used for purposes other than the manufacture of fertilizers."

From the tenor of Mr. Rusk's letter, it is evident that there is a sincere desire on the part of his department to avoid any unnecessary exactions, and at the next session of Congress, or when the tariff schedule is again considered, it appears probable that some steps will be taken to repeal a duty which protects no American industry, and imposes a burden upon farmers, fertilizer and chemical manufacturers and all American consumers of these products.

Liverpool. April 6.

[From our Special Correspondents.]

Chemicals.—Messrs. J. P. Brunner & Co. write us as follows: Both caustic soda and bleaching powder have improved this week, but the position is not altogether satisfactory yet. Caustic soda ash is flat and easier. Carbonated soda ash, on the contrary, is very scarce, and brings full prices, some makers having to decline orders for prompt delivery, being fully booked for some weeks ahead. We quote: Caustic ash, 48 per cent, 1½@1½d.; high test, 1@1½d. Carb. ash, 48 per cent, 1@1½d.; high test, 1@1½d. Soda crystals are still slow of sale, and 28 8s. 9d.@23 10s. are nearest values. On the Tyne the market has improved and prices advanced. Caustic soda is again dearer. The market opened with a good inquiry and a fair business was done at 25 15s. for 60 per cent, and 26 12s. 6d., 70 per cent prompt delivery. Sixty per cent is now very scarce and 25 17s. 6d. asked, but we hear of no business at this figure. For 70 per cent, makers are now firm at 26 15s., but resellers have come out and will accept 1s. 3d. less money. Seventy-four per cent held for 27 2s.

6d. to 27 5s., but buyers hold aloof. Seventy six per cent we quote 28 10s. The position of caustic soda is rather uncertain, as some makers are not satisfied with the present basis of make arrangement and want a re-arrangement on different lines. Unless the refractory makers can be won over it looks as if there may be some trouble ahead for the Association. At the same time we may add that makers are all very firm in their ideas of price at present. Bleaching Powder.—A smart advance has taken place on the Tyne lately, and sellers here are firmer on this account. There has been a better demand for soft-wood bleach this week, and higher prices are now asked here. In hard wood, however, there is so little doing that it is difficult to test values, but 26 17s. 6d.@27 are about quotation, although we hear of no business at even the lower figure. Chlorate of potash is steady at 4½@5d. per lb., but the demand is only on a very moderate scale. Bicarbonate of soda in request at 24 12s. 6d.@24 15s. per ton for one cwt. kegs, with usual allowance for larger packages. Sulphate of ammonia is very scarce here, and 212 is nearest value for good gray 24 per cent, early delivery, while buyers' ideas are about 2s. 6d.@25s. per ton below that figure.

BUILDING MATERIAL MARKET.

FRIDAY EVENING, April 19, 1889.

Bricks.—A slight relaxation of the demand occurred this week. Arrivals, on the other hand, have aggregated at least fifteen million brick. With the surplus of about three million brick, which was the amount on the market yesterday, and with the prospect of a considerable supply of new brick next week if the weather continues fair, it certainly looks as though the effort to sustain prices would be in vain. Quite a number of yards have begun moulding and yesterday and to day several fires were lighted. The asking prices at the moment stand about as follows: Haverstraws \$8.00@8.37½, the latter for choice cargoes; Uprivers, \$7.25@7.75; Jerseys, \$6.75@7.50, and Pales, \$3 25@3.50. The quotations at the close are only fairly firm.

Lime.—Arrivals continue to be steadily absorbed in a legitimate way for consumption. We hear of no offerings at the moment. The Rockland lime men met on Tuesday and discussed the question of continuing the Knox County Lime Association for another year. The present combination expires May 9. We understand that it was virtually decided to continue the association. Considering the salutary effects of this combination upon the whole trade during the past year, it would have been more than strange if they had decided to follow any other course.

Cement.—Best brands of imported cement command \$2.45@2.65. Rosendale is quite weak. About .90@ \$1 per bbl. would be a fair quotation, although special brands may bring \$1.10@1.15.

Roofing Slate.—Quarries seem to be adhering to circular rates pretty uniformly. The absence of large stocks prevents any desire to cut prices.

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