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THE
ENGINEERING
AND
MINING JOURNAL.

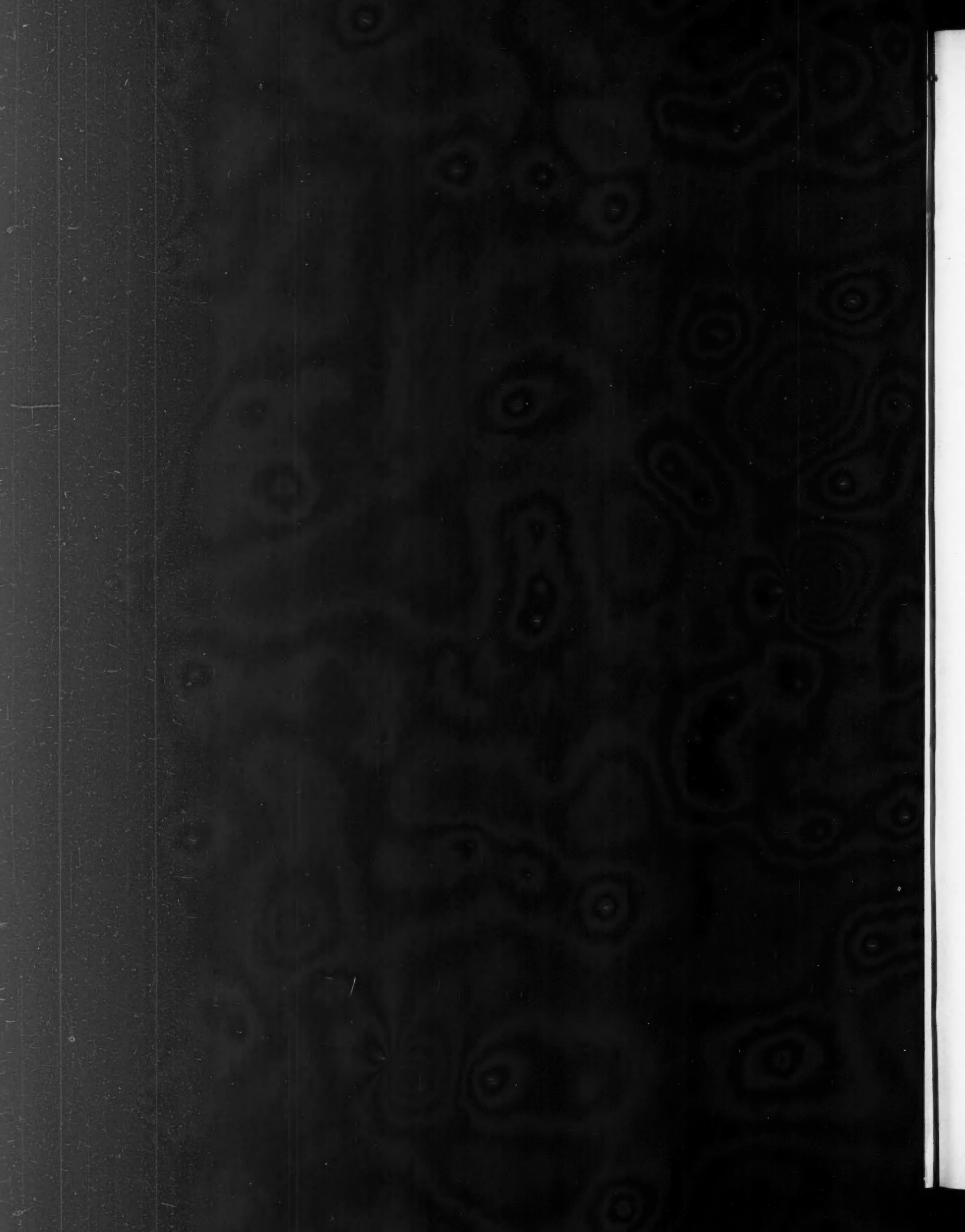
VOLUME XXIV.

JULY TO DECEMBER, 1877.

SCIENTIFIC PUBLISHING COMPANY,

NO. 27 PARK PLACE.

NEW YORK.



ENGINEERING and MINING JOURNAL.

VOL. XXIV. No. 1.

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"THE ENGINEERING AND MINING JOURNAL" ADVOCATES THE ADOPTION OF THE METRIC SYSTEM OF WEIGHTS AND MEASURES,

and urges all who are interested in the simplification of our present complicated and unsatisfactory systems to aid, by their active sympathy and encouragement the early introduction of this much needed reform.

WANTED—BACK NUMBERS OF THE ENGINEERING AND MINING JOURNAL.

A liberal price will be paid, in cash or subscriptions, for the following numbers of the ENGINEERING AND MINING JOURNAL:

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1872	XIV.	1 to 18 inclusive.	1875	XIX.	14, 15.
1874	XVIII.	4, 11.	1876	XX.	7, 12, 22, 23.

Address this office.

AN HONOR WELL BESTOWED.

We learn that the Emperor of Germany, in acknowledgment of the services rendered to German engineers visiting this country, by Mr. WILLIAM G. NEILSON, Secretary of the Centennial Committee of the American Institute of Mining Engineers, has conferred upon that gentleman the fourth class of the Royal Order of the Red Eagle, the decoration of which (a handsome silver Maltese cross, ribbon, etc.), together with a suitable letter from Baron THEELMANN, the German charge d'affaires at Washington, came to Mr. NEILSON'S hands last week. This graceful recognition is in keeping with the cordial spirit in which the German government and its representatives have from the beginning accepted the courtesy and assistance which the Institute was able to render. Mr. NEILSON was, however, far more than a mere official representative of the Institute. It is not too much to say that he made himself the personal friend of every guest of the Institute who needed his services, and that he deserves a large part of the credit which the successful execution of the plans of the Centennial Committee has reflected upon the society.

PROFESSOR HENRY WURTZ AND THE STEVENS INSTITUTE.

The honorary degree of Doctor of Philosophy, the first of the kind bestowed by the Stevens Institute of Technology, has been conferred for merit upon HENRY WURTZ, A. M., on account of the great originality and value of his scientific researches and writings in the past few years. In this recognition of the services done to science in the departments of chemistry and chemical physics by Prof. WURTZ, the Stevens Institute has honored itself no less than the recipient of its degree.

It has been too much the practice of our institutions of learning to bestow their honorary degrees on those who are merely prominent socially or politically, without any regard to their services to science or education. It is therefore with great satisfaction we note the course adopted by the faculty of the Stevens Institute in conferring this honorary degree for actual achievement in the field of scientific research. Should this be adopted as the definite policy of the Institute, its honorary degrees will be looked upon as of the greatest value. The judicious selection of Prof. WURTZ—than whom this country has no abler or more original investigator in the department of chemical physics—as the first recipient of the Institute's honors not only does credit to the Faculty, but this recognition of the practical value of Prof. WURTZ'S investigations will secure from scientists that critical examination of his remarkable results and generalizations which it is to be regretted they have not yet received.

JOHN JONES.

Recent English exchanges bring the news of the death of Mr. JOHN JONES, of Middlesborough, a gentleman whose influence upon the iron manufacture in Great Britain, and particularly of the Cleveland District, was such as to entitle him to a fame wider, though not deeper, than the esteem and affection which his personal qualities inspired in all who knew him. Perhaps his most important single act was the initiation in 1869 of the Iron and Steel Institute, a society the high character of which, and the great benefits which it has conferred upon the art of iron making, are recognized throughout the world. Mr. JONES perceived the need of such an institution, and contributed actively not only to its foundation, but also to its subsequent success.

Another, though a kindred, and we think a not less important, sphere of his influence was in the matter of arbitration as a means of settling differences concerning labor and wages. Becoming Secretary of the Association of Cleveland Iron Manufacturers in 1866, he had ample opportunity during the disastrous five months' strike of that year to observe the evils arising from want of reasonable co-operation between masters and men, and in the Board of Arbitration which was afterwards established he acted as secretary for the employers—a duty which required much patience, tact, courtesy, and industry. To the fair and considerate temper shown by the members of that board, the spread of arbitration and its maintenance in England as a just and convenient mode of deciding questions which once were referred to starvation and violence as umpires may be justly ascribed. The very copy of the Middlesborough News (of which, by the way, Mr. JONES was managing proprietor) that brings the tidings of his death contains a long report by the umpire in a case in which the two arbitrators could not agree, involving a general reduction of the wages of the Cleveland miners. After hearing evidence on both sides, the umpire decided that a reduction of about two-thirds what the masters claimed was required by the state of the trade, and must be submitted to by the men; and thus (apparently without commotion or disturbance of industry) a question was settled which in other days might have led to stagnation of trade, famine, and riot. That Mr. JONES was a pioneer in this beneficent reform is not his least claim to obituary praise.

As a Fellow of the Geological Society he held a creditable place in science; and as secretary of several trade and commercial societies, and editor and proprietor of one or more journals, his manifold activity linked him so intimately with all forms of public and social life that his place will not soon or easily be filled.

THE LOWE GAS PROCESS AND ITS OPPONENTS.

In another column will be found an interesting letter in which the gravest charges are made against our contemporary, the Gas-Light Journal. We cannot for a moment suppose that that journal would lend itself to circulating such a silly forgery as that which Mr. Dwight denounces, even for the purpose of discrediting the new process, which seems to be greatly disturbing the equanimity of the old companies. It has doubtless been the victim of a wicked and stupid hoax, yet we can scarcely imagine our conservative contemporary being deceived into publishing editorially, as it has done in this case, a similar hoax on the other side of the question. The ENGINEERING AND MINING JOURNAL, which is not controlled by any special interest, but has the single object in view of the promotion of science in gas making and the more economical manufacture of heating and illuminating gas without regard to individual interests, gladly gives our correspondent space to show the present status of the Lowe gas process and to correct misstatements concerning it. We need scarcely add we will be just as ready to give space to "the other side," if there be one.

Beyond question, the Lowe gas process is a practical success, and it threatens the old companies with a much more formidable competition than they are disposed to admit. It has gone beyond the point where unfounded statements condemning it can succeed in extinguishing it. Whether it be all that its most sanguine advocates anticipated or not is of little consequence, for it has no doubt substantial claims to the attention of gas manufacturers and engineers generally. Instead of abusing it, it seems to us the interests of the gas manufacturers and the public would be better served by having the new process thoroughly investigated by competent experts and the results of such examination published for the benefit of all. Should the process be found worthless or the gas injurious, this authoritative statement would be more effective in stopping its rapid extension than can the publication of any number of forged or genuine slanders on the process or its promoters.

THE BUILDING STONES OF NORTHERN NEW YORK.

We have received from Mr. D. MINTHORN, of Gouverneur, St. Lawrence County, an interesting statement concerning the marbles, granites, etc., of that region. Our informant thinks that for variety and beauty of these stones New York "can vie with France, Egypt, Greece, Italy, Spain, or Great Britain." Besides the common gray gneiss, he enumerates several varieties, such as the syenitic granitic granite, containing white feldspar and black hornblende, and light or dark in predominant color, according to the predominance of the latter. Many New England granites, such as the material of the New York Post Office, belong to this class, which is represented in St. Lawrence County abundantly. Then comes the greenish and bluish-gray, strong and compact granite, similar to that of Quincy, and another variety of still deeper green, "mottled like the pedestals of Cheops." Next in the series, and of increased value, are various pink, green, and dark-red porphyritic granite, from which Mr.

MINTHORN thinks the Tower of Syenne and Cleopatra's Needle could be exactly matched; and, finally, there are large masses of very compact gray and green granite, studded with garnets about half an inch apart, which he considers superior in beauty and excellence to the rest. In this latter opinion we are not inclined to agree. So far as our observation goes, the garnetiferous granites are not likely to resist the weather successfully.

The variety of marbles furnished by this belt of Eozoic rocks is also very great, ranging from white limestone and dolomite and statuary marble to straw-colored blue, drab, brown, black, yellow, and red variegated marbles. Verd antique is also represented. In fact, there is scarcely a style of the antique marbles which Mr. MINTHORN does not offer to mate or surpass from the quarries of St. Lawrence County. Adjoining the statuary marble quarry is a deposit consisting partly of pagodite or Chinese figure-stone, and possessing hardness enough to take a polish, while at the same time it does not "chip out" when chiseled in sharp lines. Foliated talc and massive chalk complete the list of resources in this line.

Mr. MINTHORN is already actively engaged in the commercial utilization of some of these deposits, and thinks that the business could be indefinitely enlarged, since he has more orders than he can promptly supply. Parties interested in the subject would do well to address him for further information. We have no personal acquaintance with him, and base our favorable opinion of his undertaking on the remarks of friends, at whose suggestion we applied to Mr. MINTHORN to obtain the account which we have given in substance above. If it should aid in developing a valuable industry we shall be glad.

THE METALLURGY OF TELLURIUM ORES.

Staff Correspondence of the Engineering and Mining Journal.

It is evident that during the last six months much has been done in the tellurated mines of Colorado. This noted belt of veins has been the source of much trouble to miners and mill men, and has been the grave of much money. In spite of the numerous failures which accompanied its early development, work on a large number of mines has been vigorously prosecuted, and to-day the district contains at least a dozen fine properties about whose intrinsic value there can be no doubt whatever.

We desire to refer, however, more particularly to the efforts that have been made to beneficiate the ore. An entirely new product (to the Colorado miner), it was quickly found that it would not be amalgamated, could be roasted only with great danger, and was exceedingly difficult to concentrate without heavy loss. The extreme richness of the higher grades rendered experiments very costly, while the lower grades, owing to the extreme discrimination of the telluride minerals, were exceedingly difficult to handle. But one process succeeded invariably, viz. the smelting process at Black Hawk and Golden. By reason of the diversified products bought and treated these works were enabled to overcome the peculiarities of the telluride ores by mixing small quantities with large amounts of other material.

No other works in the State were in such a position, and, as the prize sought was one well worth struggling for, the processes invented and patented for specially treating tellurides have been almost innumerable. Large amounts of money have been sunk in mills recklessly planned and too hastily erected. The amount of absolute folly shown in these endeavors surpasses belief, and it is to be regretted that there is still much of this going on. But a discussion of this point is not at present intended. We desire to state the present condition of Colorado beneficiation works handling exclusively these telluride ores, and to give a brief description of the mineral found and its peculiarities.

The telluride belt lies in Northern Colorado. It traverses the divide between Left Hand and Boulder creeks, and extends to the north and south of each for a distance of seven miles. Its width is about four miles. Within these limits there are many hundred veins located, many thousand in fact, the great majority of which carry tellurated ores to a more or less extent. The ore occurs as telluride of gold, silver, lead, and mercury. In a number of notable instances pockets or chimneys of exceedingly rich mineral have been found, but in most cases the tellurides are disseminated in minute particles through the vein, so that the ore seam taken out in bulk would not yield over \$30 per ton. Peculiarities in the condition of the mineral have been found in different veins. In some cases high crystallization predominates, in others this state is almost wholly absent. A peculiarity has also been noticed in some varieties comparable to the "rusty" condition in gold. Concerning this last but little is known. In fact there is still more of conjecture than knowledge in the entire question, and we can hope for but little light regarding these rare ores until a careful and exhaustive study of these chemical peculiarities is made.

It has been demonstrated, however, that it is unsafe, as well as unscientific, to roast telluride ores alone. This being the case, amalgamation, lixiviation, and chlorination are wholly inapplicable. As smelting is the only system of reduction left, and as that is wholly impossible with low grade ores, it was thought by many last year that there was no salvation for the mines unless a new discovery in chemistry occurred. This belief did much towards supporting the numerous patent processes which have of late come to the front, and in a measure excuse much of the credulity with which such absurdities as the Brett and Kindred processes have been received.

Lately, however, and none too soon for the welfare of these mines, attention has been drawn to concentration, and the results, after at least six months of test, have been so favorable that there can be no doubt that this branch of metal-

lurgy offers a correct solution of the entire question. We are not to be understood to say that nothing is left to be desired, for that would be giving too much credit to a system which is at best but auxiliary, but for the present there is one point fully decided. It is possible to work almost all tellurides having a value when raw as low as \$20 per ton. We qualify this statement because there are yet several veins in this belt of mines which have not been successfully handled by concentration machines.

Success, however, has only as yet been accomplished by one machine, the Frus vanner. There are now twelve of these machines in operation in Boulder County on telluride ore, and so complete has been their success that more concentrate is being shipped from the telluride belt than high grade ore. In other words, these vanners have rendered available already such a large quantity of low grade ore that the product from these is already larger than that direct from the mines. These concentrates are selling at valuations of \$300 a ton and upwards to \$3,000.

It appears, therefore, that, though the tellurated minerals of Colorado must still be smelted, the great bulk of these ores which have hitherto been regarded as nearly, if not wholly, unavailable, have already become of more worth to the miner than the marvelously rich pockets which have been and still are being found. It may fairly be claimed, therefore, that a tremendous stride in advance has been taken. And that there no longer exists that element of uncertainty in handling this class of mines which has heretofore retarded investments and discouraged miners.

SOUTH PARK MINES, COLORADO.

Staff Correspondence of the Engineering and Mining Journal.

The development of South Park as a mining district has been very rapid. Five years ago there was hardly anything going on in that part of the State beyond ranching and placer mining, and in the latter industry almost no capital was invested and no washing done except on a very small scale. It is now the third district in the State in point of production, and second to none in resources. Though still somewhat inaccessible by reason of its altitude and the steepness of the only cañon leading from it to the plains, a railroad is now building towards its mines, and in another year will perhaps open it to the rest of the world.

In 1872 Park County mines, which had just begun to produce, yielded ore to the value of \$208,000. In that year the placer mines produced about \$30,000. In 1873 the yield was \$459,000, about \$400,000 of which was from the rock mines. In 1874 it reached \$596,000; in 1875 the output was \$650,000; and in 1876, \$900,000, thus making in the five years a total of nearly \$3,000,000. Of this total not more than \$300,000 has been taken from the placer diggings. The great bulk, therefore, represents the results of lode workings.

The principal mines of the district—that is, those which are now producing the heaviest—are located in the Mosquito Range, a spur from the main divide which branches off to the southward from the Hoosier Pass, and forms the northern boundary of the Park. Besides these, however, the entire stretch of the Range, from Geneva Gulch down to Montgomery, is highly metalliferous, and in several places it is worked. The developed and working districts of the Park are Mounts Sinclair and Bross, Buckskin, Mosquito, Sacramento, Pennsylvania, and Horseshoe gulches on the western side, and Hall Valley on the north. Beyond these the mines are merely prospects, and are yielding very little if anything.

The ores of the Mosquito Range—which includes all the districts named above except Hall Valley—occur in limestones and quartzites; in the former, as segregations of irregular size, dip, and richness, connected by stringers of gangue rock; in the latter, as veins having many of the characteristics of fissures, and possibly belonging to that class of deposits. By far the greater amount of development has been done in the limestone, where very large and valuable deposits have been found and are now being worked. The principal of these are the Moose, Dolly Varden, Hiawatha, Russia, Ford, Sinclair, Montezuma, and Security. From these the bulk of the ore yield from Park County has been taken, and though it is doubtless true they represent apparently nothing more than disconnected ore bodies in the limestone, yet after having yielded at least a couple of million dollars in silver they are to-day in as good shape as at any time since their discovery, and show in their deepest workings an abundance of very fine mineral.

An analysis of these ores has never been made, we learn, but the following rough approximation is close enough to give an idea of their general character:

Zinc-blende	5 to 20 per cent.	Barite	10 to 15 per cent.
Galena	5 to 15 per cent.	Carbonate of lime	70 to 80 per cent.
Copper minerals	1 to 3 per cent.	Silica	6 to 10 per cent.
Iron minerals	1 to 3 per cent.		

The veins lying in quartzite have as a rule a higher percentage of gold than those in the limestone. Their gangue is largely barite, and the percentage of pyrite is generally greater. With these exceptions the ores of the Mosquito Range from Lincoln to Horseshoe show much similarity. In Horseshoe Gulch, however, there appears to be a sudden change from heavily sulphureted ores to those more oxidized. The same limestone which nearer the range bears sulphuret of silver here is rich in large and extensive pockets of galena and cerusite.

In Hall Valley the ore is in true veins lying in granite. The gangue is barite, and the principal silver bearing minerals a species of gray copper.

Much is to be expected in the future of this part of Colorado. The South

Park & Pacific Railroad is now extending its line up the Platte Cañon, and expects this fall to reach Bailey's Ranch, on the edge of the Park, about half-way from the plains to Fairplay, which is the center of supplies for most of the mines. This season also opens most auspiciously for the miner. There are now two successful reduction works in operation, the branch of the Boston & Colorado Company, and the Mount Lincoln Works, a small concentration establishment, and a sampling and shipping mill. The Golden Smelting Works also expect to put in sampling works this spring, and, perhaps, the Hall Valley Company will succeed in doing some satisfactory work on their mines and mill.

Though depending for nearly all its ore supply on limestone deposits, there is no sign whatever of any giving out in the mines. On the contrary, those most extensively opened are yielding better than ever, or, at least, equally well. In all probability the yield from these mines will reach this year a million dollars, if not more. At the present there is hardly any part of Colorado that gives any better evidence of abundant mineral resources.

THE EMPIRE MINE, IDAHO.

Staff Correspondence of the Engineering and Mining Journal.

On June 9 a couple of men entered the works of the Empire Mine, Silver City, Idaho, while the men were taking supper, and, finding a watchman on hand, politely invited him to vacate, which he did, and quietly took possession of the property. Shortly afterwards the men returned from their meal, and, finding the doors barred, immediately gave the alarm. The deputy sheriff of the town was quickly notified of the disturbance, and going up to the mine, after some parley with the men, arrested them, took away their arms, and marched them down to the town. On the following Monday they were brought before Justice Wickersham, and after examination held for trial.

This outbreak at the Empire is an undoubted sign of good times and rich developments. The Empire is one of the great mines of Idaho, ranking with the Poorman, Golden Chariot, and Ida Elmore. It came into prominence in 1871, at a time when most of the other rich veins of Owyhee District were doing very poorly. It is a narrow lode, from two to five feet in width, and showed, when first opened, some excellent ore. In spite of its fine promise it paid but poorly for some time, yielding in 1871 \$9,270. In the next two years the product amounted to \$67,000. During the succeeding years this mine, in common with nearly all in the district, suffered by a suspension of work, and has lain idle until quite recently.

It is now, however, yielding so well again as to excite the cupidity of that class of men who wait around mining towns and prefer claims of ownership whenever there appears to be any chance of drawing a little money out of the pockets of real owners. Their presence is a sure indication of rich ore and lively times, and hardly any circumstance that could have occurred shows more conclusively the revival of business at Owyhee, and the high value placed on the Empire by those who, living close by, ought to be thoroughly posted.

It is an evidence of growing civilization also that the public sentiment of Silver City, though not in harmony with the present owners of the Empire, was decidedly opposed to those who attempted to take the law into their own hands. Mine jumping gives a worse name to a district than any other crime against society. Men will risk their lives generally sooner than their money, and nothing will so quickly frighten the capitalist as the prospect or possibility of not getting that for which he pays money. Almost every mining camp in the West of any note has passed through these troublous times, and Silver City in its early day was no exception. That an outbreak of the unruly class was so promptly suppressed goes far to show the good sense of the citizens of the district, and their determination to maintain the good character of the place. In its revival Silver City needs the assistance of capital to reopen and place in working order the splendid mines which have been for so many years under a cloud, and it will certainly receive this help if money can be safely expended there, for few districts in the West can show a better record, while its mines were being worked, or a more encouraging prospect for the future.

THE LANCASTER COUNTY (PA.) ZINC MINES.

Special Correspondence of the Engineering and Mining Journal.

These mines are situated about five miles west of the city of Lancaster and about twelve hundred feet south of the line of the Pennsylvania Railroad. The country rock in which the ore is found is the Auroral or Trenton limestone, or the same as that in which the Friedensville mines near Bethlehem are located.

The ores as originally discovered had been oxidized to the condition of calamine, which, however, at depths varying from twelve to fourteen feet, were unaltered blendes in limestone. In 1847 the calamine ores were treated in Wetherell furnaces for the production of zinc oxide, but these ores not lasting very long, and the attempt which was made to use the blende for the same purpose having failed, the works were allowed to fall into decay. Desultory workings have from time to time been carried on there, and finally in 1874 Messrs. Bainford Bros., of England, purchased the mines, and under their direction have been systematically opened. Two beds of the blende-impregnated limestone have been found and worked, their direction at the surface being nearly parallel with each other, and having a strike of N. 74° E., with a slight dip to the east and an underlie to the north. The two beds are separated from each other at the surface by about thirty feet of limestone, but as the south vein dips toward the north vein it is probable that the two veins come together at some distance below the surface. The north bed averages about twenty-four feet in thickness, and it is separated from the inclosing limestones by well-defined lines of parting. The workings have been carried to a depth of 96 feet, the principal galleries, however, being 56 feet from the surface and 200 feet in length from east to west. The south bed is about 16 feet wide, and has only been explored to a depth of 56

feet by a drift from the workings in the other bed. Near the hanging wall of this south bed considerable quantities of argentiferous galena, tetrahedrite, and carbonate of lead have been found in small lenticular masses, and thin veins imbedded in the limestone.

These ores are quite rich in silver, some specimens assaying over \$2,000 per ton, the average richness being about \$150 per ton. The western extremity of both the ore beds seems to have been reached in the present workings, but to the east what is apparently the continuation of the same beds has been cut through by the Reading Railroad, three miles distant from the mines.

The great obstacle in working mine water, which has at last caused the abandonment of the Friedensville mines, is not present in any quantity in these mines, a 16-inch x 3-foot single acting plunger pump being abundantly able to raise all the water yet found. The ore after being raised through a shaft is hand-sorted, so that when carried to the adjacent dressing floors it contains about 12 per cent. of metallic zinc. The dressing floors are arranged so that the ore is carried from the top of the building by gravity through all the processes of separation. A Blake's crusher and Cornish rolls crush the ore, which, after passing through classifying trommels and slime separators, is carried to six sets of "Hartz" jigs, having four plungers each, in which the separation of the blende from the limestone is effected. The slimes are separated in three ordinary buddles. The total capacities of the floors for dressing is about 40 tons of the raw ore per day. The blende, which is manufactured into spelter, is then carried to the main furnace building, which contains two single hearth and two double hearth roasting furnaces and four sets of Belgian reduction furnaces. The ore is roasted 24 hours in the reverberatories, the final heating bringing it to a nearly "dead" condition. Each of the four reduction furnaces holds 56 retorts, which are heated by anthracite coal and blast. The charged retorts in each set hold about 1 1/4 ton of ore, which is mixed with one-third its weight of pea coal and a little salt.

The charging and reduction take about twelve hours. About 1/8 ton of zinc is produced in each furnace per shift of 12 hours. Belgian, French, German, and Spanish workmen are employed as smelters, the long apprenticeship necessary for learning how to properly manage the furnace having kept American workmen from acquiring the process up to the present time. The retorts used are made at the works, and are composed entirely of Amboy clay. They have an average life of 18 heats, those in the upper part of the furnaces lasting much longer than those nearer the fires.

It will have been noticed from the foregoing description that the dressing floors have a capacity much greater than the reduction furnaces, and it is proposed to erect twelve more of the latter, thus increasing the yield of spelter to about four tons per day. The following estimate of the cost of production based upon this increased capacity is made by Mr. E. Gybbon Spilsbury, general manager of the works:

Cost of mining 40 tons of ore a day at \$1 00.....	\$40 00
Transportation to dressing floors.....	2 00
Dressing 40 tons, loss in weight 1/4 = 26.63 tons dressed.....	20 00
2 engineers at \$1 50.....	3 00
2 tons of hard coal at \$2 38.....	4 76
Labor in roasting 26.63 tons at \$1 00 per ton.....	26 63
Fuel, 26.63 tons at \$4 00.....	106 52
Labor to reduce, say 24 tons calcined ore, say 18 shifts, at \$9 00 per shift..	162 00
Fuel for reduction in furnaces, 25 tons at \$2 38.....	59 50
Fuel used for reduction in retorts, 7 1/2 tons at \$1 50.....	11 25
Retorts used, 54 at 75c.....	40 50
Condensers used, 180 at 2c.....	3 60
	<hr/>
	\$479 76
10 per cent. of above for wear and tear and general management.....	47 98
	<hr/>
	\$527 74

Zinc produced would be at lowest possible estimate 9,900 lb. Dividing the above cost by this number of pounds would give \$4 57 as cost of zinc per pound. The following analysis shows the quality of the spelter produced:

Zinc.....	99.687
Cadmium.....	.034
Lead.....	.262
Copper.....	Trace
Iron.....	.017
	<hr/>
	99.998

The total production of spelter is at present from 15 cwt. to 20 cwt. per day of 24 hours. The silver lead found is not treated at the works, but is shipped to Balback's Works at Newark, N. J., for separation. NICHOLS.

THE NORTH SHORE OF LAKE SUPERIOR AS A MINERAL BEARING DISTRICT.*

By W. M. Courtis, M. E., Wyandotte, Mich.

This district commences near Pigeon River, the northeastern boundary between Minnesota and Province of Ontario, and extends entirely around the north shore of Lake Superior, terminating for the present at the Bruce Mines on Lake Huron. The discoveries of mineral bearing veins have been confined for the most part to the Lake Shore, or to the country opened up by the Dawson Red River Road. As yet the country back from the Lake has been but little explored, on account of its roughness, being intersected by steep, rocky trap bluffs, 1,000 or more feet high, and alternating white cedar and tamarack swamps. The forests are exceedingly difficult for the prospectors. In many places Titanic piles of rocks, protected by *chevaux de frise* of dead cedars with their hooked, tough, sharp branches, and a covering of spongy moss, sometimes several feet thick, successfully guard against the discovery of hidden treasure.

The Hudson's Bay Company for nearly a century have maintained trading posts at Fort William and other points, which probably opened the way to the first discoveries that were made at Prince's Bay, near the western limit of the district. At this point a large vein was worked by Col. Prince, the owner, as early as 1846. The richest part of the vein seems to have been on Spar Island, but work was stopped on account of excess of water. Sir William Logan states that a mass of ore weighing several hundred pounds and carrying 3 per cent. of silver was taken out. On the main land, small quantities of native and sulphide of silver were found, together with iron and copper pyrites, zincblende, and galena, in a large spar vein. On the main shore a shaft 90 feet deep and 165 feet deep was run, but apparently with the same success that has attended nearly all the mining enterprises yet undertaken. About this time the Montreal Mining Company employed Prof. Forrest Sheppard to locate lands on Lakes

* A paper read before the American Institute of Mining Engineers, at the New York meeting, February, 1877.

Superior and Huron. During the summer of 1846 he had located eighteen blocks, two miles by five, including Jarvis and Silver Islet, although not then known to have silver bearing veins.

This company spent considerable money on some native copper locations on St. Ignace, but finally turned their attention to the Bruce Copper Mines on Lake Huron. These mines have been worked with considerable though waning success until last year, when a disastrous cave put an end to the operations. I have heard some explorations are being made on other veins at this point.

About 1863 attention was again called to this district by discoveries at various points, and each year to 1868 was marked by fresh developments.

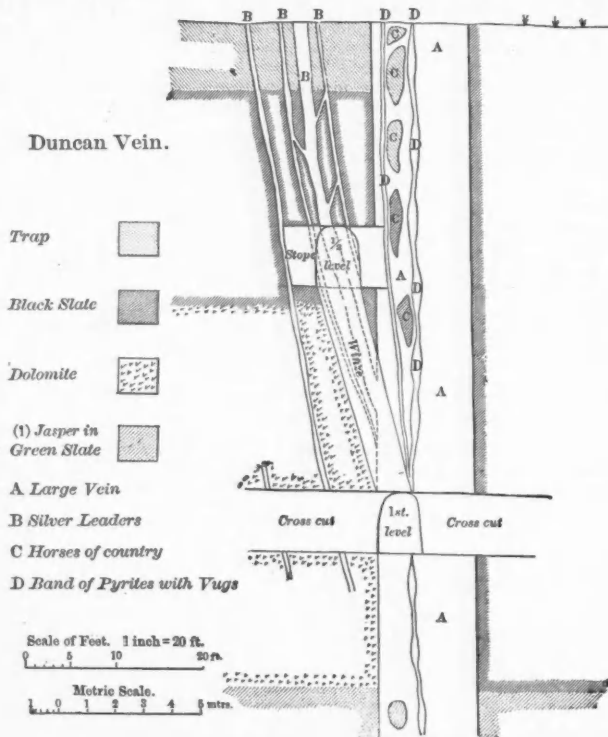
Walbridge & Co. worked a location near the Kaminstiquia River, about seven miles from Fort William, during some months in 1863, their aim having been to sell the property as a copper mine; about one ton of copper pyrites ore was obtained for specimens, and zincblende and galena were also found.

Before speaking of the different discoveries I will say a few words in regard to the geology of the district, which I take from an excellent article that was read before the Canadian Institute of Toronto, by Mr. Peter McKellar, of Fort William, one of the most successful scientific explorers of the district. This article has been published in pamphlet form under title *Mining on the North Shore*, and contains a full history of each location, although many exaggerated reports are given as facts, because they come from supposed trustworthy sources, and some extravagant hopes have not been fulfilled.

The geological formations of this section are: The Laurentian, Huronian, and the Upper Copper Rocks, described by Sir William Logan, Profs. Bell and Chapman. The Upper Copper Rocks are supposed to be the equivalent of a part of the Lower Silurian, and are divided into two divisions, the upper and lower beds.

THE LAURENTIAN ROCKS.

This series occupies the "Height of Land" principally, touching the Lake Shore in but few places within the district. It consists of granite, gneiss, syenite, and micaceous schists, almost entirely. Its veins of quartz and spar carry copper and iron pyrites, also galena and zincblende occasionally. Mr. McKellar's experience is unfavorable to the metalliferous qualifications of these rocks.



THE HURONIAN ROCKS.

This series lies generally between the Silurian and Laurentian, striking occasionally in a northeasterly direction, in a broad belt or trough, back toward the Height of Land into the Laurentian. The principal area occupied by these belts stretches westward from Thunder Bay through Shebandowan Lake, thence on to the American boundary. It consists of greenish and greenish-gray strata, with a dip nearly vertical. The principal portions have a slaty structure, consisting of chloritic, argillaceous, talcose, silicious, dioritic, and fine grain micaceous slates, with interstratified beds of massive diorite.

3 A Mine, Jackfish Lake Gold and Silver Mine, Heron Bay gold and silver, Partridge Lake gold lode, west of Mille Lac, together with lodes opposite Slate Islands, are all in this formation. Gold seems to be a characteristic of these veins, while silver, from the next formation, is absolutely free, no trace being obtained from 70 grammes of Silver Islet silver or 20 grammes of Duncan silver.

THE LOWER BEDS OF THE UPPER COPPER ROCK.

These come next in ascending order. They occupy the coast and islands, with the exception of two or three pieces near Silver Harbor, where the older rocks come in from the east end of Thunder Bay westwards on to the American territory, showing also at a few points further east underlying the upper beds.

They consist of layers of chert, spieren, dolomite and iron ore, the latter being near the base, with thick beds of clay, slate, and gray argillaceous sandstone shales, interstratified with beds of columnar trap.

The intersecting veins carry silver, galena, zincblende and copper and iron pyrites and other metals, and nicolite at Silver Islet.

Silver Islet, Thunder Bay, Duncan (or Champion lode), Silver Harbor, Prince's Bay, Spar Island, Jarvis Island, Pie Island, and many other locations are all on silver-bearing veins intersecting these slates.

THE UPPER BEDS OF THE COPPER ROCKS.

These occupy the principal part of the coast, and almost all the islands from Thunder Bay to the east end of Nepigeon Bay. They consist of sandstones, conglomerates, indurated marls, and some interstratified soapstone, crowned by an immense thickness of trappean beds, most of which are amygdaloidal in character.

The quartz and spar veins which traverse the sedimentary or lower portion hold galena, copper ores, and zincblende in very considerable quantities, also gold and silver, as at the Enterprise Mine, Black Bay. The Silver Lake, Cariboo, and the above are the principal lodes known in these strata. The above trappean beds are the famous native copper-bearing rocks of the South Shore and Isle Royale. At the former place the workable lodes conform with the strata dip at a high angle, and are of well-known richness. On the North Shore these rocks dip at low angles. Native copper with associated nuggets of silver is the principal metal found in these rocks, but occasionally the sulphurets and other ores are met in small quantities. The veins, in passing through them into the sandstone, seem to drop the native copper, it being replaced by the sulphurets. Many years ago the Montreal Company and others spent a considerable sum of money mining in these rocks without success, but that is of little importance, as there were ten times more spent in the South Shore before the mines proved productive. At the Minong Mine on Isle Royale extensive ancient workings have been discovered, and large masses of copper, some 30 tons of mass copper, were obtained last summer.

The veins have not yet been opened sufficiently to give a reliable theory for the deposit of silver in them, but as Mr. McDermott, in an article in the *ENGINEERING AND MINING JOURNAL*, Vol. 23, Nos. 4 and 5, on the Silver Islet vein, proves, the deposit of silver in the veins has been directly connected with some form of carbon in the country rock. Graphite is found at Silver Islet, anthracite at Duncan, and also by Mr. A. B. Wood on the east side of Thunder Bay. Manganese seems to be closely associated with the silver in different forms for different veins. I have noticed that an opaque milk-white spar carries galena and blende with very little silver, while yellow, brown, or rose-colored spar carries native silver and mineral rich in silver. The description of one vein will answer for all that have been opened to any depth.

The fissures consist of one main fissure, with many parallel fissures rising from the foot wall at different depths, and at some places striking into the main fissure, afterwards continuing as separate fissures again. These small fissures seem to be the silver bearing part of the vein, and the large fissure is silver bearing only in the neighborhood of these junctions. Where the main veins branch appears to be the place where the largest deposits of ore are found. Silver Islet, Thunder Bay, Duncan, and 3 A, the richest mines now discovered, are at a fork of the main fissure. All these veins carry ore in the leaders B, on plan (see accompanying sketch), rising from foot wall and running more or less parallel to the main vein. The ore is in bunches, with ground almost barren between. The plan shows the Duncan vein, cut in section at eastern extremity. At western end, the dolomite, which here has been cross-cut 88 feet without finding the end, is only about 10 feet wide on the cross-cut at that point; then come the silver leaders, and then black slate. The leaders at that point enter the large vein below first level instead of above, as on plan, and some of the largest branches of ore were found here. The silver seems to give out as soon as the leaders enter the dolomite. A is main vein, with leaders B. D is a band of iron pyrites and fluorite, more or less branching at the surface.* The vein at this band has large vugs, elongated in the direction of strike of vein, filled at Duncan with water, but often with gas at Silver Islet. They are often ten or more feet long, containing calcspar crystals up to 100 lb. weight. The vein contains horses of the country rock, trap horses being found below the line where it forms the country rock. These horses have been in part metamorphosed, shown by the black slate horses, which have a specific gravity of only 2.542 against 2.719, the specific gravity of the same slate just outside the vein. The edges of the fissures are often brecciated, carrying native silver or ore, as do also many of the black slate horses in the main vein, deposited on the surface of the slate, probably reduced by the action of the carbon of the slate.

The principal gangue, almost the gangue, is calcspar. The lime sometimes is replaced by magnesia or manganese. At Silver Islet the latter makes the spar pink, perhaps passing into rhodochrosite. At Duncan there is no pink spar, but it is colored amethyst, and cavities near the surface are filled with black oxide of manganese. The quartz of this district is often amethyst. Most of the veins on the main land yield fine specimens, especially the amethyst vein at the foot of Thunder Bay. Quartz is the second mineral in importance in the gangue. Fluorite and heavy spar enter largely into the gangue of some veins, while in others are in very small quantities or unnoticed. The minerals are native silver, argentite, zincblende, galena, iron and copper pyrites, and a few rarer minerals. At the different veins sometimes one or the other mineral will form the principal part of the ore, while the others will be more or less suppressed.

TO BE CONTINUED.

CAN WE TRANSMIT POWER IN LARGE AMOUNT BY ELECTRICITY?†

By N. S. Keith, Newark, N. J.

This question is suggested by a statement made by Dr. Siemens, widely printed in the journals of the day, that a continuous rod of copper thirty miles in length and three inches in diameter is capable of conveying that distance, electrically, energy equal to 1,000 horse-power. It is not attempted to advance the statement that the source of power shall be zinc, nor even coal, but waterfalls, which from their situation are not practically available for manufacturing establishments in their immediate vicinity.

In order to fully consider this subject, we must understand the doctrine, I may say the science, of the correlation of the forces, so called. We must understand that all matter is endowed with an amount of force, and that each atom and molecule, simple and compound, has its specific portion of the whole. This force, at rest, is called latent heat, intrinsic energy, or potential. In motion it is called heat, light, electricity, chemical affinity, attraction, magnetism, power, etc., according to its sensible manifestations. These are the effects of the one force in motion in different substances, or in different assemblages of matter. Force put in motion comes to rest by reason of the resistance to motion which it encounters; in overcoming of resistance the manifestation is sensible heat. Each of these manifestations of force is convertible to one or all of the others, and they are all caused by some mode of motion. Force may be illustrated by a spring under tension, or by a suspended weight. Release the spring and weight, and they give off as much force or energy as was used in setting up the

* This paper was illustrated by a full set of the rocks and minerals referred to.

† A paper read before the American Institute of Mining Engineers, at the Wilkes-Barre meeting, May, 1877.

ension of the spring, and in raising the weight perpendicularly the length of its fall. Any of these forces then may, figuratively speaking, release the weight and spring.

While there is but one electricity, there are two conditions of it, namely, *static*, which is electricity at rest but under high tension, and *voltic* electricity or *galvanism*, which is a mode of motion. It has but one cause, and that is force, or matter in motion. Yet we, for perspicuity, call electricity by friction, *static* or *frictional*; electricity by chemical affinity, *chemical* from its immediate cause, or *voltic* or *galvanic* from its discoverers; electricity by magnetism, *magnetic*; electricity by heat, *thermic*; electricity by mechanical power, *dynamic*.

As chemical and thermic electricity have too costly sources for our purpose, we must consider the magnetic and dynamic.

Now that we have learned what electricity is, we must understand what it is not. As an entity it does not exist; it is a signification simply. When we comprehend it as a condition or quality of matter in self-containing motion, not as a current or flow of something through matter, we will be able to deduce facts in the science, and sustain them by practical illustration. The first conception by the mind of a force or motion having its source within a circuit, and manifesting itself at all parts thereof, is that of a current or flow of something. The probability is, electric current is molecular change of form caused by tension upon the atoms composing the molecules in the direction of disrupting them. There is certainly a change of dimensions of matter subjected to electricity, as there is with heat and magnetism. This change of form causes friction of adjacent molecules and its resultant heat. This heat is the exact equivalent of the energy causing the electric current. Energy, when used as electricity, is called *electromotive force*; this varies in degree with its tension, as in case of its illustration by a weight in suspension or by a spring. Some use the term *intensity* to express the same. The tension of a spring may illustrate the electromotive force of static electricity, which imparts its charged energy with a single impulse. A suspended weight released increases its speed each foot of fall, and consequently its force and effective quantity. So with voltic electricity: each cell in circuit increases the speed and quantity of current. In case of dynamic electricity, each increment of circuit receiving electric impulse adds to speed and quantity of current.

All matter offers an amount of resistance to changes of form or arrangement of molecules, whether by heat, electricity, magnetism, or any other of the forces. This resistance is specific for each substance. The specific resistances opposed to electromotive force have been tabulated relatively in the cases of metals common in the arts, and with the important alloys. The metals are the best conductors, or, in other words, offer the least resistance. These follow solutions of binary salts, other liquids, *et sequentes*. Copper and silver offer the least resistance, are relatively alike, and are graded as 1 in scale of resistances. Iron offers nearly six times the resistance of copper, and is graded 5.95. Heat increases the resistance of metals to the extent of about 0.2 of 1 per cent. for each degree Fahrenheit rise in temperature.

Electricians have a formula which sets forth Ohm's law. This is that the current (sometimes called quantity) of electricity is the result obtained by dividing electromotive force by resistance; thus, $\frac{E}{R} = C$.

The unit of electromotive force is called a *volt*, in commemoration of Volta, the inventor of the voltaic pile. It is very nearly represented by the electromotive force, or energy, or intensity of a Daniell cell. The unit of resistance is called an *ohm*, after Ohm, who laid down the law. A wire of pure copper 6,046.5 feet in length and $\frac{1}{4}$ of an inch in diameter has a resistance of one ohm. The unit of current or quality is called a *weber*, or *veber*, after Weber, another investigator in the line.

A *veber* of current represents the energy set free by the combustion of 11 grains of carbon, or 11 grains, about, of coal, or 1 grain of hydrogen, with a development of 6 units of heat in 6,338 seconds. That amount of free or sensible heat is set free in the circuit. Thus, one volt of electromotive force forces one *veber* of electric current through a circuit of one ohm resistance, requiring to do so 4,673 foot pounds of energy, with a development of 6 units of heat in the circuit in 6,338 seconds. The heat set free is the exact measure of the force used.

If we pass this *veber* of current through a solution of copper sulphate, the electric equivalent amount of metallic copper will be deposited, namely, 31.75 grains in the same time. Now, if we increase electromotive force by adding another cell in the circuit, making electromotive force 2, and so regulate resistance that it remains one ohm, a current of 2 *vebers* passes in the same time, thus: $\frac{2E}{1R} = 2C$.

Now, we find that twice as much zinc is consumed in each cell, or four times as much in the circuit, or its equivalent in energy is used in depositing only twice as much copper. We have in the circuit four times as much heat, which is the measure of the energy expended. Chemical decomposition is the measure of current, while heat is the measure of electromotive force multiplied by current. Increase electromotive force to 3, keep resistance 1, and we have current of 3, and nine times the energy expended, resulting in nine times the heat.

It is now to be seen that by increasing definitely the amount of electromotive force, and at the same time keeping resistance as low as possible, we may use a definite amount of energy and distribute it as heat throughout the circuit in proportion to the special resistance of its parts, and utilize it as mechanical power. The object of increasing E at the expense of C is that we may save in weight of copper constituting the conductors. We get the energy distributed throughout the circuit, though but the square root of it is shown in chemical action when measured by the amount of copper or other metal deposited in a single depositing cell.

If we magnetize a core of soft, uncarbonized iron within a coil of copper wire by bringing it into the magnetic field of an electro or a permanent magnet, at the instant of stoppage of motion a current of electricity will start in the coil in one direction; that is, the molecules composing the circuit will turn in one direction, and then the action ceases. Remove the core and coil, a reversed current starts and continues as long as motion lasts in removing them from the field. If we revolve this arrangement between the poles of a magnet, thus alternately magnetizing and demagnetizing the core, we will get a succession of discharges of magnetism through the copper coil utilized as electricity. While the core is acquiring magnetism, there is no current in the coil, as there is no magnetic resistance to motion which requires force to overcome. As soon as it begins to lose magnetism an electric current is induced in the coil, which we may cause to do work by proper mechanical appliances.

We will find that the coil and core are heated, and the amount of heat is the measure of the mechanical force used, less that due to friction of the journals carrying the arrangement. If the coil completes the electric circuit within itself, so that there is no external resistance, then the total heat will be developed there-

in. If the circuit is made complete by a conductor, then the heat will be divided between the coil and conductor in proportion to their respective resistances. If this conductor be the coils of an electro-motor, the heat due to it can be utilized as work, less loss by conversion.

We have now the general requirement laid down, so will proceed to plan and construct a theoretical machine to suit the requirements of 1,000 horse power, to be transmitted, if possible, through a rod of copper thirty miles in length and three inches in diameter. As resistance of wire of same diameter is in direct proportion to its length, and as we have seen that 6,046.5 feet of copper wire, $\frac{1}{4}$ inch in diameter, has a resistance of 1 ohm, so 30 miles, or 158,400 feet of $\frac{1}{4}$ inch wire, has 26 ohms resistance. But as it also decreases in proportion to the square of the diameters, we figure in the 3 inch rod a resistance of .18 ohm, if of pure copper at a temperature of 60° Fahr.

The energy of 1,000 horse power is measured as 33,000,000 foot pounds per minute, and that of one *veber* current equals 4,673 foot pounds in 6,338 seconds, or 44.24 foot pounds per minute. So it will require 746,000 *vebers* current, or their equivalent in energy, to utilize 1,000 horse power as electricity for dynamic purposes.

We may therefore use electromotive force of 1,000 volts, resistance of 1.34 ohms, and a current of 746 *vebers*; thus $\frac{1,000 E}{1.34 R} = 746 C$. In other words, the

dynamic equivalent of 746,000 *vebers* may be had by multiplying the electromotive force 1,000 by the current 746.

It has been found that a discharge of the magnetism of a soft iron core induces a current in the coil surrounding it possessing electromotive force of one volt for about each twenty-five feet of coil. The quantity or current comes from the strength of the magnetism and number of discharges. For 1,000 volts electromotive force we will take 25,000 feet in length of copper wire or strips, weighing 1.2 pounds per foot length, or in all 30,000 pounds. This will have a resistance of .66 ohm. It should be wound upon a core of iron weighing 10,000 pounds. This core and coil, constituting what is called an armature, must be revolved between the poles of an electro-magnet having such an attraction for the armature as to call for the expenditure of 1,000 horse power in revolving it. Such a magnet will weigh, probably, 60,000 pounds, and have a like weight of copper in its coils. It should be excited or magnetized by a smaller armature revolved between the poles of a smaller magnet, with an expenditure of, say, 100 horse power. This is necessary, because, if the coil of the magnet is part of the main circuit, the resistance will be much increased.

The electro-motor receiving the current of electricity must have at least the same length of copper in its coils; and as the resistance of the coils (when the machine in motion is exerting its greatest power) is double that which they have at rest, and as it is necessary from our other fixed resistances to make the resistance of the machine .50 ohm, we make the weight of copper coils per foot 3.17 pounds, a total of 79,200 pounds, with a weight of iron about 70,000 pounds.

The cost of this apparatus will be as follows:

Exciting magnet and armature.....	\$3,500
Large magnet, 6,000 lb. iron, including work thereon, 10c. per lb.....	6,000
60,000 lb. copper, 30c. per lb.....	18,000
Armature: 10,000 lb. iron, and work thereon, 10c. per lb.....	1,000
3,000 lb. copper, 30c. per lb.....	9,000
Brass bearings, brushes, etc.....	2,500
Total for machine.....	\$40,000
Conductor: 158,400 feet copper rod at 27 $\frac{1}{2}$ lb. per foot, 4,356,000 lb., 30c.....	\$1,306,800
Ground plates and connections.....	5,000
Insulation, etc., indefinite, say.....	100,000
Total for conductor.....	\$1,411,800
Motor: Iron and work, 70,000 lb., 10c.....	\$7,000
Copper, 79,000 lb., 30c.....	23,700
Brass, brushes, etc.....	2,500
Total for motor.....	\$33,200

The energy of 1,000 horse-power expended on the machine generating the electric current is distributed throughout the circuit in proportion to the special resistances of the several parts. The armature, having a resistance of .66 ohm, absorbs 66-134 or 492.5 horse-power; the conductor 18-134 or 134.3 horse-power; the motor 50-134 or 373.2 horse-power. This last amount is all that can be utilized with this arrangement, even if there is no loss. We may make our electric machine and the motor larger, or place two of them, making the resistances of them one-half as much, but not with any increase of utilizable power, as the resistance of the conductor remains the same.

Let us consider a resistance of .33 ohm for machine, .18 ohm for conductor, and .25 ohm for motor, and we have 33-76 or 434 horse-power for machine, 18-76 or 237 horse-power for conductor, and 25-76 or 329 horse-power for motor. This is less available power than before. The resistance of the earth returning the current we may count as nothing. Under no circumstances can we utilize the full power expended.

If we decrease the resistance of the machine to .33 ohm, and increase that of the motor to .83, keeping total resistance the same, we will gain. Then the machine will absorb 33-134 or 246.2 horse power; the conductor 18-134 or 134.3 horse power; and the motor 619.5 horse power. With a larger conductor or shorter distance, this proportion may be increased.

There are various sources of loss, especially with electricity, of such electromotive force and tension. I have no doubt that at least 2 per cent. of the energy expended on a magneto-electric or dynamo-electric machine at a waterfall may be used at a distance by an electro-magnetic motor as mechanical power.

The amount of heat developed throughout the entire circuit will be equivalent to that from the combustion of 200 lb. of coal per hour, or 42,746 heat units per minute. That proportion due to the armature, having resistance of .33 ohm, is sufficient to raise its temperature one degree Centigrade per minute. Of course, then, some arrangement for cooling by water must be applied.

What the effect of a discharge of a portion even of this current, with its high tension, through the body of a man would be, I leave you to imagine. Probably it would be worse for that man than it was for the one who was kicked by the Kentucky mule; "they swept up the pieces" in that case, as the voracious reporter states.

COAL DISCOVERIES IN ALASKA.—Some small shipments of coal have been received in San Francisco from a mine near Conalaska, in Alaska, and a company, known as the Kimberly Coal Company, has been organized to work the mines regularly. The coal is of a good quality, and is said to exist in great quantity there.

LECTURES ON MINING.—No. XLIII.

By Prof. W. W. Smyth, M. A., F. R. S., Royal School of Mines, London.

LADDERS AND MAN-ENGINES IN SHAFTS.

The next matter to which we must look is that of the fittings and arrangements of the shaft for the purpose of hoisting the mineral; and to another question which goes with that—the most convenient and most practicable means for the passage of the men. In some cases the arrangements for the two will be about identical, in others very different. In the present lecture we will look to the subject of traveling in the shaft, which in some shallow mines may be a very simple matter, but in deep mines, where you have to deal with a large number of people, it is a matter requiring a great deal of attention, in consequence of the accidents which are likely to occur when anything goes wrong. The first plan we find in mines in comparatively uncivilized countries is that of opening the shaft at an angle of 20° or 30° , and then cutting steps in the floor: this is thought to be most convenient, especially where the men have to bring up the mineral on their shoulders. In some exceptional instances it may be seen in other places—in the salt mines at Cracow, although they have perpendicular shafts for drawing the mineral, they have also a large number of these inclined shafts, with steps cut in the rock salt at first, but afterwards replaced by wooden steps. In some few metalliferous mines, and in the Mostyn collieries in Flintshire some few years ago it might be seen in use. In Mr. Beaumont's lead mines similar inclined shafts, fitted with a wooden staircase, are used, and the horses are led up and down morning and night. Carried a long way they cannot, of course, be convenient, but they have this advantage, that they can be carried in different directions, so as to make a great stair-case, as in the lead mines last mentioned. In other cases the men slide down the inclined shaft on a piece of board, the rubbing parts being, of course, properly protected, generally holding on to a rope; by the side of this steps are cut for the passage up. In the neighborhood of Salzburg a whole series of mines are fitted in this way with fir poles. These are exceptional methods; by far the most frequent plan for metalliferous mines is that of traveling on ladders. The method of letting men down by a rope is represented in an illustration in Agricola's book, which represents a man sitting on a cross stick at the end of the rope passing from the windlass. This lowering the men by means of a rope is the most usual method in the coal mines in Great Britain, and in metalliferous mines of great depth. Sometimes a man will step into the kibble with one foot, leaving the other foot free to ward himself off the sides with, and in the Isle of Man and the North the men will similarly place one foot in an iron stirrup, and have the other free. In such cases the difficulty is to see about you, and also the meeting with the other kibble coming up. In Spain both officers and men are lowered by the rope, sitting with one leg through a loop in the rope; and they have also a very prudent rule in those parts, that besides the one rope in which he sits the man going down shall have another loop round his chest, so that in case of losing his hold he will not fall. We may, however, look more particularly at the ladders in metalliferous mines both in this and other countries, which when properly put up have formed a very convenient method where the depths are moderate. In the North of England it is commonly the case that instead of ladders they have stemples of small diameter, while near the top of the shaft, if the ground stands in walling, they will stick in some pieces of wood. The difficulty of keeping your candle alight as you lower yourself from one piece to the next adds to the inconvenience, and to have to travel thus for any great distance would not only be very risky but fatiguing. This is a plan by no means to be recommended, and would be incompatible with a large number of men traveling through the shaft.

There is another method which, the lecturer was glad to say, is seldom to be seen in this country any longer, and is becoming rarer on the continent—that of putting cross steps to a single longitudinal piece of wood, and making what they call a ladder. These, suspended one after another, were apt to get broken up, and hanging vertically they threw a great strain on the chest and heart; and it cannot be looked upon in any other light except as an indication of a method of great rudeness. Ladders used for the principal traveling in mines are formed of two cheek pieces, almost invariably rectangular, set at 12 to 14 inches apart. The steps in this country are generally round, and thickened in the middle; more commonly they are of flat wood; they must be of such form as to give great strength, and yet not be too thick to be grasped by the fingers. Of late years, both in Great Britain and on the Continent, but more especially with us, wooden rungs have been replaced by iron, and some people say they can be more readily grasped. The lecturer doubted whether this was not very much the effect of habit; but there is no doubt that when iron ladders are used in countries where there is excessive cold the metal is very trying to the hands, and when they are much worn they may become almost as sharp as knife edges, while in many mines the action of acid waters will affect them, and perhaps not visibly so. Almost universally the distance asunder is 10 to 12 inches between the middle of the steps; in some districts they are content to put them 12 inches asunder, and then you find the men are fatigued without knowing why. As a general rule, when the distance does not exceed 11 inches, the men retain their power longer and are less fatigued than when large distances are employed. Nothing can be more objectionable than a long string of ladders one after another, and the lecturer was glad to see that the new Act had not left this subject unnoticed. With a suitably inclined ladder, the center of gravity of a man climbing up falls between his feet, and is thus supported, and if one step should break he has still hold of the others, since it is a rule that you should not let one step go till you have firm hold of another. Whereas on a vertical ladder the center of gravity falls outside the ladder, the man is obliged to pull himself up by the muscles of his arms and chest, so that there is a great strain thrown on these muscles, and if a step breaks he is left unsupported. It is not inexplicable, therefore, why diseases of the chest and early deaths are common amongst miners. It is generally said that this position of the ladders is necessary from want of room in the shaft; such might be the case in some of the old shafts, perhaps, but there is very little excuse for this sort of thing at the present day, and if the shaft be narrow all that has to be done is to make the inclined ladders shorter.

With inclined ladders the foot of each ladder rests on one side of a collar, or stage, on the other side is a man-hole, through which the head of the next ladder comes. By this means if a man drops a tool or anything they fall no further than the first stage. In a medium shaft there is no occasion to shorten the ladders too much, between 2 and 3 fms. being very common; the former size is often seen in the Harz, and the men seem always to be getting on and off the ladders, but the momentary change of position is very advantageous and relieving. Now and then in passing a piece of machinery it may be necessary to have a vertical ladder, but generally speaking it will only be for a fathom or two. At certain intervals it may be well to have distance pieces in the ladder, a longer rung passing through the cheeks, and being fastened by means of a nut or cross

piece. And, again, to prevent the ladder swinging a strut may be placed against the wall and against the side of the ladder. The collars require careful attention; in a mine subject to dry rot the accumulation of three or four men on one of them may cause it to give way. Here and there, especially in woody countries, what are sometimes called sump ladders are used, being long logs of wood, with steps cut into the sides, and these may come in very useful for rough usage. In blasting and sinking a shaft chain ladders are very convenient, as wooden ladders would soon be destroyed by the fragments from the blasting. When the Ecton Mine was at work it was entirely fitted with chain ladders, which are said to have done good service.

The use of ladders is a convenient mode of getting access to the mines down to the depth of 100 or even 200 fms. but during the last half century when many of our mines reached the depth of 300 fms., the question arose very naturally whether a good deal of time was not lost in this method, and whether the men were not subject to a great deal of fatigue and disease. It must be remembered that the traveling is not in the open air; and the lecturer knew mines in this country where to travel 100 fathoms was as fatiguing as to travel 150 fathoms where better ventilation and wider shafts are employed. When the men reach the surface in all sorts of weather in a state of heat and exhaustion the consequences are very serious. It may be said, why do not the men in metal mines go down by means of a rope, as the colliers do? It must be borne in mind that while the latter generally all go down to one level, in the metal mines the men would have to be put down to ever so many different levels. Take the following imaginary case: 500 men have to be conveyed to a medium depth of 1,200 ft., the average weight of men being 140 lbs.; this will give $500 \times 140 \times 1,200 = 84,000,000$ foot pounds. This may be taken in round numbers as the labor of 84 men for one day, and this labor is thrown away if the men have to pull themselves up that height. Supposing a man's labor to be worth only $\frac{3}{4}$ per day, that would give the sum of £12 12/ per day thus lost, and for 300 working days of the year no less than £3,780. Such sums might very profitably be spent in putting in some arrangement by which the men could be lifted to the surface. The great inconvenience and time taken up in lowering the men by a rope to the different levels is very much against this method, even were the shafts suited to it, which in the majority of cases they are not. Take the same case of 500 men, and say you could take 8 at a time, it would require 63 journeys to be made to raise or lower the men, and allowing only 3 minutes for each journey (2 minutes for the passage and a $\frac{1}{2}$ minute for getting in and out), each set would take 3 hours 9 minutes, or for both raising and lowering $6\frac{1}{4}$ hours must be given up to this work. About 1830 the subject began to be mooted both in the Harz and in Cornwall; but the engineers in the Harz were beforehand, and in 1839 had actually got machines at work upon the system, which 3 years later was introduced into Cornwall. This machine was the man-engine or Fahrkunst, or Waroquiére (so called in Belgium or France from the name of a large mining proprietor in Belgium.) The idea was first suggested to a miner in the Harz, on seeing the reciprocating movement of two pump rods: he conceived the idea that if a man alternately stepped from one rod to the other as the latter was about to make its upstroke, the man would travel continuously upwards. The man verified his idea by affixing pieces of paper to rods as he passed up the shaft. It soon began to be looked on in the Harz as necessary as soon as the mine reached 200 fathoms to put in a Fahrkunst. In Cornwall, with the assistance of the Polytechnic Society, a machine of this kind was first put up at the Tresavean mine, and a very great success it proved. In the Harz the machines were at first only appendages of the pump rods, afterwards they were put up on a small scale, with light rods, to be worked on a small water-wheel. In Cornwall they are formed of solid rods, like the pump rods, 7 inches at top, 5 or 6 inches below. In the Harz the rods were of wire rope, strengthened at intervals by planks, and the steps were attached by resting on a bracket, which was well whipped to the rope. With five to seven strokes per minute, and each as much as 12 feet, you could travel at the rate of 60 feet per minute, and consequently could get to the depth of 200 fathoms in about 20 minutes. The enormous gain to the men by the use of these machines cannot be fairly calculated, and they are thus enabled to work places in the deeper parts of the mine which otherwise they could not. In some cases the rods are single, the men stepping off on to a platform at the end of the stroke; and these single rods have to be balanced in the same way as the single pump rods are balanced. Some difficulty has been experienced in certain cases in the equilibration of the double rods, especially in Belgium, where it was attempted to work them direct from the steam cylinder. One disadvantage resulting from this is that when the steam is used at any considerable pressure it starts the rod with a blow, which may jerk a man off his legs, if he is stepping on at the time. A better plan is that of working it at some distance from the engine by a system of cranks, and the rods are equilibrated by being connected by strong chains passing over a pulley. Considerable masses of timber are placed in the shaft, to act as catches in case of a fracture; the accidents, however, have been extremely few.

CORRESPONDENCE.

THE LOWE GAS PROCESS.

Methods Employed to Counteract its Success.

TO THE EDITOR: SIR.—Appreciating the interest you have always shown in the progress of our operation, which has been based upon a careful examination into the actual working of the Lowe process, I am emboldened to ask space in your columns for the purpose of explaining its present status, and the position assumed towards it by the old coal-gas interest. This is rendered necessary by the fact that their organ, the *American Gas-Light Journal*, has recently indulged in gross misstatements, and has declined to allow a prompt correction of the same, compelling me to address their readers through your paper. I regret that I cannot furnish you the original article written for that journal, but its editor, exhausted by his recent attacks upon us, has fled to the hill country for rest, carrying the manuscript with him. I should be sorry to interfere with his comfort and pleasure during retirement, but must take this public opportunity to notify him that in my humble judgment it would have been better to give me space for my own letter in his issue of yesterday than to have printed one purporting to come from me, which he ought to have known was a forgery. If he did not know it, opportunity to say so will be given him immediately on his return, when proper legal proceedings will be commenced.

This desperate attempt to put us in a false position is one of a series employed by certain parties deeply interested in the old system, and is new only in being a wanton attack upon the personal character and integrity of the managers instead of one on the process, as heretofore. The latter has apparently proved too strong for them; its unbroken series of successes has withstood all their misrepresentations, and they have therefore concentrated fire on the former. It is a gratification to the owners to observe that their general reputation rendered

it necessary at the very first onslaught to rely upon a barefaced fabrication, no such letter as is credited to our office ever having been written there or anywhere by any of us. It is a stupid attempt to make us appear as engaged in forming bogus companies with fictitious capital for swindling purposes, and is a peculiarly refreshing charge to come from the old corporations, which, however they may oppose the use of water in gas, have employed it generously in the dilution of their stock. To show the gross injustice of this clumsy charge, it may be stated that in Baltimore, where is the largest plant with which the Lowe process is associated, 50 miles of mains have been laid, and the works are so far completed as to justify expectation of distributing a million feet per day in September. Yet not a share of stock has been issued, nor will be until the enterprise is in full and successful operation. And when issued, it will be in all for a sum so much less than the stock of the old company as to give it a decided advantage in the earning of dividends. It was only the preceding issue of the *Gas-Light Journal* in which the editor commended with words apparently sincere "the faith that its managers have shown in the ultimate success of their scheme. They have put their own money in it."

To you, Mr. Editor, who know some of the peculiar restrictions by which your young contemporary is surrounded, this sudden change of tone will doubtless suggest that it has undergone discipline during the interval at the hands of its master, and it may be we should pity and not blame.

In the former editorial of the *Gas-Light Journal* many inaccurate statements were made, and as my corrections of these have been deferred by the editor, I will make them briefly here while awaiting the tardy justice of your contemporary.

True to the conservative instincts of the men it serves, and who control the existing companies, it hunts up the records of old methods and experiments, and states that "the practical results obtained in this country in making the hydrogen and carbonic oxide gas from steam and carbon have varied, according to the best information at our command, from 160 to 260 lb. of carbon for every 1,000 feet of water-gas. Taking the average of these at 210 lb. of carbon per 1,000 feet of gas would give a yield of about 11,000 feet of H and CO to each ton of carbon. To this must be added 5 or 6 gallons of petroleum per thousand, etc." To which we reply, as does also Mr. W. P. Fish of the Utica Gas Works in the last number of the *Gas-Light Journal*, that the simple fact is, in actual operation the Lowe process requires but 50 lb. of coal and 3 gallons of oil for every one thousand feet of finished gas, and on favorable occasions the quantity of coal has fallen so far below this as to give a yield of 54,000 cubic feet to a ton. This includes, of course, all the fuel employed in generating steam, decomposing and superheating. While these figures can be substantiated by personal examination of our books and our works, both of which have always been open to intelligent inspection, it would seem idle to quote old time theories, but the *Gas-Light Journal* evidently thinks that figures like wine improve with age, and never presents anything modern if something half a century old serves its purpose better.

Another error into which that paper falls is contained in the statement, "If a leak of gas occurs, there is danger of loss of life or serious injury to any one breathing it, owing to the 33 per cent. of the carbonic oxide which the gas contains as sent out from the works."

The charge that the new gas is "poisonous" is one on which the old companies have greatly relied, as it appeals to popular or ignorant fear, though it does not bear an intelligent examination, even admitting the CO to be in considerable proportion. In combustion it would be a valuable constituent, and in connection with the presence of an increased proportion of H and a reduction of CH₄, its waste products would show much less CO₂, and hence the air of an apartment would be less vitiated by its burning than if ordinary coal-gas were used.

In the event of a leakage its strong odor, at least as powerful as the common gas, would give notice to the senses, and if the warning were unheeded it is reasonably certain that coal-gas would smother a person considerably before the Lowe gas could poison his blood.

But lest a conscientious doubt may still remain, painful as it is to destroy this pet argument of our adversaries, we are compelled to state that analyses of London City gas show it to contain 7½ per cent. of CO, New York, Brooklyn, and Newark coal-gases from 3 to 6 per cent., while repeated examinations of the Lowe gas show it to contain but 2.72. And lest our elastic friend of the *Gas-Light Journal* should denounce these figures, it must be stated that they come to us from parties characterized in his editorial of June 16th as "professors of unquestioned integrity and ability."

This argument, however, has always lacked the simple merit of honesty. Originally raised by certain prominent engineers in New Jersey, they have recently given evidence that there is something contained in the Lowe-gas more deadly to their business than CO, by slipping through the Legislature an amendment to the general law for the organization of gas companies which practically precludes the formation of any new companies. It makes it a penal offence (\$100 per day) to send out gas containing 2 per cent. of CO or 10 per cent. of H. The force of the amendment will be appreciated when it is stated that it does not affect the existing companies, and that they make as high as 6 per cent. of CO and 46 per cent. of H.!

This is one of many conclusive evidences given us that the old companies are thoroughly alarmed by the successes of the Lowe process, and are vainly striving to avert the sure-coming competition. If the new system is really so imperfect—so given to failure, we can hardly understand why such desperate warfare should be waged against it. Experts and builders, who after due investigation have commended it, are threatened by the old interest with a withdrawal of patronage on that account—facts are distorted, ridicule and abuse are employed, special and prohibitory legislation is obtained, and even slander involving the grave act of forgery is used. Fortunately the inevitable result of all this wild opposition is to open the eyes of the intelligent public to the fact that a genuine and powerful competition in the distribution of gas is at last definitely promised, and the public are more interested in this than the maintenance of vested rights representing oppressive monopolies. The struggle is always a hard one, but has one ending.

The *Gas-Light Journal*, in the number referred to, also puts out a list of complaint against the Lowe gas, comprising in all twelve names, though none of them are signatures. They are so many statements alleged to have been made by consumers in Manayunk (Phila.), but put in the language of the writer of the article.

It would not be strange if, during that stage in our operations which has always been acknowledged to be inevitable where the new gas passes through old mains and dissolves the dirty deposits left by the coal-gas, some annoyance should occur. We distinctly promise it for a brief period. But it is something new for the old managers to listen to the opinion of consumers as possessing authority, and, since they are disposed to do so now, we take pleasure in calling attention in a general way to the widespread dissatisfaction throughout the United States with the average coal-gas distributed by their friends, even including the Manhattan Company of this city, and for the real opinion of our customers in Man-

yunk would refer them to testimonials on file in our office and that of the Gas Trust of Philadelphia, signed by hundreds of the most intelligent residents, including many mill-owners using large quantities of gas. We refer also most confidently to a dozen other towns where our process is in use, including Trenton, N. J., and Harrisburg, Penn. And as the same gentlemen have lost no opportunity of misrepresenting the facts concerning Utica, it may be appropriate to close with a letter recently received from the manager of the works at that city:

OFFICE OF THE UTICA GAS-LIGHT COMPANY, UTICA, June 4, 1877.

GEO. G. WASHBURN, ESQ., ELYRIA, OHIO:

DEAR SIR: Answering your inquiry of the 31st May last, I will state that in July, 1874, this company entered into an agreement with Messrs. S. A. Stevens & Co. and T. S. C. Lowe, by which they were to erect machinery and apparatus on our premises for testing the "Lowe process." Operations were commenced in the autumn of that year, and continued until January, 1876, when their works were consumed by fire, but the burning of their works has no significance whatever as to the merits of their process, as it was from an accident just as likely to occur under one process of manufacture as another.

In the process of this experiment we employed Prof. Henry Wurtz (an eminent professional expert) to test the gas, and his able report, published in the *ENGINEERING AND MINING JOURNAL* of November 20, 1875, shows a reduction of carbonic acid—of gas-tar to one-fourth, sulphur to one-third, and ammonia to one-fifth of same impurities from coal; the show of naphthaline was inconsiderable. Quality, 19 to 20 candles, and uniformity of quality all that could be desired, and cost, in holders, much less than coal-gas of lower candle-power.

We had previously tested, very thoroughly, other hydrocarbon methods, and found them impracticable, unprofitable, or otherwise unsatisfactory. We have also experimented with other processes, particularly for utilizing petroleum, since the destruction of the Lowe works on our premises, but have found nothing as convenient and economical, either as an adjunct of established coal works or as an independent process.

Accordingly we have just purchased the rights covered by the several letters patent collectively known as the "Lowe process," so far as they apply to this locality.

Trusting that this will meet the requirements of your interrogatories, I am,
Truly yours,
H. H. FISH, Treasurer.

New works are expected to start in Lancaster to-day, larger ones will go into operation in Baltimore and Indianapolis in the early autumn, many applications are coming in from other important cities, and we have even received propositions from some repentant coal-gas companies.

We therefore conclude with the prophetic quotation,

"No pent-up Utica contracts our powers—
The boundless continent is ours."

Very respectfully,

GEORGE S. DWIGHT.

NEW YORK, July 3, 1877.

WESTERN NOTES.

Staff Correspondence of the Engineering and Mining Journal.

A recent experiment made in the Morning Star claim (placer) in California on sluice pavements gives some interesting and valuable results. The company in question laid out three sections of their flume, 65 feet long each, and about 300 feet from the bank. The upper section, nearest the bank, was paved with the ordinary wooden blocks. The second was fitted with old railroad iron. The third was similar to the first. When a clean up was made, 9 ounces more were derived from the middle section than from the other two combined.

It must be confessed that this is a rather startling result, and better than can be expected in ordinary cases. While it is true that there can be much improvement in sluice paving, the results attained in this instance must be regarded as rather exceptional. It shows, however, that wooden floors are comparatively poor, and that there is a large advantage in metal riffles. In the case of the Morning Star, the rails were laid lengthwise the sluice and close together. On the score of economy this style of riffle has also many advantages.

The 1,750-Foot Level.—The mining world of California, or at least that portion which earns its livelihood in speculating in stocks, are just at present awaiting with great anxiety to hear from the developments now in progress in the Bonanza mines below the 1,650-foot level. All the rich ore hitherto produced from the California and Consolidated Virginia have come from above this level. The many who think that those great mines are near exhaustion confidently expect that no ore to any amount will be found below. Believers in the property, on the other hand, look for even finer developments than above. It will not be long before the point is decided. The 1,750-foot level will now shortly be opened. Two winzes are being sunk, which at last accounts had been penetrated 25 feet below the 1,650-foot level, and so far are in splendid quartz. It will require about two months before any extensive results are determined. There is nothing but good news so far.

Stocks.—The recovery in mining stocks in San Francisco, though making a good show on paper, and in reality something of a gain, has not yet caused any material alteration in general business prospects. The Pacific capital is still dull and quiet. Confidence is far from being restored. Even the magnificent dividends of the two bonanza mines, amounting to \$2,160,000 for the month past, has fallen on a market with but little life in it. A monthly production of about \$3,000,000 in bullion is now being reported from the stocked mines.

The contemplated removal of the Boston & Colorado Smelting Works from Black Hawk, Colo., to Denver, will be one of the most important industrial changes in the West. These works are producing at the rate of over \$2,000,000 in fine bullion annually, and are probably the finest reducing establishment in the West. Their removal will be caused by the growing scarcity of fuel (wood) in Black Hawk. Once located in Denver, they will exercise a more powerful influence in the mining districts than ever before, and will, no doubt, before long enter into competition with the local works of Utah, New Mexico, and Montana for ores from those districts.

Ceased Work.—The National Mining Company have finally, after many years of discouraging work, thrown up the sponge on the Whitlatch Union Mine at Unionsville, Montana, and stopped work. The history of this mine is similar to that of many other fine properties in the West. Discovered in 1864, it yielded magnificently from surface quartz, and was worked with more or less persistency, and under many proprietors, for nearly a mile along its outcrop. The vein is a flat one, or rather dips into the hill at an angle of about 30° from the horizon. The quartz was of high grade (\$50 to \$100), and was easily mined. As depth was attained, the difficulties of mining increased, and the recklessness with which it had been worked gradually compelled the segregation of smaller claims into larger ones, and the abandonment of long stretches of the vein by individual owners who were unable from lack of capital to prosecute a systematic development. Of the resultant organizations into whose hands sections of the vein grad-

ually fell, none have worked more zealously and persistently than the National Company of New York. At times their property has paid enormously, but the reserves of ore were never kept in advance of the production, and, by reason of a sudden turning of the vein, the workings during 1875 and 1876 were driven far off the lode, and the stopes gradually exhausted. The mine is now abandoned, and is a monument of misdirected energy. Altogether this vein has yielded fully \$4,000,000 in gold. The suspension of operations upon it is a serious blow to Helena and Montana in general. In spite of the failure, the property is one of the finest to be found anywhere.

MINING NEWS.

Staff Correspondence of the Engineering and Mining Journal.
COLORADO.

SAN JUAN MINES.—One of our correspondents sends us the following notes from San Juan:

Belle of the East, situated on Five Belles Mountain, about half a mile from Enterprise City, and about three miles from Lake City. This mine was first discovered by J. Hill, and by him sold to J. C. Foote for the sum of \$7,000. There are two tunnels run in on this mine. No. 1 or upper tunnel is now in a distance of 60 feet, and cuts the main shaft at a depth of 90 feet, and will cut the East shaft at a depth of 160 feet. This tunnel is 6½ feet high by 4 feet wide. No. 2 or lower tunnel is now in a distance of 30 feet, and will strike the main shaft at a depth of 190 feet, and the East shaft at a depth of 340 feet. Both of these tunnels are being run on the vein, thereby rendering the owner a great saving, as they are taking out mineral all the time.

There are three shafts—1st, the main or discovery shaft, is now down to a depth of 65 feet, with one level running due east a distance of 75 feet, always on good (pay) mineral ranging from 1½ to 3 feet wide. There is also a stull 30 feet long and back stope started. 2d. No. 1 East shaft has been sunk to a depth of 50 feet, and has shown a mill test of 415 oz. This shaft is to be sunk so as to strike both of the tunnels and will be used as an air shaft. 3d. No. 2 East shaft has only been sunk 20 feet, and already shows good mineral. The mineral taken out of this mine shows galena, gray copper, white spar, carbonate, sulphurets, hematites, and pyrites. All the above facts are obtained from Mr. W. B. Find, the Superintendent of this mine, who was kind enough to make the measurements in our presence. This mine is being rapidly developed, employing 36 men working night and day.

Enterprise Tunnel, situated about one mile from Lake, was located by Mr. W. B. Fonda, its present superintendent, and is now owned by the Enterprise Tunnel Company. The site for the tunnel is as good a one as could have been selected in the entire San Juan country, it lying in the same mineral belt as the celebrated Belle of the East, Belle of the West, Ute Ute, Plutarch, Ocean Wave, Wave of the Ocean, etc., and is known as the richest mineral belt of the San Juan. The tunnel is now in a distance of 75 feet, and is well timbered with post and cap, and is expected to strike rich blind leads. Timber and water sufficient for all practical purposes are close at hand. The air in the tunnel is very pure, as at its present terminus a shaft has been sunk for the purposes of ventilation, and Mr. Fonda informs me that while working the men have found on the bed of the tunnel boulders of float weighing all the way from 5 lb. to 12 tons, in proof of which he showed me one boulder weighing fully 12 tons. Assays made from the float have run from 47 to 183 oz.

The Ute, situated about 4¼ miles from Lake City on Henson Creek, is owned by the Messrs. Crooke Bros., proprietors of the concentrating smelting works near Lake City. This mine has 3 shafts. No. 1, upper or discovery shaft, is down to a depth of 65 feet, and has shown mineral from the very grass roots, and now shows a pay streak averaging 2 feet and 6 inches. From the bottom of this shaft there is one level running due east a distance of 120 feet, running in mineral all the way, and one level running due west a distance of 155 feet, also running on mineral. All the ground on this level is to be stoped out.

No. 2 is down a depth of 60 feet, and is still being drove at its present terminus. There is a level running due east at a distance of 160 feet. In this level we saw an immense amount of mineral, but it was mainly galena, and of a very inferior quality at that.

No. 3 is the same depth as No. 2 (60 feet), and 150 feet distant, with the mentioned level of 160 feet, connecting shafts Nos. 2 and 3. This shaft has also one level running due west a distance of 185 feet. Every inch that has been driven has been in mineral, and Messrs. A. Cree and J. Simons informed me that last winter, in four months, they took out of the levels over 900 tons of ore, with a force of only twenty-six miners. They also informed me that the mine has averaged over 30 tons of ore to the fathom.

Mr. Simons is now sinking shaft No. 1, so as to connect with a drift being driven by Mr. Cree from shaft No. 2 and running due east. This shaft is running on ore all the time, and when it reaches the lower level, to which it will furnish fresh air, there will be greater facilities for working this mine, and it will be an easy matter to take out from 10,000 to 15,000 tons of ore. Mr. F. A. Wood is the superintendent of this mine. Although this mine has an immense amount of mineral in sight, still I have not very much faith, for I am assured by old experienced miners that the majority of mines in this section grows poorer and poorer the deeper they go down. This has been demonstrated in every case where a mine has been sunk in this district to any considerable depth.

I say this without any fear whatever, in spite of the threats made to mob me, in case I did not join in the great hue-and-cry to praise up Lake District above all others, for I am but uttering my honest convictions when I say that the best mines are not in this district, but on the other side of the Range, at least as far as San Juan is concerned.

DEFNOC.

"Defnoc" need not get excited on this point. Neither "old experienced miners" (who as a rule are no judges whatever on these points), nor learned professors, nor any one else can give an intelligent opinion on mines so slightly developed as those of Lake City. Only a slight depth has been gained, and comparatively little stoping has been done. A few cross tunnels have been driven—that is all. One who will attempt to theorize on these premises risks his reputation to no good, and may be laughed at. Judging by analogy, which is the only guide we have in the absence of extended knowledge of the mines, the veins of Lake City are just as promising and valuable as those of any other part of the West. Does not our correspondent know that without exception every mine in Gilpin County became poorer in grade as depth was gained? And yet Gilpin is now the foremost mining camp in the State. A few of its inhabitants kept on through the poor placers in the mines, and after a little while they all began to improve again. It will not do to reason upon imperfect data. We know that the Lake City silver mines are quite similar to those around Silverton and Georgetown (not the ore necessarily, but the mines), and believe that they will turn out to be as good. There is certainly no known reason why they should not. The opinion of the traditional "old experienced miner" is a deceptive guide.

The *Silver World* gives the following interesting notes concerning some of the prominent mines around Lake City:

"The Alpine Tunnel Company have put a force to work on their Buckeye property in Burrows Park.

"Angier & McKinney have struck a vein of good mineral in the Old Hickory, on Larson Creek. They have been running for the vein, on two tunnels, during the past winter, and their labor has at length been rewarded. The vein was reached in the south tunnel at a point 65 feet in and at a depth of 70 feet.

"The Ocean Wave and Wave of the Ocean mines are turning out their usual rich yield of mineral. Seven thousand pounds of ore was sold this week to Crooke, which yielded as follows: No. 1, 388 oz.; No. 2, 215 oz.; No. 3, 146 oz.; average, 218 oz. There are 900 sacks, equal to 40 tons, of high grade ore now on hand on the dumps, which, with the high grade ore which will be taken out during the season, will be sold to Crooke. There is not less than 500 tons in sight in the several levels and drifts, which will not be taken out until the company's smelting works are completed and ready to treat it.

"Work is soon to be resumed on the famous Hotchkiss Mine. The indebtedness will all be paid up and a large force put to work developing the mine and taking out ore, which will be treated by Crooke Brothers' smelter. There have been many senseless and idle rumors afloat, at home and abroad, to the effect that this mine is 'played out.' The fact is that it never looked better or more promising than it does to-day. There is an immense amount of as rich mineral in sight as has ever been taken out, and no sign of diminishing. The owners mean business, and promise to open the eyes of unbelievers and gossipers.

"We made mention last week of the filing of articles of incorporation of the Ocean Wave Mining and Smelting Company. The officers of the company are, W. R. Bernard, President; B. L. Riggins, Vice President; A. T. Gunnell, Secretary and Treasurer. These gentlemen, with A. Danford and Zenas Snowden, constitute the Board of Trustees. The object of the company is not only to work the Ocean Wave and Wave of the Ocean lodes, as a stock company, but to erect smelting works at this place for treating the ore from their own property and other equally good mines from which they have secured the ore yield. The machinery for the smelting works, which will include one rotary and one blast, has been ordered of Frazer, Chalmers & Co., Chicago. It is understood that the works will be erected on the mill site in the northern part of the town, at the point where the river contains a series of falls and rapids. The works will be completed by early fall.

"Byron J. Smith, Esq., who has extensive mining interests in Burrows Park, returned this week from a winter's absence East. We are gratified to announce that he has associated with him several gentlemen of large means, and that they will prosecute work upon their mines throughout the season. Mr. Smith being authorized to spend \$10,000 to \$15,000 in labor and development. Their mines comprise several of the best known and most valuable in the American Basin, among which are the American Eagle, Flower of the West, and Captain Lee. The gentlemen interested are B. J. Smith, of Madison, Wis.; A. G. Hoyt, of Santa Fe, N. M.; Judge Henry Hoyt, Frank Lee, and Hal Wright, Ph.D., all of Wilkes-Barre, Pa. Mr. Smith will also work the Woodstock and Rochester, his individual property, also lying in the American Basin."

MONTANA.

The Alice Mine, at Butte, is now working 30 men, and is developing the mine extensively. About \$50,000 has been expended in opening this property, and the results are in every way so encouraging in quantity of ore placed in sight that the owners have bought a 20-stamp mill. The mine is sunk to water level and below about 130 feet.

The Monroe Mill, at Vipored, was to have started on the first. The mines owned by this company are producing well, and will probably keep this mill steadily employed.

The Algonquin, Sharktown and Salmon lodes, at Phillipsburg, are the principal mines of that camp now at work. Some little work is also being done on the Hope. The mills have not yet opened.

The Montana Company's works, at Jefferson, continue to give satisfaction, and are handling large amounts of low grade ores from the neighboring districts.

The copper shipments from Butte are growing monthly. The competition for this element of Montana freight trade has grown so sharp that the railroad (Union Pacific) is now handling the whole of it, while river transportation companies receive but a very little. Most all the copper ore mined and sold goes to Pope, Cole & Co., Baltimore. This branch of mining in Butte promises to advance so rapidly that the copper yield will, in a short time, exceed that of any other district in the country excepting Lake Superior.

The National Mining Company are winding up their affairs and selling off their property. Thus ends a promising enterprise. The company, after 11 years of failure, caused almost wholly by mistaken enterprise, are disgusted. It is likely that the mine will shortly be reopened under different hands.

NEW MEXICO.

A new copper-silver district has just been struck in the Mogollon Range, sixty-five miles north of Silver City.

In the '76 mine a face of ore 20 feet in width has lately been developed. The ore is very rich in chloride and native silver.

The Moreno placers are doing especially well this year. Some of the early clean-ups are very encouraging. Water is plenty and labor abundant. The big ditch is delivering about 500 inches of water.

The Jacarilla district is receiving a good emigration this year. Various dry washing machines have been tested with fair results, and some gold has already been shipped. The area of rich placer ground in this vicinity is immense, and is bound, sooner or later, to furnish employment for many thousand men. The water question, however, is not yet settled, and until it is the Jacarilla mines must be still uncertainties.

Silver City district is producing more bullion this year than ever before since it became a mining camp. The great lode of the district, the '76, is doing so magnificently that every one feels encouraged, and a great amount of prospecting is being done in the hopes of striking a similar ore body. Grant Company will probably contribute one-half of New Mexico's bullion produce this year, which, by the way, will exceed that of 1876 by certainly \$300,000, including the yield of the Clifton and Santa Rita copper mines. The main gold yield of the Territory is now coming from northern districts. The new Benuen mill, which was built to work the ores of the '76 mine, is working finely and saving a high percentage of metal. The ores of this lode carry considerable chloride, and are not very difficult to treat.

NEVADA.

The Condor Mill (Pioche) was burned to the ground on the night of June 21. The engine, boiler, and fly-wheel were comparatively uninjured. Besides the

loss of the mill about \$6,000 in wood, quicksilver, salt, and other supplies were destroyed.

The Alps Mining Company (Pioche) are producing about 20 tons of good ore daily.

The ore in the lower levels of the Raymond & Ely is improving in quantity and quality. The mine is keeping 15 stamps steadily employed.

Reports from the Eberhardt and Aurora Mines still continue so favorable that the stock is selling in London at good figures.

There is a report of the discovery of nickel near Virginia City. The sample of ore tested yielded 22 per cent., but this was doubtless a picked sample. The ledge is stated to be a very broad one, and to carry a large body of ore.

The Comstock is now turning out over three millions in bullion monthly, two-thirds of which are paid as dividends.

In the Best & Belcher, Gould & Curry, Hale & Norcross, Crown Point, and Savage, bonanzas are confidently expected in a few months. Prospecting goes on in the mines with unflagging energy, and in every direction. The main hope of explorers now lies in the "last county" in which the Consolidated Virginia and California bonanzas were found. It is demonstrated in fact that the ore-bearing zone of this great lode is broader than was ever expected before, and that the true east wall lies, in places, a thousand feet away from the granite base of Mount Davidson. The Suro Tunnel is advancing steadily towards the lode, and will probably in its outward course define exactly the eastern limits of this great ore channel. It is now in 17,500 feet. A steady increase in the flow of water from the header has been noticed.

THE EDGE MOGGIN SILVER MINE, MAINE.

The Edgemoggin Silver Mine is located in the township of Sedgwick, Hancock County, Maine, and comprises a tract of land of 300 acres. A recent report made on this mine describes the country rock as granite, serpentine, and quartzite, with an abundance of carboniferous limestone. The metallic lode lies in a fissure of four feet, whose walls are clearly made out on both sides, and are rapidly increasing in breadth as the work progresses. The two argentiferous galena veins, which are rich in gold and silver, lately examined, one mile and a half farther along the shore, can be worked in connection with this mine, as the ore can be conveyed by boat or lighter to the smelting works at a very trifling cost; also the copper ore from Blue Hill Neck can be conveyed to the smelting works in like manner, as the distance is but nine miles; the ore being yellow sulphuret of copper, assaying from eight to eighteen per cent. of metallic copper. The cost of labor ranges from \$1.25 to \$1.50 per day. Coal can be delivered by vessels at the wharf of the mines, which is on the property. Recent assays made by several authorities from specimens of the ore from this mine have given results as follows: Assay No. 1, for silver, yields per ton of 2,000 lb., 102 oz. 173 grains; value, \$118.84. Assay No. 2, for gold, yields per ton of 2,000 lb., 226 grains; value, \$9.69. Assay of selected ore at the College of Technology, Boston, Mass., yielded 207 oz. 456 grains per ton of 2,000 lb., equivalent to \$228.74. A sample of ore sent to the U. S. Mint at Philadelphia yields (by several assays) 153 ounces of silver to the ton of 2,000 lb. Gold value, \$180. The amount of lead in the above assays ranges from 30 to 40 per cent.

UTAH NOTES.

TO THE EDITOR: SIR—The following notes may prove of interest to the readers of the ENGINEERING AND MINING JOURNAL. The winter of 1876-7, notwithstanding the general depression of business throughout the country, has been, on the whole, a prosperous one for the mining population of the Territory. There has not been, it is true, any conspicuous sales of mining property to foreign companies, and consequently no unearned money has come into the Territory. But, withal, our progress has been steady, and money and labor have been fairly plenty. The discoveries of gold in the Crismon Mammoth, in Tintic District, stimulated the development of that mine, and the product of gold from the little five stamp mill of the company has been steady and immensely profitable to the owners of the mine. I cannot, at present, say what amount has been taken out, but the shipment of bars, valued at from \$5,000 to \$15,000, shows a gratifying result from their "Bonanza." In the south, at Leeds, the mines have proved much better than was expected, and the bullion shipments are now regular and considerable. At Shauntie the mines have done well, and all the smelters have all they can do, and new ones are projected to supply the demand for increased reduction works. At Rush Lake the smelters have been steadily employed to their full capacity, and the shipments have averaged about 30 tons of bullion per day. At Sandy all the smelters have been worked to about their full capacity, and new ones erected, the old smelters that have lain idle have been repaired and put in blast, and the Pascoe works kept busy at Salt Lake. Add to that, the large quantities of high grade ore shipped to the East, and you can form some idea of the product of the mines. The shipments of base bullion has averaged, I think, about 2000 to 2200 tons per month, and of copper ore and matte about 100 to 125 tons. The new mill of the Ontario Mine was completed about New Year's, and has worked with wonderful success since upon the ores of its own mine. Among the mines the most noted are the Old Telegraph, Yosemite, Revere, in Bingham Cañon; the Hidden Treasure and Flavilla in Dry Cañon; the Flagstaff, Prince of Wales, Frederick, and Reed & Benson in Cottonwood, and Crismon Mammoth in Tintic; the "Cave Mine" and "Horn Silver" at Shauntie, and the "Barbee" and "San Francisco" at Leeds. The Territory has, during the present year, made more real progress than ever before, and shown that mining, intelligently carried on, is a safe and immensely profitable business, even in the face of the most discouraging circumstances.

Yours very truly,

J. H. MORTON.

GROWTH OF METALS.

A correspondent of the *Chemical News* says:—I know of few more intently interesting subjects than the formation of minerals in relation to time. In my simplicity, perhaps, I have always thought it to be a more or less rapid proceeding, although an esteemed and talented friend in Dublin thinks exactly the reverse. My direct object the other day in writing to you was to tickle mineral collectors a little, so that they might be induced to look up some of their neglected old acquaintances. It is very refreshing to have got an advocate in my friend Mr. Collins, especially as it appears that I gave him the germs of his silver-growth in a bit of argentite. Touching *silver-growth*, I must say that his observed "upward" growth has been the exception to the goings-on of my own argentite specimens. Ever since I gave him (February, 1876) the specimen he refers to, its relatives in my cabinet have been, perruquier-like, curling off Q. C.'s silver wigs

* Experts who have examined the mine report five million dollars in sight; I think, perhaps, they did not examine very critically. In the Ontario about \$3,000,000 is said to be in sight, while I know that the Old Telegraph can safely be said to be the greatest silver lead mine in this country.

so fast that I stand a chance presently of being deprived of this particular kind (?) of argentite altogether. These silver-growths have been very noticeable all this month, and more particularly so the last few days. My other authentic specimens of argentite show, as yet, no such sportive characteristics. Touching *copper-growth*, allow me to say that during last week from the bulk of the moss-copper—referred to in my last, and just afterwards pressed down into a glass-topped box—five copper filaments reached the under surface of the glass. Elasticity, I fancy, had little or nothing to do with these remarkable movements. The long *gray* filament in another box, before mentioned, has increased visibly in terminal thickness, and has bent low down, as if through additional weight. The shorter (younger) *red* filament, also referred to, has now reached the top of the same box by an up-growth of nearly half an inch. Perhaps, as in child-growth, it may be that periods of mineral growth alternate as to states of widths and length. In any case the facts are interestingly recreative, if unimportant. Touching *gold-growth*, I wish to say that last year, about this time, I discarded several hundreds of gold stones from my collection. I gave away a good many to persons luxuriating in mineral-love. The rest I wrapped up in bits of newspaper, and put into a box out of my way. To-day I overhauled the contents of this box, and to my delight found that out of 181 of the despised specimens 72 of them are now of appreciable interest. Many of the gold-growths on these stones are so palpable to unaided sight that it is simply impossible that they could have escaped my eye, and my sense, too, if there, when I put them away as comparatively worthless. I should add that nearly all these stones were found by me in the same locality since 1862, and that the gold (electrum), taking an average of more than 100 assays of the gold from the same place, contains from 15 to 20 per cent. of fine silver! Many of the growths proceed from iron sulphide (marcasite), along with copperas crystals (melanterite?). Some are associated with tellurium-bismuth crystals (tetradymite); others proceed from quartz, apparently pure, or slightly iron stained (?). Perhaps those friends to whom I gave gold specimens last year and the year before will oblige by examining them and reporting thereon. If more weighty evidence is needed than "mere cabinet specimens" in proof of gold-growth, allow me to add that I have just put under a water-tap an almost forgotten mass of irregular white quartz crystals, weighing (by guess) half a hundredweight or more. This big stone, on "showing specks of gold," was taken out of a mountain-wall in Merionethshire in 1862 or 1863. It has been in my possession ever since; always, somehow, in the way; kicked against very often, and as often at the disposition of anybody for the taking. But "things change their titles as our manners turn." It is no more to be unnoticed upon a floor. It now shows a number of very beautiful leaf-like and other silver-gold growths, and must be henceforth duly respected under a glass case. A rare find this in my favor. Mr. Collins will recollect, perhaps, seeing it last year, when it was only "specked with gold." I wish he could see it now. Every atom of his unbelief as to gold-growth (if any remain) would evaporate very quickly. "I s'pects I grow'd," said Topsy. I suspect that gold grows too; for "increased bulk and weight," by this discovery, have now been amply proved beyond all further questioning. The extreme limit, as to time, of this electrom-growth is a year or thereabouts. My belief is that the proceeding was a very rapid one. Why not? Moss-copper and argentite show rapid growth. Chemists witness rapid crystallization very commonly. Without anticipating my promised communication on mineral-growths as I have myself observed them, I will add another heavy fact which I have also noticed to-day. A lump of amorphous quartz, weighing (by guess) 20 to 25 lbs., neglected, as its companion lump above mentioned. This lump when I got it in 1862, and when I last looked at it in 1876, had hundreds of specks of gold upon it. Upon washing it just now I discovered to my surprise that at least half of the specks had disappeared by dropping off; but, by way of compensation, upon this stone, also, there is now a crop of beautiful silver-gold growths, thus making it very far more interesting than it was before. (Query: Would electrum-coin sprout in any such way in hard times?)

NOTES.

LARGE ORDER FOR PIG IRON.—The Coleman iron furnaces at Cornwall, Lebanon County, Pa., have received an order for 50,000 tons of pig iron. This will keep the six furnaces steadily in blast for one year.

IMPORTING IRON ORE FROM SPAIN.—The Philadelphia *Ledger* of to-day says: "The Cambria Iron Company has recently been importing iron ore from Spain at a cost not exceeding \$8 a ton, and yielding about 60 per cent. pure iron. It costs less to bring ore to Johnstown from Spain than from Lake Superior."

A NEW PROCESS IN THE METALLURGY OF NICKEL, invented by M. Hessel, consists in a novel treatment of the mineral oxides of nickel, and specially of hydro-silicate of nickel and magnesia. The mineral oxides of nickel are mixed with some sulphides or persulphides of alkaline metallic ores, or alkaline earths in proportions varying with the composition of the mineral and the nature of the veinstone or gangue. If this renders it necessary, some meltings—alkalies or alkaline earth, or salts of these bases—are added. This mixture is melted in a suitable furnace. The sulphides, alkaline, or alkaline earths react upon the oxides, or upon the silicate of nickel, formed by a double decomposition of sulphide of nickel and alkaline silicates or alkaline earths. The gangues are combined with the melted material on the bed of the furnace, and produce some scoriae in addition to the silicates previously named. The separation of the sulphide of nickel and scoriae takes place in the apparatus. This melting gives (1) sulphide of nickel which does not contain sulphide of iron, or, at least, very little, if the operation has been well conducted; (2) alkalies or alkaline earths in excess; (3) silicates of various bases forming the slag, and which are separated. The sulphide of nickel, accompanying some other sulphides, is washed afterwards over an inclined grating, with addition of some of the silicious meltings. A slag is formed floating on the surface of the bath, into which passes all the iron, the alkalies, the alkaline earths, but where little nickel enters if the operation is well conducted. This slag is removed, and there remains at the end of the grating only the oxide of nickel. This oxide is reduced by the processes in common use, more especially by those used in Germany.—*The Engineer*.

IMPORTANT DISCOVERY OF POTASH SALTS IN PRUSSIA.—A discovery of mineral salt of much interest and importance has, says the *Times*, recently been made at Aschersleben, in Prussia, in the vicinity of the Hartz Mountains. Within the last twenty years the Governments of Prussia and Anhalt have been deriving large profits from the working of sundry pits or mines productive of potash salts, situated at Stassfurth and Leopoldshall. Hitherto these undertakings have enjoyed a monopoly, but an independent party of explorers, aided by the diamond rock-boring apparatus, have succeeded in reaching the potash deposits at moderate depths not far from Stassfurth. The first boring reached what is called the "kainit" portion of the potash layer, which was proved to have a thickness of fifty English feet. As the Prussian mining law entitles the discoverers to a concession equal to an area of 2,189,000 square meters, it is computed that this discovery includes about 66,000,000 tons of potash salts. But the explorers, consisting chiefly of English capitalists, have proceeded further, and by means of other borings have obtained the command of an enormous area of these valuable deposits, which are now going to be extensively worked. The discovery is likely to be of great service to chemical industry, by providing an ample supply of one of its staple commodities, the want of which threatened at one time to be rather serious. The extraordinary fertility imparted to the soil by the use of potash manure also renders the discovery a matter of direct interest to the agriculturist. Experience gained in Germany and Holland shows that, by the use of the kainit and other forms of potash, land naturally poor can be made to bear extraordinary crops. This system of fertilization has been found peculiarly advantageous in the case of peat lands and moors.

NICKELIFEROUS IRON ORES.—An analysis of some native iron from Brazil, made by M. Damour, shows an extraordinary high proportion of nickel, namely 38 per cent., or considerably above the ordinary proportion of nickel in meteoric iron. The metal, which has a very fine grain, and a luster like that of steel, exhibits the so-called Widmanstättian figures when a polished surface of it is acted on by an acid. Strange to say, it resists for an indefinite length of time the combined action of air and water, without showing the least sign of oxidation. The results of Damour's experiments with this iron having been laid before the Paris Academy of Sciences, Boussingault remarked that, according to Berzelius, meteoric iron is not oxidizable by moist air. He also called attention to certain experiments he himself had formerly made with a view to rendering iron unoxidizable by incorporating with it nickel. Having added successively 5, 10, and 15 per cent. of nickel, he very unexpectedly found that the alloy was more oxidizable than pure iron. But if 38 per cent. of nickel—the proportion found in the iron from Brazil—be added, the alloy is absolutely unoxidizable. M. Stanislas Menier, who reports the transactions of the Academy for *La Nature*, hereupon observes that, if Berzelius's proposition be true, then Boussingault's explanation is insufficient, for in meteoric irons the nickel is in the proportion of only 8 per cent., and of course they should be very oxidizable. Some specimens of the Brazil iron were presented to the Academy by M. Daubree. They are of interest owing to the intrusion of magnetic pyrites, or pyrrhotine, which they present. These specimens were broken off from great masses of the iron found in the province of Santa Catarina. The iron appears to be of terrestrial origin.

THE CHELTENHAM FIRE-CLAY WORKS.—This establishment has for twenty-two years stood in the front line of fire-brick and retort manufacturers. From the small factory started by Charles P. Chouteau, in 1855, it has steadily enlarged, until now it is not only one of the largest, but the most perfectly-equipped manufactory in the country, and represents an investment of \$200,000. The works were destroyed by fire in January, 1875, and in rebuilding no expense was spared in order to secure the most modern machinery for the new buildings. The result of improvements then made was shown the following year, when Evens & Howard secured the contracts for the gas retorts required for Chicago and Cincinnati, against the competition of all the large manufacturers of the country. Perhaps the most interesting point in relation to these works is the great care with which the material is handled. As the clay is taken from the mines it is separated into three masses, according to quality. From this time forward the care is never relaxed until the manufactured articles are packed on the cars. Sometimes men are working it over, picking out injurious materials; again it is being plowed or harrowed to expose it to the mellowing influence of the sun, or it is being ground, or washed, or kneaded with the same care a baker gives his dough, and so on for two years it is under constant manipulation. They manufacture all grades of fire-clay ware, and only the "cream of the mines" is used for glass pots, gas retorts, and fire-brick; the ordinary grades which vitrify at a lower temperature being best adapted for sewer pipe are used for this purpose. Their facilities for making this discrimination are unequalled. A visitor, in passing through the works, is impressed with the spirit of progress manifest on all sides. Here is a brick-machine, of French patent, purchased at the Centennial; alongside the railway switch is a newly-constructed bin for loading cars with clay in bulk, thus dispensing with the cost of barrels; in another place is the washing department for washing the clay for fine grades of work, and so on every hand is noticed the continued effort to improve. The factory consists of three works, located at Howard Station, Missouri Pacific Railroad, four miles from the city, and connected with the entire railway system of the country. The factory is managed by competent engineers, educated expressly for this work, the entire force being in charge of Superintendent E. T. Howard, who is considered the best posted man in the West in regard to the processes of manufacture and the wants of the trade. The company's success is due, in a great measure, to the discrimination used in employing labor and the experienced supervision constantly exercised. Evens & Howard keep on hand three grades of fire brick, one for iron and steel furnaces, one for lead furnaces, and another for jobbing purposes. They also make to order fire-brick of all sizes and shapes, for any kind of a manufactory; their sewer and water pipe ranges from one inch to thirty inches caliber; their gas retorts have superseded all others in the West and South. The material used is the best in the country, the crude clay from their mines being used for glass crucibles throughout the United States and Canada.—*St. Louis Republican*.

[Further information with regard to these manufactures can be obtained by addressing Evens & Howard, 916 Market Street, St. Louis, Mo., whose advertisement will be found on another page.]

ASSAY DEPARTMENT OF THE ENGINEERING AND MINING JOURNAL.

This department is opened for the purpose of affording to miners and prospectors the means of ascertaining the general character and approximate value of minerals found, and, when so desired, the actual value of the ore will be determined by careful assay or analysis.

Replies will be made in the columns of the *ENGINEERING AND MINING JOURNAL* to questions asked regarding the nature and the commercial value of minerals and of samples sent. The results of assays will also be published in these columns, except when otherwise requested.

No charge will be made for these examinations or replies.

Where assays are desired, the following rates will be charged. The amount should invariably accompany the order.

Assay for Gold.....	\$2 00	Assay for Lead.....	\$1 50
" Silver.....	1 50	" Zinc.....	3 00
" Gold and silver.....	2 50	Control Assays.....	3 00
" Copper.....	2 00	Zinc Analyses.....	5 00

Postage or expressage on samples must always be prepaid.

Communications, samples, etc., to be addressed to
Western Office,

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Denver, Colorado.

OR
ENGINEERING AND MINING JOURNAL,
(P. O. Box 4404.) 27 Park Place, New York.

ANSWERS.

Denver Office:

SAMPLES AND QUESTIONS.

66. F. H. E., Magnolia.—Mineral consists mainly of galena (sulphide of lead) the gangue is a decomposed granite. It looks rich, but does not resemble at all other ores of your camp. Allow us to advise you not to send any written communication in with your ore sample; it is in violation of the postal laws.

67. D. J. M., Santa Fe, asks for information concerning a new patent ore pulverizing process, of which the specifications are as follows: "The ores, being well heated through and through, are placed in a bath whose ingredients are 85 gallons water, 14 gallons strong vinegar, 30 pounds common salt, 2 ounces sulphuric acid, 3 ounces of nitric acid, and 4 ounces of caustic soda. The whole to be boiled down to 95 gallons of solution, which will answer for 3 tons of ore."

Let us examine this process in three ways: 1st, as to cost; 2d, as to the chemistry of the operation; 3d, as to the mechanical working. 1st, Cost. Water, of course, is free; vinegar will cost 40 cents per gallon, and 14 gallons will cost \$5.60; the salt at 2½ cents will cost 87 cents; the 5 ounces of acid will cost 50 cents, and

the caustic potash about 5 cents; together the mixture sufficient for the disintegration of three tons of ore will cost \$7.02, or \$2.34 per ton. To this must be added at least 25 cents per ton for wasting (it would probably cost more), so that the total cost, outside of capital invested and labor for applying the liquor, would be \$2.59 per ton. Now it is well known that we are crushing ores to the finest powder in stamps at an expense of not over \$1 per ton, and this figure can undoubtedly be diminished to 75 cents. It is evident, therefore, that the new process is utterly useless on the score of cost alone. 2d. The chemistry of the process is particularly absurd. It would be difficult without a thorough test to say exactly what combinations would be formed in merely making the solution, before it is mixed with the ore, but it is certain that the nitric and sulphuric acids would be largely if not wholly neutralized by the potash and salt, and all that would be left would be a weak solution of acetic acid (vinegar), utterly unable to cope with the ores or affect them chemically. 3d. The mechanical impracticability of the plan is as easily shown. The solution measures 95 gallons, or less than 13 cubic feet. Three tons of quartz (pure) measures about 40 cubic feet. The same amount of heavy base ores will measure at least 25 cubic feet. Let any one try to make a solution or a mechanical suspension of 25 cubic feet of dust in 13 cubic feet of liquor, and he will find himself with a job of some magnitude and difficulty on hand.

68. E. R. F., Caribou.—The mineral is magnetic iron, very good and pure. We doubt if you can make any money by claiming it. You are too far away from fuel and supplies.

69. ALBERT ELLINGWOOD, Ward.—Marcasite, rich in gold. Will bring a good price as smelting ore at Black Hawk.

70. J. S. WARD, Silver City, New Mexico.—The sample of pure silver sent is a remarkably fine ore. You have our best thanks. On breaking open the limestone rock on which it lay we found the cracks and seams full of chloride.

71. *The new metal* called Lavoisium is of a silvery white appearance, and quite malleable and ductile. In the spectroscopic it exhibits lines which coincide exactly with those of copper, which indicates either that the specimen obtained and tested contained copper or that it is not new. The supposed new element was discovered in France. It is said to be quite abundant, occurring in iron pyrites and other minerals.

72. E. M., Cheyenne.—The sample of coal will not coke. Analysis showed 15 per cent. of water, 30 per cent. volatile matter (combustible gases), 42 per cent. of fixed carbon, 2½ per cent. sulphur, and 10 per cent. of ash. This coal will not compete with other mines in Colorado or Wyoming. It may show differently in depth. You failed to mention whether the vein lay flat or was turned up on edge, or at what depth you took the sample sent. Probably the vein will pay to explore if the specimen we have was taken from near the surface.

73. FRANK GIRARD, Rosita.—Iron ore generally occurs in beds of sedimentary origin. Sometimes, however, it is found inclosed between granite walls in deposits having all the appearance of fissure veins.

74. T. W. CAMPBELL, Virginia City, Montana.—Much of the talk about "rusty gold" is bosh. True, we do not yet know positively whether gold exists in pyrites as a pure metal or not, but there is scarcely any doubt that it does. The term "rusty" is used merely as a cloak to cover our lack of information on the point. It has been shown, however, that when the gold is alloyed to a high degree with silver it will not amalgamate, and it is believed by most intelligent mill men that this is the reason why a higher saving cannot be effected simply by the mechanism of stamps and copper. Chemical methods of breaking this alloy have been tried frequently with more or less success.

ASSAYS.

75. C. C. D.—61 per cent. lead.
76. H. A. B., Denver.—2.2 oz. gold, 37.9 oz. silver.
77. E. C. H., Denver.—Trace of gold, 8 oz. silver.
78. P., Denver.—(1) Trace of gold, 10½ oz. silver. (2) Trace of gold, 11.8 oz. silver.

79. S. H. L., Uncompahgre.—(1) Trace of gold, 15 oz. silver. (2) 16½ oz. silver.

80. J. B. L., Fairplay.—4½ oz. silver.

81. J. A. J. CHAPMAN, Alpine.—457½ oz. silver.

82. PHILLIPS, Denver.—13½ oz. silver.

83. M. H. HALL, Santa Fe.—Gray copper analyses: Copper, 40.1 per cent.; sulphur, 23.65 per cent.; iron, 1.82 per cent.; arsenic, trace; antimony, 18.1 per cent.; mercury, 3.7 per cent.; zinc, 8.4 per cent.; silver, 4.3 per cent. This is a rather peculiar tetrahedrite, as it contains mercury and at the same time a high percentage of silver. We believe this is the first specimen found in the United States carrying quicksilver.

84. EDWARD TEALE, Ophir.—No wonder you could get no metal out of your rock. If it is all like the sample sent, better present the United States with a warrantee deed of your claim. The mineral is almost wholly hornblende. Whereabouts in Ophir District could you have found it?

85. M. A. A., Central.—Gold, 4½ oz.; silver, 10 oz.; copper, 18½ per cent.

86. EYNGE, Forks of Animas.—Zinc, 14.6 per cent.; lead, 25½ per cent.; silver, 99.4 oz.; copper, 12½ per cent.

87. W. B. ANDREWS, Del Norte.—Gold, 12 oz. A very rich ore. Do not bother yourself about the silica contained in your mineral. It will cause you no trouble.

88. F. P. BLAKE, Canon City.—Sample consisted mainly of carbonate of copper (green). Contained 68.4 per cent. of copper and 23 ounces of silver per ton.

89. J. W. ORD, Deadwood.—1. Gold 2¼ oz., silver 10 oz.; 2. gold 2½ oz., silver 12 oz.; 3. gold 4¼ oz., silver 16 oz.; 4. gold 1.1 oz., silver 18 oz.; 5. silver 221 oz., lead 30½ per cent.; 6. silver 89.4, lead 4 per cent. The gold ores are in a slaty matrix, with seams of quartz intermingled. The first silver ore is a true argentiferous galena. The second is a quartz ore containing a little lead and a goodly quantity of light ruby silver. Both appear to be good pieces of property, if you have not deceived yourself by taking unfair and unequal samples.

90. H. F. PEABODY, Laramie, Wyoming.—Your sample did not yield anything in either gold or silver, for it proved to be an impure graphite. The analysis was as follows: Carbon, 78.2 per cent.; volatile matter, 3.4 per cent.; ash, 18.1 per cent. The ash consisted of iron, alumina, magnesia, lime, and silica. The mineral, we believe, could be cleaned mechanically from most of its deleterious ingredients, and would then furnish a very good article of graphite. The best graphite of commerce comes from Siberia and England, and carries from 90 to 94 per cent. of fixed carbon.

91. HENRY WARD, St. Louis.—1. Silver 18½ oz., lead 43 per cent.; 2. silver 292 oz., lead 12 per cent.; 3. silver 500 oz., this ore carries bismuth; 4. silver 24 oz., lead 31½ per cent.; 5. silver 22 oz., lead 29 per cent. No. 3 is an interesting ore, and probably contains chilenite, a combination of bismuth and silver. The former metal was not detected till after crushing, so that we cannot be sure of the mineral without an analysis. If you desire one, send also a larger sample.

ASSAYS.

New York Office:

XIV. G. S. D., New York.—*Peat*.—Water expelled at 212° F., 12.05; vol. comb. matter, 59.98; fixed carbon, 23.17; ash, 4.80; included in above, sulphuric acid, 0.35; phosphoric acid, 0.22.

XIX. F. C. B., Richmond, Va.—Sample sent iron pyrites, said to contain a variety of metals, some of which can be seen in the specimen. Their presence or absence can only be determined by assay. If this is desired, please remit the requisite amount, as per scale of charges above.

XX. A. W. D., New York.—Can only determine contents of ore by assay.

XXI. L. H., New York.—Mispickel contains silver, 0.94 oz.; gold, none.

XXII. " Blende " " 4.38 oz.; " trace.

XXIII. " Iron pyrites " " trace; " trace.

XXIV. " Iron pyrites and galena contain silver, 7.84; gold, trace.

STATISTICS OF COAL PRODUCTION.

This is the only Report published that gives full and accurate returns of the production of our Anthracite mines.

Comparative Statement for the week ending June 30, and years from Jan 1st.

Tons of 2,240 lb.	1877.		1876.	
	Week.	Year.	Week.	Year.
Wyoming Region.				
D. & H. Canal Co.	52,769	1,101,720	.....	868,105
D. L. & W. RR. Co.	55,059	1,106,518	40,436	629,488
Penn. Coal Co.	27,210	531,144	26,200	430,854
L. V. RR. Co.	23,228	489,272	19,447	431,982
P. & N. Y. RR. Co.	2,125	27,374	151	12,517
C. RR. of N. J.	52,106	771,811	125	550,514
Penn. Canal Co.	15,915	167,180	14,123	136,661
	228,502	4,195,048	100,482	3,060,161
Lehigh Region.				
L. V. RR. Co.	60,762	1,450,166	75,304	1,066,943
C. RR. of N. J.	44,146	741,897	30,021	531,978
D. H. & W. B. RR.	361	6,072	1,842	18,146
	105,269	2,198,135	107,167	1,617,067
Schuylkill Region.				
P. & R. R. Co.	136,141	2,873,528	158,589	1,905,999
Shamokin & Lykens Val.	12,108	302,669	18,148	378,630
	148,249	3,176,197	176,737	2,284,629
Sullivan Region.				
Sul. & Erie RR. Co.	50	5,119	37	26,351
Total	482,070	9,575,099	384,423	6,988,199
Increase	97,647	2,586,900	.....	.....
Decrease	.....	.....	.....	.....

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

Receipts and shipments of coal at Chicago, Ill., for the week ending June 30, and year from January 1:

	Week.	Year.
	Tons.	Tons.
Receipts	37,094	686,687
Shipments	4,349	94,787

The shipments of coal at Cleveland, Ohio, for the week ending June 30 were as follows: shipped coastwise, 11,082 tons; total for year, 93,723 tons; foreign shipments, 5,978 tons; total for year, 35,263. Total of coastwise and foreign shipments for week, 17,050; for year, 128,986.

Receipts of Coal at Boston, for the week ending June 29, and years from Jan. 1.

Tons of 2,240 lb.	1877.		1876.	
	Week.	Year.	Week.	Year.
From				
Alexandria and Georgetown	3,374	26,224	12	20,622
Philadelphia	17,215	266,882	2,157	220,873
Baltimore	2,570	59,092	4,108	58,349
Other places	11,047	133,512	7,762	126,812
Great Britain	.....	1,249	.....	3,806
Nova Scotia	.....	5,983	981	5,405
Total	34,206	492,942	15,020	435,868

Shipments of coal at Pictou, N.S., for the week ending June 30, and year from January 1:

	Week.	Year.
	Tons.	Tons.
To Canada	906	7,126
United States	1,200	8,191
Other Provinces	1,785	14,027
Total tons	3,891	29,344

The Exports of Coal from Baltimore for the week ending June 29 were — tons, and since January 1st, 20,462 tons as against 17,450 tons for the corresponding period of 1876

Perth Amboy business: Tons. Received for the week 29,535 Shipped for the week 27,083 On hand June 30 128,516

The Receipts of Coal at Rondout, N.Y., by the Delaware & Hudson Canal for the week ending July 4 were — boats, carrying 26,567 tons.

The decrease of shipments of Cumberland Coal over the Cumberland Branch, and Cumberland and Piedmont Railroads amounts to 47,913 tons, as compared with the corresponding period in 1876.

Belvidere Delaware RR. report for week ending June 30.	Week.	Year.	Year.
	1877.	1876.	1876.
Coal for shipment at Coal Port (Trenton)	818	10,937	100,920
" " " " South Amboy	11,901	117,371	203,966
Coal for distribution	2,253	85,652	67,799
Coal for Company's use	828	37,390	26,151

The production of Bituminous Coal for the week ending June 30, was as follows:

Tons of 2,000 lb., except where otherwise designated.	Week.	Tons.	Year.	Tons.
Cumberland Region, Md.				
Tons of 2,240 lb.	26,032	677,464	.....	.....
Barclay Region, Pa.				
Barclay RR. tons of 2,240 lb.	4,318	160,409	.....	.....
Broad Top Region, Pa.				
Huntingdon and Broad Top RR.	1,460	67,950	.....	.....
*East Broad Top	895	23,909	.....	.....
Clearfield Region, Pa.				
*Snow Shoe	504	21,180	.....	.....
*Tyronne and Clearfield	22,347	605,334	.....	.....
Allegheny Region, Pa.				
*Pennsylvania RR.	4,552	95,853	.....	.....
Pittsburg Region, Pa.				
*West Penn. RR.	3,108	90,051	.....	.....
*Southwest Penn. RR.	540	19,842	.....	.....
*Penn & Westmoreland gas coal, Pa. RR.	12,059	352,955	.....	.....
*Pennsylvania RR.	5,476	174,512	.....	.....
*For week ending June 21.	.....	.....	.....	.....

The Production of Coke for week ending June 21.

Tons of 2,000 lb.	Week.	Year.
West Penn. RR.	1,049	30,740
Southwest Penn. RR.	10,715	287,004
Penn & Westmoreland Region, Penn. RR.	1,467	37,057
Pittsburg, Penn. RR.	1,176	35,095
Total	14,407	420,796

COAL TRADE REVIEW.

NEW YORK, Friday Evening, July 6, 1877.

Anthracite.

The business in anthracite coal has been fair, although curtailed by the occurrence of the national holiday. That dealers and manufacturers are becoming very well supplied with coal, is evidenced by the great difficulty experienced in moving certain grades and sizes. Buyers have largely anticipated their wants at low figures, and in so doing have secured a control of prices that they will be able to hold for a long time, especially as the mining companies continue to weaken their own position by excessive shipments.

We have closed the production for the first six months of the year, with an excess over the corresponding period of 1876, of 2,586,900 tons; the output for this year being 9,575,099 tons as against 6,988,199 tons last year. The production last week was 482,070 tons, as compared with 439,924 tons for the previous week, and 384,423 tons for the corresponding week of last year. We have now started on what has usually been the most active half of the year. From July 1 to December 31, 1876, the production was at the rate of only 425,000 tons per week. This large business was brought about by low prices; and it is not probable that the same rate of increase can be maintained during the next six months as has been accomplished during the half year just ended. By low prices we have greatly extended our markets and increased consumption, and it is quite probable that the excess of production at the end of the year will be still larger than it is now, but if such should be the case the business of 1878 will probably suffer for it, especially if any arrangement should be brought about to advance prices.

It is generally believed that if the Delaware, Lackawanna & Western Railroad Company should be successful in negotiating its \$10,000,000 loan, and there is no doubt expressed of its being able to do it, that the prospects of any arrangement among the several companies to either regulate prices or production during any portion of this year are very meager. It is thought, however, that soon after the return of Mr. Gowen from Europe, the plans for next year's business will be discussed.

The Scranton Republican of the 4th inst. makes the following interesting statement:

"The reduction on coal developed in the New York market by the recent sales, fixed the price at such a figure that it became a question with the receivers of the Lehigh and Wilkesbarre Coal Company whether they could keep their coal on the market, at the former rate of \$1.20 per ton to Mr. Parrish for mining, and the additional transportation charge, they could not hope to do it and have any balance left for rents and other expenses. A conciliation of fifteen cents has been made by Mr. Parrish, fixing his compensation at \$1.05, and the transportation charge has been reduced to \$1, which will enable the receivers to keep in the market and securing their share of sales maintain operations.

"The Susquehanna Coal Co. stopped their operations at Nanticoke yesterday, on account of the dull sales and low prices of coal. The time for their resumption is indefinitely postponed."

The Republican assumes a more belligerent tone than a few weeks ago, when referring to the encroachments of the Reading Railroad on the trade of the Lackawanna companies. Perhaps the ten million loan of the D. L. & W. is inspiring courage to the Northern company, and will enable it to keep up the fight for some time yet.

It would seem, from the above, as if the Lehigh & Wilkesbarre Company were brought almost to the stopping point, and it can mine coal quite as cheaply as the Lackawanna Company, yet at the present prices it was not able to pay running expenses, to say nothing of interest on bonds. How much better are any of the other companies doing? But as long as they can borrow money we hear the same story, that they are "making their fixed charges." When the borrowing power is exhausted the bubble bursts, and some committee tells the deluded stockholders the "bottom facts."

Bituminous.

The business in bituminous coals continues without a new feature; shipments being mostly on orders secured earlier in the season, with occasional small orders for steamers, or other purposes where anthracite cannot be conveniently used. The boatmen's strike on the Chesapeake and Ohio Canal has assumed serious proportions. The course of procedure on their part tends to deprive them of public sympathy and greatly injures their cause. They are reported to have blocked the passage on the canal, and to have threatened vengeance on those who might accept lower rates of freight than are demanded by the strikers. No one questions the right of the boatmen to ask for an advance on rates that, in some cases, appear to be so low as to make it impossible to support their families, and pay expenses; but when they attempt to intimidate and prevent those who are desirous of loading from taking such rates as they can get, the law should be prompt to take hold of such conspirators and inflict a punishment that would a standing example for all future efforts of the same nature.

Gas Coals.—For a fortnight we have had rumors that the Pennsylvania Railroad Company had fixed freight rates on gas coals for 1878, conditional on orders being given at once. It is now said two or three of the large gas companies have contracted for all of the coal they may require up to March, 1879, at \$5.50 per ton. This move tends to leave the Baltimore & Ohio road out in the cold so far as next year's business is concerned, and indicates that the Pennsylvania company does not anticipate a better state of things next year than has existed this year. The arrangement between these two companies to divide the gas coal business expires in March of next year, and should the Pennsylvania company secure, in the meantime, a large proportion of the New York business we may look for some very strong competition in the remaining markets, and probably lower prices next year. The gas companies have plainly expressed their disapproval of this railroad combination, and by withholding orders appear to have been successful in convincing the officers of the roads that the arrangement was ill-advised and injurious to their interests.

The outlook for Provincial coals this year is very encouraging. The exports to the United States will probably be three times as great as last year, while New York city will take about double what it did in 1876. The Block House mines are as fully occupied as they can be, supplying coal to the principal gas companies of this city, Brooklyn, Jersey City and the East.

New York and Philadelphia.

Wholesale Prices of Anthracite Coal f. o. b. at the Tide Water Shipping Ports per ton of 2240 lb.

	Lump.	Steamer.	Grate.	Egg.	Stove.	Chestnut.
Wyoming Coals.						
*Lackawanna at Rondout	2 50	2 50	2 60	2 60	2 60	2 60
*Scranton at Hoboken	2 18	2 26	2 41	2 55	2 35	2 35
Wilkesbarre at Port Johnston	2 65	2 65	2 65	2 65	2 75	2 60
Smyouth, R. A.	.....	.....	2 65	2 65	2 85	2 70
Susque; Coal Co., (S. H. Brown & Co.) at Amboy	2 50	2 50	2 60	2 65	2 75	2 60
Kingston at Hoboken	2 50	2 50	2 60	2 65	2 75	2 60
Pittston at Newburgh:	.....	.....	.....	.....	.....	.....
A. S. Swords	2 50	2 50	2 50	2 50	2 60	2 50
*Penn. Coal Co.	2 51	2 47	2 50	2 48	2 51	2 45
Wyoming at Perth Amboy	.....	2 65	2 65	2 65	2 75	2 75
Lehigh Coals.						
Old Company at port Johnston	3 25	.....	2 85	2 85	2 75	2 60
Old Company's Room Run	3 25	.....	2 85	2 85	2 75	2 60
Sugar Loaf, Hobok. & Amb.	3 25	.....	2 85	2 85	2 75	2 60
Lehigh at Perth Amboy	3 25	.....	2 85	2 85	2 75	2 60
Honey Brook Lehigh	3 25	.....	2 85	2 85	2 75	2 60
Mount Pleasant at Hoboken	3 25	.....	2 85	2 85	2 75	2 60
Cross Creek at Port Johnston	3 00	2 70	2 75	2 75	2 75	2 75
Schuylkill Coals at Port Richmond, Philadelphia.						
Schuylkill white ash	.....	.....	.....	.....	.....	.....
Schuylkill red ash	.....	.....	.....	.....	.....	.....
Lorberry	.....	.....	.....	.....	.....	.....
Lykens Valley	.....	.....	.....	.....	.....	.....

Boats towed by the D. & H. Co. at its expense to and from New York Harbor.

*These quotations represent the average prices of the last auction sale

Per ton. Freight from Hoboken and Weehawken to New York 35c. " " Elizabethport & Port Johnston to N. Y. 35c. " " South Amboy to New York 35c.

Freight by the boats of the companies from Hoboken, Rondout, Port Johnston, Weehawken, South Amboy and Perth Amboy to New York City and vicinity 50c. Pittston coal at New York delivered by Penn. Coal Co.'s boats 60c. per ton additional. Lackawanna coal delivered to carts in New York or Brooklyn, 50 cents per ton additional.

	Grate.	Egg.	Stove.	Chestnut
Pittston.....	\$4 95	\$4 95	\$5 20	\$5 10
Wilkes-Barre.....	4 95	4 95	5 20	5 10
Lackawanna.....	4 95	4 95	5 20	5 10

For retail delivery in city the prices are as follows: Stove and chestnut \$5.75; grate and egg, \$5.50 per ton.
Prices soft coal f. o. b. vessel for Lake shipments will be from 15 to 20c. per ton more than prices on cars.

Freights

Representing the latest actual charters up to July 5.
Per ton of 2240 lb.

Ports.	From Philadelphia.	From Baltimore.	From Georgetown.	From Elizabethport, Port Johnson, South Amboy, Hoboken and Weehawken.
Augusta, Me.....	157 1/2 @ 175			1 50
Albany.....				
Alexandria, Va.....				
Annapolis, Md.....				
Bangor, Me.....	1 50			1 00
Bath, Me.....	1 27 1/2			1 00
Baltimore.....	65			
Boston, Mass.....	115 @ 120		1 00	1 00
Bridgeport, Ct.....			1 30	80
Bristol, R. I.....				1 00
Beverly, Mass.....				1 00
Cambridgeport, Mass.....	1 50			
Charleston, S. C.....				
Danversport, Mass.....	1 25			
East Greenwich, R. I.....				
Fredericksburg, Va.....				
Fall River.....	1 15		1 35	80
Gloucester.....	1 30			
Greenport, N. Y.....				
Hartford, Conn.....				
Hoboken.....			1 20	35
Hudson.....				
Jersey City.....			1 20	35
Lynn, Mass.....	1 25			
Medford, Mass.....				
Middletown.....				
Marblehead, Mass.....	1 65			
Nantucket, Mass.....				85
New Bedford.....			1 40	85
Newburyport.....				1 10
New Haven.....			1 30	50
New London.....	1 15		1 35	
Newport.....	1 15			80
New York.....	90		1 20	35
Norfolk.....	50			75
Norwalk.....				50
Norwich.....	115 @ 120			1 40
Pawtucket.....	120 @ 125			90
Philadelphia.....				
Portland.....	1 25		1 50	1 00
Portsmouth, N. H.....	1 35		1 65	1 10
Providence.....	110 @ 115		1 35	80
Poughkeepsie, N. Y.....				
Quincy Point, Mass.....				
Richmond, Va.....	60			
Salem, Mass.....			1 55	1 30
Saugus, Mass.....				
Saco, Me.....				
Somerset, Mass.....				
Thomastown, Me.....	1 35			
Troy.....				
Trenton, N. J.....				
Washington.....	65			
Wilmington, N. C.....				
Wareham.....			1 50	

* And discharging and towing. † And discharging. ‡ And towing. § 3c per bridge extra.

Rates of Transportation on Anthracite Coal to Tide Ports.

Lehigh and Wyoming Coals.	From Penn Haven.	From Mauch Chunk.	From Hazleton.	From Upper Lehigh and Sugar Notch.
To † Newark, N. J. (117 miles) via Central Railroad of New Jersey.....	1 36	1 22	1 80	1 10
† Mauch Chunk, Pa., via Central Railroad of N. J.....	14	58	49	
† Phillipsburg, N. J., 46 miles.....	0	56	14	05
Elizabeth Pt., 114 miles Pt., Johns., Hoboken and South Amboy, N. J., shipping and wharfage 15c. add.....	1 00	36	44	1 35
High Bridge, N. J.....	1 80	60	58	19
Elizabeth, Cranford, Westfield & Elizabethport, for consumption.....	1 80	60	2 18	2 19
Jersey City, N. J., (121 miles) and New York, via L. V. RR.....	1 59	22	01	1 92

From Mauch Chunk to New York (121 miles), (towing 1 1/2 limits) and Jersey City via Lehigh Valley RR.....
From Mauch Chunk to Philadelphia (93 m) via L. V. and L. & S. RR. and North Penn. RR.....
From Mauch Chunk to Philadelphia (92 m) via L. V. and Perkiomen RR.....
For way points between Mauch Chunk and Phillipsburg on the New Jersey Railroads.....
From Phillipsburg, N. J., to Hoboken (84 m) for shipment via Delaware, Lackawanna & Western RR., Morris and Essex Division.....
From Phillipsburg, N. J., to Newark (75 m) via Delaware, Lackawanna & Western RR.....
* Rates on line coal from Hazleton are 10c. per ton above these figures.
† The cost of unloading is to be added to these rates. No charge less than 40c. per ton will be made for any distance. Tolls from Mauch Chunk to Phillipsburg for way points will be \$1.00 per ton.
‡ On coal received by canal at Jersey City, a charge additional to the freight, of twenty cents per ton, will be made for trans-

ferring it from boat to boat, and thirty cents per ton for placing the same on the wharves and reshipping.

The distances in the above table are computed from Mauch Chunk. From Ashley to Mauch Chunk the distance is 51 miles, and from Upper Lehigh, 33 miles. From Hazleton 24 miles, and from Penn Haven 8 miles.

From Wilkes-Barre to Perth Amboy via the Lehigh Valley Railroad Company, the distance is 161 miles, and from Mauch Chunk it amounts to 106 miles.

Schuylkill Coals.

To	From Pine Grove.	From Tamaqua.	From Schuylkill Haven.
Port Richmond, via P. & R. R. R., Main Line, for shipment.....	1 45	1 40	1 25
Harrisburg, via Lebanon Valley Branch.....	98	1 37	1 22
Allentown, via East Pennsylvania Branch.....	1 22	1 17	1 02
Lancaster, and Points on Lancaster Branch, via R. & C. R.R.....	1 40		
Dauphin, via Schuylkill and Susquehanna ranch.....	70	1 25	1 10
Slatedale Junction, via Berks and Lehigh ranch.....	70	1 18	1 03
Lebanon, via Lebanon and Tremont ranch.....	1 34	1 29	1 14
	82		

From Tamaqua, to Catawissa, McAuley, Matville, Rupert, and Danville, via Catawissa and Williamsport Branch Railroad.....
From Tamaqua to Williamsport, Hall's, and Montourville, via Catawissa and Williamsport Branch Railroad.....
Coal sent to points on the Catawissa and Williamsport branch will be charged one and one-half cent per ton per mile, and two cents per ton additional to Tamaqua.

From Port Clinton to Philadelphia via Schuylkill Canal, including freight and charges for the use of cars and barges, and for tolls (exclusive of cost of unloading).....

An additional charge of 25 cents per ton will be made on Chestnut and Pea Coal to whatever point consigned. If the shipper signs a release of all demands arising from a deficiency of weight at the place of destination, and agrees to indemnify the company from all claims by reason thereof, such additional charge will not be made. Releases, properly prepared, will be furnished, and can be signed at the coal offices of the company, at St. Clair, Palo Alto, Schuylkill Haven, Mount Carbon, Pine Grove, and Tamaqua.

For shipment via Main Road or Schuylkill Canal, one and one-half cent per ton per mile, and two cents per ton additional to Schuylkill Haven, Pine Grove, Tamaqua, or Port Clinton, for Cars as the case may be.

For consumption at local points in coal region, including Shamokin, Herndon, Schuylkill Haven, Pine Grove, and Tamaqua, three cents per ton per mile, and two cents per ton additional; and a charge for car service, of fifteen cents per ton to individuals, and five cents per ton to manufacturers, when in Philadelphia and Reading Railroad cars, provided no charge, including freights, tolls, and car service, shall be less than twenty-five cents per ton.

Sent westward via Northern Central Railway (in N. C. R. W. Co.'s cars), four and two-tenths cents per ton per mile, to Locust Gap, Shamokin, or Herndon. provided no charge will be made less than fifteen cents per ton.

One mile extra will be added for coal passing through the East Mahanoy Tunnel.

Fractions of distances and rates will always be stated in tenths.

No charge will be made for weighing or making returns of coal shipped, and the latter will be furnished free of charge, upon application to the Weighmaster; if these returns are to be sent by mail, envelopes, properly stamped and addressed, must be furnished to the Weighmasters.

All coal will be charged the rates (both lateral and Main Line) current on the day it is weighed; it will also be way billed on the same day.

Circulars relating to freights on Schuylkill coals will be found in the issue of this Journal of March 24 & March 31 in the "Coal Trade Review."

For freights on Pennsylvania & New York Railroad we refer to our issue of June 23.

For freights on anthracite coal from Rondout and Newburgh we refer to our issue of June 30.

For rates of transportation on coal via the Erie Canal we refer to our issue of June 30.

For freights on coal via Geneva, Ithaca and Sayre Railroad we refer to our issue of June 16.

Rates of Toll

For rates of toll we refer to our issue of June 30.

Towing.

For rates of towing we refer to our issue of June 30

IRON MARKET REVIEW.

New York.

FRIDAY EVENING, July 6, 1877.

American Pig.—Although we have had a holiday to break the week, yet it was impossible to bring about a state of quietness greater than that which has existed for several weeks past. Prices are generally weak, and buyers with cash have matters very much their own way. We only hear of a sale of 500 tons of No. 1 foundry on private terms. We quote No. 1 foundry at \$18@19; No. 2 foundry, \$17@18; and forge \$16@17.

Scotch Pig.—There has been no business in this article except in a very small way. Prices remain unchanged as follows: Coltness, \$27.50; Eglinton, \$24.50; Glenarnock, \$25.50. According to Messrs. John E. Swan & Bros., the stock of pig iron in Connal & Co.'s stores at Glasgow was 140,067 tons on June 22, as against 64,038 tons a year previous. The number of furnaces in blast was 106 as against 116 at the corre-

sponding time last year. The shipments from December 25 showed a falling off of 4,065 tons as compared with the like period of 1875-76.

Rails.—We learn of no business having been consummated, although there is some under negotiation. We continue to quote iron rails at mills at \$33@36 and steel at \$44@46.

Old Rails.—Without business, we quote nominally at \$18.50@19.

Scrap.—We note a sale of 200 tons of No. 1 wrought to go East—prices not made public. We quote at \$23@24.

Baltimore, Md.

July 3, 1877.

Specially reported by Messrs. R. C. HOFFMAN & Co.

Baltimore Charcoal.....	\$29@31	Mottled and White.....	\$15@16 00
Virginia Charcoal.....	28@32	Charcoal C. B. Blooms.....	58@60 00
Anthracite No. 1.....	20@21	" " Billets.....	60@65 00
" 2.....	19@20	" " Scrap Blooms.....	45@50 00
Anthracite No. 3.....	18@19		43@45 00

Boston.

June 29, 1877.

Pig is dull, and prices still tending downward. We quote \$22.50@23.50 for No. 1, \$21.50@22 for No. 2, and \$21@22 for grayforge. Scotch pig is neglected and prices are easier. We quote \$24@30 for store lots. The foreign markets are dull.

Bar is dull, quoting \$46@47 for refined, and \$37@38 for common. Nails are in light demand at unchanged prices. Sheet is selling at 3c. @ 3 1/2 c. per pound. Russia is quiet at 12c. currency. We quote English spring steel 7@8c. gold; 9@11c. for German; 9@11c. for machinery; 14@15c. for cast; 10@12c. for blister; 8c. for American spring; 13 1/2 @ 14c. for cast; 9c. for blister; and 8c. for machinery.—Commercial Bulletin.

Chattanooga, Tenn.,

July 3, 1877.

Specially reported by J. F. JAMES, dealer in pig iron, ores, etc.

Nothing new to report in the condition of our market since last report. Prices unaltered.

Tenn., Ala. and Ga. Charcoal, No. 1 Foundry.....	\$18 00@19 00
Tenn., Ala. and Ga. Charcoal, No. 2 Foundry.....	17 00@18 00
Tenn., Ala. and Ga. Charcoal, Gray Forge.....	15 00@16 00
Tenn., Ala. and Ga. Coke, No. 1 Foundry.....	19 00@20 00
Tenn., Ala. and Ga. Coke, No. 2 Foundry.....	17 00@18 00
Tenn., Ala. and Ga. Coke, Gray Forge.....	16 00
Charcoal or Coke, white and mottled.....	14 00@15 00
Tenn., Ala. and Ga. Cold Blast (car wheel).....	22 00@28 00
Old rails.....	18 00@19 00
Wrought scrap.....	12 00
Cast scrap.....	10 00
Muck bar.....	32 00@33 00

Iron Ores.

Red Hematite (about 55 per cent. metallic iron) f. o. c. at mines.....	1 25
Brown Hematite (about 55 per cent. metallic iron).....	1 75

Cleveland, O.

June 30, 1877.

Specially reported by Messrs. C. E. BINGHAM & Co.
Per gross ton, on four months' time. Subject to change in market. Discount for cash 4 per cent.

FOUNDRY IRON.

No. 1, L. S. Charcoal.....	\$26 00	Am. S., No. 1, Ch. Val. \$24 00	
No. 2, " " ".....	25 00	" " B. 1, " " 22 00	
No. 1, Anthracite.....	24 00	" " No. 2, " " 21 00	
No. 2, " " ".....	22 00	No. 1, Massillon.....	24 00
No. 1, Bituminous.....	24 00	B-1, " ".....	22 00
No. 2, " " ".....	22 00	No. 2, " ".....	20 00

CAR WHEEL AND MALLEABLE IRON.

No. 3 L. S. Charcoal.....	27 00	No. 5 & 6, L. S. Charcoal.....	\$27 00
No. 4, " " ".....	27 00		

BESSEMER IRON.

Nos. 1 & 2, L. S. Char. \$26 00	
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FORGE IRON.

No. 1, Gray.....	\$19 00	White and Mottled.....	\$18 00
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Cincinnati, O.

July 3, 1877.

Specially reported by Messrs. TRABER & AUBREY, commission merchants for the sale of pig iron, blooms, ore, etc.

Below we hand the closing quotations of our pig iron market.

CHARCOAL.	
Hanging Rock A1 Extra.....	\$25 00@25 50-4 mos
" No. 1 Foundry.....	24 00@24 50-4 mos
" No. 2 " ".....	22 00@22 50-4 mos
" Soft Silver Gray.....	22 00@22 50-4 mos
" Mill.....	20 00@21 00-4 mos
Tennessee, No. 1 Foundry.....	22 00@23 50-4 mos
" " 2 " ".....	22 00@22 50-4 mos
" " Mill.....	20 00@21 00-4 mos

STONE COAL.	
Ohio, No. 1 Foundry.....	21 50@22 50-4 mos
" " 2 " ".....	20 50@21 50-4 mos
" Silvery.....	19 50@20 50-4 mos
" Mill.....	@ 20 50-4 mos

COKE.	
Ohio & W. Va. No. 1 Foundry.....	23 00@25 00-4 mos
" " 2 " ".....	22 00@23 00-4 mos
" " Mill.....	@ 20 50-4 mos

CAR-WHEEL.	
Hanging Rock, C. B. Car Wheel.....	38 00@40 00-4 mos
Tennessee, " " ".....	30 00@31 00-4 mos
Missouri, " " ".....	30 00@31 00-4 mos
Alabama, " " ".....	30 00@35 00-4 mos

BLOOMS.	
Charcoal.....	50 00@51 00-cash.
Cast.....	50c @ 55c- "
Wrought.....	75c @ 1 00- "

Louisville, Ky.

July 3, 1877.

Specially reported by Messrs. GEORGE H. HULL & Co.

No decided change in the market. Fair inquiry for consumption, but no quotable change in price. The usual time, four months, is allowed on the quotations below.

FOUNDRY IRONS.	
No. 1 Hanging Rock, Charcoal.....	\$24 00@24 50
No. 2 " " ".....	21 00@22 00
No. 1 Southern Charcoal.....	21 00@22 00

COAL TRANSPORTATION AND GENERAL MINING STOCKS.

Name and Location of Company.	Feet on Vein.	Capital Stock	SHARES.		ASSESSMENTS.			DIVIDENDS.				HIGHEST AND LOWEST QUO. PER SHARE IN CURRENCY.						SALES.						
			No.	Par Val.	Total levied to date.	Date and amount per share of last.		Total paid to date.	Last Dividend.	Rate per Ann.	June 30.		July 2.		July 3.		July 4.		July 5.		July 6.			
						H.	L.				H.	L.	H.	L.	H.	L.	H.		L.	H.	L.			
Coal Stocks.																								
Consol. Coal.....	Md.	10,250,000	102,500	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Del. & H. Canal.....	Pa.	20,000,000	200,000	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Del. Lac. & W. RR.....	Pa.	26,200,000	262,000	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lehigh C. & N.....	Pa.	10,448,550	208,971	50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lehigh Valley RR.....	Pa.	27,042,900	540,858	50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Maryland Coal.....	Md.	4,600,000	46,000	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
N. J. Central RR.....	Pa.	20,600,000	206,000	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Penna. Coal.....	Pa.	5,000,000	50,000	50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pennsylvania RR.....	Pa.	68,868,700	1,377,476	50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Phil. & Read. RR.....	Pa.	34,276,755	685,575	50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
General Mining Stocks																								
Alpha Cons. g. s.....	Nev.	300	3,000,000	30,000	100	180,000	Aug. 1875	\$1 00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Am. Flag, g. s.....	Colo.	5,300	600,000	60,000	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Belcher, g. s.....	Nev.	1,040	10,400,000	104,000	100	864,400	Feb. 1877	1 00	15,397,200	Apr. 1876	\$1 00	12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bertha, g. s.....	Vir.	645	300,000	30,000	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Best and Belcher, g. s.	Nev.	545	10,080,000	100,800	100	236,992	Feb. 1877	1 00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bobtail, g. s.....	Colo.	2,500	1,366,630	27,326	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bobtail Tunnel, g. s.	Colo.	.....	100,000	20,000	5	6,000	July 1873	0 30	20,000	Dec. 1876	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bullion, g. s.....	Nev.	94 1/2	10,000,000	100,000	100	2,552,000	June 1877	1 50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Caledonia, g. s.....	Nev.	2,188	10,000,000	100,000	100	1,360,000	June 1877	50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
California, g. s.....	Nev.	600	54,000,000	540,000	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Chollar Potosi, g. s.	Nev.	1,400	2,800,000	28,000	100	1,338,000	May 1877	2 00	3,080,000	Feb. 1872	1 00	12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cleveland, g. s.....	Colo.	3,715	250,000	25,000	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cons. Hercules & Roe.	Colo.	16,500	1,000,000	100,000	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cons. Imperial, g. s.	Nev.	468	50,000,000	500,000	100	475,000	May 1877	0 20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cons. N. Slope & E.C.T.	Colo.	15,000	500,000	10,000	50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cons. Virginia, g. s.	Nev.	710	54,000,000	540,000	100	474,600	June 1873	3 00	29,160,000	June 1877	2 00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Confidence, g. s.....	Nev.	130	2,496,000	24,960	100	243,840	Mar. 1873	1 00	78,000	May 1865	8 1/2	24	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Crown Point, g. s.	Nev.	600	10,000,000	100,000	100	1,473,370	June 1877	1 00	11,588,000	Jan. 1875	2 00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Douglas, g. s.....	Colo.	21,000	1,000,000	10,000	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Eureka Cons. g. s. L.	Nev.	.....	5,000,000	50,000	100	100,000	May 1876	1 00	1,000,000	Aug. 1875	1 00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Eureka G. M. g. s.	Calif	.....	1,000,000	10,000	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Eschequer, g. s.....	Nev.	400	10,000,000	100,000	100	280,000	Sept. 1876	1 00	2,094,000	May 1877	2 00	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gould and Curry, g. s.	Nev.	621	10,800,000	108,000	100	2,242,000	Apr. 1877	1 00	3,934,800	Oct. 1870	10 00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Granville Gold.....	N. C.	9,000	1,000,000	100,000	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Hale & Norcross, g. s.	Nev.	400	11,200,000	112,000	100	2,410,000	Apr. 1877	.....	1,598,000	Apr. 1871	1 00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Henry Tunnel.....	Nev.	3,000	2,000,000	20,000	25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Hukill, g. s.....	Colo.	3,288	1,000,000	100,000	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Indian Queen, g. s.	Nev.	1,000	3,000,000	30,000	50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Julia Cons., g. s.....	Nev.	3,000	11,000,000	110,000	100	330,000	Apr. 1877	1 00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Justice, g. s.....	Nev.	2,100	10,500,000	105,000	100	1,760,000	June 1877	1 50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kentuck, g. s.....	Nev.	95	3,000,000	30,000	100	270,000	Dec. 1874	1 00	1,252,000	Mar. 1870	5 00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kossuth, g. s.....	Nev.	2,700	5,400,000	54,000	50	405,000	Aug. 1876	0 50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lacross.....	Colo.	3,900	1,000,000	100,000	50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Leopard, L. g. s.....	Nev.	1,500	5,000,000	50,000	100	75,000	Mar. 1876	1 00	162,500	Dec. 1876	0 50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lucerne Mining.....	Colo.	4,200	5,000,000	50,000	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mariposa, preferred.	Cal.	44,387	5,000,000	50,000	100	1,425,000	June 1877	1 00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mariposa, common.	Cal.	48,387	10,000,000	100,000	100	1,425,000	June 1877	1 00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Memphis.....	Colo.	6,000	500,000	60,000	500	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Merrimac, s.....	Mass.	1,500	500,000	50,000	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mexican, g. s.....	Nev.	800	10,000,000	100,000	100	151,200	June 1877	0 10	65,000	June 1877	400	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Moose.....	Colo.	39,000	2,000,000	200,000	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
N. Y. & Colo. g. s.	Colo.	.....	1,000,000	50,000	200	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Northern Belle, s.	Nev.	1,600	5,000,000	50,000	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ontario.....	Utah	3,000	10,000,000	100,000	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ophir, g. s.....	Nev.	675	10,080,000	100,800	100	2,934,400	May 1875	2 00	1,394,400	Mar. 1874	4 00</													

Delaware, Lackawanna & Western Railroad Company.—With reference to the new \$10,000,000 loan of this company, and the questions as to what rate the loan will be taken at, and the objects of the same, the Philadelphia Ledger of the 5th inst. says: "This movement is all very well, perhaps, but where are purchasers for so large an amount of railway loan to be found just now, and at what prices? Railroad credit is just now a good deal out at the elbows, and as European capitalists hold about as much of that sort of investment as they desire, the home market will have to be mainly looked to for takers. The bonds of the Delaware, Lackawanna & Western now consist of a second mortgage for \$1,633,000, convertible bonds for \$600,000, Lackawanna and Bloomsburg first \$370,900, and second \$209,000, making a total of \$2,812,900. It is said that the issue of the consolidated mortgage for \$10,000,000 has been in contemplation for some time, and that it was at first suggested that the proceeds, after retiring the above named liens for \$2,812,900 could properly be applied to the purchase of sufficient Morris & Essex stock to at least give the Delaware, Lackawanna & Western the control of that corporation. Whether or not this as the real purpose of issuing the mortgage is not known. It is reported, however, that purchases of Morris & Essex stock in considerable amounts have recently been made, and it is possible that even now the Delaware, Lackawanna & Western people have secured the controlling interest in that corporation. If, on the other hand, this was not the object of the company in authorizing the issue of this mortgage for \$10,000,000, it indicates that the finances of the corporation are in such a condition that funds will be required to meet obligations that have already accrued, or those that will accrue."

Seattle & Walla Walla Railroad.—This company has concluded an agreement with the Seattle Coal Company to build a branch or extension of its road from the present terminus at Renton, Washington Territory, to the coal mines at Newcastle, a distance of six and a half miles. The road is to be completed by October 15, and the company further agrees to carry all the coal furnished from the mines to the port of Seattle at fixed rates for 20 years. On the other hand the Seattle Coal Company is to transfer its locomotives to the Seattle & Walla Walla Company, and also to make some advances. Work on the extension has already begun.

Coal Creek & New River (Tennessee) Railroad.—A company by this name has been organized to build a railroad from the Coal Creek Mines in Anderson County, Tenn., northeast to a point on the Cincinnati Southern, in Scott County. The distance is about thirty miles through a somewhat difficult country.

COUPONS AND INTEREST are due on the bonds of the following companies during the present month:

- American Dock and Improvement Company.**—Coupons.
- Achison, Topeka & Santa Fe Railroad Company.**—Coupons.
- Cannelton Coal Company.**—Coupons.
- Central Railroad of New Jersey.**—Interest on consolidated bonds are due.
- Chesapeake & Ohio Canal Co.**—Coupons.
- Chesapeake & Ohio Railroad Company.**—Coupons on the gold and currency bonds become due.
- Consolidated Coal Company's 7 per cent. and convertible bonds, coupons.**
- Crown Point Iron Company.**—Coupons.
- Cumberland Coal & Iron Company.**—First mortgages; coupons paid by Consolidation Coal Company.
- Dale Coal Company.**—Coupons.
- Delaware & Hudson Canal Company.**—Registered first mortgage bonds 1884 and 1891; interest.
- Eureka Coal Company.**—Coupons.
- Grand Tower Mining, Manufacturing & Transportation Company.**—Interest.
- Holiday Coal Company.**—Coupons.
- Ithaca & Athens Railroad Company.**—1st mortgage 78 of 1890; interest in gold.
- Mahoning Coal Railroad Company.**—Coupons.
- Maple Grove Coal Company.**—Coupons.
- Milwaukee Iron Company.**—Coupons become due.
- Monongahela Navigation Company.**—Coupons.
- Morris & Essex Railroad Company.**—Interest on 7 per cent. bonds of 1875 paid by Delaware, Lackawanna & Western Railroad Company; also interest on the convertible bonds of 1900.
- Peytona Cannel Coal Company.**—Coupons.
- Quicksilver Mining Company.**—Coupons.
- Swedes Iron Company.**—Coupons.
- Thomas Iron Company.**—Coupons.
- Union Coal Company.**—Coupons paid by Delaware & Hudson Canal Company.

- The Glendon Iron Co.,** of Boston, has declared a dividend of 2 per cent., aggregating \$20,000.
- The Globe Nail Co.,** of Boston, declares a semi-annual dividend of 10 per cent. on its capital stock of \$350,000.
- The National Tube Works Co.** has declared a quarterly dividend of 3 per cent., equal to \$13,500.
- The Moinona Coal Co.,** of Boston, has declared a dividend of 3 per cent., equal to \$9,150.
- The Central Coal Company of Pennsylvania** will hold its annual election on the 10th inst.

Philadelphia Stocks.

PHILADELPHIA, FRIDAY EVENING, July 6, 1877.

Although the Stock Board adjourned to celebrate the Fourth of July, yet the transactions for the week have been larger than the previous one. Prices show but little change, Lehigh Coal & Navigation Company being the weakest, having declined from 19 1/2¢ at the

opening to 18 1/2¢ at the close. Pennsylvania Railroad and Lehigh Valley have been fairly active, and close at a slight advance.

Harleigh Coal Company.—70 shares of the stock of this company were sold at auction during the week at \$1 per share.

Pennsylvania Salt Manufacturing Company.—136 shares of the stock of this company were sold at auction during the week at from \$65 to \$65 1/4 per share.

Miscellaneous Sales and Quotations.

Sales and quotations of the stocks and bonds dealt in here and at Philadelphia, for the week ending the 6th inst. are given in the following tables. The Philadelphia quotations will have a * affixed.

STOCKS.	QUOTATIONS.—			Sales Shares.
	High est.	Low est.	Clos- ing.	
American Coal Co.....	—	—	—	—
*Cambria Iron Co.....	59	58	55	30
*Pennsylvania Salt Man'g Co.	—	—	64	—
*Westmoreland Coal Co.....	—	—	55	—
*Buck Mountain Coal Co.....	—	—	40	—
*Schuylkill Nav. Co.....	—	—	—	—
St. Louis, I. M. & S. RR. Co.....	—	—	5 1/2	—
Spring Mountain Coal Co.....	—	—	30	—

BONDS.	QUOTATIONS.—			Sales Shares.
	High est.	Low est.	Clos- ing.	
D. L. & W. 78, Conv't., 1892 J. & D.	—	—	100	—
" " ad mtg., 1881 M. & S.	—	—	106	—
N. J. C., 1st mtg., new. F. & A.	110 1/2	—	110 1/2	\$2,000
" " 1st mt., cons. 1892 Q.	—	—	57 1/2	—
" " Conv't. M. & N.	—	—	52 1/2	—
L. & W. B. Coal Co., cons. Q.	21 3/4	21 1/4	19	2,000
Am. Dock & Imp. 78. J. & J.	—	—	41	—
D. & H. C. Co., 1st m., 1884 J. & J.	—	—	—	—
" " " " 1891 J. & J.	—	—	97	—
" " " " 1877 J. & J.	—	—	89 1/2	—
" " " " reg., 1894 A. & O.	—	—	89	—
" " " " comp., 1894 A. & O.	102	—	101	4,000
St. L. I. M. & S., 1st mt. 1892 F. & A.	80 1/2	101	101	4,000
Ches. & Ohio, 1st mt., 1893 J. & J.	80 1/2	—	89	4,000
*L. V. RR., con. m. 68, 1893 J. & D.	80 1/2	—	110	—
" " " " 2d. m., 78, 1910 M. & S.	107	—	107 1/2	3,000
" " " " reg., 1898 J. & D.	107	—	107	1,000
*P. RR., 1st mtg., 1880 J. & J.	104 1/2	—	107	6,000
" " " " Gen. mtg. reg., 1910 A. & O.	107 1/2	107	107	3,000
" " " " Con. m. 68. cou., 1905 J. & D.	93	—	92	3,000
" " " " reg. 1905 Q.	108 1/2	—	105	8,000
" " " " gen. M. Coup., 1910 J. & J.	107 1/2	—	107	4,000
" " " " New Loan 58.....	—	—	—	—
*P. & R. RR., 78, 1893 A. & O.	92 1/2	—	92 1/2	6,000
" " " " con. m. 78. cou. 1911 J. & D.	—	—	38	—
" " " " Deb. 68, 1893 J. & J.	—	—	44	5,000
" " " " New conv't. 78, 1893 J. & J.	45	44	44	5,000
" " " " Con. mtg. 78, reg. J. & D.	—	—	101 1/2	—
" " " " 68, 1844-80..... J. & D.	—	—	50	—
*P. & R. C. & I. Co. Deb. 78 M. & S.	—	—	—	—
*P. & R. C. & I. Co.....	—	—	—	—
*L. C. & N. Co. 68, 1884 M. & Q.	101 1/4	101	101	18,700
" " " " RR. loan 1897 F. & C.	—	—	—	—
" " " " Con. mtg. 78. J. & D.	—	—	—	—
" " " " Cvt. gold, 1894 M. & S.	—	—	—	—
" " " " Gold Loan, 1897 J. & D.	87	86 1/2	86	2,500
*Schuylkill Nav., 68, 1897 M. & Q.	108 1/2	108	108	9,000
*Pa. Canal Co..... J. & J.	65	—	60	5,000
*Susquehanna Coal Co. 68.....	—	—	—	—

Total transactions for the week. \$86,200

Copper Stocks.

Reported by Wilson W. Fay & Co., Bankers and Brokers Room 7, Traveler Building, 31 State Street.

BOSTON, THURSDAY EVENING, July 5, 1877. The dull market still continues, there being very few sales in most of the stocks. Although there may be prospects of more activity, it looks now as if it would hold off until the warm weather is gone.

Calumet and Hecla remains firm and has been selling at 169 1/2 bid and 169 1/4 asked, closing this afternoon at 169 1/2 bid and 169 1/4 asked.

Copper Falls hangs just as it was at the time of our last report, \$3 being bid for it (asst. paid) and \$1 bid (asst. paid).

Duncan Silver has been quite lively the past week, it rising as high as 2 1/4, there being sales at 2 1/4, 2 1/2, 2, 1 1/2 the lowest; sales being the last and the stock looks weak now at 1 bid and 1 1/2 asked.

On Franklin there is nothing of importance doing \$5.50 being the best bid, and the stock offering at about \$8.

Allouez is offering at \$6 and no bidders. Central is about the firmest looking stock on the list, there being a steady bid of 38 1/2 for it and no stock offering. Quincy hangs firm at 35 1/2 bid and 36 1/2 asked. Pewabic remains unchanged, 1 1/2 being bid and 1 1/4 asked. Ridge also remains unchanged at 2 bid and 2 1/4 asked.

Gold and Silver Stocks.

NEW YORK, FRIDAY EVENING, July 6, 1877.

Business was suspended for two days on the American Mining Board, with the result of reducing the business to 24,570 shares. The market has been quite steady. The transactions in Moose aggregating 4,000 shares, and in Leopard 3,200 shares. With these exceptions the transactions were in every case less than 2,000 shares.

Ontario Silver Mining Company.—The present daily bullion output of this mine is about \$6,000. It is anticipated that the product for July will amount to \$180,000.

NEW YORK MINING STOCK EXCHANGE.—The sales for the week amount to 17,730 shares, a decline of 5,820 as reported in our last.

Sales.		
Atlantic.....	4,300 shares	\$7 12 1/2 @ \$6 75
Calumet Hecla	80	" 170 00 @ 169 75
Central.....	450	" 35 00 @ 40 00

Closing Quotations.

	Bid.	Asked.		Bid.	Asked.
Allouez..	2 00	5 00	Mesnard..	50	1 00
Atlantic..	6 75	7 12 1/2	National..	25	40
Cal't Hecla	169 00	170 00	Osceola..	19 00	21 00
Central..	39 00	40 00	Pewabic..	1 00	2 00
Franklin..	4 00	7 50	Quincy..	34 25	37 00
Madison..	30	75	Ridge....	2 00	3 50

Gas Stocks.

NEW YORK, FRIDAY EVENING, July 6, 1877.

The gas stock market shows but little change in quotations, and no improvement over the dull condition prevailing for some time past. The principal feature in our report is an advance in the stock of the Manhattan Company.

Municipal (N. Y.) Gas Company.—We are informed that this company is now supplying 275,000 feet of gas per day, and that it is making active preparations to materially augment this amount; the company anticipate by the winter to make 1,500,000 feet per day. This, it will be remembered, is the "Tessie du Motay" Water Gas Process.

Bids for lighting the Twenty-fourth Ward.—The Gas Commission, consisting of the Mayor, the Controller, and the Commissioner of Public Works, received two bids on the 2d inst. for lighting and fitting up the public lamps in Riverdale, in the Twenty-fourth Ward, from July 16 until December 31, 1877. The Yonkers Gas-Light Company proposes to light the lamps at \$15.45 each for the whole period, and \$8 additional for fitting each lamp, and the New York and New Jersey Globe Gas Company offers to light each lamp at \$11.46, and \$10 extra for fitting. No awards have yet been made.

The Chicago Gas Difficulty.—The Inter-Ocean of the 3d inst. says: "Judge Drummond, of the United States Circuit Court, yesterday rendered the decision so anxiously waited for in the case of Cornelius K. Garrison against the city of Chicago and the People's Gas Light and Coke Company, familiarly known as the West Side gas case. Garrison, as a stockholder of the gas company, several months since filed his bill for an injunction to restrain the city from breaking its contract to pay \$3 per 1,000 cubic feet for gas. The decision is in favor of the city, as it refuses the injunction, and holds that the city authorities had power to make the contract in question."

Ald. Throop, the chairman of the Council Committee on Gas, stated last evening that he anticipated no further difficulty in settling the question of compensation to the West Side Gas Company. The hands of the Council were now free, and they could dictate terms, but he thought there was no disposition to be unjust. That company had always been allowed fifty cents per 1,000 feet more than the South Side Company, and Mr. Billings was ready to make such terms. The South Side Company asked for the current year \$1.75 per 1,000 feet, and he had in his pocket a proposition from Mr. Billings offering to supply gas at \$2.25. He thought the Council would agree to a price not very remote from that."

Joplin, (Mo.) Gas and Coke Co.—Coupons falling due during the present month will be paid by Metropolitan National Bank, 108 Broadway, N. Y.

Atlantic City (N. J.) Gas and Water Company.—This company will pay its July coupons upon presentation.

Chelsea (Mass.) Gas Co.—The dividend period of this company occurs during the present month.

The Burlington (N. J.) Gas Co. has reduced the price of gas to \$2.50 per 1,000 feet.

Brookline (Mass.) Gas Co.—The semi-annual dividend period of this company will occur on the 15th inst.

East Boston (Mass.) Gas Co.—The semi-annual dividend period of this company will occur on the 15th inst.

Lancaster, Pa.—The new works using the Lowe gas process blew in a few days ago.

The following list of Companies in New York and vicinity are corrected weekly by GEORGE H. PRENTISS, Broker and Dealer in Gas Stocks, No. 30 Broad st., N. Y.

Companies in New York and vicinity.	Capital Stock.	Par.	Dividends.		Quotat'ns		
			Rate of an.	Am of last.	Date of last.	Bid.	As'd
Mutual, N. Y.....	\$5,000,000	\$100	10 1/2	2 1/2	Apr. '77	94	95
" " Gold Bonds	90,000	1,000	7 1/2	3 1/2	Feb. '77	107	107
N. York ".....	4,000,000	100	10 1/2	5	May '77	125	130
Metrop. ".....	2,500,000	100	10 1/2	5	June '77	130	132 1/2
" " Certf.	1,000,000	100	7 1/2	3 1/2	" " "	100	103
" " Bonds	500,000	1,000	7 1/2	3 1/2	" " "	108	—
Harlem ".....	1,850,000	50	8 1/2	4	July '77	98	104
Manhat. ".....	4,000,000	50	10 1/2	5	July '77	190	195
Brooklyn, B'klyn.	2,000,000	52 1/2	15 1/2	5	July '77	150	160
Nassau, ".....	1,000,000	25	10 1/2	4	July '77	—	80
" " Certf.	700,000	1,000	7 1/2	3 1/2	July '77	95	100
People's, ".....	1,000,000	10	10 1/2	3 1/2	July '76	—	40
" " Certf.	300,000	1,000	7 1/2	3 1/2	July '77	80	85
" " B'ds	325,000	100	7 1/2	3	July '77	90	96
Metrop. ".....	1,000,000	10	10 1/2	3 1/2	May '77	85	70
Wm'br'g ".....	1,000,000	50	10 1/2	3	Apr. '77	120	126
" " Certf.	1,000,000	50	7 1/2	3 1/2	July '77	100	108
Citizen's ".....	1,200,000	20	10 1/2	4	Jan. '77	70	80
" " Certf.	320,000	1,000	7 1/2	3 1/2	Apr. '77	95	97
J. C., N. J.....	750,000	50	10 1/2	5	July '77	160	—
Cent. Westch. N. Y.	466,000	50	7 1/2	4	July '77	85	90
Subur'n ".....	295,000	50	7 1/2	3 1/2	Apr. '77	90	100

‡Paid irregularly.

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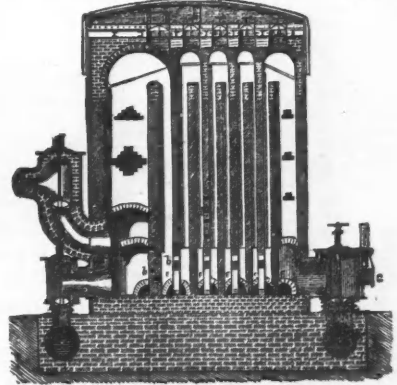
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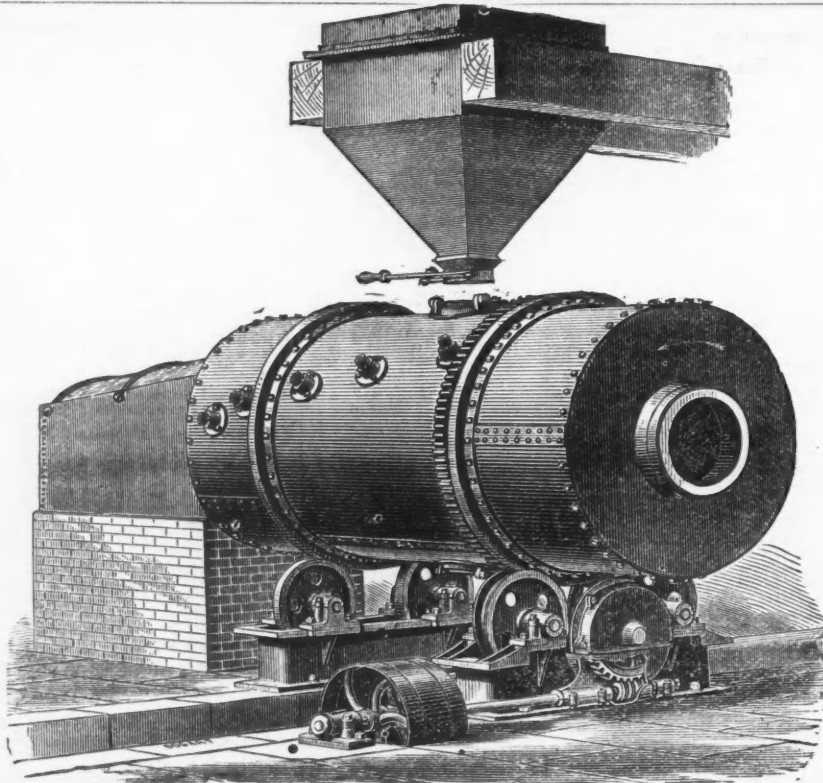
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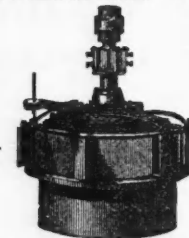
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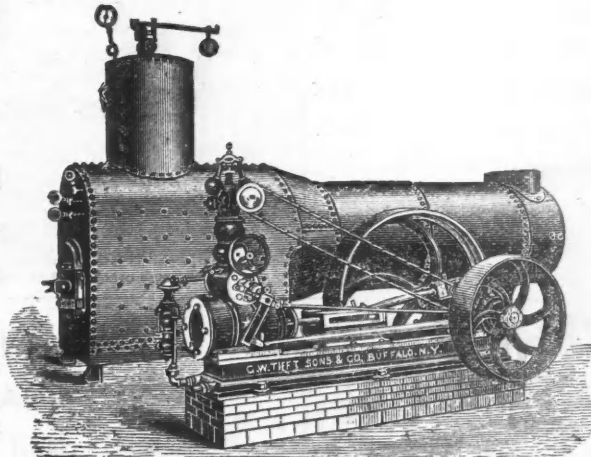
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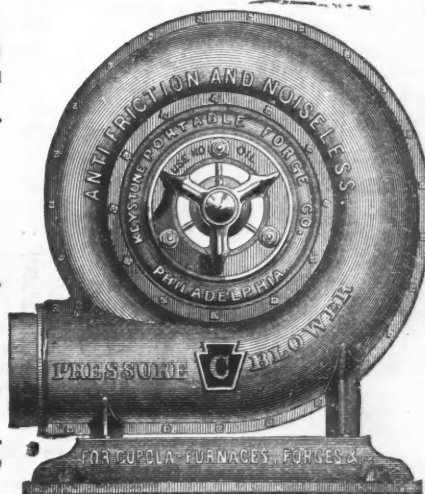
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