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DURING the past week the courts at Butte, Mont., have been trying a mining case of some interest—the suit of JOHN T. WIGGIN vs. B. J. FINE and the Shonbar mine. Messrs. WIGGIN and FINE organized the Shonbar Mining Company, which took over the mine in question, and fell out over some matters connected with the enterprise. The Shonbar Mining Company had a capital of 300,000 shares. Mr. WIGGIN, when on the stand, gave an account of the division of these shares. Where the bulk of the certificates went is of no consequence to the moral which we draw; it was the disposal of 1,000 shares only, out of the total of 300,000, which attracted our attention. These 1,000 shares it appears, according to Mr. WIGGIN's testimony, were distributed among the newspapers. No explanation is given, but it may be assumed that they were gifts to certain persons connected with the local press, which is unfortunately a custom only too prevalent in mining regions of the West where companies are organized for speculative purposes. The intention is, obviously, that the newspapers shall boom the mines and companies in question, or at least be prejudiced in their favor, and it is to be regretted that they carry out their share of these bargains with so much fidelity. There is nothing which reacts so seriously upon the mining industry of any particular section of the country as the failure of a concern boomed in this way, and they generally fail, because if they could stand on their merits there would be no necessity for booming, and there is nothing so injurious to the press as such venality. In this particular case a considerable amount of the stock of the company which was organized in February, 1891, was sold in Boston in the early part of the same year. In November the company suspended operations and the mine was sold at sheriff's sale to satisfy unpaid wage bills.

THE IMPROVEMENT OF OUR ROADS AND THE WORLD'S FAIR.

A short time ago Col. ALBERT A. POPE, of Boston, who is well known as one of the leaders of the movement for the improvement of our country roads, wrote to the Director-General of the World's Fair at Chicago, urging that strenuous efforts be inaugurated to make a comprehensive exhibit of improved roads and road-making machinery at the Exposition. To carry out this plan Colonel POPE proposed that some of the roads adjacent to the Exposition grounds should be constructed in accordance with the most approved systems used in Europe and this country. "Cross sections of these roads should be shown in some suitable place, together with the best machinery for preparing the material, making and taking care of roads."

Colonel POPE's letter was referred to Dr. S. H. PEABODY, chief of the Department of Liberal Arts, who replied that he was fully in accord with Colonel POPE in regard to the matter, and although it would be difficult to find space in the Fair grounds to illustrate such work in a large and practical way he would endeavor to find a place for an exhibit illustrating the methods of constructing good roads by sections, and otherwise, in the Department of Liberal Arts.

Therefore, the matter is now in the hands of the State commissions on the World's Fair, and it is to be hoped that they will realize the importance of making these exhibits.

The question of good roads is one of the most vital importance, and, although there are very encouraging signs of an awakening interest in the matter on the part of the people, the tardiness with which they have become interested in it and the abominable condition of the great majority of our country roads at the present time is due undoubtedly, in great measure, to the ignorance of the people as to what a good road really is or how to make it. A comprehensive road exhibit at the World's Fair would probably do more than anything else to convince the farmers and others, who have to use the roads most, of the advantages to be derived from their improvement, and would be a most powerful factor in bringing about legislation for the construction and maintenance of scientifically built highways.

THE PRODUCTION OF GOLD AND SILVER IN THE UNITED STATES IN 1891.

Elsewhere in this issue we print an abstract of the forthcoming report of Mr. E. O. LEECH, Director of the Mint, on the production of gold and silver in the United States in 1891. The promptness with which these statistics are issued is very commendable and greatly enhances their value. Already these reports, though the present is but the twelfth year of their issue, have risen to pre-eminent position as statistical authorities, and their reliability is recognized by statisticians the world over. This year Mr. LEECH, who deserves the most unqualified praise for the work which he has done in their compilation during the past four years, has undertaken a new line of investigation in separating the output of silver in the United States according to the character of the ore, free milling and smelting ores, from which it was produced. This is an inquiry of much interest which has never been carried to definite result, hitherto.

Mr. LEECH reports the total production of gold in the United States in 1891 as 1,604,840 fine ounces, valued at \$33,175,000, while the yield of silver was 58,330,000 fine ounces, of the commercial value of \$57,630,040

A comparison of Mr. LEECH's statistics with those already published is interesting.

PRODUCTION OF GOLD AND SILVER IN THE UNITED STATES IN 1891.

	U. S. Mint, April 18, fine ounces.	ENGINEERING AND MINING JOURNAL, Jan. 2, fine ounces.	Wells, Fargo & Co., Jan. 20, fine ounces.
Gold.....	1,604,840	1,620,000	1,546,976
Silver.....	58,330,000	58,000,000	61,851,025

Thus it is seen that the figures which we published in our statistical number, Jan. 2, 1892, were accurate within $\frac{1}{100}$ of 1 per cent. in the case of gold, and within $\frac{1}{10}$ of 1 per cent. in the case of silver.

The chief lesson of these statistics is that the production of silver is still being maintained at the same steadily increasing rate as in the past four years. From 1880 to 1886 the increase in the production of silver was large, but it was not steady, as in two years there was a falling off from the years immediately preceding. In 1887, however, the great increase commenced, the yield for that year being 41,721,592 ounces, while for the subsequent years it was respectively 45,792,682, 50,094,571, 54,516,300 and 58,330,000, or an increase of about 4,000,000 ounces per year. In 1880 the production of silver in the United States was 30,320,000 ounces; hence it has nearly doubled in the last twelve years. The reason for the decrease in the value of silver is obvious.

Another interesting point in these statistics is the considerable increase shown in the world's output of gold. In our issue of March 5th, 1892, we stated that even from the incomplete statistics that we then had we felt warranted in making the statement that full returns would prove that there had been an important advance in the yield of the gold mines of the world, and Mr. LEECH's figures bear out our assertion.

GOVERNMENT TIMBER TESTS.

In our issue of February 27th we referred editorially to a bill which had been introduced in the House of Representatives asking for an appropriation of \$40,000 for the continuance of the exhaustive and elaborate tests of the timber grown in this country, which has been undertaken by the Forestry Division of the Department of Agriculture. While recognizing the urgent needs of such tests, and the obvious advantages to be derived from them, we opposed the granting of the appropriation asked for on the ground that such work should be done by the citizens interested rather than by the Government, saying: "Such work as this does not properly constitute a function of a republican government, and these should be limited as closely as possible to doing that which the citizens are unable to do for themselves. . . . Work which is of interest to but a portion of the people, and which can be conducted by private or by voluntary public enterprise, should not, in our opinion, be performed by the Government at the public expense. The very foundation of free republican government is in the self-reliance of the citizen, and the looking to the Government to do what the citizen can do for himself is destructive of that foundation."

We opened our columns to a discussion of the question, and in succeeding issues have printed letters on both sides, publishing several this week, with which we close the discussion.

The contention of our critics has been, for the most part, that the benefits which have already resulted and are to result from the execution of this series of tests which Mr. FERNOW has begun are obvious, and affect all the people of this country. Therefore, it is argued, that it is right that they should be made. Mr. FERNOW, himself, in a letter printed in our issue of March 5th, points out that investigation as to the effect of turpentine gathering upon the strength of timber of Longleaf pine has shown that, contrary to accepted opinion, "boxed" timber from which the resin has been extracted is not of inferior, but, if anything, of greater strength than "unboxed" timber; "not less than 600,000 acres in the South is 'boxed' annually, the timber of which, because of the assumed deterioration, cannot find ready market, thus depreciating valuable property over a large section of the country, without reason, to the amount of several million dollars."

We grant that this is an important contribution to our knowledge, but to argue that it is proper for a government to make such studies is to argue that it is proper for a government to undertake coal mining in order to displace some of the wasteful methods which may now be used by individual miners in the prosecution of this industry. Our reserves of anthracite coal are comparatively limited, and anything that would tend toward economy in their extraction and utilization would be to the advantage of the people, and would add to the sum total of their wealth; or if the Government thought that it could make shoes better than the individual manufacturers in Lynn, Mass., the Government should engage in the shoe manufacturing business, or at least in experimental shoe manufacturing, to find out some better way of making and repairing shoes than we now know; or the Government should establish experimental kitchens, because, as every one knows, the general and special ignorance of the entire nation concerning the relative values of foods and of how best to cook them is deplorable, and simply barbarous, and the subject is one affecting all the citizens. If the theory that it is right for the Government to make these timber tests because they will be useful to the citi-

zens of this country is correct, it is equally right that the Government should take up any of these investigations which we suggest, or almost any other industry or investigation which the mind of man can conceive. We do not think, however, that either Mr. FERNOW or Prof. JOHNSON, who argues upon the same lines, would assert that the Government should go to this length.

Prof. JOHNSON thinks that no attempt could ever be made in the direction of "an adequate study of the timber of this country by an authority, body, society or corporation without being paralyzed at the outset by the size and cost of the undertaking and the patent impossibility of completing it except by Government aid." If the costs of these tests is to be so great certainly \$40,000 seems to be altogether an insufficient appropriation to start with; but we have now tolerably complete data as to the strength and properties of iron and steel, nearly all of which have been obtained without intervention of the Government and a considerable portion of these have been furnished by the railways themselves, which, it is claimed, are largely interested in carrying out the timber tests in question.

Why should not the necessary information concerning timber be obtained in the same manner as our knowledge of iron and steel, and if this is of such importance to the railways why should not the latter make this investigation on their own account, just as they make investigations as to the best kinds of lubricants for car axles, the best types of locomotives, etc.? Both of these questions are of vital importance to the public at large, as they affect, more or less directly, the cost of transportation of the products of our mines, farms and factories.

Dr. RAYMOND criticises our position by comparing the work which the Forestry Division of the Department of Agriculture proposes to undertake with the work of the Geological Survey, which he assumes we approve; but we do not approve *all* the work which the United States Geological Survey has done or is doing. Much of it has been and is, we think, analogous in character to these timber tests, and ought not, properly, to be done by the Government. The work of the United States Geological Survey was at first confined to the Territories; indeed, when it was commenced, there were but four States in the area of the Rocky Mountains. Even after the Territories had been made States it was still right that the Geological Survey should continue its labors in mining districts within their borders, for the mineral lands were still the property of the Government, and title to them could only be obtained through Government patent. The work of the Geological Survey, however, should have been confined to this field, and we see no justification of its undertaking investigations of the copper and iron resources of the Lake Superior region, or of the phosphate fields of Florida; or making a treatise on lead smelting in Colorado, as one of our correspondents, whose letter we print in this issue, pertinently remarks.

Mr. WILLIAM KENT, alone of our correspondents, criticises the broad principle upon which we have taken our stand, which he does on the score of its being pure "theory." This resembles the characterization of political reform by the practical politician as "theoretical;" but it is they who are the theorists in believing that they can prevent it. The abolitionists were regarded as theorists, even as fanatics, for many years, but eventually the whole nation came to see that the theory for which they fought was right. It does not prove the principle we contend for is wrong because certain citizens and bodies of citizens of such high standing as the mechanical section of the American Association for the Advancement of Science have advocated such work as this being done by the Government. It is no argument to say that a thing is right or should be advocated because the majority wants it. It is the duty of the press to stand firm to right principles even when in the minority. Such papers as the ENGINEERING AND MINING JOURNAL aim to create, not necessarily to follow, public opinion.

The opinions of Hon. ABRAM S. HEWITT, which we print this week, command respect. He calls himself a "strict constructionist of the Constitution," and agrees with us that the State should not undertake work which should properly be left to the citizen, but investigations which are necessary for the guidance of the officers of the Government in carrying on the great engineering and mechanical work intrusted to them may properly be undertaken at the public expense. No one will question the correctness of this position, but this is not at all what the Forestry Division proposes.

The justification of the work as argued by its advocates is that it will add to the general store of useful knowledge. No claim whatever is made that it is undertaken in the interest of the general Government, but on the contrary it is urged on the plea that it will benefit the citizen, and more especially certain associations of private citizens, such as the railroads, the owners of pine lands where turpentine is produced, etc.; in other words in the interest of classes well able to make the investigations themselves.

The principle for which we contend has been stated concisely and admirably by Hon. DAVID A. WELLS, than whom we have no more thoughtful and safe leader, when he says, "the functions of government should be restricted to such general acts as are necessary for the good of the commonwealth, and which the citizens cannot perform for them-

selves. . . . A government cannot be truly free and at the same time paternal."

Nearly every custom which has grown to be recognized as an abuse of the functions of government had its origin in some plausible scheme to benefit the citizen. It is when government is entering upon a policy that has no logical stopping point short of pure socialism that the warning voice should be raised. It is easier to guide the formation of correct principles than to eradicate erroneous convictions.

BOOKS RECEIVED.

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

Breadstuffs in Latin America, being Bulletin No. 35 of the Bureau of American Republics, compiled from Official Returns to October 1, 1891. Published by the Bureau, Washington, D. C. 1892. Pages 91.

Report of the Special Committee on the Prevention of Smoke in St. Louis, Mo. Pages 47.

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 Mines of Galena Gulch, Arizona.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: In the fall of 1891 explorations in the Galena (Gulch district, some 20 miles southeast of Prescott, in the Aqua Frio Valley, resulted in the finding of very rich gold rock in what is called the "Jessie" claim. The continued and profitable working of the vein since that time caused a good deal of excitement, and since then the valley has been filled with prospectors, and many claims located, from which valuable ores are being taken. In this vicinity was done the first work in gold quartz veins in this county. This was late in the "sixties" and in the early "seventies." Trouble with Indians and great cost of mining supplies soon closed the mines, and since the six most promising claims were patented the district has remained idle. In the "Statistics of Mines and Mining" for the year 1872, by U. S. Commissioner R. W. Raymond, four pages are devoted to the description of mines of this vicinity.

Of the patented claims, the "Galena," "Dividends Nos. 1 and 2," are on the same vein, and joining them on the west side are the "Ticonderoga" and "Independence," on a nearly parallel vein. The "Jessie" is a parallel vein and adjoins the "Dividends" on the east. All these veins have a course of about N. 25 E. and S. 25 W., and dip steeply to the southeast.

The "Jessie" vein is small, the pay streaks varying from 2 ins. to 4 ins., the pay chute, as far as developed, being about 350 ft. in length. The gold at a moderate depth is principally in the sulphurets, and the ore which has been shipped to the sampler at Prescott, varies from 7 oz. to 36 z. per ton in gold. A large portion of the vein rock, averaging about \$50 per ton, has to be left on the dump at present, as the parties have no means of treating it. A shaft has been sunk to the depth of 120 ft., and the ore holds in richness. From this vein there have been shipped since October about \$20,000 worth of ore by the energetic lessees. The charges are very severe, as, besides a royalty of 25%, it costs \$7 and \$8 per ton to haul it to the sampler. The sampler and railroad freight charges are \$32 per ton; 95% of assay value is paid. It takes good ore to stand that and yet it has yielded a handsome profit.

The lessees have discovered and located an extension on the "Dividend" vein and bonded the two "Dividend" claims, upon which they have already begun work. As these claims prospect well, throughout their length, in free gold we may expect a very active camp for sometime. The ground to the northeast for the distance of about two miles has been located and from the extreme north claim ("Legal Tender") several tons of rich ore have been sold and some second class ore which yielded \$65 a ton has been treated at a 5-stamp mill in the neighborhood.

Altogether there is great promise of a rich gold field being developed. Timber for mining purposes is abundant at a short distance to the west, but at an elevation of one to two thousand feet above the mines. Water is scarce, but there is a strong probability that the deepening of the mines will supply the deficiency. Should the Southern Pacific Railroad build the branch to Prescott which is now being surveyed it will pass within three miles of the mines.

The patented mines, the "Jessie," and two extensions north on the Dividend vein, lie in syenite, which is cut by many porphyry dykes. Further north on the course of the vein the rocks change to talcose and siliceous slate. In the slate country there are many narrow veins or seams of rich ore, but these grow larger in northernmost claims. The owners are very actively at work, and will soon be able to keep a good-sized mill busy, if they can only get one to handle their ore.

JOHN F. BLANDY.

PRESCOTT, ARIZ., April, 1892.

Government Timber Tests.

In our issue of April 16 we printed the following letter from Hon. David A. Wells:

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: I am so situated that I cannot give much thought now to the specific question of an appropriation for "timber tests," but I am entirely one with you in the opinion that the functions of government should be restricted to such general acts as are necessary for the good of the commonwealth and which the citizens cannot perform for themselves; and in judging of any particular case, should prefer to err on the side of over-caution than that of liberality; for a government cannot be truly free, and at the same time paternal.

DAVID A. WELLS.

NORWICH, Conn., April 13, 1892.

Senator Mills, of Texas, writes as follows:

SIR: Yours of the 11th inst. received. I beg to refer you to the letter of the Hon. David A. Wells, April 13th, 1892, for my opinion in reply to the question which you propound. Mr. Wells has expressed my views as clearly as I could have done myself.

R. Q. MILLS.

WASHINGTON, D. C., April 15, 1892.

EDITOR OF ENGINEERING AND MINING JOURNAL:

SIR: I am in receipt of your letter of the 11th inst. with the inclosures in reference to the question of a Congressional appropriation for timber tests. You ask my opinion as to the propriety of making such an appropriation.

By education and conviction I am what is called a strict constructionist of the Constitution. I believe that the State should never undertake any duty which can properly be left with the individual, and that the general government should not appropriate to itself any of the powers reserved to the States. Nevertheless, under the doctrine of implied powers, the general government has been compelled to perform many functions which were not contemplated by the framers of the Constitution, and as civilization grows and the wealth and interests of the country increase, many occasions arise where neither the individual nor the State can respond to the pressing necessity of the case, and the general government is forced to intervene. The surveys of the territories, certainly within the purview of the Constitution, necessarily led to a correlation of surveys within the several States, and finally to the geodetic and geological survey now undertaken by the general government.

In the same way the tests of iron and steel required for public work rendered necessary the purchase of an adequate testing machine and finally its general use by the public, with great advantage unquestionably to every industrial interest. I am not prepared to say whether timber requires to be tested to any greater extent than is now done by individuals or has been done by the Government in the various public works which it has undertaken. But certainly if the officers of the Government find themselves without adequate knowledge to carry on the great engineering and mechanical problems which they are compelled to confront, it would be proper to extend the area of tests from iron and steel to other metals and to timber and other materials. I do not know where to draw the line except in the necessities of the Government and the judgment of its executive officers. While, therefore, I am not prepared to advocate timber tests, I am prepared to say that under the precedents which exist and the work now being done I see no objection in principle to carrying governmental agency into such departments of industry as are not likely to be enlightened and determined by individual interests and efforts.

As to the proposed appropriation, therefore, I would decide the question, not upon constitutional grounds, but upon the evidence of necessity given by the public officers who are charged with the execution of important works.

ABRAM S. HEWITT.

NEW YORK, April 16, 1892.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: I have read with interest the articles which have appeared in your valuable journal upon the interesting timber tests that have been undertaken by Mr. B. E. Fernow, Chief of the Bureau of Forestry of the Department of Agriculture, and the question of further appropriations for the continuance of the same. No public spirited citizen, and least of all an engineer, will deny the benefits that are to be derived from such an investigation; but, nevertheless, I agree with you in the stand that you have taken in the matter. The tendency toward paternalism in government is entirely too strong at the present time, and if carried further will surely lead to evil results, as the people, by becoming accustomed to have everything done for them, will gradually lose the ability to do things for themselves. The mechanical system of life of Mr. Bellamy's Utopia would finally be realized.

I do not mean to argue that the continuance of these timber tests would in itself be at all a dangerous step in this direction. It would simply constitute another precedent for the Government undertaking work which does not properly belong to the functions of government. It is a sound principle, I believe, that the Government should do nothing for the people which the people can do for themselves. Such matters as the coast and geodetic survey, the maintenance of lighthouses and the life-saving service, cannot well be undertaken by the people; all these require a systematic and concerted action which can be given only by some central power. With the Geological Survey, which has been cited in this discussion, the case is entirely different. Your correspondents on the other side of the question have argued that if it were right for the Government to carry on this work it is right that it should make the timber tests; but these undertakings are not exactly analogous. The Geological Survey was primarily undertaken to demonstrate the value of the public lands in the mining regions of the West, which was to result directly in the benefit of the Government, and consequently of the people; but without underrating the value of the work which the Geological Survey has done, I am of the opinion that it has done much which it ought not properly to have done. For instance, Mr. Emmons' monograph on Leadville, Colo., is one of the classics of the literature of economic geology. I doubt if any other scientific work has ever had such immediate and directly practical value as has this treatise upon the ore deposits of Leadville. It was right that this work should be undertaken. By demonstrating the value of the mineral resources of that district, it led to their exploration and, eventually, to the sale of the Government's mineral lands there; but of what importance in that connection was the elaborate article on the methods of smelting at Leadville, written by Mr. Guyard, and included in that monograph? The article was valuable from a technical standpoint, and formed an important contribution to metallurgical literature; but who can honestly assert that it is one of the functions of Government to furnish the people with technical literature?

The timber tests, as it is proposed to carry them out, do not add to the value of the public lands where timber is sold at so much per acre, but they will undoubtedly add to the value of timber land in the hands of private owners, who are cutting it and selling it for use in industrial work. They will also add to the general wealth of the people by demonstrating the manner in which timber can be used most economically and to the best advantage; but so does all knowledge add to the general wealth of the whole people and it might as properly be argued that the Government should conduct the universities, colleges and other institutions of learning. Iron and steel are now our most important structural material. We have elaborate series of tests upon their strength and properties. Some of these have been made by the various governments of the civilized world for their own purposes, which is proper, but as a whole they

have been compiled by private individuals. Why then should not our timber tests be made in the same way? If they are going to result in such immense benefit to the railway companies as it is argued, the railway companies are certainly able to make them.

NEW YORK, March, 1892.

ANTI-BELLAMY.

ARGENTINE.*

By A. Harp.

"Argentine" consists of nearly pure tin dust in a very fine state of division, and is also called "tin dust." It is used principally for ornamenting paper, such as silver paper, and is manufactured in only a few places, as the demand is small. The process of manufacture described is that carried on in Herdain, near Breslau, Germany. The materials required are tin, hydrochloric acid and zinc. Tin is used in the granulated form and also as it exists in all kinds of alloys such as gun metal and white metal, the turnings forming the waste material of other factories being suitable. The turnings are placed in open copper vessels holding about 250 litres, and ordinary hydrochloric acid of 20° to 22° B. is added and boiled. As long as an excess of tin is present copper and antimony will not dissolve. The solution will contain chiefly tin and a little lead, and is run into wooden casks to cool, when most of the lead crystallizes out as chloride. This is separated by filtration through sand, and converted into oxochloride, by Pattinson's method, for sale as a white pigment. The clear solution has a density of 33° to 40° B., and contains 17% to 23% Sn, with small quantities of lead and antimony. It is desirable that these impurities should be small in amount, as they are injurious to the color of the product. The undissolved metal is exhausted by boiling three times with fresh acid, when it is washed and dried. On account of its admixture with antimony and metallic chlorides, this waste copper is not fit for castings, and is sold to a metal refiner. Not all the tin is removed by this process, as the metal residue retains 2% to 3%, the complete extraction of which would be accompanied by too much antimony and lead.

The next operation is the precipitation of the tin in wooden casks holding about half a cubic metre each. They are filled with water, and an iron basket well plated with tin and holding zinc scrap is suspended in each. Each cask receives twice daily an addition of 2½ litres of the strong solution (about 40° B.) of tin chloride, which is thereby diluted to 200 times its volume. The metallic tin precipitated by the zinc from this dilute solution takes the form of a very light sponge, which is carried by adherent hydrogen gas to the surface of the solution, whence it is removed every morning, and well washed in a separate cask. It is then dried in a shallow oblong steam-jacketed zinc pan, in which it is moved about with wooden shovels. The dried dust is sifted in a rotating sieve provided with very fine meshes. It forms an extremely finely-divided metallic powder of a tin-gray color. It consists of nearly pure tin with a very small quantity of lead and sometimes antimony. The output is about 500 kilos. per month, and its value is 280—300 marks (the mark equals 23.8 cents) for 100 kilos. of good quality. The liquor in the cask becomes gradually charged with zinc chloride, and is drawn off when its strength reaches 20°—25° B. It is concentrated to about 50° B. by evaporation in enameled cast-iron pans, and sold for preserving timber.

An almost obsolete process for making silver paper involved the employment of a metallic dust prepared mechanically by grinding to powder an alloy composed of 95.5% of tin and 2.5% of zinc, which was then mixed with a solution of glue and painted on ordinary white paper, a gloss being afterward imparted by pressure. A genuine silver paper was also made by cementing silver leaf to paper with white lead and glue. By the modern process "Argentine" is employed, and the cementing material is a "wax-solution" prepared in one of the following ways: Four kilos. of ordinary beeswax and ¼ kilo. of potashes are boiled with 50 litres of water; or 3 kilos. of starch are emulsified and boiled with 75 litres of water containing 5 lbs. of beeswax and 1½ lbs. of potashes; 25 kilos. of "Argentine" are stirred into this solution contained in a rocking trough through which the roll of paper is caused to pass. The dull gray-coated paper is then passed through a hot calender under great pressure, which gives a high polish to the paper resembling tin-foil. Sometimes the calender is smeared with coconut butter, which increases the gloss and gives a greasy feel to the paper.

A considerable difficulty in the manufacture of the "Argentine" is occasioned by the appearance of small crystalline particles in the finished product, which had the effect of introducing irregular blotches into the silver paper. This is found to be due to the fact that the precipitated tin sponge is likely to contain small crystalline needles of the metal when the tin chloride solution from which it is precipitated is insufficiently diluted, or when the zinc plates are contaminated with other metals in such a way that electrical currents are set up in the solution. Plates of tin and zinc connected by a copper wire and immersed in dilute tin solution caused the formation of crystalline needles of tin at the tin electrode, while the spongy metal separating at the zinc was free from crystals. Plates of zinc and lead employed in the same way gave similar results, and in this case impurities in the zinc plate were found to have a less effect on the result. As it is not possible in practice to employ pure zinc a lead plate in electrical connection with the ordinary impure zinc may be used in order to obtain a tin sponge free from crystals.

This modification of the process gave very satisfactory results as carried out in the following way: A wooden cask was divided into two compartments by a wooden partition containing a few holes to allow the solution to pass freely. Plates of lead and ordinary commercial zinc were placed in the separate compartments and connected by a copper wire. The cask was filled with water charged with 1% of the strong tin chloride solution (45° B.). The formation of sponge went on regularly and quickly at the zinc plate, and was quite free from crystals, while only a few crystals of tin separated at the lead plate, which became covered with a dark-gray film. Large quantities of good sponge were obtained from successive additions of the strong liquor. The distinction between sponge and crystals must be taken as merely relative, for the microscope shows the sponge to consist entirely of very small crystals, which are not recognizable as such by the naked eye.

* From *Papier Zeitung*, 1891, No. 16, 2584, through *Journal of the Society of Chemical Industry*, January, 1892.

RICHNESS OF EARLY PLACER MINES IN CALIFORNIA:

Written for the Engineering and Mining Journal by S. S. Boynton.

The present revival in gold mining recalls the richness of the early placer mines in California when men made fortunes by a few weeks' work. A thousand instances might be given showing the fabulous sums obtained from the auriferous gravels of the pioneer mines. There were few richer districts than the region embraced in the various bars and hills on the East Branch of Feather River in Plumas County. On Smith's Bar one company took out \$1,500 a day, and old miners assert that such results were not uncommon. Bishop & Johnson, the first company that worked in Smith's Hill, washed out \$1,000 in gold dust before noon on the first day that they worked. The richest spot on the East Branch was the famous Rich Bar, and among the lucky miners was Barry Van Dike, who took out \$100,000 within a few weeks. He and six others worked a claim at the head of Rich Bar in the summer of 1851. Richard Thompson, a well known merchant, of Spanish Ranch, Plumas County, assures me that this company took out from 5 lbs. to 25 lbs. of gold a day; in other words, from \$1,000 to \$5,000 a day. He saw one pan of gold washed that contained \$5,000, the largest nugget weighing 30 oz.

Stony Bar, opposite Rich Bar, was another spot famous for its gold; this ground was worked by Henry Keep & Co., in 1858, for the third time and yielded \$16,000. A Frenchman obtained on French Ravine, in 1851, 250 lbs. of gold, or as much as his mule could climb the mountain with. John Marcovich, who worked on Rich Bar at a later day than the period already named, told me that on several different occasions he washed from the gravel in his claim \$100 a day and others working near him obtained fully twice this sum to the man. O. P. Powers, who worked in the bed of the river at the lower end of Rich Bar, took out \$1,000 in a single day's work.

The locality known as Rich Gulch, on Soda Creek, in the same county, yielded immense returns. One old miner tells me that he and his companions averaged \$100 a day to the man for many days in succession. A man whose name I was unable to learn is said to have washed out \$500 in a common rocker between 7 o'clock in the morning and 3 o'clock in the afternoon; this would average him a little over \$71 an hour. Another location famous for its gold was Poor Man's Creek, near Onion Valley, in Plumas County. On this stream Wm. Greenleaf washed out \$2,500 in gold dust in one day. B. W. Barnes, of La Porte, states that \$500 per day to the man was not unusual pay in the flush days of California. He says that the shipments of gold from Spanish Flat, Warren Hill, La Porte and Secret Diggings loaded 30 mules per week. He mentions one instance where he met a train of ten mules all loaded with gold, each mule load averaging 125 lbs. In 1857 two miners left La Porte with \$75,000 in gold dust.

Another mining region from which fabulous sums were extracted is that known as Stringtown, on the South Fork of Feather River, in Butte County. Judge C. F. Loft related to the writer the following incident showing how plentiful gold was there: He and three other miners in the fall of 1889 were working at Long's Bar when a friend came to their tent after they had gone to bed. He woke them up and told them he had struck good diggings on the South Fork some miles from where they were then working. They had been making upward of \$100 a day, but he persuaded them to leave there, and on the following morning they shouldered their blankets and mining tools and followed him to the new discovery. About half-past three that afternoon they reached the place where he said he had found good pay. They turned over some rocks in the clay and began searching for gold, and before sundown each had gathered a tin cupful of gold, making for each man between \$300 and \$400.

Nathan Worthing at this same place took out \$1,100 in one day's work. In the spring of 1850 Allen Sherman, an old miner still living at Stringtown, camped on the bank of the stream with eighteen companions. It was during the rainy season, and the miners did not want to work, believing that in the spring they could obtain all the gold they could carry. The following day he dug out \$54, the second day another miner went with him and the two washed out \$162. From that time on these two miners got from \$108 to \$324 a day, but during the winter they could not induce another member of their company to search for gold. In one claim 32 ft. long and 16 ft. wide they extracted 300 oz., or \$5,400. Within a few miles of the same locality W. H. Chappell washed out in eight hours 48½ oz., worth \$868.50, or at the rate of over \$100 an hour. Near the same spot three men named Rockwell, Ross and Waterman, the latter a brother of the late Governor Waterman of California, washed out \$2,300 in a single day. Wymans' Ravine, in Butte County, was one of the spots where miners realized handsome returns from a few hours' work. One man in the winter of 1851 obtained on an average \$100 per day, yet it is said that he did not work over half the time, for each night he gambled off what he made during the few hours that he worked.

Eli Buchard, a resident of Thompson's Flat at the present time, took from where he now lives \$400 in three hours' work. A mining claim on Fargo Ravine, in which he was interested with two partners, yielded him \$3,700 in three months, yet this was considered a poor claim. E. M. Sparks, an experienced miner, told me that in 1851 he passed the claim of John Crawford and partner in Oregon Gulch, Butte County, where they had taken out \$198 before dinner time. Near the same place a mining claim averaged \$270 per day to each of the four owners. It is very probable that such instances of rich gold mines might be recalled in almost every section of the gold mining region of California, but enough has been given to show the fabulous sums that must have been extracted from the mines of this State during the flush period. Now that gold mining is attracting more attention, and as efforts are being made to resume hydraulic mining, such items may be of interest.

Analysis of Banca Tin.—The following is an analysis of metallic tin made from the alluvial or stream tin deposits of the Island of Banca, off the coast of Sumatra, reported by *Iron*: Tin, 99.961%; iron, 00.019%; lead, 00.014%; copper, 00.006%.

Discovery of Salt in Egypt.—*Industries* reports that a discovery of salt, which seems likely to have important consequences, has been made by the officers of the Egyptian Salt Department, 25 miles west of Minieh, a point on the Nile about 150 miles above Cairo. The salt is said to be of good quality, and the deposit to extend over an area of 1,000 acres.

MAGNETIC IRON ORE IN GRANVILLE COUNTY, NORTH CAROLINA.

Written for the Engineering and Mining Journal by H. B. C. Nitz, E. M.

During a recent visit to this part of the State I made a cursory examination of some magnetite deposits which have been but recently brought to light, although their existence has been known to the old settlers for some years past, and can, therefore, hardly be claimed as a new discovery. However, inasmuch as a preliminary investigation induces me to believe that there are workable deposits of good ore here, which will add to the mineral resources, and whose future development will aid in the promotion of the iron industry of North Carolina, I will give a brief description of the geological and other interesting features of these ore beds.

They are situated in the northwestern part of Granville County, in Oak Hill Township, about 14 miles northwest of Oxford, the county seat, $7\frac{1}{2}$ miles west of the Durham & Oxford Railroad, and 6 miles south of the Atlantic & Danville Railroad. Geologically, they occur in the bed of Huronian slates and schists, and consist of a series or succession of lenticular ore bodies, lying conformably between slate walls, striking from 3° to 6° N. E. and S. W., and dipping at very steep angles toward the southeast. The ore is properly speaking a red hematite which is partly magnetic, and with occasional streaks of very pure, coarse crystalline specular ore. It is compact, hard and fine grained. The gangue is mostly quartz and slate. Openings have been made at three points. At Rhodes' store, Seth P. O., opening No. 1 shows $7\frac{1}{2}$ ft. of ore as far as exposed. Its strike is N. 3° E. and dip nearly vertical. Several hundred feet northeast is opening No. 2, in which the ore bed measures 21 ft. in thickness. The following analysis by Dr. F. P. Venable represents an average sample taken from these two openings: Silica, 17.82%; metallic iron, 52.48%; sulphur, 0.096%; phosphorus, 0.097%.

The outcrop has been traced about two miles northeast and two miles southwest from this point. About 1,100 yds. from here an opening, No. III., has been made on the Watkins place, on the waters of Grassy Creek, about 80 ft. above its level. The thickness exposed is about 18 ft. The

THE MINING DISTRICT OF URURO, BOLIVIA.

Written for the Engineering and Mining Journal by Otto F. Pfordte, M. E.

The city of Oruro is situated about 150 miles south-southeast of La Paz, the capital of Bolivia, and is reached from the sea coast by the Molle-do-Arequipa-Puno railway, at which latter place Lake Titicaca is crossed by boat to the Port Chivilaya, a distance of 90 miles. From Chivilaya a stage is taken to La Paz, 40 miles distant, and from there the trip to Oruro is also made by stage, requiring generally three days in passing along the high plateau of Bolivia, in which Oruro also is situated, at an altitude of about 12,500 ft. above sea level.

Oruro is exclusively a mining town, having about 7,000 to 8,000 inhabitants, the majority of whom are natives and employed in the mines, the better classes being the mine-owners, merchants and political officers. The city is situated in a crescent formed by the Oruro Mountains, which lie in the immediate vicinity and mainly toward the west. This mountain chain, in which the mines are located, extends about three and a half miles north and south and is composed chiefly of porphyry and slate, the latter occurring mainly, and reaching its greatest altitude of about 600 to 700 ft., toward the south and southwest. The average height of the hills may be taken at 800 ft., the highest elevation, called Tetilla, reaching perhaps 950 ft. above the level of the plain.

The mineral region is confined to the middle portion of the hills, the northern and southern parts being barren, although considerable prospecting has been done in them at different times, but without favorable results. The district was discovered by the Spaniards about 315 years ago, who founded the city, commenced to extract the ores, and continued mining until a general depth of about 80 to 100 metres below the level of plain had been reached, nearly all the ore above that point having been removed in the main lodes, while small ramifications were neglected. The War of Independence, in 1822, put a stop to all operations, which were not resumed until about 30 years ago, when the clearing of the old works was started very gradually, without showing any very prominent



FIG. 1.—ORURO, BOLIVIA.

strike is N. 6° E., and the dip about 80° S. E. An analysis by Dr. F. P. Venable of an average sample taken from this opening shows: Silica, 19.08%; metallic iron, 54.90%; sulphur, trace; phosphorus, 0.070%.

To either side of this opening the outcrop of slaty micaceous rock is impregnated with small crystals of magnetite, extending over a distance (across the strike) of at least 180 ft., as roughly stepped off. The float ore is very heavy in spots over the Watkins place, and large masses of very fine ore have been piled up, to clear the land for cultivation. About 100 ft. south of the Watkins opening a small blast has exposed the gray micaceous schist containing small crystals of magnetite, and coated or stained in places by malachite. This a very suggestive fact, and whether or not these iron ore deposits bear any relation to deposits of copper in depth (as is the case in some of the Maryland copper mines) is worthy of investigation. As far as present explorations have gone it is impossible to make any estimate of the probable amount of ore available in mining operations, though it may be said that the probability of finding large deposits of workable ore are very encouraging.

Wood Pavements in Paris.—In an article on this subject contributed to the *Revue Pratique des Travaux Publics* by M. Brown Vibert, the author remarks that, to insure durability, this class of pavement must be laid with considerable care. The concrete foundation should be 6 in. thick, and made with 300 lbs. to 400s lb. of Portland cement to a mixture of 9 cu. ft. of sand and 27 cu. ft. of gravel. As soon as it has set the concrete should be covered over with a $\frac{1}{4}$ -in. layer of mortar, consisting of 660 lbs. of Portland cement to every 35 cu. ft. of sand, and left to harden two or three days. The blocks should then be set in rows, separated from each other by a space $\frac{1}{4}$ in. wide. These cracks are filled with cement mortar, and a layer of broken porphyritic stone $1\frac{1}{2}$ in. thick, spread over the pavement. This layer is soon driven into the wood by the action of the wheels. Provision must be made for the expansion of the wood, and, for this reason, in wide roadways, a space about 2 in. wide is left open along the sidewalk and afterward filled with sand. In a roadway 131 ft. wide an expansion of no less than 16 in. was observed to take place in 15 days, the blocks being very dry. In Paris these blocks are 6 in. high, 3 in. thick and $8\frac{1}{2}$ in. long. The cost as laid is about \$2.37 $\frac{1}{2}$ per sq. yd. for Landes pine, and \$3.50 per sq. yd. for northern spruce blocks. The duration is said to be about seven or eight years under heavy traffic, and about fifteen under moderate.

results, until about 10 or 15 years later, when the prospects became quite good, and the prosperity of the district was again assured. The mines which were first reopened, however, have by this time passed their best days, and though they still continue to produce ore, there is nothing like the output of 10 to 15 years ago.

There are two general systems of veins in the district, called the north-south and east-west systems, from their general direction. The former has generally a porphyritic gangue, with narrow streaks of rich gray copper, while in the latter the vein matter consists of iron pyrites, with streaks or spots of gray copper, which sometimes fill almost the entire vein from wall to wall. Neither system is very prominent over the other in size or quality of the ore. The dip of the veins varies from nearly vertical to 60° N. The ores, down to about 30 metres below the surface, are oxidized, and below that they are sulphide ores in the form of gray copper, iron pyrites and antimony sulphide. Frequently gray tin oxide is found down at a considerable depth, and the iron pyrites sometimes contains as much as 15% of tin, which is most abundant nearer the surface.

At the present time only four mines are in operation, viz., San José, El Socabon de la Virgen, which are on the eastern slope of the ridge, and Atocha and Itos, which are on the western slope. Near the latter is also the mine Santo Cristo, which was in operation up to a short time ago. Besides these there are a number of smaller mines and mining claims, which, however, have no importance, and in many instances have been absorbed by the larger companies. San José is situated about $1\frac{1}{2}$ miles north of Oruro and is the deepest mine in the entire district, being opened to a depth of 300 metres; the old Spaniards having gone down about 110 metres, while the remainder is modern work. At present two shafts extend down to the 250-metre level, from where a small auxiliary shaft has been sunk 50 metres further for exploration only. A third shaft for a steam hoist is probably completed to the 250-metre level by this time. The tunnel is but about 40 metres below the hoisting engine and but little above the surrounding plain. The water is raised from the mine in large leather buckets by a steam hoist, at the rate of about 100 cu. m. per day.

The two classes of veins, above described, are seen in this mine, the veins with the porphyritic gangue having slate wall rock, interchanging material, however, on descending, so that the same lode further down has slate gangue and porphyry walls. The ore in both veins occurs in the form of thin seams of gray copper, varying from 2 mm. to 20 and

even 30 mm. in thickness, the pure ore assaying up to 2,400 oz. silver per ton. The pyritic lodes are from 2 m. to 3 m. wide, carrying spots of gray copper of a somewhat lower grade, which in some places fills the entire vein, porphyry being the wall rock of the same. At the intersection of two lodes one of them generally changes its direction, though sometimes both may do so.

In the mine the ore is roughly separated into three classes, viz., pure shipping ore, mixed shipping and amalgamating ore, while the third class also contains gangue in addition to the last two constituents. The fines, called *llampu go* to the jigs, which are worked by hand. Their production is about one ton per month of 440 oz. material. The average monthly product of the mine is about 22 to 23 tons of shipping ore, assaying 800 oz. silver per ton, and 225 to 250 tons of amalgamating ore, running from 120 to 150 oz. per ton.

El Socabon de la Virgen is another of the important mines. It has a tunnel 500 metres long, with its direction S. 70° E., at the level of the town or plain, the mouth of the tunnel being situated at the western part of the town. At 500 metres from the mouth the hoisting engine, having its boilers at the mouth, is located, and the tunnel continued some 60 to 80 metres further for exploration work. All above the tunnel level, and down to about 60 metres below are old works, but from there downward the modern work has been done, extending to the 175-metre level, with galleries every 25 metres apart. The extreme length of the galleries is 320 metres N. W. and 160 metres S. E.; in the latter end the rock changes to slate and the lode is lost. The lode has an average width of two metres, and its strike is about N. 45° W., with a dip of 70° N. near the top, which, however, decreases in depth to 55° N., so that the hoisting shaft leaves the vein and cross-cuts have to be driven for communication. The ore generally consists of very low grade pyrites, with spots and pockets of gray copper, called *cochizo*, which in rich spots may assay up to 750 oz. silver per ton, though the general product, which includes about 40% of the total vein matter, assays from 150 oz. to 180 oz., and is all sent to the amalgamating establishment at Machicamarca, 18 miles from Oruro. The water from the lowest portion of the mine is raised by a winze to the 150-m. level. This winze is worked by 10 men, raising about 6,000 litres per hour, which are then pumped to the surface. Most of the modern work in this mine has been done under the able management of Señor Carlos G. Avalos, a Chilean mining engineer, who took charge of it about five years ago, and has since then improved the value of the property by the purchase of conflicting claims and an increased production and development. A vertical hoisting shaft from the surface lacks but a short distance of its completion to the 80-metre level.

In the Itos mine, which is situated on the western slope of the hill and has recently been acquired by the Socabon company, there is one vertical shaft near the end of a 150-m. tunnel and another but 30 m. beyond the former, having depths of 190 m. and 220 m. respectively, the latter reaching the lowest works in the mine. The old works extend down to about 50-60 m. below the tunnel level and include an old tunnel 530 m. long, which is rarely used at present. There are three or four lodes seen at the tunnel level, which have in the past produced large quantities of ore. The lodes are not so well formed nor as wide as those of the other two mines mentioned; in fact at present the veins are rarely 50 m. wide. The veins in this mine are very scattering, especially in the slate region, whereby exploration is made very expensive and unsatisfactory. There are said to be 200 workers in and about the mine, and the following, apparently very much exaggerated figures, were given as the weekly production of the mine: 60 tons amalgamating ore assaying 164 to 180 oz., and 7½ tons shipping ore assaying from 450 to 600 oz. The ore in this mine contains much antimony sulphide, running low in silver.

The Atocha mine, situated just above Itos, has been a very heavy producer, and is said to have been more extensively explored than any other mine in the district, and judging by the plans of the mine, which were seen by the writer, this statement seems very probable. At present the production has fallen off, though some work is still going on.

The mine Santo Cristo, just below the Itos, has been the smallest of these three mines, but work is stopped entirely at present and may not be resumed.

The amalgamating works, of which there are several, one for each of the principal mines, are generally situated at a distance of 12 to 20 miles from Oruro across an almost level plain. During the wet season the roads are very bad and sometimes impassable, so that the greater portion of the milling ore is transported in the dry season. The power utilized generally is that of water applied to large overshot wheels of 25 to 35 ft. diameter. At one of the mills, Obrajes, there are hot springs, the water from which is utilized in the works.

The amalgamating ore is crushed by stamps so as to pass through a 40-mesh screen, it is then roasted with salt, iron pyrites requiring 25% and other ores 16% - 17%. The charge, consisting of 2,500 lbs. of roasted ore, is then placed in copper lined vats, with a rotating copper stirrer in shape of a cross. After the first half hour a small quantity of salt and 45 lbs. to 60 lbs. quicksilver are added and then 5 lbs. every half hour until the end of the fourth hour, when a final quantity of 10 lbs. to 15 lbs. is charged. The temperature is kept at 70° C. These pans have no settlers and when amalgamation is completed water is added, the spouts opened and tailings discharged gradually. The diluted amalgam goes to a clean-up pan, after which it is filtered, pressed into cakes and distilled by means of a cylindrical iron hood, placed vertically, the lower open end of which extends into a tank filled with water for collecting the mercury.

The amalgam generally contains about 17% of silver. The losses of silver in roasting and amalgamation are very high. The cost of labor in Oruro is about as follows, in the currency of the country: 1 boliviano = \$0.65 U.S. currency; miners, *bols.* 1.40 per day, carriers, 1.00 to 1.20; boys, .60 to .80; first mines boss *bols.* 12. per week; second mine boss, 1.60 per day. On the surface, where many Indian women are employed, the following wages are paid: Best women, *bols.* .50 per day, others, .20 to .40; men, *bols.* 1.20; first overseer, *bols.* 15. per week; second overseer, 10. per week. These wages vary; in the Socabon they are somewhat higher than the figures given.

Of other materials, salt, which is gathered on the plains, costs *bols.* 2 per 100 lbs.; *taquia*, the dung of llamas, which is utilized for fuel, costs .60 per 100 lbs., and *yareta*, a resinous moss also used for fuel, is .40 to .50 per 100 lbs.; charcoal costs *bols.* 5.00 per 100 lbs., and English coke would cost *bols.* 255.00 per ton, though when the Antofagasta & Bolivia Railway

reaches Oruro it will be but *bols.* 80.00 per ton. Freight from Oruro to the coast at Arica at present is *bols.* 4.25 per 100 lbs., and from there to England *bols.* 40.00 per 2,240 lbs. The arrival of the railroad now in construction will be of great benefit to the entire district.

In the accompanying illustrations Fig. 1 represents the greater portion of Oruro with part of the surrounding hills. At P, north of the city, is the pass to the mine San José, and at S the buildings and tunnel entrance of El Socabon de la Virgen are situated. Fig. 2 shows the large overshot water-wheel used at Piloca, the mill of Atocha, in Sepulturas, 6 miles from Oruro. A frue vanner and wooden stamps will also be observed on this plate.

TUNGSTEN.

Written for the Engineering and Mining Journal by T. A. Rickard, M. E., F. G. S.

In the ENGINEERING AND MINING JOURNAL of April 9th there was an editorial note referring to the use of tungsten in the manufacture of steel and the present limited supply of wolfram—the chief ore of the metal. Tungsten is used for the purpose of toughening the steel, by Krupp, for instance, in the making of heavy ordnance. The following notes regarding the occurrence of another ore of the metal—scheelite—may be of interest.

Scheelite is tungstate of lime—CaO WO₃. In Otago, in the south island of New Zealand, it has been found in workable quantities, but the want of a regular market has prevented the development of the industry. Scheelite occurs irregularly distributed among the quartz folia of the quartzose schists, which are the characteristic rocks of the gold fields of Otago. On washing a pan of gravel there is always to be seen, mixed with the gold and black sand, a dull, white mineral; so also in testing a "dish" full of lode matter there will be found among the residuum of pyrites and gold a large percentage of the same heavy substance. In both instances the mineral is scheelite.

From Waipori parcels of scheelite have been sent at intervals to England, but at Glenarchy, at the head of Lake Wakatipu, there is a mine of some importance. A quartz lode of varying width (3 ft. to 4 ft.) traverses the metamorphic slates, cutting across them both in dip and strike. The lode is very similar to an ordinary gold quartz lode; it is indeed slightly auriferous, but is chiefly remarkable for the occurrence in it of large bodies of scheelite. The latter appears to be a segregation in the quartz lode. Large blocks of the mineral are to be seen, easily distinguished from the quartz by its dull lustre and somewhat yellow color. In the lode itself the scheelite becomes mixed with the quartz, though showing a tendency to keep to the hanging or upper wall; but there are small (1½-in.) veins in the inclosing country, which are parallel to the main lode, and which are nearly pure scheelite.

This mine, worked by adits driven into the steep hillside, was at one time in active operation, as is evidenced by the remains of a concentrating plant to be seen immediately below. The writer was informed that several large shipments were made to Europe, but that the proprietors soon spoiled their market by careless concentration and the shipment of very inferior stuff. The plant, without a shed to protect it, is now practically ruined.

This is not the only important deposit of the mineral in that country, for the writer has seen very fine samples which came from Nelson, at the northern end of the same island. In the Abercrombie ranges, New South Wales, there are also deposits of scheelite.

Production of Pig Iron in France in 1891.—A bulletin of the British Iron Trade Association gives the production of pig iron in France in 1891 as 1,919,185 metric tons, a decrease of only 2¼%.

Imitative Forms in Rocks.—There is a universal tendency to seek and sometimes to see in the forms of objects around us representations of the human figure or of animals and plants, says M. Stanislas Meunier in *Popular Science Monthly* for May. Many interesting examples have been recorded and pictured in *La Nature* of rocks and mountains presenting resemblances to animated forms. We are quite ready to discern in the clouds all sort of personages; and at periods when superstition has been active, apparitions have been described, the whole existence of which consisted of misinterpreted simple resemblances. Stones have usually been considered especially worthy of attention in this category; in tubercles of sandstone and nodules of flint it is easy to find features analogous with the most various objects. A block of sandstone is exhibited in the forest of Fontainebleau on which one willing to see it may recognize a petrified knight on his horse, all of the natural size. A nodule of sandstone was once brought to me in the geological laboratory of the museum, on which the owner saw the portrait of our Lord on the cross. Some persons are specially ingenious in finding resemblances in flints; and Boucher de Perthes admitted into his Atlas of Celtic and Antediluvian Antiquities a whole series of figures of imitative forms of that mineral.

Why we Should Teach Geology.—Geology in its broadest scope should be taught in our schools and colleges, and for at least twelve good reasons, says Prof. A. S. Packard in *Popular Science Monthly* for May. At the outset we would claim that it holds equal rank with astronomy or biology. The former science tells us of the existence of other worlds than ours and gives us some conception of the immensity of space. The study of plants and animals carries an impressive lesson as to the unity prevailing amid all the diversity of Nature, besides affording the hope that we may at some time discover the origin of life, since it has already opened the way to an explanation of the origin of the existing forms of life; while the grand outcome of geological study is that it brings vividly before the mind the immensity of time, enabling us to realize that time is only less than eternity. It also teaches us that our earth has had a history, that our own race has had a high antiquity; and thus the contemplation of past geological ages, reckoned by millions of years, the fact that our earth is coeval with the sun in age—all these considerations tend to immeasurably expand our mental horizon, and thus to react in a way to broaden the mind. Geology is also the complement of biology. As soon as one has mastered the rudiments of botany and zoology, and of the distribution of life forms in space, the range of his thoughts should be extended to take in the orderly succession of life in past ages, and the evolution of modern specialized plants and animals from the earlier, generalized types.

DECISION OF THE SUPREME COURT IN THE SOUTH CAROLINA PHOSPHATE CASE.

Coosaw Mining Company vs. State of South Carolina.

This decision was rendered on April 4th, 1892. Mr. Justice Harlan delivered the opinion of the Court, as follows:

This suit was brought by the appellees, March 23d, 1891, in one of the courts of South Carolina, and, subsequently, on the petition of the appellant, the defendant below, was removed into the Circuit Court of the United States. 45 Fed. Rep., 804. Its object was to obtain a decree enjoining the Coosaw Mining Company, its servants, agents and employes from claiming any right, title, interest or grant in or to the phosphate rock and phosphatic deposits in Coosaw River in that State; from digging, mining or removing such rock and deposits in the bed of that river, and from obstructing by suit or otherwise any agent or other person acting by authority of the State Board of Phosphate Commissioners from digging, mining and removing the same.

The appellant claimed, in its answer, to have a contract with the State by which it acquired an exclusive right, for an indefinite period, to occupy, dig, mine and remove such rocks and deposits in Coosaw River, and that, in violation of the Constitution of the United States, the obligation of its contract had been impaired by a subsequent act of the legislature.

The decree below, rendered September 16th, 1891—the Chief Justice and Judge Simonton concurring—proceeded upon the ground that the appellant did have, at one time, and for a limited period, a contract with the State, of the kind mentioned, but that such period had expired before

appellant's claim of an exclusive right, for an indefinite period, to dig, mine and remove phosphate rocks and phosphatic deposits in that part of Coosaw River which it occupies. Its provisions are, therefore, given in full as follows:

"Whereas differences have arisen between the Coosaw Mining Company and the comptroller-general as to the times and manner in which the said company shall make their returns of the number of tons of phosphate rocks and phosphatic deposits dug, mined and removed by them from the beds of the navigable streams and waters of the State, and also as to the times when the royalty thereon shall be paid; therefore, for remedy thereof.

"SEC. 1. *Be it enacted, etc.*, That the said Coosaw Mining Company and all other companies and persons engaged in digging, mining and removing phosphate rocks and phosphatic deposits from the bed of the navigable streams and waters of the State shall be, and they are hereby, required, from and after the passage of this act, to make to the comptroller-general true and faithful returns of the number of tons of phosphate rocks and phosphatic deposits they have so dug, mined and removed and shipped, or otherwise sent to market, at the end of every month; and shall punctually pay to the State treasurer the royalty already provided by law to be paid thereon at the end of every quarter or three months, the first quarter to commence to run on the first day of March in the present year.

"SEC. 2. That the said Coosaw Mining Company, and all other companies and persons mentioned in the preceding section, shall, within 10 days from the passage of this act, enter into new bonds, in the penal sums and in the manner and form already provided by law, but conforming, in their conditions, to the terms set forth in the said preceding section, and

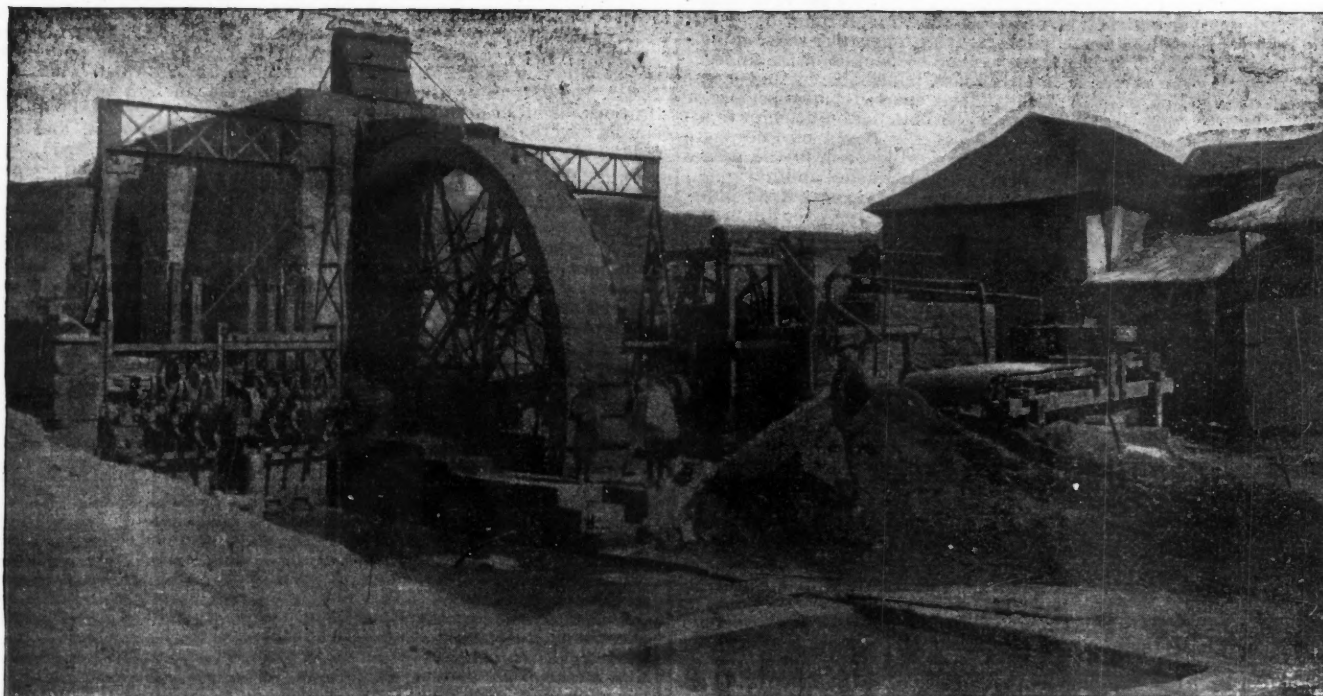


FIG. 2.—STAMP MILL AT PILOCA, NEAR ORURO, BOLIVIA.

the institution of this suit. *State v. Coosaw Min. Co.*, 47 Fed. Rep., 225. The relief asked was, therefore, granted.

The principal question to be considered depends upon certain legislative enactments relating to phosphate rocks and phosphatic deposits in the navigable waters of South Carolina. It is necessary to ascertain the scope of those enactments.

By an act which took effect March 1st, 1870, the State granted to certain named persons and their associates the right, for the full term of twenty-one years, to dig, mine and remove phosphate rocks and phosphatic deposits from the beds of the navigable streams and waters within the jurisdiction of the State of South Carolina. This grant was made upon the express condition that the grantees pay the State \$1 per ton for every ton of phosphate rock and phosphatic deposits so dug, mined and removed, and \$500 as a license fee before commencing business under the grant.

The act further provided that before commencing operations under authority of the act, the grantees and their associates, should file, or cause to be filed, in the office of the State auditor, a bond in the sum of \$50,000, conditioned that they would make true and faithful returns to that officer annually, on or before the first day of October, and oftener, if required, of the number of tons of phosphate rocks and phosphatic deposits dug, mined and removed by them, and punctually pay to the State treasurer, annually, on the first day of October, \$1 per ton for every ton of rocks and deposits by them so dug, mined and removed during the year preceding, such bond to be renewed annually and approved by the attorney-general. 14 Gen. Stat. S. C., p. 381.

The Coosaw Mining Company, it is admitted, succeeded to all the rights given by this act.

On March 28th, 1876, another act was passed entitled "An Act to settle definitely the period at which returns shall be made of phosphate rocks and phosphatic deposits dug and mined in the beds of the navigable streams and waters of the State of South Carolina and the royalty shall be paid thereon, and also to fix the terms on which this act may be accepted by the parties named therein." This act is the foundation of the

also pay to the State treasurer the royalty accrued up to the said first day of March of the present year. And whereas it is desirable that the said Coosaw Mining Company, and all other companies and persons engaged in digging, mining and removing phosphate rock and phosphatic deposits as aforesaid, shall accept the terms of this act, in order to make it binding on them respectively; and whereas the said Coosaw Mining Company have already occupied so much of the Coosaw River as lies opposite to and south of Chisolm's Island, whereon their works are located, and to the marshes thereof, and have expended large sums of money in establishing themselves thereon with sufficient mining plant for mining and preparing for market the phosphate rocks and phosphatic deposits of that part of the said Coosaw River; therefore, in consideration thereof.

"SEC. 3. That the said Coosaw Mining Company, on accepting the terms of this act within ten days from the passage thereof, shall thenceforth have the exclusive right to occupy and dig, mine and remove phosphate rock and phosphatic deposits from all that part of the Coosaw River above mentioned so long as and no longer than they shall make true and faithful returns of the number of tons thereof they shall so dig, mine and remove, and ship or otherwise send to market, and punctually pay the royalty thereon, as provided in the first section of this act.

"SEC. 4. That all other companies and persons engaged in digging, mining and removing phosphate rocks and phosphatic deposits as aforesaid under gift and grant of the State of South Carolina, or by authority thereof, who shall accept the terms of this act within ten days from the passage thereof, shall thenceforth have the same exclusive right where they have respectively occupied and established themselves for mining purposes, and on the same limitations as are prescribed in the preceding section of this act.

"SEC. 5. That all acts and parts of acts inconsistent with this act be, and they are hereby, for the purpose of this act, repealed." *Acts of S. C.*, 1875-6, p. 198.

The appellant accepted the terms of that act, and thereby, it is contended, acquired the exclusive right in question. The act which is supposed to have impaired the obligation of its contract with the State was

that of December 23d, 1890, creating a Board of Phosphate Commissioners, consisting of the governor, attorney-general, comptroller-general, and two individual citizens, charged with the exclusive control and protection of the rights and interest of the State in the phosphate rocks and phosphatic deposits in its navigable streams and marshes. The latter act empowered the Board—if, upon full investigation and examination, they deemed it advisable—to require all persons or corporations digging or mining phosphate rock or phosphatic deposits in the navigable streams and marshes of the State, to pay a royalty not to exceed \$2 per ton for all or any phosphate rock so dug or mines, six months' notice being given before raising the royalty above \$1.

It, also, authorized and directed the board after the first day of March, 1891, "to take possession and control of the Coosaw River phosphate territory heretofore occupied by the Coosaw Mining Company," and to issue licenses to mine and to remove therefrom phosphate rock and phosphatic deposits, in like manner as was then provided by law for the other navigable streams and waters of the State; each ton of phosphate rock or phosphatic deposits, the product of such mining operations, to be deemed the property of the State until the said parties paid thereon a royalty, to be fixed by the board, at not exceeding two dollars per ton on each ton of phosphate rock or phosphatic deposits dug, mined and removed, and six months' notice to be given before raising the royalty above one dollar.

It was further provided that if any person interfered with, obstructed, molested, or attempted to interfere with, obstruct, or molest, the Board, or any one by them authorized or licensed, in the peaceable possession and occupation for mining purposes of any of the marshes and navigable streams and waters of the State, it was authorized, in the name and on behalf of the State of South Carolina, "to take such measures or proceedings as they may be advised are proper to enjoin and terminate any such molestation, interference or obstruction, and place the State, through its agents, the said Board of Phosphate Commissioners, or any one under them authorized, in absolute and practicable possession and occupation of the same."

Other sections of the act made it an offense, punishable by fine or imprisonment or both, at the discretion of the court, for any person or persons to willfully interfere with, molest, or obstruct, or attempt to interfere with, molest, or obstruct, the State or the Board of Phosphate Commissioners, or any one by them authorized or licensed, in the peaceable possession and occupation of any of the said marshes and navigable streams and waters of the State, "including the said Coosaw River phosphate territory," or who shall dig or mine, or attempt to dig or mine, any of the phosphate rock or phosphatic deposits of this State without a license so to do by the Board. The Board were authorized and empowered to inquire into and protect the interests of the State in and to any phosphate deposits or mines, whether in the navigable waters of the State or in land marshes or other territory owned or claimed by other parties, and in the proceeds of any such mines, and to take such action for or in behalf of the State in regard thereto as they might find necessary or deem proper. All acts or parts of acts inconsistent with the provisions of the act of 1890 were repealed. *Acts of S. C. 1890, p. 691.*

The Coosaw Mining Company undoubtedly acquired by the act of 1870, and upon the conditions therein prescribed the right for the full term of 21 years to dig, mine and remove phosphate rocks and phosphatic deposits in the navigable waters of South Carolina. But the right thus acquired was not made an exclusive one. The State was at liberty, so far as that act was concerned, to grant similar rights to other associations or persons. This is not disputed.

Did the appellant, by its acceptance of the act of 1876, acquire an exclusive right with respect to that part of Coosaw River then occupied for the purposes of its business? If this question be answered in the affirmative—as, in view of the express language of the act, it must be—the State is, nevertheless, entitled to a decree upon the issue as to the impairment of the obligation of the alleged contract, unless it be held that that act gave an exclusive right to the Coosaw Mining Company, *in perpetuity* conditioned only upon its meeting the terms prescribed by the third section, namely, that it would make true and faithful returns of the number of tons of phosphate rock and phosphatic deposits dug, mined, removed, shipped or otherwise sent to market, and pay the royalty as provided for in the first section of that act. It cannot be denied that the third section, if it be construed literally and without reference to other sections or to the act of 1870, will bear this interpretation. But the act of 1876, if interpreted as it ought to be, in connection with that of 1870, will, to say the least, bear equally another construction, namely, that the right granted by the original act for the term of twenty-one years, was made, by the act of 1876, exclusive, *only during the remainder of that term*, as to the part of Coosaw River occupied by the appellant's works, "so long as and no longer than" it made the returns and paid the royalty prescribed by the latter act. Under the latter construction, the right of the appellant, by the acts of 1870 and 1876, to dig, mine, and remove phosphate rocks and phosphatic deposits in the navigable waters of the State, ceased altogether after the expiration of 21 years from March 1st, 1870. If the act of 1876 materially altered that of 1870 in respect to the times and manner of making returns, or the royalty to be paid, the Coosaw Mining Company received in consideration therefor what it did not previously have, that is, an exclusive right for a limited period in the particular part of Coosaw River which it occupied when the act of 1876 was passed.

If the act of 1876 is fairly susceptible of either of the constructions we have indicated, as we think it is, the interpretation must be adopted which is most favorable to the State. The doctrine is firmly established that only that which is granted in clear and explicit terms passes by a grant of property, franchises, or privileges in which the government or the public has an interest. *Rice v. Railroad Company*, 1 Black, 358, 380; *Fertilizing Co. v. Hyde Park*, 97 U. S. 666; *Hannibal R. R. Co. v. Packet Co.*, 125 U. S. 271; *Central Transportation Co. v. Pullman's Car Co.*, 139 U. S. 24, 49; *Stein v. Bienville Water Supply Co.*, 141 U. S. 67, 80; *State v. Pacific Guano Co.*, 22 S. C., 50, 83, 86. Statutory grants, of that character, are to be construed strictly in favor of the public, and whatever is not unequivocally granted is withheld; nothing passes by mere implication. *Holyoke Co. v. Lyman*, 16 Wall., 666; *The Binghamton*, 3 Wall., 51, 75. This principle, it has been said, "is a wise one, as it serves to defeat any purpose concealed by the skillful use of terms to accomplish something not apparent on the face of the act, and thus sanctions only open dealings with legislative bodies." *Slidell v. Grandjean*, 111 U. S. 412, 438.

The wisdom of the rule adverted to is well illustrated by the present case. Neither the title nor the preamble of the act of 1876 suggests the purpose on the part of the Coosaw Mining Company, or of any other association or corporation, to obtain, or the intention of the legislature to grant, a new right to dig, mine and remove phosphate rocks and phosphatic deposits, much less a grant of such a right in perpetuity. The title discloses only a purpose to settle definitely the time for making returns of rocks and deposits so dug, mined and removed, to establish the royalty to be paid, and to fix the terms on which the act might be accepted by the parties named in it. If the parties, so named, had in mind to acquire a grant for an indefinite period, their purpose was concealed under the general words in the title, "and also to fix the terms on which this act may be accepted by the parties named therein." Turning to the preamble, which has been said to be a key to open the understanding of a statute, we find that the occasion of the passage of the act of 1876 was a dispute between the Coosaw Mining Company and the Comptroller-General of the State, not as to the right of that company to dig, mine and remove phosphate rock and phosphatic deposits, but only as to the times and manner in which it should make its returns and pay the prescribed royalty; and that "for remedy thereof" the act was passed. Neither the title nor the preamble indicates a purpose to enlarge the right given by the act of 1870 for 21 years to one for an indefinite period.

While express provisions in the body of an act cannot be controlled or restrained by the title or preamble, the latter may be referred to when ascertaining the meaning of a statute which is susceptible of different constructions. In *United States v. Fisher*, 2 Cranch, 358, 386, Chief Justice Marshall said: "Neither party contends that the title of an act can control plain words in the body of the statute; and neither denies that, taken with other parts, it may assist in removing ambiguities. Where the intent is plain nothing is left to construction. Where the mind labors to discover the design of the legislature it seizes everything from which aid can be derived; and in such case the title claims a degree of notice, and will have its due share of consideration." *United States v. Palmer*, 3 Wheat, 610, 631. This rule is especially applicable in States whose constitutions, like that of South Carolina, provide that "every act or resolution, having the force of law, shall relate to but one subject, and that shall be expressed in the title." *Meyer v. Car Co.*, 102 U. S., 1, 11, 12.

So, in *Beard v. Rowan*, 9 Pet., 301, 317: "The preamble in the act may be resorted to, to aid in the construction of the enacting clause, when any ambiguity exists." The ambiguity here referred to is not simply that arising from the meaning of particular words, but such as may arise, in respect to the general scope and meaning of a statute, when all of its provisions are examined. Interpreting the act of 1876, with such aid as may be properly derived from its title and preamble, we are of opinion that the legislature did not intend to grant the appellant an exclusive right, for an indefinite period, but only an exclusive right, during the balance of the term of 21 years fixed by the act of 1870; and not even an exclusive right for that period except upon the performance of the conditions set forth in the act of 1876 as to making returns and paying the prescribed royalty.

It results that the contention of the State must be sustained, whether we apply the rule requiring public grants to be favorably construed for the government, or whether, independently of that rule, we give effect to the intention of the Legislature as disclosed by the words of the statute.

It is contended by the appellant that this case is not one of which a court of the United States, sitting in equity, could take cognizance. In meeting this question, the counsel for the State have placed some reliance upon the provisions in the act of 1890 authorizing the Board of Phosphate Commissioners, in the name and on behalf of the State, "to take such measures or proceedings, as they may be advised are proper, to enjoin and terminate" any molestation, interference or obstruction of the peaceable possession and occupation for mining purposes of the navigable streams of the State, either by the board, or by any one licensed or authorized by it, and to take such action, for and in behalf of the State, as they deem proper for the protection of its interests. This statute is not important here except as showing the authority of that board to bring suits, in the name of or for the State, to protect its interests. The suit may have been cognizable in the State court, sitting in equity. But if it was not one of which the Circuit Court of the United States, sitting in equity, could properly take cognizance (*Payne v. Hook*, 7 Wall. 425, 430; *Arrowsmith v. Gleason*, 129 U. S., 86, 98) the pleadings, upon removal of the case from the State court, should have been reformed so as to make it a case to be tried at law. It is necessary, therefore, to inquire whether, according to the principles of equity, as recognized in the courts of the United States, the State can obtain relief by a suit in equity.

[Judge Harlan then cites numerous precedents and concludes as follows.—Ed.]

These principles are applicable to the present case. The remedy at law for the protection of the State in respect to the phosphate rocks and phosphatic deposits in the beds of its navigable waters is not so efficacious or complete as a perpetual injunction against interference with its rights by digging, mining and removing such rocks and deposits without its consent.

The Coosaw Mining Company, unless restrained, will not only appropriate to its use property held in trust for the public, but will prevent the proper administration of that trust for an indefinite period by obstructing others, acting under lawful authority, from enjoying rights in respect to that property derived from the State.

These conflicting claims cannot be so effectively, or conclusively settled by proceedings at law, as by a comprehensive decree covering all the matters in controversy. Proceedings at law, or by indictment, can only reach past or present wrongs done by the appellant, and will not adequately protect the public interests in the future. What the public are entitled to have is security for all time against illegal interference with the control by the State of the digging, mining and removing of phosphate rock and phosphatic deposits in the bed of Coosaw River, such security was given by the decree below. *Decree affirmed.*

Irrigation in Egypt.—At the date of a recent official report, according to *Engineering*, Egypt had 565,744 acres of irrigated land under cultivation, or about 8,840 square miles. The irrigated lands extend along the Nile for a distance of 535 miles. The revenue derived by the Egyptian government in 1890 from water tax and rented lands was £5,084,547. The population of the irrigated districts is returned as 5,879,431.

THE CONDITION OF GOLD IN PYRITE.

Written for the Engineering and Mining Journal, by Albert Williams, M. E.

Treatises on ore deposits frequently refer to the occurrence of gold in the form of a natural sulphide as possible and probable. Theoretically, and apart from actual demonstration, the argument in favor of such an assumed occurrence follows along two distinct lines of observation. In the first place there is the common and well-recognized transition of the surface oxidized ores to the sulphide state below water level, a feature of such wide and general occurrence that both the projects of mining and metallurgy and the theories of ore deposition are largely affected by it. Miners who have free or easily reducible ores at the surface count on striking sulphide ores in depth, and, if prudent, lay their plans accordingly. The most accepted theories as to the origin of ores, whether by ascending solutions, lateral secretion, segregation, infiltration or molecular substitution, assume the existence of sulphide combinations as, if not the original condition, at least the proximate first stage of most ores at the time of deposition, such theories being fortified partly by observed modes of occurrence and partly by the chemical fact that solutions of the alkaline sulphides (in the laboratory and in nature) are solvents for sulphides of the heavy metals, the successive steps of solution from whatever may have been the true original source, transfer and precipitation as ore being thus pretty fairly accounted for.

In the second place, the behavior of auriferous ores in the amalgamation process sometimes points to the condition of the gold which is not satisfactorily explained by calling it "rusty," that is, coated with a film of iron oxide, etc., or assuming it to be protected by particles of silica, which, by repulsion, prevent contact of the metal with quicksilver to a degree admitting of perfect amalgamation. For, if either of these suppositions covered all cases, then by fine crushing and the use of a grinding pan it would be possible to get all the gold in a clean bright state favorable to amalgamation. Some authorities, it is true, describe artificial gold sulphide as being so unstable that it is decomposed by mere attrition. But it is known, as a matter of fact, that, making all reasonable allowance for misplaced blame upon rusty gold which is put forward to excuse poor milling practice, there is really foundation for the belief that gold often does occur in a state which resists amalgamation, even with the best mechanical appliances.

While the theory of the existence of a gold sulphide meets with no objections, and is assumed as a convenient working hypothesis, to establish it by positive proof is another and by no means an easy matter. A sulphide ore (pyrite, arsenopyrite, chalcopyrite, marcasite, blende, galena, etc., a mixture of two or more of these, or of silver sulphides, perhaps in connection with arsenides, antimonides or tellurides) which carries 10 oz. to 20 oz. gold per ton, would be of exceptionally high grade. The bulk of the auriferous sulphuret concentrates does not run higher than one or two ounces per ton. And since of this gold a large part, nearly all or the whole, may be in the metallic state, laboratory experiments become very difficult and their results uncertain, owing to the small percentage of gold (whether native or as sulphide) available to work upon. The same difficulty was met with in determining gold tellurides. If an auriferous pyrite ore is crushed and, without roasting, is panned or horned, a portion of the gold contents (as determined by fire assay) may be recovered, the gold being in various degrees of comminution down to a fineness which may escape the most careful panning. Such a pyrite, examined under the microscope, sometimes shows minute films and flakes of gold lying along the cleavage planes as though squeezed out in the process of crystallizing, or in particles in the mass of crystals. Most of the gold-bearing pyrite does not occur in large blocky crystals, but finely disseminated through the quartz, spar or other gangue, and hence does not lend itself ready to observation.

Some sixteen years ago Mr. W. C. Wynkoop detected what he believed to be a natural sulphide of gold in copper pyrite from the Stoughton mine, Ward District, Boulder County, Colo. This ore was not amalgamable raw, showed no gold nor any signs of an unknown mineral under the microscope, but on treating with ammonium sulphide gave a filtrate containing gold. From time to time experiments have been made by many persons to test the existence of this supposed natural gold sulphide, yet is it doubtful whether the recorded observations have established the fact of its occurrence so satisfactorily as to meet with general acceptance. Recently, however, certain investigations have been described in the ENGINEERING AND MINING JOURNAL (December 19th, 1891), by Mr. T. W. T. Atherton, of the Nambucca Heads Gold Mining Company, of Deep Creek, New South Wales, which seem to be conclusive, if any doubt remains. Mr. Atherton, premising that the existence of gold in the form of a natural sulphide in conjunction with pyrites has often been advocated theoretically as a possible occurrence, claims that up to the present time, as he believes, this occurrence has not been established as an actual fact, and that during his investigations on the ores of the Deep Creek mines he has found in them the long sought gold sulphide. It is aside from the present purpose to discuss the question of priority of discovery here. A description of Mr. Atherton's experiments will be found in the issue of the ENGINEERING AND MINING JOURNAL referred to.

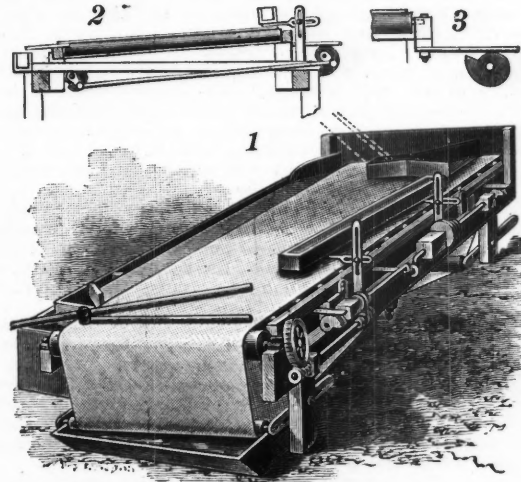
If natural gold sulphide exists and is not amalgamable, it cannot be reduced by any simple process of grinding, which, however, may liberate some other forms of refractory gold. Roasting would probably drive off the sulphur more easily than from other sulphides, as the gold sulphide, it is to be presumed, is a less stable compound. But roasting would leave the freed gold in such a minute state of subdivision as to make it an awkward material to handle by any amalgamating appliances, since it would be likely to escape in the slimes. Concentration, roasting, chlorinating and leaching ought to save it, or, perhaps, even a raw lixiviation process may be practicable. At present concentration and smelting after roasting (or raw, if in small proportion in the smelting mixture), in connection with silver lead smelting, seems to be the simplest and surest mode of treatment. But fine crushing before concentration would tend to slime the gold sulphide, which most probably exists as an intimate mixture scattered through the base sulphides, as a distinct mineral, perhaps, yet indistinguishable to the eye and not mechanically separable from the other sulphides.

These questions are pertinent: Does much of this gold sulphide

really exist, and is its occurrence more frequent than is supposed? If so, will it prove to be of sufficient importance to modify metallurgical methods?

THE ROWE CONCENTRATOR.

This machine, invented and patented by Thomas Rowe, of Triumph, Idaho, embodies the features of a Frue vanner and a vertically reciprocating shaking table, with additional features peculiarly its own. It consists primarily of a revolving endless belt, inclined longitudinally and transversely, carried and driven by rollers on a jiggging frame, which derives a vertical motion from cams, which, after a period of revolution, allow the frame to fall back on the blocks of the stationary main frame. The traveling motion of the belt is derived from one of the rollers at the higher end, which in turn is driven by worm gear, the speed of revolution being adjustable by means of cone pulleys, one on the main driving shaft and the second on a short counter shaft, both shafts being journaled on the main stationary frame. The number of vertical shocks can be modified only by changing the speed of the primary power.



The pulp is fed through a perforated chute at the lower end of the belt; the belt, in the meanwhile, travelling toward the elevated end. The bumping is supposed to settle the heavier and more valuable minerals while the lighter gangue remains on top ready to be washed over the lower side of the belt into a suitable tailings trough by water issuing from a water feed trough, which is readily adjustable either in height or in its position over the belt. The tailings trough is divided into two portions, the one at the higher end receiving the richer tailings, which, as middlings, may be treated again; at the higher end the concentrates are washed by water from two adjustable perforated pipes, then pass with the belt over the driving roller and finally into a settling tank filled with water, where they are deposited.

CLARKSON & SPURGE'S IMPROVED PRESSURE GAUGE FOR GASES.

At the last meeting of the English Camera Club in London, April 29d, Mr. J. B. Spurge exhibited one of Messrs. Clarkson & Spurge's improved pressure gauges for compressed gas, devised in consequence of various accidents which have taken place with gauges. The instrument is represented in Fig. 1; the upper part is an ordinary Bourdon gauge with a specially formed inlet, by means of which the whole of the interior of the Bourdon tube is filled with glycerine, absolutely free from all traces of air. A is the plunger acted upon by the gas, and communicating pressure to the glycerine; should the Bourdon tube fracture then the fluid will

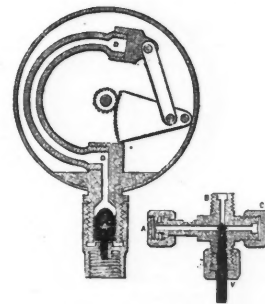


FIG. 1. FIG. 2.

escape, and the plunger stop the orifice by acting as a valve. Fig. 2 is an apparatus for demonstrating that the energy required to indicate the pressure is $\frac{1}{10}$ of an ordinary gauge to give any particular indication due to the permanently charged tube. The coupling A is to connect it with a cylinder, V is valve which closes the outlet B, and C is closed with a cap. The method of using this consists in attaching it to a cylinder, closing the valve V, and opening the cylinder valve. The inclosed chamber will now be charged to the pressure of the cylinder, when it is again closed. The outlet controlled by V is then put into communication with a small gasholder. V is next opened, and the gas measured by letting it expand into it. By substituting for the cap C the gauge and repeating the experiment, the difference in volume indicated by the holder will demonstrate the energy.

THE CONSTRUCTION AND MAINTENANCE OF HIGHWAYS.*

Written for the Engineering and Mining Journal, by Eugene L. Munnin.

The ideal road has a firm, dry foundation, on which the best material is laid on scientific principles. The grades and curves are slight, and there is ample drainage. It is neither too flat to readily shed water, nor so convex as to cause vehicles to avoid the sides. The hard, compact surface is impervious to water, and free from ruts and depressions. The best road material gives a good foothold to horses, yet offers little resistance to traction. It is easily cleaned, suited to all traffic, and adapted to all grades.

Construction.—Among the points to be observed in determining the location of a highway are those arising from the amount and character of present and prospective travel over it, and the nature of country through which it must pass. Money cannot be more profitably spent in road construction than in preliminary surveys. The more care taken in the examinations the better the location. Though a straight road is the ideal one, the expense of construction and maintenance may make it impracticable.

When a load is drawn uphill, the force exerted, equals not only the force required to haul it that distance, but also the work necessary to raise it through that vertical height. No grade should exceed 3 ft. in 100 ft. Long, steep grades are to be avoided owing to the extra strain, thrown on horses, and the damage caused by the acceleration of the surface water. The lower portion of long ascents should be made comparatively steep. A level stretch between two ascents serves to rest the horses. In mountainous regions the sharpest admissible curve is one of 130 ft. radius, but one of a 100 ft. is far better. On curves the road should be elevated on its outer or convex side, while the grade should be less, and the road wider than on adjacent parts.

As the road should be a trifle higher than the adjacent land, the "cuts" and "fills" need not balance; the former may be a little in excess. Engineers should not make many deep "cuts" or "fills," for, besides the additional expense, the natural beauty of the country is marred, and the adjoining property injured. Also, in deep "cuts," the action of the sun and wind in drying the roadway is not as rapid.

It would be well to bear in mind, that freshly dug earth increases from 15% to 25% in volume, while embankments shrink from 8% to 20%. In excavations, the side slopes should not be greater than 1 in 1½, and by sodding the slopes, the expense of maintenance will be lessened. If springs are found in them, the water may be conveyed by tile drains to the side ditches. A road located upon a hillside is most cheaply built if one-half be made by excavation and the other by embankment. In such a case the drain should be on the inner side.

All agree that the foundation should have the same grade as the surface; but there is a difference among engineers as to its proper transverse section. Since there is no reason why the middle of the road should have extra thickness of road material, the foundation should have the same form as the surface.

One important cause of failure in road construction is lack of proper drainage. As frost—that arch enemy of good roads—cannot act on a dry one, too much attention cannot be paid to this question. In moist soils, sub-drains should not be more than 20 ft. apart and should lead into the side ditches. Tile drains, or those constructed of stone or brick, covered with brush, on which the road material is placed, are frequently used. A cheaper method is to dig ditches across the roadbed and fill them with brush or broken stone in such a manner as to leave an open water space. Culverts should be of stone and large enough to be easily cleaned. With the center of the road slightly higher than the sides and two side ditches, each 3 ft. deep, surface drainage is secured. Yet, on a stretch of continuously descending road, water bars should be placed at suitable distances apart, depending on the grade, etc. If there is only one side gutter, the bars should be placed diagonally across the road; but with two side ditches, they may be made in the form of a V, with the apex in the center and towards the ascent.

The serious objection to the transverse section in the form of an arc of a circle is that carriages avoiding the steep sides, or water standing on the flat center, cause increased wear. The best form is to have two planes, sloping gently toward the sides, connected by an arc in the center. A roadway of 24 ft., with a sidewalk and side ditches, requires an allowance of 50 ft. With considerable advantage this allowance can be increased to 66 ft.

I am not a believer in the theory of having only a portion of the roadway metaled, that is, of using broken stone on, say, 16 ft., and allowing the other part to remain as a dirt road; the mud in wet weather would wear away the improved part rapidly.

Construction.—In construction of a road an excavation for the foundation is first made to the proper depth; after the watery soil of marshy places is replaced by stone or gravel, the necessary sub-drains are laid. When the foundation has the proper grade and transverse section it is compacted well by rolling. Such a foundation is important for a good road of any kind. If a gravel road is to be built, a 3-in. layer of angular gravel, with a small amount of binding material, is then put on. This is either moistened and rolled or thrown open to traffic until hardened. Two or three similar layers are put down and treated in like manner. On top of these a layer of hard pan and tough gravel is placed, and by rolling a surface of great hardness can be obtained.

For a rubble stone road, rocks not more than 10 in. in diameter are laid at the bottom. On this a 2-in. layer of broken stone is rolled until the small stones are wedged into the interstices of the larger. A second layer of smaller stone is then added and rolled, and the surface is finished by using a layer of gravelly earth. For a Macadam road use 3-in layers of broken stone, rolling each separately; Macadam's practice was to reject all stones weighing over 6 oz.

A ½-in. layer of finer stone with a little binding material is placed on top and well rolled. Usually a thickness of from 9 in. to 15 in. is required, though a 4-in. layer of trap rock made a splendid road in Bridgeport. The Telford road differs from the Macadam in that the broken stone is placed on a pavement foundation of rough cobble stones of from

6 in. to 8 in. in size. One object of this sub-pavement is to secure good drainage. The Telford is the best but the most expensive road. The stone used in either case should be quartzite, syenite, or trap, and can be broken by hand or by rock breakers.

Even if the town is too poor to construct roads properly, the earth roads now in use may be wonderfully improved at a small cost by scientific treatment. In reconstructing old roads, the first duty is to clean out and make larger, if necessary, all drains, ditches and culverts. Remove all stones above 2 in. in diameter from the roadway, and make the material at the top as homogeneous as possible in order that the surface may be of uniform hardness. After bringing the road to a uniform grade and suitable transverse section, it should be well rolled. If the soil is clay, remove all trees from the roadside, make the ditches very deep and put in a number of sub-drains. If the town can afford to burn the clay, a fair road can be obtained. If not, finish off with a well-rolled layer of gravel about 4 in. thick. A sandy road should be narrow and thickly bordered by trees in order that the sand can be confined. Shallow ditches and a top layer of clay or gravel improves the road.

The United States consul at Port Sarnia, Mr. S. D. Pace, in his report to the State Department on the roads of Ontario, states that "very durable and substantial roads" are built there without the use of broken stone. Though no excavation is made in the center of the road, the culverts, ditches and grades are very carefully constructed. A 4-in. layer of sand and gravel, precisely as they leave the pit, is strewn over the surface. This becomes hardened under traffic. A new coat is applied yearly, and in a few years a "practically indestructible road" is built.

Sidewalks should be placed between the roadway and the side ditch on the north or east side. These sidewalks may be of brick, of coarse sand, screened gravel, common ashes, or foundry cinders and slag.

Maintenance.—No road, however well constructed, will give a maximum wear unless it is properly maintained, but many of the methods now used cannot be too strongly condemned. The common practice of using a road scraper in putting gutter-mud and vegetable refuse on the middle of the road is one of the most pernicious. Remember that the dust of dry weather is the mud of wet, and that it is less expensive to remove the former than the latter. The object of sprinkling the road in summer should not be to lay the dust, but to prevent the surface from becoming too brittle. Mud is annoying to travelers, prevents the drying of the road, and causes unnecessary wear by softening the road material. While water standing in ruts increases the wear by causing the hollow to become widened, a pick should never be used to make a channel for the water to run to one side. Repairs should be made in wet weather; yet ruts should be refilled as soon as they occur, care being taken not to produce surfaces which vehicles will avoid in traveling. In the spring, after the frost comes out of the ground, the whole surface should be rerolled. Provision should be made against direct communication between dirt and improved roads by inducing the farmer to use broken stone on that part of his road leading to the main road.

No practical benefit is obtained by the system of "working out" road taxes. Every county should employ a civil engineer as road supervisor. Its roads should be divided into districts and each district placed in charge of a man who should devote his whole attention to the repair of his section. He should be on the road during wet weather in order to see where the water stands, and should be directly responsible to the county engineer for the faithful discharge of his duties.

Economy.—The resistance of carriages on roads is (according to Gen. Morin) given approximately by the following empirical formula:

$$R = \frac{W}{r} [a + b(u - 3.28)].$$

In this formula R = total resistance; r = radius of wheel in inches; W = gross load; u = velocity in feet per second, while a and b are constants, whose values are: For good broken stone road, $a = .4$ to $.55$, $b = .024$ to $.026$; for paved roads, $a = .27$, $b = .0684$.

Professor Rankine states that on gravel the resistance is about double, and on sand five times the resistance on good broken stone roads.

A horse hauls twice as much on a good road as on a poor one. The Highway Commissioners of Illinois in 1888 estimated that on the roads in that State a horse could draw a good load only three months a year, two-thirds of a load for three months, and only one-half for the remaining six months. With this as a basis and allowing \$3 a day as the expense of a two-horse team and driver, it is readily seen that, owing to poor roads, the owner of that team loses at least \$300 per year. Professor Ely's estimate, that poor roads cost a farmer \$15 a year for every horse he owns, is a low one. Professor Haupt says that it costs to haul one ton of freight one mile ¼ mill on ocean; 2 mills on rivers; 3 mills on canals; 5 mills on railroads; and 15 cents on highways.

The obstacle to better roads is that bugbear "higher taxes;" yet it has been shown by experience that a first class road can be kept in good order for less money than is annually wasted on our inferior ones. The method in vogue in many States of each township keeping its own roads in repair is unjust. Many towns in Massachusetts are required to keep in repair roads which are used almost entirely by residents of other towns on their way to and from the large cities. The New York *Evening Post* of January, 1889, says: "We know of a village within 50 miles of New York which deliberately refuses to keep a piece of main road in repair because it would, if in good condition, divert traffic from its own stores to those of a neighboring village."

With convicts, under the direction of competent men, at work on the construction of roads a good one would not only be obtained at a minimum cost, but that vexed problem of convict labor would be solved. In Georgia 30 men build an average of 5 miles of Macadamized road per year at one-third of contract price.

As narrow tires cause undue wear of road surface, the States should pass laws regulating the width of the tire proportional to the load. Having a tire of from 4 in. to 7 in. in thickness, and with the rear axle 14 in. longer than the front one, every market cart of France is a roadmaker. Switzerland, Belgium, Saxony, and Austria, which are noted for their good roads, all have laws regulating the width of the tire to be used.

Farmers should not bear the whole expense of the construction of roads. If our Government can make large appropriations for the improvement of rivers and harbors, and can make large grants for the construction of rail-

*The articles are sent us in response to our offer to publish essays in competition for the prizes offered by the Pope Manufacturing Company, of Boston, made in our issue of February 27th.—Ed. E. AND M. J.

roads, why should not our highways, the property of the nation, be improved by the Government? In conclusion, let me quote, "Every judicious improvement in the establishment of roads and bridges increases the value of land, enhances the price of commodities, and augments the public wealth."

GOOD ROADS.*

Written for the Engineering and Mining Journal by Lawrence E. Baker.

The character of our roads at the present time is by no means good. But what more can be expected when all of them, with few exceptions, are made of nothing but natural soil and supervised by unskilled men?

But whatever the defects of our dirt roads, they are with us and likely to remain some time, and can, with skilled superintendents, be greatly improved. How then can this be done? Lay out the road as straight and level as possible. But as straightness is always sacrificed to light grades, in securing the latter we have sometimes to lengthen the road.

Drain thoroughly the road bed, for without it no road, natural or artificial, will ever be a good road. In draining we must have an eye to composition of the substratum, as well as to the amount of surface to be drained. If it is a clayey substratum it will retain water, and unless our ditches are very deep it will soon become seepy and our foundation will give way; but, on the other hand, if the substratum is sandy and consequently porous, we need not dig the ditches so deep or so wide.

The foundation is a very important part in the construction of any road, especially a dirt road; if we find that we have a clay foundation it will be best to mix clean sand, or if sandy, mix about half clay, in order to make the foundation pervious and impervious respectively, or else water will get through and soon the foundation will become seepy and miry. In adding sand be careful to exclude all vegetable matter.

It is practically conceded that the best shape for the roadbed is two inclined planes sloping from center about 1 ft. in 20 ft. and rounded with a curve at their angle. It is very common, however, to give a convex shape instead, and soon the road is worn in the centre and a ditch is formed. The width of road should be, of course, governed by the traffic. One open ditch on each side of the road is generally sufficient, unless the foundation is impervious to water, and in that case one may be made in the centre, consisting of fascines, brick, plank, tiling, etc., covered and connected with the side drains. For Macadam and Telford roads the side ditches should be covered. They can be made of the same material as the center ditch above. All of them should be deep and large enough to carry off the water. Three feet deep and one foot wide at bottom, with slope of 1 to 1, is generally large enough.

Dead levels must be avoided in the road, and the road and ditches should have, at least, a grade of 1 ft. in 120 ft. The steepest grade allowable is 1 ft. in 12 ft. and this is for very short distances; in case a steep grade of any length is unavoidable, it must be divided into stretches of about 100 ft. each. The tractive force on ordinary roads is about one in thirty, and this is generally adopted now as maximum on hills. The proper grade can be gotten by dividing the tractive force by the weight of vehicle and load.

Even if the above instructions were carried out to a letter, our roads would be far from models. Some plan for reducing friction should be adopted. This may be accomplished by covering the road beds with some artificial material that will make them hard and smooth. The best materials are wood, shells, slag, gravel and stone, of which the last two are most available and are generally used.

Gravel Roads.—Having located the road, the first thing is drainage, for without it all the stones and surface covering will be utterly worthless. Remove all of the surface dirt to reach the subsoil; give it the same grade and cross section as the dirt road; roll and pack well the foundation to secure it from any water that may seep through the gravel. Select the gravel, which must not be too clean or dirty, for in neither case will it bind; screen it, leaving out all that will not pass through a ring 2½ in. inner diameter; then put it on by layers of 3 in. or 4 in. each; roll each layer thoroughly, filling in all depressions as the roller passes over. A thickness of 16 in. is sufficient.

Macadam Road.—The roadbed is prepared as in the gravel road. The best stones are compact basalt or syenite; other good ones are granite, hornblende, trap-rock, flint, etc. They must be broken into well shaped cubical pieces; no round stones must be used; they are best broken by hand, as machines waste by crushing much of the stone too fine and they seldom break it into cubical shape; hence it is hard to bind. No stone must be too large to pass through a ring 2½ in. inner diameter.

The broken stone is put on in layers 3 in. or 4 in. thick, and each layer thoroughly watered and rolled so that it may bind well; on the last layer a coating of fine screenings of the same material or fine sand should also be used to bind the stone. Successive layers are added and rolled well until a thickness of from 6 in. to 15 in. has been attained. Thorough rolling is very important, for without it the stone will not unite and form a secure, smooth, water-tight flooring, as Macadam said.

Telford Roads.—These differ from the Macadam principally in having a sub-pavement for foundation; the roadbed is prepared as in the gravel or Macadam road; a solid foundation of large, irregular blocks of stone is then laid carefully by hand. They are made irregular so as to hold the broken stone and have it bind sooner. The spaces between these blocks are wedged in with smaller pieces; the foundation may be made of softer material, as it is not subjected to the weather or wear of traffic. After laying carefully the foundation, the broken stone is put on by layers and rolled as in Macadam roads.

Maintenance.—Roads of whatever character are best maintained by daily attention, and if possible this should be done. The water ways should receive constant attention and never be allowed to fill up and overflow; they should at least be cleaned and repaired in the spring and fall. The maintenance of roads should be in the hands of the separate counties, and should be provided by taxation and not by compulsory labor. In each county there should be a skilled superintendent of roads, and these superintendents should be under the general supervision of a state engineer. The state should maintain a few through roads, or what are generally known as national roads.

THE PRODUCTION OF GOLD AND SILVER IN THE UNITED STATES IN 1891

We are indebted to the courtesy of Mr. E. O. Leech, Director of the Mint, for the following abstract of the report he has transmitted to Congress on the production of the precious metals, covering the calendar year 1891:

The product of gold from the mines of the United States aggregated 1,604,840 fine ounces, of the value of \$33,175,000. This is an increase of \$330,000 over the product of the previous calendar year. The increased product is due largely to improved processes of treatment and to the increased amount of gold extracted from lead and copper ores.

The product of silver from our own mines was 58,330,000 fine ounces, of the commercial value of \$57,630,040, or of the coining value in silver dollars of \$75,416,565. This is an increase of 3,830,000 ounces over the previous year. The increased silver product was due principally to new finds in Colorado and Idaho and to the cheapening of the processes of smelting lead and copper ores bearing silver.

The Director of the Mint has made a special effort to distribute for the first time the silver product of the United States as to the sources of production. He estimates that of the total product for the last calendar year, 28,497,000 fine ounces was produced from quartz and milling ores, 23,707,000 from lead ores, and 6,126,000 from copper ores; total silver output, 53,330,000 fine ounces.

PRODUCT OF SMELTERS AND REFINERS.

The total product of government and private refineries in the United States, including foreign material smelted and refined, was: Gold, 2,169,863 fine ounces; silver, 69,336,415 fine ounces.

DEPOSITS AND PURCHASES OF GOLD AND SILVER.

The total value of the gold deposited at the mints during the year was \$70,915,632, of which \$24,853,180 was foreign coin and bullion. The deposits and purchases of silver aggregated 73,088,626 standard ounces, of the coining value of \$85,048,584. The amount of silver purchased by the government during the year was 54,393,912 fine ounces, costing \$53,796,833. The average cost of the silver purchased during the year was \$0.989 per fine ounce. The average cost of the total amount purchased under the act of July 14th, 1890, has been \$1.02 per fine ounce.

PRICE OF SILVER.

The price of silver at the commencement of the calendar year 1891 was \$1.058 per fine ounce, and the close, December 31st, was \$0.955 per fine ounce. The average price for the calendar year was \$0.99 per fine ounce. At the date of the passage of the act of July 14th, 1890, the price of silver was \$1.07½ per fine ounce; at the date the law went into effect it had advanced to \$1.13. The highest point touched was on August 19th, 1890, \$1.21 per fine ounce. The lowest point touched was on March 28th, 1892, \$0.85½ per fine ounce.

At the lowest price of silver during the year the commercial value of the pure silver contained in the silver dollar was \$0.73½; at the highest price, \$0.826, and at the average price \$0.764. At the price of silver March 28th, 1892, the commercial value of the pure silver dollar was \$0.66.

COINAGE.

The coinage of the mints during the calendar year 1891 was as follows:

Description.	Pieces.	Value.
Gold.....	1,770,620	\$29,222,005.00
Silver dollars.....	23,562,735	23,562,735.00
Subsidiary silver coins.....	20,451,916	3,956,121.60
Minor coins.....	63,906,700	1,312,441.00
Total.....	118,691,971	\$58,053,302.60

GOLD AND SILVER BARS MANUFACTURED.

In addition to the coinage gold and silver bars were manufactured as follows: Gold, \$87,865,473; silver, \$6,979,510; total, \$44,844,983.

Gold bars were exchanged for gold coin, for use in the industrial arts, of the value of \$12,495,094.

IMPORTS AND EXPORTS.

The imports of gold aggregated \$45,298,928; the exports of gold, \$79,187,499; net loss of gold, \$33,888,571. The imports of silver aggregated \$27,910,193; the exports of silver, \$28,783,393; excess of exports over imports, \$873,200.

GOLD AND SILVER USED IN THE INDUSTRIAL ARTS.

The value of the precious metals used in the industrial arts in the United States during the year was: Gold, \$19,700,000; silver, \$9,630,000; total, \$29,330,000, of which \$10,697,679 gold and \$7,289,073 silver, consisted of new bullion.

STOCK OF MONEY IN THE UNITED STATES.

The total metallic stock of the United States on January 1st, 1892, was gold, \$688,665,211; silver, \$47,131,670; total \$1,235,797,881; against a metallic stock on January 1st, 1891, of gold, \$704,597,128; silver, \$486,545,076; total, \$1,191,142,204.

The total amount of paper and metallic money in circulation on January 1st, 1892 [exclusive of the amount in the Treasury and its branches] was \$1,592,393,629, against \$1,528,594,627 on January 1st, 1891, an increase of \$63,799,002. The amount of paper and metallic money in actual circulation on April 1st, 1892, was \$1,608,641,520.

WORLD'S PRODUCT OF GOLD AND SILVER.

The product of gold and silver in the world for the calendar years 1889, 1890 and 1891 was as follows:

	Gold		Silver.	
	value.	Fine ounces.	Commer- cial value.	Coining value.
1889.....	\$123,398,000	123,205,000	\$115,197,000	\$159,295,000
1890.....	119,464,000	132,833,000	139,475,000	171,744,000
1891.....	124,229,000	140,865,000	139,175,000	182,129,000

The product of gold increased in 1891 over the prior year nearly \$5,000,000, the increase being principally in South Africa. The product of silver increased in 1891 over the prior year about 8,000,000 fine ounces.

The increase in the silver product was principally in the United States, Australia and Bolivia.

The report is replete with valuable statistics covering the production, coinage and movement of the precious metals in the world, and contains a review of the product of the mines of each of the gold and silver producing countries of the world.

TEMPERATURE OBSERVATIONS IN THE DEEP WELL AT WHEELING, W. VA.

The Wheeling deep well, says the report of Dr. William Hallock, who conducted the investigations there, was sunk by the Wheeling Development Company, and by it generously dedicated to science. It is 4,500 ft. deep, 4½ in. diameter and dry; cased to only 1,570 ft. The strata are nearly in situ, undistorted and dipping only 50 ft. to the mile. More satisfactory geological conditions can scarcely be imagined. Being dry, ordinary U. S. Signal Service maximum thermometers were used, and no especial precaution need to be taken to prevent circulation of the air. The following results were shown:

Depth. Ft.	Tem. Fahr. Deg.	Depth. Ft.	Tem. Fahr. Deg.	Depth. Ft.	Tem. Fahr. Deg.	Depth. Ft.	Tem. Fahr. Deg.
1,350	68.75	2,375	79.20	2,232	89.75	4,125	104.10
1,591	70.15	2,486	80.50	3,375	92.10	4,200	105.55
1,592	70.25	2,625	82.20	3,482	93.60	4,375	108.40
1,745	71.70	2,740	83.65	3,625	96.10	4,462	110.15
1,835	72.80	2,875	85.45	3,750	97.55		
2,125	76.25	2,900	86.60	3,875	100.05		
2,236	77.40	3,125	88.40	3,950	101.75		

These observations, when plotted, show a slow increase for the upper half of the uncased portion, about 1° Fahr. for 80 to 90 ft., whereas the lower part shows a more rapid increase, about 1° Fahr. for 70 ft. The whole series gives a well defined and regular curve, with a deflection at 2,900 to 3,000 ft., where an oil sand occurs. Practically all the rest of the uncased well is shale. The increase in the rate at which the temperature rises as the bottom is approached can only be temporary or we should have an inconceivable or improbable state of temperature at comparatively slight depths.

The report then makes comparisons of the results of observations at the Spenberg well near Berlin, which is 4,170 ft. deep, the Schaladabach, near Leipsic, which is 5,740, and the Wheeling well, 4,500. Their top temperatures are given, respectively, 48.8°, 51.0° and 51.3°; their bottom temperatures, 118.6°, 135.5° and 110.3°, which shows a much lower average increase in temperature in the Wheeling well than in the other two.

THE DIAMOND FIELDS OF INDIA.*

By A. Mervyn Smith, M. E.

That the diamond fields of India were known from the very earliest times we have ample evidence. In the *Puranas* (sacred books of India) eight localities are mentioned as yielding diamonds, and of these three have been identified with the three great diamond fields known in India at the present day: 1, Matanga (Kistna and Godavery); 2, Paunda (Chota Nagpur); 3, Vena Gunga (Wairagarh). The diamondiferous area in India, so far as is known, is perhaps more extensive than that of the rest of the world put together, and nine-tenths of the famous jewels of the world are certainly Indian stones. The Koh-i-Noor, Nizam, Great Mogul, Regent, Great Table and Austrian Yellow are historic gems of Indian origin. Worthy of ranking with these we have only the Matan, from Borneo; Star of the South, from Brazil, and Porter-Rhodes, from the Cape. That the Indian mines still produce stones of large size and of the purest water we have evidence in the fine gem known as the Gor-don-Noor (Gordon Orr), recently brought to London by the Madras firm of jewelers, Messrs. Orr & Sons. This stone weighs 213½ grains, and is remarkable for its brilliancy and fine limpid color; it is said to have been discovered in the Kistna diamond fields (Matanga of the *Puranas*).

In India diamonds are found in alluvial workings and in the original gangue or bed rock. So far diamonds have been found *in situ*, both in the upper and lower Vindhyan rocks (Silurian). These consist of a series of shales, limestones and sandstones, cut up and much mixed with intrusions of trap. A species of conglomerate made up of what looks like felted hornblende (Kimberlite), with embedded pebbles of jasper, serpentine, quartz and sandstones is the matrix in which the diamond is found. When exposed to the action of the weather, as in shallow workings, this conglomerate is of a rusty brown color and very friable, so that it can be readily broken up and the gangue washed away, leaving the pebbles, which are of a white, red, blue and green color. A load of gangue yields about a quart of pebbles, and if from this a carat (¾ grains) weight of diamonds is recovered, the mine is considered worth working.

Overlying the diamond conglomerate are beds of hard sandstones and shales, which have to be cut through before the diamond gangue is met. In the deep mines the gangue is extremely hard and tough and of a green-blue color. It requires months of exposure to the atmosphere and frequent sprinklings with water before the matrix becomes sufficiently friable to allow of the pebbles being extracted without breaking them. All attempts to crush up the matrix without destroying the included diamonds have hitherto failed, and, owing to the long delay before results are known, the natives seldom work the conglomerate in the rock workings unless it is somewhat decomposed and softened by the weather. The pebbles are about the size of hazel nuts and are generally opaque. The presence of green pebbles—serpentine—is considered a good sign by the native miners.

The alluvial workings are generally on river banks where the ground is made up of detrital matter from the Vindhyan rocks. During the dry months of the year the water is diverted from shallow reaches of the Kistna River in localities where diamonds are known to occur, and the gravel lying on the exposed bed-rock collected and carefully examined by the young women and children. The gravel is first screened so as to remove the large and the very small particles, the remnant is then spread on mats and carefully examined in the sunlight (the light of the sun at

nine in the morning and three in the afternoon is considered best), and from long training the children are at once able to detect the gems even though they are covered, as the Indian diamonds are, with a ground-glass tint. Indian diamonds are noted for their beauty and whiteness. Most of the stones found are white, a few yellow and dusky stones are also met with. Blue and red stones are very rare. Bort (half crystallized diamonds),* carbonado (black opaque, amorphous diamonds) have not been met with on the Indian fields.

The Hindus distinguish diamonds according to their color. The white rank first and are called Brahmins; the yellow are known as Kshatris; the dusky as Vaishyas, and the flawed stones as Sudras. The diamond dealers are chiefly Marwarees—a race who are the chief bankers and money lenders in India. These men are perfectly acquainted with the phosphorescent and electric qualities of the diamond, and they are also aware of the extreme uniformity of its specific gravity. A boiling solution of some salt of zinc called by the natives "Tutenagum Baspam," which solution has a specific gravity of 3.5, is used for the weight test. Into this solution the stones submitted for examination are thrown. All such as float are rejected as not being diamonds, the Marwarees knowing that the diamond has a specific gravity of 3.52.

The stones that sink are then examined. The larger pieces are rubbed with a silk handkerchief to excite their electric properties, and held near to light substances as small pieces of tissue paper. Diamonds thus rubbed readily attract light substances. The phosphorescent qualities are brought out by exposure of the stones to sunlight, and then taking them into a dark room, where the diamonds give off a gleaming light. The most usual test is that of hardness, the diamond being the hardest of all stones. Cut stones which have been tested as above are then examined by boys especially trained, who sort them according to their color and flaws, and it is very seldom that these youngsters make a mistake, so sharp are their eyes in detecting flaws and shades of color. The appraisal according to size is finally made by the seniors.

Although the diamond fields in India are the most extensive known, and the majority of the great diamonds of the world are the produce of these fields, yet no continued attempt has been made to work them on a large scale by Europeans. Many reasons may be assigned for this seeming want of enterprise on the part of the British, who are the paramount power in India.

Excepting at the great seaports, the unofficial European population of India is small, very small, not equal to that of a fourth rate town in Great Britain. What little there is of this European element is centered in the military stations, *i.e.*, near the great arsenals and cantonments of British troops. The maxims of the old East India Company still prevail, and the unofficial Britisher is regarded by the Government as an "interloper," who must be kept out of the country.

It is strange, yet none the less true, that mining is at the present day only carried on in such districts as are not directly subject to the British rule. The only part of India where diamond mining in the bed-rock is practiced at present to any extent is at Panna in Bundelkhand, the Rajah of which derives a large revenue from the royalty on these gems.† In the native states of Chota Nagpur alluvial mining is practiced to some extent, but it is hard to arrive at returns, as the trade is principally in the hands of Greek and Armenian merchants who, for obvious reasons keep their transactions in precious stones secret.

At Panna occurs one of those circular basins or pipes of diamondiferous gangue which has rendered the Kimberley mine so famous. Captain Franklin describes it as a huge basin like an inverted cone 100 yds. wide and 100 ft. deep. Two-thirds of the basin are filled with a green mud containing a calcareous matter and with a thick covering of calcareous tuff. The diamonds occur in the green mud, and the natives whose appliances do not admit of their going below a depth of 50 ft., say that diamonds become more abundant as a shaft descends. In Kimberley a similar formation has been worked to a depth of 800 ft. and found richer the lower the inclines were sunk.

WATT'S ELECTROLYTIC PROCESS FOR ZINC ORES.

The following process for the treatment of zinc ores by electrolysis were invented by Mr. Alexander Watt, of England, one of the best known of electro-metallurgists, and were patented in 1887 and 1888.

The object of this process is to effect the purification of crude or impure zinc and the extraction of metallic zinc from its ores, more especially from calamine or native carbonate of zinc, by means of electrolysis. In carrying out the process the impure zinc, however obtained, is employed as an anode, and is placed in a solution, or electrolyte, composed of a vegetable acid. A current of electricity is then passed through the liquid, and the zinc is rapidly dissolved. In a short time zinc of great purity is deposited upon a cathode or negative electrode, while the surface of the anode assumes a discolored, or even black appearance, due to the impurities with which the zinc is always more or less associated. After a time these impurities become dislodged, and fall to the bottom of the tank or vat, and may be collected and separated in any well known manner. The acid found most useful to effect this purpose is acetic acid.

Sometimes it may be preferable to charge the acid solution with zinc in the first instance; this may be effected in the following manner: A porous cell, partly filled with a portion of the acid solution which is to form the electrolyte, is immersed in the tank containing the acid solution, the liquid in both vessels being on a level. The negative pole of a dynamo-electric machine, or other source of electricity, having attached to it a strip of zinc or other suitable metal, or a block of carbon, is immersed in the porous cell, and a stout plate of zinc, connected to the positive pole of the electric generator, is immersed in the bulk of the liquid. After a time the solution becomes sufficiently impregnated with the metal under the action of the current and is ready for use.

When the acid solution is employed direct as the electrolyte, there is a considerable evolution of gases resulting from the decomposition which takes place, to check or counteract which carbonate or oxide of zinc is added to the solution until the evolution of gas nearly ceases.

* Abstract of an article in the *London Mining Journal*.

† Kimberlite is the name applied to peridotite by the late H. Carry-Lewis. Peridotite is an olivine igneous rock. It is doubtful if this is the same.—Ed. E. & M. J.

* Bort is the name applied to all diamonds when unfit for cutting.—Ed. E. & M. J.

† Dr. King, Director-General of the Geological Survey of India, has recently visited Panna to examine the diamond mines.

In treating certain ores of zinc, but more especially the native carbonate, or calamine, for the purpose of extracting the metal therefrom, the ore, after being picked, finely pulverized and sifted, is digested in strong vegetable acid, say acetic acid, until a concentrated solution of acetate of zinc, more or less impure from earthy matters, is obtained. This solution is afterward used as an electrolyte; plates of carbon, platinum, or other metal insoluble in the vegetable acids being employed as anodes. The cathodes or receiving plates are preferably also of carbon, but they may be of any suitable metal. The separated zinc is then removed from the cathode, and is made up in any convenient form for the market.

The impurities which remain after the treatment above described may in some cases contain cadmium, antimony, and other metals of considerable commercial value, which may be separated in any convenient manner.

Subsequently Mr. Watt found in some samples of zinc, whether commercial or in the ore submitted to him for treatment by the above process, that lead was present in varying proportions.

Lead being soluble in some vegetable acids, acetic acid for example, it was found in such cases that the lead present in the electrolytic solution or bath injuriously affected the electro-deposition of the zinc. To obviate this difficulty the lead may be converted into an insoluble salt.

In carrying out this process, a combination of vegetable and mineral acids (by preference acetic and sulphuric acids) in a more or less dilute condition is employed for the electrolytic solution or bath. The principal effect of the sulphuric acid is to convert the lead into sulphate, which is insoluble in the vegetable acid and which is deposited at the bottom of the tank or vat in which the solution is prepared or used. The lead thus becomes harmless so far as the electro-deposition of the zinc is concerned.

The mixture of the two acids, also, in some cases, yields better results in the electrolytic treatment of zinc than are obtained when either a vegetable or a mineral acid is used separately, as the zinc is less likely to form "trees," or irregularities of a similar nature.

In some cases solutions of zinc, prepared with vegetable acids (acetic acid by preference) mixed with sulphate of zinc, were employed, in which case it was found that if any lead be present in the solution, or in the impure zinc employed as anodes, in the process of electrolytic refining of zinc, that the lead does not become deposited with the zinc upon the cathode or receiving plate.

The preferable mode of procedure is to first prepare a mixture of the vegetable and mineral acids moderately dilute, and in this digest a suitable quantity of powdered zinc ore, oxide of zinc or other product, from which it is desired to extract the zinc, until the acid mixture becomes sufficiently saturated, when the whole is allowed to settle, and the clear liquor is afterward drawn or pumped off for use as an electrolyte for the extraction of the metal. When refining impure zinc by this process, a mixture of the vegetable and mineral acids (acetic and sulphuric acids by preference) is prepared in a suitable dilute condition, which may be used as the electrolyte direct. Impure zinc is then employed as anodes in the electrolytic bath thus formed, and a current of electricity passed in the usual way, when the acid liquor soon becomes charged with zinc, which finally deposits upon the receiving plate or cathode. If preferred, a dilute solution of the corresponding salts of zinc, say acetate and sulphate of zinc, for example, may be used as the electrolyte.

Coal, Iron and Steel Product of Belgium in 1891.—Official returns show that the output of coals from the 130 mines in Belgium was 19,865,345 tons, half a million tons or 2.5% decrease from that of the present year, while stocks have increased to 568,826 tons, being now 45.5% more than a year ago. The total product of foundry iron was 65,436 tons, 4.8% decrease; forge iron, 437,182 tons, 1.7% decrease; Bessemer iron, 185,438 tons, a decrease equal to about 3.4%. The total is therefore 688,056 tons, about 100,000 tons less than in the previous year. Finished iron products made up 503,082 tons, a decrease of 11,300 tons, or 2.14%. Steel ingots totalled 243,729 tons, about 9.7% decrease, while finished steel totalled 313,517 tons, accounting for the whole of the decrease in ingots.

A New Discovery of Diamonds in South Africa.—A tremendous excitement has recently been created in Pretoria, the capital of the Transvaal, owing to the alleged discovery of diamonds on the lands of the municipality, says the correspondent of the London *Mining World*. Five diamonds are alleged to have been found in the early part of last week on the Pretoria town lands, and affidavits have been made to that effect by the finders. Sceptics say that experts declare that these stones are Brazilian diamonds, and are nothing like any diamonds ever found in South Africa. Other experts contend that that goes for nothing, because all diamond experts know very well that Kimberly, Dutoitspan, Bultfontein and river stones are all different, and can be picked out at a glance, and this being so they see no reason why diamonds found so far away as Pretoria should not have their peculiar characteristics.

Minerals and Gems of the Ural Mountains.—Mr. Geo. P. Kunz, in a recent lecture in the Cooper Union free course on the "Minerals and Gems of the Ural Mountains," in which region he has traveled extensively, said that while the Ural Mountains were teeming with the rarest gems, yet, owing to the crude methods of mining and the restrictive laws of the Czar, but a small portion of them were brought to light. Diamonds, which were supposed to exist in these regions, have never been discovered, but the finest quality of white topaz is found in large quantities. In speaking of the art productions of the Ural Mountains, he said that the iron castings of statues, cooking utensils and medallions of this region are among the finest in the world, and the bronze statue of Peter the Great has never been equaled. The output of gold for 1891 was equal to three-fourths of that of the United States; about 50,000 oz. platinum of the first quality were produced.

Stone for Road Metal.—In a paper read before the Boston Society of Civil Engineers recently, Mr. W. E. McClintock remarked that the specific gravity of a rock is no indication whatever of its fitness for road metal. Thus slate weighs 175 lbs. per cu. ft., and pure mica about 183 lbs., but no one would think of using either of these. The best material for this purpose was, he considered, trap rock, after which he would place felsite, and then came granite. As regards the latter, however, it differs in quality, that containing hornblende being preferable to those with mica. The latter was

soft and should not be used unless it was very difficult to get better material. In cases where the traffic is light and the stones previously mentioned difficult to procure, sandstone may be economically used for metal, in spite of its inferior wearing powers. Of two sandstones he held that the coarser grained was to be preferred. Gneiss he held to be of about the same value as a good sandstone.

Thomas Steel for Rails.—Thomas steel for rails was the subject of a paper recently read by Herr Johann Ryber before the railway section of the Austrian Engineers' and Architects' Society, says *Iron*. In it he reviewed the present status of the Thomas process with special reference to its adaptability to rail manufacture, and gave a number of tabulated statements of test results obtained with Thomas-steel rails on different European railways. From the experience thus far gained with the metal Herr Ryber concludes that the method of manufacture has been sufficiently developed to warrant the use of the steel for rails, even though the matter of uniformity of texture is yet open to discussion. He further favors the use of hard steel for rails, particularly for rails of heavy cross-section, pointing, in support of his view, to the unfavorable experiences made with heavy rails of comparatively soft steel in a number of places where they were tried.

The Pfister Process for Preserving Wood.—This method of impregnating logs with zinc chloride, in order to preserve them, is now in use in Austria. The timber is impregnated in the forest as soon as possible after it is felled, according to *Engineering*. The zinc chloride solution has a specific gravity of 1.01 and is forced into the thick end of the log by a force pump. To this end, an iron disc of suitable diameter and furnished with a cutting rim is forced into the end of the log and secured by clamps. The time required for this preliminary work is only three or four minutes for each log. After a pressure of two or three atmospheres has been maintained at the thick end of the log for a few minutes, the sap begins to exude at the opposite end, and finally a weak solution of zinc chloride comes through, showing that the operation has been completed. About 2½ gallons of the solution are required per cubic foot of timber treated. Though rapid, the process does not appear to distribute the solution so uniformly as other methods.

Ancient Gold Workings in Mashonaland.—Mr. Theodore Bent read recently an elaborate paper on the Zimbabwe ruins in Mashonaland, to which we referred in our issue of April 16, before the Anthropological Institute of London. He summed up his main conclusions as follows: "First, the ruins and the things in them are not in any way connected with any known African race. The objects of art and of special cult are foreign altogether to the country, where the only recognized form of religion is that of ancestor worship. The cult, too, is distinctly pertaining to a pre-Mohammedan period, which is, perhaps, the furthest back that we know with any degree of certainty. The second point is also obvious, that the ruins formed a garrison for the protection of a gold-producing race in remote antiquity. Forts of a similar structure are found all the way through the gold-producing country, and were erected to protect the mines. The cumulative evidence in favor of the race's being one of the many tribes of Arabia is very strong—the special cult, the monolithic decorations, and the later evidence of Arabian intercourse with the country, when their power was reduced only to the coast line. Aristeus tells us 'that a large quantity of spices, precious stones and gold was brought to Rome by the Arabians.' The testimony of most travelers is to the fact that little or no gold came from Arabia. It is, therefore, not too much to suppose that a portion, at least, of the 'Thesaurus Arabicus' came from Mashonaland as well as from India."

PATENTS GRANTED BY THE UNITED STATES PATENT OFFICE.

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

TUESDAY, APRIL 12TH, 1892.

- 472,614. Process of distilling carbonaceous material. Benjamin Brazelle, St. Louis, Mo.
 472,618. Re-pressing brick machine. James A. Frey and John Thompson, Bucyrus, O. Assignor to the Frey-Scheckler Company, same place.
 472,621. Process of making coke. Frederick J. Jones, Bedford, Eng. Assignor to the Economic Gas and Coke Company, Limited, London, Eng.
 472,668. Process of making aluminates of alkalis. Emil Fleischer, Wiesbaden, Germany.
 472,682. Means for dry separation of materials of different specific weight and different size. Hermann Pape and Wilhelm Henneberg, Hamburg, Germany.
 472,691. Art of making tin plates. George H. Benjamin, New York, N. Y.
 472,753. Cre screening apparatus. Thomas A. Edison, Llewellyn Park, N. J.
 472,848. Ore roasting furnace. George F. Bartlett and Augustus J. O'Neill, Butte City, Mont.

TUESDAY, APRIL 19, 1892.

- 472,981. Smoke consumer. William H. Burden, Cleveland, O.
 472,984. Machine for making asphalted sheet metal pipe. John P. Culver, Los Angeles, Cal.
 473,003. Heating and welding by electricity. Henry Howard, Halesowen, near Birmingham, England.
 473,013. Apparatus for separating natural gas from oil, water, etc. William Moore, Kokomo, Ind.
 473,020. Method of corrugating pipes. William J. Flecker, Peoria, Ill.
 473,068. Ore separator. Simon G. Elliott, Quincy, Mass.
 473,067. Petroleum burner. Ferdinand E. Forester, New York, N. Y.
 473,104. Amalgamating apparatus for separating gold and other metals from their ores. George J. Atkins, London, England.
 473,105. Electrolytic apparatus for separating gold and other metals from their ores. George J. Atkins, London, England.
 473,117. Electrode for use in electro-metallurgical processes. Paul Héroult, Neuhäusen, Switzerland. Assignor to the United States Aluminum Metal Company, of New York.
 473,118. Apparatus for producing aluminum or other metals. Paul Héroult, Lauffen, Switzerland. Assignor to the United States Aluminum Metal Company, of New York.
 473,143. 473,144. Apparatus for charging gas retorts. André Coze, Rheims, France. Assignor, by direct mesne assignments, to Socrates Newman and James Green, St. Louis, Mo.
 473,145. Gas retort. André Coze and Alexandre Lencauchez, Paris, France. Assignors, by direct and mesne, to Socrates Newman and James Green, St. Louis, Mo.
 473,186. Method of producing metallic zinc. Parker C. Choate, Brooklyn, N. Y.
 473,275. Elevator for mining cars. Thomas Wakefield, Ely, Minn.
 473,371. Stamp mill attachment. Louis K. Tulloch, Angel's, Cal.
 473,385. Amalgamator. Wilton E. Darrow, Amador, Cal.
 473,393. Electrode. Paul L. T. Héroult, Schaffhausen, Switzerland. Assignor to the United States Aluminum Metal Company, of New York.
 473,395. Art of amalgamating silver ores. Alexis Janin, San Francisco, Cal.

PERSONALS.

Mr. James C. Bayles has returned from Europe.

Mr. A. B. Forbes Leith, of the Illinois Steel Company, has gone to Scotland for his usual summer sojourn.

Mr. John G. A. Leishman, vice-chairman of Carnegie Brothers & Co., Limited, of Pittsburg, sailed for Europe last week, and will be absent about two months.

Mr. John Murray has written an interesting and valuable historical paper for the "Overland Monthly" of April, with regard to the date of the discovery of gold in California.

Mr. John H. Jones, for many years in charge of the bureau of anthracite coal statistics, has accepted the position of general freight agent of the Philadelphia & Reading Railroad, formerly held by him.

Mr. Murray Morris Duncan, manager of the Roane Iron Company, at Chattanooga, Tenn., has accepted the position of manager of the Antrim Iron Company of Mancelona, Mich., made vacant by the resignation of Mr. G. Fitzgerald.

Mr. Theodore F. Van Wagenen, mining engineer, formerly manager of the Union Sampler at Denver, has organized the Deming Ore Company, purchased the old smelter plant at Deming and will utilize it for a sampler, removing the same to a site about a mile east of the city.

Some time ago "Public Opinion" offered \$300 in cash prizes for the best three essays on the question, "What, if any, changes in existing plans are necessary to secure an equitable distribution of the burden of taxation for the support of the National, State, and Municipal Governments?" The competition attracted much interest, and the committee, consisting of Hon. Josiah P. Quincy, of Boston, Hon. Jno. A. Price, Chairman National Board of Trade, and Mr. W. H. Page, Editor of "The Forum," have just awarded the first prize to Mr. Walter E. Weyl, of Philadelphia; the second to Mr. Robert Luce, editor of "The Writer," Boston; and the third to Mr. Bolton Hall, of New York.

OBITUARY

Nathan B. Clark, Chief Engineer of the Navy, who died at his home in Washington, April 18th, was very well known throughout the service. He was born in Pennsylvania, and entered the Navy in 1861 as a Third Assistant Engineer. He was retired in 1868 as a First Assistant Engineer, and in 1885 was promoted to Chief Engineer.

William Smith, one of the oldest iron manufacturers of Pittsburg, died at his home in that city last week at the age of 73 years. Mr. Smith was born in Dudleyport, England, on February 18, 1819, and went to Pittsburg in 1842. Upon his arrival there he engaged in the foundry business, and for two years operated the Carron foundry. Later he formed a partnership with Jacob Painter and Joseph A. Jenks under the firm name of Jenks & Painter. In 1854 Mr. Smith withdrew from the firm and engaged in the foundry business on his own account in Pittsburg. In 1858 Jas. Park, Jr., and David E. Park became interested with him. In 1861 Mr. Smith, Edwin Miles and Thos. S. Blair put in operation the Black Diamond Steel Works. Some years after Jas. and David E. Park bought their interests. At the close of the civil war Mr. Smith started a pipe mill, and at the time of the panic of 1873 had one of the largest and best equipped pipe mills in the country. During the crisis of 1874, through his connection with the Cascade Ore Company and the Escanaba Furnace Company, he failed. For the past few years Mr. Smith has not engaged in business, but has made his home with one of his sons in Pittsburg.

INDUSTRIAL NOTES.

The Browa-Boucell Iron Company, of Youngstown, O., has been incorporated with a capital of \$1,000,000.

The American Telephone and Telegraph Company is rapidly completing a telephone line from this city to Chicago.

The Thomson-Houston Carbon Company's works at Fremont, O., recently destroyed by fire, are to be rebuilt immediately.

Victor Bishop & Co., dealers in carbons for diamond drills, and all mechanical purposes, have removed from 12 to 21 Maiden Lane, New York.

The Reading Iron Company's large mill and puddling works has resumed operations and 200 men have gone to work, puddlers are being paid \$3.40 per ton instead of \$3.75 as formerly.

The greater part of the Passaic Chemical Works has been destroyed by fire, causing a loss of fully \$50,000. The works consisted of a series of one-story detached wooden buildings, situated at the eastern extremity of Newark, N. J., on the river.

The Bessemer Iron, Mining and Manufacturing Company has been organized at Galveston, Tex., with \$1,000,000 capital. R. W. Campbell, of Galveston, and others are the incorporators. The company will erect furnaces and rolling mills.

The Gadsden Iron Company, Gadsden, Ala., reports that it has determined to discontinue business as soon as its present stock is run out, which will be in about two months, and will wait for an improvement in the iron market and better prices.

The Jeffrey Manufacturing Company, of Columbus, O., reports the following recent orders for its electric coal mining machine: Congo Mining Company, Congo, O., one machine (second order); Redstone Oil, Coal & Coke Company, Grindstone, Pa., one machine (third order); also three complete equipments for the Hocking Valley, O.

The Crane Iron Company held its annual meeting at Catasauqua, Pa., last week, and the following directors were elected for the ensuing year: Samuel Dickson, Charles S. Wurtz, Lemuel Coffin, Alexander Biddle, Samuel R. Sibley, George M. Troutman, Joseph Wharton, Robert F. Kennedy and H. W. Hazard. The board of directors organized by electing H. W. Hazard, president, and James M. Hodge, secretary and treasurer.

Mr. Wallace Andrews, president of the New York Steam Company, proposes to grind coal, in the Connellsville (Pa.) coke regions, to a fine powder and mix it sufficiently with water to make it semi-fluid, and then force it through pipes to New York. There it will be allowed to settle in great tanks and the water drained off. The coal dust will then be pressed into bricks and used for fuel. Mr. Andrews, it is known, has given much attention to the question of transporting finely-divided solid material by means of pipe lines, but the success of the present scheme will certainly be regarded as doubtful.

The Thomson Electric Welding Company will at once establish an electric metal working plant for jobbing purposes, in connection with its works at Lynn, Mass. Its facilities will be complete, and will enable it to turn out, and promptly, in large or small lots, a general line of work in iron, high or low carbon steel, brass, copper, aluminum and other metals, either by welding, brazing, forging, or other methods covered by its patents. Sections of iron and steel from No. 18 wire to six sq. ins., can be butt welded by the present machinery. The company is ready at once to make contracts.

The McCullough Iron Company held its annual meeting at North East, Md., on the 12th inst. The following board of directors was elected: E. A. Harvey, Huxley Harvey and George W. McCullough of Wilmington; Enoch McCullough and John W. McCullough of Cecil County, Md.; Henry Whiteley, of Philadelphia, and W. Irving Walker, of Baltimore. The board then organized as follows: E. A. Harvey, president; E. M. McCullough, vice-president; Huxley Harvey, treasurer; John W. McCullough, secretary; Henry Whiteley, managing director; George W. McCullough, general superintendent.

MACHINERY AND SUPPLIES WANTED AT HOME AND ABROAD.

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

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

No charge will be made for these services.

We also offer our services to foreign correspondents who desire to purchase American goods, and shall be pleased to furnish them information concerning goods of any kind, and forward them catalogues and discounts of manufacturers in each line, thus enabling the purchaser to select the most suitable articles before ordering.

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

GOODS WANTED AT HOME.

2,642. A light locomotive and cars to haul logs and lumber; also a saw or husk frame carriage and headlocks. Mississippi.

2,643. Brick machinery. Tennessee.

2,644. Sheet iron (best), perforated sheet iron, washers, rivets, etc. Virginia.

2,645. A 15-H. P. coal hoister complete. Texas.

2,646. Polishing felts, grits, powders, pulleys, shafting, mandrels for emery wheels, heavy mandrels for grindstone, belting, and an engine lathe 8-in. swing, 40 in. between centers. Arkansas.

2,647. Machinery to equip a mill for mining and preparing graphite for market, including putting it into foundry facings and other manufactured products. Georgia.

2,648. Flour barrel and hoop machinery. Virginia.

2,649. A second-hand piston pump to run by belt; capacity 250,000 to 300,000 gallons per day. Nebraska.

2,650. Ten tons 56-lb. and 40 tons 25-lb. T rails. North Carolina.

2,651. A second-hand brick press in good order, with grinding pan, with a capacity for manufac-

turing from 8,000 to 10,000 fire brick per day. Colorado.

2,652. A planer and engine lathe. Arkansas.

2,653. Porcelain tubs, heaters and other bath house supplies. Texas.

2,654. Iron for street railway to be equipped for electric system. Texas.

2,655. A threshing machine, a mower, and a small size engine for plantation use. North Carolina.

2,656. An ice-breaker to be run by steam power. Maryland.

2,657. An 80-H. P. engine and boiler complete, with stack and all fittings. Kentucky.

2,658. Prices on iron sheeting and roofing. Kentucky.

2,659. A carload of pipes from 1/2 in. to 3 ins. and a lot of fittings and brass cocks. Mississippi.

2,660. Hydrants to establish a system of water-works. Mississippi.

2,661. A one-horse ice wagon. Maryland.

2,662. Machinery to crush crude corundum into dust. Alabama.

GENERAL MINING NEWS.

Copper Monarch Mining, Smelting and Refining Company.—This company has been incorporated at Denver with a capital of \$500,000. The principal object of the company is to operate the Daly group of mines in Cochise County, Arizona, and to operate leased properties in Pueblo County, Colorado. The principal office is at Pueblo, with a branch office in Cochise County, Arizona. The directors are Charles Ruter, DeWitt C. Turner, Lewis B. Strait, Lyman W. Chandler and George J. Hartman.

ALABAMA.

St. Clair County.

Broken Arrow Coal Mining Company.—The traffic manager of the Richmond & Danville Railroad at Birmingham, Ala., has filed a bill in equity in the Federal Court asking that a receiver be appointed for this company. The petitioner claims to be the holder of \$3,500 of bonds executed by defendant company. The deed of trust covering these bonds he claims was issued to the other defendants. He further claims that defendant company owes interest on these bonds, and that a sale of the property is due by the failure to pay.

Walker County.

Carbon Hill Coal and Coke Company.—This company, of Carbon Hill, Ala., is preparing to erect coke ovens at Galloway.

ARIZONA.

Maricopa County.

Bonanza.—This mine at Canon del Oro is said to be looking well. The shaft is 80 ft. deep and in 15 ft. of ore. The ore is carbonate of lead, running yearly 100 oz. of silver to the ton.

Pinal County.

Manmoth Gold Mines, Limited.—During March this company produced bullion valued at \$16,600. The mill ran 30 days, averaging 2,900 tons of ore. The expenses for the month were \$12,200.

ARKANSAS.

Sebastian County.

Jenny Lind.—Mabebery Brothers, of Fort Smith, have begun the making of coke from the coal produced at the Jenny Lind mines. The coke is of good body, fine luster, and is said to have been pronounced by experts to be of excellent grade.

CALIFORNIA.

Amador County.

Clinton Consolidated Mining Company.—On the 350 level the vein is from 8 ft. to 30 ft. wide and is supplying \$6 ore to the 30-stamp mill. All the vein matter is stoped, about 100 tons a day are milled and it is proposed to increase the milling capacity.

Butte County.

Sierra Buttes Gold Mining Company, Limited.—The forty-fourth ordinary general meeting of this company was held in London on the 7th inst. The Chairman reported that there had been no change of consequence in the condition of either the Sierra Butte or Plumas Eureka mines. With regard to the Uncle Sam, results had been excellent. From February, 1889, to the end of the past half year 28,387 tons of ore had been extracted from the mine, yielding \$289,335. The cost of production during this time had averaged 26s per ton and the profit of 15s. per ton. Of the profit realized, £11,500 had been transferred to the capital account of the Uncle Sam for the erection of the mill, etc., and the other £9,566 had been transferred in equal moieties to the credit of the Sierra Buttes and the Plumas Eureka mines. The company now has thirty stamps dropping on Uncle Sam ore. The yield of sulphides in the mill is about £16 per ton, or in weight 1.15 per cent. of the ore treated. The cost of concentrating is 19 cents per ton of ore stamped; the cost of roasting is £2 8s per ton of concentrates; the cost of chlorination is 23s per ton. Consequently the cost of treating the sulphurets is about 40 per cent. of their gross yield.

The directors declared a dividend of 6d. per share on the Sierra Buttes shares payable on April 8th, and 9d. per share on the Plumas Eureka shares payable on the same date. The total payments on

Sierra Buttes shares to date, including the dividend just declared, have been \$317,994, while the Plumas Eureka shares have returned \$471,090.

Eldorado County.

(From our Special Correspondent.)

Placerville Gold Quartz Mining Company.—The mine has been closed down. It is understood, however, that work will soon be resumed, the water power of the company's canal being utilized to generate electricity, by which means the Dalmatia and other neighboring properties are being worked at a very low figure.

Mono County.

Bodie Consolidated Mining Company.—The capacity of the Bodie mill is to be increased by the introduction of additional pans.

Bulwer Consolidated Mining Company.—At the annual meeting of the stockholders of this company, held April 13th, 85,567 shares were represented. The following officers were elected: Herman Zadig, president; Charles H. Fish, vice-president; W. S. Wood, M. Thomson, E. B. Holmes, Robert Sherwood and H. L. Shippy, directors. L. Osborn was re-elected secretary and John W. Kelly, superintendent. The secretary's financial statement showed a credit of \$25,000. A dividend of 10 cents a share was declared.

(From our Special Correspondent.)

Mono Mining Company.—The raise from north drift 1,600 ft. level, has been extended 7 ft.; the seam of ore is small, but looks well. The ore stopes above 700 ft. level continue the same. In the stope below the south drift, 700 ft. level, the ore will average from 6 to 11 inches wide and is very rich. The mill is running steadily, the average battery samples for the week being \$39.42; tailings, \$9.96.

Nevada County.

Brunswick Consolidated Gold Mining Company.—The shaft is now 585 ft. deep. For the last 50 ft. the formation has not changed and a ledge of ore that will mill from \$25 to \$30 per ton and averaging a foot in width has been followed. The vein has developed from two inches to from 18 ins. to 22 ins., its present size in the bottom of the shaft.

San Bernardino County.

(From our Special Correspondent.)

B. & B. Gold Mining Company.—J. E. Blake, president of the Continental Oil Company, and President Manvel, of the Atchinson, Topeka & Santa Fe Railroad system, having become interested in this company, more active operations have been inaugurated.

Shasta County.

(From our Special Correspondent.)

Josephine Mining Company.—This company's property is an extension of the Calumet, and is mainly owned by Walker Brothers, of Salt Lake City. The ore is similar in character to that of the Calumet, but the owners failed to make it pay, and after sinking about \$50,000, have done little work. There is now a prospect of active operations being resumed. The owners intend to introduce the McArthur-Forrest process.

Shasta Gold Extracting Company.—This company has erected a mill of 10 tons capacity at Calumet Spur to run on custom ore. The McArthur-Forrest process will be used. Ore assaying \$15 will be paid for at the rate of 40 per cent. of the assay value, and thence on by a graduated scale until \$150 rock is paid for at the rate of 75 per cent. of its assay value.

COLORADO.

Mineral surveys approved by the United States Surveyor General, of Colorado, during the week ending April 16th, 1892:

Survey No. 7,293, Land district, Montrose, Name of claim, St. Paul Lode; 7,245, Montrose, Red Mountain Park, Illinois, Triangle, Kentucky Giant, Molly Belle, Topeka, Delaware, Old Log Cabin, Con Cave, Atlantic, Molly McCarty and Arcade Lodes; 7,351, Garfield, Achilles, Homer, Hector and Helen of Troy Lodes; 7,369, Central City, Gem Extension Lode; 7,331, Central City, Pleasant View No. 2 Lode; 7,391, Central City, Baltimore Lode. Amended Surveys.—3,914, Garfield, Jote Smith Lode.

Arapahoe County.

Citizens' Coal and Coke Company.—This company, it is said, is about to build an extensive coking plant on the Union Pacific line, near Seventh street, in Denver, Colo. This company is supposed to be an auxiliary to the Union Pacific, and will enter into strong competition with the Colorado Fuel and the Colorado Coal and Iron companies.

Chaffee County.

Pawnee Mining and Milling Company.—The new 20-stamp mill of this company has been running for over a month on ore from the Lady Murphy mine, leased by it. The bullion product has averaged about \$200 a day in addition to several tons of concentrates, worth from \$20 to \$30 a ton.

Clear Creek County.

Colorado Silver Mining Company, Limited.—This company has 52 men at work at 15 different points. The February ore sales amounted to ten tons, of which the average assay was good.

Custer County.

Bull-Domingo Mining and Leasing Company.—The

main shaft of the Bull-Domingo mine has reached a depth of 800 ft., thereby giving access to a large-body of ore which will be taken out for shipment. No more sinking will be done at present.

Geysir Mining and Milling Company.—This company is now at work on the 1,450 ft. level. No sinking is going on at present, all the men being at work in the drifts.

El Paso County.

Blue Bell.—Water has been encountered by the shaft of this mine and work in that direction has been discontinued temporarily. The tunnel, however, is being pushed and when completed will serve to drain the shaft.

Consolidated Mining Company.—The 45-ft. tunnel in the Dead Horse lode has been completed. Work is being pushed vigorously in this company's property.

Mineral Hill Mining Company.—A strike has been made in this company's tunnel. The size of the ore body has not yet been determined, but the ore is said to assay well.

Gilpin County.

Topeka County Mining Company.—This company has been incorporated with a capital stock of \$1,000,000, to operate the Topeka extension group of mines in Russell districts. The directors are Mason B. Carpenter, Percy C. Hamilton and Edward W. Williams. The principal office is in Denver.

Hinsdale County.

The gold fields near Slumgullion continue to excite considerable interest. The local exchanges, however, although full of the excitement, fail to give any details. At the Eagle group of mines many men are said to be at work.

Lake City advices report that the mines at Carson Camp are being worked more generally than those of any other district adjacent to Lake City. Among the more prominent producers are the St. Jacobs working about 40 men, the George III, with a force of about 30 men, the Dunderberg, with 15 men, and several others which are operated on a limited scale. The ore is said to be all of high grade.

Lake County.

Ground for the new smelter to be built by Edward R. Holden and others, at Leadville, was broken on April 16th.

Blind Tom.—Development work at this property is being done energetically by the lessees. A 4,000-ft. shaft has been sunk and a 1,100-ft. drift run north, from the extreme end of which an 80-ft. winze has been sunk. The contact has been struck and the indications for pay ore are thought to be good.

Castle View Mining Company.—In addition to the large bodies of argentiferous iron ore exposed at this mine, a good chute of lead ore has been struck. No shipments are being made at present, but a force of miners is busy preparing the mine for vigorous work.

Mikado Mining & Smelting Company.—Some shipments are being made from this property and a good deal of development work is being done.

(From our Special Correspondent.)

A marked increase in the amount of ore treated by the local smelters, during the month of March, over that of the previous month, is noticed. This, of course, caused a corresponding increase in the bullion product. The following table will show how this ore is divided:

Smelter.	No. of Stacks.	Tons of ore.	Tons of Bullion.
American.....	5½	6,000	828
Arkansas Valley.....	5	800	310
St. Louis.....	4	5,500	647
Elgin.....	2	2,000	240
Totals.....	16½	21,500	2,625

The number of stacks given means the average number in blast during the month. Some improvements to the different plants were made, notably the blowing in of the 5 large Bruckner cylinders at the Arkansas Valley Works, and an additional furnace at the American.

The Penrose shaft has steam up, and will commence pumping at once, the whole plant having been thoroughly overhauled and put in order, as is the case with the Star of Hope, and the Sixth Street shafts, all of these being now under one management pending the removal of the water.

Ouray County.

Paymaster.—An ore body has been struck between the third and fourth levels of this property, which is said to be of good grade.

Union Trust.—At this mine the shaft is down 250 ft. and the managers continue to sink at a rapid rate, owing to the strike in the Yankee Girl, which is close to the Union Trust side lines.

Yankee Girl Silver Mines, Limited.—The mine superintendent reports as follows: Yankee Girl Mine—No. 10 level, Southwest ore body, Stope: Ore 12 ft. long, average width 18 ins.; assays 30 to 200 oz. of silver per ton. No. 11 level, West drift: Ore 2 ft. wide in face; total width not determined; ore assays 20 to 150 oz. of silver per ton, and 4 to 25 per cent. copper. The mine is looking better.

It is reported that a strike has been made in this property. In drifting on the eleventh level, toward

the Union Trust mine, an ore body was struck which is said to be very large.

Pitkin County.

Ada.—This group of mines on Woody Creek has been sold to J. J. Yeckel and others. The consideration is not stated.

Champion-Empire Mining Company.—This company has been incorporated to work several claims on Smuggler Mountain, already considerably developed; two shafts, 400 ft. and 490 ft. deep, having been sunk, a joint incline will be run by this and the Pontiac and Mineral Farm Companies to connect with the Cowenhoven tunnel. The capital stock of the Champion-Empire Company is \$2,000,000, divided into shares of \$1 each.

Della S. Consolidated Mining Company.—The Aspen "Leader" has the following concerning the recent strike at this property, the announcement of which was published in last week's Engineering and Mining Journal: "It is understood that the ore body was found in doing development work in the Della S. claim, which lies at about the center of the group. Mr. Brunton says they have about 3 ft. of ore. For some days the tunnel had shown small pockets of fine ore, but nothing as rich as shown by the present vein."

Mollie Gibson Consolidated Mining & Milling Company.—The complaint of Jerome B. Wheeler against J. H. Hagerman, R. J. Bolles, C. E. Palmer, and this company was filed in the district court of Pitkin County on the 11th inst. The complaint is very long; it is signed by Augustus C. Brown, Walcott & Vaile and J. M. Downing, attorneys for the plaintiff, and it asks the court to set aside the sale 109,501 shares of stock of the Mollie Gibson Company made by Wheeler to Hagerman in February, 1891, and an accounting for the profits in the way of dividends since that time. The stock was sold at 90 cents a share. Plaintiff claims that it was then worth \$7 per share and is now worth \$10 per share; that the defendants conspired to keep plaintiff ignorant of the value of the mine for the purpose of buying the stock at a low figure. The prayer also asks for an injunction restraining defendants from transferring their stock on the books of the company. This is the suit that has long been rumored would be started by Mr. Wheeler, and of which the Engineering and Mining Journal of March 19 published a brief account.

Rio Grande County.

Eunice Mining Company.—A meeting of the stockholders of this company, operating at Creede, recently called at \$1,000,000, was held at Denver on the 14th inst. The following directors were elected: H. R. Henderson, of Creede; W. H. Leves, Frank F. Mead, Frederick Robinson, Jr., W. R. Crowell, of Denver; Ernest Riall, of Omaha; and Francis V. King, of New York City. The property of the company lies on Mammoth Mountain, and assays taken from the ore body are said to run well in silver and gold. The shifts are being worked.

San Miguel County.

Shipments of ore and concentrates from Telluride for the week ending April 9th have been: From Sheridan Con. 19 cars; From Smuggler-Union, 29 cars; From Cimarron, 1 car; total, 49 cars; total shipped since January 1st, 940 cars.

Caribbean.—This mine at Ophir has been closed down.

Saguache County.

It is reported that D. H. Moffat has purchased a half interest in the Baltimore, Hard Cash and Domingo from Frank Roubush. These mines are 1,000 ft. northwest of the Amethyst. The consideration is not given. J. H. Seward has sold the Little Emma mine for \$5,000. It lies on the line with the Bachelor and is said to show 20 oz. at a depth of 15 ft. A strike is reported on the property of Messrs. Pomeroy & Griswold, another on Wagon Wheel Gap and a third on the School Section. No reports of the assays have been published yet. The strike on the Bachelor property is said to be good. It is reported that an Omaha syndicate has purchased the Little Annie and the Lora mines, situated on Mammoth Mountain, from Messrs. Rialls & Leves, of Denver. Several well known Denver people are in the syndicate. It is understood that the property will be developed at an early date.

Margary.—This claim, which is an extension of the Eunice on Mammoth Mountain, has been sold to a syndicate of Denver people. Preliminary assays of the ore are said to show both gold and silver in good quantities. The members of the syndicate will, it is reported, spend a considerable sum in development work. The incorporation papers will be filed shortly and the company will be stocked at \$1,000,000.

IDAHO.

Alturas County.

Juniper.—A 300-ft. tunnel has been run on this property with its face 175 ft. below the surface. In its last 60 ft. there is a vein from 4 ins. to 2 ft. wide, averaging 140 oz. silver per ton.

Star.—The lessees of this property, near Hailey, have run 56 ft. on a vein 6 ft. to 10 ft. wide, 10 ins. to 22 ins. of which is 170-oz. galena and the balance fine concentrating ore.

Owyhee County.

DeLamar Mining Company, Limited.—Hon. J. R. DeLamar, formerly the sole owner of the DeLamar

mines, was in Boise City recently, says a local paper, having just returned from a visit to the mines. He was greatly pleased at the showing made, and said that during the last 30 days the company has opened three new veins. One of these is 11 ft. wide and runs \$70; the second is 8 ft. wide and runs \$75; while the third has been cut into 6 ft. so far and runs \$65. This gives 25 ft. of new ore of an average value of \$70 per ton, half the value being in gold and half in silver. These strikes are at a depth of 500 ft. The output for the past month has been \$91,000, of which \$16,000 was in shipping ore. The ore reserves, which have just been measured up and valued at the close of the first year of the new management, are more than double what they were at the beginning of the year, without including any part of the new strikes referred to. Capt. DeLamar estimates that the dividend for the month of April will be about \$120,000.

Phillips & Sullivan.—The owners are drifting north from the Hicks winze on ore of good grade. The width of the vein is not known, but where cross-cut above it was twenty ft. They have opened a block of ground 180 ft. in length by 160 ft. in height.

Trade Dollar.—A strike has been made in the property in "C. winze." This winze is sunk from tunnel No. 2 to a depth of 50 ft., when a drift is started north, and it was here that the rich ore chute is cut. This chute of ore is known to be 70 ft. long in No. 1 tunnel, and from intermediate workings and the present strike it has been proved to extend down without a break, and is richer than ever at a depth of 450 ft. The vein is about three ft. wide, between good solid walls. There is about 12 ins. of talc on the hanging wall which is easily picked down, leaving the ore on the foot wall stripped for "gadding" off.

Shoshone County.

Bunker Hill & Sullivan Mining and Concentrating Company.—This company and the owners of the Mammoth have arrived at an amicable understanding of their late controversy over the Mammoth claim, which is well known as the Lackawanna and Mammoth case. The terms of the settlement have been made public, but it is understood that the claimants of the Mammoth realized quite a handsome consideration. The property goes into the hands of the Bunker Hill & Sullivan Company, which will remove severe restrictions on its operations and give it an opportunity to work its mines on a more extensive scale. Notwithstanding the present distressing state of affairs on account of the shut-down, it is plain, says the Spokane "Review," that active preparations are going on for mining on a greater scale than ever before. The improvements on the tramway are going on with all possible haste.

INDIANA.

Madison County.

It is reported that a 6 ft. seam of coal has been discovered at Anderson.

IOWA.

Boone County.

Clyde Coal Company.—This company has begun sinking a new shaft on its land near the Des Moines River, at Boone. This will be in order by the opening of the coming season, and many more men will be given employment. Other improvements are said to be under consideration.

KANSAS.

Cherokee County.

During the week ending April 16th the output of ore from the mining districts of Galena and Empire City was: Rough ore, pounds milled, 2,541,670; rough ore, pounds sold, 1,580,940; zinc ore, pounds sold, 1,554,050; lead ore, pounds sold, 250,180. Sales aggregated a total value of \$17,295.

KENTUCKY.

Union County.

Ohio Valley Coal and Mining Company.—This company, at DeKoven, is opening the seam of coal known as No. 9. The coal is said to be of excellent quality, suitable for coke making, and it is the intention of the company to put up a large coke plant at this place.

MICHIGAN.

Copper.

Centennial Mining Company.—At the annual meeting of the Centennial Mining Company April 13th the following were elected directors: Alfred M. Hoyt, F. B. Hinsdale and James W. Jackson, New York; S. L. Smith, Michigan; D. L. Demmon, Boston. A resolution was unanimously carried authorizing a mortgage to secure a series of 7 per cent. coupon ten year bonds aggregating \$500,000, none of which are to be sold under 90 per cent. of their face value. The company will reserve the right to pay the same, or any part of them, after five years from date of issue. If interest is unpaid for six months the whole issue shall be declared due on written request from holders of a majority outstanding. F. B. Hinsdale, who presided, says the policy of the new management is to issue some \$75,000 bonds at present and push the work at No. 3 shaft vigorously. If copper is found more bonds may be issued for mill equipment and the development of No. 7 shaft. Treasurer Demmon

made the statement that the company is free from debt. A motion that the by-laws be so amended as to change the general offices to New York met with strong minority objections but was finally carried. Mr. Hinsdale said it was not the present intention of the directors to remove the treasurer's office from Boston. F. B. Hinsdale was elected president and D. L. Demmon secretary and treasurer. Orders have been telegraphed to start work at the mine immediately.

Tamarack Junior Mining Company.—During the past week or two changes of a favorable nature are said to have taken place in the mine. The openings on the lode show much better for mineral and appearances for the future look altogether more promising and bright. By the end of this month or the beginning of next No. 2 shaft will be in the lode.

Gold.

Fire Centre Gold Company.—A run of 52 tons of ore from this property has been made in the Ropes mill, giving an average of \$8.36 a ton. In a former run 202 tons yielded \$1,628.86, an average of \$8.06 a ton.

Michigan Gold Company.—At this mine they are following the vein which pinched to small proportions a few weeks ago, owing to the intrusion of a dyke, but it has again widened out to 2 ft., and they are expecting rich pockets such as were encountered nearer the surface.

Iron—Gogebic Range.

Lowell.—At this mine, better known as the Ironton, the work of sinking No. 3 shaft is progressing well. The shaft is near the west line of the property which adjoins the Federal. It is in the solid quartzite foot wall. Still the sinking, which is done entirely by hand, has progressed at the rate of 18 ft. per month. The present depth is 317 ft. At 335 ft. another level will be opened up in the body of ore coming in from the Federal. To complete this sinking, together with a 10 ft. sump and run a cross-cut into the ore, will take some two or three months yet, after which the Lowell will again be ready to enter the shipping list.

Iron Marquette Range.

Lake Superior Iron Company.—This company has declared its regular dividend of \$1 per share (\$60,000) and an extra dividend of \$2 per share (\$120,000) from the reserved earnings of previous years, payable April 28th to stockholders of record April 21st.

Penn Iron Company.—Shipments from the Carry and Vulcan mines have begun. This season's shipments, it is thought, will exceed those of 1891.

MONTANA.

Beaverhead County.

Polaris Mining Company.—Returns have been received from five car loads of ore from this mine that averaged \$300 per ton net. The mine is now yielding 50 tons of that class of ore per week. The ore has to be transported 45 miles by wagon.

Deer Lodge County.

Bimetallic Extension Mining Company.—Cross-cutting with the diamond drill is still under way in the south cross-cut, and it is thought some ten days time will yet be required before the vein is reached in this direction. When the diamond drill work is finished for the present, the cross-cutting to the north vein will be commenced; but until the drill work has ceased no other will be done. After the cross-cutting is begun north it will be energetically pushed to reach the veins. It is understood that the stock will soon be placed in the St. Louis market.

Granite Mountain Mining Company.—While the last monthly dividend was passed reports from the mine are encouraging. In No. 17 east, south of shaft, the ore along the foot wall, which at last reports was running 102 oz., has improved in grade and widened to 18 ins., the assays ranging from 60 to 170 oz., the average being 75 oz.

Hope Mining Company.—President Porter, of this company, reports that large bodies of ore have been encountered, and that four months' supply of ore may safely be estimated in sight.

Puritan.—This property east of the Front mine is being developed by an incline shaft 140 ft. deep. Ore is being extracted from the 100-ft. level. The vein follows almost a due easterly and westerly course from the shaft on the 100-ft. level and is about three feet in width, but while the whole vein is well mineralized the pay ore is a rich galena and lies in small streaks varying in width from one to four inches and yields an average assay of 212 ounces silver and 45 per cent. lead. In the face of the east drift on the 100-ft. level there is now about six inches solid of this ore and several specimens have been taken out that are covered with native silver. The face of this drift is now about 150 ft. from the shaft, and as it is running into a mountain it is gaining depth very fast, and as progress is made the vein is getting wider and the small ore streaks are coming together, while all of the vein matter is becoming soft. There is about six inches of talc next to the rich ore that is impregnated with silver and almost rich enough to ship.

Jefferson County.

Boulder Smelting Company.—The plant is nearly completed and will be started in a few days.

Elkhorn Mining Company, Limited.—Following is the report for the month of March: "Mill worked 28 days and crushed 1,180 tons. Bullion produced in the mill, \$33,480; 311 tons of smelting ore sold, \$20,308; total product, \$53,788. The total expenses, including expenses of removing pumps to lower level, \$25,530. Estimated profit for the month, \$33,258. The 1,350 level south is now in 430 ft.; the breast of ore is 8 ft. wide, assaying 100 oz. to 110 oz. per ton. The footwall has not yet been reached.

North Horn.—This mine, six miles southwest of Radersburg, is looking very well, a large body of good ore having been uncovered. This property was owned by Mrs. Warner, John Richards and Richard Thomas. Last week John Richards and Richard Thomas sold a third interest to J. B. Sanford and Charles Clarke, of Helena, for \$51,000. Mrs. Warner is reported to be holding out for \$100,000 for her half interest, and it is currently reported that a deal is now on with New York capitalists for that amount.

Summit.—This mine, 14 miles west of Radersburg and eight miles east of Elkhorn, is owned by Wells, Hyde & Pierce. They have sunk the shaft nearly 300 ft. and have cross-cut to the vein. It is now 16 ft. wide. They are now said to have 3 ft. of ore that will average more than \$150 per ton. They have sunk a second shaft about 300 ft. from the main shaft down the hill, and struck the vein there.

Lewis and Clarke County.

Montana Company, Limited.—The manager states that the total output for March was \$45,488, and the working expenses for the month \$37,000. The value of silver produced in March has been estimated at the price current instead of at the standard value of \$1.29 per oz., as heretofore. Had the March return been calculated on the standard value of silver hitherto adopted, the gross total sum would have been \$50,600 instead of \$45,488 as above. In addition to 7,000 tons of ore crushed in the mills during March, 1,275 tons of tailings were treated, yielding \$6,700, at a cost of \$2,950, which figures are included in the above return.

Madison County.

Easton.—Three tunnels, one of which is in ore, are being driven on this property. No. 1 is now in 100 ft., but 100 ft. more will have to be run before the rich chute, which the other two have cut, will be reached. However, this tunnel is already in 5 ft. of low grade ore.

Noble.—The 2,100 ft. tunnel on this property has cut the vein at the depth of 1,000 ft. and exposed 16 ins. of good ore.

Meagher County.

It is reported that placers in Confederate Gulch belonging to James King have been sold.

Cumberland Mining & Smelting Company.—The smelter of this company began operations on May 21st of last year, and until its present shut-down on March 25th, had run in all 249 days. Its total product in bullion for this period is 7,441,835 pounds, equal to about 3,721 tons, and average daily production was 15 tons. The ore smelted which yielded this product amounted to about 13,000 tons. In an interview with C. E. Severance, of the Cumberland mine at Castle, the following information was gained by a local paper: "During the forty-one days the new management has been in charge of the property it has kept one stack of the smelter in constant operation and this has turned out a carload of bullion per day on an average. The smelter at the end of 41 days was closed down to await the advent of cheaper and more expeditious modes of transportation, but a very progressive policy has been outlined for the development of the mine. The sum of \$6,000 per month will be expended for the next year. Drifts will be run on the 500-ft. level throughout the entire extent of the property and the ore bodies above that level thoroughly shown up. In fact the development policy will be more vigorous than ever before displayed and the entire property will be shown up. In regard to the Midland Railroad Mr. Severance had nothing to communicate. He, however, does not think the camp will be supplied with railroad communication during the present year, and is shaping his mining operations with this view."

Paragon.—A short cross-cut from the 100 ft. shaft has been made, discovering a fine body of ore. It is the intention of the owners to thoroughly develop this vein.

Queen of the Hills Mining Company.—It is stated that work will commence on this property on May 1st.

Silver Bow County.

Blue Bird Mining Company, Limited.—The remaining property of the Blue Bird Mining Company has been listed and advertised to be sold by the sheriff, May 9, at 2 o'clock. The list includes all the mining claims owned by the Blue Bird Company, consisting of the Blue Bird, Poorman, Mouo No. 2, Azor, Lackawanna, Honor, Solace, Jellyman, Sir John, Le Petit Duc, Abe Lincoln, Van Zandt, Fraction, Leggat No. 1, General Grant, Harriet, Dover, Matador, Mohawk, Jemima, John A. Logan, Giltead, Westend, Cleveland, Fleming Fraction, Little Duke, Wildflower, Little Darling, Darling, Lena K. and a lease on a portion of

the Little Darling from P. A. Largey. Besides the above mining property, there is to be sold a water right, located by Van Zandt and Fleming in Gimlet gulch, a railroad right of way over a number of the above claims, the Blue Bird mill, hoist and machinery, five lots and six houses in Rocker, a portion of the surface ground of the Chariot, one-half mile from Rocker, together with a powder house on it, and some ranch property.

Boston & Montana Consolidated Copper and Silver Mining Company.—The new plant at Great Falls has begun to produce matte; only one of the 8 furnaces was in heat April 13th, however.

Butte & Boston Mining Company.—The fire at the works of this company, on the 13th instant, destroyed the smelting department as well as the calcining building. It is thought, however, that much of the machinery can be used again. The damage is appraised at \$100,000; partially covered by insurance.

Leo.—A strike is reported in this property, formerly the Major Budd, in the 1,000-ft. tunnel. At a point 700 ft. from the mouth a raise was put up which struck ore; while another one nearer the mouth struck some high grade ore. A winze was put down 100 ft. and a cross-cut is now being made.

Moulton Mining Company.—A strike was made in the Moulton mine this week, but it is of such a low grade that at the present price of silver it scarcely pays to take it out. The vein was struck directly under the mill after about a month's prospecting, and while there is plenty of ore in sight it only averages between 15 and 20 oz. The strike was made in virgin ground. About 300 ft. west of the mill some leasers have been taking out ore which runs all the way from 50 to 80 oz., and some samples have been shown which assayed 800 and 900 oz. It is the intention to drive into the ground below these leases as soon as possible and see what is to be found there. The Moulton mine is running light handed at present, but the mill is running with a full force, largely on custom ore, however.

MISSOURI.

Jasper County.

(From our Special Correspondent.)

Joplin, April 18th.

The long looked for advance in the price of zinc ore was finally realized last week. Monday opened with an advance over the previous week, and the ore buyers seemed to be after all that was in sight. The highest price was \$25 per ton, with an average throughout the entire district of \$23 per ton. Lead ore remained in good demand at \$24 per thousand. Following are the sales from the different camps:

Joplin mines, 1,260,580 lbs. zinc ore and 255,880 lbs. lead; value, \$20,634.35.

Wehch city mines, 1,600,980 lbs. zinc ore and 43,680 lbs. lead; value, \$19,437.75.

Carterville mines, 1,575,490 lbs. zinc ore and 66,340 lbs. lead; value, \$19,677.15.

Zincite mines, 121,540 lbs. zinc ore and 5,430 lbs. lead; value, \$1,588.80.

Oronogo mines, 37,780 lbs. lead; value, \$814.

Carthage mines, 199,310 lbs. zinc ore; value \$2,362.

Wentworth mines, 42,000 lbs. zinc ore; value, \$483.

Burch Center mines, 2,270 lbs. zinc ore; value, \$53.55.

Galena, Kan., mines, 1,164,050 lbs. zinc ore and 219,980 lbs. lead; value, \$17,295.

Districts, value, \$81,345.60.

Aurora, Lawrence County, mines, 29,400 lbs. zinc ore, 722,040 lbs. silicate and 15 lbs. lead; value, \$12,858.

Lead and zinc belts, total value, \$94,203.60.

The Empire Zinc Company, of Joplin, made its first shipment of spelter direct to Europe last week, and another shipment will be made this week. The total shipment will include 50 tons, and is said to be a trial order, and should this prove satisfactory, we trust that regular shipments will be made.

The next most important transaction was the consummation of a sale of a fourth interest in the Victor mine, of Carterville, by Mr. G. B. Young, of Joplin, to E. S. Dwight, of Toledo, O., for \$25,000 cash. The Victor mine is located in the southwest corner of the town of Carterville, and the Victor company holds a long lease on 40 acres of the common land. Prospecting was first commenced on this property in the year 1887, and not less than \$10,000 was spent before the ore body was found and the mine put on a paying basis; in fact the mine has been a steady producer for the past two years, and last year the company declared a dividend of \$36,000. The average output is now about 100 tons of zinc ore per week. There is said to be a large amount of ore blocked out and in sight in the underground workings.

The McKee and McAntire mine, on the Crossman Bros. & Porter lease of the "1,000 Acres" is improving with almost every foot of development made, and last week cleaned up and sold 74,000 lbs. of free zinc ore and 8,000 lbs. of lead.

NEVADA.

Eureka County.

Cortez Mines, Limited.—It is reported that these mines will be closed down, owing to the low price of silver.

(From our Special Correspondent.)

During the month of March the Eureka & Palisade Railroad Company received for transportation to Salt Lake 1,762 tons of ore from the mines of Eureka District, as follows: Diamond, 824 tons; Eureka

Con., 585 tons; Bullwhacker, 195 tons; Jackson, 117 tons; Richmond, 17 tons; Williamsburgh, 16 tons, and Lord Byron, 10 tons.

Diamond.—The roads are still in bad condition for hauling, and there will be no ore shipped from this mine for a week or two. There were 8,000 sacks of ore ready for shipment April 9th.

Eureka Consolidated Mining Company.—The furnace dumps have been leased for one year to a party of men who will jig the slag for what lead they can find in it.

Ruby Mining Company, Limited.—About 70 tons of ore had been hauled from the Bullwhacker mine to the railroad during the first ten days of April, yet the mine is reported to be looking poorly. Considerable dead work may have to be done before the lessees will again have as good a thing as they have enjoyed for the past year or more. The lease will expire May 10th and may not be renewed; every effort is therefore being made to clean up the ore in sight before that date. It is reported that a surface tunnel, which was abandoned many years ago, will be continued for the purpose of tapping the 170-ft. level of the Dunderberg mine; that this work would hardly pay the company, but it is to be driven as a last resort, and if it does not pay the mine will be closed down. The ore being mined on the 500-ft. level in the Home Ticket section of this mine is of very low grade.

Lander County.

Big Creek Antimony Company, Limited.—The Superintendent reports that the ledge has been struck in a cross-cut 100 ft. below No. 3 level and is looking well.

Pittsburg Consolidated Gold Mining Company, Limited.—During March this company produced bullion valued at \$12,000. The expenses for mining and milling were \$8,500.

Lincoln County.

The new Ferguson district, south of Pioche, is said to contain some promising prospects. The Magnolia, owned by Ferguson & Co., is at present the best looking claim. This ledge crops out from 10 to 20 ft. above the surface and is from 20 to 50 ft. wide, and apparently 5,000 ft. long. They have sunk on this ledge 15 ft., all in ore. The ore taken out of the shaft will go, it is said, no less than \$1,500 to the ton. They have on the dump ready for shipment 18 tons of ore, which, they say, will net \$20,000. There are twelve claims in the district that show free gold in the quartz.

Lyon County.

Carson River Dredging Company.—The dredger of this company has started to work on the bed of the Carson River, below Dayton. The river gravel is supposed to carry much quicksilver and amalgam, lost from the mills on the river.

Storey County—Comstock Lode.

(From our Special Correspondent.)

The following is the weekly statement of the ore extracted and milled, with the amount of bullion shipped, etc.:

Mine.	Tons extracted.	Car sam- ple assay.	Tons milled.	Battery assay values.	
				April 9.	Bullion shipped.
Con. Cal. & Va	1,187	.....	870	\$17.50	\$21,389.65
Hale & Norcross	535	.....	441	17.05	4,418.00
Overman	137	\$26.04	143	.....	.....
Potosi	350	.....	200	24.38	.....
Savage	523	.....	523	20.50	17,500.00
Yellow Jacket	210	.....	.....	.....	.....

* Cars. † Yield for the week.

Belcher Mining Company.—The ore uncovered in the north drift, 300 level, is of high grade, and advices received yesterday are to the effect that the ore, which a week ago varied in width from 6 in. to 3 ft., shows some signs of widening out. It is the intention to raise and sink on it. The north drift on the seventh floor from the south raise, 1,300 ft. level, has the face in quartz assaying from \$4 to \$11 per ton.

Consolidated California & Virginia Mining Company.—The mine expenses have necessitated the drawing on the San Francisco office for \$6,000 during the current month, leaving only \$9,000 on hand after paying all expenses for March. The various openings in the mine are yielding the usual amounts of ore, but the weekly reports fail to give any reasonable basis for the rumors of decided improvement on the 1,750 and 1,800 levels.

Consolidated Imperial Mining Company.—Ore continues to be taken out from old fillings, and small streaks are being found on the upper levels, all of which is being shipped to the Brunswick mill for reduction.

Ophir Silver Mining Company.—Some fair milling ore is being extracted from the mouth of the north drift, 1,465 level.

Overman Silver Mining Company.—Bunches of fair grade ore are being encountered in the upraise, 1,200 level, from northwest drift, which has connected with the winze down from the 1,100 level. On the 1,100 level, on 42 level above the track at a point 240 ft. in northwest drift, a cross-cut has been made to eastward 15 ft. on a seam of good ore. There is also about 2 ft. of ore in the north west drift, on

ninth floor 1,100 slope, which assays from \$32.37 to \$42.55 per ton.

White Pine County.

(From our Special Correspondent.)

Messrs. Ross & Sire have a mine which adjoins the Cornell property that has about 400 tons of ore on the dump ready for shipment. There are considerable quantities of ore at the various mines in White Pine District, which will be hauled to the railroads for transportation to the smelters as soon as the roads will be in good condition. On April 5th 16 tons of ore were received at the E. & P. R. R. depot from the Cornell mine for transportation to Salt Lake.

NEW MEXICO.

Grant County.

Grant County Mining and Milling Company.—This company, which has been operating several mines under lease as well as the Bremen Mill, has suspended operations owing to the unprofitable workings of its low grade ores at the present price of silver.

Jim Crow.—The strike in the mine is giving evidence of permanence. At a depth of 80 ft. there is 6 in. to 18 in. of remarkably rich ore.

Lincoln County.

Lady Godiva.—A press dispatch from White Oaks announces that a three-foot vein of high grade gold ore has been struck in this mine.

PENNSYLVANIA.

Coal.

Since the blowing out of so many ovens in the coke regions many of the Hungarian and Polish workmen are said to be leaving for their native country, taking with them enough money to secure them comfortable homes, while some others are leaving for the anthracite fields.

Cora Coke Works.—These works, belonging to John S. Newmyer & Sons, will soon cease operations for want of coal. Ten of the 42 ovens in the plant were blown out some time ago, and the remaining coal in the hill is nearly worked out. The firm has, however, purchased a body of coal on Washington run, on the P. McK. & Y. R. R., and will build a block of 50 ovens there.

H. C. Frick Coke Company.—The work of rebuilding 125 ovens at the Mammoth Coke Works of this company has been commenced and they will be fired up as soon as ready if the condition of trade permits.

Kingston Coal Company.—Senator W. H. Hines and E. P. Cosgrove have brought suit against this company at Williamsport, to recover \$325,000 for coal and minerals taken from land claimed by them.

Pennsylvania Railroad Company.—Officials of this company are reported to have said that they were endeavoring to purchase the output of several collieries, and that they would if necessary make extensions to the collieries. They admitted also that an extension has been surveyed from Tomhicken through Hazleton to Port Jervis, and that other extensions would be made in the near future. The officials of the Philadelphia & Reading Railroad said that they were not at all disturbed at the Pennsylvania's aggressive attitude, and that it would not interfere with the anthracite combination.

Simpson & Watkins, the coal operators, recognizing the high premiums paid by their employes for insurance, have adopted a plan by which the latter are insured in one of the largest capitalized accident insurance companies at a moderate figure. The plan was submitted to the men several weeks ago for their adoption, and was approved of by a large majority. The cost of the insurance is about 1.1% of the wages earned, which amount is deducted by the company every pay day. The benefits derived are as follows: For accidental injury while at work, at home, on the streets, on the railroads, or any injury which results in the loss of any two members of the body, they receive for the former one-half of their wages, together with medical attendance free, for the duration of the disablement. For the latter they receive one-half of their year's wages, the company furnishing medical attendance. If death results from injuries within three months one-half of a year's wages is paid, together with medical attendance and funeral expenses.

CHEMICALS AND MINERALS.

NEW YORK, Friday Evening, April 22.

Heavy Chemicals.—While the market, generally speaking, may be called dull, the position of most of the heavy chemicals is quite firm. Caustic soda is better, prices in some instances being slightly higher. Carbonated soda ash is firmer, as is also alkali. The Durham colliers' strike continues. This has, of course, had some effect on this market, especially in Newcastle brands of sal soda, which are somewhat scarce. Quotations are as follows: Caustic soda, 70%, 2.95@3.10c.; 74%, 2.97½@3.12½c.; 76%, 3.12½@3.25c.; 77%, 3.12½@3.25c. Carbonated soda ash, 48%, 1.62½@1.75c.; 58%, 1.50@1.55c. Alkali, 48%, 1.60@1.65c.; 58%, 1.47½@1.57½c. Sal soda, English, 1.10@1.12½c. Bleaching powder, 2.15@2.20c. on the spot.

Acids.—Business continues good in this market, and manufacturers report better prices, especially in sulphuric acid. It is said that, with the exception of old contracts which were closed at low prices, the

business now doing is at better figures. We continue to quote acid per 100 lbs. in New York and vicinity, in lots of 50 carboys or more: Acetic, \$1.60@2.20, according to quality; alum, lump or ground, \$1.55@1.80; muriatic, 18", \$1.20; 20", \$1.12; 22", \$1.25; nitric, 40", \$4; 42", \$4.50@4.75; sulphuric, 90c. @ \$1.10; mixed acids, according to mixture; oxalic, \$7.25@7.75. Blue vitriol is quoted all the way from \$3.25@3.50. Glycerine for dynamite, 11 1/2 @ 12 1/2 c., according to quality and quantity.

Brimstone.—This market, owing to the unsettled feeling abroad about the instability of prices, has been very quiet. Prices are lower than last week. We quote: Brimstone to arrive, \$22.50 for best mixed seconds, and \$21.50 for best unmixed thirds.

Fertilizers.—The market has slackened off in fertilizers. There is still a fair demand for ammoniates and most of the city lots have been picked up, but we do not hear of any large sales in any one special case. Quotations are: Sulphate of ammonia, \$2.90 for bone goods and \$2.90@2.95 for gas liquor. Dried blood, \$1.95 @ \$2 per unit for high grade and \$1.85 @ \$1.90 for low grade. Acidulated fish scrap, \$11 @ \$12 factory. Dried scrap, \$23.50 @ \$24. Azotine, \$1.85 @ \$1.90. Tankage, \$17.50 @ \$21, according to grade. Bone meal, \$22.50 @ \$23.50.

Double Manure Salts.—Quotations are as follows for lots of from 10 to 50 tons ex-vessel New York: 48-53%, \$1.13 1/2 @ \$1.23 1/2; 90-95%, \$2.13 @ \$2.23 1/2.

Kainit.—There is nothing of interest to report of this chemical. Prices remain \$8.75 for invoice weight and \$9 for actual weight, New York and Philadelphia.

Muriate of Potash.—There has been the usual number of arrivals during the week, and the market continues as last reported.

Phosphates.—There is nothing of any interest to report of this market. From Charleston we continue to hear rumors of low-priced sales, but no actual transactions below the price last quoted in this column last week have come to our knowledge. Kiln-dried 57% guaranteed is quoted at \$5.25 @ \$5.50 f. o. b. Charleston.

There was a meeting of the Charleston fertilizer companies on the 19th inst. for the purpose of trying to put them all under one management. Nothing definite was arrived at, but there is to be another meeting at an early date, and rumor says F. S. Rodgers is to be general manager and Albert M. Rhett general superintendent.

Nitrate of Soda.—This market continues very quiet. Quotations for spot goods are \$1.70 @ \$1.72 1/2. Quotations for nitrate to arrive differ very much, according to the dealer. The majority declines to name any price.

Liverpool. April 13.

(Special Correspondence of Joseph P. Brunner & Co.) There is very little life in our market for heavy chemicals at present, which is quite an unusual feature at this season of the year.

On the Tyne the chemical manufacturers still continue to have trouble owing to the difficulty of getting supplies; on this account stocks have been reduced considerably in that district.

Soda Ash.—Manufacturers are declining to sell except for small lots, for any delivery earlier than July. The quotations are quite nominal, and for the commoner qualities may be quoted as follows: Caustic ash, 48%, 45 6s. 3d. per ton; 57@58%, 46 7s. 6d. per ton; carb. ash, 48%, 45 9s. 9d. per ton; 58%, 46 12s. 9d. per ton; ammonia ash, 58%, 46 7s. 6d. per ton, all net cash. For prime brands a considerable premium on above quotations are demanded.

Soda crystals are steady at £3 10s. to £3 12s. 6d. per ton less 5%, but there is not much activity to report.

Caustic soda is very flat, and orders very scarce. Quotations remain unchanged as follows: 60%, £9 7s. 6d. per ton; 70%, £10 10s. per ton; 74%, £11 10s. per ton; 76% £12 7s. 6d. to £12 15s. per ton, all net cash. For parcels under 10 tons 5s. per ton extra is charged. The Alkali Company will not sell on this market for export to the States.

Bleaching powder quiet at £7 15s. to £8 per ton net cash for hardwood packages; to all quarters except the United States and Canada.

Chlorate of potash is receiving little attention, and although the syndicate price for any delivery extending to June is 7d. per lb., resale parcels can be had at 6 1/2 d. For July to December the syndicate quote 6 1/2 d., while resellers would probably take 6 1/2 d. per lb., less 5%.

Bicarbonate soda in fair demand at £6 15s. to £7 per ton, less 2 1/2 %, for one cwt. kegs, according to brand and quantity, with usual allowances for larger packages.

Sulphate of ammonia.—There is not much going on in this article, and the position shows little change. The nearest spot quotations are £10 6s. 3d. @ £10 7s. 6d. per ton for good, grey 24%, and £10 10s. @ £10 12s. 6d. for 25%, both in double bags, less 2 1/2 % f.o.b. here.

MINING STOCKS.

[For complete quotations of shares listed in New York, Boston, San Francisco, Baltimore, Denver, Kansas City, Deadwood, Dak., Pittsburg, St. Louis, London and Paris, see pages 461 and 466.]

NEW YORK, Friday Evening, April 22.

The market for mining stocks continues as dull as ever, and prices, if anything, are weaker. Nothing of interest has occurred during the week. Occasionally, a rumor starts out to cause a favorable reaction upon some particular stock, but the attempt

always proves abortive and dullness once more reigns. It will take something more than mere rumors to infuse life into the market.

The Comstocks were in but little request and prices show a decline over last week. There was a sale of 125 shares of Consolidated California & Virginia at \$4; 100 shares of Crown Point at 45c., assessment not paid. Comstock Tunnel stock appeared in some demand during the week, 3,100 shares being sold at 13 @ 14c.; of the bonds there was a sale of 1,000 shares at 16c. It is rumored at the Exchange that the company will pass the interest on its bonds, and that this is the reason for the present price. Owing to the lateness of the hour we were unable to see Mr. Theodore Sutro, president of the company, on the subject. There was a sale of 100 shares of Mexican at 45c., and 150 shares of Sierra Nevada at \$1.35 @ \$1.40.

The only other Nevada stock dealt in was Eureka Consolidated, of which 100 shares were sold at \$2.

Of the California stocks Bodie Consolidated was dealt in to the extent of 500 shares at 40 @ 45c. Of Bulwer 1,100 shares are reported to have been sold at 50 @ 55c. There was a sale of 200 shares of Plymouth at \$1.75, and 400 shares of Standard at \$1.35 @ \$1.60. Belmont declined during the week with reported sales of 2,100 shares. The stock opened at 50c. and closed at 30c. Of Brunswick Consolidated, transactions during the week aggregate 6,500 shares at 9 @ 11c. This company has levied assessment No. 3 of 2c. per share, payable immediately at the office of the company, Nevada Block, San Francisco, Cal., or to the treasurer, Mr. H. R. Lounsbury, 57 Broadway, New York City.

Of the Colorado stocks there were sales of 400 shares of Chrysolite at 18c. @ 19c., and 600 shares of Leadville Consolidated at 16c. @ 18c.

The Black Hills stocks were quiet. Of Caledonia 500 shares were sold at \$1 @ \$1.05; while of Deadwood Terra only 50 shares were sold at \$2.05.

Ontario shows a sale of 20 shares at \$41. The only other Utah stock dealt in was Horn Silver, of which 800 shares were sold at \$3.05 @ \$3.20. This is lower than for a long time past.

Of Alice 100 shares were sold at 60c. Only one transaction is reported in El Cristo, viz.: 100 shares at 65c.

Boston. April 21.

(From our Special Correspondent.)

In the early dealings of the past week there was a good degree of activity in the copper stocks, and prices advanced on good buying orders and the firmness of the ingot market both here and abroad; but the supply of stock was more than equal to the demand, and in consequence all the advance was lost, and the market closes with a downward tendency, and at prices generally the lowest for the week.

Boston & Montana advanced from \$44 @ 45 1/2 on the report that the Anaconda mine was to be shut down, but on the denial of the report, the stock dropped to \$42 1/2, and was freely offered at the decline. There was also some expectation that a dividend would be paid next month, but it is now stated that there is no probability of a dividend for the present. Butte & Boston sold at \$15 1/4, but subsequently declined to \$14 1/4 on the general weakness of the market.

Calumet & Hecla was the strongest stock on the list, selling up from \$277 to \$280, but it was offered to day at \$278 without takers. There were no sales of Tamarack during the week. The stock is offered at \$175, which was the price of the last sale. Centennial sold in the early dealings at \$10 and advanced with the rest of the market to \$12 1/2, reacting and selling to-day at \$11, closing at \$10 1/2 bid, 11 1/4 asked. Franklin advanced to \$15 1/2, with reaction to \$15 1/4. The annual meeting was held yesterday, which is reported as harmonious, but no account of the condition of the company was given for publication.

Oseola sold up to \$33 1/2, reacting to \$32 on to-day's market. Kearsarge, which sold last week at \$12 1/2, advanced to \$14 1/2 and closed at \$13 1/2.

The balance of the list was pretty generally neglected. Only a small lot of Atlantic is quoted at \$12. Of Allouez 100 shares only sold at \$1, and 250 shares of Arnold sold at \$1 1/2.

Santa Fe was steady on small sales at 37 1/2 @ 40c.

The silver stocks were entirely neglected and no sales are reported for the week.

3 P. M.—The market this afternoon was a shade firmer for Boston & Montana and Butte & Boston, the former selling at \$42 1/2 and the latter at \$14 1/4, an advance of 1/4 and 1/8 respectively. Centennial sold off to \$11.

San Francisco. April 16.

(From our Special Correspondent.)

Prices have continued weak in the mining stock market during the week ending to-day, but notwithstanding no bad break has occurred and trading has been more active than might have been anticipated. It was expected that by the 10th of this month Mr. Mackay would have arrived, and his non-appearance has been an additional cause for the market sagging all the more, as by his late letters no date is set for his appearance on the scene.

During the week Consolidated, California and Virginia shares have declined 65 cents, that stock selling this morning for \$4.05. Of the other northenders Ophir sold for \$2.10; Mexican, \$1.45, and Union, \$1.25. All these show a decline of from 20 to 50 cents per share.

In the middle group of Comstocks, Hale & Norcross has shown the greatest decline, a loss of 55 cents per share having taken place on the week's business. In spite of this loss, however, rumors

continue rife of an advance soon to take place in this stock. It sold this morning at \$1. Best & Belcher was quoted at \$2.30, Gould & Curry at \$1.35; Potosi at \$1.10, and Savage at \$1.35.

The Gold Hill and South End Comstocks have shared in the general depreciation of values during the week, Alpha selling for 25 cents; Belcher, \$1.40; Caledonia, 25 cents; Chollar, 90 cents; Crown Point, \$1.10; Kentucky, 5 cents; Overman, 80 cents, and Yellow Jacket, \$1.

Of the outside stocks scattering sales have been made of Mono at 90 cents, Mt. Diablo at \$1.10, and Nevada Queen at 75 cents, with trading very light.

SAN FRANCISCO, April 22d. (By telegraph.)—The opening quotations to-day are as follows: Best & Belcher, \$2.20; Bodie, 35c.; Belle Isle, 15c.; Bulwer, 45c.; Chollar, 90c.; Consolidated California & Virginia, \$4.20; Gould & Curry, \$1.25; Hale & Norcross, 90c.; Mexican, \$1.30; Mono, 75c.; North Belle Isle, 15c.; Ophir, \$2.20; Savage, \$1.45; Sierra Nevada, \$1.20; Union Consolidated, \$1.05; Yellow Jacket, 75c.

St. Louis. April 21.

(From our Special Correspondent.)

Business was very dull this week and limited for the most part to one property—Central Silver. Prices were rather better, but as only a dozen stocks were bid on the change was not a general one.

Central Silver opened at 1 1/2 c. on a sale of 1,700 shares; 1,000 shares more sold the following day at the same figure. On Monday 500 shares sold at 1c. and on Tuesday 12,000 shares sold at the same price, the market closing at 1c.

Granite Mountain was on the market this week and several trades were made. Opening at \$13.50, 50 shares sold. Then the market became quiet, with \$13 bid and \$13.75 asked.

American & Nettie opened at 55c. and closed at 50c. Sales were 200 shares at 55c. and 200 shares at 55 @ 55 1/2 c.

Elizabeth opened at 42 1/2 c. and soon sold at 45 @ 46 1/2 c., 300 shares changing hands. On Monday 200 shares brought 45c., and the stock closes firm at 43 1/2 c.

Silver Bell had a sale of 200 shares at 12 1/2 c. The stock is neglected at 12c. bid.

One thousand shares of Little Albert sold at 4c. on Tuesday. The stock closed at 3 1/2 c.

Bi-metallic was very strong, and from an opening of \$18.50 is now quoted at \$20; no sales. Yuma is stationary at 3c. bid.

A new property has been listed. It is known as the Eureka & Excelsior and opened at 7 1/2 c.; it then advanced to 9c. and closes at 8c.; no sales.

MEETINGS.

Hudson River Ore and Iron Company, at the office of the company in New York City, May 10th, at 12 o'clock noon.

Iron Silver Mining Company, at the office of the company, No. 52 Broadway, New York City, May 3d, at 12 o'clock noon.

Morgan Mining Company, at the office of the company, No. 230 Montgomery street, San Francisco, Cal., May 7th, at 11:30 A. M.

Santa Juliana Mining Company, at the office of the company in New York City, April 27th, at 12 o'clock noon.

Sloss Iron and Steel Company, at the office of the company in Birmingham, Ala., April 29th, at 12 o'clock noon.

ASSESSMENTS.

Table with columns: COMPANY, No., When levied, Div't in office, Day of sale, Am. per share. Lists various mining companies and their assessment details.

DIVIDENDS.

Bulwer Consolidated Mining Company, dividend No. 20 of ten cents per share, \$10,000, payable April 23th, at the Farmers' Loan and Trust Company, New York City.

Daly Mining Company, dividend No. 62, of twenty-five cents per share, \$37,500, payable April 30th at

the office of Messrs. Lounsbury & Co., Mills Building, No. 15 Broad street, New York City. Transfer books close April 27th and reopen May 1st.

Homestake Mining Company, dividend No. 165 of 10 cents per share, \$12,500, payable April 25th at the office of Messrs. Lounsbury & Co., Mills Building, New York City. Transfer books close April 20th and reopen April 26th.

Ontario Silver Mining Company, dividend No. 191 of fifty cents per share, \$75,000, payable April 30th at the office of Messrs. Lounsbury & Co., Mills Building, No. 15 Broad street, New York City. Transfer books close April 27th and reopen May 1st.

PIPE LINE CERTIFICATES.

UNCONSOLIDATED STOCK AND PETROLEUM EXCHANGE.

	Opening.	Highest.	Lowest.	Closing.	Sales.
Apr. 16.....	58 1/4	59 1/4	58 1/4	59 1/4	41,000
18.....	59 1/4	59 3/4	59	59 3/4	6,000
19.....	59 3/4	59 3/4	59	59	12,000
20.....	58 3/4	59 1/4	58 3/4	59 1/4	11,000
21.....	59 1/4	59 3/4	59	59 3/4	36,000
22.....	59 1/4	59 3/4	59	59	25,000
Total sales in barrels					131,000

COAL TRADE REVIEW.

NEW YORK, Friday Evening, April 22d.
Statement of shipments of anthracite coal (approximate), for week ending April 16th, 1892, compared with the corresponding period last year:

Regions.	April 16, 1892.	April 18, 1891.	Difference.
	Tons.	Tons.	
Wyoming Region.....	376,850	328,676	Inc. 48,174
Lehigh Region.....	102,080	87,632	Inc. 14,448
Schuylkill Region....	180,035	174,613	Inc. 5,422
Total.....	658,965	590,921	Inc. 68,044
Total for year to date.....	10,596,696	9,651,590	Inc. 945,106

Statement of shipments of anthracite coal for month of April, 1892, compared with the corresponding period last year.

Compiled from the returns furnished by the mine operators.

Regions.	March, 1892.	March, 1891.	Difference.
	Tons.	Tons.	
Wyoming Region.....	1,622,338.15	1,300,240.03	Inc. 322,098.12
Lehigh Region.....	433,016.06	399,351.11	Inc. 33,664.95
Schuylkill Region....	1,016,894.18	813,838.05	Inc. 203,056.13
Total.....	3,072,248.39	2,513,430.19	Inc. 558,818.20

Regions.	For year 1892.	For year 1891.	Difference.
	Tons.	Tons.	
Wyoming Region.....	4,769,386.19	4,219,737.19	Inc. 549,649.00
Lehigh Region.....	1,313,586.05	1,273,529.01	Inc. 40,057.04
Schuylkill Region....	3,011,705.17	2,538,355.15	Inc. 473,350.02
Total.....	9,094,677.41	8,031,621.15	Inc. 1,063,056.26

The stock of coal on hand at tide water shipping points: March 31st, 1892 was 821,023 tons; on February 29th, 1892, 885,653 tons; decrease, 64,630 tons.

PRODUCTION OF BITUMINOUS COAL for week ending April 16th, and year from January 1st.

EASTERN AND NORTHERN SHIPMENTS.

	1892.		1891.
	Week.	Year.	Year.
Phila. & Erie R. R.....	1,308	27,170	40,270
Cumberland, Md.....	77,800	1,007,202	1,284,266
Barclay, Pa.....	3,607	59,396	51,990
Broad Top, Pa.....	13,227	175,558	176,946
Clearfield, Pa.....	67,764	1,076,731	1,326,317
Allegheny, Pa.....	25,535	339,022	425,595
Beach Creek, Pa.....	43,171	668,022	691,891
Pocahontas Flat Top.....	50,108	720,757	706,479
Kanawha, W. Va.....	41,072	731,298	672,411
Total	323,602	4,803,176	5,376,174

WESTERN SHIPMENTS.

	1892.		1891.
	Week.	Year.	Year.
Pittsburg, Pa.....	26,433	384,284	269,072
Westmoreland, Pa.....	41,015	538,693	611,867
Monongahela, Pa.....	16,516	140,488	167,606
Total.....	83,964	1,063,465	1,048,545
Grand total	407,566	5,866,641	6,424,719

PRODUCTION OF COKE on line of Pennsylvania R. R. for the year ending April 16th, 1892, and year from January 1st, in tons of 2,000 lbs.: Week, 101,010 tons; year, 1,710,505 tons; to corresponding date in 1891, 883,015 tons.

Anthracite.

The shipments during the past week have exceeded the allotment by but 33,965 tons. Stocks are decreasing, however, and this surplus will be taken up. This tendency to keep to the allotment makes the market firm, though it is still quiet. There seems to be a demand for all the coal produced under the restriction. It is stated that an advance of from 10 cents to 15 cents per ton will be made by the Reading May 1st. At a meeting of the Western Sales Agents yesterday the price of coal at West-

ern points was advanced 25 cents a ton. This, it is said, was done to meet the advance in freight to Western points of 25 cents, made some time since. In fact, the whole tendency of the market is toward higher prices.

The sensation of the week, of course, was connected with the Reading deal. The Pennsylvania Railroad announced a cut in rates of 26 cents a ton, or from \$1.70 to \$1.44, based on the published terms of the Reading to individual operators, viz.: 40% of New York net prices. The Pennsylvania assumes that the average net price is \$3.60, and states that freights will be advanced if the price of coal advances. The officials state, furthermore, that the change of rates had been in contemplation for some time and that nothing inimical to the Reading was intended.

But the Reading officials and the coal trade in general think differently, and believe that it is a declaration of war. Yet they do not think, since the Pennsylvania carries but 8% of the anthracite product, that this will affect the deal in the slightest. It is said among other things that the operators favored by this reduction will calmly pocket the difference and will not make cut-rate prices. Coal has been known to advance in the face of a decrease in freights and *vice versa*. The Reading people are going calmly about their way, securing collieries every day, while the Pennsylvania, it is stated, though on the same hunt, has secured but two. Among other collieries secured by the Reading are the Wilburton and Morris Ridge collieries, as well as the Mount Carmel and Bellmore.

Bituminous.

The number of scattering orders, some of which are for large tonnages, has somewhat surprised the coal operators, who thought that the trade was virtually closed. These will probably continue to come in for some little time, as the stocks of the consumers in many cases are low. There is no active bidding for trade on the part of the operators, who nearly all have their hands full. Prices, therefore, remain firm, although there are still rumors of cutting in the Clearfield region. There has been a serious blockade on the Pennsylvania Railroad during the past week, making Philadelphia and South Amboy deliveries very difficult. The Baltimore & Ohio seems to neglect the coal traffic. It has been difficult for a number of operators to get cars, and even to get their own cars returned. The Chesapeake & Ohio Canal has been handling from 300 tons to 400 tons daily of Cumberland coal, but vessels at Georgetown are scarce; owners have ceased to look for freight there. The operators have urged them to send their crafts to Georgetown.

Ocean vessels at all the ports are in fair supply; but the owners are complaining of low freights, and not without reason, for there has been a steady decline in freights from Philadelphia to Boston, for instance, from \$1.30 in January, 1890, to 75c. in 1892. During the decline as low as 50 cents was received. Many of these owners, therefore, are advertising their vessels for sale.

As our statement to the effect that when the Norfolk & Western Railroad makes new tolls, as is reported, the Pocahontas Coal Company would not be so strong a factor in depressing the market has been construed by some to intimate that the Pocahontas Coal Company had been cutting rates, we should say that no suggestion of this was intended at all. The Clearfield producers, some of which are credited with exceptional favors from the Pennsylvania Railroad, have been the chief "cutters" of prices, and the fact that the Pocahontas Company with its excellent coal has scarcely held its own in this market of late is proof that some one is "cutting" prices. As a rule Cumberland companies live well up to the agreement.

We believe that the Pocahontas Coal Company has abandoned those aggressive tactics which were an important factor in the depression of 1890, but the fact remains that it is favored not only by a wide vein of excellent coal and cheap mining, but by a remarkably low tariff on a road which has been always able to fulfill its promises of rapid delivery, and it has been enabled to declare satisfactory dividends on its stock.

It is hardly known what action the Pennsylvania Railroad will take in reference to the threatened competition of the Baltimore & Ohio in transportation to New York. We hear that the Baltimore & Ohio has made some contracts but not as many as it would like; still it looks as if it was after some of the Pennsylvania's business. It has just concluded an agreement with the Columbia Iron Company whereby the Somerset and Cambria branch will be extended from Johnstown, Pa., into the bituminous coal fields of northern Cambria County, hitherto controlled by the Pennsylvania.

NOTES OF THE WEEK.

The Philadelphia & Reading Coal and Iron Company has begun preparations for the erection of a large new breaker at Preston No. 3 slope, near Ashland. When completed it will give work to over 500 men.

It is reported that the Pennsylvania Railroad has purchased the Duhois estate. The consideration named is reported to be about \$17,000,000. There are about 28,000 acres of land in the tract, the greater portion of which is underlaid with coal. With the exception of perhaps 2,000 or 3,000 acres, the whole tract is heavily timbered. The annual output of manufactured lumber amounts to upward of 20,000,000 ft. The low-grade division of the Allegheny Valley Railroad, now under control of the Pennsylvania Railroad, runs through the tract from east to west,

while the Ridgeway & Clearfield, connecting with the Philadelphia & Erie at Johnsonburg, gives an outlet to the north.

Boston. April 21.

(From our Special Correspondent.)

The anthracite market is very firm; in fact it has not been so strong for years. The hand of the combination is plainly seen and dealers here are anxious to know what the agents of the allied companies intend to do. Some prominent dealers here expect to see the prices advanced 25c. on anthracite and 15c. per ton on other grades. There are others who expect an advance of only 10c. per ton. Buying is quite extensive except in a few cases where dealers are very conservative and are rather skeptical in regard to the power of the combination. Prices on anthracite are very firm.

We quote f. o. b. prices net at New York: Stove, \$3.75@3.90; egg, \$3.60@3.75; free broken, \$3.50@3.65; chestnut, \$3.30. Lykens Valley: Broken, \$4.00; egg, \$5.00; stove, \$5.40; chestnut, \$4.50.

As about all the soft coal contracts in this section of the country have been closed there is a comparative lull in the market. Prices are held firm by dealers, especially by those who have closed contracts and who desire to keep the good faith of their customers. One large contract remains to be closed, and that is by the New York & New England Railroad Company which will take about 175,000 tons, and most likely place its order some time next month. Soft coal on cars here is steady at \$3.75 per ton.

Freight rates remain steady. There is not much doing, which tends to depress rates. We quote: From New York to Boston, 55@60c.; from Philadelphia to Boston, 80@85c.; from Philadelphia to Portland, 80c.; to Bath, 85c.; to Providence, 75c.; from Baltimore to Boston, 90@95c.; Newport News to Boston, 75@80c.; Sound Points, 70c.

Retailers have done a good business so far this month. In fact this and last month have been active ones in the retail coal trade, and prices have been firmly maintained in consequence.

We quote: Stove, \$5.50; nut, \$5.50; egg, \$5.25; furnace, \$5.25; Franklin, \$6.75@7, all sizes; Lehigh egg, \$5.50; Lehigh furnace, \$5.50. Wharf prices 50 cents less than the foregoing.

The receipts of coal at this port for the week ending April 16th were 406,546 tons of anthracite and 12,729 tons of bituminous, against 28,241 tons of anthracite and 23,228 tons of bituminous for the corresponding week last year. The total receipts thus far this year have been 470,107 tons of anthracite and 179,026 tons of bituminous, against 303,101 tons of anthracite and 286,661 tons of bituminous for the same time last year.

Buffalo. April 21.

(From our Special Correspondent.)

There is no news of interest to the coal trade. Prices remain unchanged. Anthracite is in light request, but bituminous is fairly active. The weather for several days has been bright, but with brisk winds.

Navigation interests have received a damper. Shippers are not anxious to send coal westward, and nearly all vessels have left port light. Down freights from Chicago have fallen so low that bare expenses will be realized for the trip. Some of our vesselmen have stopped fitting out their boats, preferring to await developments.

The Welland Canal opened April 19th; vessels passed the Sault Ste Marie Canal April 18th. Duluth harbor is again blocked with floating ice. Water will be let into the Erie Canal next Sunday.

Vessel charters for coal were made during the past week at 25c. to Toledo, 40c. to Chicago, Milwaukee and Sheboygan; Duluth dropped 10c., contracts having been made at 20 c. per net ton.

The total shipments of coal this season to noon to-day as reported at the Custom House were 44,168 net tons, distributed as follows: 28,800 to Chicago, 3,400 to Milwaukee, 5,153 to Duluth, 1,000 to Superior, 700 to Racine, 2,000 to Gladstone, 1,100 to Sheboygan, 2,010 to Toledo.

Chicago. April 21.

(From our Special Correspondent.)

The meeting of the Anthracite Coal Association of this city, referred to last week, was held at the Wellington Hotel. The following subjects were discussed: "Relation of the wholesale to the retail dealer," "the jobber," "control of stocks which enter into competition with production," "deliveries," "credits," "railroad rates," "relations between ourselves, municipal, railroad and manufacturing contracts."

A report of this convention will be presented to a meeting of the Western anthracite shippers, to be held to-day in New York. It would appear that the sole object of the meeting of operators here was to prepare themselves for the New York convention and to formulate some plan of action with regard to general Western business. We are assured that the question of prices was not discussed, and only an informal interchange of ideas was indulged in with regard to any subject matter concerning the market. The operators, shippers and companies' officials who attended the meeting were: George Merryweather, Robert Law, Walter S. Bogle, A. T. Thatcher, H. S. Vanigen, John W. Lowe, I. W. Skeele, F. S. Peahody and G. W. Meeker, Chicago; E. W. Saunders, St. Paul; C. E. Wales, Minneapolis; Thomas Hodgson, M. E. Robinson and J. C. Batchelor, Buffalo; S. C. Schenck, Toledo; E. Elmore, H. M. Benjamin and F. R. Buell, Milwaukee. There is some inquiry for hard coal and it is evi-

dent that dealers are taking more interest in it than has been manifested for some time. One of them, connected with a large house here, remarked: "My house has not yet been successful in obtaining offers of less than \$5.25, and if we cannot get our supplies at less figures we may as well pull out of the business." This in itself shows the almost utter demoralization which has prevailed in the anthracite coal market in past years, and accounts in a large measure for the cutting and slashing of the circular. It is evident that in the future all who handle, buy or consume anthracite coal will have to pay its market value, be it much or little.

Retail trade continues excellent for the season and the consumption has been greater than was expected. The season is drawing to a close and still the demand is good. Of course the weather is entirely responsible for this condition. The stocks carried over are insignificant and Western shipments will be heavy. Since the opening of navigation several vessels have arrived with coal for this port and South Chicago.

Bituminous coal is quiet and the excessive supply so notable of late is gradually being worked down to more reasonable limits; there is, though, still a large surplus. As to the matter of prices, they are holding their own fairly well considering the tonnage moved. Several important railroad contracts have been placed and there are others still in abeyance. There is no trouble expected in Indiana, and in several districts miners' representatives have already signed contracts for the coming season. In Illinois the same harmonious condition exists between employer and employe. In Iowa the situation is not so bright, and difficulty is anticipated, though resident agents say that the points in dispute will be smoothed over and the matter settled before May 1.

Demand for coke is rather quiet, and further improvement will very largely depend on the outlook for iron. Best or Frick's coke remains very steady as quoted.

Quotations are: \$4.65 furnace, \$5.05 foundry crushed, \$5.40 Connellsville; West Virginia, \$3.90 furnace, \$2.10 foundry; New River foundry, \$4.90; Walston, \$4.65 furnace, \$5 foundry.

Circular prices are unchanged at the following rates: Lehigh lump, \$6.25; large egg, \$5; small egg, range and chestnut, \$5.25. Retail prices per ton are: Large egg, \$6.00; small egg, range and chestnut, \$6@6.25.

Prices of bituminous per ton of 2,000 lbs., f. o. h. Chicago, are: Pittsburg, \$3.15; Hocking Valley, \$3; Youghiogheny, \$3.25; Illinois block, \$1.90@2; Brazil block, \$2.35.

Pittsburg. April 21.

(From our Special Correspondent.)

Coal.—The market has not been active and there was only a moderate inquiry for local purposes. A rise in the river since our last report enabled the coal men to forward to Cincinnati 1,056,000 bushels; to Louisville 1,452,000. In fact the stage of water in the Ohio River for some time past has made shipments possible as fast as the boats were loaded. There is a large supply of coal in all the Southern and Western markets. Prices rule at a very low figure. Robert Jenkins, one of our coal men, has purchased 200 acres of coal land at Minersville, Rostraver Township, in the Monongahela Valley, and will open a new mine immediately.

On April 20 the railroad miners of District No. 5 will hold a convention in Pittsburg, when steps will be taken to organize another district composed of the Monongahela River miners. A meeting will be held at Monongahela City to perfect the organization.

Connellsville Coke.—The orders for some time past have been limited. The blowing out of 500 furnaces caused a drop in the coke production of 6,002 tons. There seems to be a feeling that if the present stagnation in the coke trade continues for 30 days a still worse condition of affairs will be the result, which may possibly cripple the coke business for the balance of the year. Charges are still made that some of the independent operators are quoting coke considerably below regular rates to secure contracts, and refuse to take any action to maintain standard rates. Of the 85 plants 3,486 ovens made six days, and 7,835 five days. The shipments for the week aggregated 114,030 tons, distributed as follows: For Pittsburg, 1,910 cars; points west of Pittsburg, 3,000; to points east of Pittsburg, 1,425; total, 6,335. Western shipments decreased 164 cars; Pittsburg, 15 cars. Prices are unchanged.

METAL MARKET.

NEW YORK, Friday Evening, April 22, 1892.
Prices of Silver Per Ounce Troy.

April.	Sterling Exch. ge.	London.	N. Y. Cents.	Value of sil. in \$1.	April.	Sterling Exch. ge.	London.	N. Y. Cents.	Value of sil. in \$1.
16	4.87½	39½	86	.665	20	4.87½	39½	87	.672
18	"	39½	86½	.666	21	"	40	87½	.675
19	"	39½	86½	.669	22	"	40½	87½	.676

The market, which had been very quiet around the Easter holidays, became firm on the 19th on a

continental order, and all silver offered was absorbed. At the close of the week the buying has been either suspended or the order completed, and silver does not look so firm. Rumors about a gold loan on Indian account are not confirmed.

The United States Assay Office at New York reports the total receipts of silver for the week to be 91,000 ounces.

Silver Bullion Certificates.

	Price.		Sales.
	H.	L.	
April 16.....	.....	.....	.....
April 18.....	.....	.....	.....
April 19.....	86½	.....	40,000
April 20.....	87¼	87¾	118,000
April 21.....	88	87¾	55,000
April 22.....	.....	.....	.....
Total sales.....	.....		213,000

Domestic and Foreign Coin.

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

	Bid.	Asked.
Trade dollars.....	70	75
Mexican dollars.....	68	70
Peruvian soles and Chilean pesos.....	67	70
English silver.....	4.83	.....
Five francs.....	93	95
Victoria sovereigns.....	4.86	4.90
Twenty francs.....	3.86	3.90
Twenty marks.....	4.74	4.76
Spanish doubloons.....	15.69	15.70
Spanish 25 pesetas.....	4.81	4.83
Mexican doubloons.....	15.50	15.70
Mexican 20 pesos.....	19.50	19.60
Ten guilders.....	3.96	4.00
Fine silver bars.....	87½	88½

Copper.—The demand for copper has fallen off somewhat this week, and the business done was much smaller than for the last six weeks or so. Consumers are now rather well supplied, and first hands sticking out for high prices no impetus has been given to trading. Besides, the reopening of navigation is now close at hand, and the first shipments are awaited impatiently, being expected to arrive at point of consumption toward the middle of May. There is continually a very large demand for wire bars, and for spot delivery rather a large premium could be obtained, and even for shipment promptly upon the opening of navigation, prices can be realized that are somewhat higher than for other forms of Lake. A few days ago some sales of wire bars were made at 12¼c., but since then there have been no buyers above 12c. For casting copper there has been, if anything, a better inquiry, and prices are steady at about 11¼@11½c. We have not heard of any business in Arizona pig copper.

On the 18th a report appeared in the papers that the upper works of the Anaconda had closed down, which would have meant a reduction of one-half in its output, but this rumor was quickly contradicted by Mr. Haggin.

The negotiations regarding the restriction of production are dragging along in London, where a meeting was held on the 19th, only to be postponed to some unfixd date.

The London market opened firm after the holidays at £46 2s. 6d. for spot and £46 12s. 6d. for futures, but when the meeting of the producers was adjourned without any definite action having been taken, the market became rather flat and prices gave way to £45 7s. 6d. and £45 17s. 6d., the closing figures being £45 10s. for spot and £46 for three months prompt. According to cables received the statistical position of copper does not show any change for the first half of this month. Hardly any buying orders have come over from Europe for the past fortnight, which may be explained partly by the fact that values with us are rather higher, and partly by the fact that consumers abroad are well stocked. Besides, consumption in Europe does not appear to be as good as in this country. For manufactured we quote: English tough, £48 10s @£49; best selected, £49 10s. @£50; strong sheets, £58 @£58 5s.; India sheets, £54 10s. @£55; yellow metal sheets, 5¼d.

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

To	Copper	Matte.	Lbs.	Value
To Liverpool—	Copper	Matte.	Lbs.	Value
S. S. Normandie.....	4,101	bags.	441,260	\$30,000
" Servia.....	2,193	bags.	242,141	16,000
" Denmark.....	1,857	bags.	200,387	14,000
To London—	Copper.	Lbs.	Value	
S. S. Buffalo.....	29	bbls.	36,250	\$3,988
To Hamburg—	Copper.	Lbs.	Value	
S. S. Marsala.....	171	bbls.	217,342	\$24,650
To Rotterdam—	Copper.	Lbs.	Value	
S. S. Spaarndam.....	270	bbls.	337,500	\$35,439

Tin was rather excited and prices showed a not unimportant advance for the week. The good statistical position of the article had been manifest for some time, but owing to the dull condition of things in general had but little effect on prices, until now, when a very large demand has sprung up and it is seen that everywhere stocks are small. The East is a reluctant seller and offers nothing except May-June shipment, so evidently there is a falling off in production there, while there surely is an increase in the consumption in Europe and the United States. A further rise from to-day's figures of 20¼@20½c for spot and futures, is therefore more likely to occur than not.

In London the opening prices of the week were £92 10s. for spot, and £92 10s. for futures, and the

closing figures are £93 10s. and £93 10s. respectively.

Lead remains rather scarce, and the Western producers will sell only at higher prices. Nevertheless there is no deficiency on the Atlantic Coast as large quantities of Mexican hullion are continually arriving here, where they can be kept, to advantage, even after paying the duty of 2c. per pound. The market is somewhat irregular, and we have to quote 4¼@4¾c.

The London market is again lower, the price for Spanish lead having declined to £10 10s. and for English £10 12s. 6d.

Chicago Lead Market.—The Post, Boynton Strong Company telegraph us as follows: "Sales for the week will foot up to 700 tons at 4½c. and 4½c. The market is strong at the close, with 4½c. bid and 4½c. asked."

St. Louis Lead Market.—The John Wahl Commission Company, telegraphs us as follows: "Lead is quiet at 4½c., at which price buyers do not appear as eager for the metal as they were a few days ago, still the market cannot well be called weak, but we rather think prices have reached top for the present."

Spelter is rather firmer and bigger. Producers are mostly entirely sold out up to the end of May and we can to day raise quotations from 4½@4¾c.

In London good ordinaries are quoted at £22 5s., and specials at £22 7s. 6d., but these prices are only for prompt delivery, there being no buyers for forward.

Antimony is dull but steady; Cookson's at 14¼@14½c., L. X. at 12¼@12½c. and Hallett's at 10¼@11c.

IRON MARKET REVIEW.

NEW YORK, Friday Evening, April 22.

Pig Iron.—This market continues to exhibit the same features which have characterized it for some weeks past. There is the same disinclination on the part of buyers to secure any iron, except for immediate requirements, and business has been dull. Sellers display some impatience at the backwardness of consumers, for they say that at the present figures there should be no difficulty in disposing of a great deal of iron. Yet such is the case, and although it is alleged that prices have not been shaded in order to book orders, the greater portion of the week's sales has been made by the agents of those furnaces which are obliged to market all their product in order to keep running.

During the week there has been some talk to the effect that negotiations were pending having for an object the consolidation of the Cahaba Coal and Mining Company, the Excelsior Company, the Pioneer Mining and Manufacturing Company, and the Woodward Iron Company with the Tennessee Coal, Iron and Railroad Company and the De Bardeleben Coal and Iron Company, of which the latter two recently combined (as mentioned in the ENGINEERING AND MINING JOURNAL of March 12th, 1892). It is stated that representatives of these companies met in New York and talked the matter over. No definite plan has been given out and it is hinted by more than one person that the whole story is simply a movement to affect the price of the Tennessee Coal, Iron and Railroad Company's stock and bonds, which are listed on the New York Stock Exchange.

Prices remain unchanged, as follows: Northern No. 1 X, \$16; No. 2 X, \$15; Southern No. 1 X, \$15.50 @ \$16; No. 2 X, \$14.50 @ \$15.

Spiegeleisen and Ferro-Manganese.—With the exception of a few small sales of spegeleisen at private terms nothing of any interest has occurred in this market. Quotations remain as follows: 20% speiegeleisen, \$26@27, and 80% ferro-manganese, \$61.50@62.

Steel Rails.—There have been no large transactions during the week, and great dullness still prevails in this market. Prices for standard sections remain unchanged, but the fact that light rails are offered at the same price—\$30 f. o. b. mill—would indicate the desire on the part of the mills for more work. An item of general interest to the trade was the sale of 10,000 tons of hillets by the Maryland Steel Company. Exact figures are not obtainable, but the price is said to have been low. We understand that during the week hillets have been offered freely at \$22. This will serve to show the condition of the market. Steel rails continue to be held at \$30 f. o. b. mill and \$30.75 tide water.

Rail Fastenings.—There is nothing of interest to report of this market. It continues lifeless. Quotations nominally are as follows: Fish and angle plates, 1½@1¾c.; spikes, 1½@2c.; bolts and square nuts, 2½@2¾c.; hexagonal nuts, 2¾c.

Merchant Steel.—Although prices have been fairly well maintained, manufacturers declare that they cannot sell at lower figures without suffering actual loss. Business in the market for merchant steel has been as dull as it could be. Nothing of importance has occurred during the week. We quote: Mushet's special, 48c.; English tool, 15c. net; American tool steel, 7@8c.; special grades, 13@18c.; crucible machinery steel, 4½c.; crucible spring, 3½c.; open hearth machinery, 2½c.; open hearth spring, 2½c.; tire steel, 2½c.; toe calks, 2½@2¾c.; first quality sheet, 10c.; second quality sheet, 8c.

Tubes and Pipe.—This market has been quiet featureless. Prices remain unchanged. We quote ruling discounts as follows: Butt, black, 57½c.

butt, galvanized, 47%; lap, black, 67%; lap, galvanized, 55%; boiler tubes, under 3 in. and over 6 in., 55%; 3 in. to 6 in., 60%.

Structural Material.—Some dealers report a fair business during the week, but the majority state that the resumption work has not been serious yet. We continue to quote: Beams, 2'30@2'50c.; angles, 1'90@2'10c.; sheared plates, 1'85@2c.; tees, 2'40@2'60c.; channels, 2'40@2.50c. Universal plates, 2'10c.; bridge plates, 2'10c. on dock. In some cases lower prices have been obtained, but on the whole the above quotations are fair.

Old Rails.—Nothing of interest can be said of old rails, for nothing is doing. They are quoted at \$20.50, and we do not hear of any sales, even at this price.

Buffalo. April 21.

(Special report by Rogers, Brown & Co.)

The demoralization in prices has induced a small movement in the direction of providing for future wants. This demoralization has reached an acute stage, giving the impression there was no bottom, until a point was touched where furnaces began to draw the line, beyond which they would not go. This has given a slight tone of firmness; aside from this former conditions prevail. The consumption of iron in the region tributary to this market continues below the normal. We quote on the cash basis f. o. b. cars Buffalo: No. 1 X foundry strong coke iron, Lake Superior ore, \$15.75; No. 2 X foundry strong coke iron, Lake Superior ore, \$14.75; Ohio strong softener, No. 1, \$15.75; Ohio strong softener, No. 2, \$14.75; Jackson County silvery, No. 1, \$18; Jackson County silvery, No. 2, \$17; Lake Superior charcoal, \$17@17.25; Tennessee charcoal, \$18.25; Southern soft, No. 1, \$14.75@15; Alabama car wheel, \$19; Hanging Rock charcoal, \$20.50.

Chicago. April 21.

(From our Special Correspondent.)

There is less activity in the crude iron market, brought about by the belief on the part of consumers that prices will go no lower. Implement makers have bought quite freely to piece out the season's requirements, and some orders are still coming forward. There is also quite a little revival in finished iron, and as the month draws to a close mill agents take a firmer stand, and bars and steel sheets are fetching 25c. to 50c. a ton more than they were a month ago. The mills look for a certain amount of trouble when the scale comes up for consideration. Structural material gives promise of further activity, and the season bids fair to be a busy one. Plates and sheets are moving more freely, and light gauge black sheets are in fair inquiry from jobbers and dealers, some of whom have already placed contracts for summer delivery. Merchant steel is in some demand, and the amount of business handled by the mills has been surprisingly large. Heavy sections of steel rails are rather quiet, but demand for the light kinds is fair.

Pig Iron.—Actual transactions for coke iron are larger, and the improved demand evidently results from a firmer belief on the part of consumers that bottom has been reached, or that prices are not going to be any lower, and they are consequently disposed to cover for legitimate requirements. The movement of carload lots has been notably good for local brands. Several of the largest agricultural implement makers in this vicinity have been obliged to buy more iron, and a number of inquiries are now in the market ranging from 300 to 1,000 tons. American Scotch irons are in fair demand in small quantities, and the aggregate tonnage is large. Local coke iron is firmer, and to all appearances the weak spots have been eliminated. Lake Superior charcoal is less active than a week ago, some inquiry for round lots is noted from bargain hunters, but our inside figures cannot be shaded to any extent. Southern soft iron continues in moderate demand in small lots.

Quotations per gross ton f. o. b. Chicago are: Lake Superior charcoal, \$16.75@17.25; Lake Superior coke, No. 1, \$14.50@15; No. 2, \$14@14.25; No. 3, \$13.75@14; Lake Superior Bessemer, \$16.50; Lake Superior Scotch, \$15.50@16; American Scotch, \$17@17.50; Southern coke, foundry No. 1, \$15; No. 2, \$14.50; No. 3, \$14; Southern coke, soft, No. 1, \$14.50; No. 2, \$13.75; Ohio silveries, No. 1, \$17.50; No. 2, \$17; Ohio strong softeners, No. 1, \$17.50; No. 2, \$16.50; Tennessee charcoal, No. 1, \$17.50; No. 2, \$17; Southern standard car wheel, \$20@21.

Structural Iron and Steel.—The actual tonnage required for the steel frame building "Teutonic" reported last week is 601 tons. Several more new buildings will be ready for figuring on by end of month. Regular quotations car lots f. o. b. Chicago are as follows: Angles, \$2@2.10; tees, \$2.20@2.30; universal plates, \$2.05@2.15; sheared plates, \$2.10@2.15; beams and channels, \$2.25@2.50.

Plates.—Demand is now active from warehouse, but agents state there is not much mill business. Steel sheets, 10 to 14, \$2.40@2.50; iron sheets, 10 to 14, \$2.20@2.30; tank iron or steel, \$2.10@2.15; shell iron or steel, \$3@3.25; firebox steel, \$4.25@5.50; flange steel, \$2.75@3.25; boiler rivets, \$4.10@4.25; boiler tubes, 2 3/4 in. and smaller, 55%; 7 in. and upward, 65%.

Merchant Steel.—There is still a good demand from implement makers, and new business crops out in unexpected quarters. In some specialties mills are behind with orders. We quote: Tool steel, \$6.50@6.75 and upward; tire steel, \$2.25@2.30;

toe calk, \$2.40@2.50; Bessemer machinery, \$2.10@2.20; Bessemer bars, \$1.75@1.90; open hearth machinery, \$2.40@2.60; open hearth carriage spring, \$2.25@2.30; crucible spring, \$3.75@4.

Galvanized Sheet Iron.—There is a fair movement of this article and warehouse business has greatly improved. Discounts are weak, but unchanged at 70% off on Juniata from mill and 67 1/2% off from warehouse, and 67 1/2% and 5% off on charcoal; an extra 2 1/2% or 5% is given on quality orders.

Black Sheet Iron.—Sheet steel of the lighter gauges is higher. Black sheets are in fair inquiry and some good orders were placed last week at 25c. Chicago basis No. 27; dealers ask 3@3.10c. for same gauge from stock.

Bar Iron.—Mills are much stiffer, and the tendency is upward. Some fair sized orders are in the market, and railroads are buying more freely. Mill orders are placed at 1'60@1'65c., and deliveries restricted to July 1st. Jobbing orders are filled at 1'70@1'80c., according to quality.

Nails.—Wire nails are in good inquiry, and some mills are quoting \$1.70 and others \$1.75 on the new card. Jobbing price is \$1.85 from stock. Steel cut nails are in moderate demand from factory at \$1.60 regular average. Jobbing trade is good at \$1.70 from stock.

Steel Rails.—Large orders are very limited, but small contracts for early use aggregate a good sized tonnage, running from 100 to 1,000 tons. Quotations on such are \$31.50@32. Other track supplies are in light demand. Splice bars are quoted at 1'80c. for steel or iron, spikes at \$2.05@2.2 per 100 lbs. track bolts; hexagonal nuts, \$2.65@2.70.

Scrap.—Transactions are few, and prices weaker. It would appear that almost any offer is accepted. No. 1 railroad, \$17; No. 1 forge, \$16; No. 1 mill, \$10.50; fish plates, \$18; axles, \$21; horseshoes, \$17; pipes and flues, \$8; cast borings, \$6.50; wrought turnings, \$9.50; axle turnings, \$10.50; machinery castings, \$10; stove plates, \$8.50; mixed steel, \$10.50; coil steel, \$14; leaf steel, \$15; tires, \$15.50.

Old Material.—One lot of iron rails changed hands at equal to \$19.50 Chicago, but inquiry is very light. Old Steel rails are flat at \$13@14.50 according to length and condition. Old car wheels are very dull at \$15.50@16. Sales limited to a few car lots.

Louisville. April 15.

(Special Report by Hall Brothers & Co.)

Lethargy still pervades the iron market. While there has not been much change in the last week, sharp competition for business has caused some shading even of the already remarkably low figures. Quantity, which has heretofore been a governing factor for prices, seems to have not been considered recently by some companies, and carloads have gone at the lowest figures out for round lots. We quote:

Hot Blast Foundry Irons.—Southern coke No. 1, \$14@14.25; Southern coke No. 2, \$13@13.25; Southern coke No. 3, \$12.75@13; Southern charcoal No. 1, \$16@17; Southern charcoal No. 2, \$15.50@16; Missouri charcoal No. 1, \$17@17.50; Missouri charcoal No. 2, \$16.50@17.

Forge Irons.—Neutral coke, \$12.50@12.75; cold short, \$12.25@12.50; mottled, \$11.50@12.

Car Wheel & Malleable Irons.—Southern Standard brands, \$20@21; Southern (other brands), \$18.50@19.50; Lake Superior, \$19.50@20.50.

Philadelphia. April 22.

(From our Special Correspondent.)

Pig Iron.—The makers of best No. 1 foundry have within the past 24 hours vigorously sought to make sales on a basis of \$16 without success. Foundry men act very strangely, and when questioned admit that prices are probably at their lowest, but they do not buy. What the outcome will be no one can tell. No. 2 is sold all the way from \$14.50 to \$15, but very few large contracts are reported. The situation is very disappointing all around. Forge iron is very little better. An occasional large lot is taken, merely to keep the mills going. Quotations, \$14@14.50. Furnace men are trying their best to make sales. There are rumors of large transactions with Southern furnace companies, but they cannot be verified; offerings are made, and some Southern iron is selling.

Steel Billets.—Rumors of large transactions are rife; so far as facts are uncharted, only small sales are proven. Quotations range from \$25 to \$25.50. Buyers declare there will be lower prices within a week. Some shading has been done, but the facts cannot be got at. All hands are very reticent.

Muck Bars.—One or two sales have been made at quotations which cannot be had.

Merchant Iron.—Some makers claim a further improvement has taken place, but the bar mill men are having a hard time of it and are not running full time. Quotations, \$1.60@1.75. The conditions of the market seem to be changing.

Nails.—Nails are moving quite freely, but at prices that are not at all satisfactory. Building operations have set in, and dealers and storekeepers are now starting up, having waited as long as possible. Car-load lots, \$1.65.

Sheet Iron.—The makers report a good demand for sheet, and orders coming in quite briskly for both immediate and summer delivery. The manufacturers are willing to book ahead as far as buyers see fit to risk the placing of orders.

Merchant Steel.—A good demand has set in for all kinds of merchant steel, but it transpires that much of the business for the past week or two has been done at concessions from card rates. The sellers of merchant steel have been pushing trade very actively.

Plate and Tank Iron.—The only activity this week is among the smaller buyers of plate tank, and the aggregate is quite satisfactory. Buyers of ship plate are now negotiating for deliveries for the next two or three months, some say for longer periods, but extremely low prices are reported. The condition of the plate trade is bad enough, but an improvement as to volume of business is likely to present itself before long. Refined plates are selling at 2'10c.

Structural Material.—Small orders are coming in quite freely on a basis of 1'90c. for bridge plate and angles. Beams, channels and tees range from 2'25@2'30c. There are several very heavy requirements as usual, but nothing further is known concerning the placing of them.

Steel Rails.—Two or three additional rumors are out referring to the early placing of large orders for rails, but no mills are mentioned, and it is probable the rumors have not much back of them. Quotation, \$30. The only actual business admitted by the companies here is the placing of small orders.

Old Rails.—Old rails are quoted at \$20.

Pittsburg. April 21.

(From our Special Correspondent.)

The market has shown but little change. Demand continues small and there is no improvement in prices. Pig iron sales have been restricted to limited amounts, to be used as mixtures principally, for immediate delivery. The larger consumers, generally, refuse to consider orders of large blocks at present prices and, as there is no inclination on the part of leading producers to shade the prices now ruling, trade continues to be of a hand to mouth character.

The statistics show the falling off that has taken place in consumption since the beginning of the year and the extent to which the furnaces have been piling up their output. There has been an increase of 132,366 gross tons of iron, held by the furnaces and the storage yards, over the amount unsold on the first of the year. Since our last issue we have conversed with several furnacemen from the Shenango and Mahoning valleys, who said: "We do not propose to close down any more furnaces. Of course, some are filling orders for iron sold for future delivery; others, who have been less fortunate in securing contracts, are piling up their stock as fast as made."

A well-informed iron dealer makes this statement: "Business is in a very depressed condition, but it is very unlikely that stocks of pig iron amounting to less than 9% of the year's consumption should be the primary cause of the depression. The difficulty is not with pig iron any more than it is with other branches in which there is either over-production or the capacity for over-production. The demand is large enough in some directions, but in others there is such disproportion that the entire machinery is out of adjustment."

Coke Smelted Lake and Native Ores.

2,000 Tons Bessemer, June, July	.....	\$14.35 cash.
1,500 Tons Bessemer, April, May	.....	14.50 cash.
1,000 Tons Bessemer, May, June	.....	14.50 cash.
1,000 Tons Grey Forge, May, June	.....	12.90 cash.
1,000 Tons Bessemer Spot	.....	14.50 cash.
700 Tons Grey Forge	.....	12.90 cash.
500 Tons Bessemer, April	.....	14.50 cash.
500 Tons Grey Forge, April	.....	13.00 cash.
500 Tons Grey Forge	.....	12.85 cash.
500 Tons Grey Forge, April, May	.....	12.90 cash.
500 Tons Grey Forge	.....	13.00 cash.
250 Tons No. 2 Foundry	.....	14.25 cash.
200 Tons No. 1 Foundry	.....	15.25 cash.
100 Tons No. 1 Silvery	.....	17.00 cash.
50 Tons No. 1 Silvery	.....	15.50 cash.

Charcoal.

100 Tons Mill Iron	.....	17.75 cash.
100 Tons Warm Blast	.....	19.00 cash.
100 Tons Cold Blast	.....	27.60 cash.
75 Tons No. 3 Foundry	.....	19.50 cash.
25 Tons Cold Blast	.....	26.75 cash.
25 Tons Cold Blast	.....	26.00 cash.

Steel Slabs and Billets.

1,200 Tons Steel Billets and Slabs	.....	23.00 cash.
1,000 Tons Steel Billets April, May	.....	22.75 cash.
500 Tons Steel Billets May	.....	23.00 cash.
500 Tons Steel Billets and Slabs	.....	23.60 cash.

Muck Bar.

2,000 Tons Neutral, next four months	.....	25.60 cash.
1,000 Tons Neutral, May, June	.....	25.00 cash.
500 Tons Neutral	.....	25.60 cash.

Ferro Manganese.

150 Tons 80% domestic delivery	.....	63.00 cash.
100 Tons 80% imported delivery	.....	62.00 cash.

Skeip Iron.

500 Tons Skeip Iron	.....	1.77 1/2 4m
450 Tons Narrow Grooved	.....	1.55 4m
350 Tons Wide Grooved	.....	1.57 1/2 4m

Steel Wire Rods.

460 Tons American Fives, May	.....	31.85 cash.
500 Tons Rail Ends, May	.....	16.50 cash.

Scrap Material.

250 Tons Leaf Springs, gross	.....	20.50 cash.
200 Tons Railroad Steel Tire, net	.....	16.00 cash.
100 Tons No. 1 Railroad W. Scrap, net	.....	17.00 cash.
50 Tons Old Horseshoes, gross	.....	22.00 cash.
50 Tons Coil Springs, gross	.....	18.00 cash.

Old Iron and Steel Rails.

500 Tons Old Iron Rails	.....	21.25 cash.
500 Tons Mixed Steel Rails	.....	15.50 cash.
300 Tons Old Iron Rails	.....	21.50 cash.
100 Tons Old Iron Rails	.....	21.40 cash.

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

Main table of New York Mining Stocks Quotations, including columns for Name and Location of Company, dates from April 16 to April 22, and Sales.

*Ex-dividend. †Dealt at in the New York Stock Ex. Unlisted securities. ‡Assessment paid. §Assessment unpaid. Dividend shares sold, 6,145. Non-dividend shares sold, 12,900. Total shares sold, 19,045.

BOSTON MINING STOCK QUOTATIONS.

Table of Boston Mining Stock Quotations, including columns for Name of Company, dates from April 15 to April 21, and Sales.

Dividend shares sold, 7,872. Non-dividend shares sold, 8,372. Total shares sold, 16,244.

COAL STOCKS.

Table of Coal Stocks, including columns for Name of Company, dates from April 16 to April 22, and Sales.

†Ex-dividend. Total shares sold, 1,192,012

San Francisco Mining Stock Quotations.

Table of San Francisco Mining Stock Quotations, including columns for Names of Stocks and Closing Quotations from April 15 to April 21.

DIVIDEND-PAYING MINES.

NON-DIVIDEND PAYING MINES

Main table with columns: NAME AND LOCATION OF COMPANY, CAPITAL STOCK, SHARES (No., Par), ASSESSMENTS (Total levied, Date and amount of last), DIVIDENDS (Total paid, Date & amount of last), NAME AND LOCATION OF COMPANY, CAPITAL STOCK, SHARES (No., Par), ASSESSMENTS (Total levied, Date and amount of last).

G. Gold, S. Silver, L. Lead, C. Copper. *Non-assessable. †This company, as the Western, up to December 10th, 1891, paid \$1,400,000. ‡Non-assessable for three years. §The Deadwood previously paid \$275,000 in eleven dividends and the Terra \$75,000. ¶Previous to the consolidation the Terra \$75,000. Previous to the consolidation the Terra \$75,000. ¶Previous to the consolidation the Terra \$75,000. ¶Previous to the consolidation the Terra \$75,000.

STOCK MARKET QUOTATIONS

Aspen, April 18. The closing quotations were as follows: Agnes C., Argentinum Junata, Aspen Deep Shaft, Aspen Contact, Best Friend, Bimetallic, Bushwacker, Carbonate Chief, Della S., Homer & Alta, Justice, Little Annie, Mollie Gibson, Nolan Creek, Park, Mamie & Queen, Pontiac, Sheep Mountain S. & M. Co., Snuggler, St. Joe & Mineral Farm, Yellow Boy.

Baltimore, Md., April 21. Bid. Asked. COMPANY. Atlantic Coal, Balt. & N. C., Big Vein Coal, Conrad Hill, Cons. Coal, Diamond Tunnel, George's Creek Coal, Lake Chrome, Maryland & Charlotte North State, Silver Valley.

Pittsburg, Pa., April 21. Prices highest and lowest for the week ending April 21: Allegheny Gas Co., Bridgewater Gas Co., Chartiers Val. Gas, Columbia Oil, Consignee Mining Co., Consolidated Gas Co., East End Gas Co., Fisher Oil Co., Forest Oil, Hazlewood Oil Co., Hidalgo Mining Co., La Noria Mining Co., Luster Mining Co., Mansfield C. & C. Co., Manufacturers Gas Co., Nat. Gas Co. of W. Va., N. Y. & Clev. Gas Coal Co., Ohio Valley Gas Co., Pennsylvania Gas Co., People's Natural Gas Co., People's N. G. & P. Co., Philadelphia Co., Pine Run Gas Co., Pittsburg Gas Co., Red Cloud Mining Co., Silverton Mining Co., South Silver Gas Co., Sterling Silver Mining Co., Tuna Oil Co., Union Gas Co., Washington Oil Co., Wmoreland & Camb., Wheeling Gas Co., W'house E. Light, W'house Air Brake Co., W'house Brake Co., Ltd.

St. Louis, April 20. Closing Prices. Bid. Asked. Adams, Colo., American & Nettie, Colo., Bi-Metallic, Mont., Elizabeth, Mont., Granite Mountain, Mont., Hope, Leo, Little Albert, Montrose Placer, Colo., Mickey Breen, Pat Murphy, Colo., Small Hopes, Colo., Silver Age, Silver Bell, Yuma, Ariz.

Deadwood, April 16. Bid. Asked. Bullion, Caledonia, Calumet, Cambrian, Carthage, Deadwood Terra, De Smet, Double Standard, Elk Mountain, Emmett, Equitable, Florence, Golden Reward, General Merritt, Harmony, Hester A., Homestake, Hermit, Iron Hill, Isadorah, Maggie, Monitor, Rainbow, Retriever, Ross-Hannibal, Ruby Bell, Ruby Wilkes, Seabury-Calkins, Silver Queen, Stewart, Tornado, Troy, Uncle Sam.

Helena, Mont.

(Special report by SAMUEL K. DAVIS.) Prices highest and lowest for week ending April 16, 1892: Bald Butte (Mont.), Benton Group, Mont., Bi-Metallic, Mont., California (Castle), Mont., Champion (Oro Fino), Mont., Combination (Phillips'g), Mont., Copper Bell (Cataract), Mont., Cornucopia, Mont., Cumberland (Castle), Mont., Elizabeth (Phillipsburg), Mont., Florence (Neilhart), Mont., Fourth of July, Wash., Glengary (Victor), Mont., Helena & Victor, Mont., Ingersoll, Mont., Iron Mountain (Missoula), Mont., Jersey Blue (Butte), Lone Pine Consolidated, Moulton, Mont., Poorman (Coeur d'Alene, Idaho), Queen of the Hills (Neilhart), Southern Cross (Deer Lodge), Mont., Yellowstone (Castle), Mont.

Trust Stocks.

Special report by C. I. Hudson & Co., members New York Stock Exchange The following are the closing quotations April 22: AMERICANS. Am. Cotton Oil Com., Am. Sugar Refineries, Am. Sugar Refineries, Distillers' & Cattle Feeders, Linsed Oil, National Cordage, National Lead Co., National Lead Co., Standard Oil, W. U. Beef Co.

Foreign Quotations.

London, April 9. Highest. Lowest. Alaska Treadwell, Amador, Cal., American Belle, Colo., Appalachian, N. C., Can. Phosphate, Can., Colorado, Colo., Cons. Esmeralda, Nev., De Lamar, Idaho, Dickons Custer, Idaho, Eagle Hawk, East Arevalo, Idaho, Eherhardt, Elkhorn, Mont., Elmore, Idaho, Emma, Utah, Esmeralda, Idaho, Flagstaff, Utah, Garfield, Nev., Golden Feather, Golden Gate, Cal., Golden Leaf, Mont., Golden River, Cal., Guston, Jay Hawk, Mont., Idaho, Josephine, Cal., Kohinor, Colo., La Luz, Mex., La Plata, Colo., La Valera, Mex., Maid of Erin, Colo., Mammoth Gold, Ariz., Mount McClellan, Montana, Mont., Mona Lake Gold, New California, Colo., New Consolidated, New Eherhardt, Nev., New Gold Hill, N. C., New Guston, Colo., New Hoover Hill, N.C., New Russell, N. C., New Viola, Idaho, Old Lout, Colo., Parker Gold, N. C., Pittsburg Cons., Nev., Poorman, Plumas Eureka, Richmond Con., Nev., Ruby, Nev., Sam Christian, N. C., Sierra Buttes, Cal., Silver King, Plumas Eur., Cal., United Mexican, Mex., West Argentine, Colo., Yankee Girl, Colo.

Paris, April 7.

Francs. East Oregon, Ore., Forest Hill Divide, Cal., Golden River, Cal., Laurium, Greece, Lexington, Mont., Nickel, New Caledonia, Rio Tinto, Spain, Tharsis, Spain, Vieille-Montagne, Belgium.

CURRENT PRICES.

These quotations are for wholesale lots in New York unless otherwise specified: Acid-Acetic, No. 8, pure, 1,040, Hydrocyanic, U. S. P., Alcohol-95%, Absolute, Ammoniated, Alum-Lump, Ammonium Chloride-Pure, Amalgamating solution, Sulphate, Ammonia-Sul., in bbl. lots, Carbonate, muriate, white, in bbls., Aqua Ammonia-(in cbsy) 18%, Arsenic-White, powdered, Barium-Carbonate, pure, Chlorate, crystal, Chloride, commercial, Iodide, Nitrate, powdered, Sulph., Am. prime white, Sulph., foreign, refined, Sulph., oil color, Carb. lump, No. 1 Casks, Runcorn, No. 2, bags, Runcorn, Bauxite, Bichromate of Potash-Scotch, American, Bichromate of Soda, Borax-Refined, in car lots, Concentrated, in car lots, Refined, Liverpool, Bromine, Cadmium, Cadmium Iodide, Chalk, Chloride, precipitated, China Clay-English, Southern, Chlorine Water, Chrome Yellow, Chrome Iron Ore, Chromalum-Pure, Commercial, Cobalt-Oxide, Copper, Crude, Fluorspar-Powdered, No. 1, French Chalk, Fuller's Earth-Lump, Glauber's Salt-in bbls., Glass-Ground, Gold-Chloride, pure, crystals, liquid, 15 gr. g., s. v., doz., Chloride and sodium, Oxide, Gypsum-Calcined, Land Plaster, Lime Acetate-Am. Brown, Litharge-Powdered, English flake, Magnesite-Crude, Kaolin-See China Clay, Kieserite, Lead-Red, White, American, in oil, White, English, Acetate, or sugar of, white, Granulated, Nitrate, Lime Acetate-Am. Brown, Litharge-Powdered, English flake, Magnesite-Crude, Kilos, Calcined, Brick, Manganese-Ore, per unit, Oxide, ground, per lb., Mercuric Chloride-(Corrosive Sublimite)

Powdered, Marble Dust, Metallic Paint-Brown, Mineral Wool-Ordinary slag, Ordinary rock, Ground, Mica-In sheets according to size, 1st quality, Naphtha-Black, Nitre Cake, Ochre-Rochelle, Washed Nat Ox'rd, Lump, Washed Nat Ox'rd, Powder, Golden, Domestic, Oils, Mineral, Cylinder, light filtered, Dark extracted, Extra cold test, Dark steam refined, Phosphorus, Precip., red, white, Plumbago-Ceylon, American, Potassium-Cyanide, Bromide, domestic, Chloride, English, Chlorate, powdered, English, Carbonate, Caustic, Iodide, Nitrate, refined, Bichromate, Yellow Prussiate, Red Prussiate, Pumice Stone-Select lumps, Original cks., Powdered, Pyrites-Non-cupreous, p. units, Quartz-Ground, Kotten Stone-Powdered, Lump, Original cks., Rubbing stone, Sal Ammoniac-lump, in bbls., Salt-Liverpool, ground, Domestic, fine, Common, fine, Turk's Island, Salt Cake-Powdered, Crude, Soapstone, Sodium-Prussiate, Phosphate, Stannate, Tungstate, Hyposulphite, in casks, Strontium-Nitrate, Sulphur-Roll, Flour, Sylvinit, Talc-Ground French, S. O. F., Terra Alba-French, English, American, No. 1, American, No. 2, Tin-Crystals, in kegs or bbls., feathered or flossed, Muriate, single, Double or strong, 54° B., Oxy. or nitro., Tin Plates, charcoal, best coke, ermillon-Imp. English, Am. quicksilver, bulk, Am. quicksilver, bags, Chinese, Trieste, American, Zinc White-Am. Dry, Antwerp, Red Seal, Muriate solution, Sulphate crystals, in bbls.

THE RARER METALS.

Arsenic-(Metallic), per lb., Barium-(Metallic), per gram, Bismuth-(Metallic), per lb., Cadmium-(Metallic), per lb., Calcium-(Metallic), per gram, Cerium-(Metallic), per gram, Chromium-(Metallic), per gram, Cobalt-(Metallic), per lb., Didymium-(Metallic), per gram, Erbium-(Metallic), per gram, Gallium-(Metallic), per gram, Germanium-(Metallic), per gram, Indium-(Metallic), per gram, Iridium-(Metallic), per oz., Lanthanum-(Metallic), per gr., Lithium-(Metallic), per lb., Magnesium-(Metallic), per lb., Manganese-(Metallic), per lb., Chem. pure, per oz., Molybdenum-(Metallic), per gm., Niobium-(Metallic), per gram, Osmium-(Metallic), per oz., Palladium-(Metallic), per oz., Platinum-(Metallic), per oz., Potassium-(Metallic), per lb., Rhodium-(Metallic), per gram, Ruthenium-(Metallic), per gm., Scandium-(Metallic), per gram, Selenium-(Metallic), per oz., Sodium-(Metallic), per lb., Strontium-(Metallic), per gram, Tantalum-(Metallic), per gram, Tellurium-(Metallic), per lb., Thallium-(Metallic), per gram, Titanium-(Metallic), per gram, Thorium-(Metallic), per gram, Tungsten-(Metallic), per lb., Uranium-(Oxide), per lb., Vanadium-(Metallic), per gm., Yttrium-(Metallic), per gram, Zirconium-(Metallic), per oz.