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We learn with much pleasure that Prof. GEORGE W. MAYNARD, of 35 Broadway, has secured nearly the whole of the necessary capital for the completion of the ditches, etc., for the Osceola Gravel Mining Company, of Nevada.

This enterprise was referred to at some length by us in the ENGINEERING AND MINING JOURNAL, June 16th last, and more recently, August 11th, we reported that the gold already obtained this season with the very small amount of water at the command of the company amounted to \$12,000, and, it is believed, will go to \$25,000 during the season.

This enterprise is, we believe, one of the best ever offered here, the investment being based on well ascertained value and being free from the usual heavy promotion charges. The money received is all to be devoted to the development of the property, chiefly in bringing in a large supply of water, and the control of the property and all the profits remain with the investors until their investment shall have been fully repaid, when they still remain large stockholders. On the whole, the enterprise appears to us to be a good model for investors in mines to study, and, were they to apply the lesson in other cases, mining would soon become that popular field for capital which is justified by the large profits it brings to those who use prudence and knowledge in making their investments.

We have no doubt the Osceola will prove a very remunerative property to those who join in it.

THE DE BEERS DISASTER—REPORT OF THE COMMISSION OF INQUIRY.

This week has brought the Report of the Government Commission appointed to inquire into the facts connected with the fire in the De Beers diamond mine, at Kimberley, which resulted in the loss of 250 lives, to which we have already referred in our issues of July 14th and 28th and August 25th. As we anticipated from the details we have already published, it constitutes a complete indictment of the responsible management of the company, and includes in its apportionment of blame the government mining inspector and sub-inspector of the district. The manager of the mine is clearly proved to have broken the mining regulations of the colony, necessary for the safe working of the mine; and the Commissioners are satisfied that, even after the fire broke out, had the signaling of the imprisoned men being attended to promptly, the lives of all the Europeans in the mine would have been saved.

The evidence further shows that, although the mine is extensively timbered and is extremely dry, there was no provision of means for extinguishing fires, and this in face of the admission made by both the manager and the Inspector of Mines, "that an outbreak of fire is one of the dangers to be guarded against in mines," and with the warning they had in the fact that twice, recently, fires have broken out in the underground workings of the Kimberley mine.

The Inspector is strongly blamed for not learning of the accident in time to give any assistance by his advice to the management, and the Commissioners state that "if the Inspector had examined the shaft as he should have done, he should have been able to take such measures as would have prevented the sacrifice of so many lives."

On this report the natural conclusion of the sad business would be a criminal charge of manslaughter against the management and inspectors, but the newspapers from the Cape do not state whether the government will take action or not. The lesson is a sad one, and should be taken to heart in this country as elsewhere, for the one thing clear is, we want no such mine management or rotten inspectorship where the lives of men are at stake.

The damage to the mine is calculated to be something under \$500,000, but this is a trifle to the shareholders, as the value of the company's shares at the present market price represents a sum amounting to \$38,898,800, and we do not suppose the families of the poor blacks who lost their lives will recover much in the way of compensation.

THE WASTE OF ANTHRACITE AND THE EXHAUSTION OF THE SUPPLY.

The statistics of coal production, which we publish in our usual market report, show that during the month of August the shipments of anthracite from the Pennsylvania mines to market amounted to 4,097,563 gross tons, which is the largest anthracite output ever made in one month, and is at the rate of 49,000,000 tons a year.

During the eight months of the present year the shipments of anthracite to market have amounted to 23,619,291 tons, being 1,755,495 tons in excess of the shipments during the corresponding period in 1887. During the months of September, October, November and December, 1887, the shipments amounted to 12,777,222 tons, and as we shall certainly largely exceed that amount this year, it appears probable that we shall send to market this year 37½ or 38 million tons of anthracite.

If we include the coal sold and used at the mines, say 6 per cent of the shipments, the grand total output for the year will probably amount to 40,000,000 gross tons.

The average waste of anthracite in mining and preparation for market has been carefully estimated from many reliable data by the Geological Survey of Pennsylvania, as follows:

Coal left in pillars, etc.	45	per cent.
Coal lost in mining by blasting, etc.	15	"
Breaker waste 16 per cent of 40 per cent.	64	"
Total loss	66½	"

Or only about one third of the coal goes to market; if therefore, we produce 40,000,000 tons this year, it represents the exhaustion of 120,000,000 tons of our available supply, and this does not now much if it at all exceed 9,000,000,000 tons.

At the present rate of production and present percentage of waste in mining our entire supply of anthracite coal will last only 75 years.

This statement is not based on any mere guess, but is founded on reliable data, and it is so startling in its significance that it should certainly attract the attention of the managers of our great coal companies, and even of the government of the State of Pennsylvania. It is not claimed that we have yet reached our maximum production, and every increase means that the coal will be worked out in proportionately less time than here stated.

Long before the supply has been exhausted the demand for anthracite will have exceeded the supply, and prices will be limited only by the prices of other fuels; and as cheap fuel is the very foundation of indus-

trial prosperity, it is not difficult to imagine the resulting effect on the industries of a large part of this country.

The present enormous, disgraceful and unnecessary waste in mining anthracite should be stopped, and if the interests of the great coal companies are not sufficient to impel them to do this, then the government of the State, which is the guardian of the citizens' interests, should intervene to save these from the disastrous consequences of the spendthrift policy of those who now monopolize our invaluable supplies of this fuel.

THE COST OF MINING IN CORNWALL AND DAKOTA.

On another page our correspondent, Mr. BENEDICT, calls attention to the fact that, although the rates of wages paid at the Cornish mines are, as an average, from one third to one fourth those paid our miners in the West, yet the cost of doing equal work here is no greater and is often less than there. This fact we did not question, on the contrary it is perfectly well known to all who have made themselves familiar with the subject.

Some years ago we had occasion to visit the Cornish tin mines, and at the Dolcoath—a magnificent ore-body—the total cost of mining, stamping, and concentrating the tin stone was in round figures about \$5 a ton of rock raised. The output of the mine was at that time about 200 tons a day, and there were nearly 1050 names upon the pay-roll, of which about one half were "underground" hands, at an average wage of about three shillings, or 75 cents a day, and the balance "surface" hands, mostly women and girls, whose average pay was about 25 cents a day. The underground work in Cornwall, as here, is done for the most part by contract, at so much per fathom of ground or per foot of drift.

Such an expenditure of labor for such an output would bankrupt any mine in America at our rates of wages, and yet the best miners we have here, and those who make our records of low cost and high wages, are these same Cornishmen who do so little in their day's work at home. There are no men in any country who can do more work in a day underground than Cornishmen, and there are none who know how to do less while having the appearance of working.

In this country it is not alone, though it is largely, the use of better tools, machines and appliances, that reduces the cost of work by increasing the output per man; it is also the independence, energy, and ambition that characterize our people, and that are, in part at least, born of the hope each good miner cherishes of being one day a mine owner himself.

Such cases are not rare even in Cornwall, but the bonds of tradition, and of the miners' union, are there too strong to be readily broken; and, perhaps the intense veneration which the Cornishman at home has for his forefathers, restrains him from doing things better than they did, lest he throw discredit on them. There is no patent on this suggestion, and if it does not explain the undoubted fact that we in our mines accomplish fully three times as much to the man per day as they do in Cornwall, we shall be very pleased to receive a better explanation of it.

We believe that tin can be produced in Dakota with our present rates of wages quite as cheaply as in Cornwall, from ore carrying the same percentage of metal, but we do not believe that fifteen or twenty pounds of tin to the ton of ore will pay any English company in either country, and this is the percentage given by Prof. VINCENT in his report on the Harney Peak properties.

MEXICO AS A FIELD FOR AMERICAN ENTERPRISE.

It is somewhat surprising, that under the existing conditions the neighboring Republic of Mexico should have remained so long, almost a *terra incognita* to all but a few mine owners, engineers, railroad men, and a very insignificant sprinkling of tourists. The fact is that distant Europe is far more familiar to most people than is our neighbor Mexico.

There are no geographical considerations to create an obstacle. The demarcation of the frontier follows for a great distance the Rio Grande, a river that presents no greater difficulty in crossing than the larger rivers of Texas; while the westerly portion of the line, where it leaves the river, is a purely imaginary one. The country possesses the same features on the Mexican side as on the American. It has been invaded already by four lines of railroad from the United States, owned and operated by Americans; three of these lines, viz., the Sonora line from Nogales, Ariz., the Mexican Central from El Paso, Texas, and the Mexican National from Laredo, Texas, have been open for traffic for five years, and the fourth road, from Eagle Pass, Texas, is of more recent construction.

Is it the bad reputation that our neighbors across the border have had for acts of lawlessness that has deterred enterprise? This can hardly be the case, for as between the ruffianly and law-breaking class on each side of the frontier there is little to choose, and but little inquiry is

needed to satisfy any one that this bad character applies only to a very small portion of the community, living only on the border.

The dangers in Texas, New Mexico and Arizona have been far greater, as in addition to border ruffianism the settlers and miners in those parts have had to contend with a far worse enemy, the murdering Apache, and yet what results and triumphs have been achieved there in comparatively few years.

The hesitation to embark in enterprises in Mexico cannot now arise from distrust of the political situation there and uncertainty as to its future. PORFIRIO DIAR has just been re-elected President for the term of four years. Twelve years ago he entered upon his first term of office, and found the country in an unhappy and disturbed condition, bankrupt and ruined in credit. He devoted his attention with marked success to re-establishing law and order. He showed remarkable firmness of character, and proved that he was thoroughly capable of coping with the difficulties that confronted him, though hampered by lack of the means, always so essential to good government. He displayed at the same time great enlightenment of mind and foresight in everything that could conduce to the welfare of the people and the prosperity of the country, and he recognized that the surest way to consolidate the government and develop the internal resources was to open up the country by railroad communication. He accordingly inaugurated the system of granting railroad concessions (in most cases to Americans, thus showing his confidence and friendly feeling toward them) with liberal State aid in the shape of subventions for every kilometer constructed. His successor as President, MANUEL GONZALES, continued his policy of friendship to the United States and protection to foreigners investing capital in the country.

With the gradual opening up of the Republic by railroads, involving the expenditure of large sums, the material prosperity of the country improved, and political disturbance of the public peace disappeared.

DIAR was again elected President in succession to GONZALES, and this second term of office was mainly devoted to restoring the national credit. In this he has succeeded as fully as in his former efforts, and an equilibrium in the budget of the country has been established, an amicable settlement with the foreign creditors has been arrived at, and the Mexican loan issued last May in Berlin and London at 85, is now quoted at 93.

Much of this work has been accomplished by Mexico without the assistance of the United States, her nearest and most friendly neighbor; but by not taking part in it, this country has been deprived of the profits reaped by other foreigners, and this is because our bankers have held back from establishing relations in Mexico. The important banking business of the country has hitherto been for the most part in the hands of the English, while now the Germans, by the prominent position they assumed in placing the loan, seem to have gained a foothold in this branch of business in addition to nearly monopolizing the trade of the country, which they have done for years.

We are glad, however, to have been able to record in our issue of September 8th a step in the right direction, which shows that some of our countrymen, at least, are alive to the situation. We refer to the purchase of the Mortgage Bank of Mexico, with an amended and liberal charter, by a strong American syndicate, having the well-known banking house of Messrs. H. B. HOLLINS & Co., of Wall street, at its head.

It is well worth our while to make efforts to cultivate closer commercial relations with Mexico. The resources of that country in mineral, agricultural and natural products are immense, though but little known or appreciated by our capitalists. The railroad traffic returns for the past half year show that the aggregate increase in traffic receipts of the three principal railroads in Mexico, viz., the Mexican Central, the Mexican National and the Mexican (Vera Cruz line) amounted to \$1,050,000 over the corresponding period in 1887. This is a good showing, especially when we consider that the National consisted of disjointed sections, and the Mexican Central only opened its long and valuable Guadalajara branch, connecting with a city of about 100,000 inhabitants, in May of this year. The national will be completed within a few days, and will connect Monterey and St. Luis Potosi, both prosperous and important cities of about 40,000 inhabitants each, with the capital, so that we can safely look forward to a still further increase in the receipts of the railroads and greater business activity.

Vexatious custom-house regulations and fines for their infraction are undoubtedly two real obstacles to wide commercial intercourse. Moreover, a knowledge of the language of the country and of the ways of the people is here, as elsewhere, indispensable to successful trading. President DIAZ and his government are well disposed towards Americans, and anxious to promote American enterprises. It remains for us only to take advantage of the inducements offered in the richness of the country, its nearness to us and this friendly feeling towards us, and to increase our business interests in the country where, indeed, we should have greater influence than other foreigners. As it is, much more English and German than American capital is in the country, in the purchase of lands, mines and various industrial undertakings, and under the present satisfactory political conditions there can be no doubt that the develop-

ment of the country, and increase in values of all kinds, will be much more rapid and greater in the next four years than they have been in the past twelve.

The immense mining and engineering interests already established by Americans in Mexico, and the vast and profitable field that lies there for further development, invite our enterprising capitalists and manufacturers to investigate and cultivate closer and more liberal relations with this friendly neighbor.

NEW PUBLICATIONS.

TOPOGRAPHICAL MAP OF THE PORTAGE LAKE MINING DISTRICT. By L. G. Emerson, C.E. and M.E., Hancock, Mich.

A new map of Portage Lake Mining District has been compiled by Mr. L. G. Emerson, of the Quincy mine, and, as might be expected, the work is executed with great accuracy and detail. The ownership of every section and subsection of land is denoted, and the scale is such as to present the district with perfect clearness. Townships are distinctly marked in different colors, and the approximate limit of copper range and amygdaloid conglomerate is delineated, so that to all interested in that region it is a most useful map of references.

MEXICAN TARIFF AND CUSTOM-HOUSE LAWS. Translated and published by Ramon V. Williams New York. Price \$2

This is a reliable and, we may say, almost an official translation of the Mexican tariff and Custom-House laws, as it is taken from the official edition by the Chancellor of the Mexican Consulate-General in the United States. The book is indispensable to every shipper and is useful to the ordinary traveler, as the Custom House regulations on the Mexican frontier are stringent, and the close observance of them is necessary to avoid annoyance and loss by fines.

"TURNING LATHES: A Manual for Technical Schools and Apprentices." Edited by James Luk n, B.A. London: E. & F. N. Spon. 1888. Price, \$1.00.

This is a complete little handbook, containing all that a beginner could desire. The lathe, with its important modifications for special work, tools, and methods, are all described in a lucid, chatty style, happily free from any overloading of pleasantries which often obscure the solid and important facts in treatises addressed to the novice. Illustrations are abundant, and are well executed.

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 Discrimination Against Anthracite in Railroad Tolls.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: In your article on anthracite, you refer to the rates of freight on anthracite, as compared with bituminous. Pardon me for giving you a few examples that bear upon the subject, and may help to confirm your position. I have had the matter brought more forcibly to my attention to-day, that the rates are not fair or "reasonable" in many instances, from the fact that vessel owners charge the same to carry a ton of either character of coal. If it requires a chemical analysis to determine what the rate on coal should be, why is not the same method employed to classify other articles of transportation? A barrel of flour pays the same rate of freight the same distance, whether it sells for \$3.50 or \$5. The St. Paul & Duluth Railroad charge to transport a net ton of anthracite from Duluth to St. Paul or Minneapolis, \$1.50, and to transport a net ton of bituminous the same distance, \$1; and when I was in St. Paul recently, asked why there was a difference in the charge for the same service, and I could not get any satisfactory answer. If it is a question of car service, then let it be so understood; but if a ton of anthracite is loaded into cars and unloaded as quickly, then the car service question does not apply. I trust the matter will continue to be agitated. The Inter-State Commerce Commission recently rendered a decision that a railroad company could not charge any more for transporting a barrel of high-priced oil than a barrel of low-priced oil; so why is not a ton of coal a ton of coal, whether it contains 65 per cent fixed carbon and 35 per cent of volatile matter and ash, or 85 per cent fixed carbon and 15 per cent volatile matter and ash?

J. RAYMOND CLAGHORN,
President State Line & Sullivan R. R. Co.

PHILADELPHIA, Sept. 17, 1888.

Cost of Mining in Cornwall.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: In your editorial on "Dakota Tin Mines and their Enemies" in to-day's issue of the JOURNAL, I note what appears to be a tendency on your part to fall into a very common error in relation to wages, meaning that in which a "day's" labor is measured in TIME and not in WORK ACCOMPLISHED. It seems to me that the only fair way in which wages may be compared, particularly as between different countries, is by the quantity of work done, and not simply by the time a person is employed.

You mention 75 cents per day as the amount paid to miners in Cornwall in comparison with \$2.75 paid in Dakota, seemingly leaving it to be inferred that the cost of producing tin in the Black Hills must be much greater than in Cornwall because of the great disparity in wages, apparently in favor of Cornwall. I had occasion to visit the tin mines in the latter place in 1886, and, in spite of the so-called cheap labor, I found that it cost about as much (yes, even more in some instances) to sink shafts, etc., there as it does in our Western States and Territories, where miners are paid \$3 per day. For example, on consulting my notes taken at Cornwall, I find that for sinking shafts it cost from \$30.75 to \$48.40 per linear foot; for driving levels, from \$8.75 to \$12.50; sinking winzes, \$12; upraise, by machine drill, \$8, etc., etc., or fully as much as the average cost of similar work in the West.

Also, upon comparing these figures with those in the annual report of the Tamarack Company, as published in to-day's JOURNAL, it will be

seen that they are practically the same, though the wages per day at Lake Superior are probably but little more than half way between those of Cornwall and our West. Hence, in spite of the difference in wages per day, the cost of the work accomplished is practically the same in the three instances cited.

W. DE L. BENEDICT, Mining Engineer.
32 LIBERTY STREET, NEW YORK, Sept. 15.

THE SUDBURY COPPER-NICKEL MINES.

The Canadian Mining Commission, which has been visiting the mines in the Canadian Lake Superior silver district, on its return east visited the Sudbury copper mines and obtained from Dr. Edward Peters some very interesting information concerning both the mines and the treatment of the copper-nickel ores they produce. We reproduce from a report in the Toronto *Globe* Dr. Peters's testimony as follows:

The ore throughout the country is uniform as far as I have seen. Whether it would pay for copper alone would be a toss-up. If coke could be got at \$6 a ton, a reasonable dividend might be paid under good management. Mining would cost \$2 a ton, breaking 30 cents, calcining 50 cents, and smelting into matte \$2.50—that is, assuming a large quantity to be treated. A ton of matte containing 25 per cent copper would be worth \$40 to \$45 in the United States market; that is, taking into account the duty, but not the transport. If we were smelting for copper we would use ore with a higher percentage of that metal. The present price of nickel is 65 cents a pound, which I consider to be rather high; if it was 25 to 30 cents much more of it would be used. The present consumption is about 1000 tons annually, and that is principally used for plating. I think we might sell it with a handsome profit at 25 or 30 cents. I think there is an ample supply of ore here.

It is a hard country to prospect, as the rocks do not crop out well. If this were in the United States thousands of prospectors would be here on the strength of what has been already done. There seems to be some connection between the deposits in this section, but I do not think they could be called fissure veins. I would describe them as forming a mineralized belt, with the minerals concentrated at certain points. I think the Canada Copper Company have sufficient stock of ore on hand to represent every dollar they have expended here, and to build the smelting works besides. Of course that is only an opinion, but it is based on pretty good evidence.

Dr. Peters said openings have been made in the Stobie, Evans and Copper Cliff mines, as well as at four or five other places to prove veins. At the Copper Cliff mine some \$25,000 or \$30,000 have been expended. We have sunk down about 350 feet on the vein, and drifts have been run at right angles to the shaft some 600 feet, besides which a great deal of surface clearing has been done. On the Evans vein the shaft has been sunk to a depth of 85 feet. At the Stobie mine two tunnels, 30 or 40 feet, have been run in and a considerable quantity of ore has been quarried. There is at this mine a three-drill compressor, a large stone-breaker, the necessary pumps, etc. At the Copper Cliff we have a six-drill compressor, a large hoisting engine, a rock-breaker, a rock-house for separating ore, several pumps and all necessary machinery. As regards the Evans mine, a three-drill compressor will be set up in about a week, also a breaker, which is on its way, and there will be erected a very large rock-house.

The company have not yet attempted to treat the ores, but about 3000 tons have been shipped for treatment elsewhere. It smelts easily, but the combination of nickel and copper has not been met with before in such quantities as to require separation in a wholesale way. The only other mine of the kind in America is the "Gap" mine, of Pennsylvania, and there they use the old European way of dissolving in acids, which would never do for our works.

The process I approve of for treatment of our copper ores is the old German blast-furnace method, modified to suit American conditions. You first sort the ore, break it to the proper size, pile it upon wood in large heaps and then set fire to the wood. It burns for two or three months, sending forth the sulphurous acid gas till about three-fourths of the sulphur is gone. The ore that originally carried 35 or 40 per cent, should come out with 4 or 5 per cent. The iron is changed into oxide of iron, and is just like common iron ore, having lost its sulphur and taken up oxygen instead. The ore is then put into the blast-furnace, treated on the same principle as pig-iron, and the sulphur combines with the metallic constituents which form the matte.

The composition of the matte may be 30 per cent sulphur, 20 per cent nickel, and 20 to 25 per cent copper. Six tons of ore will produce one ton of matte. We are not yet in a position to say which of our mines is the most valuable, but as they now look I think the Evans promises to be better than any other. It carries about the same amount of nickel as the other mines, but the ore is more massive, and apparently there is a larger body of it. I think the Evans will show, taking an average of the whole mass, 3½ per cent nickel, 3 per cent copper, 40 per cent iron and 24 per cent sulphur, leaving say 30 per cent of rock. I consider the company justified in putting up large works and have so advised them this spring. As a rule I only advise the erection of reducing-works when I see enough ore mined to pay their cost, and that is the case here. We shall have to get the matte refined elsewhere.

The sending of a large quantity of nickel matte into the States has never yet been tested, but Americans are so much more ready to alter their plant and undertake any new thing of the kind than Europeans that I think we shall be able to do better in the United States than anywhere else. In shipping to the States we have to pay duty on the metal that is of most value in the matte. Were the duty taken off it would of course be an advantage to that extent, unless the price fall and offset the gain. I think we can dress a good deal of our ore to 20 per cent, and, speaking in the aggregate, I think it will show 2½ per cent nickel and 3 per cent copper. I understand that before I came here three shipments were made, one of which went to England two to the United States. The company did not realize one dollar a ton on the shipment to Swansea, the charges were so exorbitant there. The ore carried 12 per cent of copper, and the nickel in it was worth \$35 to the ton. But the smelters allowed nothing for the nickel, and on the thousand tons smelted that was a loss of \$35,000, a large quantity of which was shipped from the Copper Cliff. We figured up that the charge for smelting was \$50 a ton, whereas our eastern men only charge \$10 per ton.

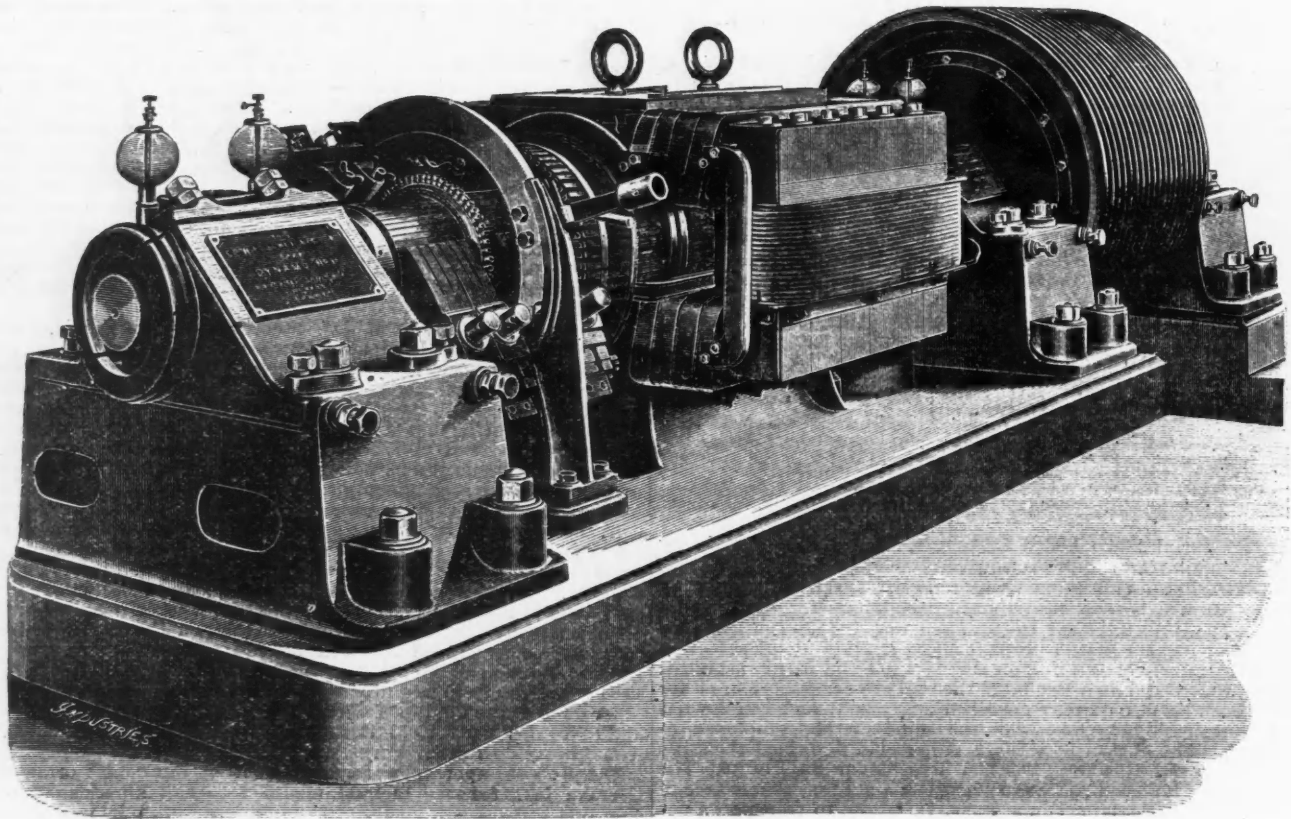
THE COWLES ELECTRIC FURNACE PLANT AT STOKE-ON-TRENT, ENGLAND.

The works of the Cowles Syndicate Company, which have just been erected at Stoke-on-Trent, England, are described in our excellent London contemporary, *Industries*, from which we make the following extracts and copy the accompanying engravings:

The new works are very complete and conveniently arranged. They use coal slack which costs 4s. a ton on the stoking floor. The boilers are of the Babcock & Wilcox type, and provided with mechanical stokers, so that one man only is required to attend to the generation of steam for the whole of the works. When we mention that the power of the boilers represents between 500 and 600 i. h. p., it will be understood that the principle of labor saving has been fully recognized in the planning out of these works.

The process of manufacture may be broadly divided into three heads: (1) The reduction of the aluminous ore; (2) the refining of the alloy produced in the first instance, and (3) the subsidiary processes of preparing the materials for the electric furnace, and recovering certain waste products. The actual process of reducing the ore in the electric furnace is by far the most important, and requires nearly the whole of the steam power available. The main engine, which is used exclusively to drive the dynamo supplying current to the furnaces, is a fine compound condensing horizontal tandem engine, and was made by Messrs. Pollit &

double horseshoe type, and has a drum armature wound with bars of naked copper insulated from the core and from the driving horns by mica. The end connections are made according to a method patented by Mr. Swinburne. The section of conductor is $\frac{3}{4}$ inch by $\frac{1}{4}$ inch, and there are 128 bars when counted all round the armature, and these are connected with sixty-four commutator strips by screws, no soldering being used. It will interest electricians to learn that this method of connection, which is adopted also in other parts of the machine, has proved perfectly reliable, notwithstanding the fact that the machine occasionally carries 6000 ampères. The bars are placed edgewise on the core, and are connected in groups of four, so that the winding is electrically equivalent to an armature having thirty-two external conductors and sixteen commutator strips. The sub-division of each conductor into four has been adopted in order to reduce as much as possible the tendency to heating from eddy currents, which, with a conductor $1\frac{1}{2}$ in. wide, would be excessive. Even with this sub-division there is still a certain amount of heating, but this is quite within safe limits. The machine works now almost continuously night and day, and what heat there is generated by eddy currents and resistance is carried off by an air blast from a Schiele fan. The machine, when we saw it at work, gave about 5000 ampères at a pressure of 60 volts: but occasionally the current would rise as high as 6000 ampères. The core of the armature is 20 inches diameter by 36 inches long. The magnets are 37 inches by



COMPTON 400 HORSE-POWER DYNAMO.

Wigzel. It is provided with automatic expansion gear, and the centrifugal governor is set to maintain the speed at 76 revolutions. The work on the engine is necessarily subjected to rapid fluctuations, and, notwithstanding this circumstance, the governor appears to have perfect control of the speed. As an additional precaution against "racing," should the load be suddenly thrown off and the governor become accidentally disabled at the same time, there is an electrical device for stopping the engine automatically if the speed exceeds a certain limit. The engine can also be stopped from various points in the engine and furnace-houses by pressing a push button. These push buttons are all connected in parallel with a main circuit leading to one of T. tes' patent electric stop valves. On the spindle of the stop valve, which is provided with the usual screw and hand wheel, is fixed a steam piston working in a cylinder containing normally high pressure steam on both sides. The communication between the two sides of this piston is controlled by a small steam valve, which in its turn is controlled by a spring held off by a trigger. The trigger is connected with the armature of an electromagnet, and upon completing the circuit by pressing a button in any part of the works, the spring is released, the auxiliary valve establishes communication between one side of the piston and the condenser, while the steam on the other side forces the piston down and the valve on to its seat, thus bringing the engine to rest. The engine has a 23-inch high-pressure and a 43-inch low-pressure cylinder. The stroke is 5 feet, and at the time of our visit the steam pressure was 75 pounds. The fly-wheel is 20 feet in diameter and weighs 30 tons; it is provided with eighteen grooves for as many ropes, by which the power is transmitted to a 4-foot rope pulley on the dynamo.

The dynamo, which we illustrate, has been manufactured by Messrs. Crompton, and is said to be the largest machine in England, and probably the largest in the world. It has been designed for an output of 5000 ampères at 60 volts pressure, when running at 380 revolutions per minute. It is a very compact and handsome machine of the horizontal

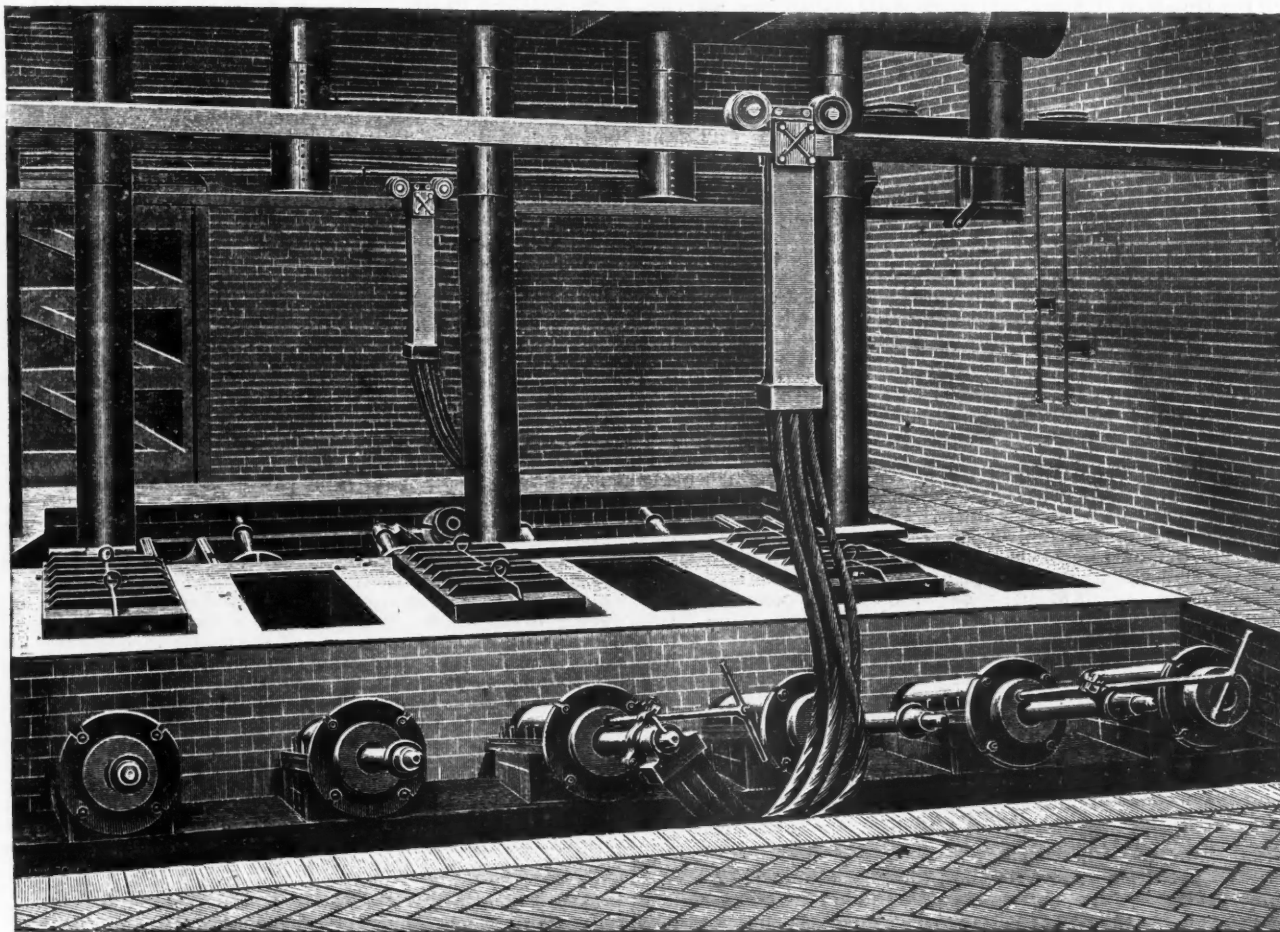
6 inches cross section, and compound wound, with the main preponderating. The machine is almost a series dynamo pure and simple; but a shunt has been added to facilitate the starting, when, with the furnace cold, the resistance in the external circuit is necessarily large. As will be seen from our illustration, the shunt coils are wound on the yokes, and the series coils on the horizontal limbs of the magnets, there being four turns on each limb, but only three of them in circuit. Each shunt coil contains 250 turns, and the shunt current is about 50 ampères when in regular work. In the furnace house there is a rheostat, by which the furnace men can, within certain limits, vary the shunt current and the pressure given by the machine, and to facilitate quick starting there is a switch on the dynamo by which the two shunt coils can be placed into parallel. The main coils are all in series, and the total exciting power when in regular work is therefore about 42,000 ampère turns. The current is taken off by four brushes on either side. These brushes are attached to the large ring, clearly shown in our illustration, and by means of a long bar placed into the socket, also shown, a man keeps the brushes during the run to the non-sparking point. The smaller ring surrounding the commutator serves as a strengthening piece to the sections, which, owing to their great length, require some additional support. The driving power is transmitted to the armature conductors by forty-eight driving horns of aluminium bronze. The current coming from the dynamo is led by copper bars to an enormous cut-out, and from there to the furnaces in the adjoining room. A huge current indicator is inserted into the circuit, in order to enable the attendants at the furnace to judge of the progress of the operation, and to keep the current within certain limits, by adjusting the distance between the electrodes. The current indicator is simply a solenoid of nine turns through which the current passes, and into which is placed an iron core suspended from a spring. The movement of the core is made visible by a pointer playing over a large dial, and the axis of the pointer is carried through the wall, so that the indications are repeated on a second dial in the engine room. The electrodes

can be withdrawn or advanced by means of a screw and handle, and a boy on each side of the furnace watches the current indicator and manipulates his electrode so as to keep the current as uniform as possible. The construction of the furnace is exceedingly simple. Each furnace is a rectangular pit, constructed of fire-clay, and provided at either end with an inclined cast-iron pipe, through which the electrode is introduced, as will be seen on reference to our illustration on page 237, which represents a nest of furnaces in one of the furnace rooms. The current is supplied by the two copper bars running horizontally across the furnaces, and by flexible cables, which can be clamped to the bars in any desired position. Only one furnace is running at a time, the other furnaces being meanwhile either charged or left to cool. Each electrode is a bundle of from seven to nine carbons (each $2\frac{1}{2}$ inches diameter), round which is cast a cylindrical head of iron when ferro-aluminium is to be produced, or copper when aluminium bronze is to be produced. A stout copper rod is attached to the center of the head, and projects through the cover of the cast-iron pipe already mentioned, and to the outer ends of these rods are clamped the flexible cables pending from the omnibus bars overhead. The furnace is charged as follows: On the bottom is thrown a layer of limed charcoal; the electrodes are then inserted, and two pieces of sheet iron

furnace cover, and to save this a pipe is placed over the hole, which carries the products of combustion up into a settling tank overhead, from whence the fine dust of aluminium oxide is periodically collected and charged again. The spectroscope shows, however, no aluminium lines when the flame is examined, which is due to the comparatively low temperature of the flame. The lithium band, on the other hand, is strongly marked.

It is both interesting and important to note that the addition of aluminium to iron alters its magnetic properties; the more aluminium there is present the less magnetic is the alloy, until with about 17 per cent the "ferro" becomes non-magnetic. This quality of the alloy is made use of at the works for roughly sorting the product by a simple magnetic test, the men with a little practice becoming quite competent to determine the percentage of contained aluminium with a fair degree of accuracy. The company do not, however, rely entirely upon the magnetic test, as there is a well appointed laboratory, where all the alloys produced are chemically analyzed, as in other metallurgical works. There is also a mechanical laboratory containing a 30-ton testing machine, by which the tensile and transverse strength, elongation, and elastic limit of the alloys are determined.

We are informed by the manager at the works that, owing to the vari-



COWLES ELECTRIC FURNACE.

connected by stirrups, and forming the sides of a bottomless box, are then put in to serve as a temporary receptacle for the charge of ore, metal, and charcoal, whilst the spaces between the sheets of iron and the longitudinal walls of the furnace are filled with charcoal, after which the sheet-iron box is withdrawn. To start the current a few broken pieces of carbon are thrown into the furnace so as to bridge across between the electrodes, and the whole charge is then covered with a top layer of charcoal, and the furnace is closed with a cast-iron cover provided with a hole in the center, through which the gases generated during the process escape. These gases are ignited, and burn with a white or slightly purple flame. At first, and shortly after turning on the current, the gases given off are mostly hydrogen and oxygen; but when all the water has been driven off, the combustible gas is chiefly carbonic oxide, the carbon being supplied by the charcoal and electrodes, and the oxygen coming from the ore. With careful manipulation, 1 pound of contained aluminium can be produced for every 3 pounds of the ore used.

By the intense heat in the center of the furnace, the reduced aluminium and the alloying metal—iron or copper as the case may be—are volatilized, and the ascending vapors become condensed in the upper and cooler layer of charcoal. They are here so intimately mixed as to form nearly or quite a true chemical compound, the liquid alloy running back in rivulets, and collecting at the bottom of the furnace. A "run" usually lasts an hour and a half. The furnace is then left to cool, and the current is laid on to the next furnace, which had previously been charged. Thus the operation is a continuous one, going on night and day. Sometimes the cooling is accelerated by playing into the furnace with a water hose. During the run, a certain small quantity of aluminium escapes with the gases by the hole in the

ous improvements and simplifications introduced, the Cowles electric process produces aluminium alloys at very greatly lower cost than claimed by any other process. By a further improvement, now being carried out, the cost of manufacture can yet be further lowered. This improvement consists in the adoption of a tap furnace, in which the alloy, as it is formed at the bottom of the electric furnace, is drawn off in a pure state through a tap hole, very much as in a cupola. Such tap furnaces have already been erected, and have been for the last three months practically at work night and day in the Cowles Company's Works at Lockport, New York, and we are assured that it has been found possible to very materially reduce the cost of manufacture by this means. The electrical energy required for the production of one pound of contained aluminium, varies of course with the grade of the alloy. For very high grade alloys it is 15 H. P. hours, and for low-grade alloys it may rise to 30 H. P. hours, the average being about 22 H. P. hours.

We have now described the most important parts in the process of manufacture, and will say a few words about the auxiliary processes of preparing the materials and recovering waste. The charcoal is ground to a powder under a pair of edge runners, then sifted and soaked in a weak solution of lime. After drying it artificially it is ready to be charged. The charcoal used in a previous charge, and which has been partly changed to graphite, is treated in a similar manner, and thus used many times over. The dust of alumina collected from the settling chamber is charged again with fresh ore, and thus utilized. The residue of metal in the refining furnace is also saved. After the charge of this furnace, which amounts to from 15 hundredweight to 20 hundredweight, has been tapped off, the slax, consisting principally of a mechanical and very intimate mixture of alloy and carbon, is put into a revolving drum for breaking

the mass into smaller pieces; and afterwards a large portion of the carbon is washed out by water. These operations are carried out in a separate building called the reclaiming-house. The alloy thus reclaimed is charged again into the electric furnace with additional ore. The works now produce daily from 15 hundredweight to 20 hundredweight of high-grade "ferro" and rich aluminium bronze product, containing from 15 to 17 per cent of aluminium. As the regular commercial grades of bronze contain respectively $1\frac{1}{2}$, $2\frac{1}{2}$, 5 , $7\frac{1}{2}$, and 10 per cent of aluminium, the electric furnace product above mentioned is remelted in ton quantities, and pure copper is added to reduce it to the exact desired percentage. This is cast in ingots weighing about 12 pounds each.

The Cowles Syndicate Company is composed almost entirely as regards its directors and members of prominent metallurgists and manufacturers having works connected with the English and Scotch iron, steel, copper, and brass trades. Mr. Alfred S. Bolton, of Cheadle, Staffordshire, is the Chairman, and Mr. B. M. Plumb Managing Director.

It may be added that the Cowles Company claim that, by certain means now devised and successfully tried, with their electric furnace they can also produce the unalloyed, or pure aluminium, in commercial quantities and at far less cost than thus far claimed by any other known process. For this method they have recently filed patents in America, and when these are ready for issue similar patents will be filed in Europe. They state that when the pure metal has a wide demand, and can be produced and sold by others at as low a price per pound as they now sell the aluminium contained in its valuable alloys, they will commence the manufacture of the pure material.

THE LINEFF ELECTRIC TRAMWAY.

An experimental line about one tenth mile in length near Kew Bridge, London, has been recently examined and reported on by Mr. Gisbert Kapp, an electrical expert, and from his report, published in the *Electrician*, we make the following extract:

The Lineff tramway system belongs to that class where the current is supplied to the car by means of a conductor placed under ground, but whereas in other systems the metallic surface of the conductor is exposed along its whole length, and a contact brush or slider rubs along it to take the current off, in the Lineff system nearly the whole length of the conductor is insulated, and the current is taken off at certain points, about three feet apart. At these points are fixed small saddle-shaped contact pieces, over which trails the bight of a metallic rope, suspended from shoes which pass through the slot of a channel, and are attached to a flexible beam under the car. The rope consists of a stranded wire cable protected with gun-metal ferrules, which can be easily renewed when worn. It is insulated from the shoes which pass through the slot, and the connection between it and the main controlling switches is also insulated. The rope in passing over the contacts collects the current, which is thus led to one of the main controlling switches, and from there to the motor, returning through the framework and wheels of the car to the rails. The great difficulty with all underground conductors for tramways is their insulation. A cable protected by insulation over its whole surface may be buried in the ground, and no escape of electricity can take place. If, however, the insulation is removed at certain points along the cable, so as to expose at intervals the metallic surface, electricity can escape at those points, and it is evident that the escape will be the greater the more the conductor is bared. A conductor only partially insulated cannot be simply buried in the ground, but must be supported on insulated brackets clear of the surrounding ground of masonry. Even if so supported, a certain amount of electricity is lost by leakage, and, generally speaking, the loss will be in proportion to the metallic surface exposed. Now, in other systems of underground conductors, the metallic surface is exposed from one end of the line to the other, and the leakage resulting therefrom must obviously be very much greater than with Mr. Lineff's arrangement, where nearly the whole of the conductors may be covered by insulation, and only a few inches of metallic surface are exposed at intervals. It is doubtless due to this arrangement that the insulation resistance, even after the very severe test described in the appendix, was yet found to be as high as 10,000 ohms, being at the rate of 1000 ohms per mile. With this insulation resistance, the loss of current over a double line between Kew Bridge and Hammersmith would not reach two ampères, and the power wasted would amount to about three quarters of a horse-power, or about 1 per cent of the power required to work an eight minutes' traffic over this line. I know of no other underground system which comes anywhere near this in perfection of insulation.

Another advantage of the Lineff conductor is the facility with which crossings can be arranged. The conductor consists of iron piping, with a copper conductor inserted. The saddle-shaped contacts are screwed into the pipe, which is sub-divided into sections, each sufficiently short as not to be influenced by changes of temperature. Connection between adjacent sections is made by short pieces of insulated cable, and it is thus an easy matter to arrange for two conductors to cross each other without interference. Such crossings have been fitted at one end of the experimental line, as already stated, and I have found the car and its collectors to take these crossings easily, the working being facilitated by the ingenious manner in which the shoe beam is attached to the under side of the car.

The direction of motion is controlled by a reversing lever, and the speed by a switch lever.

Having carefully examined and tested the Lineff system, I have come to the conclusion that it is superior to other systems employing an underground conductor, and that it will be found suitable for suburban lines having a heavy traffic.

A Great Australian Gold Nugget.—The *Melbourne Argus* of July 24th has a dispatch dated Dunolly, July 23d, saying a splendid nugget of gold was discovered at the Burnt Creek Company's mine this morning. It was found in the puddling machine, and it is surprising that it escaped notice till it reached there, as it weighs 286 ounces, and it is estimated that the net weight of gold will be at least 375 ounces. In consequence of the discovery shares in the mine rapidly advanced.

THE NEW MICHIGAN GOLD FIELDS.

Written for the Engineering and Mining Journal by Richard A. Parker, M.E.

Pursuant to my suggestion of about a week ago, I take pleasure in sending you herewith an outline of the conditions that surround the Ishpeming gold-fields. I leave to-morrow for a trip to the Porcupine Range, west of the great copper mines, to see if an abandoned property can not be resurrected; and if one half of the statements of the interested owners can be relied on, there is a big thing on the tapis.

The discovery of quantities of rich gold quartz, four to seven miles west of Ishpeming, has attracted no inconsiderable amount of attention, and the many adverse criticisms of outside skeptics who are not familiar with this section of the country are hardly worth the replies that the local papers have attempted. The finding of valuable gold quartz, in a regular deposit, extending over some proven two miles of ground, is a fact that can not be successfully disputed. From the early history of the Upper Peninsula, as gleaned from the notes of Dr. Houghton, gold has been found, and we know of his faith in his discovery; next to him no small share of credit is due to the persistent efforts, both by word and deed, of Mr. Julius Ropes, of Ishpeming. His attention was drawn to the fugitive argentiferous galena deposits of the range some twenty-five years ago, and finding that a number of his assays yielded gold in paying quantities, he did not stop until he found a gold-bearing quartz ledge in the northeast corner of the property now known as the Ropes mine, and which covers the south half of northwest quarter, Section 29, Town 48, Range 27, here the quartz occurs in a compact deposit in a serpentine dolomitic horizon, which, in places, is distorted by dioritic dikes and intrusive masses of dolomite, lenticular in form but of no very great extent either laterally or transversely. As a rule the latter occur in lenticular masses, the majority axis of which is parallel to the general stratification, though occasionally to the north of the quartz vein it occurs in thin beds. The quartz is found on the contact between dolomitic masses and diorite on the north and metamorphic talcose schist on the south, resting on a mass of compact serpentine; it may be interesting to note that the enclosing rocks of the vein are very free from silica. Would not this tend to support the theory advanced by Mr. S. F. Emmons,* who argues for the occurrence of ore deposits by a process of leaching through country-rocks, which has deprived them of their vein-forming material, and the replacing of the country-rock by the quartz along the line of contact? Probably it is from this cause that the quartz in places passes into the wall-rock, making it excessively difficult to mine "clean" from the walls. In the locale of the mine the vein is commonly regarded as a true fissure, but the evidence to support such a view is wholly wanting; neither a banded structure of the vein matter, slickensides nor clay seams are visible; there are no walls to speak of, as such.

The workings of the Ropes mine are located upon the north face and midway to the summit of a ridge extending for half a mile in a north-east and south-west direction. The accompanying sketch will give an idea of the geological features of the mine. It has been worked for a number of years, but I understand without the payment of a dividend. In this age of intelligent and, therefore, economical mining, with the advantages possessed in the use of compressed air, high explosives and railway facilities, properties that yielded a low value per ton are now paying dividends which but a few years ago would have been abandoned; with the accredited value of the quartz as given by officials of the company, with proper mining appliances for rapid handling and underground developments in accordance with modern acknowledged principles of mining, this property should be placed on the list of dividend payers. There are two mills, the combined capacity of which are forty-five stamps, provided with the necessary number of Frue vanning machines to handle the pulp; but let me pass from ancient history to something more modern and at the same time somewhat more interesting.

In the diagram accompanying, you will find the present extent of developments there shown, extending from Section 34 through 35 and 36. The first discovery of gold west of the Ropes mine was made on the Lake Superior Iron Company's mine a year ago last spring, and but little work was done in 1887. As soon as the snow went, early this year, active operations began by the placing of a boiler and small hoist on the ground, building a boarding house and sinking a shaft about 250 feet west of their east boundary line. The free gold then found was sufficient to warrant further exploration on the adjoining land, and this resulted in the finding of gold quartz upon the land now known as the Michigan Gold and Silver Company's. The possession of the lease of this land is in dispute, an outline of which will be given further on.

The policy of the Lake Superior Iron Company has been extremely conservative, and one that is hardly worth following. It can be readily understood that the company does not wish to lose its ore, nor have the operations at the mine hampered by curious and inquisitive strangers; but when permission to descend the shaft is refused to Mr. Ropes, and the general public is given to understand that they are not wanted, it would seem as though their conservatism had been carried too far. I did not care to run the risk of a refusal at their hands.

Upon my arrival at the ground I found that the miners were coming from a recent blast and going to dinner, and so went on in company with Mr. Ropes, to whom I am (as well as others) under great obligations for his many courtesies, to the explorations of the Michigan Gold and Silver Company. Returning, we found the ore was hoisting from a shaft 65 feet deep, miners busy washing it from mine dirt and sorting out some 30 pounds or so wherein the gold was plainly visible. The gold did not have the massive appearance of that found further east, being apparently a concentration of extraordinary small particles, which, by imperceptible gradations, faded from sight. The vein is claimed to be of an average width

* See Structural Relations of Ore Deposits, advance sheets Transactions of the American Institute of Mining Engineers, Boston meeting, February, 1888.

Leases are given upon the basis of 10 per cent royalty, and for a term of twenty years; a stated number of men are to be employed regularly, but, unlike leases for iron ore, they do not call for the payment of royalty unless valuable mineral is extracted, when it, apparently, is optional with the lessor whether he will take ten per cent of the mineral itself (as has been done in the case of the Michigan G. & S. Co. by Gingress) or its cash equivalent. It seems to me that the former method contains many objectionable features, and opens avenues for misunderstandings between lessor and lessee.

of 3½ feet, with a \$10 average value of the vein. With labor at \$1.65 to \$2 per day, abundant railroad facilities (as the Chicago & Northwestern Railway are planning to parallel the gold range from their Michigamew spur), there should be a profit realized on its treatment.

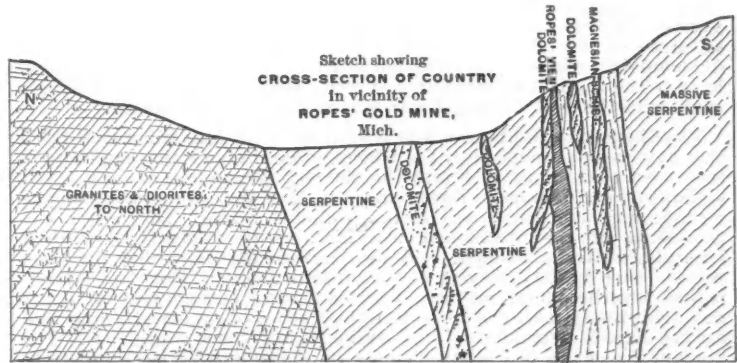
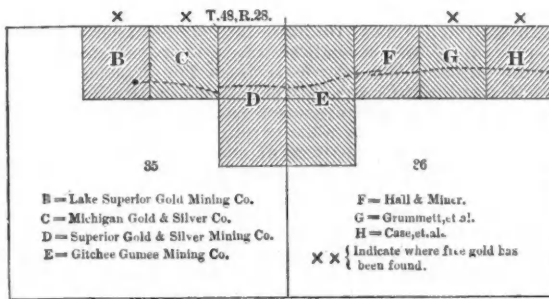
Last summer the vein of the Michigan Gold and Silver Company was uncovered by removing from 2 to 5 feet of soil the entire length of the forty acre tract. The course of the deposit is approximately east and west. In places it is thrown to the north or south, or split by intrusive dioritic masses, and near the eastern end of this company's land, the vein having a slight southeast trend, outcrops within 25 feet of the south boundary line as it passes into the adjoining property on the east. The surface dip of the vein is about 80 degrees to the south, so that within a comparatively short distance the vein would pass wholly beyond the south line and into the adjoining southern territory. But while this condition of affairs certainly obtains, the general dip of the entire country-rock is to the north, and at depth I look to see the vein assume the same dip. In fact, this change of dip is noticeable in the Ropes mine (some two miles north of east from this mine), where, at a depth of 200 feet or so the vein loses its southern dip, is perpendicular for 100 feet, then bends under and assumes the normal dip of the country-rock to the north.

The character of the surface-quartz found is identical in all the openings I have visited, and changes its appearance simultaneously as depth is achieved; the surface rock being white, friable and having the appearance of a marble, with thin, black interpenetrating seams of hornblende running irregularly through it. At a depth of 60 feet the changes noticeable are a more compact mass, more vitreous luster, increased hardness, absence of the irregular hornblende streaks, the occurrence of dark, banded parallel seams on the wall side of the quartz and on the cleavage seams, asbestos is also seen. It has the physical

buildings until the title is quieted, when doubtless it will be vigorously worked by whoever may gain possession.

East of the Michigan Company's land a north and south eighty acre tract has been stocked by Messrs. White, Barrows and others of Marquette, and explorations upon the property begun this week. Their vein will probably be found thrown to the north of the course of that of its western neighbor; east of them the Gitchi-Gumee Mining Company has been organized upon land owned by the Breitung estate, and work is soon to begin on its 6-foot seam of quartz; the next forty acre tract east is operated by Hall & Miner, of Ishpeming, who have some good surface quartz 4 feet wide, all of the same general character as that found elsewhere on the range in a shaft 12 by 15 feet deep; east of them one Grummet is at work in a shaft 45 feet deep, from which specimen rock has been taken. He has the same width of quartz as that in the Hall & Miner explorations. East of Grummet, Mr. J. M. Case, of Marquette, is working an option on the quartz lead, and showed me some excellent quartz with fine free gold scattered through it; the shaft is 16 feet deep, with about 5 feet of quartz.

These explorations comprise the present extent of the gold finds to date; though work is being conducted a mile further east of the Case property and directly south of the Ropes mine in the dioritic horizon. West of the Lake Superior some parties have begun operations. The regularity of the strike of the deposit is worthy of note, as it is contained within all the forties enumerated. What the width will be in depth is, of course, impossible to foretell. The surface average is between 2 and 4 feet, in places wider or narrower. I would have liked very much to have been able to see the only deep (?) working shaft on the range, that of the Lake Superior Company's; but it was not to be. We can, however, for the present take their word for underground work and see "what we can see."



appearance of typical gold-bearing quartz; but little, if any iron pyrites is found as compared to that usually associated with gold, but in its place galena and black antimonial silver are frequently seen.

The company have one shaft 70 feet and a small one hardly 10 feet deep, from both of which specimen-rock has been taken. The latter shaft has been estimated to have yielded some \$10,000. This I question. While undoubtedly it has furnished quite an amount of extraordinarily rich rock, it would take more and richer quartz than I saw in the vault of the company's office (including the 10 per cent additional removed by Gingrass) to refine into \$10,000 worth of bullion. The "shrinkage" of the apparent amount of gold in a specimen when panned out is disappointing to the neophyte in gold mining, and this disappointment is but added to when the pannings are reduced to a button; however, it should clearly be understood that in spite of these arid-chilling remarks a wonderful find has been made at this property, and one which augurs well for its future. One specimen that I saw in the company's office being entirely similar to some phenomenal gold quartz I have had the pleasure of mining in the Last Chance Mine, Atlanta, Idaho Territory. The gold contained was massive and deep in color, probably \$16 to \$17 an ounce, and the quartz was identical even to characteristic stains; in fact, it seemed like meeting with an old friend who had been lost to sight for years; but, of course, such rock cannot be depended upon in the making of the mine; good as it is to find, reliance must be placed upon the general average of the vein independent of abnormally rich pockets like these, and with such a narrow vein as this shows upon the surface, the grade of the quartz must be high.

I have not been able to obtain definite information as to the average value of this ore. Captain Trevarthen, of the Michigan mine, told me that the vein in places in the shaft was 10 to 12 feet wide; that it would assay from \$10 to \$300 a ton, and that 5 feet would average \$50 a ton. While appearances are deceptive, I feel inclined to give credence to his statements of the values of the ore, for the quartz looks "healthy."

The controversy in regard to the ownership of the lease of this property may be briefly outlined as follows: One Peter Gingrass, of Ishpeming, owned the fee of the land and gave option for a lease to one Foley, of Hancock, who worked the mine, but not very vigorously, as I understand; after a lapse of some time, during which nothing was done by him, he asked for a lease, but was refused it; one Grummet was then given an option for a lease, but he likewise neglected to avail himself of its privileges, and Gingrass ignored him and gave an option to the Hon. Peter White, of Marquette. Mr. White then sold this option to the Michigan Gold and Silver Company, of Cleveland, who are now in possession and working the mine. In a trial held at Marquette this spring, Judge Grant gave his decision in favor of this company, and they proceeded to work the property, when a partial injunction was obtained by Foley restraining them from working at a depth greater than 10 feet from the surface. By a card recently published in the *Mining Journal* of Marquette, I see that Mr. Foley proposes appealing the case to the Supreme Court; meanwhile but little can be done; the company in possession are averse to expending any large amount of money upon the mine or

What will be done with the quartz?

It will be nearly three miles to haul it to the Ropes mill, and that is the only one here; yet it would seem to be the only prudent course to adopt, before action is taken by the mine owners to send a trial load of their ordinary quartz to that mill for treatment; then if the returns are satisfactory let some convenient site be chosen, well situated in reference to the mines, where an abundant supply of water is to be had the year round, and erect a small ten-stamp mill of the latest improved pattern for the treatment of custom lots of ore; by this means the smaller companies will receive return for their ore as it is mined, and enable them to prosecute their underground work. Ten stamps will certainly be large enough for some time to come to treat the ore as mined, and should it prove inadequate to the work imposed upon it by the increased output from the mines, it could be readily added to. A scheme of this kind where the mines pledge themselves to furnish a definite amount of quartz per annum at a stated charge per ton for treatment in return for the erection of the mill, would certainly obtain all the necessary capital for its successful operation.

MARQUETTE, Mich., Sept. 13, 1888.

Large Hydraulic Press for Forgings.—The huge hydraulic press for the manipulation of heavy forgings erected at the works of Messrs. Cammell & Co., Sheffield, England, is now working, and is giving every satisfaction. The press is of 4000 tons nominal power, but will work up to 5000 tons. Probably it is the largest press of the kind in existence.

Proposed Italian Canal.—An Italian engineer, M. Bocca, has just finished estimates for a ship-canal to cross Italy. The canal would start from Castro on the Mediterranean Sea, and end at Fano on the Adriatic. The length would be 282 kilometers, the width 100 meters, and the depth 12 meters, allowing large ironclads to pass. The canal would drain lakes Perugia and Bolsena, and would allow of a systematic irrigation of that whole region. The cost is estimated at \$100,000,000. The work would occupy 300,000 men for five years.

Strength of Glass.—A number of experiments on the transverse strength of glass have recently been carried out by Mr. F. Connert, who finds that the ordinary empirical formula for the strength of beams is inapplicable in this case:

$$\text{For soft glass, } W = 39.62 \frac{b}{l} t^{1.5873}$$

$$\text{And for hard pressed glass, } W = 52.18 \frac{b}{l} t^{2.5}$$

Where W = breaking weight in pounds applied to center of bar tested, b = breadth of bar, l = length of bar, t = thickness of bar in inches.

Durability of Ganister Bricks.—At the Glasgow Exhibition Messrs. Lowcock & Company, of Middlesborough, England, exhibited samples of ganister brick which have undergone the test of 2000 tons and upwards of steel being melted in front of them. One sample was a piece of

brickwork taken from a Siemens-Martin open-hearth furnace which had been working at Messrs. Bolckow, Vaughan & Company's, of Middlesbrough, for twelve months; it had run 462 casts and produced 6056 tons of Siemens mild steel without rebuilding.

Montana Dividends.—For the first eight months of this year Montana properties have paid over \$2,000,000 in dividends, being an increase for the month of August of nearly a quarter of a million. The dividends distributed are:

Boston & Montana Copper Company	\$200,000
Granite Mountain	1,200,000
Hecla	120,000
Hope	50,000
Jay Gould	172,000
Montana Limited	320,000
Original	3,000
Parro	72,000
Total	\$2,147,000

Artesian Well-Boring in Nevada.—We learn from the *Mining Industry* of Denver that artesian well-boring is now a sort of mania in parts of Nevada, and some of the borings are proving successful. A fine flowing well was struck a few days ago in Douglas County, Carson Valley, at a depth of only 310 feet, and without encountering rock of any kind. Improved boring machinery has been ordered from the East, and we may expect to see the experience gained in the Comstock mines, in "feeling ahead" for water, brought into play. By tunneling into the mountain that forms the rim of the basin of Lake Tahoe, a very large supply of water might be obtained, and as the diamond drill will easily bore ahead 1000 feet or more, it would be an excellent tool for use in tunneling for water. In case of striking a strong flow, several holes could be sent into the source, thus saving the cost of driving forward a large tunnel. Many great bodies of water have been thus tapped and drawn off in the deep workings of the Comstock. In the Union Consolidated mine cocks were fitted into the diamond drill holes and the water drawn off as it could be taken by the pumps. In running the Sutro Tunnel the diamond drill was sent ahead to tap shafts in which water had accumulated to the depth of several hundred feet. Good hits were nearly always made with the drill, though it was sent ahead a great distance.

The Chinese as Goldseekers in Australia.—On Australian gold-fields that have been abandoned by the whites, either because they appeared to have been worked out or because the yield of the precious metal was not sufficiently satisfactory in European estimation, the Chinese always make a good living, and sometimes secure valuable prizes. They enter into possession of the abandoned workings, resume operations in their leisurely, methodic fashion, and are occasionally rewarded for their perseverance by the discovery of a handsome nugget. But "fossicking" is their favorite pursuit on these deserted fields. This consists in slowly and deliberately raking over the unsightly heaps of upturned earth that are the dismal mementoes of the white man's former presence. The vigilant eye of the Chinaman detects in these hurried accumulations many a minute particle of gold and sometimes a piece of quartz studded with the precious metal that escaped the observation of his white predecessor; and there is rarely a day in which he does not return to his tent in the evening the richer for this process. In traveling through the gold regions of Australia no sight is more familiar than the abandoned diggings, dotted here and there with the patient, plodding Chinese, each bent low with his handy little rake analyzing the contents of the white man's leavings, or scrutinizing the alluvial deposits in the bed of the neighboring creek.

Fossils, Coal and Natural Gas in Assiniboia, Canada.—We extract the following from a letter from David Dwight Wells to the *Evening Post* descriptive of Manitoba in the neighborhood of the Canadian Pacific Railroad. About ten miles from Medicine Hat there is a bed of fossils of the cretaceous period, more wonderful, if the specimens exhibited form any criterion, than anything yet described by geologists. Those who have seen it report that one can walk for miles over what seems to have been the bed of an ancient ocean, and which is paved, as it were, with ammonites, nautili, fossil fish, sponges, leaves, fruits, and even what are claimed to be the fossil eggs of such marine animals as turtles. Many of them preserve their luster and shell marking almost as perfectly as if just taken from the original ocean. All of these fossils are silicious, and many are pure chalcedony; so that it looks as if animal life had been terminated, and it remains preserved by an infusion of silica in a liquid form into the waters of the sea in which they lived. Leaving Medicine Hat, we cross the South Saskatchewan, and rise a hundred feet or more to the level of the high prairie plateau which extends to the mountains. For nearly two hundred miles this prairie is underlaid by two strata of bituminous coal, and, as might be expected, natural gas has been struck all over this country. We first see it at Langevin, thirty-five miles west of Medicine Hat, where it is used to pump water and light the house of the attendant of the water-tank. This is the last settlement in Assiniboia.

The Croselmir Zinc Process.—Some experiments are now being made in Denver, at the old Bailey smelting works, on a lot of zinc blende tailings from the Colonel Sellers concentrating mill, says the *Leadville Herald Democrat*. The new Croselmir process for treating argentiferous zinc blendes is being tried. In this process the ore is roasted in kilns, at a low temperature, steam being introduced into the kiln during the roasting. Under these conditions the zinc sulphide is converted into zinc sulphate, which seems to be mainly the basic or soluble sulphate. After the roasting in the kilns is completed, water is run through the heap and the zinc sulphate is dissolved. The solution is then drained off into sumps, and the zinc precipitated as carbonate. In the residue left in the kiln, is the lead, iron, gold, if there is any in the ore, and most of the silver. The percentage of lead and iron in the residue is higher than in the original ore, most of the zinc and sulphur having been removed. As the ore has also oxidized, during the roasting, the residue becomes a good smelting ore and can be treated at a low price. The plant which is required for this process is not expensive and the cost for labor is not much. By this process a large proportion of the zinc is recovered from the ore and becomes a marketable product, while the remainder of the ore is converted into a product which can be treated by lead smelters at

a low cost. Some variations may be made in the process, but it is essentially as described. Among other things it may be necessary to add a small amount of sulphuric acid to the water used as solvent for the zinc sulphate, but this would not increase the cost of the process much. In the experiments at Denver, with the Colonel Sellers tailings, the latter being fine, have been made into brick by the addition of a small amount of clay, in order that they may be suitable for roasting in kilns. Iron is converted into sulphate and leached by the water, is precipitated before the zinc is thrown down.

The Coal Measures of Kansas.—Mr. L. C. Wooster, of Eureka, Kan., gives the following information in a letter to *Science*: The drilling of a 2000-foot well at Emporia, Kan., has furnished an excellent section of the coal measures of this State. The location of the section, unfortunately, can be given but approximately. Beginning somewhere in the upper half of the upper coal measures, it ends in the lower third of the lower coal measures. The section is very interesting, however, independently of its position in the formations. In the depth of nearly 2000 feet there are 112 strata with an average thickness of nearly 18 feet. Of these strata, 50 are shale, 50 limestone, and 12 sandstone. The limestone strata average 9½ feet in thickness, the shale 25 feet, and the sandstone 24 feet. In the upper thousand feet are ½ of the shale strata, ⅓ of the limestone and ⅓ of the sandstone strata; but in the first thousand feet are ⅓ of the shale, nearly ¼ of the limestone and ¼ of the sandstone. The total thickness of the shale is 1242 feet, limestone 465 feet, and sandstone 286 feet. Mingled with the shale are three beds of coal in the first 500 feet and one bed in the last 500. The thicknesses average less than one foot. The section teaches that the conditions under which the coal-measures were deposited were exceeding variable, and that the tracing of the strata through eastern Kansas will not be a holiday task. These deposits, even including the limestone, are mostly shallow-water accumulations, and are quite rich in fossils, especially the limestone. In-crusting corals, crinoid joints and brachiopod and conchifer shells are especially abundant. Trilobites are rare.

Electric Transmission of Energy in the Comstock Mines.—In the *ENGINEERING AND MINING JOURNAL* of June 16th we referred to the proposal to run a portion of the Nevada mill by power transmitted from water-wheels in the mines. We now learn from *The Mining Industry* that the Brush Electric Light Company has shipped to the Nevada mill two dynamos and motors of an improved pattern, and it assures the Nevada mill people that it will be able to put upon the stamps 80 per cent of the power generated at the bottom of the shaft. There are to be six dynamos, one always to be held in reserve, and six Pelton wheels 40 inches diameter instead of one of 11 feet diameter, to be made of phosphor-bronze, to drive them, each attached to the dynamo shaft directly. As already explained, these wheels will be set up at the Sutro tunnel level of the Chollar mine, in a large chamber already prepared to receive them. A column of water brought down the side of Mount Davidson in a wrought-iron pipe will be delivered through a proper nozzle upon the surface Pelton, which stands in the mill, under a perpendicular pressure of about 460 feet. This wheel is 10 feet 10 inches in diameter. After the water leaves the wheel it is piped to the main shaft of the Chollar mine. Down this shaft (and the incline at its bottom) the water is conveyed in two pipes to the electric chamber on the Sutro tunnel level. The water will be put upon the wheels under a perpendicular pressure of 1630 feet. In no place in the world has water been used on a Pelton wheel under such a tremendous head. The water will be delivered upon each wheel through a nozzle somewhat less than half an inch in diameter. Each wheel is intended to develop about 125 horse-power. This will make a total of some 750 horse-power delivered by the six wheels. As this is the first attempt in the history of mechanics to operate water-wheels under such an enormous pressure (as well as the fact of the utilization of the power by electrical transmission), the result of the experiment will everywhere be anxiously awaited.

PATENTS GRANTED BY THE UNITED STATES PATENT-OFFICE.

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

PATENTS GRANTED SEPT. 15TH, 1888.

- 389,542. Non-Conducting Covering for Steam-Pipes, Boilers, etc. Henry C. Bradley, Milwaukee, Wis.
- 389,545. Process of Manufacturing Wrought-Iron. Lucius D. Chapin, Hyde Park, Ill.
- 389,552. Material for Cleaning and Polishing Metals. John Dean, Cleveland, Ohio, Assignor of one fourth to George H. Kingsley, same place.
- 389,566. Process of Making Acid Phosphate. Charles Glaser, Baltimore, Md., Assignor of one half to Charles F. W. Danemann, same place.
- 389,574. Puddling-Furnace. Thomas C. Jones, Lynchburg, Va.
- 389,575. Furnace. Walter R. Jones, Rome, Italy.
- 389,585. Mechanism for Making Seamless Tubes. Reinhard Mannesmann and Max Mannesmann, Remscheid, Prussia, Germany.
- 389,587. Rock-Drill. John Massett, North Tarrytown, N. Y.
- 389,591. Process of Making White Lead. Norman K. Morris and William West, Denver, Colo.
- 389,608. Gas-Engine. Halcyon Skinner, Yonkers, N. Y.
- 389,613. Mechanism for Operating Drills. Wilhelm Niemi, Bellevue, Ky.
- 389,617. Apparatus for Condensing Metallic Zinc. Edward Walsb, Jr., St. Louis, Mo.
- 389,623. Horse-Power Machine. William H. Willicraft, Juniper, Ariz.
- 389,642. Sectional Steam-Boiler. Albert M. Dimmick and Elmer Z. Smith, Wilkes-Barre, Pa.
- 389,671. Regenerative-Furnace. William Swindell and John C. Swindell, Allegheny, Pa.
- 389,718. Steam-Boiler-Cleaner. John S. Roake, Brooklyn, N. Y.
- 389,720. Combined Cleaner and Heater. John D. Sullivan, New Orleans, La.
- 389,725. Pump. James W. Vanmeter, Oakville, Tex.
- 389,730. Combined Steam-Pressure Gauge and Draft-Regulator. Moses Wilkes, Trouton, N. J.
- 389,736. Throttling Device for Steam-Cylinders. George W. Cisco, Montvale, N. J.
- 389,737. Balance-Slide-Valve. George W. Cisco, Montvale, N. J.
- 389,740. Rock-Drill. Albert W. Daw and Zacharias W. Daw, Aamdals Kobbervoerk, Skafve, over Thelemarken, Norway.
- 389,755. Lubricator. William F. Mattes and John F. Lewis, Scranton, Pa., Assignors to William F. Mattes, trustee, same place.
- 389,769. Pumping-Engine. Edward G. Shortt, Carthage, N. Y.
- 389,770. Duplex Pumping-Engine. Edward G. Shortt, Carthage, N. Y.
- 389,773. Boiler-Furnace. William W. McClafferty, New Orleans, La.
- 389,775. Steam Rock-Drill. Abraham J. Sypheer, Iron Mountain, Mo.
- 389,797. Pipe-Coupling. Solomon R. Dresser, Bradford, Pa.
- 389,822. Electric Railway System. John D. Nicholson and William J. McElroy, Pittsburg, Pa., and Thomas J. McFlige, New York, N. Y.

THE METALLURGY OF STEEL.*

By Henry M. Howe.

(Continued from page 221.)

He finds^a that when hardened steel is dipped into nitric acid of 1.23 sp. gr. it becomes covered with a black-brown, sooty, amorphous layer of carbon, giving a brown streak on white paper: that unhardened steel under these conditions acquires a coating which inclines to blue, gives a black gray streak, and appears to be crystalline. We may join him in provisionally terming these hardening and cement carbon respectively, remembering that we use these names somewhat generically, to indicate conditions of carbon each of which may be shown later to comprise several distinct varieties.^b

The following paragraphs detail the teaching of Brinnell's experiments, first as to the condition of carbon as inferred from the tests just described, second as to fracture. Many of the inferences are my own: but this matters little, for the evidence in support of each is given, and the reader can satisfy himself as to its validity.

§ 242. BRINNELL'S EXPERIMENTS ON THE CONDITIONS OF CARBON.—I. *That the change from cement to hardening carbon does not occur below W, but is sudden and complete at W,* is indicated by the following experiments. In 3, 4, 20 and 21^a the carbon is initially cement. On heating nearly to W and quenching it remains wholly cement (3 and 20) while, if we heat just to W and quench, we find it wholly hardening (4 and 21). Again, in 36-7, 43-4 and 67-8 the carbon, either initially hardening or (as in 67-8) first made hardening by heating above W, is partly changed to cement by stay in the region blue-tint—W. (That this partial change occurs will be shown.) Now, in 36, 43 and 67 the steel is quenched after heating nearly but not quite to W, while in 37, 44 and 68 it is quenched after heating just to W. In the former three the carbon remains partly cement, in the latter it is found to be wholly hardening.

2. *That carbon remains in the hardening state at all temperatures above W* is shown by the fact that, whenever steel is quenched from a point above W, and so hurried through the range W X in which it is possible for the carbon to change back from hardening to cement, only hardening carbon is found. This is true whether the quenching be from a yellow heat (73),^c a bright yellow (5, 7, 22, 38, 45, 60, 66, 69), a bright white (6, 23, 39, 46, 61), or from a temperature above the melting point (79): and whether it be preceded by a fall (7, 8, 78) or a rise of temperature, and whether this rise be direct from the cold (5, 6, 22-3, 38-9, 45-6), or be preceded by oscillations of temperature (60-1, 66, 69, 73) and, finally, whether the carbon be cement or hardening initially.

3. *That carbon tends to become wholly cement at tem-*

peratures between X and W but not including W is shown by the following facts. A, if steel containing hardening carbon be long exposed to this range of temperature its carbon becomes wholly cement. This occurs when the steel cools slowly from W to X (11, 15, 29, 30, 31, 51 to 57, 63-4, 70-1, 74-5-6, 80-1); when it is cooled from W to blue, heated to V and quenched (58); and in two out of three cases in which it is slowly heated and cooled between X and V++ (27-8).

B, when the carbon is initially all cement none of it changes to hardening below W, even at temperatures barely below W (3, 14, 20).

C, when it is initially all hardening or is made hardening by heating to W, at least part of it always becomes cement during any subsequent appreciably long exposure to temperatures between a brown tint and W.^a

These last two facts are true whether the steel be quenched after the exposure (B, 1, 2, 3, 18 to 20; C, 9, 10, 32 to 36, 40 to 43, 67, 77), or slowly cooled (B, 12 to 14; C, 24 to 26, 47 to 49).

4. *That the change from hardening to cement carbon is always slow* is shown by the fact that no cement carbon is formed when steel passes rapidly, as in quenching, through the range W X, (6 to 8, 21 to 23, 37 to 39, 44 to 46, 59 to 61, 65-6, 68-9, 72-3, 78-9, 82), and that if the carbon be hardening it does not change completely to cement unless the steel be long exposed to temperatures between a blue tint and W. *E. g.* this change is only partial if the steel be heated from X only to V or some lower point and slowly cooled (24 to 26, 47 to 49), or from X only to some point below W and quenched, (32 to 36, 40 to 43), or if it be cooled slowly from above W only as far as V and then quenched (9, 10, 77).

5. *That the change from hardening to cement carbon is most rapid at V* is probable, though not readily proved, as Brinnell's test for these two forms of carbon is qualitative only.

We thus have two critical temperatures, W and V. At W and all higher points the carbon becomes hardening instantly; at all points below W, even those very slightly below it, the carbon becomes cement slowly. This latter change appears to occur most rapidly at V.

§ 243. BRINNELL'S RESULTS CONCERNING FRACTURE.—He recognizes nine distinct simple types of fracture, supposed to result from nine corresponding types of structure, set forth at length in Table 85, and more briefly here.

Hardening carbon.	Cement carbon.	Transition from hardening to cement carbon.
Bright porcelanic, d	F. Bright	Dull porcelanic d H.
Bright granular } Fine	F. Hackly e	Leafy crystalline G.
crystalline. } Coarse D.	crystalline. { Coarse A.	Dull coarse crystalline I.

As Table 85 indicates, there is reason to suspect the existence of four more types.

Usually the whole fracture belongs to some one of these types: but in some cases, in which the transition from one type to another is incomplete, different portions of one and the same fracture belong to two quite distinct types: *i. e.* the fracture is composite.

The chief changes of fracture as inferred from our present data are probably as follows.

^d Brinnell terms these fractures "amorphous:" as this word signifies absolute freedom from crystalline structure, such as is found in glass, and as these fractures are probably simply extremely fine-grained yet crystalline, "porcelanic" seems to me more accurate.

^e "Zackig." Others translate this "pointed crystalline." "Hackly" is well-established, briefer, and I think more expressive.

* Copyright by the Scientific Publishing Company, 1887.

^a J. A. Brinnell, Stahl und Eisen, V., p. 611, 1885; from Jernkontoret's Analer, 1885. Also a much over-condensed unintelligible translation in "Notes on Construction of Ordnance, No. 37," Ordnance Dept., Washington, June 22, 1886. Cf. Coffin, Trans. Am. Soc. Civ. Eng., XV., p. 318. This paper is by far the most important contribution to our knowledge of the fracture of steel since Cherriff's classical work.

^b It has been proposed to abandon the name "cement" for "non-hardening." We can adopt Rinman's name "cement" as meaning the carbon of unhardened steel, without thereby committing ourselves to any particular theory as to its composition. These names are only provisional. As "cement" is well established, and as every new name increases confusion, we may as well keep the old till we know enough to frame moderately permanent new ones.

^c In this and the succeeding section, unless otherwise stated, numerals refer to the numbers of Brinnell's experiments, Figure 61.

1. When cold steel is gradually heated the fractures change thus:^a

TABLE 84—GENERAL SUMMARY OF FRACTURE CHANGES.

Fracture of cold steel.	Change at a gentle glow to	Further change at V to	Further change at V + to	Further change at V + + to	Further change at W to	Further change at light yellow to	Further change at bright white to
F.....	F H	H	C	C (?)	F	E	D
E.....	E H (?)	H (?)	(?)	(?)	F (?)	E (?)	D (?)
D.....	D H	H	G	G F	F	E	D
C.....	C	C	C	C	F	E	D
B.....	B (?)	B (?)	B (?)	B (?)	F (?)	E (?)	D (?)
A.....	A	A	A	A	F	E	D

2. The fractures thus set up may be preserved by sudden cooling: but, if cooled slowly instead of suddenly from the temperatures at which they are thus formed, they behave as follows:

F } Change between W and X to { C } Coarse follows coarse, fine
 E } yields fine.
 D }
 C (?) }
 B (?) } Remain unaltered.
 A }

These statements will be verified in § 244.

Under the special conditions of Brinnell's experiments changes of temperature appear to affect the fracture thus:

1. Those either rising or falling which change the condition of the carbon, always change the fracture from the hardening-carbon (granular) group toward the cement-carbon (hackly) group, or back, the change of structure-group being simultaneous with and like in direction and rapidity to that of carbon, sudden, direct, and at W from cement to hardening; slow, through intermediate transition fractures, and between W and X from hardening to cement.

2. Those which do not change the condition of carbon,

A. If falling do not change the type of fracture,

B. If rising do not change the existing fracture till they pass the temperature at which it was acquired: beyond this they coarsen it.

3. Exposure to a white or higher heat without subsequent forging always causes coarse crystallization (the higher the coarser), which indeed cannot be originated otherwise.

4. To break up by heat-treatment coarse crystalline structure once acquired, the temperature must be varied so as to change the condition of carbon: heating to or slightly above W is probably the only way of effacing it completely.

5. Fine structures F and C once acquired can be materially coarsened only by heating above W, the structure remaining moderately fine up to a bright yellow.

Brinnell adopts the usual assumption that sudden cooling (*e. g.* by quenching) does not in itself alter the structure of the metal, but merely preserves that which existed at the instant preceding the quenching. This is neither self-evident nor experimentally proved. It is certainly improbable that quenching should originate, but not that it should modify crystalline structure. Indeed, in the case of pieces of large cross-section, the different layers must cool and contract during quenching at such different rates that interstratal movements must arise which might well alter or destroy pre-existing crystallization. In small bars, however, this motion is probably slight, and here the assumption that quenching fixes the existing structure is hardly improbable: as it greatly facilitates discussion, we may adopt it provisionally.

As it appears to be a general rule that the finer the fracture, other things being equal, the better the condition of

^a Where a letter is followed by (?) direct evidence is lacking.

the steel, so the means of acquiring and preserving the fine fractures, F of properly hardened steel and C of unhardened steel, are of great importance: not less important are those of avoiding the coarse fractures D and A.

§ 244. DETAILS OF FRACTURES.—We will now consider in more detail the nine fractures and the conditions under which they are acquired and lost. But the true way to obtain a clear notion of them and of their changes is to study them at the forge, a task which I heartily commend to my readers.

The general scheme of the subject, as far as I understand it, is set forth in Table 85.

a. Group 1. The lower member, F, bright porcelanic, the characteristic fracture of properly hardened steel, is acquired under two sets of conditions,

1, When molten steel is suddenly solidified and immediately completely cooled (*;*9). In the brief instant afforded, the crystalline force can only assert itself far enough to produce a porcelanic structure.

2, Whenever cement carbon changes to hardening: this change seems to be so violent that it effaces all pre-existing crystallization, and here too the steel becomes porcelanic. When cold steel is heated to just below W its carbon, if not initially cement, becomes cement: and on reaching W the change to hardening carbon occurs suddenly: hence, whenever cold steel is heated to but not far above W and quenched, a porcelanic fracture is found^b (4, 21, 37, 44). Simple exposure to W does not in itself destroy pre-existing crystallization and render the steel porcelanic: the change from cement to hardening carbon must occur; otherwise the pre-existing crystallization remains. Thus if steel be heated above W its carbon remains hardening: if we now cool it to W no change of carbon occurs, and the steel if now quenched will not be found porcelanic (8, 78). But, by cooling the steel far enough below W (*e. g.* to below V) to change its carbon to cement, and again heating to W, this cement carbon reverts to the hardening state, and the steel, if now quenched, will be found porcelanic (59, 65, 82).

If the temperature fall from above W to some point so slightly below it that but a part of the hardening carbon changes to cement, and if the temperature be again raised to W, it appears that only those crystals which had changed to cement will now undergo a change of carbon, and they alone will now become porcelanic, F: the rest will preserve the crystallization which they had before, when their temperature was above W, and a composite fracture arises (68).

Easily acquired by quenching from W, F is as easily lost, by exposure to any high temperature either above or below W. Below V it only changes to the dull porcelanic fracture H (41-2, 48-9): between V and W to the fine-grained fracture C (43, 50): while above W it changes to the coarser members of its own group, E and D (5-6, 22-3, 38-9, 45-6). In short, below W (carbon changing) it changes only to fine-grained and hence desirable fractures, while above (carbon constant) it like all others grows coarser. (TO BE CONTINUED.)

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

^b This is shown by direct experiment for steel whose fracture is either C, A or G initially. The analogy of C and A leaves little doubt that B would undergo the same change. D and H certainly and E probably change to G when cold steel is heated to V + +, and hence eventually yield F at W. The behavior of I, a transition fracture unlikely to arise in practice, has not been studied, but all analogy indicates that it too would change to F at W.

PERSONAL.

Joseph Allison, one of the pioneers of the Schuylkill coal region, died on the 17th inst., at his home in St. Clair, Schuylkill County, aged eighty-six years.

Mr. Otto Pfordte, mining engineer, now in Peru, is to take charge of the new concentrating mill of Backus & Johnston, at Lima, Peru, as soon as completed.

Dr. Hans Pirngruber, of this city, has been engaged as assistant mining engineer and chemist to the Los Angeles mine, Honduras, Central America, and this week sailed for that destination.

Mr. W. E. Terbune, late superintendent Portland (Oregon) Reduction Works, and formerly superintendent Iron Hill (Dak.) Smelter, is on a visit to this city and may be addressed at this office.

K. Tatsumo, a professor in Tokio University and a Japanese authority on engineering and architecture, is now in this country studying American architecture, preparatory to making plans for the Imperial Bank building of Japan.

We have to record the death of Mr. Jas. L. Randolph, the veteran consulting civil engineer of the Baltimore & Ohio Railroad Company, which took place suddenly on the 17th inst., at his home, near Jessup's, on the Washington Branch Railroad. Mr. Randolph entered the service of the company when quite young about the year 1836, and spent his long and useful life in various capacities in the Engineering Department. He was one of the earliest railroad engineers in this country, had to do a great amount of original research, and among the more important works that he carried out was the location and construction of the Chicago Division of the Baltimore & Ohio Railroad.

The so called Hartsfeldt Foreign Patents Association, of Newport, Ky., is again issuing cards on which it is stated that "the ENGINEERING AND MINING JOURNAL, of New York, June 20th, 1885, says: Mr. Hartsfeldt has won fame as a builder of precious metal furnaces in Europe, and the merits of his present devices have already been recognized in many of our continental countries." We have already stated in this journal (March 27th, 1886) that this statement is altogether unfounded, and that what at that time knew nothing about Mr. Hartsfeldt or his furnace. We may now say we know favorable, but a good deal that is unfavorable of both, and we shall leave no room for misunderstanding our opinion of each if the name of the ENGINEERING AND MINING JOURNAL be used to "boom" either Mr. Hartsfeldt or his furnace.

INDUSTRIAL NOTES.

A puddling furnace exploded at the Keystone Rolling Mill, in Pittsburg, on the 15th inst., causing \$10,000 damages. No person was hurt.

A California company with a capital of \$1,500,000 will establish a big iron plant near Milford, Utah, that will employ about 1,600 men.

The strike at Brown & Co.'s rolling mill against paying for burnt iron ended on the 13th inst. in a victory for the firm. Work has been resumed.

During the past week another lot of new coke-ovens of the DeBardeleben Coal and Iron Company have gone into operation at Bessemer. The company has 280 coke-ovens in operation.

Mr. Wm. Hasenzahl, manufacturer of the excellent Hasenzahl diamond prospector's drill has found it necessary to enlarge his works, and has removed to 135 West Second street, Cincinnati, Ohio, where he can fill orders more promptly than in his former works.

Decker & Atkins will soon begin the erection of iron mills, a bolt and nut factory, and a large foundry, near Charleston, W. Va. By spring the works will be in full blast. This is the first business of the kind ever started in that city. Others are making arrangements to start various factories.

The Thomson-Houston Company has been awarded the contract for the construction of an electric system for the movement of cars of the West End Street Railway of Boston. A line is to be constructed at once to Harvard square, Cambridge, and it is said that cars will be running thereon within sixty days.

The first of the new electric cars built for the Fourth avenue, New York City, surface road was running on Monday last for passengers between the Grand Central Depot and the Post-Office. The car was crowded. On the first trip down-town forty passengers were carried and on the up trip fifty-three. Charles W. Courtney, the foreman of the Julien Electric motor manufactory, managed the motor.

A private dispatch from San Diego, Cal., states that concessions have been granted to the Mount Le Carte Land and Water Company for the construction of seven gigantic reservoirs on the border line or in Lower California, to hold water from a water shed of 1200 square miles, or sufficient to irrigate 100,000 acres of land in this county and Lower California. It is estimated that the works will cost \$3,500,000.

It is announced that the contract for the Chignecto Marine Transport Railway, to which we referred in our issue of June 16th, has been signed in London, and

that one of the contractors is already on the ground. The other members of the contracting firm will arrive by the first steamer from England. The contractors are Messrs. Dawson, Symmes & Usher, who were the contractors for the celebrated Poughkeepsie bridge across the Hudson.

Our courteous correspondent who gave us the item referred to below and mentioned in our issue of last week, sends us the following explanation: In my report of the Phoenix Iron Company's No. 3 furnace, I make use of the words "first blast," which is very much incorrect. I should have said: The furnace was blown in July, 1881, banked five months in 1882, and blown out September 5th last. This would give the furnace credit for the long blast of seven years. Please correct.

The well-known Clayton Air Compressor Works, of New York and Brooklyn, has issued a very complete catalogue which fully illustrates and describes in detail air compressors, rock drills, air receivers, hoisting engines, pneumatic locomotives, boilers, steam, air and vacuum pumps. These are only the leading features of the catalogue, which contains much useful information on other items, and, in addition, has some valuable data with regard to the use of compressed air which those interested on the subject should possess.

A syndicate, it is said, has been formed by Gov. Gordon, Henry W. Grady, and others of Atlanta, Ga., and John H. Inman, Calvin Brice, Gen. Samuel Thomas, Dr. Norvin Green, and others of this State for the purpose of building a city at Rockmart, Ga., and developing the slate and marble quarries there. The property is reported to have cost the syndicate \$400,000 in cash and \$4,000,000 in stock. If true this is a pretty liberal price for undeveloped property.

The new furnace of the DeBardeleben Coal and Iron Company at Bessemer is now turning out 125 tons of pig iron daily. During the past week the company shipped over 875 tons of iron to New York, Philadelphia and Ohio River points. Since the furnace first went into blast, about two months ago, the shipments have been something over 7000 tons of iron. Furnace No. 2 will go into blast in a week or two. When this furnace is in operation the total output for both the new furnaces will be 250 tons of pig iron per day.

The Carbon Iron Company has finished its additional improvements to the Ft. Pitt Iron and Steel Works, and has begun to operate the mill to work down its bearings. Horace W. Lash, formerly of Park Bros. & Co., limited, is the general superintendent. The additions consist of an open-hearth steel-melting plant; of two 15-ton Lash steel-melting furnaces; also a large universal mill to furnish universal rolled plates 36 inches wide, of any length or thickness.

The formal opening of the Pioneer Glass Works at Gate City, near Birmingham, Ala., has taken place, and marks an important step forward in the industrial progress of that section. Fifty hands are employed at the works, and they are now engaged in making bottles, flasks, and fruit jars, the capacity of the works being 500 dozen a day. The cost of the sand is said to be 37½ cents a ton, while at Pittsburg it is stated to be \$3, and as Alabama coal is cheap enough, Birmingham should be most favorably situated for this manufacture. The Birmingham Age says this is an infant industry that don't want any tariff.

Samuel Lederer, Vice-President of the St. Louis & Zacatecas Smelting and Refining Company, left Laredo September 11th, for London to complete arrangements for the construction of the Sierra Mojada Railroad. This line will run from the coal-fields of San Felipe, in the State of Coahuila, to the Sierra Mojada mines, thence to connect with the Mexican Central at Jimenez, in the State of Coahuila. It will be nearly four hundred miles in length, connecting the Mexican National, the Mexican International and the Mexican Central by an east and west line passing through the Coahuila coal-fields, the Laguna cotton belt and the famous Sierra Mojada mining district. The present ore output from the Sierra Mojada mines is over sixty thousand tons per year, which can be trebled with railroad facilities.

THE LARGEST STEEL CASTING YET MADE IN THE UNITED STATES.—The largest Bessemer steel casting ever attempted anywhere in the world—the signing of the contract for which we referred to in our issue of July 7th—is believed to have been successfully made for the government's new war ship "Maine," at the works of the Pittsburg Steel-Casting Company on the 17th inst. This mass of metal is intended to serve as the sternpost of the war ship now building at the Brooklyn Navy Yard for the government. It is an L-shaped affair, the two arms measuring respectively 26 and 13 feet. Portions of the casting are 42 inches thick. To fill the mold called for 11 tons steel, 22,000 pounds, and the finished casting will weigh 18,000 pounds, nearly 400 pounds more than the steel gun recently cast at this establishment. Two ladles, one containing 9 tons and the other 2 tons, were drained into the mold in the short time of 1 minute 14½ seconds. The utmost skill and celerity were necessary. Lieutenants Arnold and Force represented the government, and inspected the work at every stage of its continuance. It will require five weeks to finish the sternpost, and when mounted on a car for shipment East the casting will extend from a few inches of the ties to within 4 inches of the roofs of the railway tunnels.

CONTRACTING NOTES.

Machinery and supplies wanted will be found on page xiv.

Contracts open will be found on pages xiv and xv. This week, proposals are invited for the following new contracts: No. 1069, Construction of Bridge Abutments; No. 1070, Water Works; No. 1071, Water-Works; No. 1072, Bridge Superstructure; No. 1073, Mineral Oil; No. 1074, Bridge; No. 1075, Sewerage; No. 1076, Dredging; No. 1077, Metal Work for Light House; No. 1078, River Improvement; No. 1079, Dredging; No. 1080, Iron Work; No. 1081, Sewer Construction; No. 1082, Furnishing and Laying Cast Iron Water Pipe.

GENERAL MINING NEWS.

ALABAMA.

Prospectors have recently found on a tract between Anniston and Jacksonville a large deposit of ocher of fine quality. It is stated that fifty tons per day, valued at \$30 per ton can be extracted.

ALASKA.

Mr. D. H. McNeill, one of a party now surveying the northern country for the Dominion Government, tells the Alaska Times that the mining carried on along the Yukon is done in this wise. The river freezes to a great depth, and on the banks and bars the ice is generally sold to the bottom. The miners cut away the ice and then dig up the gravel, which is also frozen, and carry it on the banks. This process is continued till the river breaks up for a couple of months, when the dirt is carried back again and washed for gold. In this way, says the informant, one man took out a thousand dollars; but it is hard work. The gold is principally coarse, the largest nugget taken out being valued at \$40. This nugget was lost, the discoverer being drowned a short time after he found it. His name was Michael Sufferin, a Canadian. Provisions are pretty dear. Flour is \$17.50 per 100 pounds; bacon, 40 cents pound; beans, 30 cents; sugar, 30 cents; dried apples, 30 cents, of all of which there is a fair supply. During the winter there were thirty-six cases of scurvy among the miners, and three deaths occurred. The Indians on the Yukon are peaceable and willing to work.

ARIZONA.

PINAL COUNTY.

The superintendent of Silver Kingmine, of Arizona, reports output of July, 91,932 ounces fine silver; output for August, 107,657 ounces; on hand September 1st, unsold, 164,000 ounces. This is sufficient to pay all liabilities at that date, and leave on hand treasury a surplus of \$40,000. The September production so far is ahead of that of last month. The new machinery worked with crude petroleum acts in a satisfactory manner.

CALIFORNIA.

GREEN MOUNTAIN MINING COMPANY.—Last June a meeting of the stockholders was called to take steps for the redemption of the company's property from sale under execution. There was not a quorum of the stockholders present. Since then Mr. Francis H. Weeks, the courteous president of this important company, informs us nothing has been done. Furthermore, he knows nothing about the company of which he is president.

NEVADA COUNTY.

BRUNSWICK GOLD MINING COMPANY.—The ten-stamp mill was started up on the 10th inst., and will run steadily for some time to come. There are between 200 and 300 tons of ore on the dump, and the ledge is well opened up, says the Grass Valley Tidings.

MARYLAND QUARTZ MINING COMPANY.—At the annual meeting, held recently, the following were elected to serve as a board of directors for the ensuing year: S. P. Dorsey, John C. Coleman, Edward Coleman, Chas. H. Mitchell, and L. V. Dorsey. The board subsequently organized by the election of S. P. Dorsey, as President and Superintendent, and L. V. Dorsey, Secretary and Treasurer.

COLORADO.

A certificate of incorporation was filed with the Secretary of State on the 9th inst. by the St. Louis & Central City Mining Company, of St. Louis. The capital stock is placed at \$250,000. The directors for the first year of incorporation are Robert M. Funkhauser, Ferdinand F. Razier and Edward I. Williams.

DUNKIN MINING COMPANY.—The annual meeting of the company was held in Leadville September 10th. Of the capital stock, 128,086 shares were represented. Messrs. Woodward Emery, James C. Elms, Brice S. Evans, E. M. Farnsworth, William Chandler, J. H. Odiome and William Faxon, Jr., were elected directors for the ensuing year. The treasurer of the company presented the report, from which the following abstract is made:

TRIAL BALANCE, AUGUST 1st, 1888.		
	Dr.	Cr.
Dunkin Mining Company		\$174,040.62
Dividend account, August 1st, 1888	\$130,000.00	
Dividend account, October 1st, 1883		85.58
Interest received on treasurer's deposits		2,271.01
Expense account and salaries disbursed by treasurer at the East since October 1st, 1883	12,445.66	
Cash on hand	33,951.55	
	\$176,397.21	\$176,397.21
Balance cash on hand at end on deposit East		\$33,951.55
Balance cash on hand, Leadville		745.88
Total		\$34,697.43

DIVIDENDS DISBURSED SINCE LAST REPORT.

September 15th, 1887, No. 18.....	\$10,000
October 15th, 1887, Nos. 19 and 20.....	20,000
January 15th, 1888, Nos. 21 and 22.....	20,000
March 1st, 1888, No. 23.....	30,000
April 16th, 1888, No. 24.....	30,000
July 16th, 1888, No. 25.....	10,000

Since last report the company has added to its plant new and first-class working machinery; also a new office, store house, ore bins and other surface improvements.

Number of tons of silver ore taken out since July 1st, 1887..... 6,642½

Number of tons of iron ore taken out since July 1st, 1887..... 5,148½

Yielding a gross product of \$275,818.15, the cost of production being about 44 per cent of gross yield.

We wish to notice the intelligence, skill, integrity and indefatigable energy of our general manager at Leadville, Mr. Schumacher, to whose keen appreciation of our wants, careful study of the property, and untiring effort in every direction, our success is in no small degree owing.

WOODWARD EMERY, President; J. C. ELMS, Treasurer.

LITTLE CHIEF MINING COMPANY.—Work is progressing slowly at the mine, until better contracts for the disposal of the output can be made. The monthly production is estimated to be from 150 to 200 tons, or about \$2,000. This, the secretary of the company tells us, is slightly above running expenses.

GILPIN COUNTY.

DENVER GOLD MINING COMPANY, LIMITED.—This company has been organized in London, with a capital of £60,000, shares 5s. each. The object is to acquire from the Denver Gold Company, Limited, in liquidation, the mines and mining property of the company, and to work the gold and silver mines to be acquired.

ROLLINS GOLD AND SILVER MINING COMPANY.—It is stated that the company has opened up five feet of splendid ore on the south or foot-wall of its vein. The ore is treated at the new 25-stamp mill recently erected. Last month 50 tons of concentrates sold at Black Hawk netted \$11.50 per ton over cost of transportation by wagon from the mill to that place. The best improved Gilpin County ore concentrators have been placed in the mill, and are giving entire satisfaction. The company is also working the Gold Dirt mine, which in an early day was worked extensively, the surface dirt from which was rich, yielding from 4½ ounces up to 12 ounces per cord. Present development work is being done through an adit now driven a distance of 700 feet. In driving an additional 300 feet the adit will be in and under the deeper workings of the vein, and will open up a block of stoping ground fully 300 feet in length.

LAKE COUNTY.

THE ANTIOCH MINE.—The ore-body in the Antioch mine is so large that 100 tons per day are taken from it, according to the *Herald-Democrat* of Leadville. The ore is of low grade, and is probably mined cheaper than in any other mine in this country west of the Mississippi River. In the Antioch the principal cost is in the loading of the ore upon the cars and tramping to the surface. Some new cars of special design have just been ordered for the mine which will reduce this cost. The ore is broken from a breast 60 feet high and 50 feet wide. It is stated that usually 200 tons of ore are dislodged at one firing, and that occasionally 1000 tons have been broken down at one time. The ore is broken by a series of holes, drilled 20 feet deep. They are loaded with No. 2 dynamite, and fired by electricity.

The great stope in the Antioch is carried directly to the surface, which is stripped of the wash and gravel. Two lines of snow fences have been built on the surface to protect the pit from snow in the winter. The walls of the vein are nearly vertical, and so far seem to stand without timber. In mining the Antioch ore there is no cost for timber, none for hoisting, and none for pumping, which are three of the great items of expense in the operation of most mines.

OURAY COUNTY.

Our correspondent at Red Mountain sends us the following item:

RED MOUNTAIN.—The hoped-for Mears Railroad has reacted Red Mountain from Silverton. This railroad is expected to be a material factor in the mineral production of this section, furnishing not only cheaper but moderately certain transportation facilities instead of the irregular wagon traffic over a road cut through a route of many obstacles and daily difficulties.

This district has thousands of tons of fair grade ores which it has not been profitable to ship hitherto. Many of these are desirable smelting ores in demand at the Durango and other smelters. The Mears Railroad has been built chiefly to accommodate this particular traffic, although there is much high-grade ore constantly shipped (upon which, in fact, so far, the output of the camp has been based).

An important feature of the railroad's value to the camps, is that it brings Durango's coal fields within reach of the mines' hoisting works, for, although this is a densely wooded region, coal can be delivered much cheaper than wood for fuel to some of the mines (especially those above timber line), even when hauled in wagons from Silverton. A fair exchange, Red Mountain ore for Durango coal, with the margin in favor, of course, of the former.

An idea of the intimacy between the railroad and the mines is gained from the fact that the present terminus of the road at the lower end of town is immediately under the dump of the National Belle mine, the ballast, indeed, being of mixed ore and mine waste

removed to make room for the track. Even in "Silver San Juan" a roadbed of silver ore is something of a novelty.

The road in its short distance from Silverton to Ironton necessitates a number of hill climbing devices and accessories, a "switchback" in Mill Gulch, "Y" at Sheridan Junction; "Y" and "switchback" at Red Mountain, and "switchback" at Yankee Girl mine. Below the Guston mine the grade is comparatively easy. It will be seen that the mountaineering hereabouts presents a variety of serious difficulties. The road is almost a private enterprise, certainly reflecting credit upon the energy of its promoters.

The rolling stock is from the D. & R. G. R.R., of which the Mears Narrow Gauge seems to be practically an extension of the San Juan branch. Six horse stages connect with another branch of the D. & R. G. at Ouray, going down loaded each day with tourist travel from the "Circle Route." As a scenic route, this bit of San Juan road compares very well with others in the State. Of course, however, it is as an element in developing the mineral resources that it is valuable to the district. Several mines are already crowding with high-grade ores its present facilities, notably the Yankee Girl, Vanderbilt, etc., of Red Mountain; the Sheridan, Mendota, etc., in Marshall Basin, high up on the range, six to eight miles by the steepest of trails. Sheridan Junction presents quite a busy scene comparatively, with hundreds of burros unloading ore and loading coal for the "high line" mines. To such tourists as are not accustomed to pack trains, there is a fine chance to see the novel spectacle in all its glory.

The basis of a mining camp's prosperity is not so much high-grade ores as large bodies, no matter how low grade so long as they are profitable. This section has high-grade ores undoubtedly, but it has always been claimed that the camp would not take its proper place among large producers until rail facilities enabled mines with generous stopping capabilities, now idle because of onerous freights, to resume shipments. The opportunity is at hand. It remains to be seen whether this opportunity will be availed of, and whether the camp will be more prosperous, and justify or exceed its friends' expectations.

In my next I will endeavor to show a few milling ventures which seem to me to be favorable. V.

PITKIN COUNTY.

During the month of August the Aspen surpassed all former records in matter of output and carried the tonnage aggregate to 2334 tons of mineral that varied in its metallic contents from 30 to 114 ounces silver, the entire costs of operations being \$14,579. The most important feature about the operation of the famous producer during the month, says the *Aspen Chronicle*, was the handling of the lower grades of mineral to the exemption of the richer classes, upon the amount of which it is almost impossible to estimate. In addition to this, one third of the force that now numbers one hundred miners, have been directed toward development work which has taken them through ground that was unproductive.

During the month levels, upraises, etc., were driven through 255 feet of ground, while it is stated that there is considerably more mineral exposed than when the present manager inaugurated his labors. The reserves are very large at this time and the property presents a better appearance than at any time in its history. The regular monthly dividend of the proceeds is now being made.

ASPEN.—An occasional correspondent sends us the following notes from Aspen, Colo., under date Sept. 8th.

Aspen presents a very flourishing condition at this time. In the week ending Friday, Aug. 24, close on 2000 tons of ore were shipped; in the week ending August 31st, over 2300, and in the week ending September 7th, 1706. As it is not profitable with present conditions to mine and ship ore under thirty ounces as a minimum for the best situated mines, and as the ore runs from this up into the hundreds, some idea of the importance of this output may be gained.

Rather the larger portion of this is taken by the Midland Railroad, whose shipments run about one hundred tons weekly more than those of the Denver & Rio Grande. This is perhaps due partially to their more convenient shipping terminals at the foot of Aspen Mountain. At all events the Rio Grande is now engaged in running a spur track from its present terminus around the town to the Hewitt sampler. Two hundred men and more than one hundred teams are working at this extension. Unskilled laborers at two dollars per day have been difficult to obtain.

Of the ore shipped the largest part goes to Denver. In the last week's shipment of 1706 tons, 1195 went to Denver, 186 to Leadville, 166 to Kansas City, 105 to Pueblo and 54 to Durango. This percentage to Denver is above the average. The freight rate on each road is to Denver \$8 per ton, as determined by the pool. In the mines great activity prevails from Tourtelotte Park down to the town, and on Smuggler Mountain, across the valley, some very successful prospecting and mining is being done. The Little Percy Consolidated, on Aspen Mountain, is getting a new surface plant in order, and is now shipping enough to pay running expenses, making no effort at present to do more. The Bay State is erecting a new shaft-house with a new boiler. The Schiller is still sinking in porphyry for the contact. The other mines to the northeast are making their usual outputs. The Aspen shipped over 2000 tons in August, and is stoping out a fine body of ore. The Enterprise also, in drifting from the present bottom of its new slope, has struck a rich chute. Some ore is also being taken from the outlying quartzite west of the main contact and beyond the great porphyry

mass. This is in ground which is disputed by the Longfellow, Cora L. and Kentucky claims. The quartzite here is stained copiously by copper minerals, and so far as exploded gives mineral running about 100 ounces in silver. It is in rocks which are the most broken on the mountain, lying as they do between the porphyry and granite.

The Smuggler, on Smuggler Mountain, is reported to be in a fine body of ore, while further up the mountain and over toward Hunter Creek Park the recent developments in the Park-Regent claims are exciting the liveliest interest. These last named are shipping from thirty to fifty tons daily and promise to take a place among the richest in the camp. Encouraged by them prospecting is being vigorously pushed further north in Hunter Creek Park, but no great strikes are as yet reported. Again, several miles to the north, along the limestone outcrop, prospecting is being pushed with considerable vigor at Porphyry Mountain. Although no definite reports have yet been made public; the general lay of the rocks seems favorable. Still further north, in the valley of the Fryer Pan, a tunnel is being run by the side of the Midland track, through the wash, to strike the limestone. Beyond the discovery of considerable float in the wash, no developments have yet been made. Beyond the Fryer Pan, for six or eight miles, some little work is being done along Lime Creek, but as the limestones lie so comparatively undisturbed and without the presence of eruptive rock, they appear less favorable than to the south.

South from Aspen for fifteen or twenty miles to and beyond Ashcroft, some desultory prospecting is being done, without, as yet, any great developments. Ashcroft is now wellnigh deserted. It is possible, however, that a spur track from Aspen and cheap transportation would bring a resumption of operations to some claims now lying idle. Much confidence is felt in the Tam O'Shanter and the Montezuma, and some prospecting is also being done on Cooper's Mountain, above the iron mine.

Rumors are prevalent that the Aspen Smelter will start this fall, but the management has as yet made no definite statement. Work is, however, being rapidly pushed on the additional fifty coke-ovens at Cardiff, whence the fuel would be derived, and it is possible that a resumption of smelting may be contemplated. K.

The following is condensed from the *Leadville Herald-Democrat*:

The owners of the Park-Regent mine expect to have their new electric hoister in operation soon. This will greatly increase shipping facilities. The output now amounts to about 65 tons a day.

The Percy Consolidated Mining Company held their annual election of officers at their office at Aspen, on September 8th. The following gentlemen were elected for the ensuing year: Clinton Markell, of Duluth, President; Hon. Charles I. Thompson, of Denver, Vice-President; George S. Newman, Aspen, Treasurer; Clinton Bennett, Secretary. George S. Newman was appointed General Manager. The Percy company are nearly ready to start up their new plant of machinery.

A little more than a half interest in the Romulus, Vulture, Little Silver and Arizona mining claims, situated in Spar Gulch, Aspen Mountain, was sold on the 13th inst. for \$22,000 by S. A. Wright and others, to J. C. Painter, of Des Moines, Iowa, for the Romulus Mining Company, the stock of which is all owned by people in the last named city. It is said that Mr. William Christy, of Des Moines, will take charge of the mine, and several thousand dollars will be spent in development work. These claims adjoin the Bonnybell.

The Manville Smelting Company has all three stacks in blast at its works.

The Arkansas Valley smelter has six of its seven stacks in blast. Nearly all of the furnaces in the camp are now running.

The mines of Leadville are at present producing between 900 and 1000 tons of ore per day. Only about 200 or 250 of this is argentiferous iron ore. About 400 tons is heavy lead ore.

The Small Hopes Company is driving a drift along the Lee Basin and Denver City line. Some ore is being mined from this portion of the Forest City ground. The ore is hoisted through the Carey shaft, which was sunk 40 feet deeper a few months ago, in order to command the ground.

The Olive Branch shipments have fallen off to about 300 tons of ore per month, but the grade of the ore continues to be high. The incline from the shaft is being driven steadily ahead, with a steam drill, and the breast is now about 200 feet away from the shaft. The breast is in ore.

DAKOTA.

A new tin mining project has been organized in Chicago by a syndicate of capitalists, who have purchased five tin mines in Dakota, and organized a company with a capital stock of \$500,000.

LAWRENCE COUNTY.

HOMESTAKE COMPANY.—The steam stamp constructed by the Homestake Company will be in operation in a few days and will crush 200 tons per day. The work on the reduction works is progressing rapidly, 100 men working day and night. It will likely be completed in November.

INDIANA.

WABASH COUNTY.

A large natural gas well has been opened at La Fontaine in this county. Trenton rock was reached at 874 feet. At 16 feet in the rock, drilling was suspended and a quantity of nitro-glycerine was ordered with which to shoot the well. When the glycerine arrived, it was found that the gas flow had increased

greatly, and the well was not shot. It is one of the best gas wells in Indiana. Two flames, each seventy-five feet high, burn from the three-inch tubing at the well. At night the light can be seen twenty miles away.

MAINE.

OXFORD COUNTY.

It is stated that a valuable deposit of rare minerals has been discovered on S. P. Maxim's farm, Paris Hill. The mine is worked by Loren B. Merrill and Kimball Stone and a large amount of lithium minerals have been obtained, also blue tourmalines, although the crystals already obtained have not been sound, yet the indications are that fine gems of that mineral may be obtained in red, green, and blue colors. Some of the minerals obtained are lepidolite, amblygonite, cleavelandite, cookeite, spodumene, and tin. The deposit is near the famous Mount Mica, and seems to be a continuation of the same ledge.

MASSACHUSETTS.

BERKSHIRE COUNTY.

CHATHAM IRON COMPANY.—This company, which has been operating the mine near the Shakers, at Pittsfield, is sinking a new shaft 60 feet below its present one, which is 125 feet deep, and will extend the levels from the lower shaft. This will give the company three levels instead of two, and allow it to further extend its operations. The product goes to Chatham. Workmen are paid \$1.40 a day for miners, \$1.35 for truckers and shovelers, and \$1.25 for common laborers.

MICHIGAN.

Shipments of iron ore from the mines of the districts mentioned below for the season up to and including September 5th, as reported by the Marquette Mining Journal, were as follows:

Table showing iron ore shipments from Marquette, Escanaba, Ashland, and Two Harbors districts for 1888 and 1887.

Total tons 2,993,005 3,158,200

PENINSULA COPPER COMPANY.—Work has begun in earnest at the Peninsula copper mine, where the shafts are sinking deeper, and a cross-cut is to be started east from the fifth level across the property to reach the several lodes which run through it. One lode, 1300 feet east, was found by the diamond drill to have about seven feet in width of very rich rock. The distance to the Osceola lode is about 1800 feet, and to the Calumet & Hecla vein about 1500. Drifting is going on at the sixth level along the lode from each shaft.

HOUGHTON COUNTY.

HOUGHTON SANDSTONE QUARRY COMPANY.—This company has been organized with a capital stock of \$100,000, shares \$20 each, to work a brownstone quarry near Portage Lake and the D., S. S. & A. Railway. The land comprises 80 acres, and is a part of section 7, township 54, range 33. The organizers are Captain W. H. Vivian and some capitalists of Detroit, the former and his friends holding the controlling interest. The total depth of the deposit is not known, though it has been explored to a depth of 40 feet.

HURON MOUNTAIN EXPLORING AND MINING COMPANY.—This company has been organized in Hancock. Its officers are: Thomas Dooling, President; John F. Ryan, Secretary and Treasurer. J. C. Foley, Thomas Dooling, W. S. Cleaves, J. F. Ryan, and Martin Conway directors. The capital stock is to consist of 40,000 shares of \$25 each. The company has been formed to explore and develop some veins of gold-bearing quartz discovered this summer in the Huron Mountains, northeast of L'Anse, by Messrs. J. C. Foley and Thomas Dooling. Assays have been made by Mr. Julius Ropes, of Ishpeming.

The Boston Transcript is the authority for the following:

FRANKLIN MINING COMPANY.—Advices from the mine say that the main lode, at the thirtieth level, seems to improve a little as development progresses north of No 3 shaft. The east lode at this level is still producing a large amount of fair stamp rock with some barrel copper. Several large masses of copper were taken out of the slope behind the drift north of the cross-cut Tuesday.

HURON MINING COMPANY.—The diamond drill has been started at the Huron mine, and while nothing has been found as yet, there are doubtless some rich bunches of copper on the lode. The drill will be run six weeks or two months, to prove both the bang and the foot wall of the lode where it is from thirty to forty feet in width, and where the prospects of finding rich ground are very good. The general appearance of the mine is reported as more favorable for an increase of product than it has been for a long time.

We take the following from the Marquette Mining Journal:

ROPE GOLD AND SILVER MINING COMPANY.—Another 50-cent assessment on the company's stock has been called, and must be paid on or before the 15th of October. The reason for calling this assessment is that the milling capacity must be further enlarged before the stockholders can get any dividends. This was the reason for calling the last assessment, and with the proceeds of the \$40,000 assessment then levied a new mill of 20 stamps was built. The mill now has 45 stamps, 18 vanning machines, and a fine outfit of boilers, engines, power drills and other mining machinery. It is estimated that there is in sight in the mine over 100,000 tons of milling rock.

The new mill of forty five stamps is treating between fifty and sixty tons of rock daily.

COPPER MINES.

The regular monthly table of the output of mineral by the principal Lake Superior copper mining companies is reported by the Boston Transcript as follows:

Table showing copper mine output for August 1888 and 1887, and January 1 to August 31, 1888 and 1887.

* Eight mines. † Nine mines. ‡ Mill not running.

MINNESOTA.

The Minnesota Iron Company has trouble at Two Harbors, because of the delay of the vessels in carrying away ore. Vessels have been scarce for some time past, and there were on the docks and in cars lying in the yards 40,000 tons of ore before the arrival of two steamships recently. The pockets at the ore docks are filled with 20,000 tons and 18,000 were in cars yesterday. The company has been shipping an average of 16,000 tons per week since the opening of navigation, 227,500 tons having gone forward up to last night, and expect to exceed this amount until the first of December, when a total of nearly 450,000 gross tons will have been sent forward. In addition to this will be the shipments by rail to Chicago, estimated at about 60,000 tons for the entire year, of which 28,500 tons have gone forward, and not less than 50,000 tons by lake and rail from the Chandler mine, making total shipments from the Vermillion range for the season of 1888 of 560,000 gross, or more than 640,000 net tons of ore. Last year's total shipments were in the neighborhood of 410,000 gross tons. The Chandler mine management intends to get rid of 50,000 tons of ore before December 31st, and will send a considerable portion of it by rail to Chicago furnaces. The mine has so far shipped about 7000 tons. Ore freights, which were \$1.25 from Two Harbors at the beginning of the season, are up to \$1.60 from Two Harbors and Ashland, with some late charters reported at \$1.65, and with vessels hard to get at that figure.

MONTANA.

SILVER BOW COUNTY.

BUTTE & BOSTON MINING COMPANY.—A circular issued by Messrs. Joseph W. Clark and A. S. Bigelow, of the Executive Committee of the new Butte & Boston Mining Company, mentioned in our last issue, page 224, giving the following particulars concerning this enterprise: A company has been formed under the laws of the territory of Montana, called the Butte & Boston Mining Company, with a full paid capital of \$5,000,000, divided into 200,000 shares of \$25 each, fully paid and unassessable. The mining claims in this property number thirty-three, comprising about 600 surface acres located at Butte City, Montana. The property comprises, among others, what is locally known as the Silver Bow group of m. s. The properties are traversed by numerous veins carrying gold, silver, and copper. The most noted of these veins are the Anaconda, south vein of the Boston & Montana Mountain View mine, the Parrott vein, the newly opened Leggett vein, the Belle of Butte vein, the La Plata vein, the Gray Rock & Josephine, or Lexington vein, and the High ore and Bell veins of the Anaconda. The railroad facilities are ample, consisting of branches from the Montana Union and the main line of the Montana Central, connecting with the Union Pacific, Northern Pacific and the St. Paul, Minneapolis & Manitoba systems of railways. The competition of these three systems insures low rates for freight. There are at present in operation stamp-mills in perfect order and condition, with sufficient gold and silver ores now in sight to run them for two years, and the property with very limited development, is now producing, in regular monthly returns, from its chloridizing silver ores alone, at the rate of considerably over \$200,000 per annum, net; with proper development and additional smelting plant, such as it is proposed to build, this company ought undoubtedly to earn \$2,000,000 over and above its fixed charges per annum. The company owns exclusive water rights of almost inestimable value, supplying sufficient water for all requirements in treatment of the various ores. The company also owns splendid mill and smelting plant sites. The development of the Gray Rock and Josephine lodes, and also of that portion of the property adjoining the Boston & Montana on the south and the Anaconda mines on the east, exposes large bodies of silver-copper ores. The company proposes to work these ores, and for their treatment, being well assured of the propriety of so doing, will erect a smelting plant, capable of reducing 600 tons per day, at an early date, and from their known character net earnings per annum, as above stated, can be assured. For the development of its mines and the erection of the smelting plant, ample working capital is provided, there being in the treasury a total of over \$800,000 in cash, or its equivalent. In order to purchase these properties and to provide itself with working capital, the company has in addition to its stock, issued its bonds secured by a first mortgage upon all its real and personal property, for \$1,000,000, payable in Boston in ten years, with seven per cent interest half-yearly. The company also provides a

sinking fund for the payment of the bonds of \$100,000 per annum, which is to be paid over to the Massachusetts Loan and Trust Company, as trustee of said sinking fund. These bonds are regarded as an absolutely safe investment, the present earnings, as above stated, being more than sufficient to provide for interest and sinking funds. These bonds were subscribed for and taken by capitalists here, largely interested in the Boston & Montana, Tamarack, Franklin, and other mines, and by capitalists in Germany.

The company's directors are as follows: President, Andrew J. Davis, President First National Bank, Butte, Mont.; Treasurer, Daniel L. Demmon, Treasurer Franklin and other mining companies, Boston, Mass.; Joseph W. Clark, President Boston & Montana, Tamarack and other mining companies, Boston, Mass.; Stephen M. Crosby, President Massachusetts Loan and Trust Company, Boston, Mass.; A. S. Bigelow, Treasurer Boston & Montana, Tamarack and other mining companies, Boston, Mass.; Hon. Hiram Knowles, Butte, Mont.; Charles Van Brunt, Boston, Mass.; Joseph A. Coram, Lowell, Mass.; C. H. Palmer, Superintendent and General Manager, Butte, Mont.

BOSTON & MONTANA MINE.—This mine made the largest product in its history in August—3,825,000 pounds of matte, giving 2,225,000 pounds of refined copper, against 200,000 pounds in June. The first twelve months of the operation of the mine show a total product of 22,127,714 pounds of matte, yielding 13,040,484 pounds of refined copper. It cost about eight cents per pound to get out this copper, and an average price of fully twelve cents per pound was received, showing a clear profit of about \$555,000. The product for the first two months of the current fiscal year—July and August—was 4,225,000 pounds of fine copper, on which the net profit was not much, if any, under \$200,000.

NEVADA.

EUREKA COUNTY.

EUREKA CONSOLIDATED MINING COMPANY.—Mr. Chas. Fries, the father of Wm. Fries, President of the Eureka Consolidated Mining Company, has returned from his trip to the mines. To an ENGINEERING AND MINING JOURNAL representative Mr. Fries said: "The outlook is very encouraging. The decrease in our profits during the last few months and the consequent suspension of dividends is due to the fact that the speiss on the dump has been running \$8 per ton lower than during the early part of the year when we were paying dividends. Now, however, it begins to run much richer again, and we know it will continue to do so, as we have a record of how it was deposited on the dump."

Yes, I believe that the mine is honestly managed, but the enormous size of our mine and mill and the insufficiency of work constantly affords an opportunity for dishonesty. I can say, however, that there is no person now in our employ whom we mistrust.

We have recovered \$5000 of the amount stolen by Charles W. Ladd, the young furnace man who abstracted small quantities of bullion and sent them to a Chicago firm of jewelers as specimens.

We are now taking about 600 tons of ore from the upper levels of the mine and about 1000 tons of speiss from the dumps per month. Recently, we increased our mill charges and since then the mines in our neighborhood that have always sent us their ore have held back for better rates. This, of course, makes things rather dull, although we have enough ore in the upper levels and enough speiss on the dump to enable us to run profitably for some years to come. I believe, however, that we should develop the lower levels of the mine. We are now working only to the 1000-foot level, the next 200 feet being filled with water; but if the Locan shaft were sunk deeper, and new drifts run out, according to the theory of the geological formation of the hill, we would strike a wide strata of the same limestone which in the upper levels has contained ore that enabled us to pay millions of dollars in dividends. To do this, however, we must pump out an enormous quantity of water from both the Eureka and the Richmond properties, and we will not do so unless the Richmond company shares the expense. At one time the company agreed to do so but they have now backed out.

Concerning the suit brought against us by Klempfer Bros., we acknowledge that \$1000 worth of ore on the dump was sold to them in 1874, but its value was \$1000 and not \$8000, as they claim. Moreover, there were certain other conditions of the contract that will throw their case out of court whenever they present their claims. These facts we have just discovered; we knew nothing about them when we took charge of the property."

RICHMOND CONSOLIDATED MINING COMPANY.—A meeting of the stockholders was held in London on August 19th and the report presented showed that the causes of small profit made during the half year are five in number. First, there is a serious diminution in the grade of ore, which has fallen from 24 1/2 to 23 1/2, being a diminution of 7 1/2 tons, which on 4000 tons of Richmond ore smelted during the year would amount to \$28,000, or about \$5500. Secondly, the failure of the ore beds discovered between the 100 and 200 levels. A year ago these beds were struck and they promised exceedingly well. However, as work was done upon them they turned out small in quantity, although very good in quality. Thirdly, there is a competition for the purchase of outside ores, from which little or no profit has been made, in consequence of the high prices which the company has paid. During the year the company expended over \$20,000 in the purchase of these outside ores, and made little or no profit upon them. The next is the low price of silver.

The fifth and last cause is the non-discovery of ore in the lower levels of the mine. The company has

been working for a long time with rock drills trying to discover, before sinking the permanent shafts, whether there was ore in quantities in the lower portion of the mine, and up to the present time no ore has been found below the 1200 level, and the company is now about to remove the machinery to make explorations on the Albion mine, and try some borings in the lower levels of the Williamsburg mine. During the year there was expended on dead work and prospecting £9520. In consequence of the shortness of ore, the furnaces were run only about half the time. The output for the year has been 4562 ounces of gold, 174,056 ounces silver, and 877 tons of lead, which is worth at Eureka £57,156. The company is now trying to find a property suitable in the neighborhood to supplement the Richmond property. Three or four years ago the Williamsburg and Hoosac mines were purchased; both the properties to-day cost the company nothing; that is to say, the profit made from the two mines has more than repaid what it has cost for them. Every effort will be made to find a suitable property for this company, and in view of that the reserve fund is not to be reduced too much, and consequently no dividend was declared. At the present time there are undivided profits amounting to £74,000. The company has lately entered into an agreement with the Eureka Company, by which the companies agree as to the price to be paid for all purchased ores in the district.

STOREY COUNTY—COMSTOCK LOSE.
We condense the following from the Virginia City Chronicle:

BENTON CONSOLIDATED.—News has been received that at the close of last week the men working in the Benton Consolidated mine filed miners' liens upon the property for back wages due them. The amount covered by these liens is represented to be \$1300. It is stated that the company was overdrawn to the extent of about \$8000 at the bank. A meeting of the board of directors would be held in a few days to discuss the situation, and it was likely that an assessment would be levied to put the company in funds again.

CONSOLIDATED CALIFORNIA & VIRGINIA MINING COMPANY.—During the week 1088 tons and 250 pounds of ore were shipped to the Morgan mill, and 1820 tons to the California mill. The average assay value of all the ore worked at these mills during the week, according to battery samples, was \$36.75.

Bullion valued by assay at about \$123,600 now on hand in local office.

Bullion shipped to the San Francisco office during the past week valued by assay at \$82,862.79.

HALE & NORCROSS.—Bullion on hand on August account valued at \$80,000, with final returns to bear from. Advancing the 500 level west drift and opening a new station on the 800.

OCCIDENTAL.—Shipped to the Atlanta mill 137½ tons of ore, extracted from the 48 and 100 levels, showing an assay value of \$30 per ton.

NEW MEXICO. GRANT COUNTY.

THE PACIFIC GOLD COMPANY.—This company has increased its capital stock from \$1,500,000 to \$2,000,000. The company designs investing the increase in new mines and other beneficial effects.

OHIO.

THE ROCKING VALLEY SUIT.

We have previously referred to this important litigation, which now appears to be finally disposed of. The following is the history of the case. In 1881 Judge Burke and a syndicate of Cleveland, Youngstown and Columbus capitalists purchased the Columbus & Hocking Valley, Columbus & Toledo and Ohio & West Virginia railroads, consolidating them into one line, under the name of the Columbus, Hocking Valley & Toledo. Arrangements were also made with different roads whereby a through route was constructed from Chicago to Newport News. In 1886, Mr. J. W. Shaw was elected to succeed Judge Burke, and during February, 1887, Mr. Shaw, in behalf of the company, brought suit against Judge Burke for \$8,000,000, which was the amount of bonds issued by Judge Burke and his directors for the purchase of coal lands. Mr. Shaw's plea was that an exorbitant price was paid for the lands in question, and that Judge Burke was guilty of criminal fraud. The suit has been decided in favor of Judge Burke, and this settles the case finally.

OREGON.

Messrs. Atwood & Reynolds, owners of the Auburn coal field, consisting of 360 acres, are pushing development work on the property as rapidly as limited means will permit. They are at present sinking a shaft and are down about 20 feet and taking out a good quality of coal. Shafts have been sunk on the ground for a distance of over a mile, and it is reported that upwards of twenty different veins have been struck. Recently an expert was sent out by the Oregon Railway and Navigation Company to examine these coal deposits, and in his report to the railroad officials he stated that from his observations he was satisfied an extensive bed of coal and of good quality would be the result of the development of this property. Messrs. Atwood & Reynolds are endeavoring to get the property in shape to supply Baker City with coal within the next few months.

PENNSYLVANIA.

The reports of the slate business from Bangor and Penn Argyle, Pa., are excellent the present season. Auld & Conger, of Cleveland, Ohio, who are prominent operators in the Bangor District, we learn, have been producing over 5000 squares of roofing slate a month, and have yet been unable to meet the demand that has been made upon them. The Bangor Slate Company report an export order of 5000 squares, and

John Galt & Son, of New York, who are also operating quarries in that region, have an export order of 2000 squares. It is asserted that in 18 years past the trade has not seen as flourishing a season as at present.

Granite in large quantities has been discovered at Rockhill, near Perkasie, Bucks County, 35 miles from Philadelphia, and Reading capitalists are preparing to open a large quarry there. An entire hill covering many acres, which was looked upon as common rock, has been discovered to be the finest granite. Masses upon masses of boulders are piled upon each other, with overhanging ledges 40 and 60 feet high. It is capable of a fine polish. This find is said to be larger than any of the New England granite quarries, and supposed to be a continuation of the bed of granite discovered at Falls of French Creek, Chester County, and Joanna, Berks County, at which place 400 hands are now employed taking out granite for Belgian blocks, monuments, etc.

SUSQUEHANNA COUNTY.

The new slope mine of the Erie Railroad, at Forest City, was flooded on the night of the 15th inst. A number of miners who were in the mine at the time barely escaped with their lives.

OIL.

Exports of refined, crude, and naphtha from the following ports, from January 1st to September 15th:

	1888.		1887.	
	Gallons	Value	Gallons	Value
From Boston	2,841,670	3,188,545	1,887,000	2,000,000
Philadelphia	92,735,579	113,462,957	1,200,000	1,300,000
Baltimore	5,641,387	5,959,652	800,000	850,000
Perth Amboy	16,126,941	11,209,335	1,500,000	1,600,000
New York	247,075,211	260,931,825	3,500,000	3,700,000
Total exports	364,420,788	394,852,314	7,887,000	8,450,000

SOUTH CAROLINA.

The following shipments of land phosphate rock from Charleston during August are reported by Mr. Paul C. Trenholm:

	1887.		1888.	
	Tons	Value	Tons	Value
To domestic ports	15,238	1,228	11,538	1,609
To foreign ports	580	.....	.....	.....
Total	15,788	1,228	11,538	1,609

TENNESSEE.

CHATTANOOGA LAND, COAL, IRON AND RAILWAY COMPANY.—According to reports negotiations extending over several months have resulted in a contract on the part of this company and Eastern capitalists, by which the latter agree to invest \$1,250,000 in carrying out the plans for the development of this company's property within two years.

FOREIGN MINING NEWS.

CANADA.

NOVA SCOTIA.

The gold mines of Nova Scotia continue to show fair yields, the returns from seven mines for the month of August giving 567 ounces of gold from about 1,280 tons of quartz rock put through the crushers. Some new mines have recently been discovered, and it is expected the output of the present year will show an increased activity in this branch of mining.

PROVINCE OF ONTARIO.

SILVER ISLET CONSOLIDATED MINING AND LANDS COMPANY.—We announced in our issue of September 8th the approaching sale of all the lands belonging to this company, which took place by order of the Supreme Court of New York at public auction at the Real Estate Exchange in this city on the 19th inst. Mr. F. B. Anderson, of the American Exchange National Bank, was the buyer at \$5000. Mr. Anderson refuses to state for what purpose this property, which is extensive, has been purchased. It is probable that he is simply the representative of parties who wish to conceal their identity.

MEXICO.

MEXICAN MINING NOTES.

Our special correspondent in Mexico sends us the following interesting news items:

LOWER CALIFORNIA.—The Santa Rosalia copper mine in this territory belongs to the Rothschilds. It has five upright furnaces, a splendid wharf, a narrow gauge railroad between the works and the mine, and ample and solid buildings. As the proceedings are kept very secret I have no particulars of the output, which is, however, believed to be small, as yet.

The Lower California Mining Company will complete their ditch and flume by the 15th of this month. Their properties are at Real del Castillo.

A schooner load of rich gold ore was recently shipped to San Francisco from the quartz mine of the Ibarra Brothers in the Calmalli District. This is said to be in a fair way to become one of the best properties on the peninsula. The Calmalli placers are also doing well.

The Blundin Mining Company, has ordered a stamp-mill for the Bonanza property at Valladares; the ore is said to average \$75 per ton.

SONORA.—Dr. Paul Gregory and Mr. W. Milford, of London, England, have been inspecting some mines in the Ures District which the former gentleman has recently sold to an English company. The development of these mines will probably be expensive, but they are said to be very promising.

A French copper company has a concession near the boundary line between the United States and Mexico, in Sonora. This embraces one of the richest mineral sections of the State and includes the well known Cananea and other copper mines, as well as gold and silver mines that are now abandoned.

The Sonora Land Company, an American venture, has sent out an exploring party through the district around Bavispe and the headwaters of the Yaqui River. The Yaqui Indians formerly held this country, but it is now open for settlement. The surveyors re-

port it to be rich in minerals. Many traces of placer gold are found.

SINALOA.—The Yedras Mining Company has had so much difficulty on account of the unreliability of Mexican labor in its district that it has sent for seventy Italian miners. These arrived at Mazatlan a week or so ago.

The Tajo mine at Rosario has, in ten years, yielded a profit of \$16,000,000. The owner is Mr. Henry Bradbury, of Los Angeles, Cal. The Guadalupe mine, in the same camp, is owned by Echeguren & Co., of Mazatlan. It is producing \$2000 to \$6000 daily and is said to have been lately sold to an English company for a large sum of money.

The Rothschilds are said to be in negotiation for the purchase of some rich mines in this State.

DURANGO.—W. W. Carroll & Co., of Ventanas, have been doing development work on their main mine below the level of the lowest tunnel and have now three shafts of ore in sight. From the lowest tunnel up to the surface the mine has several bodies of low-grade ores from which the present production is being taken. These bodies are soft and favorable to mine, and as the expense of bringing them to mill is very little they can be worked to a good profit.

The Candalaria mine at San Dimas is doing much better than I reported in my last letter. It has a body of ore 16 feet wide, which, as it is blasted out, runs nearly 200 ounces per ton after the separation of a higher grade for export. The monthly yield in bullion is about \$150,000, and the value of the exported ore will average \$100,000 more. This bonanza was reached by stopping up from some of the old workings. The claim is a mile long, and although there are very extensive old workings, at least three fourths of the property is practically virgin ground, as the old workers were unable to go to any great depth.

The double compartment shaft at the Cachamole mine at Guanacavi, recently purchased by Haggin & Tevis, of San Francisco, is now down 40 feet. It is supposed that the vein will be cut at 300 feet.

Mr. F. Mraocfeich, formerly of Kelly, N. M., owns the Trinidad and San Buenaventura mines in Avino Camp, about 100 miles west of Picardillas Station on the Mexican Central Railroad. He is shipping carbonate ores, carrying from 35 to 40 ounces of silver, to El Paso. There are seven other properties in the same camp producing milling ore that is treated on the spot. The ore-bodies, which average about \$22 per ton, are large and timber and water abundant.

CHIHUAHUA.—The Mexican smelting plant in Chihuahua City was blown out a few days ago for want of fluxing ore.

The Corralitos Mining Company is shipping its ores to the El Paso and Colorado smelters. A Munzenberger owns the Sta. Barbara mine in this camp.

The Freeman Silver Mining and Smelting Company, of Grand Rapids, Mich., owns mines in the San Jose de las Cruces Mountains in Southwest Chihuahua. A smelting plant is now on the way to the mines, sent out by a St. Louis firm.

The Purissima Mining Company, located seventy miles north of Batopilas, is erecting a twenty-stamp mill. The vein is 4 to 12 feet wide, and everything is to be run through as it comes out.

Two milling plants are being sent from Parral on mules to Morelos, where they will be erected on the property of the Gold and Silver M. and M. Company, of which J. H. Milliken, of El Paso, is President.

The San Carlos mine, at Carrizal, Magdalena District, is being worked by Lewis & Watts. They extract argentiferous galena, with 51 ounces of silver, from a 7-foot vein.

COAHUILA.—It is officially stated that 121,369 tons of coal have been mined from the various mines in this State in the past four years. The working of the largest mine was interrupted during 16 months of this time by litigation. The largest yearly product was in 1885, when over 50,000 tons were raised from one mine. At present two American companies are operating the mines, getting out as much coal as can well be handled by the railroad; that is to say, about 600 tons daily. In the near future it is thought that this production will be at least doubled. Several large sales of coal have been made to Pachuca consumers at a cheaper rate than the English coal can be laid down in that city. A shorter railroad will be opened to Pachuca some time this month, and the San Felipe coal will probably shut out the English product entirely.

Large quantities of ore are said to be held along the line of the Mexican National Railroad, waiting until construction is over, when cars can be secured to ship to the United States.

The Panuco Mining Company, of Philadelphia, is mining gold and silver at a point about 25 miles west of Candela. This company is reported to be doing a splendid business. They are using a traction engine to haul the ore from the mine to the mill, which is six miles away, over a mountain road. The engine transports 200 tons per day.

A new gold vein 11 inches wide is reported to have been discovered near Candela.

NUEVO LEON.—It is said that there are more men engaged in mining with a limited capital near Villadama in this State than in any other part of the Republic. These parties sell their ores to the highest bidders, and several American buyers are in the field, which makes competition.

The San Juan and San Antonio mines, near Monterey, belonging to Mr. D. Humbird, of Hudson, Wis., are being worked to their fullest capacity under lease to the Kansas City Smelting and Refining Company. Mr. Humbird is having smelting and concentrating machinery erected at Ceralvo, where he owns other mines and has his present headquarters.

This part of the country affords a good chance to

small investors on account of their nearness to a market for the product and because of the liberality of the Mexican National Railroad, which has always favored the miners since the present administration has been in power.

TAMAULIPAS.—Mr. S. G. Smith, of Austin, Texas, is working several mines at San Jose in the San Carlos District. The mines are of gold-bearing quartz decomposed on the surface with an iron outcrop.

SAN LUIS POTOSI.—The La Paz mine at Matehuala is said to be improving in both the quality and quantity of its output; good ore has been encountered in various points of the old workings.

ZACATECAS.—The Guanajuatillo mine, in the Blanco District, is putting in steam hoisting works and drills from England, and an air compressor from the U. S.

The San Rafael mine has received powerful pumping machinery from Germany, and will at once begin working it, and soon begin repaying of its bargain, as the outfit is far inferior to what could have been built for the same outlay in the United States.

The Cantera mine is paying large monthly dividends.

The mines owned by Clarence King, George Tew and other Americans in Sombraerete are reported doing remarkable well, all producing rich ore.

GUANAJUATO.—Within the past two years \$350,000 worth of mining machinery has been imported into this State, and the gold and silver produced amount to about \$9,000,000 yearly.

The United Mexican Mining Company, of Guanajuato is perhaps the oldest mining company in the Republic, having maintained its existence, though with many vicissitudes, since the year 1825.

The La Luz, Santa Ana and El Cedro mines in this camp are all owned by St. Louis companies, and are all doing well.

GUERRERO.—This State is known or rather supposed to abound in mineral wealth, but it is very little explored. The Guadalupe mine exported last March 90 tons of ore, which netted in Europe about \$15,000, but the mine has since been idle.

MICHOACAN.—At Talpajabua a Colorado company, represented by Mr. W. McDonald, has bought the Colorado mine on the Corona vein, the same that runs through the mines of Concepcion and Seis Senores.

The Concepcion is running 20 stamps and will soon make a connection between the main shaft and the rest of the mine. The Seis Senores is producing about 20 tons of ore daily.

A mortgage bank is about to be established here by New York capitalists who have purchased an old charter. I have often wondered why this has never been done by Americans before.

CITY OF MEXICO, Sept. 12, 1888.

The Department of Public Works has granted the following concessions:

To Pedro Lejeune, or a company he may organize, for the prospecting and working of mines and gold placers in the Sierra de Babicanora, jurisdiction of Sinoquite, District of Arizpe, State of Sonora.

To Leoncio R. Blanco, or a company he may organize, for the prospecting and working of mines, gold placers or coal deposits in Pihamo, 9th Canton of the State of Jalisco.

To Carlos David de Gheest, or a company he may organize, for the prospecting and working of mines in the Sierra de Magallan, District of Arizpe, State of Sonora, and in the Sierra de Nacosari, District of Montezuma, State of Sonora.

To Luis Lejeune, or a company he may organize, for the prospecting and working of mines and gold placers in the Sierra del Oro, or Sierra of Buenos Ayres, jurisdiction of Bacoachi, District of Arizpe, State of Sonora.

To Joaquin Dávalos for the exploration and working of mines and gold placers, at the Mineral de Oro, Partido of the same name, State of Durango.

To Augusto Tardy and Carlos Eisenmann for the exploration and working of mines and gold placers in the District of Huetamo de Núñez, State of Michoacan.

To Pedro del Valle for the exploration and working of mines in the District of Jalacingo, State of Veracruz.

To Gen. Francisco Olivares, in representation of Manuel de Hoyos Santos Coy, for the exploration and working of mines and gold placers in the place called Sierra Mojada, municipality of the same name, District of Mocovioa, State of Coahuila.

LA LUZ MINES OF MEXICO, LIMITED.—This company has been organized in London with a capital of £210,000, to acquire the La Luz mines, situated in the State of Jalisco, to which we referred in our last issue. The names of the mines acquired are "Zapopan," or "Padilla," "Topacio," "Loreto," "San Miguel," "Old Zapopan," and "S. Ildefonso."

MEXICAN COPPER COMPANY, LIMITED.—This company was organized in November, 1887 (see ENGINEERING AND MINING JOURNAL, December 17th, 1887), with a share capital of £250,000 in £1 shares, and a debenture capital of £75,000, to acquire the property known as the Inguaran copper mines.

The Mexican Financier gives the following item: PACUCA.—The St. Louis and Zacatecas Ore Company is building a sampling works here.

SOUTH AMERICA. UNITED STATES OF COLOMBIA. SANTIAGO GOLD MINING COMPANY.—We are informed by the financial agents of the company in New York that a twenty-stamp mill is now running at the mine.

COAL TRADE REVIEW. NEW YORK, Friday Evening, Sept. 21. Statistics. These figures have been corrected to September 1st by the official statement of Mr. J. H. Jones, Chief of the Bureau of Anthracite Coal Statistics.

Production Anthracite Coal for week ended September 15th and year from January 1st: 1888, 1887. TONS OF 2240 LBS. Week. Year. P. & Read. RR. Co. 208,069 4,120,726 5,017,220

Production Bituminous Coal for week ended September 15th, and year from January 1st: EASTERN AND NORTHERN SHIPMENTS. 1888, 1887. Tons of 2240 lbs. Week. Year. Phila. & Erie RR. 802 43,844 12,330

Production Coke on line of Pennsylvania RR for week ending September 15th, and year from January 1st, in tons of 2000 pounds: Week, 86,784 tons; year, 2,742,300 tons; to corresponding date in 1887, 2,427,089 tons.

Anthracite. The demand for anthracite coal has slackened up somewhat, and we even hear that prices are a little more flexible. The companies, of course, maintain rates without variation, but the individual operators are shading a little in some instances.

The enormous output of the mines, to which we have referred editorially on another page, and which is given in the accompanying official table, does not exert any depressing influence upon the market, for the simple reason that it is all absorbed by the trade, and as there statistics show, something more than 300,000 tons were taken from stock during the month of August, in addition to the 4,100,000 tons which were shipped during the month.

During the week ended the 8th of September, the shipments of anthracite amounted to about 950,000 tons, which is about 250,000 tons more than in the corresponding week of last year. There is little doubt but that the shipments will aggregate 38,000,000 tons this year, which is far in excess of anything that the market has heretofore taken.

Some of the companies are stocking up pea and buckwheat coal at the mines rather than send them to tide-water at present prices.

As showing the greater flexibility now ruling in prices, we may say that we have learned of "hard" Broken coal quoted considerably below \$4; Egg coal, \$4.25 to \$4.35; Stove and Chestnut, \$4.50, and Pea coal \$2, and even less.

The discussion about tolls on pea coal, to which we alluded last week, still continues, and there appears to be quite a strong feeling on the subject. A good many shippers object to the present rates of freight on small coal, and think that where the railroads promptly advance the freights with every advance in the price of stove and chestnut coal they should equally reduce the freights on the unsalable sizes when the market price declines.

The notice which we gave of Mr. Haddock's protest against the freights of the Lackawanna & Western, has found several responses, and it seems probable that the independent operators may be led into calling upon the railroads to put their freights down to the rates on bituminous coal, or if they will not do this the operators may appeal to the Inter-State Commissioners, when there is little doubt the present tolls would be reduced considerably.

We continue our quotations of last week as follows: Broken \$3.95 | Stove \$4.65 | Egg \$4.30 | Chestnut \$4.65

Mr. John H. Jones, Chief of Bureau of Anthracite Coal Statistics, has issued the following statement of anthracite coal tonnage for the month of August, 1888, compared with same period last year. This statement includes the entire production of anthracite coal, excepting that consumed by employes and for steam and heating purposes about the mines, but does not represent the entire anthracite coal tonnage actually transported by the respective railroad companies, adjustment being necessary in the compilation to avoid duplications, etc.

Table with 4 columns: COMPANIES, August, 1888, August, 1887, Difference. Rows include Phila. & Reading RR., Lehigh Valley RR., Central RR. of N. J., Del., Lack. & West. RR., Del. & Hud. Canal Co., Pennsylvania RR., Pennsylvania Coal Co., N. Y., L. E. & W. RR., and Total.

Table with 4 columns: COMPANIES, For year 1888, For year 1887, Difference. Rows include Phila. & Reading RR., Lehigh Valley RR., Central RR. of N. J., Del., Lack. & West. RR., Del. & Hud. Canal Co., Pennsylvania RR., Pennsylvania Coal Co., N. Y., L. E. & W. RR., and Total.

Table with 4 columns: COMPANIES, August, 1888, August, 1887, Difference. Rows include From Wyoming Region, From Lehigh Region, From Schuylkill Region, and Total.

The stock of coal on hand at tide-water shipping points August 31st, 1888, was 396,752 tons; on July 31st, 1888, 704,101 tons; decrease, 307,359 tons.

Bituminous. There is little new in this article, though we hear of one of the West India steamship lines having contracted for Eureka coal to the amount of probably

60,000 tons during the year, which is to replace Welsh coal. This order appears to have been given after due trial of the coal, which has given great satisfaction.

There is no nominal change in price of bituminous coal, though a little higher average is being obtained for the small orders that are going. The production continues very large, and cars are becoming scarce.

The ruling prices are \$2.60 f.o.b. Baltimore and Georgetown, and \$3.25 for New York Harbor.

Boston. Sept. 20.

[From our Special Correspondent.]

The coal market is not in the gilt edge, A No. 1 shape that it has been in. It is a very good market still, as viewed from this port, but matters are not quite so much in sellers' favor as for some weeks past. The cancellations due September 1st were not generally cancelled. The companies are having more coal to ship than they did a little while ago, and even the Reading folks are beginning to let it go out that they can take good care of orders now. So it will be seen that there is a noticeable change in the aspect of the anthracite market, notwithstanding the fact that prices are still very well maintained at full circular rates as last made. There is still talk of cancellation of late orders, for there are a stack of old orders still unfilled. But with less pressure to buy it will be surprising if much is done in the cancellation line.

There is nothing stirring in the line of bituminous coal. Quotations remain unchanged at \$3 25@3.50 delivered.

The continued strengthening in freights is a factor in the market still present, particularly from Baltimore and the lower ports. There seems to be an easier state of affairs at New York than lower down the coast.

We quote vessel rates, exclusive of discharging: New York, 80@85c.; Philadelphia, 90c.@\$1; Baltimore, \$1@1.05; Newport News and Norfolk, 90c.@\$1; Richmond, \$1.15@1.25; Provincial, \$1.60@1.75.

The expected advance in retail price has made its appearance, and fairly high prices now rule. The activity in the retail trade is confined very largely to old orders. Nothing to speak of has been done at the advance. Delivered prices advanced 25 cents now are: Stove and Nut, \$6.50; Egg, \$6.25; Broken, \$6; Franklin, all sizes, \$7.75; Lehigh Egg, \$6.50; Broken, \$6.25. Wharf prices 50 cents less than the above. Bituminous coal, \$4.25 on the wharf.

No advance was made in the retail price of bituminous coal.

Buffalo. Sept. 20.

[From our Special Correspondent.]

The coal trade in anthracite and bituminous continues quite brisk. Interior orders are coming in freely and liberally. The price of anthracite unchanged, but bituminous is slightly higher.

The principal topic of discussion the past week has been on the discrimination in railroad freights. Your report of this matter, as published last week in the ENGINEERING AND MINING JOURNAL, states about all that has been made public. It is said that the coal operators are in earnest and mean business; and will make every effort to have the Interstate Commerce Commissioners coincide with their views and give them redress.

The plans for the Central Dock and Terminal Coal Company's docks, trestles, etc., at this port are ready. The principal trestle will have a 6000 gross ton capacity, and will be built on a pier extending into the Erie Basin about 750 feet.

Our Natural Gas Fuel Company will not furnish any families with fuel this fall and next winter, except those that are at present receiving it, as the demand and consumption is now about equal to the supply and additional pipe lines will not be laid for some time, if at all.

Coal and coke shipments over the Buffalo, Rochester & Pittsburgh Railroad are very heavy thus far this month.

Lake freights firm and unchanged—excepting 25 cents higher to Milwaukee to-day—there is, however, a better feeling among carriers, as the idea is prevalent that with light tonnage and improved receipts an advance in quotations may be expected in a few days. Grain freights are very high from Chicago to this port, and if this condition of affairs continues, it would seem to be quite unreasonable to charge higher rates. The going figures were as follows: 75c. to Chicago and Port Arthur; 60c. to Duluth, Superior, Gladstone and Ashland; 70c. to Milwaukee; 25c. to Detroit, Toledo and Port Colborne (Canada), and 50c. to Port Huron, Bay City and Saginaw.

The shipments by lake westward from September 13th to 20th, both days inclusive, were 77,787 net tons, namely, 35,890 to Chicago, 14,900 to Milwaukee, 3350 to Duluth, 6600 to Superior, 2200 to Gladstone, 3330 to Detroit, 3800 to Ashland, 210 to Bay City, 750 to Alpena, 87 to Romney, 50 to North Baltimore, 390 to Port Arthur, 250 to Saginaw, 25 to Dover, 3675 to Toledo. Total shipments thus far this season, 1,720,000 net tons, including cargoes on vessels from Tonawanda, not reported at the Custom House at this port.

The receipts by canal of coal for second week of September, 12,087 net tons; shipments, 336 net tons.

Pittsburg. Sept. 20.

[From our Special Correspondent.]

Coal market steady, with a fair demand, there being so many just at this time housing their winter supply. Most of the miners in the pools are idle; the coal men show no anxiety to pay the price demanded. The pools have a large number of empties ready to be

loaded as soon as the men decide to go to work. The lower markets have an abundant supply on hand.

PRICE OF COAL PER 100 BUSHEL = 7600 LBS.
 First pool \$4.75
 Second pool 4.25
 Third pool 3.75
 Fourth pool \$3.25
 Railroad coal 5.00

Connellsville Coke.—The activity previously noted in the coke regions continues; the cry still comes back about the scarcity of cars. A number of smaller operators are starting up, among which we note the Overton, Emma, Parish and Great Bluff works. Atlas and Cora are about ready to start; others will follow provided the labor troubles do not interfere. Old contracts are being filled at contract prices; new contracts are refused unless at the advance.

The new rates are: Blast-Furnace, \$1.25 per ton; to dealers, \$1.35; foundries, \$1.40.

Freight rates to Pittsburg, 70c. per ton; to the Mahanov an Shenango valleys, \$1.35; East St. Louis, \$3.20; to Cleveland, \$2.80; to Chicago, \$2.75; to all other points the same proportions.

FREIGHTS.

The latest actual charters to September 21st, per ton of 2240 lbs.

From New York to:—Beverly, .80@.90; Boston, .80; Bridgeport, Conn., .65@.70; Cambridge, Mass., .80; Cambridgeport, .80; Chelsea, .80; Com. Pt., Mass., .80; E. Boston, .80; E. Cambridge, .80; E. Greenwich, R. I., .80; Fall River, .80; New Bedford, .85@.90; Newburyport, .95; New Haven, .65@.70; Newport, .80; New London, .70@.75; Norwalk, Conn., .55@.60; Norwich, .80; Portland, .80; Portsmouth, N. H., .90; Providence, .80; Quincy Point, .90; Salem, .80.

From Philadelphia to:—Annapolis, 70; Bangor, .85@.1.05; Baltimore, .60; Bath, Me., .95; Boston, .90@.1.05; Cambridgeport, 1.15; Charlestown, 1.00; Chelsea, .95; Com. Point, Mass., .95; East Cambridge, 1.17; Fall River, .80@.90; Gardner, Me., 1.10; Galveston, 3.10; Gloucester, 1.05@.1.17; Lynn, 1.10@.1.20; Marblehead, 1.05; Medford, 1.10; Milton, 1.20; New Bedford, .80@.90; Newburyport, 1.20; Newberne, .80@.85; New York, .90; Norfolk, .65; Portland, .85@.1.05; Portsmouth, N. H., 1.00; Portsmouth, Va., .65; Providence, .80@.90; Richmond, Va., .75; Rockport, 1.22; Saco, Me., 1.20; Salem, Mass., .90; Savannah, 1.00@.1.10; Washington, .85; Weymouth, 1.15; Wilmington, N. C., .60.

From Baltimore to:—Bangor, Me., 1.10; Bath, 1.10@.1.15; Boston, 1.05; Bridgeport, Conn., .90@.95; Brooklyn, .90; Charlestown, 1.10@.1.15; Fall River, .95@.1.00; Galveston, 3.00; Gardner, Me., 1.00@.1.10; New Bedford, .90; Newburyport, 1.30; New Haven, .90; New London, .90; New York, .85@.90; Portland, .1.05@.1.10; Portsmouth, N. H., 1.15; Providence, .90; Quincy Point, 1.10; Richmond, Va., .70; Salem, Mass., 1.10@.1.15; Savannah, 1.25; Somerset, .90; Williamsburgh, N. Y., .90; Wilmington, 1.10@.1.20.

* And discharging. 3c. per bridge extra. † A onside. ‡ And towing.

METAL MARKETS.

**NEW YORK, Friday Evening, Sept. 21.
 Prices of Silver per ounce Troy.**

Sept	Sterling exchange	London Pence.	N. Y. Cents.	Sept.	Sterling exchange	London Pence.	N. Y. Cts.
15	4.88½	44½	96½	19	4.88	44 3-16	96½
17	4.88½	44½	96½	20	4.87¾	44 3-16	96¾
18	4.88	44½	96½	21	4.87¾	44½	96¾

The silver market closes weak, owing to lower exchange and lack of orders for the London market.

After the sharp advance of last week some reaction was natural.

It is stated from Washington that the large new silver vault in the Treasury Department is so damp that the canvas bags containing the silver stored there are actually rotting away. Measures are being taken to improve the ventilation of the vault, and arrangements are also being made to substitute small rough pine boxes for the canvas bags for holding the silver. These boxes will each hold 3000 silver dollars, and it is proposed to store 30,000 of them in the vault. The silver is still coming in at the rate of \$500,000 a day.

Foreign Bank Statements.—The governors of the Bank of England, at their weekly meeting, made no change in its rate for discount, and it remains at 4 per cent. During the week the bank lost £200,000 bullion, and the proportion of its reserve to its liabilities was reduced from 44 01 to 42 07 per cent, against an advance from 44 40 to 45 08 per cent in the same week of last year, when its rate for discount was 4 per cent. Thursday the bank gained £311,000 bullion on balance. The weekly statement of the Bank of France shows a loss of 3,525,000 francs gold and of 475,000 francs silver.

Copper.—During the past week the market has been exceedingly firm, and under the influence of further purchases to cover bear sales the price of Lake Copper has again advanced. We have now to quote Spot and September, 17 60; October, 17 50; November, 17 50; December, 17 50; January, 17 55. It is understood, however, that the agents of the French syndicate here are selling to the trade under these prices. A good demand still exists for casting copper, which is scarce and quoted 15½@15¾. We hear also of sales of electrolytic copper to-day at 17 cents.

The London market has been very firm. The fluctuations in Chili bars continue, and prices are to-day several pounds below those of a week ago, to-day's cable reporting Spot £96@£96 2s. 6d., whilst 3 months' prompt are still quoted £79. The brokers of the Syndicate continue to accept orders from consumers for Spot at £78 10s. "G. M. B." Copper is firm and higher in price, the last figures being £77 to £77 5s. for Spot, and £77 15s. to £78 for 3 months.

Tin.—This market has been somewhat irregular, following pretty closely the course of the London market, where Spot tin declined in the beginning of the week from £102 to £99, but a marked improvement has since taken place, and prices close very firm at £104 spot and £103 5s. three months. In this market Spot tin is rather scarce, and the demand continues satisfactory. Our closing quotations are: Spot, 23 50; October, 23 50; November, 23 85.

Lead.—The beginning of the week brought some very heavy offerings, and the bull operators had to absorb about 1500 tons in one day. They continue, however, to persistently support the market, and all offerings are readily taken up. Spot, at 4 95; and October, at 4 97½ to 5c. In marked contrast with this the later months are quite neglected. November delivery being offered at 4 80, and December delivery even somewhat lower, without tempting buyers. The trade still holds back as much as possible. In London prices which were last week reported at £14 afterward fell to £13 15s., but on speculative orders for American account rapidly advanced again to £14 7s. 6d., at which price the market closes firm. English lead is obtainable at £14 7s. 6d. @ £14 10s.

Chicago, Ill.—Messrs. Everett & Post telegraph us to-day as follows: Market rules at 4 80@4 85c. Consumers are not buying. Speculative sales will only amount to about 500 tons at 4 80c.

St. Louis, Mo.—Messrs. John Wahl & Co. telegraph us to-day as follows: The market is very steady at some advance over last week's quotations, and no abatement is to be noted in the demand, which is quite good, especially from speculative channels. We may quote both hard and soft lead worth 4 80@4 85c.

Spelter.—The improvement previously reported has continued, and offerings are still very light. We quote prime domestic 5 to 5½. London is very firm at £18 15s.

Antimony.—English makers have raised their prices, and transactions in Hallett's have taken place at £39 10s. This has induced dealers on this side to advance their quotations also, which we now give as Cookson's 13½ to 14, Hallett's 9½ to 10.

CHEMICALS AND MINERALS.

NEW YORK, Friday Evening, Sept. 21.

This week shows a continuation of the general improvement in the trade noted in our last issue. Prices are well sustained and in all cases show a firmer tendency than we had to record for many weeks past.

Heavy Chemicals.—Advices from abroad report a firm market and a better feeling prevailing throughout the trade. The principal topic of interest is the combination which the caustic soda makers are endeavoring to form.

On this side caustic soda has felt the effects of the reports from abroad and prices show an upward tendency. Stock on the spot is very scarce, and it seems probable that prices will soon equal those at this time in 1887, when 2 52½c. was the ruling figure for 60 per cent and 2 37½c. for 70 per cent. This week the market may be quoted at 2 40@2 42½c. for 60 per cent to arrive, and 2 25@2 30c. for 70@74 per cent. The market closes very firm.

Carbonated soda ash, 48 per cent, is firm in price; the market shows little change. There is considerable discussion concerning the action of the window-glass manufacturers and its probable effect upon the demand for 48 per cent ash. At a recent meeting of the glass manufacturers it was agreed not to start up until October 8th. Since then, however, the Eastern manufacturers, and several in Indiana, have announced their determination to start at once. This announcement naturally causes confusion in the window glass trade, but may result in an improved demand for carbonated soda ash, 48 per cent, within the next few days. During the past week transactions have been light at the old figures, 1 22½@1 27½c. to arrive, and 1 27½@1 35c. on the spot, according to quantity.

Caustic soda ash, 48 per cent, shows limited sales, but prices as a rule are firmly maintained. We continue to quote 1 20@1 25c. to arrive, according to quantity and brand, and 1 25@1 32½c. for stock on the spot, of which there is very little.

Sal soda is in slightly better demand than last week. The recent heavy importations rather unsettled the market, but as the vessel loads have now been discharged, prices show a firmer tendency. Stock on hand is held at 95@1c., and to arrive is quoted at 90@95c.

Hyposulphite of soda is unchanged in price, and the market is without special feature of interest.

Bleaching powder is much firmer. The stock in Boston, which for some time past has been so freely offered that prices have been depressed, is now nearly exhausted, and prices are consequently a little firmer in that city. In New York, for the past few weeks, the demand has been light owing to the under selling of Boston. Hence, dealers in this city have kept very light stocks, indeed, only sufficient to meet pressing current requirement, and now that Boston's stock gives out, buyers turn to New York, only to find that supplies are unobtainable. Prices in this city are therefore very firm, with an upward tendency. The market may be quoted: 2c. @2 12½c. for stock on the spot, and to arrive, 2c., in New York.

Acids.—The market is much improved in tone. The demand for consumption continues to increase, and the large surplus stocks which for months past have been the bane of the trade, seem to be rapidly disappearing.

Acetic acid is quiet at the old figures, 2¼@2½, according to quantity and quality. Transactions have been limited.

Muriatic and nitric acids are in light demand. We

quote for muriatic, 18°, 1.10@1.15c.; 20°, 1.25@1.30c.; 22°, 1.50c. Nitric remains at: 36°, 3½c.; 38°, 4c.; 40°, 4½c.

Oxalic acid has been moderately dealt in at the advanced prices. Rumors of another advance are heard. We quote 8½c. per pound for large lots of say ten tons, while for smaller quantities 9c. is the ruling figure.

Sulphuric acid is in better demand, and prices show a firmer tendency. Quotations are unchanged at 90@95c. for 66 degrees, in large quantities, and 1c. @ 1.15c. per lb. for jobbing sales.

Tartaric acid is in moderate request at the old quotations, which are as follows: Crystals, in lots of 3000 lbs. or more, 43c. per lb.; smaller quantities in barrels, 44c. per lb.; 50-lb. lots in boxes, 45c. per lb., and one cent advance on these figures for powdered.

Fertilizers, Potashes, etc.—Prices show an upward tendency, and the demand is much improved. The ruling quotations are as follows: Azotine, \$2.30@ \$2.35, as to quality; dried blood (city) low grade, \$2.32½@ \$2.37½ per unit. Western high grade \$2.35 @ \$2.40 per unit for ground material; tankage, high grade, \$23@ \$25 per ton; low grade, \$21@ \$22 per ton. Fish scrap, \$24@ \$26 per ton f.o.b. factory. Sulphate of ammonia, \$3.20 per cwt. Steamed bones, \$20 per ton.

Charleston rock, undried, \$5 per ton; kiln dried, \$6 per ton, both f.o.b. vessels at the mines. Charleston rock, ground, is held at \$10@ \$10.50 ex steamer at New York.

Concerning phosphate rock a special correspondent writes us from Charleston, S. C., under date of September 14th: "The market continues stiff, many of the miners having sold up to their quota of 90 per cent of their year's production. The land combination and those few who have any to sell are holding it very firmly at \$5 and \$6 for crude and kiln dried, respectively. One in the combination refuses to sell kiln dried for less than \$6.50, and as none of the land miners outside have any for sale, it is not improbable that \$5.50@ \$6.50 will be the ruling price in the near future."

Refuse bone black is quoted at \$18 per ton. Dissolved bone-black is 90c. @ \$1 per unit for available phosphoric acid, and acid phosphate 75@80 per unit for available phosphoric acid.

Double manure salts have been sold in moderate quantities. Prices show an upward tendency, at about 1.15c. on a basis of 48 per cent potash.

Sulphate of potash continues scarce and in fair demand. The ruling quotations are 2.20@2.25c., on a basis of 90 per cent.

Muriate of potash is in better demand, although transactions are limited. We continue to quote \$1.80 for both spot and arrivals.

Kainit is still scarce, and transactions are, of course, limited. The quotations are nominally \$11 per ton for stock on the spot; ex store, \$10, and for shipment, \$9.75.

Brimstone is unchanged, although prices are firm and stock available limited. We continue to quote \$21 for best unmixed seconds on the spot, to arrive \$20.50, thirds to arrive \$19.50.

Nitrate of soda records another advance owing to the improved position of the article. While there is considerable stock on the spot, it is entirely in the hands of large holders, who refuse to lower their prices to any one. The ruling quotation ex store is 2.20c. for lots of less than 500 bags. Above this amount may be obtained at 2.17½c. Stock to arrive is held at 2.10c.

Acetate of Lime is sold lightly at the old figures.

Cream of tartar is sold in a small way at 32½@ 33½c. for powdered and 32@32½c. for crystals. Terms, net cash, 30 days free on board New York, or, less 1 per cent for prompt cash.

Minerals.—Business may be called fairly active. At this season of the year trade is usually good, and 1888 proves no exception to the rule. Prices are satisfactory, and the demand fair.

Sulphate of barytes, as last week, shows small sales of a jobbing character. Prices remain at \$17.50@ \$18.50 for best No. 1, off colored at \$15.

China Clay.—The demand is slightly improved, but the supply is very plentiful. We continue to quote \$13.50 for Southern and \$15@ \$18 for foreign, according to quality.

Chalk is easier and in more plentiful supply. Prices are slightly weaker at \$3@ \$3.50.

Talc is in moderate demand. Prices are unchanged. Feldspar is in good demand. Prices show little change.

Silica or ground quartz is moving fairly.

BUILDING MATERIAL MARKET.

NEW YORK, Friday Evening, Sept. 21.

It is difficult to make building material men believe that there is any improvement in the city building trade, despite the fact that the number of new buildings projected in August shows a considerable increase over the number projected in the same month last year. Many of them regard this as no augury that business will improve this year; on the contrary, they repeat their former statements that trade at present is dull, and is likely to remain so.

While this may be true in New York City, the country at large shows a marked improvement, and in many lines of the trade compensates for the dullness in New York.

Bricks.—The production has slightly decreased this week, owing to the bad weather, but a corresponding decrease in the consumptive demand has offset any advantage that sellers might obtain on this account. The demand for the superior qualities is better than that for common kinds, which are veritably a "drug in

the market." Strenuous efforts are being made by manufacturers to decrease the production, but as yet the results of these efforts are not apparent in the market.

Cement.—The volume of business is very satisfactory. Prices are well maintained. The use of cement in the new Croton aqueduct has given an impetus to the cement trade, while giving another cause for dullness in the brick market. It is noticeable that dealers who sell to the city for the aqueduct are disposed to quote prices at the highest point possible.

Lime.—There are indications, or, at least, reports, among the members of the Association that lime will be pretty scarce for the next week. The stock available is limited, and it is said that no more will arrive before the 28th inst. Association men quote Rockland lime firmly at \$1.00@ \$1.20, but we heard it stated that a supply could be obtained at 95c.

Roofing Slate continues in good demand at satisfactory prices.

For prices of building materials and wages of laborers see our "Current Prices."

IRON MARKET REVIEW.

NEW YORK, Friday Evening, Sept. 21.

Iron Ore.—The Western market has considerably advanced, due to the increase in orders and the shortage and consequent advance in Lake freights.

We hear of quite large sales at Cleveland at an advance in some cases of 50 cents a ton over ruling figures two months ago.

We quote as follows:

Specular and Magnetic Bessemer	.....	\$6.00@	\$6 15
Specular and Magnetic Non-Bessemer	.....	5.25@	5.50
Hematite Bessemer	.....	5.00@	5.25
Non-Bessemer Hematite	.....	4.20@	4.40
Menominee Bessemer	.....	5.25@	5.50
Menominee Non-Bessemer	.....	4.00@	4.25
Gogebic Bessemer	.....	5.25@	5.50

American Pig.—The higher cost of ore and the inevitable higher cost of coke will necessarily bring a higher price for pig-iron. Moreover the demand for iron is certainly much improved, and is indeed so active that many furnaces are blowing in, and stocks are very low. On July 1st the unsold stocks of pig iron were only about a three weeks' supply. They are probably even less now, so that there is every ground for expecting great increase in activity and better profits in the trade, all of which is wholly independent of politics.

From every part of the country come reports of improved business, and in the West and South we hear of better prices being obtained for iron. We are told that here higher prices are asked for Southern iron, but while the Thomas Iron Company continues its standard quotations of \$16, \$17, and \$18, and has plenty of iron for sale, it is a little doubtful whether much advance will be secured above these prices, except for extra brands that usually ask 25 to 50 cents a ton more.

Scotch Pig.—There is no change in prices here, and but little change in Glasgow, as will be seen by reference to our tables of current prices on another page. Freights continue at 10s., and as the English market continues to show great activity, notwithstanding the million tons in stock, very little iron will come at present prices. About 800 tons came in this week.

Bessemer Pig is unchanged in price and is quiet, though there is a little more inquiry for it.

Steel Rails are still very quiet, and, though \$28.50 to \$29 is nominally asked, yet if these figures are quoted the visitor does not return. Even \$28 has been shaded at some Eastern mills. We quote \$28@ \$28.50, Eastern mills.

The outlook for an exceptionally good year in railroad building in 1889 is becoming clearer. We hear of many new roads projected and many negotiations going on for the capital with which to build them; and it seems now as though we should have a very active year in railroad work.

The locomotive shops are all full of work, and their prices are advancing; and the bridge builders are also full of orders; indeed, the difficulty they find is to get the supplies promptly.

All these facts are extremely encouraging and are strengthening the feeling of satisfaction with things in general, which is rather unusual in a Presidential year, when usually each party would make believe that the success of the other will ruin the country.

We are going to have good business and fair profits this year, whichever side wins.

Structural Iron and Steel, as stated, are in good demand at unchanged prices.

Old Rails are eagerly bought at comparatively high prices. We hear of sales of several thousand tons; 1600 tons of double heads at \$24.25 ex store, and \$24 is offered. We hear of \$25 being asked in Pittsburg for old ties.

Scrap—Wrought sells at \$20.50 delivered to vessel, and \$21 is asked for choice.

Nails are unchanged in price here, where they can be bought at \$2, but elsewhere there is a better feeling, which may result in higher prices.

The Tredegar Iron Company, of Richmond, Va., has instructed its New York agents to accept no orders on spikes under \$2.25 per 100 pounds.

Louisville, Sept. 18.

(Specially reported by Messrs. HALL BROTHERS & Co.

The week past has been a very active one. There have been many good-sized sales made, covering about 12,000 tons of mill and foundry irons. There have been some good sales made in the East—one of 1500

tons of cold-blast iron. The demand for Southern iron continues to be very heavy; in fact, heavier than the furnaces are able to supply for the requirements of the consumers. Some furnaces have advanced their prices 50c. and others 25c. We consider a fair advance on coke irons to be 25c. On the whole, the market is in a very healthy condition.

Philadelphia, Sept. 21.

(From our Special Correspondent.)

Comparatively little of the pig iron that has been sold since September 1st has been taken at the advance given in recent quotations. Large consumers are still favored with inside prices. Small buyers who have been waiting until all elements of doubt were removed, have been obliged to pay a little more for early deliveries. This is about the only improvement that has taken place in the market. An active trade is going on in No. 2 iron. Forge is also under very good inquiry this week, but very few companies claim that they they have received outside prices for large lots. The market certainly has a hardening tendency, but it is, after all, deceptive. Heavy consumers claim that they can obtain all the iron they want at quotations which have ruled for 80 days past. There is not that urgent rush for material that was predicted two or three weeks ago. The real reason is that the volume of new business coming in is not large enough to induce buyers to go very far ahead of their immediate wants; and until there is a change in that respect no very sharp improvement need be counted upon.

Foreign material is not selling, and there has been no change in quotations for two or three months. Consumers have been asked to make bids, but have not done so.

All of the bloomeries are in active operation and doing well. The output is sold promptly and at full prices. There has been considerable inquiry this week for anthracite blooms, and a better demand has set in for nail slabs. Muck bars have improved 50 cents at least in asking prices, and some makers claim that they are booking a good many small orders at the advance.

The bar mills continue to book orders, and some few mills are sold up for from four to six weeks. Small lots are a trifle higher, but large buyers are still about to have their orders filled at old quotations. Mill owners say their only safe policy is to fill up with heavy "back log" orders and make the smaller fry pay the advance when they come along.

There have been several good sales of skelp iron at a slight advance over previous quotations. Nails have suffered a relapse, and concessions of 10 cents have been made on large lots; but the quality or brand in such cases was not the best.

The manufacturers of wrought iron pipe report a good trade for pipes and tubes, and consumers are now placing their winter orders. Sheet iron is active so far as light sheets and galvanized are concerned; heavy sheets are very dull. The current demand is for small lots, and card rates are rather difficult to obtain.

So far as merchant steel is concerned all kinds are in active demand, and prices are very firm. The volume of business will undoubtedly be much larger during the coming winter.

Several inquiries have just been received for good lots of plate and tank iron. Prices are firmer than they have been for a month or two. It is probable, however, that when the pending negotiations are closed the figures will be shown to be no higher than those of August. There is a vast amount of plate iron capacity in this State, and manufacturers are not willing to let opportunities slip where large orders are to be had.

The old rail trade is very unsettled. There are plenty of buyers in the market, but there is a difference of fifty cents to one dollar between their views and those of holders. Steel rails are dull, but mills engaged in the manufacture of other Bessemer steel products report a good demand. There is a heavy demand for all kinds of scrap.

For present quotations see our table of current prices on another page.

Pittsburg, Sept. 20.

Raw Iron—As compared with the first and second week of the present month, a falling off in sales is perceptible. There are two reasons for this. In the first place, furnaces here and at points that furnish a large amount of supplies to this market are well sold up; others have contracts that will require months to fill; others have sold about all the iron they can make until the first of the new year. As a matter of course, their furnaces will be out of the market for the present. In conversation with a furnace man from the Shenango Valley he remarked: "Our price for gray forge at the furnace is \$16.00 cash." One of the city furnace owners said: "We are not selling iron at present, having shipped off all we care about, until we have delivered the iron previously sold."

On the other hand, consumers generally have a good supply on hand, and contracts to be delivered that will supply them for some time. This naturally makes them less anxious to purchase more stock unless concessions are offered.

The demand for pig iron was fair for standard and favorite brands at current rates. The volume of sales has been smaller. Trade is evidently satisfactory. While some dealers are booking as many orders as formerly, the reverse is the situation with others. Common and mixed lots of iron are sold at various prices.

Pig Iron.—The weekly production September 1st, 1884, was 36,000 tons; the stock on hand, 235,000, 1888, September 1st, weekly production, 80,000 tons; stock on hand, 184,000 tons. While the weekly production has increased 44,000 tons compared with 1884

the stock on hand has decreased 51,000 tons. The situation appears to be very satisfactory, supply and demand being in healthy proportions.

Table with columns for item name and price. Includes 'Coal and Coke Smelted Lake Ore' and 'Coke Native Ore'.

Table with columns for item name and price. Includes 'Charcoal' and 'Muck Bar'.

Table with columns for item name and price. Includes 'Steel Slabs and Billets'.

Table with columns for item name and price. Includes 'Old Iron and Steel Rails'.

Table with columns for item name and price. Includes 'Spiegel'.

Table with columns for item name and price. Includes 'Scrap Material'.

FINANCIAL.

New York, Friday Evening, Sept. 21. Another dull and uneventful week in the mining market has passed. Undeniably, there has been an under tone of greater strength, but the total transactions have been limited to about 75,000 shares, which is 20,000 less than last week and about 80,000 less than the total for the corresponding week last year.

Although speculation on the exchange has been confined almost entirely to railway stocks, our mining brokers, with commendable persistency and spirit, continue to predict a "boom" this fall, which is to bring golden showers of prosperity and plenty to the weary peddlers of mining shares. "Every thing comes to him who waits" could be aptly quoted as illustrating the feeling now prevailing on our exchange. Concerning this prophesied "boom," an experienced observer of mining affairs says: "If we have a boom this year it must be based upon actual earnings, and not upon manipulation or deals. A post-hole can no longer be floated as a mine either in London or in New York. The public is naturally disgusted with the long line of wild cats that have been paraded upon our exchange as mines, and now, if you wish to secure the confidence of the investing public, you must have a mine, with its shafts sunk and drifts ready for inspection by an unimpeachable expert." The mining market at present seems to confirm these views; the properties of known value are attracting the most attention and are the first to feel the awakening at every attempt to "boom" prices. But the "cats" and the "fancies" are always there, and, as we stated last week, continue to terrify would-be investors and to hamper the market as so many sunken logs would obstruct what should be a navigable stream, and convert it into a stagnant foul smelling pool.

Advices from San Francisco to-day report the market fractionally stronger at the closing.

Horn-Silver matters are progressing favorably. The election will be held in Utah, October 2d, when another attempt will be made to oust the Francklyn crowd. Proxies are coming in rapidly. Mr. A. C. Washington will probably go to Utah to represent the stockholders who favor Francklyn's retirement. We explained the position fully in these pages August 25th. The stock shows no sales this week.

Ontario has declared its regular monthly dividend of \$75,500 for August; total paid to date, \$9,500,000. The stock was not sold this week. Daly also announces its monthly dividend, the fifteenth, of \$37,500. This makes \$750,000 paid by this company to date, and we are informed that it has a large surplus.

The Idaho Gold Quartz Mining Company, of Grass Valley, California, paid its two hundred and twenty-seventh dividend last week. It amounted to \$23,250, or seven dollars and a half per share. There are only 3100 shares, and the total dividends paid to date aggregate nearly \$5,000,000. The stock is not to be had.

Brunswick shows sales of 1200 shares at 16@18 cents, closing stronger at the latter figure.

Plymouth Consolidated was sold to the extent of 450

IMPORTS AND EXPORTS OF METALS AT NEW YORK SEPTEMBER 12 TO SEPTEMBER 19, AND FROM JAN. 1,

Large table with multiple columns for imports and exports of metals. Includes sub-sections for 'IMPORTS' (Copper, Steel Sheets, Pig-Iron, Tin Plates, Bar-Iron, Steel and Iron Rods) and 'EXPORTS' (Copper, Copper Matte, Copper Ore). Columns include 'Week. Pounds.', 'Year. Pounds.', and 'Corres. date 1887'.

CURRENT PRICES.

Table of current prices for various commodities including chemicals (Acid-Acetic, Muriatic, Nitric, Oxalic, Sulphuric), alkalis (Alkali, Ammonia), building materials (Bricks, Cement, Lime), and metals (Aluminum, Iron, Steel).

Table of current prices for building materials and metals, including Scotch Pig, Bessemer Pig, Spiegeleisen, and various grades of iron and steel.

Table of current prices for Philadelphia and Birmingham, including stock market quotations and local commodity prices for both cities.

Table of current prices for various metals and alloys, including Aluminum, Bismuth, Cadmium, and others, with prices listed in dollars and cents.

DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES.

Main table with columns: NAME AND LOCATION OF COMPANY, CAPITAL STOCK, SHARES, ASSESSMENTS, DIVIDENDS, and NAME AND LOCATION OF COMPANY, CAPITAL STOCK, SHARES, ASSESSMENTS. Contains 150 rows of data for dividend-paying mines and 150 rows for non-dividend-paying mines.

G. Gold. S. Silver. L. Lead. C. Copper. * Non-assessable. + This company, as the Western, up to Dec. 10th, 1881, paid \$1,400,000. † Non-assessable for three years. ‡ The Deadwood previously paid \$275,000 in eleven dividends, and the Terra \$5,000. Previous to the consolidation in Aug., 1884, the California had paid \$31,321,000 in dividends, and the Con. Virginia, \$24,360,000. ** Previous to the consolidation of the Copper Queen with the Atlanta, Aug., 1886, the Copper Queen had paid \$1,250,000 in dividends. † 1,300,000.

NEW YORK MINING STOCKS QUOTATIONS.

DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES.

Table with columns for Name and Location of Company, dates from Sept 15 to Sept 21, and Sales. Includes companies like Adams, Alice, Argo, etc.

*Ex dividend Dealt in at the New York Stock Ex. Unlisted Securities †Assessment unpaid Dividend shares sold, 20,140. Non-dividend shares sold, 55,760. Total New York, 75,900.

BOSTON MINING STOCK QUOTATIONS.

Table with columns for Name of Company, dates from Sept 14 to Sept 21, and Sales. Includes companies like Atlantic, Bodie, Bonanza, etc.

* Assessment paid Boston: Dividend shares sold, 12,787. Non-dividend shares sold, 11,571. Total Boston, 24,358.

COAL STOCKS.

Table with columns for Name of Company, Par val. of sh'rs., and dates from Sept 15 to Sept 21, and Sales. Includes American Coal, Barclay Coal, etc.

*Bid. †Asked. ‡Ex-dividend. Of the sales of this stock, 74,776 were in Philadelphia, and 248,640 in New York. Total sales, 323,416.

San Francisco Mining Stock Quotations.

Table with columns for Company, and dates from Sept 14 to Sept 20, and Sales. Includes Alpha, Alfa, Belcher, etc.

shares to-day at \$8@8.13. No authentic news from the mine has been received as yet.

Quicksilver Preferred shows one sale of 100 shares at \$37; Bulwer, 200 shares at .55. Mono was sold in the early part of the week at 95. An assessment of fifty cents per share was levied in San Francisco on Thursday. Standard was not dealt in. Bodie was slightly weaker at \$1.40 on Wednesday, opening at \$1.55 last Saturday.

The Amador County mines, as usual, were freely sold. Amador shows sales of 1600 shares, opening at \$2.70 and closing at \$2.25. Mr. A. P. Minear and Senator Wallace are in the city with encouraging news from the mines, of course, but why did Amador decline this week?

Astoria was dealt in to the extent of 7400 shares at 21@25c., closing weaker at the former figure. Another decline. Middle Bar opened at 46c. and closed at 44c. Hollywood was firm at 38@40c. with sales of 5800 shares.

Among the Colorado properties Robinson Consolidated sold at 90c.; Little Chief, 3000 shares at 22@23c., and Plutus, 2300 shares; at 95c. Lacrosse was active, opening at 11c., advancing to 12c., and closing weaker at 8c. Sales, 5000 shares. Cashier closed at 10c., also a little weaker. Sales of the stock amounted to 5200 shares. Monitor fluctuated from 10c. to 13c., with total sales of 3600 shares.

Kingston & Pembroke was active at \$2.13@2.38. Iron Silver sold at \$3.50@3.55.

Among the Dakota properties, Homestake was active at \$11 and \$11.50. The aggregate sales were 430 shares. This company announces its 122d dividend, of \$25,000. Total dividends paid to date, \$4,218,750. Deadwood-Terra sold at \$1.65. Iron Hill at 19c.

The Comstocks were fairly active. Consolidated California & Virginia sold at \$9@10, closing at the former figure, with total sales of 1370 shares. Ophir at \$6.25. Consolidated Imperial at 40@43c. Sales was large, amounting to 4200 shares at these figures. Union Consolidated closed at \$3.10. Exchequer opened at \$1.20, and closed at \$1.10. Found Treasure was neglected at \$2.

Among the Tuscaroras, Belle Isle sold at 40@43c. North Belle Isle at \$2.75@2.85, and Tornado at 23@30c., with sales of 5700 shares.

Barcelona was rather neglected at 90c.@1.00, although quite a number of sales at the former figure were made to-day.

El Cristo was active at 95c.@1. Santiago was not sold.

Sutro Tunnel was dealt in at 9@11c. Trust certificates are quoted at 62.

The Colches Mining Company of New Mexico, to which we referred in our last issue, will be listed shortly, we are informed.

Silver Mining of Lake Valley was sold at 27@29c.

Savage sold at \$3@3.95. Sierra Nevada, \$3@3.40. Silver King, \$1.95@2.10.

Sutter Creek sold at \$1.10@1.20, with sales of 2400 shares.

The Hector Gold Mining Company, a California corporation having a mine in Amador County, Cal., has proved an expensive lesson to its Eastern stockholders. A few of these gentlemen met on the 20th inst. in this city to devise means of protecting their investment, and in the discussion that took place some rather discreditable facts came out.

In the ENGINEERING AND MINING JOURNAL, July 16th, 1887, it was stated on the authority of a paper published near the mine that the stock being offered in New York was "to provide working capital," but it is now said that the money was not used for this purpose.

It appears from the complaint in a case in the New York courts, referred to in the ENGINEERING AND MINING JOURNAL, October 8th, 1887, that Mr. Julius Leszynsky negotiated the sale of the capital stock, \$300,000, of the Hector Company to Mr. Geo. Wm. Ballou, of this city, for \$75,000, that is at 25 cents a share; and it further appears that Mr. Ballou sold some 60,000 shares of the stock here at \$1.25 and \$1.50 a share, but being unable to dispose of enough of it at this handsome advance on cost, he failed to pay the \$75,000 and the 240,000 unsold shares went back into the original owners' hands. Messrs. Thos. B. and S. S. Valentine and John S. Finch, of San Francisco, against whom Mr. Leszynsky brought suit for \$2,500, commissions on the sale to Ballou. The net selling price of the property would therefore appear to have been about \$50,000, and the "ground floor" for the New York investors \$300,000. A suit has been brought against Mr. Geo. Wm. Ballou to make him refund the money he received when he represented that the mine was owned here.

The San Francisco owners who control the company have intimated an intention to assess the stockholders until they freeze them out, and then they expect to sell the mine again to some one else.

Mr. Leszynsky says he has documentary evidence that the mine when running made \$3,000 to \$4,000 a month profit, while the official statements show it made no money. On the whole, the outlook is not cheerful for the Eastern stockholders, but by joining forces they may oblige the parties who got their money to disgorge, and we will be pleased to put any stockholders who may desire it in communication with the chief victims here, who will, we have no doubt, do the very best possible for their interests.

Meetings.

Arnold Mining Company, 19 Exchange Place, Boston, Mass., October 10th.

Breece Mining Company, Room 113, No. 115 Broadway, New York City, October 2d, at two o'clock P.M., annual election.

Dividends.

The following dividends have been declared: Daly Mining Company, of Utah, dividend No. 19, twenty-five cents per share, or \$37,500, payable September 29th, at Messrs. Lounsbury & Co.'s, No. 15 Broad street, New York City.

Homestake Mining Company, of Montana, dividend No. 122, twenty cents per share, or \$25,000, payable September 25th, at Lounsbury & Co.'s, New York City.

Idaho Gold Quartz Mining Company, of Grass Valley, California, paid dividend No. 227, seven dollars and a half per share, or \$23,250, September 11th.

Lehigh Valley Railroad Company, quarterly dividend, one and one quarter per cent, payable October 15th, at No. 228 South Third street, Philadelphia, Pa.

Ontario Silver Mining Company, of Utah, dividend No. 148, of fifty cents per share, or \$75,000, payable September 29th, at Lounsbury & Co.'s, No. 15 Broad street, New York City.

Penn Gas Coal Company, quarterly dividend, one and one half per cent, seventy-five cents per share, or \$22,500, payable September 27th, at No. 209 South Third street, Philadelphia, Pa.

The Idaho Quartz Mining Company, Grass Valley, Nevada County, California, has declared its 227th dividend to its stockholders. Number of shares in the mine is 3100. Amount declared this time is \$7.50 per share.

Assessments.

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

Pipe Line Certificates.

Messrs. Watson & Gibson, petroleum brokers, report for the week as follows:

The oil market is very narrow, and holders who have been expecting dollar oil have gradually dropped out. We think the market is a purchase on any weak spots, and believe it will get a sharp rise some day, as certificates are concentrated, and those who have them could mark up the price with but little resistance. The difficulty of getting ocean storage room checks exports, which will be large when sailing vessels come to port.

CONSOLIDATED STOCK AND PETROLEUM EXCHANGE.

Table with columns: Opening, Highest, Lowest, Closing, Sales. Shows market data for Consolidated Stock and Petroleum Exchange.

NEW YORK STOCK EXCHANGE.

Table with columns: Opening, Highest, Lowest, Closing, Sales. Shows market data for New York Stock Exchange.

Boston Mining Stocks. Sept. 20.

[From our Special Correspondent.]

There is just a little less "boom" in copper mining stocks this week, but the general tone of the market is one of firmness and confidence in the future, especially

in the stocks of those companies which are producers and dividend paying. Added strength has been given to this class of stocks by the announcement that the visible supply of copper abroad, September 15th, was 76,350 tons, against 84,140 tons September 1st, being a decrease of close on to 8000 tons. This shows that the French Syndicate, while gradually distributing their surplus, are developing an increased consumption, and making it quite clear that the position of the syndicate is impregnable. It is an interesting fact that consumers are only paying now just about the average price of the past ten years. The future prospects of the Lake Superior producing companies are looking better than at any former period for many years, while dividends for some time to come cannot fail to be regular and of an amount satisfactory to the stockholders, some of whom have been patient and long waiting.

Calumet & Hecla has declined 3 points, to \$287, but very little stock is coming out. This company, for the week ending September 17th, made a very excellent return of 711 tons, against 541 same week last year. It is believed that the Calumet & Hecla is earning net at least \$40 per square per annum. Allouez weakened off from \$3 1/2 to \$3, but later \$3 1/2 again, and closes \$3 1/2 bid. Atlantic is very steady at \$18 sales, but still offered at that. Franklin went off from \$19 1/2 to \$18 1/2, and later \$19 1/2. The report some weeks since that this company would pay a quarterly dividend of \$1 per share in October was not correct, but \$2 will be paid January, 1889, after which it is very probable quarterly dividends will be inaugurated, and it is not improbable that they may be relatively larger than the present rate of \$4 per annum. Huron has gained from \$5 to \$5 1/2, and there are good reasons to believe that this is one of the growing properties of the lake. National at \$5 1/2 @ \$5 1/2 is another property which has a good record, and an excellent promise for the future. The mine is located in what is known as the Ontonagon District of Lake Superior. In former years the mine was a considerable producer, and paid out \$320,000 in dividends. Kearsarge dropped from \$9 1/2 @ \$8 1/2, and later \$9 1/2.

Osceola \$20 1/2 @ \$19 1/2, with \$20 since and bid. Pe wabic stands 1/2 higher at \$4. Quincy has farther advanced from \$80 @ \$84, a gain of \$9 per share for this month thus far. There are those who believe this stock will reach around \$100 at no very distant date. Ridge hangs around \$2 @ \$2 1/2. Tamarack is slightly lower, selling at \$180 ex-dividend \$5, against \$186 last week. Boston & Montana fell off from \$51 @ \$50 1/2 and later 51 1/2 per share.

Among silver stocks Dunkin is assuming prominence again, advancing from 85c. to 90c., with an increasing demand for the stock, which is unusually scarce. No news of a "strike" has yet come to hand, but there are indications that something favorable is near at hand. It is probable that a remittance of \$5000 will come next week. Breceis without change at 30c. to 33c.; Catalpa, 20c. to 21c., and Crescent, 10c. bid.

3 P. M.—The market on mining stocks, in sympathy with that for railroads later in the day, has shown some indications of weakness, but only to a small degree, and probably of a temporary nature.

LATER PRICES.

(By Telegraph)—September 21st, 1 P.M.—Market quiet, price steady: Calumet & Hecla, \$288; Quincy, \$84; Boston & Montana, \$51.75; Franklin, \$19.25 bid; Atlantic, \$18; Allouez, \$3.12 1/2; Kearsarge, \$9 bid; Osceola, \$20; National, \$5.06 1/4. The feature in mining shares was Bousanza, which jumped from 1 1/2 @ 1 3/4 on a report that the English experts who had been examining the Santa Rita had reported favorably, and that President Whitney would sign the articles of sale to-morrow. Quincy Mining was a favorite also, moving up to 84.

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