

THE ENGINEERING AND MINING JOURNAL



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

VOL. XLVI. OCTOBER 27. No. 17.

RICHARD P. ROTHWELL, C.E., M.E., ROSSITER W. RAYMOND, Ph.D., M.E., Editors. Cable Address: "Rothwell," New York.

Books for review and all communications for the JOURNAL should be addressed, Managing Editor, P.O. Box 1833, New York.

The following gentlemen are authorized to receive advertisements and subscriptions for the ENGINEERING AND MINING JOURNAL: Mr. J. Viennot, 504 Walnut street, Philadelphia. Mr. T. W. Sprague, 178 Devonshire street, Boston, Mass. Mr. C. David, Duluth, Minn. Mr. Morgan Robertson, 195 Wabash avenue, Chicago. Mr. O. J. Frost, care Boston & Colorado Smelting Co., Clayton Block, Denver, Colo. Mr. Thomas R. McMechen, Red Cliff, Colo. Mr. H. L. Van Nostrand, M.E., Red Mountain, Colo. Mr. L. P. Fisher, 21 Merchants Exchange, San Francisco, Cal.

London Office: Finsbury Chambers, 76 Finsbury Pavement, London, E. C. Mr. Thomas B. Provis, Civil and Mining Engineer, Manager.

Peru, South America: Mr. John Newton, No 2 Calle Constitucion, Callao.

Remittances should always be made by Bank Drafts, Post-Office Orders, or Express Money Orders on New York, payable to THE SCIENTIFIC PUBLISHING COMPANY.

Advertising Rates.—See page XIII.

THE SCIENTIFIC PUBLISHING CO., Publishers,

P.O. Box 1833. 27 Park Place, New York.

CONTENTS.

Table with 3 columns: Article Title, Page, and Page. Includes sections like English Board of Trade Copper Returns, The Arid Land Survey, Steel vs. Timber in Mines and Railroad Ties, etc.

THE English Board of Trade returns for the past month throw some light on the interesting situation of the copper market, to which we referred in our last issue. An analysis of the figures shows as follows: In September the imports into Great Britain of copper ore, regulus or matte, copper precipitate, and unwrought or partly wrought copper amounted to 18,213 tons, as against 12,230 tons in the same month of 1887.

THE ARID LAND SURVEY.

Probably the most important action of Congress in the session just adjourned was the appropriation of \$100,000 for the survey of the arid land region of the United States, with a view to systematic irrigation by the construction of storage reservoirs. This amount voted is only a beginning, and is a trifle to what a complete survey with the above named object will require; but it establishes the principle that the government recognizes the question to be one of national importance, and worthy of an expenditure from the public purse.

THE ENGLISH SALT TRUST.

This great trust is an accomplished fact. All the leading salt manufacturers in Great Britain have combined, and have capitalized their properties and works at the handsome figure of £3,700,000. The working capital of the trust has been fixed at £300,000, so that the total capital of the concern is £4,000,000. Of this nearly one half of the ordinary shares, which amount to £2,000,000, are reserved by the existing owners, and the public have been invited to subscribe the balance of the ordinary shares, £1,000,000 7 per cent preference shares and £1,000,000 4 1/2 per cent debenture bonds.

It is clear that the public believe in the possibility or probability of this, for in addition to the enormous application for shares, the price of the shares is already 30 per cent premium above the price of issue. If the Trust maintains this estimated profit of 5 shillings per ton, the chemical works, which are already in a bad way from overcompetition and depression in trade, would be quite unable to compete with the German works.

The English Salt Trust will benefit the chemical industry in this country by raising the price of English chemicals, and in this interest we wish it success. But if we are not greatly mistaken, it will not be long before salt from new wells in England and, perhaps, foreign salt also will come in at a price which will cut down the profits of this trust, unless, indeed, Free Trade England should impose a duty on salt to protect the trust; a very improbable event. The dear public will, of course, then hold the shares.

STEEL VS. TIMBER IN MINES AND RAILROAD TIES.

It is only a question of time when the increased price of timber will render it necessary for our railroads to seek another material for ties and from the measure of success which has attended the efforts in this direction in Europe, India, and South America to substitute steel for wooden sleepers, as they are termed there, we believe that steel ties will some day be generally adopted, and it will then give a large new market for the metal. The following figures will give some idea of

the magnitude of the question. On the authority of the *Moniteur Industriel*, the six principal railroad companies of France use more than 10,000 ties per day, or 3,650,000 per annum. As a tree of average dimensions is estimated to give only ten ties this means a destruction of 1000 trees daily. It is estimated that in this country the annual consumption of ties is 15,000,000, equivalent to the denuding of forest to an extent of 170,000 acres annually. This, taken with all our other consumption, is more rapid exhaustion of our timber supplies than can be met by replanting, and consequently we shall sooner or later have to follow the example of the older countries, and probably substitute steel for wood. In our issue of June 25th, 1887, we gave a full description of the use of iron props, frames, and lagging in some of the French collieries, and now, in a recent paper by Mr. C. LE NEVE FOSTER to the Mining Association of Cornwall, we notice that in English coal mines steel has been employed, it is said with success, in place of timber underground for the past two years. The steel beams are tarred over with unboiled gas-tar, and have shown no signs of deterioration in more than two years, whereas in the colliery in question the average life of English or Norwegian timber is only two years. The steel beams cost about \$27.50 per ton delivered, the colliery being situated very favorably near Sheffield. A ten-foot beam, therefore, costs \$2. A timber beam of same length, and considered to be of equal strength, costs \$1.74. So in this instance the difference in first cost was so trifling that the advantage of durability alone would far outweigh it, but if we are to concede all the advantages claimed by Mr. LE NEVE FOSTER, mine owners could afford to pay a very much higher price per ton for their steel beams than that above quoted and still be gainers in the long run. These advantages are stated to be: 1. Greater durability, effecting great economy in maintenance. 2. Possibility of using the beams elsewhere when taken out; if badly bent they can be straightened. 3. Lightness and handiness. A ten-foot steel beam weighs 166 pounds; a ten-foot timber weighs three hundred-weight. 4. Increased space for ventilation, and less deterioration in the air of the mine from decaying timber.

#### COST OF COKE PRODUCTION IN ENGLAND.

Referring to our remarks in our issue of October 13th on the cost of production of coke in the Connellsville district, we are now enabled by the United States Consular Report of Mr. J. SCHOENHOF, just issued by the Department of State, to give the cost of production at Durham, the leading coke center of England.

Labor of mining and putting into trucks, per ton of coal, about ..	\$0.51
Other charges, about ..	.14
Royalty, about ..	.14
Total ..	\$0.79

There is realized from 1 ton of coal 60 to 62½ per cent of coke, so that the cost per ton of coke is:

1½ tons of coal ..	\$1.32
Cost of coking ..	.24
Labor in drawing and filling, repairing, etc., including putting on board cars ..	.24
Total ..	\$1.80

The present price at Durham on board cars is about \$1.94, so that the operators in that locality seems to be but little better off as regards profits than those at Connellsville, where the price, however, for new contracts is \$1.25. We showed by our former figures that the cost of production at the latter place is now \$1 to \$1.20 per ton of coke on cars. In mining, the natural advantages are on the American side, where the coal seams are about 8 feet thick, against 4 feet in the Durham coking collieries.

In the same Report we have the views of a leading ironmaster of Middlesborough on the subject of the American blast-furnace practice of large output of pig iron, per furnace. "The original plant costs the same relatively whether two small furnaces or one large one. The number of men is the same per ton, and is regulated by the output. The high rate to which the American furnaces are put is a heavy wear and tear on them." An instance is quoted of a furnace lately blown out, which needed no relining for sixteen years; while it is stated that the large furnaces in this country require relining every two years. Each of the furnaces in question in Middlesborough has made during its life nearly 400,000 tons of iron, which at 1 shilling per ton would have more than paid itself. With regard to labor it is admitted that men in America work much harder than in England.

#### THE RECENT LEAD CORNER.

In our market report last week we gave full particulars of the collapse of the Corwith lead corner. This scheme, which has now been in operation for some months, sought to control the entire lead output of the country, and, indeed, did so to such an extent as to permit of a great advance in the price of the metal. It was evident to every one acquainted with the production statistics of lead that such a corner must "come to grief," and the surprise was only that the collapse was so long deferred

No one seems to know the reasoning on which the corner was organized, but it was generally supposed that the expectation that a foreign lead combination or syndicate would be established was the starting point. How vain this expectation was the *ENGINEERING AND MINING JOURNAL* showed in the number of August 4th in its review of the proceedings of the meeting of European lead producers. There is not the least probability of any effective combination there, owing to the great number of mines in Spain which commence operations as soon as the price of the metal rises to a profitable point.

In this country the high figures maintained by the Corwith corner greatly stimulated output, and from Mexico to Canada the miners were straining every nerve to profit by the high price while it lasted. Mexico, Colorado, Utah, and especially Idaho, commenced turning on streams which promised a perfect deluge of the metal. Nor will these sources now suddenly stop their outflow. It is, therefore, the part of wisdom to measure the situation calmly, even though the outlook be discouraging. Only fools willingly deceive themselves.

It is well known that the Corwith corner held a vast amount of lead. Even the sale of 6000 or 7000 tons to one house in this city a day or two before the collapse was insufficient to enable the wealthy Chicago firm to carry the balance of its stock.

It is true, of course, that the drop to 4 cents will stimulate consumption, but it is well understood that even this price is artificial and may not be maintained. Yet while it lasts it will encourage larger production and the increase in stocks.

It seems quite improbable that any effective control of production can be effected in the manner of the copper syndicate. There can, therefore, be only the prospect of lower prices for lead, unless the smelters should combine or form a "trust," and this is not an encouraging scheme so soon after the collapse of the corner.

The facility with which lead ore can be converted into the metal, the enormous quantities of the ore in Idaho and other States, and the low cost of concentration which now rules, all seem to presage a lower normal price for the metal, and warn those who produce it to prepare, by the adoption of the most economical methods, to meet this less favorable condition of affairs.

At the same time the producers owe a debt of gratitude to the great firm that maintained, at the cost of a large fortune, the satisfactory prices of lead which have ruled for the greater part of the present year.

#### AN ENGLISH CRITIC.

Since the famous article of MATTHEW ARNOLD on the social conditions of American society (a view keen, but not wholly unkind, and partial but not wholly unjust), perhaps the most ambitious essay in the same line has been that of W. H. S. AUBREY, LL.D., in a recent number of the *Fortnightly Review*, under the title of "Social Problems in America." We have read it with some care, appreciating the advantage of learning how our national affairs impress the minds of the intelligent outside observers, and willing to gather whatever suggestions of value Dr. AUBREY might have to offer. Under this head, however, he has nothing to say. The perils he discerns seem to him inevitable, and the evils incurable; and his concluding statement, that he has discussed American problems "in no spirit of mere criticism or cynicism," is not consoling, because it is not true.

Regarding this essay, then, as a simple category of the weak, wicked and dangerous elements in our national character and situation, we find it invalidated by the entire incompetency and inaccuracy of its author. Trifling errors, such as the statements that the delegates to our party national conventions are selected by the State conventions, and that our Presidential election takes place on the 4th of November, might not be sufficient to justify this verdict; but there are some blunders which betray such ignorance, not only of facts, but also of probabilities and possibilities, that one such is enough to forfeit for its perpetrator all claims to be listened to by men of sense.

Such a sample is the following passage from Dr. AUBREY's treatment of the question of the silver coinage of the United States:

"Seeing that silver has been for some time at a discount, the practical effect is that the country at large has to suffer from the depreciation, for any one can obtain at the mint, in exchange for gold or United States bonds, silver coinage at the full discount, which he can use at the par value. Many large employers and storekeepers have been in the habit of purchasing silver in this way, so as to make a profit upon their payments for wages or commodities. The system is convenient for debtors and for all who have to pay money, but it is the reverse for creditors and for all who have money to receive."

Now, the man who wrote that is a hopeless ass. It is not only not true, but it could not possibly be true, in the present notorious and universal business conditions of this country. The total seignorage on the coinage of silver (amounting at this time to about \$40,000,000), being the difference between the legal value of the coins and the cost of bullion to the government, plus the mint and transportation expenses, is in the Treasury of the United States. The Director of the Mint reports it there; the Treasury statements report it, and everybody knows it is there. Moreover, if employers or anybody else could buy silver coin at its bullion

value, to use at its coinage value in the payment of wages or debts, there would not be a silver dollar in the Treasury vaults to-day. Everybody knows that, too. And gold would be at a premium, corresponding to the depreciation of silver bullion, as everybody knows it is not.

We once heard advanced in an after-dinner discussion the statement we have quoted from our English essayist. The speaker was immediately overwhelmed with offers, from all parts of the room, of money by the million to be used in the purchase of silver coin at a discount, and promises to divide profits with him on the transaction. He gravely booked a number of these; but they were subsequently cancelled, on the ground that, as he had been slightly tipsy when he spoke, it would be unfair to hold him to his preposterous engagement. It was a lesson to him. He hasn't been tipsy since, on that subject.

Unfortunately for Dr. AUBREY, people do not write for the magazines when they are tipsy, and this excuse is therefore beyond his reach. Drunkenness produces a temporary appearance of imbecility; but in this case we have encountered, not the temporary appearance, but the permanent reality.

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 Treadwell Mine Profits.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: In the ENGINEERING AND MINING JOURNAL of the 20th October, I see that you state that the Treadwell mine is yielding net \$800,000 to \$1,000,000 per annum. You have evidently been misinformed, for the gross annual shipments of bullion to California will not by any means equal the sum that you state as being profit. I have every reason to believe that the gross yield in free gold per ton of quartz, exclusive of the sulphurets, does not exceed \$3.65.

As to the Bear's Nest, I would caution investors, for my information does not confirm your favorable opinion. The estimates of the values of these properties appear to increase with the square of the distance at which the mines are located from civilization.

NEW YORK, Oct. 22, 1888.

[Our correspondent is so extremely well informed on the subject, and is so thoroughly reliable, we can only accept his correction, noting, however, that it relates to the output of the mine before the recent addition of 120 stamps.—ED. E. AND M. J.]

Magnesia Sectional Covering for Steam Pipes, etc.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: In your journal of 1st September I have read an article concerning the magnesia sectional covering for steam pipes, etc., which points out the merits of magnesia carbonate as a non-conductor of heat. Will you be so kind as to permit me to state in your journal that I have the priority of this invention. In the year 1879 I took out a patent in France (my country, Switzerland, not having patent legislation) for using magnesia carbonate, and compositions of that material, as non-conductors of heat. The patent was founded on experiments more extensive than those referred to in the article mentioned, and with much higher temperatures than steam can afford, and in which magnesia carbonate is partially decomposed.

I am satisfied to hear that my invention has found in the United States intelligent men for its exploitation, and I wish them the fullest success. I personally have not had opportunity to use the invention mentioned, and those in my country who should have been interested were not intelligent enough to comprehend its importance.

MANUEL HEGG,

SAN MIGUEL, Salvador, C. A.

Assayer and Chemist.

Exhaustion of our Anthracite Coal-Fields.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: I have read your articles in the ENGINEERING AND MINING JOURNAL as they appeared, and could not but be thereby more than ever impressed with the importance of the subject. Your estimates of coal to market from the Lehigh Coal and Navigation Company's mines made a score of years ago,\* were, I believe, the first to show truthfully and call attention to the exceedingly small percentage of coal won by the then prevailing systems of mining. While these have improved greatly under the more intelligent supervision of mining work and the general adoption of tried methods, there is still deplorable waste. The increase in the size of coal pillars and their more judicious location, and particularly the leaving of large pillars unmined at regular distances in the first opening of long gangways (i. e., a solid pillar of 40 yards for every 200 yards in which breasts are opened) is a step in the direction of better mining, but only a step. We obtain thereby but a somewhat greater per cent of the whole. The extensive uncovering of the outcrops of the mammoth bed now going on is adding a large quantity of coal once counted as lost to the percentage of coal won in mining, but the depth to which these stripping operations may be carried is limited to a few feet. By this, too, only a small additional percentage of coal is saved.

We should aim at mining the whole contents of the seam and be satisfied with nothing less, even though we must repack with material from the surface the territory excavated.

At Kohinor colliery, under the town of Shenandoah, in Schuylkill County, the land owners, Messrs. Gilbert and Sheaffer, and the lessee, the Philadelphia & Reading Coal and Iron Company, are now engaged in filling part of the territory from which the coal has been taken with a silt of fine coal refuse and water run into the mine through holes bored for the purpose from the surface. The holes are eight inches in diameter and from 350 to 400 feet deep from the surface to the bottom rock of the coal seam.

This fine coal refuse mixed with water spreads itself under the pressure of the column of silt in every direction, and packs tightly against the solid pillars of coal. So firmly does it pack itself that within a few hours after being deposited one can walk over it without leaving an impression of the foot. The water run in drains off immediately and is pumped to the surface.

It is expected that these masses of coal refuse filling the excavated places will support the strata above and admit of the removal of the pillars of coal now left in the mine.

This coal seam is the Mammoth, 50 feet thick and of the finest quality. The measures dip from 5 to 20 degrees.

The alarm sounded by you is judicious, the situation is carefully and accurately stated, and the articles are calculated to stimulate thought in the direction of a remedy for the evil.

HEBER S. THOMPSON,

Engineer for the Girard estate in Schuylkill and Columbia Counties. POTTSVILLE, Pa.

\* Extracts from the report of Mr. R. P. Rothwell, M.E., to the Lehigh Coal and Navigation Company, dated 1st May, 1869:

"Calculating from the mine plans and other data, we find the area of beds worked over yields 33,609,000 cubic yards, or 39,000,000 tons, or only eight and a quarter per cent of the total originally on the property; but, since only 11,868,291 tons were sent to market from the company's mines, it follows that only thirty and a half per cent, or less than one third of the coal worked over was made available. This, however, includes pillars and reserves now being worked, which may bring this up to thirty-three per cent." \* \* \* \* \*

"The value of a property is determined by the amount of coal we can get from it, not the amount it contains." \* \* \* \* \*

"If we credit every ton of coal sent to market with the value of two tons wasted in getting it—and that is the amount by which the value of the property is depreciated—the question of economy in mining can not fail to attract that attention which it deserves, but which it has not, up to the present time, received in this country." \* \* \* \* \*

"Formerly in Europe, when the system of mining we are now using was practiced, the waste amounted to two thirds, as with us. It is a standing reproach to us that no attempt has been made in our anthracite mines to improve the system adopted thirty years ago. Yet it is neither the spirit of this age, nor the genius of our people, to admit that we can not do what others have done before us." \* \* \* \* \*

"Such bed or beds can never afterwards be worked economically, and in many places not at all. The total waste is, therefore, fully 50 per cent." \* \* \* \* \*

"Certain it is, we can not long continue to work our mines in the present disgracefully wasteful manner. We are now sowing the seeds which in a few years will yield a fruitful harvest of trouble and expense. We are wasting throughout the anthracite region from one third to two thirds of our coal where it is cheaply and easily mined; and even now the supply above water level, which should have lasted for many years to come, is rapidly giving out, and every year will increase the difficulties and expense of mining. That the amount of coal yet in this property is enormous, and sufficient to insure a supply for probably one hundred years to come, is no reason for allowing the most valuable portion of these coal-beds to be wasted, and thus not only depreciating the value of the property itself, but, by diminishing the supply of anthracite and consequently increasing its price, we are endangering those industries on which the very foundations of our national greatness and prosperity repose. The substitution of one system of mining for another cannot be made in a month or a year; it is a subject requiring the most careful and patient study." \* \* \* \* \*

"The large companies owning the mines which they work have the most direct interest in introducing greater economy in their system of mining and in the preparation of the coal; and there are few properties within my knowledge where there is greater need of improvement than in that belonging to the Lehigh Coal and Navigation Company."

PETROLEUM AS AN EXPLOSIVE.

Written for the Engineering and Mining Journal by Prof. Peter T. Austen, Ph.D., F.C.S.

When an oil-train suffers a collision, it is a common occurrence for the oil to take fire. If the accident happens as the train is passing through a city, much loss of life and property may result. These oil fires are usually explained by the assumption that the ignition of the oil has been caused by a spark struck from impact of metallic surfaces, or by live coals from the locomotive.

The amount of oil passing through some cities is immense, and terrible calamities may happen at any time, should the contents of an oil train suddenly flow through the streets of a town in burning streams. Should this occur at night, it is hard to say what nameless horrors might result.

That petroleum evolves inflammable gases, at ordinary temperatures, is well known. As to its inflammability at low temperatures, however, I have been unable as yet to find any information. As petroleum is a mixture of varying amounts of hydrocarbons, which run from very light and volatile substances to solid and heavy ones, and, as certain of these lighter and more volatile hydrocarbons seem to be gases held in solution in the heavier hydrocarbons, and are not liquified by considerable reduction in the temperature, it is fair to infer that the temperature of the petroleum may be considerably reduced without greatly affecting its power to evolve inflammable gases. To test this, a sample of crude pipe petroleum was placed in a six-ounce flask to the depth of about an inch and allowed to stand in a mixture of ice and salt for about twenty minutes. The temperature of the oil was then found to be 0 degrees F. On applying a small flame to the mouth of the flask, the flask at once became filled with a blue flame. The flask was allowed to cool for about ten minutes, and then shaken and the flame applied. The flash again occurred. The fact is therefore established that at the temperature of 0 de-

grees F. crude petroleum evolves an inflammable gas. In this respect, then, petroleum is dangerous both in summer and winter.

When the gases from petroleum are mixed with air, the gas having sufficient oxygen mixed with it for its combustion when ignited, burns at once, and, as the heat of combustion expands the gas, air and products of combustion, an explosion results. Of course the more the petroleum is agitated the more gas will be evolved from it. Hence the iron tanks in which the petroleum is conveyed on the cars must contain in the parts not filled with oil an inflammable gas, and, as this gas will be mixed with more or less air, it will be more or less explosive. If the gas in contact with the petroleum becomes ignited, the petroleum will in most cases take fire unless the body of the liquid is very cold. If it takes fire, the heat of the combustion soon heats the body of the oil, thus causing the whole mass to boil up and evolve large quantities of inflammable gas. It is also possible that the tanks from which the petroleum has been emitted may be filled with an explosive gas. In case the oil tanks are but partly filled with oil, their condition will be more dangerous, as the agitation will liberate more gas. As the temperature increases and the oil in the tanks becomes warmer, both the oil and the gas will expand, and, unless the tanks are absolutely tight, the gas will be forced out by the internal pressure. Should the gas thus issuing become ignited, say by live coals dropped by the locomotive, or hot bearings, the tank may assume a dangerous condition. It seems, therefore, that under certain conditions petroleum may be considered as belonging to the class of explosives that explode on application of heat alone, as gun-powder, for instance.

The behavior of a tank of petroleum under pressure does not seem to have been much studied. It is a well-known fact that if a volume of air be compressed by means of a cylinder and piston the motion of the piston is converted into heat. The physical apparatus known as the "fire-syringe" is an example of this. On the end of a brass piston, working snugly in a brass cylinder closed at one end, is a piece of tinder. On driving the piston in by a powerful and sudden blow, and then withdrawing it, the tinder will be found to be on fire. That is to say, the compression of the air has raised its temperature to a point sufficiently high to ignite the tinder. If the fire-syringe is made of glass, as it often is, so as to allow the ignition to be readily seen, it will be noticed that not only is the tinder ignited, but also the oil with which the piston was lubricated. The burning of the oil causes a bright light at the moment of maximum condensation, and proves that the temperature must be at least 300 degrees. Of course, the temperature required for the ignition of the volatile gases of petroleum would be less than would be required to ignite an average lubricating oil.

The amount of heat developed by the compression of a volume of air to one quarter of its volume will be the same as is required to expand one volume to four volumes. Assuming the temperature of the air and vapor over the petroleum to be 0 degrees F., the elevation of temperature on compressing the space to one quarter will be 429 degrees. Taking the temperature to be 70 degrees F., the rise of temperature will be 499 degrees.

It follows, therefore, from the above that if an oil tank filled partly or entirely with an inflammable mixture of petroleum gas and air be suddenly compressed in such a way as to greatly reduce its volume, the gas, beyond a doubt, will be ignited by the compression, and in all probability will ignite the contents of the tank. Such a compression might result from the oil-tank being "telescoped," or falling from a height to the ground below.

If an oil tank almost entirely filled with oil were suddenly compressed, the resistance offered by the liquid would heat the latter sufficiently to cause it to evolve the lighter hydrocarbons which it contains, and even if they were not ignited by flame or spark struck by metallic friction, they might be set free in such amounts as to produce a dangerous pressure within the tank, especially if the tank were in a weakened condition. The sudden stoppage of an oil-tank car but partly filled with oil, as would occur in case of a collision, would cause the mass of oil to be hurled with great force against the front end of the tank, and in this way enough heat might be generated to evolve an amount of gas sufficient to cause the tank to become dangerous.

From these considerations it appears that there is no doubt but that petroleum may be considered as capable of ignition by impact, and when once ignited causing an explosion. It is, therefore, a question if petroleum should not be handled with the same or similar precautions that are taken in the transportation of substances explosive by percussion, or impact, as a nitroglycerine, for instance.

Rutgers College and N. J. State Scientific School.

#### CONDITION OF COAL MINERS IN BELGIUM.

Though the wages of the coal getters in Europe are low compared to what are paid in this country, we learn from a recent letter of Mr. George G. André that in Belgium, at least in the largest collieries, careful provision is made for the material welfare of the men. Mr. André writes to the *Colliery Guardian* as follows: First among the institutions due to the initiative of the Société des Charbonnages de Mariemont is the Caisse de Prevoyance, or Providence Fund, established for the ten collieries of the Center. This parent fund provides pensions for workmen crippled by accident, and for the widows and orphans of those who may be killed in the mine, as well as for those who, by reason of age, are unable to continue their labor in the pits. This fund, like those of a similar character which exist in France, is contributed to equally by both masters and men, and it is administered by both parties.

As the complement of this principal institution, there are the *caisses particulières de secours*, which, according to the terms of the central *caisse*, must be established at each of the collieries. These are additional relief funds, to be drawn upon when the incapacity to labor is of a nature, or arises from causes, that do not fall within the scope of the central institution. In the management of these auxiliary funds the men have the chief share, the Board of Direction being composed of seven members, four of whom are elected by the men and three by the masters.

All these institutions have a semi official character, being the joint creation of employers and employed. But there are yet others wholly

contributed to and controlled by the men. These are the *sociétés libres de secours mutuels*—free mutual relief societies—the object of which is to afford additional relief where required. The contribution is 1 franc a month, and the relief is 1 franc a day while unable to work. These societies are in a very prosperous state. As they receive no contribution from the employers they cannot be regarded as part of the remuneration of labor; but they are to be taken into account in estimating the material condition of the miners. There are besides co-operative societies for supplying the chief necessities of life and gunpowder for blasting at the lowest possible cost to the workman. These, too, are to be regarded as successful institutions.

The Mariemont Company are the owners of some 600 cottages which they let to their workmen at a merely nominal rent. This constitutes another important addition to the miner's pay. Under no conditions will the company sell these cottages to their men, but for the purchase of any other house they lend the requisite money free of interest, to be repaid by easy installments. A by no means inconsiderable number have already availed themselves of this means of becoming houseowners.

The moral and intellectual welfare of the miners is not less cared for than the material. Chief among the institutions founded by the Mariemont Company for this end is the industrial school at Morlanwelz, in which instruction is given to some four hundred students. Then there is a society for popular instruction—a society which in the last twelve years has given four hundred lectures, besides musical and other entertainments. It has also founded a popular library, which is much frequented; and it produces for gratuitous circulation a small weekly newspaper. This society, whose members contribute 2 francs a year, is chiefly composed of working people, and these have the principal part in its management. It may, indeed, be correctly described as a co-operative instruction and entertainment society.

Perhaps the most important of the institutions at Mariemont, especially when we take the tendency of the times in regard to the relations of capital and labor into account, are the "explanation chambers" and the "board of conciliation and arbitration." The former are assemblies of the representatives of both employers and employed, in which the workmen who conceive they have a grievance may freely discuss the matter. These "chambers" have been in existence twelve years, with the happiest results both to masters and to men. The board of conciliation is a real court of arbitration, composed of members chosen half by the masters and half by the men. This institution, which has been in existence six years, deals mainly with questions of wages. For the prevention of strikes nothing better than this tribunal can be conceived.

#### A NEW ALUMINUM PROCESS.

We take the following from our contemporary *Industries*: Messrs. Brin Brothers, the inventors of the industrial process of separating the oxygen from the nitrogen of the atmosphere, last Friday showed some experiments in connection with a new process of making aluminum alloys, at their laboratory, 9 College street, Belvedere road, London. An ordinary but rich clay was mixed with a reducing agent called by the experimenters "a flux," and made into a paste with water. Some pig iron which had been run into bars  $\frac{3}{4}$  inch thick and 2 inches broad, was broken into pieces; these pieces were charged with the paste and alternate layers of coke into a small cupola. A further quantity of coke to fill the furnace was put upon the top of the charge, and the blast from a fan turned on. In about twenty-five minutes the pig iron had melted. According to the inventors, nascent aluminum is produced in contact with the molten iron, and penetrates the same, the effect of the combination being to reduce the melting point of both metals and to yield a more fluid product than either of them separately. The contents of the furnace were then discharged into a ladle, and castings were made of the "aluminum steel" containing about 1.75 per cent of aluminum. The nature of the flux was not revealed, as Messrs. Brin have not yet completed all their patents, but the inventors state that its cost is not higher than that of the clay used. The castings were exceedingly sonorous, for when suspended by a string and struck with a piece of metal the vibrations lasted from 30 seconds to 45 seconds. The castings were of white fracture, and free from blow holes. The silicon and some other impurities of cast-iron are thrown out in the form of slag. The aluminum has thus a two-fold function in this process—it forms definite alloys with the iron, and aids in clearing out its impurities.

In another experiment the ready manner in which aluminum can be reduced by the process was illustrated. A piece of thin soft scrap iron was coated with the clay and flux and inserted in a blow-pipe flame. At a bright yellow heat the clay was reduced, and metallic aluminum became occluded in the whole thickness of the iron, giving the latter a white surface. The resulting metal, instead of being soft and pliable, became tough and springy, and it was claimed had acquired all the properties of first class steel. Some of the alloy thus made was put into strong pure nitric acid, and was not acted upon thereby; whilst a piece of the original scrap iron was rapidly attacked under the same circumstances. The proportion of aluminum in the steel produced depends within certain limits upon the proportions employed of the original ingredients for charging the furnace. Alloys of copper and of some other metals can be formed in the same way. Some copper aluminum bronze was exhibited; also, such a bronze alloyed with from 17 to 20 per cent of steel. This alloy can be made hard and with a fracture like fine cast-steel; or by careful annealing and repeated rolling a fibrous texture can be produced. Mr. Frederick Varley, who has made experiments with Messrs. Brin's aluminum steel, states that it has all the properties of the best iron for conducting magnetism, whilst chilled castings will make excellent permanent magnets. He suggests the use of the bronze containing 20 per cent of aluminum as telephone and telegraph conductors, believing that the bimetallic character of the alloy will be found to be a corrective of self-induction. The principle of producing alloys by applying aluminum vapor in its nascent state, is found to work with a long range of metals besides iron, and makes an exceedingly fine aluminum-silver alloy, possessing valuable properties.

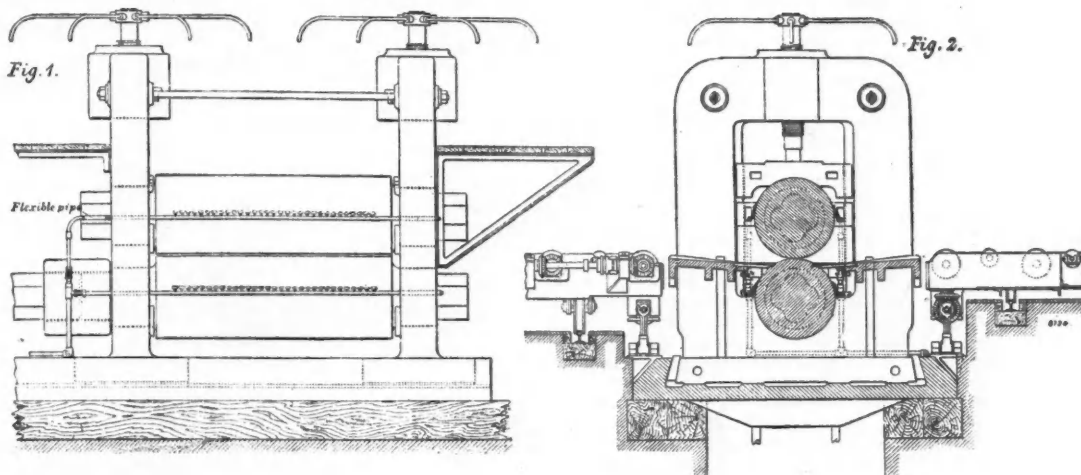
METHOD OF HEATING ROLLS BY GAS.

In view of the great economy said to be effected in rolling-mills by the use of gas-heated rolls, and the fact that this system has been adopted by Bolckow, Vaughan & Co., and other of the largest steelmakers in England and Scotland, we reproduce from our contemporary, *Engineering*, the illustrations and description of the arrangement. Before rolls can be used at the commencement of a week's work they must be gradually heated. If not, the local expansion caused by contact with large masses of hot metal will cause fracture, and serious loss will result. The heating is usually effected by lighting fires under the rolls or by placing large pieces of heated metal near them, or by first rolling thin metal. But neither of these plans is uniformly successful, and the breakage of rolls is not an infrequent occurrence.

To effect a uniform and regular heating, Mr. Franklin Hilton, of Middlesborough-on-Tees, has devised the method illustrated. The agent by which the warming of the rolls is brought about is gas burned in jets which are uniformly distributed the whole length of the rolls at each side. When these jets are lighted and the machine is put into slow rotation, every part of each roll is gradually and uniformly heated without the production of any dangerous strains. The arrangement is clearly shown in the engravings: the two upper pipes are connected to the riders and rise and fall with the roll, the connection to them being made by flexible tubes; the lower tubes are stationary. This method of heating rolls is in use by Messrs. Bolckow, Vaughan & Co., the Dowlais Iron Company, and the Steel Company of Scotland. In one mill the average life of the rolls previous to the application of the gas was 79½ days, and after the application 342 days. In another large plate mill, with rolls 36 inches by 9 feet, and weighing each 17 tons, two rolls only have been broken, and both cases were due to the neglect of the men in charge in not turning on the gas. Even these rolls ran 342 days each, and would, no doubt, have been in existence still had the neglect not occurred. It is thus seen that the gas-heating appliance

down the river Murray, but can be reached more easily by immigrants, we believe, *via* South Australia. The other town and settlement are named Renmark, the situation being about 140 miles distant from Mildura. A considerable area of land is now ready for occupation at Mildura, and the town is being constructed. As long ago as March last there were 270 persons in the settlement, and there had been sold 1610 acres of agricultural and horticultural lands, 458 town lots and fifty-four suburban lots. Two newspapers have already been started in the town, one under Messrs. Chaffey's control, and the other an independent paper, which represents their critics and the settlers who are not disposed to be satisfied with everything that is done by the great contractors. But little has been done at Renmark at present; delay in the starting of the works having been occasioned by the slowness of the South Australian Government in finally settling the terms of the agreement. We shall therefore confine our remarks to the Victorian settlement, merely remarking that the soil, climate, arrangements and terms of sale are alike in the two places. The climate is admirably suited to the production of grapes and other fruit of various kinds, and the soil is well adapted for irrigation, although there are some difficulties in conveying the water, owing to the porous character of the soil. The common agricultural land is offered, with irrigation rights, at £15 an acre, and plots suitable for fruit at £20. Considering that, previous to irrigation, the land was probably not worth £2 an acre, these prices seem high to start with, the place being far from a market and without a railroad. Presumably, however, the Australians who purchase know what they are about, and if Messrs. Chaffey can find customers, it is not for outsiders to find fault with their prices.

From a report presented to the Agricultural Bureau of South Australia, in June last, by Mr. Stewart Murray, chief engineer of water supply to the government of Victoria, we learn the system of irrigation, and the various arrangements of the settlements. At the time mentioned nineteen miles of main channel, in five lines, four of which start directly from the river, had been permanently surveyed. These channels are



HILTON'S METHOD OF HEATING ROLLS BY GAS.

promises to effect a very considerable economy in rolling-mill expenses while, if it were no more successful in its result than the methods it is designed to displace, it would be far preferable to them in respect of cleanliness and ease of manipulation.

IRRIGATION IN AUSTRALIA.

The following interesting account of the first attempts at irrigation on a large scale in Australia, under the auspices of the governments of Victoria and South Australia, appears in our contemporary *The Engineer*: Two tracts of land on the banks of the river Murray, 250,000 acres each, have been granted to Messrs. Chaffey Brothers, Canadian engineers, who have had successful experience in the irrigation of large tracts of country in California, in order that they may establish irrigation settlements. The conditions under which the two grants have been made are practically identical. Messrs. Chaffey have undertaken to expend £10,000 during the first twelve months, £35,000 during the first five years, £140,000 in the second five years, £75,000 in the third period of the same duration, and £50,000 in the fourth; £300,000 altogether in twenty years. The money is to be expended in irrigation works and plant, agriculture, horticulture, the making of roads, railways, bridges, and other improvements, the establishment of a fruit-preserving industry, and in other ways calculated to establish a successful settlement. The contractors are prohibited from disposing of more than 160 acres of land in one lot, the object being to provide for a large number of settlers who will make a living by fruit growing, as a rule, rather than by ordinary farming. The rights of diverting water from the Murray River are ample, though stringent conditions are laid down as to the number of cubic feet per minute that may be taken in each month of the year, so that the interests of landholders and others dwelling near the river below the settlements may not be injured. The Victorian deed, which was signed about a year ago, authorized Messrs. Chaffey to enter into the immediate occupation of 50,000 acres, while the South Australian agreement, only recently signed, makes a similar arrangement as to 30,000 acres. Each of these tracts of land is to form an irrigation settlement complete in itself. The plans of the two settlements, as finally surveyed, have been prepared, including arrangements for a town in each. The Victorian town and the tract of and around it is named Mildura. It is about 500 miles from Melbourne,

laid out on a uniform grade of 6 inches per mile, the bed widths varying from 15 to 25 feet, the slide slopes being two horizontal to one vertical, and the normal carrying depths generally 3 feet. Trial surveys had been made of twelve miles of additional channels, but of none of the distributories, though they were planned. They are for the most part to be small channels, fed from the mains, but in some cases pipes have to be used. The lines of main channel surveyed up to March last provided for the watering of about 25,000 acres. The average cost of these channels 15 feet wide at the bed, is about £320 per mile for earthwork only. The clearing of the sites of channels was done by day labor, costing about £35 per mile. The machinery and plant on the ground include a pumping barge, adapted to drive two 20-inch centrifugal pumps (Tangye's) two steam force pumps, and a 6-inch and an 18-inch centrifugal pump. The whole of the water for irrigation will have to be pumped from the varying level of the surface of water in the river to the level for delivery into the main channels; and some will have to be pumped twice to supply high-level areas. A good deal of objection has been raised in Victoria to the plan of pumping large volumes of water; but Messrs. Chaffey do not deem the cost of pumping to be a serious item in the expenditure, and Mr. Murray seems to consider it unavoidable. To irrigate any considerable portion of the Mildura area, by gravitation, he says, including the construction of a weir on the river with the long channel of conveyance thence to the settlement, would cost more for interest on capital and maintenance of works than the cost of pumping. The machinery for the preparation of the land includes four engines—three of them traction and one portable—a digging machine, steam cultivator, steam plow, ditch-digging machine, and large steam harrow. Up to the beginning of March Messrs. Chaffey cleared the land and steam-cultivated it to a depth of 18 inches, free of charge to purchasers, but since then they have only done the work by contract. A good deal of work in roadmaking, bridge construction, fencing, and building had been done when Mr. Murray was at Mildura, and progress since has been rapid.

We have already stated that the purchase of land at Mildura includes water rights, but it also includes a *pro rata* responsibility for the expense of maintaining and carrying on the irrigation works. In fact, each purchaser becomes a shareholder in the Mildura Irrigation Company, to which corporation Messrs. Chaffey Brothers hand over each section of the works on its completion, to be held in trust for the settler

and to be worked at their cost and for their benefit. Messrs. Chaffey do not actually undertake with purchasers to carry out any other works than those in existence at the time of sale, except that they are bound to bring water to the highest point in each plot of land sold. But it is to their interest to act liberally, not only because they hope to have other irrigation settlements to manage, but also because they have an interest in the unsold portions of the Mildura settlement. Mr. Murray reports favorably on the soil generally, and says that purchasers have come forward much more readily than could have been expected at an early stage of the proceedings. Some orange groves, vineyards and fruit orchards have been planted, and while the trees are growing, culinary vegetables and other crops will be cultivated. The experiment is being watched with great interest in Australia. If it proves remunerative to the settlers, there is no doubt that similar undertakings will be hereafter carried out on an extensive scale in all parts of the continent, thus increasing its wealth-producing capacity in an incalculable degree.

#### STEEL RAILS AND SPECIFICATIONS FOR THEIR MANUFACTURE.\*

By Robert W. Hunt.

Having some twenty years experience in trying to make good Bessemer steel rails, and now devoting my thoughts and energies to seeing that other people seek the same end, I venture to lay before the Institute some of the conclusions deduced from my practice and observations.

Those who only know the Bessemer manufacture of to-day, cannot appreciate the many changes which have taken place in steel rail making. The first steel rails used in the United States were imported by the Pennsylvania Railroad Company from England. The first rolled in this country were made at the North Chicago Rolling Mill from steel made at Wyandotte, Mich., on May 24th and 25, 1865. But this was simply an experimental rolling of six rails. In 1867 some tons were rolled in the Spuyten Duyvil (N. Y.) Rolling mill from steel made at Troy, N. Y. But it was not until August, 1867, when the Cambria Iron Company, of Johnstown, Pa., arranged with the Pennsylvania Steel Company, of Harrisburg, Pa., to roll their steel into rails, their own rail mill not being completed, that the making of Bessemer rails in America was put upon a commercial basis.

As it was my fortune to have charge of the steel department of the Cambria Iron Company at that time, and having been ever since engaged in rail making, I know the accepted practices of the business from that period, and of the difficulties encountered, and the measures adopted to either avoid or overcome them. The word steel then conveyed a very definite definition to the minds of all men. The character and peculiarities of its behavior under treatment, either hot or cold, were expected to be like tool steel, as that had been observed while under the manipulations of the maker, or afterwards of the smith. And the one thing most earnestly impressed upon every one's mind, and emphasized as the very essence of good workmanship, was, that steel would bear only the most moderate heat. In the converting house all the possible practices of crucible steel teeming were introduced. The ingot molds were carefully brushed out and heated and smoked, before being used. When the steel was teemed, all doors and windows of the casting house were closed, etc.; and time was not spared on any of the details. This was the English practice, and we in America followed it.

At first steel rails were rolled in mills which had been designed for iron rails. Other rolls were used, and the number of passes were increased, making the reductions very gradual. But even with these easy reductions, at the low temperature at which the metal was worked, and with the weak machinery, breakdowns were of distressingly frequent occurrence. In May, 1868, A. L. Holley, who then had charge of the Pennsylvania Steel Works, completed and started that company's steel rail mill, it being the first mill in America especially designed for that work. In designing this, Mr. Holley accepted the 21-inch Cambria mill as being the best type of the Fritz three-high mill, and while increasing the diameter of the rolls and otherwise strengthening its parts, largely followed it, even to the general plans. But steel rails were not immediately accepted as the rail of the future. For a long time the two leading English engineering papers—*Engineer* and *Engineering*—carried on a controversy over the merits of iron versus steel rails. And the railroad people suggested early in the day that if steel rails were to be adopted they must be obtained at a lower price. But we could not keep on breaking coupling boxes, rolls, housings and engines, and give our friends cheaper rails, and at the same time make money for our companies. No one dreamed that the business would, in the smallest degree, approach what it has since reached. Had an engineer proposed making the necessary outlay—even had he known how—to build a mill which would have safely handled the metal as then treated, he would not only have been denied the money, but the services of some safer man would have been sought by his prudent and wise directors. To have named \$600,000 as the cost of a rail mill would have endangered an engineer's personal liberty. So one day some bold fellow queried: "Can't we get the stuff a little hotter?" It was tried, and a little, after a while, became a good deal, and that hotter still, until many tons of blooms have been drawn from the heating furnaces with the cinder running off them.

In the early days all blooms were allowed to cool, and were carefully cold chipped before being charged into the reheating furnaces. After the drawing of one heat, and before the charging of another, the doors of the furnace were always raised, and the furnace cooled down. Then the heat was brought up very gradually, and plenty of time taken to allow the steel to "soak." It was expected to produce but 50 per cent as many steel as iron rails, and all employes working by the ton were paid twice as much for steel as iron. But the railroads wanted cheaper rails, and more Bessemer rail mills had been built and were building. They were all looking for work, and were desirous of meeting the views of their friends the consumers. The Bessemer

managers were not asked if they could, but were told, "You must manage to lessen your costs, and by all means get out more product." Truth compels me to say that they did not need much urging on this last point. And as the certainty of steel rails having come to stay became manifest they were permitted to alter, add to and strengthen their plants.

Well, the rush was kept up, slacking when dull seasons came, to be renewed with redoubled vigor when the tide again set in. Change followed change in rapid succession in the details of the manufacture in all its stages. No doubt many of the earlier practices of both the converting house and rolling mill were carried too far, and some of them were utterly without use.

In 1876 I had the honor of presenting to the Institute "A History of the Bessemer Manufacture in America." In it I endeavored to tersely tell of the rapid changes which had occurred in the art up to that time. And it is not necessary to repeat them; sufficient to again say that in all its branches they came very rapidly, and have not yet ceased.

Remember during all this time the makers have been trying to make good rails, all harassed beyond measure with every complaint, and seeking most earnestly to obviate them. But let the complaint be never so loud, the seller offering rails at 25 cents per ton less, would, as a rule, take the order.

Such has been the history of the business.

When steel rails were first put down the railroad traffic had increased to so great an extent, and the quality of iron rails had so fallen off, that it was impossible for the roads to keep up their tracks. The results from the first steel rails were so wonderful that, as a rule, no very careful records of their wear were kept. After a time this was changed, but by that time the "lame ducks" had been eliminated and we had "the survival of the fittest." The poorest had yielded results so much beyond those obtained from iron rails, that their failure had not caused much comment. But when the record period was reached, every failure caused a shock of horror; and the question was asked: "Why can't you make rails like the early ones?"

While claiming that injustice has been done later rails, at the same time I acknowledge many of them have not been as good as the best of the earlier ones.

I have candidly admitted some of the changes on the part of the makers. How has it been on the part of the consumers?

The weight of engines and cars, speed of trains, and amount of traffic, have been added to. How much?

The railroad engineers and managers have been spurred on by the same character of questions as their brethren of the Bessemer faith. "Can't you give us cheaper service and greater tonnage?" They have also answered every time, "Yes." But no one desires to turn backward. The rail makers do not want to confine their mills to a boasted "annual capacity of 30,000 tons." Neither do the railroad managers long for light engines, small cars, and scanty traffic.

The country has grown. The world moves. Retrogression is impossible. The conditions being as they are, the duty of all parties is to work in harmony, and, drawing conclusions from the experiences of the past, seek to produce rails which will yield fair service under the present requirements without greatly increasing their cost.

The first duty falls upon the railroad engineer in designing his section. If that is bad, the steel maker will be heavily handicapped in trying to furnish a satisfactory rail. I suppose it is hopeless to even expect the adoption of standard sections. We are seemingly no nearer it than when A. L. Holley read his admirable paper on that subject at the Philadelphia meeting of the Institute in 1881—*Transactions*, Vol. IX. I will not, therefore, at this time venture to submit any designs, and feel tempted to leave that duty to some one with the bright hope of youth imprinted upon his brow. But I will say that I am fully convinced great mistakes have been made in the designs of the heavier sections. And I believe that the unsatisfactory results obtained from many of them have been primarily due to the proportions of the rails.

One of the most prominent chief engineers of the country said to me not long ago that he supposed his road would lay 80-pound rails next year, but he was at a loss what section to adopt, for if their 80's gave as much poorer service, as compared with their 65s, as the latter had in relation to their old 60s, he guessed that they would have to adopt a 90-pound rail for the following year.

This states it broadly, but it is a generally admitted fact that the increased sections have, as a rule, been disappointing in their wear. I am convinced that this has been largely the fault of the sections themselves. Increased weight of rolling stock, greater speed, augmented traffic, etc., demand heavier and stiffer rails.

The exhaustive experiments of O. Chanute, presented to the Institute in 1881, *Transactions*, Vol. IX., demonstrate the rapid augmentation of the crushing strains as the wheel weight is increased. He found "11,000 to 12,000 pounds weight upon a locomotive driving wheel of about 5 feet diameter. The pressures were generally 35,000 to 40,000 pounds to the square inch, although they occasionally ran much beyond this, but with 14,000 pounds on a driver the pressures became from 50,000 to 80,000 pounds to the inch, or beyond the elastic limit even of steel. Under empty freight cars, with say 2400 pounds on a 33-inch wheel, the pressures were generally 20,000 to 30,000 pounds per square inch; but with a car loaded with 11 tons, increasing the weight to, say, 5150 pounds per wheel, these pressures became about 35,000 to the inch; while, if the car was loaded with 20 tons, thus giving 7400 pounds to the wheel, the pressures increased to 50,000 or 60,000 pounds to the square inch."

He said then: "As we increase the weight upon our cars, therefore—and I believe this to be the correct and inevitable practice—we must be prepared to find our steel rails wear out faster than they hitherto have done."

But is depending principally upon increasing the depth of the metal in the heads of the rails the proper way to meet this condition of things? One reason given for increasing the depth of metal in the rail head has been the provision of more metal for more wear. But is this economy realized? When a given amount has been worn off, the rail is so rough it must come out of the track. English double-headed rails were expected to be turned after the first head was worn out. But was it ever done?

The larger the mass of metal when finished, the hotter it will be, pro-

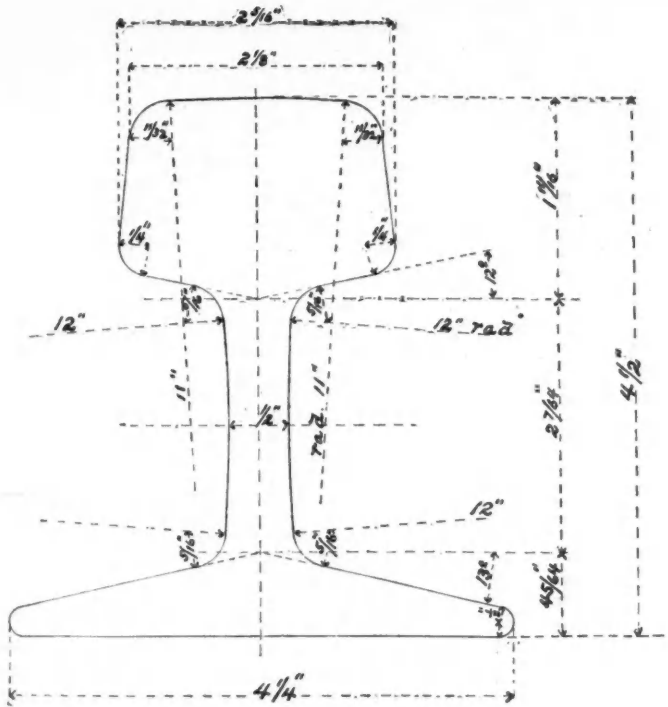
\*A paper read at the meeting of the American Institute of Mining Engineers, October, 1888.

viding the same length of time has been spent in putting it into shape. And every steel maker knows the effect of cold finishing. I mean by this, having the steel at a low temperature when the final reductions are made. The smaller the section rolled on a given mill, the deeper will the effect of the compression of the rails penetrate, and the finer will be the grain of the steel.

I would favor increasing the width of the head more than its depth. I know that it has been argued that owing to the shape of the wheel

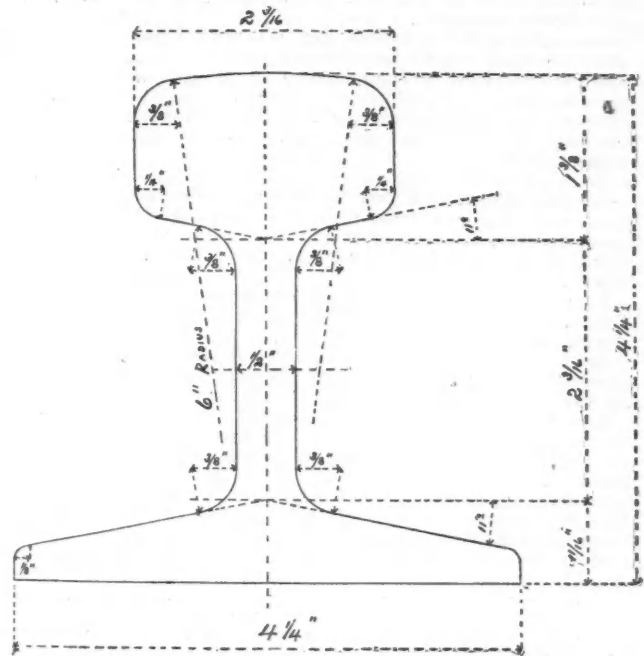
adopted. The second section (Fig. 2) is that of a 60-pound rail which has been in the tracks of one of the roads using also the first section for many years, and insists upon remaining there to witness the coming and departure of the "big fellows." I may be wrong, but these appearances seem to be on my side. But my conclusions are not formed from this single case. They are based upon the observations of many years.

In discussing Dr. Dudley's paper—Transactions, Vol. IX.—in 1881, I called attention to the fact that rails of the closest chemical composi-



65 lbs.

Fig. 1.



60 lbs.

Fig. 2.

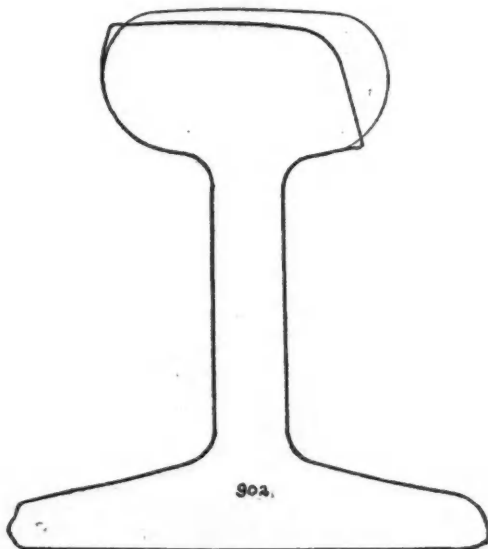


Fig. 3.

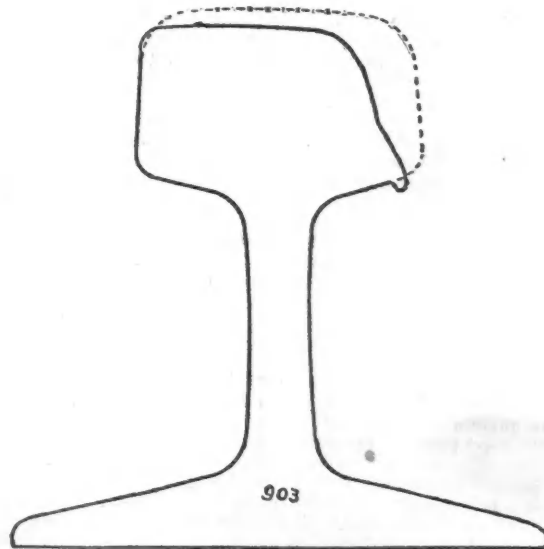


Fig. 4.

tread only a given amount of bearing can occur. But is this so? And how long does the wheel tread maintain its original form?

In discussing the proper shapes for rail heads, importance has been attached to the forms of the tires which are to pass over them. As just suggested, at which stage of the tire's life will this have the most effect? One of the principal tire makers of the United States tells me that by the views of their customers they are compelled to keep rolls for 115 different sections.

As brittle rails must be avoided as well as rapidly wearing ones, the engineer, when designing his rail, must not lose sight of the importance of distributing his metal so as to avoid, as far as possible, cooling trains.

As before stated, I do not now propose presenting my ideal rail section. But, as supporting my position against deep heads, rolled on existing mills in the ordinary manner, I give two (2) sections. The first (Fig. 1), a 65-pound rail, which is represented by many thousands of tons now in service, and which has been represented by many other thousands of tons whose days of usefulness are over. Not that these rails can be said to have failed, but they have not given the service expected when the design was

tion differed widely in wear. In fact, one of Dr. Dudley's best, No. 902 (Fig. 3), and one of his poorest rails (Fig. 4), No. 903, were chemically practically the same, but the best was a rail of round and shallow head, the other a deeper headed pattern. As these so fully sustain my position, I give them with their history:

"No. 902, steel of 1871, was on high side of 5 degree curve, north rail, north track, in Gables Cut, near Summerhill. In service from August, 1871, to July, 1879—7 years 11 months; grade, 39.6 feet to mile; tonnage, 40,061,230 tons."

"No. 903, steel of 1876, was on high side of 5 degree curve, south rail, south track, west of Bridge No. 1, Summerhill. In service from August, 1876, to July, 1879—2 years 11 months; grade, 39.6 feet to mile; tonnage, 21,504,824 tons."

Their analyses were as follows:

	No. 902.	No. 903.
Carbon.....	0.322	0.355
Silicon.....	0.026	0.029
Phosphorus.....	0.077	0.108
Manganese.....	0.492	0.490

If the manner of supporting the joints is not right, the rail makers

must not bear all the blame when they go down. I think that most railway engineers will unite in saying that as yet a perfect joint has not been attained. Some are much better than others; but as to which is the best, they are far from being in accord. With so many bright minds investigating this, we may expect the best possible results to be reached in time.

We will assume the section selected to be the best possible; it now remains for the maker to furnish a good rail rolled to it.

The character of the permanent way of the railroads of the United States is improving each year. Consequently the demand that the mills shall deliver their rails well finished and straight in all directions is much more imperative than in the past. Of course, absolute accuracy in so gross a product is both unnecessary and impossible, but practical accuracy is attainable.

I consider it of the utmost importance that most of the straightening shall be done while the rails are hot. In other words, that the hot straightening shall be conducted so as to leave the minimum work for the cold press. Every blow of the gag is a bid for a break. The harder the steel, the greater the danger. Moreover, gagging is apt to take out one bend by putting in two others. Endeavoring to have two wrongs make a right.

To bring the breaking danger down as low as possible the cold straightening should be done before the rails are absolutely cold. At the same time, if the rail goes under the cold press too hot, the steel will not possess elasticity, and each blow will leave a dent; and, if excessively applied, the rail will be either "wavy" or "lumpy." Such rails will, of course, make a rough track.

Some mills in taking side bends out of their rails apply the gag to the flange. I cannot approve of this, and believe that it greatly increases the danger of broken rails.

But, after the rails are delivered to the trackmen, they should not be carelessly thrown from the cars. This was not the practice with the early steel rails.

The drilling should be accurate, and if proper drill presses and drills are used, it can be done. If the holes are to be anything from  $\frac{1}{16}$  under to  $\frac{1}{16}$  over size, I do not see any use in naming the diameter in the specifications.

So long as the purchasers of rails exact a guarantee from rail makers, I think the chemical composition of the steel should be largely left with them. But if the purchaser believes that carbon is the best hardening element for steel, it is not unreasonable to ask for as much as the maker is willing to put in, knowing what proportions of other elements his metal will contain, and still guarantee his rails. No doubt as the sections are increased harder steel can be safely used.

The mere replacing of a broken rail with a whole one may fall far short of the damage sustained by the road in whose track the accident has occurred, leaving the danger to human life out of consideration. Therefore the purchaser has a right to insist upon some precautions being taken to avoid, as far as possible, such disasters. And these precautions, if correct ones, are also in the interest of the makers.

Steel rails are made very rapidly and the demands of the trade necessitate that they shall be made very cheaply. The workmen are paid by the piece, and while generally making good wages they must produce a large tonnage to realize them. No matter how desirous the general management may be of producing only good work, it is very necessary that safeguards should be provided. Most makers have these in some form, but there are mills where the chances are taken.

The tests which I prefer are those I used for 15 years at Troy. My experience gives me confidence in them. I do not wish to say that Troy rails have never broken in service, but such accidents have been very infrequent, and could almost always be traced to individual mechanical causes.

This plan of making tests has the merit of furnishing a check on the grade of the steel early in its manipulation; and I consider it more convenient than any drop test, and at least equally efficient.

As may be generally known, the Troy works have for years made a very wide range of Bessemer steels, from .05 to 1 per cent of carbon; and we were fortunate enough to have considerable reputation for our success in so doing. On the higher grades, where great accuracy was required, it was my practice to have a test ingot taken to represent every 15-inch ingot cast. This accomplished two results, it made the workmen careful, and let us know of any variations which might occur. I do not think this extra precaution necessary in making rail steel in any works where ordinarily good practice prevails, and I should most certainly discourage any of my clients from contracting for rails with others.

As has been proven by the fracture of many ingots, the metal in cooling, if the ingot is left upright until the interior steel sets, will form a funnel-shaped cavity in its top end. But if the ingot is thrown upon its side before that metal has solidified, this cavity will extend lengthwise; the distance being limited by the condition of the interior steel. Hence it is manifest that ingots should not leave an upright position before the metal has set sufficiently to prevent this cavity from so extending. Everything is against this lengthwise defect being taken out by the subsequent rolling of the ingot, and it will most probably cause pipes and cold shuts in the rails; but if the cavity is maintained at the top end of the ingot, it can be cut off.

Again, if ingots are drawn too soon from the pit, and thrown upon their sides, there is danger of the crust, which has formed at the top end, breaking and permitting the interior liquid steel to escape, or "bleed." That will certainly make a pipe.

It is only from sound and compact ingots that we can hope to produce good rails. Such ingots only can be made by care in casting them. Therefore the careful steel maker will not only use good molds, but also exercise a close supervision over the manner of pouring the heats. When from any cause this is not, or can not be done, the resulting ingot should not go into No. 1 rails.

Nearly every manufacturer uses somewhat different sized ingots, and frequently they vary in their shape. Of course, each one follows the practice which under the controlling circumstances seems to yield the best results. It is well known that the same length ingot will not always roll equally well. I have found, when the metal was cracking badly in the blooming rolls, good results to be at once obtained by pouring the ingot shorter. Of course, this is easily explained, and points to

the necessity of closely watching and controlling the temperature of the "blow" in the converter. And I fully believe that a strong influence on the quality of the resulting steel rests at this very point.

As every ingot, if properly handled, has more or less of a cavity at its top end, therefore, the bloom rolled from it will be piped or spongy at that end. To be certain of having a sound rail made from the upper part of the ingot, a sufficient length must be cut off to remove this spongy steel. These pieces need not necessarily be treated as scrap, there being many purposes for which they will answer.

It is not necessary for me to tell this Institute that care should always be exercised in heating steel. As the carbon is increased, so is the danger. I believe more unsatisfactory rails can be traced to over-heat in the furnace than any other one cause.

I commend our fellow-member William Metcalf's paper, "Steel: Its Properties; its Use in Structures and in Heavy Guns," read before the American Society of Civil Engineers, March 2d, 1887, to the careful consideration of every steel maker and user. It is, in my judgment, worthy to be considered a text-book on the treatment of steel.

My investigations of the service of thousands of tons of rails, and the analyses of many hundreds of them, have shown the greatest variation in the wear of rails of the same section and chemical composition. This being so, there must be some physical cause. Can we find a chemical reason for rails showing "soft" in wear, having chemical composition given in I?

	I.	II.
Carbon .....	0.39	0.40
Sulphur .....	0.059	0.064
Phosphorus .....	0.085	0.080
Manganese .....	0.722	0.779

If so, why did another make, in the same track and under seemingly the same conditions, analyzing as in II., wear "hard"?

Our Bessemer friends are all right on their chemistry. They know a great deal more than the people who made those early good rails, and it is not in that direction that investigation is most needed.

As I said early in this paper, every rail maker wants to give his customers good rails. Now, I honestly believe it is to his interest that the purchaser should be represented by intelligent inspection. No matter how good the mill organization may be, the men all work by the ton, and do not always realize the importance to their own interests (which are the same as their employers), that only good work should go out. Hence the right kind of inspection is of assistance to any mill.

If I were a purchaser of rails, I should draw fuller specifications than these, which I now have the honor to present to you, and I should accept all the risk of the results. But railway managers are not yet willing to assume this position. I have therefore endeavored, while not relieving the makers of any responsibility, or introducing novel practices, to assist the railroads in obtaining better and more uniform rails.

It is recognized as the commercial rule that rail makers should give a guarantee with their rails. In these specifications I have embraced such an one as is given by some of the largest makers in the country, and under which they have sold rails for many years. It seems to me to be fair in its provisions, and I believe the other requirements of my specifications will tend largely in the direction of making sellers safe in the guarantee. If this is so, the railroads will, of course, receive satisfactory rails, and everybody ought to be happy.

[TO BE CONCLUDED.]

#### CHINESE SALT.

We take from the U. S. Consular Report just issued the following account of the salt industry in China:

Chinese salt is produced in the flat, marshy country on the east coast of Kiang-Su province. These marshes cover an area of several hundred square miles. There are thirty-six principal salt-flats. It is all produced by evaporation in flat pans heated by burning dry seeds and brushwood, and is of two qualities only, the upper layer, a brownish white the superior, and the lower a dark brown, the "peoples' salt." It is principally evaporated in the autumn and spring. The cost of production is 2 cash per catty; 1040 cash are equal to a Mexican dollar; a catty is 1  $\frac{1}{2}$  pounds. The salt is sold to the merchants at a fixed rate of 3 cash per catty, which is determined by the Government. The duty (lekin) and official charges thereon amount to about 45 cash per catty. It is retailed at from 50 to 52 cash per catty, according to locality.

Salt cannot be sold or consumed in the province where it is produced. This law is with a view of increasing the "squeezes" and emoluments to the government officials. Kiang-Su salt is exported principally to the provinces of Anhui, Kiang-Si, Hupeh, and Honan. Evaporated salt is produced also in the provinces of Chè-Kiang, Szechuen, Kuantung, and Shantung.

Ching-Kiang receives its salt from Chè-Kiang, as it is nearer and the transportation cheaper. Salt is exported in junks of from 400 to 1000 piculs (a picul is 133  $\frac{1}{2}$  pounds) carrying capacity, and is packed in straw bags of 84 catties' weight. Merchants desiring to engage in the salt business must produce the best references at the salt commissioner's yamen at Yangchau. They must further deposit with this official a sum proportionate to their proposed transactions, which deposit in each case amounts to several thousand dollars. The permits to trade are drawn by lottery; in case of banks the deposit is refunded.

Each permit is for about 800 pounds of salt. The principal or official salt merchants obtain their licenses from the board of revenue at Peking, and they hold them during their lives. They are accounted rich men, reside mostly at Yangchau, and live in fine style, fine houses, and have numerous servants. There are scarcely ever any failures in this trade, it is carefully and fairly conducted, and only by merchants of the highest standing. A very small quantity is smuggled, as all craft are carefully and frequently searched as they pass along the river and canals.

The salt commissioner resides at Yangchau, a mandarin of the third rank, and wears a blue button. His fixed salary is 4000 taels per annum; a tael is about \$1.30. The office is considered to be worth, in one way and another, 30,000 taels per annum. The imperial treasury at Peking derives a large revenue from the salt trade. The manufacture and the



traffic give employment to many thousands of people. The wages of the people employed on the junks in the transportation of salt are \$2 and \$3 per month. The captain, or chief man of the boat, receives \$4 per month. The workmen at the salt flats receive from \$3 to \$4 per month. The employers providing them with rice, which is their chief food. Their wants are few, their expenses nominal, and they live on and are contented with these wages.

**The Stanley Coal Heading Machine.**—Mr. Stanley, of the Haunchwood Brick and Tile Company, England, has invented a new coal heading machine, which is at work both on the bank and in the mine. This machine is made to cut an annular groove around the face of the heading, leaving a core which either falls or is got off as the work proceeds. The machine can cut a heading in about one fourth of the time which would be occupied if the work were done by hand labor. It will cut through the hardest material, such as thin bands of ironstone, without difficulty. Experiments are said to have demonstrated in a satisfactory manner the utility of the machine.

**The Highest Chimney in the United States.**—The chimney which has just been completed for the Clark Tread Company, at Newark, N. J., is the highest chimney in the United States, and one of the highest in the world. Three higher stacks are cited as existing in Scotland, but they were built for carrying off noxious fumes from chemical works, and not for creating a draft for steam-boiler furnaces. These chimneys are Townsend's, at Port Dundas, Glasgow, which is 454 feet high; Saint Rollox, at Glasgow, 436½ feet high, and Dobson & Barlow's, at Bolton, 367 feet high. The Clark chimney is 335 feet high, and supplies draft for 23 boilers having an aggregate capacity of 4000 horse-power. The cost of the chimney is said to have been \$35,000.

**Endless Belt Hydraulic Motor.**—We take the following description from the *Genie Civil*: A Russian engineer, M. Tain, has invented a new means of utilizing a current of water. The apparatus consists of an endless cable, carrying a series of canvas cones, which open and shut like an umbrella. The endless cable passes over a double drum on board a pontoon, and at the other end over a pulley suspended from a buoy. The current opening the cones on the rope moves the cable at a certain speed, and this drives a shaft or drum. On the upper part of the rope the cones are naturally closed by the current to which they present their points. This plan, it is suggested, would serve to raise a certain quantity of water for the purpose of irrigation.

**Electrical Tramway "Series System" in England.**—An opportunity will shortly be afforded of testing the practicability of the series system of electric traction in England upon a working scale. The series traction syndicate are now engaged upon the construction of a line at Gravesend, near London, some three miles in length, with which rapid progress is being made. The system adopted is, as regards its leading features, identical with that known in America under the name of Short-Nesmith, but the syndicate hold several other patents relating to the question of series traction, including the telpherage patents of Fleeming Jenkin and Ayrton and Perry, and improvements in detail will, no doubt, have been effected. If the difficulty of the somewhat numerous contact points can be dealt with successfully this system will possibly prove more successful than when it was tried in Denver, Colorado, and had to be abandoned.

**The Cost of Making Chilled Cast-Iron Car Wheels.**—E. Warne, of Easton, Pa., has printed figures, obtained from the Taylor Iron Works, at High Bridge, N. J., on the cost of making car wheels. It is based on the use of three-quarters of charcoal pig at \$26.50 per ton and one-quarter old wheels, at \$19 per ton, equal to \$24.63 per ton for the stock, four wheels being made from one ton:

Iron.....	\$6.16
Melting, core drying.....	.20
Sand, molds and cores, flour and facing.....	.15
Foundry labor of molding and casting.....	.85
Outside work, unloading materials.....	.10
Repairs, wear and tear, taxes, insurance, motive power and delivery charges.....	.40
Cost.....	\$7.86

With wheels selling at \$8 apiece, this would leave a profit of 14 cents per wheel.

**Weam's Postal Railway.**—The Electro-Automatic Transit Company, of Baltimore, which is the owner of the Weam's electric postal railway patents, is erecting an experimental track at Laurel, near the city of Baltimore, and is engaged in experimenting with a car of special construction.

The motive power for this road will be supplied by electricity, and the cars will be controlled and the brakes applied by the same power.

Each car is built of sheet iron, about 21 feet long and two feet square. Two cars constitute a train, and when so joined they are connected after the vestibule pattern by a flexible connection. The rails are three in number, one above for carrying the current to the car and two below constituting the return. The speed which it is expected to attain is five miles per minute. The motors for this road will be of a special type and will be furnished by the Sprague Electric Railway and Motor Company, of New York. They will be of 25 H. P. each, and especially adapted for this work. The power car will carry three motors, making 75 H. P. available for driving each train. Self-oiling bearings of special type will be used. The power is furnished by a 100 H. P. Ball engine.

**Railroad Across Asia Minor.**—The consular reports lately issued by the English Government include a paper which presents some interesting details relative to the projected railway from Scutari, the Asiatic suburb of Constantinople, to Bagdad on the Tigris. In August last an imperial order was issued sanctioning the construction of the proposed line by a syndicate of English financiers. A French company, in favor of adopting a narrow gauge system, also made a bid for the contract, but the Sultan decided for the British competitors and for a wide gauge road. It is estimated that the line can be built at a cost of \$77,500,000. Its length is 1400 miles, or more than 100 miles greater than that of all the present Turkish railway systems, European and Asiatic combined. Once in successful operation, the road will create a new Asia Minor, open to the trade of the world a vast territory now

closed, totally change the character of the country, and practically advance Turkey in Asia from, say the sixteenth to the nineteenth century. Navigation from Bagdad, the terminus on the Tigris, to the Persian Gulf, is easy. A new through highway to the East, independent of the Suez Canal, will thus be open, which will bring Europe nine or ten days nearer to India than it is now.

**Wheeler's Electrical Fire Engine.**—A recent invention is Prof. S. S. Wheeler's electrical fire engine. It is intended to be worked by the current of an electric light wire, which can be tapped for temporary service anywhere that it is wanted. Each engine will carry on a reel some 500 feet of insulated fine copper wires, bound together, cable fashion, so as to equal a No. 3 wire, for transmission of the current. As "it is a good deal easier to squirt electricity than to squirt water," the engine, it is intended, shall be placed near the fire and the electric connection made as is convenient. The powerful current of an arc-light wire will not be required, that of the ordinary incandescent light circuit, which is much lower in intensity, being amply sufficient to run the motor of the engine. The great advantages claimed for the electric fire engine are that it can be instantaneously started up at full speed; that it is much lighter than a steam fire engine of equal power; that it costs one third less; that it is safer and easier of control; that it is noiseless in its operations, and that it is economical. Where there are no electric light wires in the street to be tapped, it will not be impracticable to run it by means of storage batteries charged from a dynamo at the engine house or at any other convenient established point.

**Laying Railroad Track by Machinery.**—An invention which promises to revolutionize the present method of railroad construction was put to a practical test recently on the Green River branch of the Northern Pacific Railroad in Washington Territory. George Roberts is the inventor, and the trial of the new machine was made in the presence of the Superintendent of Construction, the Chief Engineer, and about 300 railroad men. The machine worked beyond the expectations of the inventor and to his entire satisfaction, the men laying at the rate of two and a half miles of track per day, and twelve men doing the work of seventy-five by the old way. It handled ties and rails of the heaviest kind—used in constructing mountain roads—with the greatest ease, placing them rapidly and accurately in position. The machine is so constructed that it can be used on any ordinary flat car, the motive power being a small 8 horse-power engine. All construction material is moved on rollers from the rear to the front, where the machine takes up the rails and the ties, laying them very rapidly. Where the test was made the grade was steep and difficult. The great success attending the trial has caused the Northern Pacific to secure the refusal of the first machine, and the inventor is now arranging for building two more machines to cost \$1200, and the inventor receives a royalty of \$50 per mile.

**Rave's Process for the Utilization of Tar Residues of Petroleum.**—The acid tarry material formed by refining petroleum with sulphuric acid has until recently been a waste product. The *Société Oléo Graisse* are at present engaged in utilizing it by Rave's process. The acid tar is kneaded with iron cuttings or filings, the iron being in slight theoretical excess. After more or less time the acid combines as metallic sulphate. Hot water is added. The sulphate dissolves, the excess of iron falls to the bottom, and the black mass melts and rises to the surface. After thorough washing this black mass is found to possess all the mechanical proportions of the best purified soft bitumen. The solution of sulphate is drawn off and allowed to crystallize. The "bitumen" is heated in a still until it assumes almost any required degree of hardness. According to the amount of heating, there may be obtained: 1. An elastic substance, strongly resembling India-rubber, or, 2, a material hard and tough as ebonite, which is an extremely good non-conductor of electricity, is unacted upon by acids or alkalis, and is, therefore, well adapted for making galvanic batteries, coating acid tanks, and the like. Upon pushing distillation to the extreme, a bright metallic looking carbon is left which is hard enough to scratch glass and is a remarkably good conductor of electricity.—*American Chemical Journal*.

MAPS RECEIVED.

**Hocking Valley Coal and Iron Region.** By Wm. H. Jennings, Engineer Columbus, Hocking Valley & Toledo Railway Company, Columbus, Ohio. The map shows the lands which are controlled and operated by the various coal corporations, with the railroads and connections to which they are tributary. Price: Paper, \$1; cloth, \$2; mounted, \$3. Sold by the Scientific Publishing Company, New York.

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 OCT. 23D, 1888.
- 391,400. Steam-Generator. Walter M. Brown, Albany, N. Y.
  - 391,421. Gold-Separator. William A. Merralls, Kansas City, Mo.
  - 391,423. Hoisting and Conveying Apparatus. Benjamin J. Pleasance and Peter A. Patterson, Cleveland, Ohio.
  - 391,431. Device for Cleaning Oil-Wells and Promoting the Flow of Oil. Ralph Shoff, Bolivar, N. Y.
  - 391,440. Hoisting-Machine. Paul Vonhof, Sachsenburg, Prussia, Germany.
  - 391,441. Welding-Machine. Daniel Warner, Toledo, Ohio, Assignor to George W. Heartley, same place.
  - 391,447. Electric Railway. Parvin Wright, Denver, Colo.
  - 391,449. Rock-Drilling Machine. Camille Bornet, Paris, France.
  - 391,457. Pumping-Engine. Henry Davey, Westminster, England.
  - 391,474. Tyre. Henry B. Kelper, Lancaster, Pa.
  - 391,492. Metallic Railroad Tie. William J. Stifer, Bridgeton, Assignor of one half to Samuel M. Manifold, York, Pa.
  - 391,512. Electric Switch. William B. Cleveland, Cleveland, Ohio.
  - 391,523. Water-Wheel. William F. Englebright, Nevada City, Cal.
  - 391,527. Stamp-Guide. John A. Gowan, Butte City, Mont.
  - 391,539. Water-Wheel. Selden B. Lard, Waterville, Kan.
  - 391,542. Machine for Making Battery-Plates. Albert F. Madden, Newark, N. J., Assignor to the Electrical Accumulator Company, of New York.
  - 391,563. Steam Boiler. Gilbert A. Colby, Chicago, Ill., Assignor, by mesne assignments, to M. Cochran Armour, same place.
  - 391,590. Electric Motor. John Doyle, Hoboken, N. J., Assignor to himself and C. Coles Dusenbury, Lake Mahopac, N. Y.
  - 391,639. Steam Generator. James A. Palmer, Philadelphia, Pa.
  - 391,667. Plunger Pump. William O. Webber, Lawrence, Mass.
  - 391,686. Feed-Water Heater. Walter M. Brown, Albany, N. Y.
  - 391,707. Coal-Mining Machine. Johnathan W. Harrison, Ypsilanti, Assignor of one half to Charles R. Miller, Adrian, Mich.

## THE METALLURGY OF STEEL.\*

By Henry M. Howe.

(Continued from page 309.)

He conceives that the carbon of steel in a roughly similar way "dissolves" the iron itself, *i. e.* renders the whole mass amorphous at temperatures above W, and holds it amorphous as long as the temperature is rising (or stationary): but when the temperature falls, and long before it reaches W again, crystallization sets in, and is the coarser the higher the temperature has been, the slower and more tranquil the cooling. Such analogies only suggest, never prove, often mislead.

2. They seem to be further based on the fact that certain steel ingots, which had been held unnecessarily long at a high temperature, and which had cooled slightly before forging, broke with a strongly developed crystalline fracture at the first blows of the hammer. In one case the ingot was raised to a bright orange: then, while awaiting its turn at the hammer and without removing it from the furnace, its temperature was allowed to fall to a bright red. It was then hammered, but broke at the first blow.

In another case when a forging which had been thus treated was turned in a lathe, a cavity, lined with crystals some of which were 0.5 inch in diameter, was found, formed in his opinion by the first blows of the hammer, which separated the weakly united crystals.

As he describes these cases, however, long exposure to a high temperature seems quite as competent as the slow decline of temperature to explain the crystallization and consequent brittleness.

3. The evidence rebutting Chernoff's statements is based on experiments with small bars. In these, as already shown, the interstratal movements which quenching produces and which tend to break up crystallization, should be much less severe than in large masses. As to the effect of quenching on the fracture of large masses I have no evidence. It is possible that in them extremely rapid cooling may completely efface crystallization, thus suggesting fallaciously that slow cooling alone originates the coarse crystallization which it preserves.

4. At the melting point, and perhaps at temperatures between it and bright whiteness, pre-existing crystallization is effaced, and so it is when the temperature, rising from the cold, reaches W. It is possible that, finding steel quenched from these temperatures porcelanic, Chernoff inferred that it would be when quenched from intermediate temperatures.

I have shown at this length the opportunities for error, because the positive and generally accepted statements of this most brilliant metallurgist cannot be dismissed lightly.

To sum up, in most of the points in which Brinnell's statements are opposed by those of others it seems quite clear that he is right.

§ 250. METHODS OF HEAT-TREATMENT.—PRACTICAL APPLICATIONS of the foregoing follow. 1. The more or less complete restoration of overheated and even of burnt steel, by reheating to W, repeatedly if need be, followed by forging, by quenching, or by undisturbed slow cooling according to the requirements of the case. (See § 263.)

2. The annealing of steel castings, which not only relieves the initial stresses, but effaces the columnar structure, renders the fracture very much finer, and greatly

increases strength, elastic limit and ductility.\* (Cf. Table 9, p. 19.)

On account of the tendency to crystallize above W, and also while the temperature is falling from W to V, Coffin anneals by heating to or slightly above W, cooling rather rapidly to V by opening the furnace doors, then closing them and finishing the cooling very slowly.<sup>b</sup> To hasten cooling, one side and the top of the furnace may be movable and counter-weighted: while, if the piece be large, it may be run in and out on a truck whose top forms the furnace-bottom, and which with its load is run into the open air in cooling to V.

Here, as in annealing in general, while the temperature should reach W, it should rise no further beyond W than is needed to assure us that this point has been reached: and the cooling should not be excessively slow. Ignorance of these cardinal principles has probably been the chief cause of the injury so often done by annealing, and thus of the somewhat widespread distrust of this operation.

3. Means of accelerating cooling after forging has ceased.—Power is saved by using a high temperature for forging—the metal being then the softer—but at the risk of excessive crystallization during the subsequent cooling. Hence expedients to hasten this cooling.<sup>c</sup>

Coffin's rail-process (Figure 63) consists in immersing the rail in water immediately after leaving the rolls, till its temperature falls to V, then allowing it to cool slowly in the air. To equalize the cooling, submerged jets of water play on the thick rail-head. The rapid cooling to V removes the opportunity for crystallization: the slow cooling from V down allows most of the carbon to pass to the cement state, and avoids the stresses of unequal contraction which would arise were the sudden cooling more complete. Toughness is promoted in both ways.<sup>d</sup>

To further equalize the cooling, I suggest holding the rail by a guard, which incloses web and flange so as to restrict the circulation of water about these thinner parts, as is successfully done in hardening mowing-machine knives.

\* The almost complete lack of ductility of many unannealed steel castings which on annealing become very ductile, shows the accuracy of the definition of steel "an alloy of iron which is cast while in a fluid state into a malleable ingot." The ingot is usually not malleable, and does not become so till reheated. (Cf., p. 1.)

<sup>b</sup> Trans. Am. Soc. Civ. Eng., XV., p. 325, 1887.

<sup>c</sup> While the undisturbed slow cooling from an excessively high temperature to which rails rolled unduly hot are exposed, doubtless tends to induce a coarse crystalline structure and consequent brittleness, especially in case of phosphoric iron, this tendency has unfortunately been most grossly exaggerated. So well conducted a journal as the "Railroad Gazette" (1888, p. 316), gravely stated that a prick punch could be driven by a moderate blow nearly up to the hilt into a rail which had been finished unduly hot, and that the best steel can "be so softened by heating and annealing as to be almost as soft as lead, and equally unable to resist impact and abrasion." From this nonsense and from positive and absurdly untrue statements which follow as to the existing method of rolling, the editor appears to have been the victim of a hoax. It is doubtful, indeed, whether one could readily detect the difference between the hardness proper of two rails, one of which had been finished at a light yellow and the other at a cherry-red, though the difference in structure would indeed be readily seen. What is surprising and depressing is that such a person could be made to believe such rubbish. (Cf. Engineering and Mining Journal, XLI., p. 390, 1886.)

R. W. Hunt reports rails which, under apparently identical conditions, greatly outlasted others apparently similar in all respects including section, except that the latter had much thicker (deeper) heads than the former, and hence for given quality of metal should have lasted much the longer. The inferiority of the thick-headed rails is reasonably referred to their higher finishing temperature and slower cooling. ("Steel Rails," a paper read before the Am. Inst. Mining Engineers, Oct. 5th, 1888, to appear in Transactions, Vol. XVII., 1889.)

<sup>d</sup> U. S. Patents 368,132 and 378,083, August 9th, 1887, and February 21st 1888. After leaving the rolls the rail has its crop-ends sawn off at once as usual, and thence passes between feed-rollers, of which several pairs grasp it firmly, and which lie above a water-bosh. When the rail has arrived at over this bosh the rollers are stopped, and the bosh raised by bell-crank levers, submerging the rail, while sprays of water play on its head to equalize the cooling, the thick head naturally tending to cool more slowly than the web and flange. When the rail has cooled so far that its remaining heat would suffice when evenly distributed to bring its temperature to V (a low red), the bosh is lowered, and the rail thenceforth allowed to cool slowly.

TABLE 86 A.—INFLUENCE OF CLEMANDOT'S PROCESS OF COMPRESSION-HARDENING (CARNOT, OP. CIT.).

	Composition.						Properties under tensile test.						Specific gravity.		
	Carbon.	Silicon.	Mangan-ese.	Phos-phorus.	Sulphur.	Tungsten.	Uncompressed.			Compressed.			Natural.	Hardened.	Com-pressed.
							Tensile strength, lbs. per sq. in.	Elastic limit, lbs. per sq. in.	Elongation, % in 8 in.	Tensile strength, lbs. per sq. in.	Elastic limit, lbs. per sq. in.	Elongation, % in 8 in.			
1. ....	.10	.06	.34	.02	.08	.....	57,600	34,180	42	65,100	46,900	37	.....	.....	.....
2. ....	.25	.07	.12	.03	.08	.....	60,800	32,000	32	78,600	49,100	30	.....	.....	.....
3. ....	.....	.....	.....	.....	.....	.....	83,200	41,200	25	103,800	61,100	24	.....	.....	.....
4. ....	.51	.11	.84	.03	.02	.....	89,600	44,800	24	103,500	72,500	20	.....	.....	.....
5. ....	.62	.16	.22	.03	.08	8.02	.....	.....	.....	.....	.....	.....	7.995	7.982	7.988
6. ....	.81	.19	.82	.03	.08	.....	113,100	59,700	10	194,150	118,800	10	7.769	7.720	7.777

4. Lowering the finishing-temperature, whether by rolling slowly, by rolling double or quadruple lengths—this has been found to improve the quality of wrought-iron greatly,—by employing thicker piles or ingots, or by throwing a jet of water, steam or air on the metal during the last part of the rolling so as to cool it nearly or quite to V, as is done in tyre-rolling. In case of rails the thick, slowly cooling head may be advantageously cooled thus during the late passes.

Three uniformly heated steel bars cut from a single billet were rolled by a competent American metallurgist, one very fast, one normally, one very slowly: their merit was inversely as their finishing temperature.

The tyre-roller's aim in lowering the finishing temperature is that scale may not form after rolling ceases, and thus that the tyre's surface may be smooth: doubtless he is sometimes ignorant of the incidental great structural benefit to his metal. Eye-bar makers, however, formerly ignorant of the structural injury due to hot finishing, have lately been forced by the repeated failures and rejection of hot-finished eye-bars when tested whole, to lower their finishing temperature expressly to benefit the metal structurally. They hold the bars before the last passes, till they have cooled properly.

Thermo-tension,<sup>a</sup> or subjecting the red-hot metal to high tensile stress which is maintained during cooling, may perhaps come under this head. If, owing to the tension, the piece elongates, or does not shorten in conformity to the cooling, its diameter must decrease more than conformably to the cooling, which implies a movement of the particles among themselves: this, like forging, may so long as it lasts suffice to prevent crystallization. It is possible that this destruction of previous crystallization occurs chiefly or even wholly as the metal cools past the temperature of weakness at or near V, which will be described in § 256.

5. Clemandot<sup>b</sup> subjects bars of cherry-red-hot high-carbon steel to a pressure of say 14,000 to 43,000 pounds per square inch, exerted preferably by the smooth, cold faces of a hydraulic press. The steel is said to be fine-grained, harder and stronger than unhardened steel, yet practically as ductile, and specially suitable for magnets. The scanty statements about it are not over-convincing. The rationale is not known. It may be that the distortion due to the pressure rapidly breaks up any crystallization acquired during rising temperature, while the cold press-faces cool the steel so fast as to prevent further crystallization and to hinder the change of carbon from the hardening to the cement state. Indeed, Lan finds that, under identical conditions, a decidedly larger proportion of the total carbon is in the hardening state in steel treated by Cleman-

dot's process than in that cooled in the usual way. The mean of five pairs of concordant analyses showed that a steel containing 0.70% of carbon had 0.585% of hardening carbon when thus compressed, but only 0.49% when uncompressed.

This process is probably inapplicable to large pieces, as the removal of heat from them would necessarily be slow. It has been applied to magnets successfully<sup>c</sup> and with surprising results: it imparts to them a coercive force, less intense indeed than that due to quenching-hardening, but apparently more enduring. For, while the coercive force of quenching-hardened steel falls greatly on tempering, Carnot states that that of compression-hardened steel is not lessened even by reheating and forging.<sup>d</sup> Compression-hardening has further advantages over quenching-hardening in that it neither cracks even the hardest steels, nor makes them untoolably hard. Unlike quenching- and hammer-hardening it apparently does not lower the density. The following results are reported.<sup>e</sup>

I suggest hastening the cooling by pressing with thick copper blocks, iced before or during compression.

6. In Chernoff's process the cooled forging or casting is heated to W, so as to acquire a porcelanic structure, then slowly cooled. As it is impracticable to heat exactly to W, and as the porcelanic structure is not acquired till W is reached, he recommended heating slightly above W; and, on account of the tendency to crystallize in cooling from above W, to quench till the temperature fell to or below W, then to cool slowly so as to avoid the stresses which quenching to the cold would cause.<sup>f</sup>

7. Coffin's axle-process, in use at the Cambria Iron Works, goes a distinct step beyond Chernoff's. Recognizing the tendency to crystallize during slow cooling from W to V, Coffin heats to slightly above W, quenches to V, then cools slowly.

Six axles tested within a month of adopting this process showed the following admirable properties.

	Tensile strength, pound <sup>s</sup> per square inch.		Elongation in 8 inches.	Contraction of area.
	Elastic.	Ultimate.		
Maximum.....	46,940	95,600	20	42
Minimum.....	39,120	80,900	13.7	16.5
Average.....	42,420	87,830	16.5	30.9

Two halves of an axle, one treated by this process, the other untreated, gave the following results.<sup>g</sup>

	Tensile strength, pounds per square inch.		Elongation in 4 inches.	Contraction of area.
	Elastic.	Ultimate.		
Untreated.....	80,000	71,520	24.5%	51.5%
Treated.....	44,000	72,020	24.07%	57.2%

(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.

<sup>a</sup> Thurston, *Mats. of Engineering*, I., p. 526; *Metallurg. Rev.*, I., p. 10. Also Jarolimek, *Journ. Iron and Steel Inst.*, 1885, II., p. 642, from Dingler's *Pol. Journ.*, CCLV., pp. 1-9, 56-60.

<sup>b</sup> "Trempe par compression," *Le Genie Civil*, V., p. 217, 1884; *Comptes Rendus XCIV.*, p. 952, April 3d, 1882; *Journ. Iron and St. Inst.*, 1882, I., pp. 335, 338. Cf. Percy, *idem*, 1885, I., p. 31, who incorrectly thinks that the principle is covered by Waitworth's method of compression: the rate of cooling forms an essential difference.

<sup>c</sup> L. Clemandot, Private Communication, Sept. 21, 1888.

<sup>d</sup> A. Carnot, Rept. Committee on Chemical Arts, of la Société d'Encouragement, Reprint "La Trempe par Compression," Paris, Steinheil, 1886.

<sup>e</sup> *Revue Universelle*, 2d Ser., VII., p. 415, 1877.

<sup>f</sup> *Trans. Am. Soc. Mechan. Engineers*, IX., to appear: *Mechanics*, Dec., 1887, p. 317.

## PERSONAL.

Mr. W. de L. Benedict, mining engineer of this city, has gone to California on professional business.

Prof. W. P. Blake, mining engineer, of New Haven, Conn., is examining mines in the Coeur d'Alene district, Idaho.

It is stated that a Mr. Markham, an expert, has been sent out from Cornwall, England, to examine and report on some tin property near Custer, Dakota.

Mr. Frank Reynolds, Superintendent of the United Coal and Coke Company, at United, Pa., died last week, aged thirty-two years, at his home in Connellsville, after an illness of several months.

Mr. Alex. Graham, for a long time the manager of the Tintic Mining and Milling Company, at Tintic, Utah, has assumed the management of the Manhattan Mining and Reduction Company's mines at Austin, Nevada.

The American Institute of Architects, at its recent session in Buffalo, N. Y., decided to perfect the scheme of consolidation with the Western Association of Architects. R. M. Hunt, of New York, was re-elected President, A. J. Blorr, of New York, Secretary, and O. P. Hatfield, of New York, Treasurer.

State Superintendent of Public Works James Shanahan, State Engineer John Bogart, with the following corps of engineers, John Bisgood, George Bailey, Fred. Knedner, H. Beach and H. H. Servors, have begun the annual inspection of the canals of the State of New York. The Erie Canal will be inspected first. The inspection had been postponed a month on account of bad weather.

The Board of Trustees of Cornell University at Ithaca, N. Y., have appropriated \$80,000 from the permanent funds of the university for a chemical laboratory. The new building is necessitated by the great increase of students. The trustees named the present physical laboratory Lincoln Hall, in honor of President Lincoln. It is an imposing brown stone structure.

Mr. Philip R. George, for over forty years the manager of the mining interests of Cooper, Hewitt & Co., died on the 21st inst. at Ringwood, N. J., aged sixty-eight years, where he had resided for the last thirty-five years. Originally a Cornish miner, by force of his ability, strict integrity and great energy he rose to the important position of manager of the most extensive mines of New Jersey.

The following changes have been made in the management of the Sheffield & Birmingham Coal, Iron and Railway Company: Mr. J. G. Chamberlain moves to Sheffield as General Superintendent and Chief Engineer of the company. Mr. J. B. Carrington is appointed Superintendent Coal and Coke Department and Principal Assistant Engineer. Mr. Alex. McIlwaine goes to Sheffield as founder at the furnace, and Mr. W. J. Haynes is in charge of the coke-ovens.

The Brotherhood of Locomotive Engineers has decided to hold its next convention in Denver, Colo., October 17th, 1889. The following grand officers were re-elected at the annual meeting held in Richmond, Va., this week: Third Grand Engineer, J. R. Spragge, of Toronto, Canada; First Grand Assistant Engineer, Henry C. Hays, of Cleveland, O., and Second Grand Assistant Engineer, A. M. Cavener, of San Francisco.

Mr. W. H. Lawrence, Superintendent of the Spring Valley Water Works, San Mateo, California, died there on the 21st inst. Mr. Lawrence came to San Mateo County in 1860 and began working for the Spring Valley Water-Works as chain carrier with Von Smith, surveyor for the company. He rose to the position of superintendent by sheer force of ability, having shown great executive powers as well as unusual comprehension of mechanical details.

The Aqueduct Commissioners, New York, have appointed a committee of experts to examine the entire work of the new aqueduct and report to the board the result of their investigation from time to time. It is composed of State Engineer and Surveyor John Bogart, Albany; Chief Engineer George W. Birdsall, of the Aqueduct, and the following practical builders and masons: George Lee, Mount Hope; John A. Bana, George R. Brown, Chauncey M. Sprague, of New York, and James L. Brush, of Brooklyn.

Mr. S. H. Stowell, who was for many years the sole editor of *Stowell's Petroleum Reporter*, and continued interested in its publication after its consolidation with the *Pittsburg American Manufacturer* paper until his growing weakness compelled him to cease work, died at his residence near Pittsburg, Pa., on the 18th inst. Mr. Stowell was one of the earliest, if not the first, of the statisticians of the American petroleum business, and his figures are the basis of all reports as to the production of the earlier years.

Mr. Walter Lee Brown has resigned as chief chemist of the Chicago, Burlington & Quincy Railroad, to assume the management of the gas-works at Evanston, Ill. Mr. Brown's retirement from railway work is greatly to be regretted. Mr. Brown was a leader of the organization, in 1887, of the American Association of Railway Chemists, was its first vice-president, and was an active participant in its work up to the time of his retirement from railway service. Mr. G. H. Ellis, for some time past assisting in the chemical laboratory of the Chicago, Burlington & Quincy Railroad, succeeds Mr. Brown as chief.

The Secretary of War has appointed Maj.-Gen.

John M. Schofield, Col. Henry L. Abbott, Corps of Engineers; Col. Henry W. Closson, Fourth Artillery, and Lieut.-Col. Alfred Mordecai, Ordnance Department, members of the Board of Ordnance and Fortifications provided for by the act of Congress of September 22d last. Capt. Charles C. Morrison, Ordnance Department, is designated recorder of the Board. The Board is instructed to prepare suitable regulations "for the inspection of guns and material at all stages of manufacture to the extent necessary to protect fully the interests of the United States," etc.

## INDUSTRIAL NOTES.

The Edith Blast Furnace Company will blow in its plant at Allegheny, Pa., on the 31st inst., after a shut-down of several months.

The Lehigh Iron Company, at Allentown, Pa., on the 23d instant, relighted the fire in its hot furnace. The Allentown Iron Company at the same place blew in an additional stack a few days ago.

A Westmore furnace is being built at Hackettstown, N. J., on ground donated by the Warren Iron Company, to experiment with the reduction of zinc ores. This is to be followed by a furnace for producing iron from the ore.

Messrs. Sidney Shepard & Co., Buffalo, N. Y., and Messrs. C. Sidney Shepard & Co., of Chicago, Ill., are the sole manufacturers of the Buffalo miners' lamp, which is meeting with great favor in the mining regions.

At Floodwood, Ohio, one of two large furnaces has been completed, and was blown in last week. The two furnaces will have a capacity of over 300 tons per day. The one blown in has a capacity of about 150 tons per day.

At the Anaconda mill, in Montana, after several months' trial of one steam stamp, the owners have given an order to Messrs. Fraser & Chalmers, of Chicago, for eight more, thus enormously increasing their crushing capacity.

The Allegheny Bessemer Steel Company, at Duquesne, Pa., expects to get into operation January 1st. In the rail mill hydraulic machinery will in nearly every instance take the place of roll hands, furnace men, shearmen and hot-bedmen.

The Lewis Foundry and Machine Company, of Pennsylvania, has received an order from the American Wire Nail Company, of Covington, Ky., for the erection of a Ganet rod mill on the Anderson, Indiana, gas belt. The works will cost in the neighborhood of \$200,000.

The Mayville furnace, at Mayville, Wis., owned by the Northwestern Iron Company, has gone into blast. The blow-in was unusually good, the fires burning well from the first, and blast going on without as much as a puff of gas. The foundry is now working on No. 1 and 2 foundry iron.

The Ingersoll Rock Drill Company of New York City is supplying a complete plant of mining machinery for operating the Ely copper mines of Vermont to Mr. William H. Case of Knoxville, Tenn., who has contracted to furnish the Copperfield Mining and Smelting Company with this machinery.

It is reported that the Calumet & Chicago Rolling Mill Company, Chicago, Ill., proposes to erect a plant somewhere on the Belt Line in Chicago and equip it with the modern machinery for the manufacture of structural steel of the largest size. The rolls will be from 25 to 35 inches in diameter and it is proposed to outdo Pittsburg on heavy structural shapes.

The Norway Steel and Iron Company, with extensive works at South Boston, Mass., has decided to wind up its affairs, but will not be closed until next spring, as the winding up of the business cannot be completed before that time. The business of the company consists of rolling iron, steel, boiler plates, etc. The concern is particularly well known because of its extensive dealing in Swedish iron.

It is understood that Mr. Hamilton Disston, the Philadelphia saw manufacturer, has become a partner of Andrew Carnegie. Henry Phipps, Jr., Mr. Carnegie's principal partner, has withdrawn from the active management of Carnegie, Phipps & Co., as already mentioned in our last issue. It is also stated that the Disston Manufacturing Company may remove its immense plant to Pittsburg.

An agreement has been entered into between the Westinghouse Electric Company, of Pittsburg, and the Consolidated Electric Company, of New York, by which the former is placed in control of the latter company. The use is given to the Westinghouse Company of all the Sawyer-Man patents and entire capital stock of the Sawyer-Man Electric Company. For the use of these, the Westinghouse Company agrees to pay to the stockholders of the Consolidated Electric Company \$150,000 every year during the continuance of the agreement, which is 6 per cent interest on the Consolidated's capital. The capacity of the Consolidated plant is 7500 electric lamps a day. The Westinghouse Company has been using these lamps, and concluded that they could make them cheaper than they could buy them. The Pittsburg Company and the Edison have begun their litigation over the priority of patents of electric incandescent lamps. The Westinghouse, controlling the Sawyer-Man patents, has sued a number of companies using lamps of Edison's Company for infringement. The confidence the Westinghouse people have in their ability to demonstrate priority of patent is shown by

their liberal allowance of \$150,000 a year to the Consolidated Company for a virtual release of claim to the Sawyer-Man patents. If they establish their claim, the Westinghouse Company will have a monopoly of incandescent electric lighting in the United States.

## CONTRACTING NOTES.

Our list of machinery and supplies wanted will be found on page xiv. Manufacturers of machinery, engineers and contractors should consult our directory of "Contracts Open" on the same page. This week, proposals are invited for the following new contracts: No. 1188, Iron Bridge; No. 1189, Dredging; No. 1140, Dredging; No. 1141, Dredging; No. 1142, Furnishing Stone and Brush for Beach Protection; No. 1143, Dredging; No. 1144, Dredging; No. 1145, Lining Boilers; No. 1146, Dredging; No. 1147, Dredging; No. 1148, Furnishing Bessemer Steel Wire; No. 1149, Sewers; No. 1150, Fire-Hydrants; No. 1151, Harbor Improvements.

The Lebanon Water-Works Company has awarded the contract for the new water-works to the Scovel & Irwin Construction Company, of Nashville, Tenn. The cost will be about \$60,000, to be paid in city of Lebanon six per cent bonds. The Gordon Steam Pump Company, of Hamilton, O., will furnish the pumps; Dennis Long & Co., of Louisville, Ky., the pipe and specials; the Bourbon Copper and Brass Company, of Cincinnati, O., the valves and hydrants, and the Union Iron Company, of Chattanooga, Tenn., the boilers.

## GENERAL MINING NEWS.

Shipments of iron ore from the mines of the districts mentioned below for the season up to and including October 17th, as reported by the *Marquette Mining Journal*, were as follows:

	Tons.	Tons.
	1888.	1887.
Marquette, Marquette District.....	704,059	724,212
St. Ignace, ".....	88,633	84,152
Escanaba, ".....	688,319	707,612
" Menominee District.....	918,865	1,002,679
" Gogebic District.....	161,579	
Ashland, ".....	918,082	938,406
Two Harbors, Vermillion District.....	327,439	344,100
Total tons.....	3,817,976	3,881,221

**KANSAS CITY SMELTING AND REFINING COMPANY.**—This company, operating works at Argentine, Kan., is a close corporation and but little of its business is made public; a recent report shows that it pays 40 per cent annual dividend on \$1,800,000 invested. In addition to this it owns controlling interests in the Arkansas Valley smelter at Leadville, in sampling works at El Paso and Eagle Pass, and silver mines of Coahuila, Old Mexico. The company also holds valuable leases on paying mines of this country and Mexico from which it derives great profits.

**STANDARD OIL COMPANY.**—The company has purchased lands just beyond Newburg, N. Y., and is to erect buildings thereon. It is proposed to make this a distributing point for sections between Kingston and Jersey City, on the west side of the Hudson River. Distributing houses have been made on the east side at Poughkeepsie and Hudson.

## ALABAMA.

## BIBB COUNTY.

**CAHABA COAL MINING COMPANY.**—The miners in the employ of this company at Blocton struck on the 21st inst., owing to a reduction of 10 per cent in the price of mining coal, which went into effect on that date. The company so far has made no effort to compromise the matter. All the mines at Blocton have been shut down and work in almost every department suspended. These mines furnish coal for many of the leading furnaces and railroads in the South, and the strike will cut off the coal supply from these roads.

## JEFFERSON COUNTY.

**ALABAMA CONNELLSVILLE COAL AND COKE COMPANY.**—This company will shortly begin to build a number of the best and latest improved coke-ovens at Wetona.

**VULCAN COAL AND COKE COMPANY.**—This company has been organized with a capital stock of \$100,000, shares \$100 each, paid up. The property is situated about three miles from Birmingham on the Georgia Pacific Railroad, in what is known as North Birmingham. It is now being worked, but it is not expected to get out more than 500 tons per day during the coming winter and spring. The incorporators are W. B. Lightfoot, H. B. Ausley and T. H. Frill.

## ARIZONA.

## YAVAPAI COUNTY.

Professor Seblott, the manager of the Comet Smelting Company, of Utah, in which French capitalists are interested, has arranged for the purchase of a belt of seven copper mines in this county for \$200,000. It is stated that he has cabled an expert from Paris to come out and examine this belt. The property is isolated, being ninety miles from the Atlantic & Pacific Railroad, and almost inaccessible from the Colorado River, 25 miles distant, but a branch railroad line to Prescott is to be built.

## CALIFORNIA.

## AMADOR COUNTY.

**PLYMOUTH CONSOLIDATED MINING COMPANY.**—A telegram received on the 22d inst. from A. Haywood, the treasurer, in San Francisco, states: "Have no doubt fire is out. Everything going first-rate. Will have mine open soon."

**SUTTER CREEK GOLD MINING COMPANY.**—We

are officially informed that the company has several hundred tons ready for milling, which will be resumed. Now the company is contemplating leasing the forty-stamp mill from the Hector Company this winter.

NEVADA COUNTY.

**MASSACHUSETTS HILL MINING COMPANY.**—Articles of incorporation have been filed at San Francisco for this company, to operate in Grass Valley district. The capital is \$1,500,000, shares \$10 each. The Directors are W. B. Bourn, Thomas Brown, J. de W. Allen, James D. Hagne, William Alvord, Harold Wheeler and Horace F. Cutter.

PLACER COUNTY.

**HATHAWAY.**—This mine, near Ophir, has been sold to Valentine Brothers, of San Francisco, it is said, for \$12,000. The rock pays from \$10 to \$12 per ton, free milling. The sulphurets average about 3 per cent. Valentine Brothers will at once put up hoisting works, and will sink the shaft to the depth of 500 feet. They will also complete a 10-stamp mill. The mill will be run by water-power. Mr. George Horn, the manager of the Valentine mines in this State, will take charge of the mine.

PLUMAS COUNTY.

**PLUMAS EUREKA GOLD MINING COMPANY, LIMITED.**—The report for September shows total receipts, \$33,545; total working expenses, \$21,935.

**SIERRA BUTTES GOLD MINING COMPANY.**—The report for September shows total receipts, \$17,531; total working expenses, \$17,078.

COLORADO.

The Denver Coal Association has been formed to regulate the price of coal mined and sold in this state under the following certificate of incorporation: Under and by virtue of the laws of the State of Colorado, we, whose names are hereunto subscribed, citizens of the United States, hereby certify that we have, and do by these presents, organize ourselves, our associates and successors into a body corporate, for purposes other than for pecuniary profit, under the name, for the object, and subject to the provisions of the articles following:

**ARTICLE I.** The name of this corporation shall be "The Denver Coal Association," and its principal office shall be kept and its principal business carried on in the city of Denver, Arapahoe County, Colorado.

**ARTICLE II.** The particular business and object for which it is formed is for the promotion of the general interests of the coal trade, and to that end it shall have all and singular the powers now or hereafter conferred by law on bodies corporate and necessary or proper for the successful carrying out of such object; but it is not organized for purposes of pecuniary profit.

**ARTICLE III.** Its affairs shall be managed by a board of directors, consisting of nine members, two of whom shall be the president and vice-president of the association, the remaining seven to be elected annually by the members of the association from among themselves. The following-named persons shall be and constitute such board of directors until the next annual meeting of the association, viz:

Directors—Austin G. Gorham, *ex-officio*; Henry Goodridge, J. A. Kebler, *ex-officio*; James Pallot, F. J. Spencer, E. R. Taggart, Frank Trumbull, J. J. Thomas and D. S. Woods.

**ARTICLE IV.** The Board of Directors shall have power to make such prudential by-laws as they may deem proper for the management of the affairs of the corporation, and shall have power also to impose upon members of the association fines and penalties of reprimand, suspension and expulsion for violation of its by-laws or regulations, and may enforce the payment of the fines imposed by appropriate action at law in the name of the corporation, but no fine or penalty shall be imposed unless the same has been provided for in the by-laws previous to the commission of the offence.

**ARTICLE V.** The corporation shall have commencement and these articles be in force on and after the filing of the certificate of incorporation by the Secretary of State in the office of the Recorder of Deeds of Arapahoe County, Colorado.

Witness our hands and seals this 27th day of July, 1888.

EDWIN R. TAGGART. JAMES PALLOT.  
HENRY GOODRIDGE. DEWITT S. WOODS.  
SIMEON W. CANTRIL. JULIAN A. KEBLER.  
JOSEPH J. THOMAS. AUSTIN G. GORHAM.

The most important of the by-laws is the following:

**SEC. 12.** The Board of Directors shall have power to fix the prices at which Colorado lignite coal shall be sold by operators to retail dealers in the city of Denver, and by retail dealers in said city both at the yard and delivered to dwellings.

The prices which shall govern during June, July and August of each year shall be fixed during the month of March preceding.

Those for September, October, November, December, January, February, March, April and May shall be fixed during the month of July preceding.

Provided, That such prices from August 1st, 1888, until June 1st, 1889, shall be as follows:

Operators' prices to retail dealers, per ton, in cars, free on board cars at Denver:

KIND OF COAL.	Aug. 1, 1888,	Sept. 1, 1888,
	to Aug. 31, 1888.	to May 31, 1888.
Egg or lump.....	\$2.80	\$3.05
Mine nut.....	1.25	1.25
Screened nut.....	2.00	2.00

Retail dealers' prices to dwellings:

KIND OF COAL.	Price at yard.			Prices delivered.		
	Ton.	Half ton.	Quarter ton.	Ton.	Half ton.	Quarter ton.
*Egg or lump.....	\$3.50	\$1.75	\$0.90	\$4.00	\$2.25	\$1.25
*Mine nut.....	1.40	.70	.40	1.90	1.20	.85
*Screened nut.....	2.50	1.25	.65	3.00	1.75	1.15
†Egg or lump.....	3.75	1.90	1.00	4.25	2.40	1.35
†Mine nut.....	1.40	.70	.40	1.90	1.20	.85
†Screened nut.....	2.50	1.25	.65	3.00	1.75	1.15

\*August 1st, 1888, to August 31st, 1888.  
†September 1st, 1888, to May 31st, 1888.

For quantities less than one quarter of a ton at yards, 20 cents per 100 pounds. Except in car-loads, sales of coal hereunder shall be made only in the following quantities, to wit:

First—One or more tons of 2000 pounds each.  
Second—A single half-ton of 1000 pounds.  
Third—A single quarter-ton of 500 pounds.  
Provided, That sales of less than 500 pounds may be made at the yard but not delivered, and that a reduction of 25 cents a ton on screened nut may be made for steam to blocks and a reduction of 25 cents per ton on egg and lump coals may be made at schools, the city of Denver, the county of Arapahoe, and to hotels and public restaurants.

The parties to the agreement are the following:  
The Colorado Fuel Company, by J. A. Kebler, General Manager.  
The Fox Coal Company, E. R. Taggart, Agent.  
Goodridge & Marfell, Stewart Coal Company.  
Standard Coal Mining Company, by J. J. Thomas & Company, Agents.  
The Marshall Consolidated Coal Mining Company, by Austin G. Gorham, General Manager and Vice-President.  
The Colorado & Texas Fuel Company, by Frank Trumbull, President.  
Garfield Coal Company, by James Pallot.  
The Simpson Coal, Binford & Spencer.  
Jackson Coal Company, by D. S. Woods, Secretary.  
Thomas H. Faulk for the Cleveland Coal Company.  
For McGregor Coal Company, William Francis.  
The Baker Coal Mining Company, by Charles G. Buck, Vice-President.

CHAFFEE COUNTY.

**TILDEN MINING COMPANY.**—This company, at Alpine, is coming to the front again. The litigation of five years' standing has been settled, and operations are now being pushed. A body of ore near the old workings has been opened up, and the first shipment made.

CLEAR CREEK COUNTY.

**LEAP YEAR.**—A lode has been discovered in Argentine district, the ore from superficial workings running 6.74 ounces gold and 54.45 ounces silver per ton at the smelters, says the *Register-Call*. This discovery has proved an incentive for other mine owners in that district to resume work upon their several properties.

**LITTLE GIANT MINING COMPANY.**—The Little Giant and Morning Star lodes on Red Elephant Mountain, purchased by this company, a syndicate of St. Louis gentlemen, has been capitalized at \$1,500,000, shares \$10 each, under the laws of Illinois. H. J. Steber is President, E. J. Amann Secretary and Treasurer, and J. J. Yeckel Manager and Superintendent. The company took hold of the property in June, since which time they have erected a plant of machinery, a shaft-house and are at present erecting an ore-house. The developments on the property consist of a shaft 201 feet deep and four levels. A force of 18 men is employed, which is shortly to be increased.

**M. X. MINING COMPANY.**—This company has been organized for the purpose of engaging in gold and silver mining in Clear Creek County, with a capital stock of \$100,000, shares \$10 each. The directors are Rudolph Dallmeyer, J. C. Fisher, William W. Wagner, Hugo Manning, William D. Oenck, W. A. Dallmeyer, and Philip Mixsell. The offices will be at Idaho Springs and at Jefferson City, Mo.

**NEATH MINING COMPANY.**—The stockholders are reported to be signifying their willingness to agree to the terms of the proposition recently made, and referred to in our issue of August 25th, and it is believed that work can shortly be resumed.

EAGLE COUNTY.

Our correspondent at Gilman sends us the following:  
**BLEAK HOUSE.**—Extensive work is being done on the Bleak House vein, and the results are apparent from the shipments of ore.

**CHAMPION.**—The Champion is shipping large quantities of ore and the grade is up to the best.

**GOLDEN COMET.**—This vein has four leases upon it, all extracting ore. Mr. J. J. Hill is making extensive preparations for a great amount of work this winter.

**WARRIOR'S MARK.**—The Warrior's Mark, leading the fissure veins in Eagle Cañon, is outputting 5 to 6 cars of ore per month, and the grade is becoming far better as they go down in the winze. An assay recently showed 195 ounces gold.

**WATER NYMPH.**—Opposite the Warrior's Mark is situated the Water Nymph vein, owned by Mr. A. Homburg, of Red Cliff. A fine streak of galena has been encountered in the heading, pitching very steeply into the mountain. The ore runs 64 per cent lead and 29 ounces silver.

HOLY CROSS MINING DISTRICT.

Some extensive work has been accomplished in this section during the summer, and many of the properties are looking better. Mr. Shoford has been operating his placer claims this summer, with far better results than expected. There has been a steady and improved showing of gold as he sunk through the wash. Bed-rock has been reached and pannings exhibit quantities of fine gold, with pieces worth from a quarter to a dollar. If some of the owners in this section should operate their placer claims a surprise might be in store for many.

LAKE CREEK MINING DISTRICT.

This section is going to come to the front before long. In various claims some high-grade mineral has been opened up. Mr. D. Morgan brought some very fine specimens of gold ore from his mines to this point last week. The mining outlook in this section is surely and steadily becoming brighter, and it will be such ere long that mining men from many other localities will be induced by the prospect to invest here.

GILPIN COUNTY.

**GREGORY-BOBTAIL MINING COMPANY.**—The production for September is estimated, on a basis of gold being worth \$17.50 per ounce, as follows: Mill ore, 973 ounces, \$17,027.50; smelting ore and tailings, \$4,972.50; total, \$22,000.

GUNNISON COUNTY.

**SYLVANITE.**—Mr. John D. Morrissey has assumed the management of this mine for the company that has recently purchased it. Plans are now being devised for winter work. There is some necessary development work already commenced on the property that will probably be continued at once, such as driving the lower tunnel, which is designed to cut the ore chimney at a great depth. New York parties are interested in the company.

LAKE COUNTY.

The *Leadville Herald-Democrat* reports the following:

The Star of the West, Garden City and Satellite mines, which are being worked by Mr. Houghton, are making an output of about 600 tons per month. The ore is of a good grade. These mines are being worked through the Star of the West and Satellite shafts. The latter shaft is now being sunk deeper for the purpose of commanding all the ground between Carbonate and Iron hills. The shaft is now about 630 feet deep, and it will probably be necessary to sink it to a depth of between 700 and 800 feet. When sunk to sufficient depth, the ground is to be thoroughly prospected by a drift south, which will cut through the blue limestone to the contact, here dipping south, and will cross the course of the South Iron, North Iron and Silver Cord ore shoots. Also another drift will be driven north for the purpose of prospecting for other ore shoots not known in that direction. Workings of the Satellite mine are now over in the rocks of Carbonate Hill, which are dipping toward the basin between Iron and Carbonate. The South Iron ore shoot has now been followed to this point. It is in the basin lower down that the largest body is expected to be.

Both the Star of the West and Satellite shafts are equipped with excellent plants of machinery, especially the former. There are two 50 horse-power Abendroth & Root boilers and a 100 horse-power Dickson hoisting engine with two drums.

**LEADVILLE CONSOLIDATED MINING COMPANY.**—Of the ore which was struck in the No. 2 raise from the lower level of the Hegeman shaft, 25 tons were taken out and shipped. The lot assayed 34 ounces silver, 5 per cent lead, and 15 per cent in excess in iron and manganese. The mine was shut down on the 1st inst., as already mentioned.

**LITTLE SILVER COMPANY.**—This company continues to do energetic prospecting work in its property, with no success at all so far. Neither the Sullivan nor the Dexter pumps are run now, the latter shaft being drained by the Cora Belle-Bankok. The mine produces a few tons of ore, taken out in the course of prospecting work, each month.

**MIAMI MINING COMPANY.**—The company has commenced to sink its shaft deeper in order to reach the second or dolomite flint contact.

**PRESIDENT MINING COMPANY.**—The company is putting an engine on the Amity property, and proposes to prospect and develop it. The new ore-body which was recently struck in the President is thought to be pitching into the Amity. The mine is not doing so well now as in the first part of the month, the ore being of lower grade and being sent chiefly to the concentrating mill.

**ST. KEVIN MINING COMPANY.**—We are officially informed that negotiations for the relief of the company from a large portion of its financial obligations are now pending. The president authorizes us to publish the following from the *Leadville Herald-Democrat*: "The company is now running all twenty stamps of the mill, an ample water supply having been secured. About 60 tons of ore per day are being dressed, from which about 12 tons or one carload of pyritic concentrates are produced. The low-grade ore which is furnished the mill assays from 12 to 30 ounces silver. In the mine, the low-grade ore is being broken chiefly in the 350 and 400-foot levels. From the latter a raise for air and prospecting purposes has been made to the 350-foot level. This raise has opened a large body of low-grade ore between the levels, which averages seven feet in thickness. Some ore for the mill is also being taken from the break of the 150-foot level, east, which is now being driven ahead in order to prospect the vein in that direction. This is the first important prospecting

work which has been done in the St. Kevin vein, east of the shaft, no levels hitherto having been driven more than 100 feet in that direction. In the slope, above the 150-foot level, a body of ore, 90 feet long and from 2 to 3 feet wide, which assays from 80 to 50 ounces, has been opened. All ore from the St. Kevin mine, however, which assays over 50 ounces, is at present being sent to the mill and dressed before shipping.

**ULSTER-NEWTON.**—Prominent shareholders state that they will, in all probability, do no more prospecting work on this property, and will abandon the enterprise. Nearly all the shareholders in the Ulster-Newton are St. Louis people. It is said that their reasons for the decision are on account of their inability to make satisfactory terms with the owners of the property.

#### PITKIN COUNTY.

**ST. JOE CONSOLIDATED.**—The several interests in this mine on Smuggler Mountain have been transferred to prominent mining men and capitalists of Denver, who will inaugurate a new system at the mine.

#### SUMMIT COUNTY.

**CHAMPION.**—The lessees of this mine think they have now struck the ore for which they have been prospecting for the past fourteen months. When the mine was last worked before the present lease, the incline which had been following the ore chute struck a fault, and no more prospecting work was done. The present lessees have continued the old incline down through the hanging-wall of the vein, and now have struck ore which is thought to be the continuation of the old ore chute.

**QUEEN OF THE WEST.**—Seven or eight men are working in this mine. A small amount of ore is being shipped, but it is doubtful if the mine is paying expenses.

**ROBINSON CONSOLIDATED MINING COMPANY.**—The lessees of the G. B. R. claim of this company have been obliged to reduce their ore shipments to about 30 tons per day, water interfering with the mining of a greater quantity of ore.

#### DAKOTA.

Governor Church, in his annual report as to the discovery of tin in the Black Hills, states that there is not to-day a producing tin mine nor a pound of Dakota tin in the market. The governor renews his recommendations that the law preventing aliens from acquiring extensive tracts of land be amended so capitalists or money corporations can loan money in the territory on land, and in case they become owners, to be allowed a certain time in which to dispose of it.

#### CUSTER COUNTY.

**GRAND JUNCTION.**—Work is to be resumed on this mine, and a contract has been let for running a tunnel 400 feet in length to tap the ore-body at considerable depth. It is also stated the company will probably move the mill to a point where it may be supplied with ore directly from this tunnel. The distance from the mine to the mill and the necessity of handling the ore often precluded all possibility of profitable working.

#### LAWRENCE COUNTY.

**SEABURY-CALKINS CONSOLIDATED MINING COMPANY.**—This company has decided to rebuild a larger and more substantial hoisting plant than the one recently burned, and before the first of December everything will again be in operation. Shipments of ore will be made to the Omaha Smelting Works.

#### GEORGIA.

#### HABALSON COUNTY.

**CAMILLE GOLD MINING COMPANY.**—This company is now at work sinking its shaft 200 feet deeper than it was, and is making arrangements to put in new hoisting machinery to facilitate the handling of the material. As soon as the shaft is sunk 200 feet deeper it is the intention to add 40 to 60 additional stamps to the mill, thus trebling or quadrupling its capacity.

#### IDAHO.

E. A. Stevenson, governor of Idaho, in his annual report, states that the report from the United States Assay Office at Boise City, shows the gold, silver and lead production of the territory for the year was \$8,905,135, of which the gold was \$2,522,209, the silver \$3,422,657, and the lead \$2,960,270.

**DEER CREEK MINING COMPANY.**—Mr. J. C. Hall has furnished us with the following: The company had a surplus carried over from last year of about \$5000, and with water from melting snow during spring washed out sufficient to have a balance of \$1749 50 on August 9th, when the new ditch was completed, since which time there has been no general cleaning up; but several partial cleanings made amounted to about 600 ounces of gold dirt. A final cleaning will be made this fall as late as possible before cold weather. The company is trying to put the property in shape for extensive work next season.

#### INDIANA.

#### GRANT COUNTY.

**MISSINEWA MINING COMPANY.**—This company has sold its natural gas plant at Marion, four wells, twenty miles of pipe, etc., to the Citizens' Gas Company, for \$100,000.

#### KENTUCKY.

**UNITED JELICO COAL AND IRON COMPANY.**—This company has purchased coal and iron lands and mines in the Jellico region, on the Kentucky-Tennessee line. The company was organized by Eastern capitalists, the owners of the main Jellico Mountain, the Jellico Mountain coal and coke and the East Tennessee coal properties, with a capital stock of \$5,000,000. This leaves out the Proctor Mining Company, which was originally to have been a party to the combination. The total of mining lands acquired by the consoli-

tion is said to be 60,000 acres, paid for by an issue of \$2,000,000 first mortgage bonds, with \$4,000,000 of stock. Of first mortgage bonds, \$500,000 additional is placed in the hands of trustees to purchase additional lands, and \$1,000,000 of stock is also left unissued.

#### MICHIGAN.

[From an Occasional Correspondent.]

**MARQUETTE.**—Gold items are scarce. Michigan still finds some good specimen rock. Prospectors are working as far west as Clarksburg, but with no flattering results as yet.

In your last number of the JOURNAL I note that Venstrom proposes introducing his magnetic separator on this range. There are beyond doubt in this district vast bodies of mine waste that contain a large percentage of magnetic rock and ore, the successful separation of which from gangue and the removal of sulphur and phosphorus from the crushed ore, will yield enormous revenue, and we all are awaiting the advent of the man and machine that will accomplish the object.

The work of the Republic Reduction Company is hand-sorting (only) the dumps upon the Republic Company's ground. They have had a very marked success in their work, both in cost of operating and quantity obtained. The latest official returns of shipments from Marquette are 15,524 tons for the week ending on the 17th inst. The product runs from 62 to 63 per cent. of metallic iron and of a Bessemer quality.

A new (Edison system) plant for the treatment of the Samson (formerly Argyle) mine dumps is in process of erection at that mine, and it is expected to be in operation within a month or six weeks from now. The heavy framing is completed.

The recent progress of electrical matters is astonishing, and the coming of two concerns to this range shows conclusively that there will be found a way to treat the lean ores that have lain idle for so long.

If given permission I hope to be able to send you some interesting matter concerning the operation of the magnetic separators.

#### COPPER MINES.

It is said that efforts are being made by Thomas F. Mason and others who own land in Section 15, adjoining the Tamarack Senior, to organize a company for the purpose of opening the Calumet lode on that property. It is believed, however, that it will take four years to bring it to a producing point.

**ADVENTURE.**—Mr. Edward Trevillian has leased this mine for three years. Work on the property will begin at once. There are several hundred tons of good rock in the mine, which Mr. Trevillian will stamp.

**EVERGREEN.**—The ore mined during the summer is being hoisted. A deposit of copper was found, from which it is said 15 to 20 tons of copper was taken.

Our special correspondent sends us the following: Developments are taking place which promise in the near future to have an important effect on the Upper Peninsula. A railroad company has within the past ten days been incorporated, to be known as the Northern Michigan Railroad Company, the originators of which are local capitalists. The intention is to build a railroad in almost an air line from Houghton to Watersmeet, touching the Huron and Atlantic mines, and also the mines of Ontonagon County. This road will run for almost its entire length along the copper range south of Portage Lake, and through a heavily timbered country, heretofore wholly undeveloped, but known to be immensely rich in mineral. With the opening up of this new tract of country I look to see new mines discovered.

**ATLANTIC MINING COMPANY.**—The mine, just at present, is looking a little poor, but there are several places of most excellent ground which have recently been opened up. At the 18th level, north of No. 3 shaft, the lode, which is full of copper, has just been tapped. At this point some excellent stoping ground will be developed. Work at the 7th level, north of No. 1 shaft, has recently been commenced anew, after lying idle for some time. The ground already opened is showing up well and will furnish a good deal of excellent stoping ground. The skip road is being extended from the 5th to the 7th levels at No. 1 shaft. A new hoist, with balance weight, has recently been completed at this shaft, and is working very satisfactorily. They are hoisting at this shaft from 90 to 100 skip loads per shaft, and only using three quarters of a cord of wood. About 1000 tons of rock are being taken from the mine each day, about 960 of which are sent to the mill. The product for the month will be in the vicinity of 220 tons. Up to September 1st the mine had produced 2,746,000 pounds of ingot.

**FRANKLIN MINING COMPANY.**—General repairs, which are always necessary at any mine, are being made, such as new boilers, etc.; the old ones are gradually being replaced by new ones of the "fire-box pattern," which the management think will cause a large saving as to fuel, etc., and will furnish a supply of steam for all purposes as the mine is worked deeper. At the mine, a few days ago, we saw a handsome pile of barrel and mass copper, which shows there is still a present value to the old mine, to say nothing about the future, and as the new or east lode, which has been recently struck on the foot-wall side of the old lode, will doubtless add much to the future production of the mine at an early day, as we understand openings are rapidly making and prospects flattering, we look to see the product of the Franklin increased during the coming six months. The new sand wheel which is about completed at the Franklin mill will be in operation in a very short time; it will distribute the sand on the flats in such a way as to give the company plenty of sand room for years to come, and entirely obviate the necessity of moving the mill, as some have supposed would be necessary.

**HURON MINING COMPANY.**—The outlook for the management and stockholders at this mine seems to be very good now. Discoveries have recently been made with the diamond drill, which promise good results, and from the nature of the rock already gone through, greater developments are expected ahead by the management, which is not often far out of the way regarding anything of this kind. From the amount of copper already produced thus far this month, I think the output for the entire month will show an increase over that of last month (September) and from the character of the ground worked, together with the results already attained with the diamond drill, I look to see the Huron continue to improve. Everything on the surface about the location is kept in good trim running order, and has an air of prosperity and thrift.

**TECUMSEH MINING COMPANY.**—All along the copper range extending through Houghton and Keweenaw counties are old abandoned mines which will at some future day be worked, and some of them at no very distant day either. Among them is the old Tecumseh, which lies south of the Osceola. The mining site comprises a large amount of land, through which many of the best lodes must run. We hear from some of the best mining men of the district that this old mine would well pay to open and develop, and understand there are negotiations now going on with a party of English capitalists for the purchase.

#### MONTANA.

#### DEER LODGE COUNTY.

**HOPE MINING COMPANY.**—An official report to us shows that the production for September amounted to \$132 in gold, \$16,376 in silver, a total of \$16,508 for the month, and a grand total of \$179,303 for the nine months of 1888.

**SAN FRANCISCO CONSOLIDATED MINING COMPANY.**—Everything in connection with the mine is in active operation. The main shaft, an incline, is now down 465 feet, going for the 600 level. The only development going on now is in the shaft and 400-foot levels, both east and west. The 400 west drift is in 323 feet. The company is said to have sufficient money in the treasury, after all bills have been paid, to run for several months and in fact until after the new mill is erected. A plot of ground of 60 acres directly on the railroad, about one mile from Phillipsburg, has been purchased and building the new mill will commence about March 1st. It is the superintendent's opinion that by the time the mill is completed the mine will be in condition to produce at least 50 tons per day of ore that will pay a handsome profit after the milling expenses are taken out.

#### JEFFERSON COUNTY.

A fifty-ton concentrator is being built at Cataract, about nine miles from Wickes, for a St. Paul syndicate, to treat the silver-lead ores of the Evening Star mine, owned by J. O. Briscoe, of Helena. There are at present about 7,000 tons of ore on the dump, and the mine is being constantly opened up. The new concentrator, when completed, will cost in the neighborhood of \$25,000. The machinery has been furnished by Messrs. Fraser & Chalmers.

#### LEWIS & CLARKE COUNTY.

**EMPIRE MINING COMPANY, LIMITED.**—The official report shows that the production for September was: Bullion, \$16,500; concentrates, \$1600; total, \$18,100. The working expenses for the month were \$13,110. The short run (24 days) is accounted for by the breaking of casting to engine, which is now repaired.

#### SILVER BOW COUNTY.

**ALICE GOLD AND SILVER MINING COMPANY.**—Arrangements are making for resuming operations on the Magna Charta mine, which has been lying idle for the past twelve months. At the same time the old twenty-stamp mill will begin dropping on ore.

**BLACK ROCK.**—A fire at this mine last week destroyed the hoisting-works. The mine is under lease to W. A. and Joseph Clark and was being regularly worked, the ore being shipped to the Butte Reduction Works. A new hoist will be constructed at once. After this work has been finished the shaft will be put down to the 200-foot level.

**PARROT SILVER AND COPPER COMPANY.**—The Bellona mine has been purchased by this company and \$65,000 deposited in the First National Bank of Butte. This sum is to be handed to owner when a mining patent has been granted. In the event of the non-arrival of the patent the money will revert to the Parrot Company. The Bellona lode joins the company's mines immediately on the south. During the past year it has been worked under lease and considerable development work has been done.

We have received the following from a Butte City correspondent:

**BUTTE & BOSTON COPPER AND SILVER COMPANY.**—This new organized company covers a larger area of mining property than the Anaconda, the Chambers syndicate or the Boston & Montana Consolidated.

The property may be divided into three groups of mines, the first group consisting of the Bell of Butte, the Annie & Ida and the Chicago, lying between the Alice mine on the west, the Aurania and Moose, worked by the Boston Consolidated, on the east.

The second group consists of the Transit, Del Monte, Missoula, Wappelo, Buenos Ayres, Alexander, Flag, La Plata, Sister, Midnight, Josephine, Gray Rock and others. The west boundary adjoins the Lexington mines, and the ore-bodies west from the Gray Rock shaft are like those rich silver ores found in the upper levels of the Lexington mines. On the east the Gray Rock adjoins the Wild Bill, the Belle and the High Ore. Two distinct veins run from the Gray Rock into the Belle and the High Ore mines.

The management proposes to sink a new shaft on

the Gray Rock, between those two veins, to strike the ore-bodies known in the Belle and High Ore by their richness in copper and silver.

The work done in the old Gray Rock shaft is a model to show how not to work a mine. It looks as if the former management of this mine tried to avoid tapping the vein. Recently the present manager, as I was told, made several cross-cuts, and, of course, found a big, strong vein within a few feet from the old levels. This was especially the case in the 200-foot level, and also in the 300-foot level. East from the shaft is a strong vein of copper ore, carrying from 1 1/4 to 3 ounces of silver to the per cent of copper.

The third group of mines consists of the Silver Bow properties, covering from 250 to 300 acres of mining ground.

On the west they join the Tramway & Sonohomish lode, the controlling interest of which is bonded to Mr. Raunheim.

Both these two properties adjoin west the Johnston and Pennsylvania (Harrison Lloyd tunnel), in regard to which I demonstrated in my last letter of the 10th, referring to the Boston & Montana Consolidated, that they are crossed by five copper veins—the Bellona, the two Parrots, the Anacouda, St. Lawrence, and the South Mountain View.

The Silver Bow properties take in all the ground south of the Boston & Montana, Colusa Gambetta properties, and therefore are bound to receive these veins in their course due east and southeast referred to above.

The Manager of the New Butte & Boston Company proposes to sink a shaft east from the Pennsylvania in order to tap all these copper veins.

The Butte & Boston runs a 30-stamp mill, of which the estimated profit is \$20,000 per month.

The company has already bought a range south of Butte to erect a copper smelting plant. I understand there is water in sufficient quantity for all purposes. In my next letter I shall give you some items on other copper properties here.

NEVADA.

EUREKA COUNTY.

**EUREKA CONSOLIDATED MINING COMPANY.**—At the annual meeting held in San Francisco on the 15th inst. the old management, composed of the following directors and officers, was re-elected for the ensuing year: William Fries, President; P. N. Lilienthal, Vice-President; W. S. Wood, D. Friedenrich and F. Benjamin, directors. Captain H. P. Bush was re-elected Secretary. H. Donnelly Superintendent and the Bank of Nevada Treasurer. The Secretary's financial statement showed a credit balance of \$34,323.50 over all liabilities. In his annual report President William Fries says that the yield from the company's mines and speiss has enabled them to disburse nine dividends, aggregating \$112,500, during the past year. In addition they have succeeded in adjusting and compromising several expensive lawsuits against the company. They are in hopes of continuing the monthly dividends, but having run into a low grade of speiss the net yield proved insufficient; however, a better quality of this material may soon be hoped for. Over 6,000 tons of ore have been extracted from the mine during the year, largely from the K. K. ground. Superintendent Donnelly in his official report says that in January last a body of ore was found between the second and third levels of the K. K., from which and the Champion and Marcelina ground nearly all the ore extracted in the past year has been taken. There is about the same amount of ore in sight now as at the beginning of the year. It has been estimated that 40,000 tons of speiss have been made at the furnace; assay value, \$20, per ton, of which 20,000 tons have been resmelted at a fair profit, leaving 20,000 tons still in the dump, and 10,000 tons matte, which will pay for re-working, which, with the ore that can be extracted from the mine, and custom ore that may be brought, will keep the furnaces running profitably for two years, as stated in previous issues of the ENGINEERING AND MINING JOURNAL. President Fries also recommends that the Richmond Mining Company be urged to unite in pumping the water from both properties through the new Locan shaft.

The papers in the Kleupfer suit have been served, and it is reported that the government timber suit will also be opened before the close of the month. This latter suit appears to be important. For years past both the Eureka and Richmond companies have been purchasing timber for their mine and smelting works from the Palisades and Eureka railroad company, and from the individual timber cutters of the county. The inhabitants of the district have derived a revenue from the sale of the timber, and no word of complaint has ever been made. Recently, however, the Commissioner of the General Land Office recommended that suits be brought against the mining companies for the value of the timber used during the existence of the mine, which is estimated at \$4,000,000. The Commissioner states that all the forests for miles around have been destroyed. The Eureka papers say that no valuable timber ever existed in the county and if any injury has been done, the community has been fully compensated by the very existence of two great mines in its neighborhood. It is further argued that the companies themselves have never felled any timber, all of it being purchased. Should the government press these suits successfully, however, it would be a serious matter for the stockholders of the Eureka Consolidated Mining Company.

LANDER COUNTY.

**HOMESTAKE.**—Mr. J. A. Blossom is reported to have sold to an English company this group of silver

mines situated in Pittsburg Mining District. The present owners will immediately put a force of men to work developing the property and building a mill preparatory to the reduction of ore.

**MANHATTAN MINING AND REDUCTION COMPANY.**—This company, to the organization of which we referred in our issue of August 25th, is making arrangements to begin active operations at the mine. Mr. A. Graham will take charge of the property as manager and superintendent. This company purchased the property of the Manhattan Silver Mining Company at sheriff's sale some months ago.

STOREY COUNTY—COMSTOCK LODGE.

We condense the following from the Virginia City Chronicle:

**BEST & BELCHER MINING COMPANY.**—The improvement on the 300 level is less than 150 feet south of the Consolidated California & Virginia north line, and is far west of any former explorations conducted in the mine. Quartz of value and extent was developed at several points in the Best and Belcher, below the present base of operations, but no considerable body of ore was found. The Chronicle recently alluded to the remarkable fact that while the Consolidated California & Virginia mine, adjoining the Best & Belcher on the north, had produced above \$200,000,000 in bullion, and the Gould & Curry on the south had proved prolific in precious metal production, the 540 feet of ground in Best & Belcher had so far proved almost barren of mineral, which is accounted for on the theory that there is a faulting of the vein in the latter. Explorations on the 300 level indicate that the point of divergence from the general trend of the vein has been discovered and may result in proving that the Best & Belcher is as fertile in ore as its neighbors.

**CONSOLIDATED CALIFORNIA & VIRGINIA MINING COMPANY.**—The official report of operations notes the discovery of ore on the 1650, further south than any heretofore developed on that level. A winze is being sunk on this ore at the end of the south drift, and the prospect is favorable for an important development in that part of the mine. The point where the winze is being sunk is located in the old Consolidated Virginia ground, between 250 and 300 feet north of the Best & Belcher north line, and west of the old 1650 level stopes. The Chronicle is officially informed that the bullion yield the current month will be ample to cover the cost of production and the payment of the regular dividend in November without intruding on the treasury surplus.

**CONSOLIDATED IMPERIAL MINING COMPANY.**—The assessment of five cents per share just levied, if all collected, will bring \$25,000 into the treasury, as the 500,000 shares of capital stock are now all out. The company intends to do some active work in the mine, and is providing the funds therefor.

**POTOSI MINING COMPANY.**—At the end of September the indebtedness amounted to \$42,702.10. The assessment (No. 31) of 50 cents per share now being collected will free the mine from debt, and by November 1st, the use of a portion of the Nevada mill will probably be had, and it is expected that a surplus can be accumulated from the profitable working of ore. The lack of milling facilities has embarrassed the Potosi, as it has other mines on the Comstock in which considerable prospecting work is always going on.

**SIERRA NEVADA MINING COMPANY.**—Quartz of value is being stripped on the 520 level.

**SUTRO TUNNEL COMPANY.**—The United States Marshal has published a notice of the sale of the Sutro Tunnel and all the property owned by the company and incorporated under the title of the Sutro Tunnel Company, in obedience to a decree of the United States Circuit Court in the suit for foreclosure of mortgage held against the Sutro Tunnel Company by Hugh McCalmont et al., for which the Union Trust Company of New York is substituted. The Sutro ranch, Sutro Springs, and Seg. Belcher mine are specified in the list of property to be sold. The sale will take place at the County Court House, November 12th, 1888, at 12 o'clock M. The sale includes all franchises and privileges granted the Sutro Tunnel Company by Congress.

The report for the month of September shows: Receipts, 1888, \$14,976; expenses, 1888, \$10,864; net, 1888, \$4,112; 1887, \$11,779; increase, \$2993. Officials of the company say that September is the poorest month of the year, owing to scarcity of water in the Carson River, so that the mills cannot be worked.

NEW MEXICO.

GRANT COUNTY.

**COLCHIS MINING COMPANY.**—It is reported that seventeen men are at work on the Legal Tender bill, taking out ore for the new mill below Silver City. The plant when completed, it is said, will handle over one hundred tons of ore every twenty-four hours.

**SANTA FE COPPER COMPANY.**—This company, which succeeds the old San Pedro & Cañon del Agua, and to the organization of which we referred in our issue of September 8th, is ready to exchange its securities for those of the San Pedro in the proportion of one share for two shares of San Pedro preferred and one share for four of San Pedro common. Irving A. Evans & Co., of Boston, Mass., will receive certificates and give receipts therefor, as well as deliver the new certificates when ready. Thirty days are given in which to make the exchange, a majority of the San Pedro stock already having assented.

SANTA FE COUNTY.

A correspondent sends us the following from Santa Fe: The San Pedro copper mine, sixteen miles from

Cerillos, on the Atchison, Topeka & Santa Fe Railroad, has been in full operation for several months past, and it supplies the copper ore for two water-jacketed furnaces which are situated near the mine. The copper deposit consists of a series of blanket veins in a contact between porphyry and limestone.

The highest grade ore-body consists of blue and green carbonates, gradually changing into copper pyrites. The most decomposed ore contains some gold, perhaps \$2 per ton. Several tunnels, inclines, and drifts have been run, but without any apparent system.

The total length of one of the inclined shafts is 610 feet. There is a good deal of ore in sight; the entire mass will average 10 per cent of copper.

The plant consists of two water-jacketed smelting furnaces, each of 25 tons per day capacity; two reverberatory furnaces; eight roasting kilns (100 tons each capacity); two engines, 80 and 40 horse-power respectively; two boilers; two No. 5 improved blowers; water tanks with all pipe connections complete; two pumps, 6 inch suction and 5 inch discharge two smaller pumps used to re-pump water back to supply tanks; one diamond drill; two Blake crushers; one pair Cornish rolls. Water from different points is plentifully supplied, sufficient for all smelting and milling purposes. Wood delivered at the works costs \$2 per cord; soft coal, \$5 per ton; coke, \$10 per ton; charcoal, ten cents per bushel; fire-clay for furnace use and fire-brick is dug close at hand, with limestone, iron ores and fine sand within a mile and in large bodies.

The copper delivered at New York will not cost more than about 6 1/2 cents per pound of fine copper.

If a proper concentration plant were erected the present output, even with the furnaces already in existence, could be increased from 300,000 pounds to 600,000 fine copper per month, and thus the cost of production be materially reduced.

Miners are paid \$2.50, surface labor \$2, and furnace hands from \$3 to \$3.50 per day.

NEW YORK.

**NORTH BUFFALO NATURAL GAS FUEL COMPANY.**—This company, a new organization, has applied to the Common Council at Buffalo for permission to lay pipes, etc, for the supply of gas for heating, lighting and manufacturing purposes.

OHIO.

The Standard Oil Company has purchased 500 acres in the Ohio oil field.

**SOUTHEASTERN GAS COMPANY.**—A successful natural gas exposition was held at Cambridge on the 23d inst. This territory has been developed by this company, which is composed of Baltimore and Washington capitalists, among whom are Henry A. Parr, president, C. Ridgely Goodwin, W. H. Snyrock, John B. Falck, L. Slessinger, R. O. Holtzman, James Hume, Edward Graves, George O. Manning and H. Hoblitzell.

PENNSYLVANIA.

COAL.

The interest of Isaac N. Large, of Denver, Col., in the lands and firm of O'Neil & Co., coal operators, was conveyed this week to W. W. O'Neil and Harriet R. O'Neil for \$70,000.

OIL.

Exports of refined, crude, and naphtha from the following ports, from January 1st to October 20th:

	1888.	1887.
	Gallons.	Gallons.
From Boston.....	3,577,890	3,336,127
Philadelphia.....	107,459,819	132,959,364
Baltimore.....	6,516,165	6,502,266
Perth Amboy.....	18,382,610	13,535,629
New York.....	288,233,469	305,998,015
Total exports.....	424,169,953	462,031,401

TENNESSEE.

**CHATTANOOGA MINING AND RAILWAY COMPANY.**—The company has leased the ore lands of the Gadsden Mineral Land Company on Dirtseller Mountain, and is building a standard gauge railroad from Melville, on the Chattanooga, Rome & Carrollton Railroad, to the mountain, a distance of about 2 1/4 miles. It is expected to begin shipment of ore about November 1st next.

BLOUNT COUNTY.

A company is being formed to develop slate quarries in this county. It is stated that there are deposits of the finest qualities of both roofing and paving slate.

UTAH.

BEAVER COUNTY.

**COMET SMELTING COMPANY.**—This company, which is composed of capitalists and bankers of Paris, propose, under the supervision of Professor Seblott as engineer and manager, to erect smelting works of a daily capacity of forty tons to cost \$50,000 in the San Francisco mining district.

The company has also secured control of the Cactus mine company's property adjoining, which it will develop.

At the Comet copper mine, the force of men will be increased to forty-five next month. This company, after a four years inaction, has through the efforts of its counsel, Judge Lochrie, resumed operations. In June last a force of men was put to developing the property, as stated in the ENGINEERING AND MINING JOURNAL of June 30th.

WISCONSIN.

IOWA COUNTY.

According to reports, a valuable zinc mine has just been discovered near Dodgeville by three brothers—David T., Jesse and Henry Williams—who have been prospecting for several years past with little success.

FOREIGN MINING NEWS.

AUSTRALIA.  
SOUTH AUSTRALIA.

Copper is attracting some attention, and lodes are being opened all over the colony. One of the most remarkable deposits seems to be that at Mount Gunson, 70 miles northwest from Port Augusta, where a rich green silicate of copper, assaying 55 per cent and carrying also 18 ounces of silver per ton, has been found in large quantities, so great that it is said to be quarried out from the side of a hill which seems to be full of it.

CANADA.

PROVINCE OF ONTARIO.

CANADA COPPER COMPANY.—This company, in the Sudbury District, has now six piles of copper ore burning, four of 250 to 300 tons, and two of 450 to 500 tons. Forty of the 75 feet of chimney is built, foundations for boiler and engines are ready and everything points to rapid completion and a start at smelting before winter. The Jenckes Machine Company, of Sherbrooke, Que., is building the water jacket smelting cupola, which will be sent up here in sections. In mining, the management report an output last month of 3000 tons of good smelting ore. The Copper Cliff has a depth of 385 feet on the dip, and a total length of drifts and cross-cuts of over 800 feet.

CENTRAL AMERICA.

HONDURAS.

SAN RAFAEL MINING COMPANY.—A number of New York capitalists, with a capital of \$1,000,000, have filed papers with the Secretary of the State of Colorado, forming the corporation of the San Rafael Mining Company. The work of the company will be prosecuted in the district of Governador. The mines to be worked are the San Rafael, San Antonio, Concepcion and Socorro. John E. Foster, Floyd & Wilson, Cassius E. Ingalls, Everett P. Schutt, John Howard, Theodore Stevenson, and Barton B. Jones, all of New York, constitute the Board of Directors.

Another corporation, under the name of the Cortland-New York-Honduras Association, having the same capital and objects, also filed its articles with the Secretary of the State of Colorado. The same gentlemen are interested in the company.

MEXICO.

We take the following from the Mexican *Financier*: CHIHUAHUA.—A correspondent writing from Guadalupe y Calvo, under date September 29th, says: "A party of prospectors recently united in exploring the Rosilla mine in Piedra Larga and struck good ore. A few days ago the deed of sale to Mr. J. D. Knotts was formally executed." Our correspondent adds that "if all the prospectors in the region were to follow the same plan of uniting their labors, they would succeed in discovering many rich veins which by their individual and desultory efforts they could never succeed in reaching."

PACHUCA.—The mining share market is flat with the exception of some brisk trading in shares of the Santa Gertrudis.

The director of the Mineral Real del Monte Company recently denounced the water which passes through the mines of San Buenaventura and Encino to the barranca which leads to the hacienda of Loreto, with the object of forming a reservoir, and by means of tubes, carrying it to the hacienda mentioned. This water has, for some time, been used by the Maravillas Company for washing off their ores, and in virtue of which it was given them by the mining deputation. The mines which were benefited by the use of this water have sent in a protest to the deputation, and, as they were not cited to appear according to the express clauses of the mining code, the matter will, doubtless, be referred to the Minister of Public Works for his decision in the affair, especially as according to the code, the owners of the water should have been cited not only to the possession given to Mr. Landero but also to the denouncement. The affair has caused considerable excitement in Pachuca and it is believed that the Minister of Public Works will decide the case justly.

SOUTH AMERICA.

UNITED STATES OF COLOMBIA.

SANTIAGO GOLD MINING COMPANY.—The last report from the Superintendent, John Grodhaus, dated September 13th, states that during the week 32 tons of ore, carrying \$27 per ton in free gold, were extracted from the La Guaca vein and 11 tons, carrying \$7 per ton, from the Harper vein. The Harper vein in the face of the tunnel is eight feet wide. South tunnel No. 4 has been extended five feet, vein is three feet wide and is rich in sulphurets, but carries very little free gold. South tunnel No. 2 west has been driven five feet, vein is one foot wide, rich in sulphurets and carries \$45 per ton in free gold. Ten stamps are now running on good ore.

COAL TRADE REVIEW.

NEW YORK, Friday Evening, Oct. 26.

Statistics.

Production of Bituminous Coal for week ended October 20th, and year from January 1st:  
EASTERN AND NORTHERN SHIPMENTS.

Tons of 2240 lbs.	1888.		1887.	
	Week.	Year.	Year.	Year.
Phila. & Erie R.R.	1,434	51,298	15,496	15,496
Cumberland, Md.	72,515	2,867,949	2,509,140	2,509,140
Barclay, Pa.	3,500	133,191	147,056	147,056
Broad Top, Pa.	8,089	284,178	269,216	269,216
Clearfield, Pa.	60,106	2,030,145	2,332,221	2,332,221
Alleghany, Pa.	15,714	627,729	681,050	681,050
Pocahontas Flat Top.	25,792	1,108,440	808,227	808,227
Kanawha, W. Va.	35,040	1,291,671	1,108,498	1,108,498
Total	222,850	9,044,601	8,130,904	8,130,904

WESTERN SHIPMENTS.

Pittsburg, Pa.	18,501	579,144	445,610
Westmoreland, Pa.	30,486	1,228,072	1,118,385
Monongahela, Pa.	8,617	321,921	303,430
Total	57,604	2,129,137	1,867,425

Grand total..... 280,454 11,173,738 9,998,329  
Production of Coke on line of Pennsylvania R.R. for week ending October 20th, and year from January 1st, in tons of 2000 lbs.: Week, 86,194 tons; year, 3,178,780 tons; to corresponding date in 1887, 2,871,123 tons.

Production of Anthracite Coal for week ended October 20th and year from January 1st:

Tons of 2240 lbs.	1888.		1887.	
	Week.	Year.	Year.	Year.
P. & Read R.R. Co.	202,116	5,566,485	5,900,540	5,900,540
Cent. R.R. of N. J.	146,516	4,523,015	3,927,947	3,927,947
D. & W. R.R. Co.	250,087	5,314,443	5,070,034	5,070,034
D. & L. W. R.R. Co.	181,985	5,540,096	4,573,790	4,573,790
D. & H. Canal Co.	100,779	3,584,046	3,077,840	3,077,840
Penna. R.R.	61,330	3,655,558	2,900,169	2,900,169
Penna. Coal Co.	37,839	1,364,544	1,223,443	1,223,443
N. Y., L. E. & W.	25,000	770,551	615,514	615,514
Total	1,006,372	30,304,648	27,289,277	27,289,277

Increase..... 3,015,371  
The above table does not include the amount of coal consumed and sold at the mines, which is about six per cent of the whole production.

Production for corresponding period:  
1883..... 25,936,102 1885..... 24,402,571  
1884..... 25,089,200 1886..... 25,232,679

Anthracite.

This market remains in an excellent condition, the demand being very active, particularly for stove and chestnut coal.

Many of the companies report orders on their books which will keep them busy until the 15th of November, at least, without any new business. Orders still continue to come in, and it is reasonably safe to assume that the trade will be in a satisfactory condition throughout next month.

The companies adhere very firmly to their last circular quotations, and we hear of one of the companies getting a little more than the quotations for chestnut. We also hear of one company buying some chestnut coal in order to fill its orders. Broken is very dull. Pea coal is in a slightly better demand than it has been for some time, owing probably to the fact that some of the producers have stopped their shipments to tide-water of this size of coal.

Dissatisfaction is expressed by some of the companies over the scarcity of cars.

The latest complainants to appeal to the Inter-State Commerce Commission against the railroads, or rather against the Lehigh Valley Railroad Company, for discriminating in tolls, are Messrs. Coxe Brothers & Company.

The production of anthracite for the week has been very large, not far short of 1,000,000 tons; indeed, some estimates place the tonnage above this figure. Prices remain unchanged, as follows:  
Broken..... \$3.95 Chestnut..... \$4.65  
Egg..... 4.30 Pea..... \$2@2.25  
Stove..... 4.65

Bituminous.

The demand for this coal is fairly good for this season of the year, and the companies are full of orders, some of them having more than they can fill at present.

We understand that a few of the companies are short of supply, and have been buying coal to supply the shortage.

The prices at tide water are nominally as follows: \$2.60 f.o.b. Baltimore and Georgetown, and \$3.25 for New York Harbor.

Boston.

Oct. 25.

[From our Special Correspondent.]

The coal companies are maintaining prices better than many have expected. There is a firmer feeling than last week. Just how this arises is not clear. Stocks of coal are lighter than it was expected they would be at this time and there is a suspicion that the companies have been restricting on the quiet, not according to any agreement, of course, but merely in keeping of a little understanding. In addition to this probable cause of the continued strength of the market, the advance in freight rates has caused an increasing desire to ship on part of retailers and less bickering over f.o.b. prices has been made.

Stove coal is so scarce even now that it is hard to obtain any unless combined with a cargo of larger sizes. Broken and egg are still in very fair supply, and prices are fairly easy at from 25 cents discount to full circular. There is a smaller supply of pea coal on hand than heretofore and f.o.b. prices on this size are not so much in buyers' favor. As heretofore, the jobber having cargoes afloat is the man sought after, and he obtains outside prices.

There has lately sprung up a good demand for bituminous coal afloat. The large contracts were in many cases taken at a price which included or guaranteed freights as low as last year's average rate. Because rates have been higher than last year, shipments have been delayed somewhat, and now the shippers in not a few cases stand to lose on the fall and winter shipments. I have already noted the action of some shippers in buying coal to fill out where they had over-sold. Bituminous coal is in rather light supply and f.o.b. prices are firmer at \$2.35@2.50, while genuine Cumberland coal would be hard to obtain at less than \$2.60, the nominal pool rate.

The advance in freights also tends to enhance the cost of provincial coal so that no more will be brought from that quarter than last year. The shipments are nearly all from Cape Breton, and the freights from that port now make the delivered price \$2.75 or thereabouts. The shipping season from that port closes in about six weeks.

The marked advance in freights is the great feature of the market. Some look for lower rates when vessels at this end go South, but there is no noticeable sign of weakening.

We quote vessel rates, exclusive of discharging: New York, \$1@1.10; Philadelphia, \$1.20@1.25; Baltimore, \$1.35@1.40; Newport News and Norfolk, \$1.30; Richmond, \$1.40; Provincial, \$1.75@ \$2.

There is talk of an advance in retail prices, and one will be made if freights or f.o.b. prices don't come down.

Delivered prices 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.

Buffalo.

Oct. 25.

[From our Special Correspondent.]

The features of the coal market are unchanged, therefore nothing new to report. The dealers are reticent relative to next month's prices, etc., so your readers must await developments until next letter.

During the past few days severe storms and gales have prevailed on the lakes, especially on Huron and Superior, accompanied by rain, sleet and snow. Many vessels damaged or completely wrecked. A few lives lost. Some tons of coal gone out of sight, perhaps forever. A propeller from Port Arthur that arrived at Owen Sound last Monday was a mass of ice from rail to the top of topmast, the ice being three inches thick on her cross-trees. This condition of the elements indicates clearly that navigation this year on the inland seas is drawing to a close, and shippers will doubtless hurry forward all the coal they possibly can, looking to the end in view. Yesterday and this morning weather clear, bright and warm.

Lake freights steady for coal at unchanged quotations. The ruling figures were as follows: \$1 to Chicago and Sheboygan, 90c. to Milwaukee, 75c. to Gladstone, Marquette, Owen Sound and Fort William, 60c. to Duluth and Superior, 40c. to Toledo and Detroit, \$1.10 to Racine, 80c. to Sault Ste. Marie, 70c. to Saginaw, 75c. to Green Bay, 50c. to Bay City, and 75c. to Lake Linden, closing dull for vessels for Lake Superior ports, but good demand for Chicago.

The shipments by lake westward from this port from October 18th to 24th, both days inclusive, were 87,560 net tons, namely, 49,280 to Chicago, 16,740 to Milwaukee, 6180 to Duluth, 2200 to Superior, 2860 to Toledo, 1940 to Detroit, 1000 to Green Bay, 630 to Racine, 550 to Lake Linden, 330 to Bay City, 1270 to Marquette, 580 to Sheboygan, 900 to Fort William, 1000 to Saginaw, and 2100 to Gladstone. The total shipments thus far this season, 2,130,498 net tons, including cargoes on vessels from Tonawanda not reported at the Buffalo Custom House.

The receipts by canal here of coal for third week in October, 7527 net tons; the shipments 273 net tons.

Pittsburg.

Oct. 25.

[From our Special Correspondent.]

Coal.—There has been good barge water since our last report. The October run was a large one, fully eight million bushels; destination, Cincinnati and Louisville. All the Southern and Western markets are overstocked, which keeps prices down to a very low figure. Prices in New Orleans declined 5 to 6 cents per barrel. Prices in the pools are:

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

Connellsville Coke.—As previously noted coke on new contracts is \$1.25, and prices will be higher in the near future. The demand continues to increase and operators are embarrassed for the want of cars. The idle ovens are rapidly disappearing. Production last week exceeds previous one 3,195 tons; shipments have increased 327 cars. The Eastern shipments continue to increase; Pittsburg shipments hold their own; if there were more cars there would be more shipments. The general impression is that a new syndicate will soon be formed and prices regulated.

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 Mahanoy and 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 charters to October 25th per ton of 2240 lbs.  
From Philadelphia to:—Annapolis, 70; Bangor, 1.50; Baltimore, 70@75; Bath, Me., .85; Beverly, 1.25; Boston, 1.30@1.40; Cambridgeport, 1.15; Charleston, 90; Charlestown, 1.00; Chelsea, .85; Com. Point, Mass., 1.10; East Cambridge, 1.12; Fall River, 1.10@1.20; Gardner, Me., 1.40; Galveston, 2.80; Georgetown, D. C., .85; Gloucester, 1.05@1.17; Lynn, 1.40@1.60; Marblehead, 1.05; Medford, 1.10; Milton, 1.20; New Bedford, 1.10@1.20; Newburyport, 1.50; Newberne, 80; New York, .90; Norfolk, 70; Portland, 1.25@1.30; Portsmouth, N. H., 1.40; Portsmouth, Va., .65; Providence, 1.10@1.20; H., 1.40; Rockport, 1.22; Saco, Me., Richmond, Va., .75; Rockport, 1.22; Saco, Me., 1.80; Salem, Mass., .90; Savannah, 1.00; Washington, .85; Weymouth, 1.15; Wilmington, N. C., 60.

From Baltimore to:—Bangor, Me., 1.60@1.70; Bath, 1.60; Boston, 1.50; Bridgeport, Conn., 1.35@1.40; Bristol, 1.25@1.30; Brooklyn, 1.15@1.25; Charleston, 1.00@1.20; Fall River, 1.40@1.45; Galveston, 2.90@3.00; Gardner, Me., 1.75; New Bedford, 1.35; Newburyport, 1.40@1.50; New Haven, 1.35; New London, 1.35; New York, 1.15@1.25; Portland, 1.50; Portsmouth, N. H., 1.60; Providence, 1.35@1.40; Quincy Point, 1.50@1.60; Richmond, Va., .70; Roxbury, 1.50, 3c.; Salem, Mass., 1.50; Savannah, 1.15; Somerset, 1.35; Williamsburgh, N. Y., 1.15@1.25; Wilmington, .85.

\* And discharging. † Alongside. ‡ And towing.



**METAL MARKETS.**

NEW YORK, Friday Evening, Oct. 26.  
Prices of silver per ounce troy.

Oct.	Sterling Exch'ge.	London Pence.	N. Y. Cts.	Oct.	Sterling Exch'ge.	London Pence.	N. Y. Cts.
20	4.87½	43 1-16	94	24	4.87½	43¼	94½
22	4.87½	43¼	94½	25	4.87	43¼	94½
23	4.87½	43¾	94	26	4.87	43¾	94

94 11-16.

**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 5 per cent. During the week the bank gained £194,000 bullion, and the proportion of its reserves to its liabilities was raised from 36·07 to 38·88 per cent, against an advance of 43·87 to 45·47 per cent in the same week of last year, when its rate for discount was 4 per cent. Thursday the bank gained £10,000 bullion on balance. The weekly statement of the Bank of France shows a loss of 7,000,000 francs gold and a gain of 3,375,000 francs silver.

**Copper.**—During the past week little or no attention has been given to copper, owing to the excitement in the lead market. A few lots of Lake copper for December delivery have been sold at 17·70, and at that figure further lots are obtainable. Some Spot copper has also been sold privately at 17·65. Casting kinds continue to be held very firmly, and are now quoted at 16½. Rumors are floating about that the French syndicate is negotiating for an extension of their present contracts with different producing companies for a further term of nine years. The European markets have shown very little variation during the week, and according to cable advices the closing quotations to-day are for Chili Bars Spot £77 15s.; three months, £78 5s. G. M. B. Spot, £77 5s.; three months, £78. Best Selected, £82. From this it will be seen that, if anything, the market is a little easier than a week ago, but the decline in quotations is very significant.

**Tin.**—The market has been very firm throughout the week. Spot tin is exceedingly scarce in this market. The demand on the part of consumers is still very satisfactory. We quote to-day: Spot, 23½@23¾; October, 23½@23¾; November, 23½.

**Lead.**—Another week of great excitement and rapid changes in value has to be reported during the week just past. The failures reported in our last issue having since been confirmed led to large quantities of the metal being forced on to the market at whatever price it would bring, and under the pressure of these forced sales the quotation for lead declined to as low a point as 3·80@3·85c. At these figures, however, strong buying set in, and about the middle of the week, it being thought that these forced sales were about over, a decided improvement in tone and some advance in quotations took place. Subsequently, on further lots being disposed of at the metal exchange "under the rule," the market again became somewhat weaker and a slight decline again took place. On the whole, however, consumers have been buying very freely at the present comparatively low prices, and the various lots forced on to the market have found their way into strong hands, and it does not seem likely that the market will decline further, at any rate for the present, as very little spot lead is now available and the new holders are very firm. The trade has been greatly annoyed by the action of some banking houses who have attached lead in different warehouses in the city, recently stored there by the firm just failed; but it seems that the usual negotiable warehouse receipts have been issued to other parties for the lead in question. It is not anticipated that this action will have any other result beyond a great deal of unnecessary inconvenience. It is also known that large shipments of lead in course of transit from the West have also been attached, and this will keep such lead off the market, at any rate for a time. Our closing quotations to-day are: Spot and futures, 3·85 to 3·95, according to brand and quality, but the market closed still rather unsettled.

The London market was very severely affected on its becoming known that large quantities of lead were held on account of American operators, and at one time quite a small panic occurred and prices were put down to £12 10s. Afterwards, however, on it appearing that the lead in question was in strong hands and would be taken off the market altogether, quotations rallied quickly up to £13 12s. 6d. Our last cable report gives the closing price to-day for Spanish £13 10s.

**Chicago, Ill.**—Everett & Post telegraph us to-day: Market is entirely nominal. The asking price is 3·75c. There is no business, except of a jobbing character.

**Spelter** is rather firm, and domestic is now quoted 5·15@5·25.

**Antimony** remains very firm and in good demand. Hallett's is quoted 10½@10¾c., and Cookson's 14c.

**METAL JOBBERS' COMBINATION.**

The wholesale metal dealers of Boston have a combination which regulates prices on certain metals when sold in jobbing lots quite as effectively as any trust regulates the price of the article it controls. The members of this metal dealers' combination meet once a week, generally Saturday, and fix the prices for the coming week on a sliding scale, according to the quantity of the metal sold and to the price of large lots each day.

Thus in the case of tin, which comes to the market in the shape of 100 pound pigs, there is one price on

these pigs in lots from 1 to 5 pigs inclusive, and another price for lots from 6 to 19 pigs inclusive, and another price for ton lots. Thus the price Wednesday, for 1 to 5 pig lots of tin, was 27 cents per pound, and for 6 to 19 pig lots 26 cents per pound. The price for pig tin in ton lots in New York, the importing port, on Wednesday, was 23½ cents for 30 day's delivery and about 23¼ cents for spot tin. The freight to this market including cartage is only ¼ cent.

All the metal dealers in the combination have some special customers whom they protect, and sell to under the combination figures, and good, shrewd buyers often can pick up lots at much less than the combination prices by buying of brokers who sell on the basis of New York prices.

The combination is in force on tin plates also, which are sold in boxes of 108 pounds net to the box. The price in New York Wednesday was \$4.60 per box for coke plates, and the price here was \$5.25.

The combination also regulates prices on jobbing lots of Russia iron and on galvanized iron. Thus the price of galvanized iron in a fair-sized jobbing lot is held by the combination at 5¼ cents per pound, while from 10 to 20 package lots could be sold at 4¼ cents. The extra price which the combination of metal dealers pays for Russia iron may be seen from the figures of a recent sale by a broker, about 18 or 20 packages, at 8½ cents per pound for Nos. 10 and 11; the price asked for which by the combination was from 9½@10 cents.

The price of sheet zinc is also fixed in the same way. It costs about 6 cents landed at store in Boston, and is sold at 6½ cents. Spelter is sold in a similar manner, and solder, which is sold for 17 cents per pound, can be bought for 14½ cents for 500-pound lots.—*Boston Commercial Bulletin.*

**CHEMICALS AND MINERALS.**

NEW YORK, Friday Evening, Oct. 26.

**Heavy Chemicals.**—The market has been quiet, with no urgent demand, light stocks and prices ruling generally firm. The only sales reported are small quantities for immediate consumption. The uncertainties of the situation preclude any speculative demand. Neither dealers nor consumers are willing to carry heavy stocks until something definite concerning the tariff legislation has been decided upon, or until the future course of the English market is actually settled. The caustic soda combination and the bleaching powder syndicate completely control these articles, but concerning soda ash there is not so much certainty. The salt combination will increase the price of raw materials to such an extent, it is feared, that the German manufacturers will be formidable competitors; furthermore, the continual battle of the Leblanc and Solvay processes for supremacy prevents any combination of soda ash manufacturers. It is obvious, therefore, that American consumers are discreet in not making heavy purchases at present. Liverpool advices report that the caustic soda makers have decided upon a reduction of 10 per cent in their November output. Other than this, there have been no new features in the English trade, the feeling of confidence noted in previous reports being still apparent.

Carbonated soda ash, 48 per cent, Liverpool brands, is not meeting with as much attention. Manufacturers seem to be much more absorbed in politics than in the question of chemical supplies. Stocks are light, however, and prices are firm at 1·27½@1·30c. from store, and 1·25@1·27½c. to arrive.

Newcastle ash is in limited supply at 1·22½@1·27½c. to arrive, and 1·30c. on the spot.

Caustic soda ash, 48 per cent, is neglected. Prices rule firm at 1·32½@1·35c. on the spot, and 1·25@1·30c. to arrive, according to quantity.

Caustic soda has recovered its firmness of a week ago, on the strength of the Liverpool reports concerning the decrease in next month's production. Consumers are not inclined to enter the market to any great extent, however, and in the absence of any special demand, we are unable to record any further rise in values. The market is firm, however. Sixty per cent, which is greatly neglected, is quoted at 2·55@2·60c., and the higher tests, 70@74 per cent, at 2·22½@2·37½c., according to quantity. Seventy-seven per cent is held at 2·37½@2·40c.

Sal soda is quiet and dull, no change in either the demand or in prices being reported. Ruling quotations are 95@1c. on the spot, according to quantity, and 95@97½c. to arrive.

Bleaching powder is very scarce, the arrivals in this port having been very light during the week. Prices show another advance. The ruling quotations are 2·25@2·30c. for small lots on the spot, and 2·20@2·25 to arrive.

**Acids.**—The market rules quiet and dull, with business almost entirely of a jobbing character, the only exceptions being nitric and sulphuric acids, which are in improved demand. There has been more talk of a "combination," but the indifference of the larger manufacturers seems to effectually check any progress in this direction.

Acetic acid.—There has been no business to test values, and prices are largely nominal. Contracts are eagerly made at anything over 1·80c., although we note that in some quarters the old quotation, 2¼@2¾c., is continued.

Nitric acid seems to be improved in tone, but we are unable to learn of any stiffening in quotations, which are about as follows: 36°, 3¼c.; 38°, 4c.; 40°, 4½c.

Muriatic acid is quiet, and without interest. Ruling prices are: 18°, 1·10@1·15c.; 20°, 1·25@1·30c.

Oxalic Acid.—No important business is reported.

Prices remain at 9c. per pound for small lots, with ½c. per pound off for large orders.

**Sulphuric acid** is very firm. Manufacturers are sold out to the limit of their capacity in most cases. We have heard of a sale of 1100 carboys at 90c. per lb. to the Standard Oil Company. Few manufacturers will accept less than 95c. for the usual trade, while small quantities are held as high as 1·15@1·25c. for 66 degrees. Sixty degrees is quoted at 90@95c.

**Fertilizers.**—The market continues in excellent condition: prices seem to be well sustained, with a fair demand and considerable business. The revised price list is about as follows: Azotine, \$2.50@2.55 as to quality; dried blood (city), low grade, \$2.40 per unit; Western high grade, \$2.50 per unit for ground material; tankage, high grade, \$2.3@2.5 per ton; low grade, \$2.1@2.2 per ton. Fish scrap, \$2.4@2.5 per ton f.o.b. factory. Sulphate of ammonia, \$3.25@3.35 per cwt.

Refuse bone-black, guaranteed 70 per cent phosphate, is quoted at \$19.00@19.50 per ton. Dissolved bone-black is 90c.@\$1 per unit for available phosphoric acid, and acid phosphate 75@80c. per unit for available phosphoric acid.

Steamed bones, unground, \$19; ground, \$25@26. Charleston rock, undried, \$5@5.25 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.

**Muriate of Potash.**—Prices have again risen, the limited supplies giving the market a tone of strength. The market may be quoted \$1.85@1.90 for both spot and arrivals.

Double manure salts are firm at 1·15@1·20c. on a basis of 48-50 per cent potash.

High-grade sulphate of potash continues scarce, at \$2.35@2.40 per 100 pounds on the spot, and \$2.30 to arrive.

**Kainit.**—The market has every element of strength; there is nothing on the spot, everything afloat has been sold, and contracts for future delivery are held very firmly; in short, the only stock obtainable is in the way of resales of small lots at advanced prices. The arrivals during the week have been very light. The nominal price ex store is \$10.50; to arrive \$9.75, and for December-January shipment, \$9.50. Resales of small lots on the way are reported at \$11.

**Brimstone.**—The market is firm and business light. Ruling prices are \$24 on the spot, \$21@23 to arrive, according to quantity and position, and \$19.50@20 for shipment.

**Nitrate of Soda.**—Prices are firm, with an advancing tendency. Sales during the month to date are estimated at 20,000 bags, while the amount on the spot is supposed to be 55,000 bags. The ruling prices are 2·22½@2·25c. on the spot, and 2·17½@2·20c. to arrive.

**Arsenic** is very firm. Prices remain as follows: White, 3¼@3½c.; Red, 5½@5¾c. on the spot, and 5½c. for lots to arrive.

Acetate of lime is sold only in a jobbing way at 1·10@1·20c. for Brown and 2·20@2·25c. for Gray.

**Cream of Tartar.**—Available supplies are pretty well absorbed, and prices are firm. We continue to quote 32@32½c. for crystals, and 32¼@33¼c. for powdered.

**Minerals.**—The market has been generally quiet. Sulphate of Barytes remains at \$21.50 for special brands of best imported, \$17.50@18 for best No. 1, best off-colored grades at \$15.

China clay is in plentiful supply, with only a moderate demand. Prices are unchanged.

**Chalk.**—Prices are nominal on account of the scarcity of supply.

**BUILDING MATERIAL MARKET.**

NEW YORK, Friday Evening, Oct. 26.

The week on the Building Material Exchange has been generally quiet, with no apparent increase in the demand, and with light stocks of most articles.

**Bricks.**—The market retains the same essential features as last week. The demand for the better grades is well maintained, while pails are slightly duller. Supplies have come to hand rather irregularly, but the light demand has prevented sellers from obtaining any advantage on this account.

**Lime.**—Arrivals during the week have been light. No urgent demand is apparent. For the next few days the market will be nearly bare, and some difficulty in securing supplies will probably be found, as we are unable to learn of any vessels afloat and due until next week.

**Cement.**—The heavy importations of Portland last week have exercised a rather depressing effect upon the market, although the volume of business, in consequence of the large stock on hand, has been larger. Towards the close the over stock was less apparent. For Rosendale cement the demand continues good, and considerable business has been done.

**Roofing Slate** continues in excellent demand, with little prospect of any increase in the supply for some time to come. Prices are very firm, especially for Pennsylvania black roofing.

Inasmuch as an exchange dedicated entirely to the building material interests of New York and vicinity has been mentioned as one of the possibilities of the future by those in favor of "consolidation," we append the following description of the proposed Pittsburg exchange, which should surely be equalled by the Empire City: The building will be modeled after the plan of the Philadelphia, Boston, and Chicago exchanges. The basement will contain a trades school for the education of boys to be carpenters, painters, masons, bricklayers, and all the arts appertaining to the building trades. The first floor will be a bank for the benefit of contractors, builders and architects,

The second floor will be the exchange proper, where contractors and architects can meet and make arrangements, and where property owners can come and see about the erection of buildings. The third floor will be for the meetings of the exchange, and also contain rooms in which boss carpenters, master painters, etc., can hold their meetings. The fourth and fifth floors will be for offices to be rented to contractors and architects, and a restaurant will be established on the top floor. The total cost is estimated at \$200,000.

IRON MARKET REVIEW.

NEW YORK, Friday Evening, Oct. 26. American Pig Iron.—The tone of the market is dull, without much change. The consumption in the territory tributary to New York harbor is restricted, and less than at the same time last year. Prices remain unchanged.

Scotch Pig.—The importations are light, and are absorbed as they arrive. Stocks are light and prices are unchanged.

Spiegeleisen is a somewhat irregular market, but as far as can be quoted Ferro may be called \$54 to \$54.50, or the same as last week.

Steel Rails.—We have no large sales to record this week, and we believe nothing of importance has taken place since the sales we referred to last week; but we hear of one mill that expects to sell between 40,000 and 50,000 tons in the coming week; \$28 is the current quotation at the mills.

Structural Iron.—Plates and Bars are steady and in fair demand, and prices are unchanged.

Old Rails still maintain the firm tone for some time prevailing. Offers are daily made at prices that importers decline to entertain, and whatever change of feeling has taken place is in the direction of consumers advancing their views nearer to holders' prices.

Louisville, Oct. 23.

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

There is really nothing new to say about the iron market in general, although it is reported that some concessions on the part of some of the furnaces have been made to secure business; this, however, is regarded as unnecessary, as there is large selling at full figures. Buyers are disposed to make engagements for extended shipments into next year, and a few contracts have been made in that way, although the average furnace is averse to selling for delivery far ahead. The buying movement is more noticeable west of here. Prices remain about as last reported, and will be found in our weekly register of prices.

Philadelphia, Oct. 26.

[From our Special Correspondent.]

Pig-iron makers and agents are determined to make it appear that a heavy demand will set in for crude iron during the latter part of November. The only basis for the statement proves to be that a goodly number of buyers have made inquiries within the last few days for supplies, but have said they would delay buying for a few weeks yet. So far makers are holding to the extreme figures of the past month. A few buyers have bought outside iron, but there is no general movement in that direction. The least possible business is being done. Southern irons are quoted at full prices. A few offers were made this week at about fifty cents off, but no replies have been received. A few lots of Western iron have reached here and some more are coming. Inferior irons are held firmly. Makers expect to sell liberally within thirty days. Choice irons are over sold as a rule. But little iron is crowded on the market, and the general feeling is that it is better to wait till consumers are in need of supplies, as any effort to sell now can be done only at concessions, excepting for the finer brands of both forge and foundry. A good many large contracts will be given out for car building work and so on. These demands, it is expected, will reflect favorably on the crude iron market. A better week's business has been done this week in blooms than last, though at no changes in quotations or prices. Very little muck bar sold this week at the extreme quotations. A good business has been done and there are negotiations pending which will keep mills busy for an indefinite time. The Pennsylvania Railroad Company has ordered 500 more cars, making 2000 within a month. Other companies have ordered, and there are rumors afloat to-day that some of the large car building orders for the season will be placed at an early day. The anxiety to secure some of this business is likely to lead to the shading of prices, but it will be very trifling. Quoted rates are still paid, but the volume of business is not very large. Skelp iron is in active demand at full prices and a large amount of business will come in at an early day. Nails move very slowly at old quotations and makers of good brands are compelled to sell at the cut rates made by the makers of poor brands. An excellent condition of business is reported by all sheet iron makers in this part of the State. An advance has been made on small lots for early delivery. The mills have more business on hand than for twelve months. A little improvement has taken place in plate and tank iron, and negotiations are pending to-day for several large lots, which will help to harden the market. The makers of structural iron are complaining of the withholding of business that was promised. Portions of two or three of the mills are off. The manufacturers are holding to their prices, expecting that business will reach them by the end of this month. Merchant steel manufacturers are all busy and prices are firm. Several good orders for pipe iron have been booked. Steel rail quotations are unchanged. Makers are unable to furnish any points with reference to future business. Rumors from out-

IMPORTS AND EXPORTS OF METALS AT NEW YORK OCTOBER 18 TO

Table with columns for Imports and Exports of Metals (Antimony, Copper, Steel Sheets, etc.) listing various companies and their respective quantities and values.

OCTOBER 22 AND FROM JAN. 1.

Table with columns for Imports and Exports of Metals (Copper, Steel, etc.) listing various companies and their respective quantities and values.

CURRENT PRICES.

CHEMICALS.

Table of chemical prices including Acetic, Muriatic, Nitric, Oxalic, Sulphuric, and various salts and acids.

Table of building materials including Bricks, Hackensacks, Haystraw, and various stones.

Table of iron and steel prices including Bessemer Pig, Spiegeleisen, Steel Billets, and various iron plates.

Table of rarer metals including Aluminum, Arsenic, Barium, Bismuth, Cadmium, Calcium, and various other elements.

Table of various metals including Lead, Tin, Zinc, and others, along with their prices.

Table of Philadelphia prices for Foundry No. 1, Foundry No. 2, Gray Forge, and other items.

Table of stock market quotations for Baltimore, Md., listing various companies and their bid/ask prices.

Table of stock market quotations for Birmingham, Ala., listing various companies and their bid/ask prices.

Table of stock market quotations for Pittsburg, Pa., listing various companies and their bid/ask prices.

Table of Louisville prices for Hot Blast Irons, Coke or Bituminous Pig, and other items.

Table of foreign quotations for London, October 13, listing various companies and their prices.

Table of Pittsburg prices for Foundry No. 1, Foundry No. 2, Gray Forge, and other items.

Table of American Pig-Iron prices for No. 1 X, No. 2 X, and other grades.

Table of iron and steel prices including Bessemer Pig, Spiegeleisen, Steel Billets, and various iron plates.

DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES.

Main table with columns: NAME AND LOCATION OF COMPANY, CAPITAL STOCK, SHARES, ASSESSMENTS, DIVIDENDS, NAME AND LOCATION OF COMPANY, CAPITAL STOCK, SHARES, ASSESSMENTS. Lists 150+ mines with their respective financial details.

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 \$276,000 in eleven dividends, and the Terra \$75,000. Previous to the consolidation in Aug., 1884, the California had paid \$31,320,000 in dividends, and the Con. Virginia, \$24,890,000. \* Previous to the consolidation of the Copper Queen with the Atlanta, Aug., 1886, the Copper Queen had paid \$1,350,000 in dividends. † 1,300,000.

NEW YORK MINING STOCKS QUOTATIONS.

DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES.

Main table of New York Mining Stocks Quotations, divided into Dividend-paying and Non-dividend-paying mines. Columns include Name and Location of Company, dates from Oct. 20 to Oct. 26, and Sales figures.

BOSTON MINING STOCK QUOTATIONS.

Table of Boston Mining Stock Quotations, listing company names, dates from Oct. 19 to Oct. 25, and sales figures.

Boston: Dividend shares sold, 15,122. Non-dividend shares sold, 10,766. Total Boston, 31,888.

COAL STOCKS.

Table of Coal Stocks, listing company names, par value of shares, and prices for dates from Oct. 20 to Oct. 26.

San Francisco Mining Stock Quotations.

Table of San Francisco Mining Stock Quotations, showing closing quotations for various companies from Oct. 19 to Oct. 25.

\*\*Bid. †Asked. \*\*Of the sales of this stock, 30,785 were in Philadelphia, and 135,730 in New York. Total sales, 293,194.

side markets show that there are a good many points which indicate that the tendency is downward rather than upward, though no sales can be heard of at lower than the quoted rates. Old rails are held entirely too high for most buyers. Scrap iron is in good demand for all kinds excepting turnings and borings.

**Pittsburg.** Oct. 25. [From our Special Correspondent.]

**Raw Iron.**—To parties not acquainted with Pittsburg and its facilities for transacting business the weekly operations in raw iron would seem astonishing, and if the entire sales could be obtained, the astonishment would be even greater. A few years ago the weekly reports of iron only reached a few hundred tons; when they aggregated three or four thousand tons it was pronounced wonderful. How is it now? Sales reported range from 30 to 40,000 tons, and even then the story is only partly told. Notwithstanding what may be termed the dull portions of the year the business doing has been a very satisfactory one so far as relates to the raw material. The demand has followed the supply so close that stocks have not increased and numerous sales have been made for future delivery, some extending into the new year. Under this condition of affairs prices have had little opportunity for developing weakness. Everything at present points to a healthy trade. The valley furnaces report they have orders booked that will keep them employed for some time, at prices that are satisfactory. We can report sales of 5000 tons Bessemer made west of this city, one half for Pittsburg parties, balance for Illinois. We hear of other large transactions that are under consideration. When consummated our readers will learn the particulars. City furnaces are well sold up and are satisfied with the situation. Holders and makers of iron are not disposed to make concessions, even for round lots. Their opinion is that the top has not yet been reached. Pittsburg prices to-day are from 50c. to 75c. per ton below prices that govern the Eastern market. Bessemer steady at last week's prices. Gray Forge firm at \$16.00@16.25 cash; extra 25 cents more. Muck bars show more firmness. Old iron rails range from \$24@25 per ton. Steel slabs and billets command previous prices.

Coal and Coke Smelted Lake Ore. 2000 Tons Bessemer 17.25 cash. 1000 Tons Bessemer 17.25 cash. 1000 Tons Bessemer, December 17.50 cash. 1000 Tons Bessemer, November 17.45 cash. 1000 Tons Bessemer, November 17.45 cash. 1000 Tons Gray Forge 16.00 cash. 500 Tons Gray Mill, Extra 16.50 cash. 500 Tons Gray Forge, at furnace 16.00 cash. 100 Tons White and M. Bessemer 16.50 cash. 150 Tons Gray Forge 16.00 cash. 300 Tons Gray Forge 16.00 cash. 100 Tons Gray Forge 16.25 cash. 150 Tons No. 1 Foundry, all ore 18.50 4 mo. 100 Tons No. 2 Foundry, all ore 17.50 4 mo. Coke, Native Ore. 350 Tons Gray Forge, Storage 15.40 cash. 100 Tons Gray Forge, Storage 15.25 cash. 500 Tons Gray Forge 16.25 cash. 200 Tons Gray Forge 16.25 cash. 200 Tons Gray Forge 16.25 cash. 50 Tons Silvery, Extra 19.00 cash. 60 Tons No. 2 Foundry 17.00 cash. 30 Tons Mill Iron 16.25 cash. 30 Tons Silvery 16.50 cash. Ferro-Manganese. 60 Tons 80 per cent. 56.00 cash. Steel Slabs and Billets. 500 Tons Nail Slabs 28.75 cash. 500 Tons Nail Slabs 28.75 cash. 1000 Tons Billets 29.50 cash. 500 Tons Billets 29.75 cash. 750 Tons Nail Slabs 28.50 cash. Muck Bar. 1000 Tons Neutral 29.00 cash. 1000 Tons Neutral, Nov. and Dec. 29.00 cash. 500 Tons Neutral 29.00 cash. 500 Tons Neutral 29.00 cash. 1000 Tons Neutral 28.75 cash. Old Rails. 1000 Tons American T's 24.00 cash. 1000 Tons American T's 25.00 cash. 1000 Tons American T's 25.00 cash. 600 Tons American T's 25.00 cash. 250 Tons American T's 25.00 cash. Skelp Iron. 200 Tons Wide Grooved, per 100 lbs. 1.95 cash. 500 Tons Narrow Grooved, per 100 lbs. 1.85 cash. Scrap Material. 250 Tons Car Axles, net 29.00 cash. 200 Tons No. 1 Wrought Scrap, net 21.00 cash. 200 Tons No. 2 Wrought Scrap, net 18.50 cash. 300 Tons O. H. Steel, gross 19.00 cash. 300 Tons Cast Scrap, gross 16.00 cash. 100 Tons Cast Borings, gross 12.00 cash.

**FINANCIAL.**

**NEW YORK, Friday Evening, Oct. 26.** A dull market, and little variation in the price of the different stocks, has been the condition of the market during the past week. We have received the following from a correspondent in reference to "wash sales":

**NEW YORK, Oct. 19, 1888.** EDITOR ENGINEERING AND MINING JOURNAL: DEAR SIR: I am informed on good authority that the fire at the Plymouth Con. mine is out, and that damage done is trifling, and that mine is about to be opened, in fact, has been ordered to be opened. Perhaps those brokers on the Consolidated Exchange who have been "washing" the stock down to \$7.00 may not understand what is putting up the price the past few days. The same crowd are at present "washing" Silver King down to \$1.65 in the face of good improvements at the mine. I dislike to see honest investors in good mining prop-

erties misled by false quotations, and hope you will find room for this in your journal. Yours, etc.

**NEW YORK, Oct. 9, 1888.** **READER.** Sutro Tunnel stock shows the largest transaction on the lists, at from 11@13c. The Trust Certificates were firm at from 65@68c. Considerable interest was displayed in Consolidated California & Virginia at from \$10.63@ \$11.88. Crown Point shows one sale at \$7. Belcher one at \$8.88. Hale & Norcross at \$7.00. Savage at \$7.13. Union Consolidated at \$4.60. Exchange sold at \$1.00 and \$1.45 assessment paid. Consolidated Imperial at 90c. Bullion advanced from \$1.90@2.25, and Best & Belcher was firm at \$3.38. Barcelona declined to 78c., but to-day was quoted at 81c. Navajo was active, advancing from \$2.25@2.60. The same may be said of North Belle Isle, which went up to \$2.75.

There was considerable inquiry for Horn-Silver, which went up to 95c., but to-day sold at from 80@ 85c. Ontario has declared its usual monthly dividend of \$75,000. One sale of 5 shares was made this week at \$33.50. A few sales of Caledonia were made at from \$3 to \$3.10. Homestake was steady at from \$10.50 to \$11.25. Kingston & Pembroke shows a few sales at from \$2 to \$2.13. El Cristo continues to be neglected at 80c. Deer Creek shows one sale at \$1.20. Castle Creek was quoted at 5c., and Holyoke at 6c. United Copper was dealt in to the extent of 550 shares, at from \$1.15 to \$1.25. There was considerable activity in Colchis, which was firm at from \$2.20 to \$2.30.

Another Colorado property has come in for public favor—the Sylvanite mine, of Gunnison County, Colorado. This mine has been on the market for some time and has but recently been placed in New York. The new owners have organized the Sylvanite Mining and Milling Company. The stock was brought out on Consolidated Stock and Petroleum Exchange to day at \$3. Iron Silver shows a few sales at \$3.40@3.45. Plutus continues to be active. It opened at 98c., but later declined to 75c., and to-day has been selling at from 85 to 90c.; Silver Cord at from 70 to 76c.; Cashier at 14@15c.

The report that the Plymouth Consolidated Gold Mining Company's mine had been opened had a strengthening effect on the price of the stock in the beginning of the week, when it advanced from \$8.50 to \$10.00, later in the week it declined again to \$8.75, and to-day it sold at \$9. Little was doing in Brunswick, which was quoted at 10@11c. Bodie Consolidated was quiet, selling at from \$1.80 @2.40. Bulwer at from 90@95c. Standard at \$1.25, and Mono at \$1.45.

The prices in the Amador stocks remain unchanged. Middle Bar sold at 38@39c. Amador at \$2.25. Astoria at 24c. and Hollywood at 40@41c. Sutter Creek was neglected. One thousand shares of Rappahannock sold yesterday and to-day at 10c. A declining tendency was shown in the price of Silver King, which went from \$2@1.55, selling at from \$1.65@1.75 to-day, some 4380 shares changing hands.

The Governing Committee of the New York Stock Exchange has added \$1,000,000 preferred stock of the Tennessee Coal, Iron and Railroad Company to its list of securities.

**Electric Stocks.** The following quotations are furnished by Messrs. Crossman & Quick, brokers, of this city: Edison, \$120@ \$125; Edison Illuminating, \$85@87; Edison European, \$8; Consolidated, \$50@60; Westinghouse, \$23½@24½; United States Illuminating, \$50@60; Daft, \$40@60; Brush, \$35@40; Brush Illuminating, \$80@100.

**Pipe Line Certificates.** Messrs. Watson & Gibson report as follows for the week. The oil market this week has been hovering around 85c.-86c., with very little outside interest and with no promise of increased activity in sight. The demand for refined is slack, and the recent break has driven out a great many who were in and deterred others from going into the market.

**NEW YORK STOCK EXCHANGE.** Opening. Highest. Lowest. Closing. Sales. Oct. 20..... 85¼ 85¾ 83¾ 85 975,000 22..... 85¼ 87¼ 85¼ 86¾ 1,069,000 23..... 87¾ 88¾ 87 87¾ 995,000 24..... 88 88 86¼ 87¼ 651,000 25..... 87¼ 87¼ 85 85¼ 644,000 26..... 85¼ 86¾ 85¼ 85¼ 603,000 Total sales in barrels..... 4,928,000 **CONSOLIDATED STOCK AND PETROLEUM EXCHANGE.** Opening. Highest. Lowest. Closing. Sales. Oct. 20..... 85¼ 85¾ 83¾ 85 2,156,000 22..... 85¼ 87 85¼ 87 2,156,000 23..... 87 88¾ 86¾ 87¾ 2,685,000 24..... 88 88 86¼ 87¼ 1,227,000 25..... 87¼ 87¼ 85 85¼ 1,396,000 26..... 85¼ 86¾ 85¼ 85¼ 1,303,000 Total sales in barrels..... 10,863,000

**Meetings.** Chrysolite Silver Mining Company, No. 13 Burling Slip, city, November 7th, at 12 o'clock m. Cactus Mining Company, office of Marshall & Royle, Salt Lake City, Utah, December 12th, at 12 o'clock, m. Action will be taken upon a contract with the Comet Smelting Works.

Idaho Consolidated Gold and Silver Mining Company, Coleman House, New York City, October 31st, at three o'clock P.M.

Philadelphia (Natural Gas) Company, No. 820 Penn avenue, Pittsburg, Pa., December 5th, at ten o'clock A.M. Special meeting to act on the recommendation by the board of directors to issue bonds to the amount of \$2,500,000, secured by mortgage upon the property of the company, on account of the increased demand for natural gas, and the desirable extension of the company's plant.

**Dividends.** The following dividends have been declared: Alaska Mill and Mining Company, of Alaska, twenty-five cents per share, or \$25,000, payable October 15th. Crescent Mining Company, of Utah, dividend No. 7, eighteen cents per share, or \$18,000, payable October 25th, at office of U. S. McCormick, Salt Lake City, Utah. Ontario Mining Company, of Utah, dividend No. 143, fifty cents per share, or \$75,000, payable October 31st, at Lounsbury & Co.'s, 15 Broad street, N. Y. City.

**Assessments.**

COMPANY.	No.	When levied.	D'ty in office.	Day of Sale.	Am't per share.
Alta, Nev.	38	Sept. 28	Nov. 5	Nov. 26	.50
Amer. Eagle, Cal.	1	Sept. 20	Oct. 25	Nov. 15	.10
Anchor, Utah.	8	Sept. 28	Nov. 3	Nov. 20	.10
Andes, Nev.	34	Oct. 5	Nov. 12	Dec. 3	.25
Baltimore, Nev.	3	Sept. 22	Oct. 25	Nov. 13	.25
Belcher, Nev.	36	Sept. 18	Oct. 23	Nov. 12	.50
Best & Belcher, Nev.	41	Oct. 16	Nov. 21	Dec. 11	.25
Bodie, Cal.	9	Sept. 24	Oct. 29	Nov. 30	.50
Chollar, Nev.	26	Oct. 8	Nov. 13	Dec. 5	.50
Crown Point, Nev.	50	Oct. 2	Nov. 5	Nov. 26	.50
Cons. Imperial, Nev.	25	Oct. 16	Nov. 21	Dec. 12	.05
Del. Monte, Nev.	1	Oct. 15	Nov. 20	Dec. 12	.25
Dickert & Myers, Ut.	1	Sept. 4	Oct. 9	Oct. 30	.50
Empire, Cal.	1	Sept. 19	Oct. 22	Nov. 8	.25
Exchequer, Nev.	26	Sept. 6	Oct. 10	Oct. 31	.20
Gould & Curry, Nev.	60	Oct. 4	Nov. 9	Nov. 30	.30
Grand Prize, Nev.	19	Oct. 13	Nov. 17	Dec. 5	.25
Horseshoe Bar Cons., Cal.	1	Oct. 9	Nov. 17	Dec. 10	.25
Iron Hill, Dak.	14	Sept. 15	Oct. 17	Nov. 3	.03
Justice, Nev.	47	Sept. 25	Oct. 31	Nov. 19	.25
Mikado, Dak.	1	Sept. 25	Oct. 27	Nov. 17	.002
Montrose, Colo.	1	Oct. 3	Nov. 12	Dec. 15	.014
Mono, Cal.	26	Sept. 20	Oct. 23	Nov. 28	.50
Mayflower, Nev.	43	Oct. 16	Nov. 16	Dec. 10	.50
North Belle Isle, Nv.	13	Oct. 23			.50
N. Commonw'th, Nv.	1	Oct. 15	Nov. 19	Dec. 11	.30
Potosi.	31	Oct. 1	Nov. 6	Nov. 27	.50
Ross Hannibal, Dak.	3	Sept. 25	Oct. 27	Nov. 17	.002
Savage, Nev.	71	Oct. 4	Nov. 7	Nov. 27	.50
Spruce Gulch, Dak.	3	Sept. 19	Oct. 25	Nov. 10	.001
Tuscarora, Nev.	1	Oct. 1	Nov. 4	Dec. 5	.05
Union, Utah.		Sept. 12	Oct. 20	Nov. 10	.005
Utah, Nev.	5	Oct. 4	Nov. 8	Nov. 26	.25
Virginia Creek, Cal.	6	Aug. 29	Oct. 9	Oct. 29	.30
Wall St., Dak.	1	Sept. 20	Oct. 22	Nov. 15	.0014

**Boston Mining Stocks.** Oct. 25. [From our Special Correspondent.]

There has not been quite so much of a boom in copper stocks the past week, and prices generally are lower, but there has been very little pressure to sell, and we look for a renewal of activity and a recovery on all the good stocks. Calumet & Hecla declined from \$320, the extreme of last week, to \$299½, but recovered to \$305, and is in fair demand at this price. Quincy declined to \$87 and recovered to 88, with very small sales, in fact there is hardly any of this stock for sale, and higher prices will have to be paid for it to bring it out.

Boston & Montana has been fairly active but heavy all the week, declining from \$65½ to \$60, and at one time it was offered at \$59, and \$56 was the best bid. Since then it has rallied and sold up to \$63, closing sale to-day at \$62. Franklin dropped to \$17½, and recovered to \$18½, the opening price of the week. Atlantic touched \$18½, and is fairly steady at about \$19.

Osecola declined from \$21¼ to \$20¼, but has been in better request for a few days past, and recovered to \$21¼. Tamarack declined \$7, with sales of small lots only, closing \$177.

Kearsarge declined from \$15 to \$11½, on reports that the mine was not looking as well as expected, and that the prospects were not quite as encouraging as was reported last week. A rush to sell stock caused the break. Subsequently, the sellers were anxious to recover their stock, which advanced the price to \$13¼, closing at \$13. Allouez very steady at \$5@5½. National declined from 8¼ to 7, at which price there seemed to be plenty of buyers, and to-day it sold up to 7½, on good reports from the mine. Huron declined also to \$6½, but is a shade better, with sales at \$6½. Pewabic sold at \$4¾, a decline of \$1¼ from last week. Mesnard sold at 60c., against 80c. last week. There was very little doing at the Board in the low-priced fancies, but on the street there is a good inquiry for this class of mining stocks, and a good deal of activity is looked for in them later on.

Bonanza has been dull but steady at \$1½, with a few sales at \$1½. It was offered to-day at \$1½ and no takers. Dunkin alone of the silver stocks shows any activity. This stock has ruled strong and steady, with sales at 95c. to \$1.

3 P.M.—There is a better feeling among the "coppers" this afternoon.

**LATER PRICES.** (By Telegraph.)—October 26th, 1 P.M.—Calumet & Hecla, \$307; Tamarack, \$179 asked; Boston & Montana, \$68¾; National, \$83¾; Kearsarge, \$13; Allouez, \$5½.