

ENGINEERING and MINING JOURNAL.

Vol. XXIII. No. 21.

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NOTE.—Communications relative to the editorial management should be addressed to Mr. BOWWELL. Articles written by Mr. Raymond will be signed thus *

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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.

WESTERN OFFICE OF THE ENGINEERING AND MINING JOURNAL—DENVER, COLO.

The Western office of the ENGINEERING AND MINING JOURNAL, at Denver, Colorado, is under the charge of T. F. VAN WAGENEN, Esq., as Staff Correspondent, and W. W. ROSE, Jr., Esq., as Manager. These gentlemen are the fully accredited agents of this JOURNAL for the Western Department, extending from the Mississippi to the Pacific, and are authorized to make contracts for advertising, take subscriptions, and collect and receipt for the same.

All business communications from the Western Department should be addressed to the Western Office at Denver.

CORRECTION.

In the report of the discussion of Mr. HOWE's paper in our issue of May 12, the remarks beginning, on the twenty-fourth line of the second column, with "I have no authority to speak for the International Committee," should be attributed to Prof. EGGLESTON, instead of appearing as the continuation of Mr. METCALF's remarks.

THE LATE GENERAL JOHN EWEN.

The Pennsylvania Coal Company has sustained a great loss in the death of General JOHN EWEN, who has been its president for more than a quarter of a century, and who died on the 19th inst., at the age of sixty-seven years.

General EWEN was a native of New York. He was educated for the profession of civil engineer, the practice of which he began in this city before attaining his majority. At this period he surveyed and laid out, under the direction of his brother, DANIEL EWEN, what was then the village of Williamsburg, now a part of the city of Brooklyn.

Afterwards he was appointed resident engineer of the Newcastle and Frenchtown (Delaware) Railroad, and held that position until the completion of the work, when he returned to this city, and succeeded Judge WRIGHT as chief engineer of the New York & Harlem Railroad. During his occupation of this office, which he held for several years, until the completion of the road to Harlem, Mr. EWEN was appointed by the Common Council to fill the office of Street Commissioner. The arduous duties of this office were so well discharged by him that he retained the position for eight years, from 1836 to 1844, under successive Democratic and Whig administrations. Mr. EWEN was appointed Controller on a change of administration in the spring of 1854 by a unanimous vote, and held that office more than three years, when he resigned to accept the vice-presidency of the Delaware & Hudson Canal Company. After one year he resigned to accept a similar position in the Pennsylvania Coal Company, of which he soon after became president. To the interests of this company he devoted his best abilities, and in its service he sacrificed his health and possibly his life.

In conducting the successful defense of his company against adverse litigation begun in 1853, continued during a period of about seventeen years, and involving claims amounting to millions of dollars, Mr. EWEN displayed both great ability and wonderful capacity for work. At the beginning of the litigation, perceiving that his efficiency in directing the defense would be greatly increased by his admission to the bar, he unhesitatingly undertook the study of law, which he prosecuted in season and out of season, so that in a few months he was regularly admitted to practice in the courts of this State. Availing himself of this privilege, he took testimony covering thousands of pages, and made at the close an able argument, filling a large volume in itself, covering all that part of the case involving especially questions of civil engineering, with which he had been familiar from boyhood.

In addition to the civic appointments and offices of trust held by Mr. EWEN at various times, he also held high rank among the citizen soldiery of New York. Elected in 1836 Lieutenant-Colonel of the Eighth Regiment of Light Infantry, he was soon afterward chosen Colonel, and later, in 1847, was elected Brigadier-General of the Fourth Brigade.

RECENT CHANGES IN SYSTEMS OF ORE REDUCTION IN THE WEST.

Staff Correspondence of the Engineering and Mining Journal.

A rather notable change is at present occurring in the metallurgy of American silver ores. Ten years ago almost every ounce of silver bullion produced in the West was retorted from amalgam (excepting such as was refined from lead bars and copper matte, of which the quantity was very slight), and amalgamation was regarded as by far the best and cheapest method of milling where smelting was not possible. To-day hardly an amalgamation works is being built in the West, and such as do exist—if they are competing for certain ores with other works using other processes—are suffering greatly in the competition. Already a number of the more prominent amalgamation works have altered their system.

The new process that has taken such hold is the wet one, having for its object either the precipitation of the metal from its solution on copper plates as cement silver, or the precipitation of the sulphide, and the subsequent decomposition of that compound by calcination. Both of these are now regarded as having decided advantages over the amalgamation process, and of the two the first is meeting with the most attention. It is not our intention in this article either to discuss the comparative merits of the two processes or to point out their defects; but simply to note the change, to show how strong a hold it has taken already in the more eastern mining districts, and how rapidly it is sweeping across the country to the Pacific, from whose milling centers the distinctive systems of American amalgamation have taken their rise.

That the change should have occurred among the camps of the Rocky Mountains instead of among those nearer to the coast, where the greatest activity in metallurgy would most naturally exist, is not remarkable when it is remembered that California supplies the quicksilver of the West, and that the expenses attending the use of that metal would be sooner felt in Colorado, Montana, and New Mexico than in Nevada. Again, the silver ores of the Sierra Nevada Range are as a class more base than those nearer the coast, and the loss of mercury on that score is greater. Lastly, the precious metal metallurgy of California and Nevada is notably more brilliant as a mechanical success than as a chemical one. The erection of mills has been guided more by common-sense than by scientific ability, while farther eastward there has been a preponderance of technical training with, in not a few cases, a lamentable lack of common-sense. As a consequence, the far western mills have been the most successful in producing bullion, but at a heavy loss, owing to imperfections in the chemistry of the processes adopted, while in the Rocky Mountain districts those works which are found to be successful are doing much better work for the amount of ore handled. It is to be remembered in this connection that we are speaking only of that branch of reduction classified as milling, as opposed to the fire-processes, or smelting. An examination of the schedule of rates paid for ores in Colorado, Utah, Nevada, and California will show a very decided difference in favor of the first two, and of Colorado in particular. The ability to pay more for custom ores is undoubtedly the direct result of better systems of beneficiation.

The present rage for wet-processes or leaching mills began in Colorado, and has now extended all over the State, and from it into Utah and Montana. Three years ago there was not a reduction works in the Territory using the wet system, while there were five large amalgamation works. To-day we have nine leaching mills in operation, and only three using amalgamation. The change is a sudden one for so short a time, and indicates a very decided revulsion of opinion in favor of wet work. In Montana there were four amalgamation works in operation. This year two new works have been added, in both of which mercury has been discarded. We have also been informed indirectly that two of the existing amalgamation establishments now running there are to be altered to wet-process mills during the present year.

In Utah the change has been less noticeable, owing to the fact that the bulk of the ores of that Territory are fit only for smelting purposes; but it is now reported that, at the new district of Leeds, a mill using the hyposulphite process is shortly to be erected. Utah has four amalgamation works, only one of which—the Ontario—is running steadily, we believe.

Two years ago it was stated in the *Mining Review*, then published at Georgetown, Colo., that amalgamation works for custom ores could not compete much longer against the steady advance of smelters. This has now proven true. If our mines contained nothing but silver and gold, the case might be different, for

then the mechanical department of mills could be so improved as to result in a very high saving of metal; though the same could be done with leaching. But if mill men have to do with ores carrying a considerable percentage of copper or lead, amalgamation will not answer. This fact should be carefully considered by all contemplating the erection of new silver mills.

It is a gratifying evidence of the rapid growth of the West in the science of metallurgy to note how high a percentage of precious metal is now being saved in our mills, and what an excellent quality of bullion in general is being produced. As late as in 1873, if 85 per cent. was saved in Colorado silver works, the work was considered well done. We have now several works that are saving from 90 to 95, and one still better. In Utah, the silver lead furnaces were contented if they had but 20 per cent. of base metal, while at present from 10 to 15 per cent. is lost in the best managed. This steady improvement may be ascribed, in a measure, to the necessities of active competition, but mainly to the employment of intelligent and trained metallurgists in the construction and operation of the newer reduction works.

THE SOUTH CLEAR CREEK, COLO., MINES.

Staff Correspondence of the Engineering and Mining Journal.

Between Idaho Springs and the forks of South Clear Creek are a number of small mining districts which have been almost wholly deserted since 1866 until the last year. In 1864 and 1865 when top quartz was becoming scarce at Central, hundreds of prospectors passed over the divide, and pushed their way up the beautiful cañon above Spanish Bar. Soda Creek, Chicago, Trail Run, Fall River, Spring Gulch, and Mill Creek were successively reached and explored from end to end. A good number of veins were found and opened, and many promising prospects were developed. Companies were formed in the East, mills built, and machinery ordered and erected with that energy and push characteristic of people spending money not their own. Many mines, however, were developed, and plenty of ore was found, but when the mineral came to the mills it would not save. In a few cases gold was found in the ores, but from the majority of the mines none of that metal could be obtained. Consequently the new districts fell into disrepute as rapidly as they had risen. The prospectors passed on up the cañon, and struck the Georgetown mines, over which a great excitement arose. Clear Creek County was formed, and, while its southern western extremity grew rapidly into a prosperous district, the eastern end was forgotten and abandoned, except by the few who clung to the little town surrounding the soda springs. The dozens of mills built slowly rotted away, and were dismantled or robbed, and their ruins for ten years have furnished the subject for many wise homilies on the infatuation of the miner.

When this ground was first explored, it was not known that silver existed in Colorado. The miner knew no metal but gold, and if his pan or horn failed to find the color of the yellow metal in the outcrop the vein was abandoned. Nearly all the veins in the district under consideration showed gold on top, and consequently were regarded as of value. But when a little depth was gained that metal generally disappeared, and, contrary to the experience in Gilpin County, the ore changed to galena and zinc blende, from which, of course, nothing could be extracted in the stamp-mill. Before the complete desertion of this part of South Clear Creek, however, several veins had been opened to a considerable extent, among which were the Seaton, Edgar, Whale, Phoenix, Hiawatha, Albro, Atchison, Capitol, United States, and Young America, and it was finally found that, at this point of the Colorado metalliferous belt, the veins carried both gold and silver, with the preponderance in favor of the latter metal, and that what gold did exist was not saved mainly because the ores were not free. But the discovery came too late to prevent the decay of the district, and to-day it is difficult to find in any part of the West so many evidences of total failure as were made on South Clear Creek between Floyd Hill and Empire.

Three years ago the Hukill Mine (which was among the early discoveries) began to be spoken of as a favorable property, and with its rapid development into the condition of a first-class mine so much attention has been drawn to the lodes of the vicinity that some of the old life is coming back to the deserted creek. The miners on the eastern slope of Virginia Cañon have always produced more or less ore since their first discovery, and are now doing better than ever. The Seaton, Victor, Veto, Crystal, Kayaroo, Queen, and Clifton are among the more notable, besides which there are a number of others that are slowly but steadily being developed into good shape. But from Spanish Bar upwards are to be found most of the evidences of the new and second growth.

In Cascade Creek Mr. J. W. Brown has expended considerable money in opening the Cascade Mine, and this year will do much more. The Lebanon Mining Company of New York also own a large amount of property in this gulch, and it is reported will reopen on several veins this season. There is a prospect of an amalgamation works in Chicago Creek shortly, if the mines now under work continue to yield as well as they did last summer.

In Trail Run, the Friedland has been quietly developed until, so far as ore in sight is concerned, it is a very fine mine. It was attacked by a cross-course tunnel 200 feet long, from which a drift has been driven eastward for 500 feet, displaying a magnificent body of ore for nearly its entire length. Work has been going on upon another drift to the west for some months past, which is reported as showing equally well. The Atchison, one of the old mines which was sunk 288 feet and then abandoned, has lately been cleaned out and will shortly be employing a good force. Some work is also to be done on the Capitol.

In Fall River a new patent process mill was built last year, but turned out to

be a failure. There is just reported, however, a rich "find" at the head of this valley, close to the range which has already attracted much attention from miners, and will, perhaps, result in additional discoveries this season.

At the mouth of Spring Gulch Mr. BAKER reopened an old and abandoned mine last summer, and, finding almost immediately some very rich ore, has continued work since.

The Albro-Hiawatha Mine, now called the Hayes-Tilden or Tilden-Hayes, which in the early days was regarded as one of the finest prospects in the cañon, is now being worked successfully by a small force of men, and will receive this year some more development. A tunnel was at one time started for this vein and driven 600 feet, but stopped because the company's faith and money were not sufficient for the work. There is also another tunnel started farther up the mountain for the same lode which has been idle for some years, but which will possibly be driven on this season.

Above Mill City the excitement caused a few months ago by the discovery of the Free American has resulted in a vast amount of prospecting all over the adjacent hills and up both forks of Mill Creek. Nothing remarkable has been found recently, but, if attention is drawn to the heavy lead veins at the head of these creeks and some work done in opening them, the results cannot fail to be good.

Favorable reports are already coming from some of the new gulch mining enterprises in this valley. For several years past a yield of between \$60,000 and \$80,000 has been obtained from this branch of mining, and enough work done to show that the bed of the creeks is worth the cost of exploration on a larger scale than heretofore.

THE LEAD MINES AT ORO CITY, COLORADO.

Staff Correspondence of the Engineering and Mining Journal.

The immense deposit of carbonate of lead which was discovered last year in California Gulch, Colorado, is to be developed this year with great vigor. About 2,600 tons of ore have been taken out so far, in work done wholly for the purpose of exploring the deposit, some of which has been shipped to St. Louis, and the rest, except some sold to the Malta Works at Oro City, stacked at the mine. Three parties are now working upon different parts of the deposit, which has been traced for a long distance on the south side of the gulch. The several veins opened show bodies of ore ranging from 8 to 20 feet in thickness, and composed almost wholly of carbonate of lead carrying from 20 to 50 ounces of silver. In one of the mines—the La Plata—a trace of gold is found. The ore in general has been found to average about 60 per cent. of lead.

The opening of this vein will undoubtedly result in the production of at least 3,000 tons of metallic lead during the present year. Hitherto this metal has not been among the staple productions of Colorado, if we except the small amount shipped East as rich argentiferous galena; but as this new deposit gives promise of considerable permanence, and is probably only one of many similar veins in the vicinity of Oro City, it may be expected that hereafter the State will yield largely of that metal. Already the St. Louis works, appreciating the value of the ore, have established sampling works in the vicinity of the mines, and talk somewhat of erecting furnaces of their own this summer for the purpose of running the ore into pigs before shipping. The Malta Smelting Works at Oro City also are expecting to handle large quantities of the ore.

At present these new mines are worked under the disadvantage of having no rail transportation within 80 miles, but should the South Park Railroad, which is now extending its line up the Platte Cañon to the Park, push on across the Mosquito Divide into the Arkansas Valley, the value of the deposit will be enhanced greatly. We have been informed that the managers of the railroad mentioned are seriously contemplating this, and have some hopes of reaching as far as Fairplay this year.

THE RARE MINERALS OF COLORADO.

Staff Correspondence of the Engineering and Mining Journal.

We learn from Prof. GRENIER of the Golden, Colorado, School of Mines that thallium, indium, and cadmium have lately been detected in Colorado ores. Thallium was found in pyritous ore (probably from Gilpin County), and indium in some of the Clear Creek County blendes. Cadmium probably occurs with considerable frequency in our galenas and blendes. Prof. BOARD, at the head of the faculty of that institution, and a careful and painstaking chemist, is, we believe, together with Prof. GRENIER, making some critical studies of our ores, which cannot fail to furnish interesting results.

As a field for the mineralogist and chemist, Colorado is hardly to be equalled by any district in the West. Of the rarer metals, nickel, cobalt, selenium, tellurium, uranium, indium, thallium, cadmium, bismuth, molybdenum, and platinum have been found, and there is scarcely a doubt that columbium, thorium, titanium, and vanadium will be recognized as soon as the proper search is made. In fact, we believe the latter was found last year in a sample of ore from Quartz Hill, Gilpin County.

The belt of tellureted veins that has given such an impetus to explorations in Boulder County, and attracted the attention of mineralogists all over the world, is now thought to traverse the entire width of the State from north to south. Two years ago sylvanite and altaite were found in the vicinity of Lake City, San Juan; and this spring altaite was found in a vein on a direct line between that point and Boulder County, and about 130 miles from each. We are of the opinion that tellureted minerals will be found on Mill Creek and Fall River, as there has been noticed there the peculiar blue granite in which the Boulder mines occur.

We have also of late received some specimens from the Elk Mountain District, which showed the same characteristic gangue rock, though the blowpipe did not reveal any of the metal. Of the hundreds of mines in Boulder County yielding this class of ore, the Smuggler, Slide, Coldstream, Melvina, Grand View, American, John Jay, Mountain Lion, and Keystone are developed to a considerable extent, and have paid well. No diminution in the quantity of the mineral has been found to be a necessary consequence of depth gained.

The principal locality for bismuth ores is yet in Geneva, where two mines are being worked that carry a considerable quantity of schirmerite. Sulphide and carbonate of bismuth—with no precious metal—occur on Sugar-Loaf Mountain, Boulder County. Nuggets of native bismuth are quite common in the upper gulches of the Blue Valley. The same metal has also been found in the Arkansas Valley.

The zinc blends of Gilpin and Clear Creek counties, and the pyritiferous ores of the same localities, offer the most interesting studies of any minerals in the State. The variety is remarkable, and the abundance of highly crystallized specimens rather unusual. Three years ago a very pure deposit of pitchblende was found in the Wood lode, Quartz Hill, and since then two new discoveries have been made of the same mineral, which will be opened this year.

Nickel ore ranging from 2 to 5 per cent. has been found in three localities in the State. None of the mines of this metal are yet worked, except the Home-plate in Lake County, where enough silver occurs in the ore to make it valuable. The most promising deposits of this metal, however, occur in the foot-hills west of Fort Collins.

Native bismuth is found in considerable quantity as float nuggets in the gulches tributary to the Blue Valley, though no ore of the metal has yet been found in the veins which are abundant on the divides.

Among the mineralogical curiosities of the tellurium belt may be mentioned a telluride of mercury lately found in the Mountain Lion Mine. Native mercury and amalgams of both gold and silver have also been found at several points along this belt.

OLD COLORADO.

Staff Correspondence of the Engineering and Mining Journal.

Old Colorado is that part of the State known to Wall Street in '63, '64, and '65, and after that time, by reason of the number of wretched failures, now forgotten or only thought of with feelings of disgust. It embraced Gilpin County, Gold Hill, Ward, Jamestown, Spanish Bar, Montgomery, Buckskin, and California Gulch. Outside of these no other mineral districts were known, excepting a few gulch mining camps, such as Hamilton and Breckinridge and vicinity. In '66, the silver excitement came upon the Territory with the discovery of the Georgetown mines, and up to '68 certainly not less than \$20,000,000 of Eastern capital was sent out to the new California for investment in buying and opening mines and building mills. What became of that money is not at present of any moment. Certainly a large part of it was spent in the mines, and as large if not a greater part wasted in foolish and unnecessary ways. By 1869, dull and discouraging times ruled in almost all of the localities named. Nearly all the mines were idle; most of the mills had broken down, and the laborers, failing to find work, were rapidly scattering over the rest of the Territory on prospecting tours or leaving Colorado wholly for Utah, New Mexico, Montana, and Nevada. The thousands who had invested in mining stocks and in patent processes for ore reduction pocketed their losses and considered Colorado a failure. To these, and to the many who emigrated to other parts of the West in search of better mining districts, it will be interesting to learn what has happened since then on these nearly abandoned camps. Contrary to the general anticipation, not one of them is yet dead, or likely to be, though in several the day of permanent revival has not come. In the majority, however, the business of mining is now in as flourishing a condition as could be desired.

Since 1869, the mines in the several districts named have yielded as follows in round numbers:

Gilpin County (Central City District).....	\$9,000,000	Buckskin	\$400,000
Gold Hill.....	1,300,000	California Gulch.....	350,000
Ward.....	100,000	Hamilton.....
Jamestown.....	100,000	Breckinridge and Vicinity.....	420,000
Spanish Bar.....	350,000	Georgetown.....	8,000,000
Montgomery.....		\$20,020,000

From the same districts the annual yield at present is nearly 5¼ millions, and is increasing at the rate of from 10 to 15 per cent. per year. The belt of mines included continues in an unbroken line for a little over 100 miles. The best developed portion now stretches from Gold Hill to Georgetown, and contains an area of 600 square miles.

Montgomery and Hamilton, although the seat of a small production, can hardly yet be regarded as reopened. Empire, Mill City and vicinity, Trail Run, Gold Dirt, Rollinsville, and Wide-Awake districts are still quiet, but cannot fail in a few years more to experience the same quickening influences that have acted so favorably in the more accessible parts of the old stamping ground of the pioneers.

THE WILKES-BARRE MEETING OF THE INSTITUTE OF MINING ENGINEERS.

The American Institute of Mining Engineers has held this week in Wilkes-Barre its sixth annual meeting. Organized in the same place in 1871 by a small gathering of twenty-two, its numbers have now increased to seven hundred, and its usefulness and influence are felt not only throughout this country, but also in Europe. Many interesting and valuable papers were presented at the meet-

ing, some on subjects which have not hitherto been brought before the Institute, as Mr. BOWIE's paper on Hydraulic Mining in California, and Mr. KEITH's paper on the Transmission of Power by Electricity. The accession to the membership was thirty-five. The local committee arranged an admirable programme of excursions, whereby the interesting features of the Wyoming Valley above and below ground were shown to the members under the guidance of Messrs. MERCUR and STEARNS. The officers elected are as follows:

President.—Dr. T. STERRY HUNT, Boston.
 Vice-Presidents.—THOMAS EGGLESTON, New York; JOHN B. PEARSE, Boston; W. P. SHINN, Pittsburg.
 Managers.—E. T. COX, Indianapolis; H. S. DRINKER, Philadelphia; A. L. HOLLEY, New York.
 Treasurer.—THEODORE D. RAND, Philadelphia.
 Secretary.—THOMAS M. DROWN, Easton, Pa.
 A full report of the meeting will be published in the JOURNAL next week.

PRIMARY LESSONS IN METALLURGY.—IV.

Written for the Engineering and Mining Journal.

It will be observed that the primitive blast furnace we have been considering does its work in a wasteful manner, because the carbon gases which escape are chiefly of the CO grade, and are capable of giving off large amounts of heat by the second combustion of CO to CO₂. We have seen that a given quantity of C gives off three times the heat when burned to CO₂ that it does when burned only to CO.

But in the blast furnace gas, a much greater part of the C is found degraded to CO₂ than in the bloomery fire gas. A reason for this may be found in the fact that the kindling temperature of ore oxygen burning with CO is lower than that of CO₂ burning with solid C to form CO. CO₂ burns to CO at a temperature of about 750° Fahr., while roasted iron ore suffers reduction when exposed to CO gas at a temperature of about 400° Fahr., so that, in the upper part of the shaft, where the materials have not been heated up to 750°, but are above 400°, C continues to take O from the ore, forming CO₂, and that the reburning of CO₂ to CO does not occur, hence the CO₂ which results from the last contact of CO with O finally escapes, mixed with the CO which had escaped contact with O, or had become too cool to combine with it. The presence of a large proportion of CO₂ in furnace gases indicates economy, because CO₂ is the lowest grade to which it may be brought, and the work that is in organic C is obtained by its degradation. There is no mode of reviving C from CO₂ known, except some processes which involve the degradation of other C, or some other substance, and the process of nature always going on, by which C is revived from CO₂ by the action of sunlight upon the green leaves of vegetation. Hence we have got the utmost from organic C when we have burned it to CO₂, whereas when we burn it only to CO we get only about one-third the possible work from it.

When the blast is heavily charged with the vapor of water, the temperature of CO₂ combustion zone is reduced, and the general action of the furnace impeded. The air and whatever vapor it may contain is immediately heated when it enters the furnace, at the expense of the fuel burning at the place where the greatest heat is required. Now, if water vapor is introduced, the gases composing the water—oxygen and hydrogen (H₂O)—are shaken each from the gripe of the other, and their condition is changed from that of a cool vapor to that of a mixture of very hot gases. We have seen in the case of C how the gasification of matter absorbs heat; and as the heat of the CO₂ combustion zone is barely high enough to accomplish the duty of fusing the iron and the slag, the presence of but little water in the blast causes trouble by thickening the slag and iron, and changing the rate of carburization. The presence of water gases in the shaft above the bosh appears to do no harm, because the O seizes C, producing CO, and the H is in itself a reducing gas, burning with O in the cooler parts of the furnace, getting O from the ore.

The heating of the air blown into the furnace, even so little as to the temperature of boiling water, banishes much of the trouble arising from vapor in the blast, and modifies the character of the iron produced, on account—among other reasons—of the higher temperature and increased carburizing power of the hotter zones of the furnace; the yield is also increased, from which it appears that the reducing power of a common furnace is greater than the fusing power.

The blast is heated in a stove on its way through the pipes from the blowing apparatus to the tuyeres, and is heated to temperatures of 400° to 1,000° and even higher, the heat being limited by the enduring qualities of the cast iron heating pipes through which the blast of air passes. Formerly a separate fire was kept up under the series of connected curved pipes constituting the stove solely for heating the blast. Afterwards a pipe or funnel was suspended within the throat of the furnace to catch a part of the gases, which were led through proper pipes to the hot blast stove, and there burned in lieu of the separate coal fire. Now the top of the furnace is completely closed by devices which can be opened for charging, and nearly all the gases are led off and burned under the hot blast stoves and under steam boilers, the gases having generally sufficient potential heat to not only heat the blast, but to generate steam enough to run engines which furnish the blast.

The large blast furnaces of the present day are essentially the same as the more ancient charcoal furnace we have had under consideration. The chief differences lie in details relating to manipulation and in the internal shape. The shafts have grown to be very high, the boshes large and less flattened, and the old double cone shape is replaced by a spindle shape, which makes it hard to say where the crucible ends and the bosh begins. These differences meet the requirements of the harder mineral coal and coke now commonly used. The reactions of the process of reduction are the same whether mineral fuel or charcoal is used, except that, as the mineral fuel contains the more ash, the more limestone is required to flux and vitrify that as well as the gangue of the ore. But as there are more non-fluxable impurities in mineral coal than in charcoal, and even more than in the ore itself in some cases, the product is commonly more contaminated with such impurities as sulphur and phosphorus than that reduced by charcoal.

N. W. W.

THE PIONEER COAL MINES, TEXAS, are situated on Honey Branch, in Bexar County, about eighteen miles southwest from San Antonio, about twenty-five miles from Pleasanton, and about fifteen miles from Castroville, Texas. The coal is of a ligneous or woody nature, soft, somewhat sulphurous, and burning to a white ash, without clinker. It does not coke. It is easily ignited, and burns freely with a good draft. It is a good steam coal, and for household purposes can be readily utilized in an open grate or in a proper soft-coal stove. The coal is now sold at \$6.50 per ton of 2,000 pounds, delivered in San Antonio. A bed of fire-clay from eighteen to thirty inches thick underlies the coal seam.—San Antonio Express.

NOTE ON THE MANUFACTURE OF FORGED IRON WHEELS—ARBEL'S PROCESS.

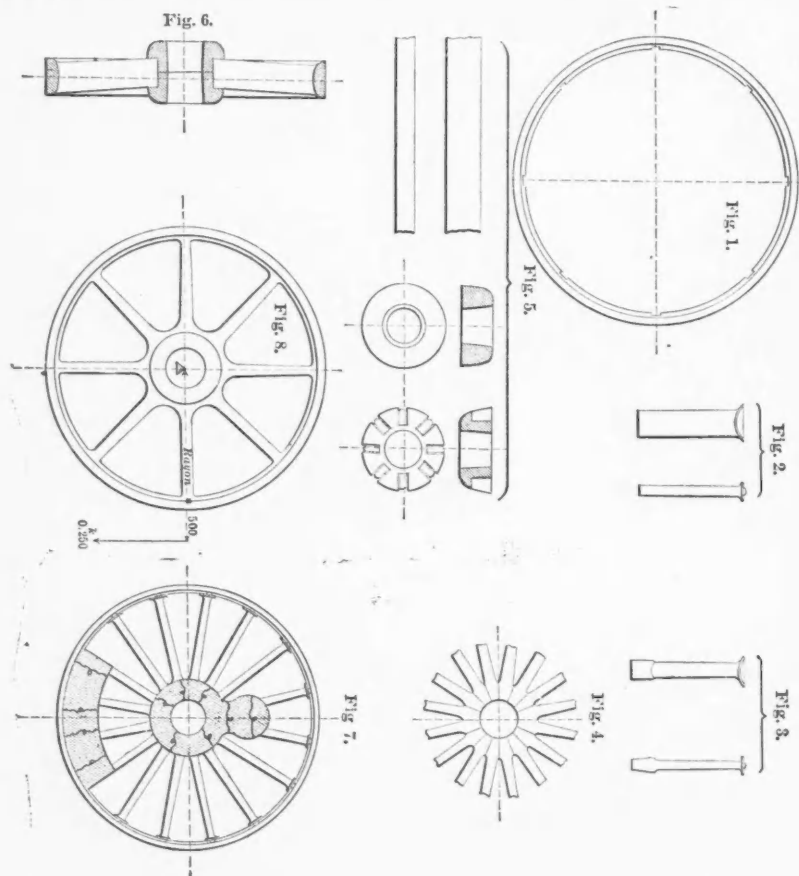
By A. Henry, Engineer of the National Corps of Mines, Professor of Metallurgy at the Miners' School, St. Etienne, France.

The manufacture of wheels of metal for locomotives and cars constitutes an important branch of the iron industry, and one closely related, moreover, to many of the conditions of railway practice, such as speed, safety of passengers, and economy of working. It has been also since the introduction of iron roads a subject of constant study on the part both of engineers of construction and iron manufacturers.

The car wheels at first used in Europe had spokes of wrought iron and a hub of cast-iron. Subsequently endeavors were made to make the wheels entirely of wrought iron, by forging successively the different parts which constituted the hub, spokes, and rim. By this treatment the expansion of the heated portions at the last forgings gave rise to interior ruptures in the already cold and finished parts. The metal was thus strained before use, and the wheels broke frequently in service. It was in consequence of these failures, doubtless, that the engineers of this country were led to employ exclusively wheels of cast-iron. The railway companies are nevertheless greatly interested in the reduction of the weight of rolling stock, while preserving abundant strength, and by the employment of wrought iron wheels one may attain this double end if the defects of manufacture which we have just mentioned are avoided. This may be accomplished by making the wheels in such a manner that the different parts are welded at the same time, whereby the interior strains which so frequently give rise to ruptures in wheels successively forged are avoided. This result has been attained by what is known in France as the Arbel process, of which I will give you a short description if you will kindly give me a few minutes' attention.

The process may be briefly summed up as follows: A pile of puddled bars of the general form of the wheel to be made is prepared, in which the different parts are properly distributed; the pile is heated to a welding heat in a reverberatory furnace, and then forged under a steam hammer, the face of the hammer and the anvil being provided with the appropriate dies. All the parts of the pile are thus welded at once, and there is nothing more to be done to finish the wheel but to remove the fins resulting from the forging, which is effected by special machine tools.

To make the pile, it is necessary first to prepare the different parts, to wit: the rim, the spokes, and the hub. The rim is made from a bar of rolled iron, of the profile indicated by the design of the wheel; this bar is cut by shears to the desired length, bent cold by a machine with three rolls, so that the two extremities come in contact, and welded at an ordinary forge fire; thus prepared, it has the form of a perfect circle. By means of a mortising machine, shallow mortises are then made on the internal surface of the cold bar, which are intended to receive the tenons prepared on the ends of the spokes, as indicated on Fig. 1.



The spokes are likewise made of bars of iron rolled to the desired profile. They are cut of the proper length, heated at one end, and swaged so as to form on this end the tenon which is intended to fit in the mortise just described on the rim of the wheel. (Fig. 2.) In the case of light wheels, or those having few spokes, the other extremity does not receive any preparation; if, on the contrary, the wheel is to be heavy with a considerable number of spokes, it is upset and flattened in the form of a wedge, so that the spokes can be arranged around the same point. (Fig. 4.) The ends thus grouped together constitute a portion of the mass from which the hub of the wheel is formed.

For light wheels the hub is made of two similar parts, each one being prepared from a puddled bar by bending hot with the steam hammer around a conical mandril; the ring thus produced is reheated and forged under a steam hammer provided with dies, which cut on the circumference the mortises in number equal to the spokes, and into which the ends of the spokes are subsequently welded. (Fig. 5.)

To make the pile for a light wheel, the rim is placed on a horizontal surface, a half hub is placed at the center, and each spoke is then arranged so that the tenon at one end fits into a mortise of the rim, and the other into a mortise of the hub. The whole is wedged, and the second half placed on top when the pile is ready to be heated. (Fig. 6.)

For heavy wheels the pile is made in the same way, but, as an already prepared hub is not employed, it is necessary to wedge the spokes tightly together. There is added at the center of the pile, if necessary, fragments of puddled iron, so as to give the hub of the wheel the dimensions called for by the designs.

For locomotive wheels, with counter weight and crank, there is added at the proper places between the spokes blooms and pieces of puddled iron in amount sufficient to form the counter weight and crank. These blooms and fragments are bound to the pocket by wires. (Fig. 7.) The reheating furnace does not present any special features. The steam hammer is situated near the door of the reheating furnace, each furnace being thus provided with its hammer.

Ordinarily two heats are sufficient to forge the wheel, but locomotive wheels of large diameter require sometimes three heats. These repeated heatings are not in any way necessary to the perfection of the welding, which is always complete after the first heating. It is evident that, in consequence of the expansion of the spokes, already tightly wedged cold to the rim and hub, the surfaces to be welded are pressed together before hammering. The pressure thus produced is such that, if the pile is taken from the furnace at a white heat, and allowed to cool without hammering, the different parts will be found to be thoroughly welded and cannot be again separated, as experience has shown many times. The repeated heatings have for their only object the accurate molding of the wheels in the dies and the proper distribution of the materials. The attainment of perfect equilibrium around the center of the wheel is also accomplished. The French railway companies, to avoid all oscillating and bumping motion of passenger cars, require that each wheel, when placed on a horizontal knife edge, shall be in equilibrium in all positions, or at least move with a weight of 250 grams applied to one of the spokes at a distance of 50 centimeters from its center. (Fig. 8.)

The process, of which I have just given a rapid description, has been used in France for twenty years for the manufacture of wheels of all designs and sizes, and, as the number of specimens brought by Mr. Arbel* to the International Exhibition shows, these wheels of wrought iron are actually in use on all the French and Algerian railways without exception, many other European roads have adopted them, and up to the present time not a case of fracture has been authenticated.

THOUGHTS ON THE THERMIC CURVES OF BLAST FURNACES.†

By H. M. Howe, A. M., E. M.

(Concluded from page 337.)

DISCUSSION.

MR. THOMAS WHITWELL.—Mr. Chairman, we had at our own furnace, on the 24th of September of last year, the temperature of the escaping gases taken. The temperature of gas set forth on the board is 400° Centigrade. The actual heat in the gases at the top of our 75-foot furnaces (23 feet and 22 feet in diameter respectively; hearth 8 feet and 9 feet respectively in diameter) varied from 400° to 480° Fahrenheit. The furnace charge was ten feet down below the level of the platform. This may have been the result of using superheated blast. Mr. Bell shows, in England; that so long as the escaping gases are above the temperature of 450° Fahrenheit, so long they have an active effect in the reduction of the minerals. As soon as the escaping gases are proved to be below 450° Fahrenheit, no further increase in the height of the furnace will be of any good. In our own case, our gases come off of a 75-foot furnace with charge 10 feet down at a temperature of 400° to 450° Fahrenheit, and therefore it shows that we are quite as high at 75 feet as there is any good effect to be gained. I may say that at the Consett furnaces we have carried out a very interesting series of experiments. We have there six furnaces, all supplied with superheated blasts on my own system. Nearly all of the furnaces are of different dimensions but of the same height, namely, 55 feet from the bottom of the hearth to the top of the platform, and are all supplied with the cup and cone system of charging. The furnaces have all 8-foot hearths. The diameters of the boshes vary from 20 feet to 22 feet 6 inches. The dimensions of the top of the furnaces vary, but we may take a line 9 feet below the charging platform in each furnace, and we have diameters varying from 20 feet down to 14 feet 9 inches. The amount of coke that is burned in blast-furnaces depends to a very large extent, in the first place, on the composition of the materials, but to a very much larger extent on the charging of the furnace itself. And in considering the question as to whether in blast-furnace practice it is necessary to have a high or a low temperature of blast, we must also take into consideration all the other elements that would change the result in working it out. In Mr. Bell's paper that was read here during the summer, I think he states that, at the Glendon furnace, with a temperature of 800° to 900° of blast he found the same result as he found at the Cedar Point furnace with a temperature of about 1,300° of blast. Therefore he would say, What is the good of extra heat of blast? I do not remember that Mr. Bell gave the composition of the iron ores at Cedar Point, which I believe to be totally different from those at Glendon. He did not give any dimension of the furnaces of the charging department or anything else at Cedar Point. Hence, unless we know all these different conflicting points, I think the

engineer should be careful in coming to a conclusion.

In 1869, four furnaces were blown at Consett. (Demonstrating on black-board.) I place the numbers on the furnaces in the order in which they stand in the works. The first furnace, number 4, was altered and had four fire-brick ovens given to it; was 55 by 20 by 8-foot hearth, and had 5 tuyeres 4½ inches diameter each, and a pressure of blast of 3½ pounds at the tuyere. Their first furnace at the point 9 feet below the charging platform was 14 feet in diameter, and the temperature of the gases passing away underneath the platform was 478° Fahrenheit, the temperature of the blast being 1,422° as proved by Mr.

* The specimens comprise chiefly locomotive wheels of 1.50 meter to 2.10 meters in diameter, the wheels of tenders, cars, mine cars, street cars, the little wheels of trucks, the wheels for gun carriages, for siege and field artillery, fly wheels with cranks for steam engines, etc.

† A paper read before the American Institute of Mining Engineers, at the Philadelphia meeting, October, 1876.

Bell. You will notice the hearth in each furnace is 8 feet diameter and 4 feet deep only, and at a height of 4 feet, or perhaps, to be accurate, I should say 4 feet 8 inches, the line sets away off of the bosh. That furnace has been in blast six years and nine months, and has made upwards of 174,000 tons of gray iron. It is now out. They are putting a new hearth and bosh into it.

Number 5 furnace was built after number 4, for the purpose of trying to make more iron than number 4 at that time, after 6 months' work, was making. Therefore the bosh, while the height is the same, was increased 22 feet 6 inches in diameter. The hearth was the same, 8 feet; the diameter, 9 feet; below the top was 20 feet. It was found that although the cubical contents of that furnace were larger, yet that the same quality of metal as in number 4 furnace could not be obtained. It had still 5 tuyeres; each was $4\frac{1}{2}$ inches in diameter; the pressure of blast was $3\frac{1}{2}$ lb.; and yet for some reason or another that furnace would not make the quality. While number 4 made only two per cent. of white iron, number 5 made 22 per cent. of white iron. The total amount of iron made in number 4 furnace out of 20,000 tons of gray forge iron was 220 tons of white. We were going as fast as we could and with the same heat of blast, and, notwithstanding the 2 feet 6 inches increased diameter of bosh and larger cubic capacity, we did not exceed 480 tons a week with that furnace. We drove up to 580 tons a week with this smaller one, number 4, thus showing that there was some element in the smaller furnace that not only gave perfect regularity in the working of the furnace, but a very much larger quantity of iron. We tried by increasing the quantity of blast in number 5 furnace, giving her five 5-inch tuyeres on the same pressure of blast, but with no result at all.

MR. BELL—Did you have independent engines to work these furnaces?

MR. WHITWELL—No, sir; they were worked off the same blast main. That is the system in England; if the new furnace gets into bad order, you go on at the same pressure until it gets right again. The furnaces at Consett are all in one line, connected with one blast main, on one pressure. We found then that the large furnace, 22 feet 6 inches in the bosh and 20 feet under the bell above, working against a furnace somewhat smaller, 20 feet in the bosh and 14 feet under the bell, produced much worse results, and that therefore the natural increase of size did not give us any advantage. The blast of number 5 furnace was kept to 500°, the stoves being 3 feet 6 inches higher than those of number 4, number 4 having the first set of stoves put up, and these only 25 feet high. In the book that Mr. Bell brought out on the *Smelting of Iron*, he says that he was consulted about that time, and that he had advised the furnace manager to lower the heats and see if they could not obviate that irregularity; that he understood his advice was taken and they were doing rather better. That book was stereotyped week by week as the papers were written, and hence it was impossible to correct it on the same page afterwards. I saw the manager of the works and said to him, "I understand that you have lowered your heats?" "No," he says, "I haven't. I am working at 1,500 degrees." I said, "It is now printed in the *Journal of the Institute of this week* that you have lowered your heats and got a better result." He says, "Well, all I can say is that Mr. Bell met me in London, and said, 'How are you going on?' and I said, 'We are going on rather better.' Mr. Bell was thinking about the hot-blast; I was not." And hence, when one idea rose in Mr. Bell's head, he printed it in his book, and afterwards, as a foot-note some 300 pages after, said that it was possible in regard to number 5 furnace that there may have been something in the structure of the furnace that had had something to do in giving the worse result. I may say, though, that at this time, in order to discover the reason why one furnace should make more iron and with greater regularity than the other, the drawings of number 5 were sent to Mr. Bell, and he was asked if there was anything wrong about them. His opinion was that they were perfectly right, and that there was no reason in the world why the furnace should not work well. I may say that the bell or cone of number 4 was 10 feet 6 inches in diameter. The cone of number 6 was 12 feet 6 inches. It being found, however, that the best results were got by keeping up the heat, that furnace has now been running for 5 years at the temperature of 1,500°, and it is still in blast.

MR. BELL—Were the angles of these boshes the same in both of these furnaces?

MR. WHITWELL—Yes, 68 degrees. The next furnace reconstructed was number 2. Our system in England has been forced upon us; that is, to tear down the old furnaces and put up new ones. It has been the case in our own works where we have had to pull down 60-foot high furnaces and put up 75-foot furnaces, simply because the others would not work economically. We have to look after the pennies over there. Number 2 furnace at Consett was next reconstructed. The managers of the company considered that one thing was proved, namely, that number 5 was too large for the materials they were charging. The materials, I should say, were mixtures of Cleveland ores calcined and the Cumberland hematites. The Cumberland ores will run on good samples sixty per cent. metallic iron, and at the time of which I speak it was customary to charge these furnaces with two-fifths Cumberland ores and three-fifths of the Cleveland calcined ores, the whole being a mixture requiring about 46 English cwt. of 112 pounds of ore to make a ton to contain 2,240 pounds of iron.

Number 2 furnace was taken in hand next. The height was kept the same. They asked me my opinion. I said: "White number 4 is doing so well, and number 5 is doing moderately well, I would copy number 4 and wouldn't make the other any larger." But as Mr. Bell had told them that the dimensions of number 5 were all right, they thought they would split the difference and put in half and half, and therefore they adopted 21 feet bosh, 8 feet hearth, 5 tuyeres, again, $4\frac{1}{2}$ inches diameter at the nozzle, and $3\frac{1}{2}$ pounds pressure of blast. They thought, however, that the angle of the bosh was too flat, and therefore they increased that angle to 71°. The cone in the top of the furnace was 11 feet in diameter, and the diameter at the upper part of the furnace was 18 feet, being a compromise between number 4 and number 5 furnace, the diameter of the bosh being 21. The depth of the hearth was still 4 feet 8 inches. This furnace, on being blown in with the same sized stoves as number 5, was found to work fairly well, but after 3 months they found that there was 18 per cent. of white iron made still while endeavoring to get gray forge, or what I believe you call No. 1 mill. I may say that the Consett Company do not sell any pig iron, having large plate mills of their own turning out 1,200 tons a week, chiefly for ships and locomotives, etc., together with government work. They require good iron for it, and work in their own mills all the metal the furnaces can make. Number 2 and number 1 were reconstructed at the same time, but number 2 was blown in first to see what result could be got by making a compromise between 4 and 5. Finding still that they had 18 per cent. of white, they then finished number 1, and did it by pulling down the work already laid in at the top to a distance of ten or fifteen feet, and reduced the size under the bell to the same as number 4 furnace. The height was still the same; bosh 21 feet, and the other dimensions as I have given them. The diameter was 14 feet 9 inches—9 feet below the charging platform; angle of bosh 71°, hearth exactly the same as the preceding cases. The percentage of white iron on the furnace being blown in fell to about two, thus showing that, while the bosh had been made a little larger—the angle at the boshes had been made steeper—the upper part of the furnace exercised a very import-

ant influence upon the whole. About this time I was traveling with Mr. Bell and a director of the Consett Company, and the question arose with regard to the height of the furnace there. Mr. Bell observed that, if the furnace had been made 30 feet higher, and the temperature of the blast had been kept to about 900°, there would be as good economy as at present. I asked Mr. Bell, "Would you guarantee that you could get 500 tons of iron a week with the same coke as at present?" He said, "I wouldn't guarantee you anything at all." I said, "What would be the saving in coke with our present heats if you put them up 30 feet higher?" He said, "You are so near the mark I don't suppose you could gain $\frac{3}{4}$ of a cwt. in coke." The gases were all down as near as possible at a point where the carbonic acid ceased to have any action in reducing the oxide of iron.

Therefore we were working as economically as possible, or very nearly so, while at the same time we were producing a very large amount of iron. Now, No. 1, II., IV., and V. produced on an average 26,000 tons per annum, and a blast seems to be likely to last 7 to 8 years. Since then another furnace has been built; to wit, No. 6, almost exactly similar to No. 1. No. 3 furnace heretofore has been very similar to No. 2, except that it has been 20 feet bosh, and not 21 feet. It was constructed first, or rather reconstructed, from the old furnace in 1868, and the Player hot blast put to it as the best approved system at that time. Owing, however, to the fact that the five hot blasts were insufficient to supply five $4\frac{1}{2}$ tuyeres with $3\frac{1}{2}$ lb. of blasts, they had, in order to maintain 700° of heat, to make constant renewals of pipes. It was found, however, that the coke was always 5 cwt. too high with heats of 900° F. This year the five Player stoves were torn down, and four fire-brick stoves put up in their place, so that the whole works, with six furnaces producing that number of tons per annum, are all at work on the fire-brick system.

Turning to another question with regard to height of furnace, I may say that at Seraing, in Belgium, John Cockerill & Co. have reconstructed their furnaces, and have built two 60 feet high at the charging platform, 16 feet bosh, surrounded with a center gas tube for taking out the gas, and also with a *tremie* or curtain placed around inside the upper part of the blast furnace. These furnaces were designed to work to the greatest possible economy in making Bessemer steel, and they have attained that result. They were the first in Southern Europe, although I believe something had been done in Sweden in that way to run the pig iron direct into the Bessemer converter, and so soon as they were blown in, each furnace being supplied with four Whitwell hot blasts on the same plan as Cedar Point, N. Y., they began to give very wonderful results, and it was not long before the Seraing Company took an order for 8,700 steel rails out of the teeth of all the English makers, and it set them on tip-toe to find out how it was that they could produce steel so much cheaper. I met Mr. Snelus on his way to Seraing traveling with Mr. Lancaster, then managing director. It was merely a question of having the furnaces built to the right size to work their materials, and they arrived at perfect regularity in the heat of the blast, and almost perfect regularity in the product of the furnace. I regret that I have not a letter received from Mr. Phillipart, the chief engineer at Seraing, about six months ago. He, however, said that for two years that they had been in blast making Bessemer iron running direct into the converter, they had not once had a hang in the furnace or a scaffold; that with the system of charging a furnace only 60 feet in height the charges descended perfectly like sand in a sand pit, equally on all sides—no slipping or anything of the kind; they kept up the temperature of the blast to 1400° F., and they were producing there No. 1 Bessemer iron with 107 pounds of coke to 100 pounds of iron. Those results show what can be done with an ore that only averages 53 per cent. of metallic iron. A short time ago I met Professor Jordan of Paris, who was director of the works of Société de Denain, near Valenciennes, where are two furnaces also supplied with my hot blasts, and he assured me that they were working with under 2,240 lb. of coke for 2,240 lb. of Bessemer iron. These furnaces also are 60 feet high and 16 feet bosh. It would appear, then, from all I can see, that while the height of furnace may in some cases increase the production, yet at the same time regularity in the working of the furnace, proper dimensions of charging apparatus, and of course regular pressure seem also to have a very great influence upon its going, and that the comparatively small furnace working in itself perfectly well will often give a larger quantity of iron than a much larger furnace might do. Height of furnace does not always give increased make. A short time ago I met a director of Bolckow, Vaughan & Co. at Middlesbrough, where they have several furnaces 93 feet high, and he told me that in his opinion, if they were building new furnaces, they would not go to the height they have at present.

The Rosedale and Ferryhill furnaces run up to 103 feet high, and in two new ones lately put to work they have not exceeded 95 feet in height, thus denoting that they had exceeded the best point; and it seems to be generally conceded that, inasmuch as the quality of coke is not so good as it used to be, owing to the men having received higher wages the last four years, and at the same time to the careless habits of working in the Cleveland district, the cokes generally in use are not so good as they were; that the small dust of the coke tends to fill up the furnaces and the interstices between the materials by which the gas ought to ascend, making fast driving in a furnace very difficult, while a shorter furnace with proper heat of blast will give a larger make in proportion than a high furnace, and with as good an economy.

The Tees Bridge furnaces, near Stockton, were put to blast two or three years ago, 65 feet high, and worked with Cleveland iron only. It would have been thought that they could not equal tall furnaces 85 feet high. They had not, however, been able to hold their own, having my superheated blast, and on a recent occasion a conversation took place at Middlesbrough Exchange, where Mr. Bell asked a managing director of the company how much coke they were using. He said 21 cwt. per ton of iron. Mr. Bell said, "Now, Mr. Richardson, I have been in the trade a good many years, and have had a good many furnaces, and I think you had better tell that to somebody else." "Well," says he, "the furnace manager is here." He saw the furnace manager, who repeated the same thing, and asked him to go up and see the books. This was not long before Mr. Bell's visit to America. A month afterwards I saw Mr. Bell and asked him if he had been up there. He said no, but he had his manager, Mr. Thompson, up; he had spent a whole forenoon there, and said those furnaces were doing as well as any other furnaces in the district, and for the size of furnace are making proportionately more iron than the other furnaces in the district, and the only reason seems to be that the blast gets through easy.

The result, therefore, seems to be that in all cases the height of the furnace must be proportionate to the size of the material, and also that, in order to arrive at a correct conclusion with regard to the effect of heat of the blast, we must know all the different details with regard to the size of the furnaces, the slope of the boshes, the charging apparatus; and no doubt one great thing is the size of the iron ore. In Cleveland the size of the calcined ore averages about six inches in cube, hard and refractory in nature. Hence it has happened with ordinary cast-iron hot blasts it has been necessary to build up furnaces to a great

height, even running the risk of the furnace making less iron, owing to the blast not getting through, and when all has been said and done that we have achieved the same or equally good results in economy by small furnaces 65 feet high, and with the fire-brick hot blasts. One word now with regard to the durability of the hot blast. At Consett that furnace number 4 has been running 6 $\frac{3}{4}$ years and making 26,000 tons per annum, and that the same stoves are going to be used again for the next blast, which probably will be another 7 years. The bricks are there as true as they were at the beginning, 7 years ago. They are not putting any new bricks in. They are raising the stoves 3 feet 6 inches, and making them equal to the others in the place. As far as we can see, there does not seem likely to be anything exceeding 5 per cent. per annum expended in maintenance. Certainly by giving the same stove 14 years work instead of 7, it seems as if the depreciation and repairs were going to amount, in the long run, to a very small figure.

Mr. BELL—Have you any experience with such furnaces 22 $\frac{1}{2}$ bosh, 20 feet high, higher than 55 feet?

Mr. WHITWELL.—Yes. The Cumberland Smelting Company, at Millom, built two furnaces lately, 70 feet high for making Bessemer. They were 50 feet bosh, 7 feet hearth, and 14 feet under the bell, and I may say that the engineer of those furnaces put up the first set of my fire-brick stoves at Consett. Those furnaces are now producing, with a material requiring 34 cwt. of Cumberland ore to make a ton of iron, 490 tons of Bessemer pig per week with the consumption of 19 cwt. They told me 18, but I am willing to put a cwt. on that. I do not think that there are any Bessemer furnaces in England certainly that can equal those. The results of the first two furnaces have been such that the company have pulled down three old furnaces 85 feet high, put in two new ones the same height as those supplied with hot blasts again, and they have within the last two months pulled down three other old ones and are putting in two more of the same dimensions, so as to have six furnaces of the new size with 23 fire-brick hot blasts, as it was very evident in their case, using 19 cwt. of coke only, that there was a large economy, and that the difference in the cost of hot blast would cover itself in the first six months of the life of a furnace.

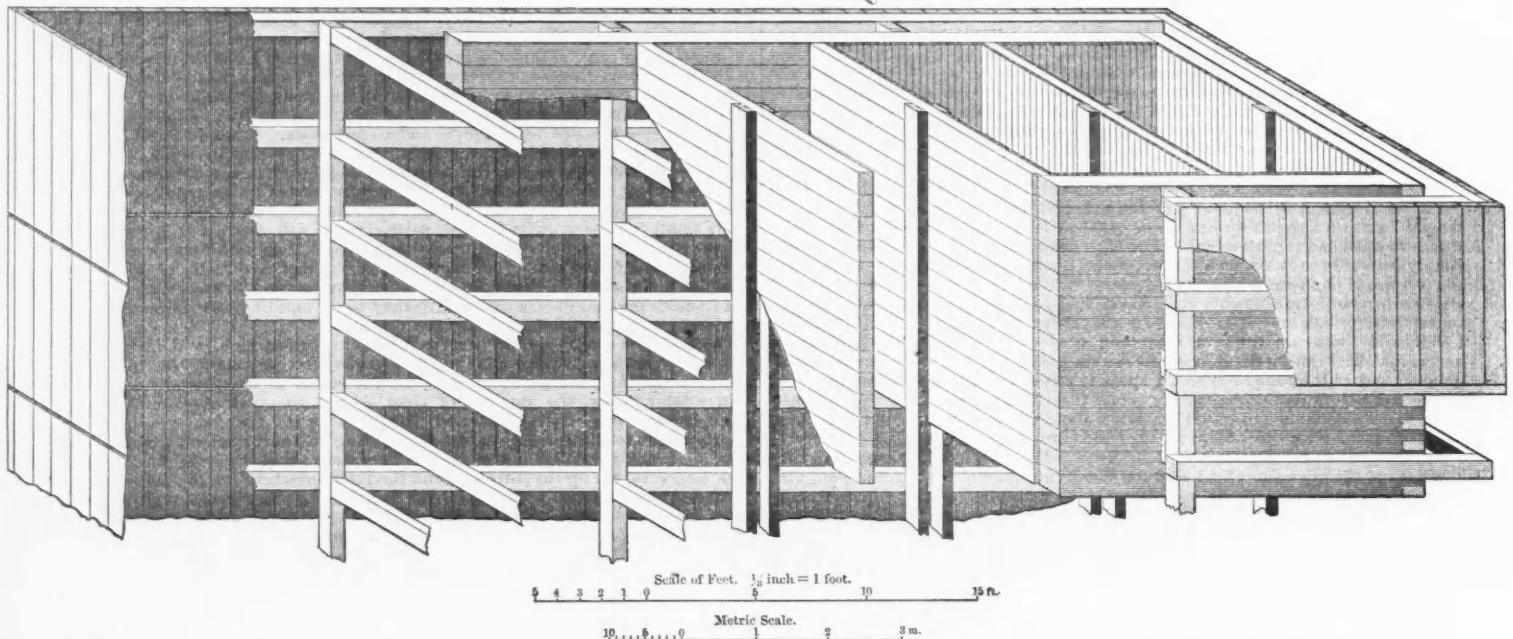
I must apologize for the length of my observations, and for having diverged from the "Temperature of the Waste Gases" to certain conditions which govern that temperature. The subject of the working of the blast furnace, however, is a most interesting one, and this must be my excuse for taking up so much of your time.

THE HOLLENBACK SHAFT, LEHIGH AND WILKES-BARRE COAL COMPANY, LUZERNE COUNTY, PA.*

By John Henry Harden, Philadelphia.

This shaft, located in the northern anthracite coal field, about 2,300 feet southwest from the Court House at Wilkes-Barre, in the County of Luzerne, Pa., is the property of the Lehigh & Wilkes-Barre Coal Company. The sinking and cribbing to the solid rock (see isometrical view in accompanying drawing) was conducted by Mr. W. W. Kenrick.

METHOD OF CRIBBING THE HOLLENBACK SHAFT.



Dimensions of the earthworks to the foundation of the cribbing, 51' 2" long, 17' 4" wide, 31' deep. Total amount of excavation in cubic yards, 998 $\frac{5}{8}$. Dimensions within the permanent cribbing, 45' 4" long, 11' 16" wide, 31' deep, divided into six parts by buntons 8" x 12", each division, 7' x 11' 6". Permanent cribbing, 12" x 12"; temporary cribbing 8" x 10"; backing, 3" thick; clay puddle, to exclude surface water, 12" thick; conductors, 8" x 5"; lining, 1" thick from top to bottom of the shaft.

In the latter part of the year 1871, Mr. H. Murray & Son contracted with the company for the continuation of the work at the rate of four hundred dollars per yard in depth, to a point 100 feet below the Hillman seam of coal; for the succeeding 100 feet the price to be increased twenty-five dollars per yard, and so on until the bottom rock of the Baltimore seam of coal was found. The size of the shaft within the cribbing timbers is 45 feet 4 inches by 11 feet 6 inches, having six divisions of equal dimensions 7 feet by 11 feet 6 inches, giving room for what is known as the "standard diamond" car, whose capacity when level full is 100 cubic feet, but when loaded by the miner 4 inches above the top contains 112 cubic feet.† Two divisions of this shaft are intended for hoisting coal from the Hillman seam, two for the Baltimore seam, one for ventilation, and one for pumps.

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

† Size of the "standard diamond" car, 8' 10" x 4' 3" x 2' 8" = 100.14; loaded 4 inches above the top, 8' 10" x 4' 3" x 3' 0" = 112.76.

The works were planned for two pairs of direct acting, high-pressure engines, twenty-four boilers, and for an estimated output of 2,500 tons of coal per day from the two seams.

The measures dip to the northwest about 18°. The sinking was carried out under favorable circumstances, the water being handled with small steam pumps and buckets to the depth required, about 600 feet. Calculating eight inches at the ends, and six inches at the sides for the shaft lining, the quantity of rock sinking in each yard in depth is sixty-four and three-quarters cubic yards, making the cost per yard six dollars and seventeen cents, the increased price for the lower portion amounting to thirty-nine cents per yard, the company finding all headgear, engines, pumps, ropes, etc.

This is one of the largest shafts, though not the deepest, in the anthracite regions, and probably larger in area than any other shaft in the world. Begun when the coal trade was good, a demand was expected for all the coal that could be mined. To-day the company do not need this so-called improvement, but would gladly see the money it and other work of like character have cost.

The shaft when set going will develop an immense body of coal from the Hillman, Baltimore, and Red Ash, they being the three seams upon which a certain value can be set. There are others, but of inferior quality and thickness. Like the Diamond shaft belonging to the same company, this will have a "blind side" on its northeast strike, a disadvantage under any circumstances wherein a large output of coal is desired, as will be obvious to any one studying the question. Unlike the Diamond shaft it has a large area of coal "above bottom." It is separated from the Diamond Basin by a natural barrier, or anticlinal, and requires independent drainage facilities. Upon the summit of the anticlinal a new shaft intended for a second opening has been commenced to comply with the law of Pennsylvania requiring every mine to have two outlets. Two shafts of moderate size would have rendered this unnecessary.

UNIVERSITY OF PENNSYLVANIA, WEST PHILADELPHIA.

MINING IN CANADA.—ANNUAL REVIEW FOR 1876.

We are indebted to Mr. Robert Bell, C. E., F. G. S. (of the Geological Survey of Canada), for the following interesting review of the mineral resources of Canada for 1876:

In the absence of any official record of the progress of mining in Canada, I have endeavored for the last ten years to bring together the principal facts relating to this important industry in the form of annual reviews for publication in some of our newspapers, those for the last two or three years having appeared in the *Globe*. Besides mining proper, I have included some allied branches of industry connected with the development of our mineral resources. Owing to the difficulty of obtaining complete information, some places at which operations have been going on may be overlooked in the following summary, and some inaccuracies of detail may have crept in; if so, additions and corrections are invited. Although, in a time of commercial depression like the present, mining suffers more, perhaps, than any other branch of business, it is gratifying to observe that if it fail in some departments or in certain localities, yet more or less progress is being made in others. In the present article

the same arrangement of the subject will be followed as was observed in the previous reviews, and localities will be described as before in their order from west to east.

GOLD.

In British Columbia there has been a considerable falling off in the yield of gold for the year. This has been due partly to the loss of a considerable number of the most experienced miners, who were passengers on board the steamship *Pacific* when she foundered last autumn on a voyage from Victoria to San Francisco. Although Cassiar has produced the largest quantity, the Cariboo district still holds out well. In the latter a small stamp-mill has been erected to test the numerous auriferous quartz veins which have been discovered. The Kootenay and Omineca districts have been almost deserted. The official report of the minister of mines states that the amount of gold known to have been exported in 1876 is \$1,339,986 worth. If to this we add as usual one-third more as the quantity estimated to have been taken away during the year in private

hands, and not reported, the total yield would be \$1,786,648 against \$2,474,904 for 1875, calculated in the same way.

On the North Saskatchewan the low state of the water during the summer favored gold-washing, which was carried on to a small extent as in previous years.

No progress has been made in the development of any of the gold regions around Lake Superior. Besides the numerous veins occurring in the country north and west of this lake which have been found on assay to contain the precious metal, "nuggety" gold exists in quartz leads at the Jackfish Lake and Partridge Lake locations, and at Victoria Cape, opposite the Slate Islands. A vein at the last-mentioned locality, which varies from 1½ to 3½ feet in thickness, was found by Dr. Harrington, of the Geological Survey, to yield four pennyweights of gold and 5½ ounces of silver to the ton.

In the Hastings region, some mining and prospecting have been done, especially in the township of Kaladar, but I have not been able to obtain any exact figures as to the yield.

In regard to gold mining in the Province of Quebec, I am indebted to Mr. L. Rivard, inspector of gold mines for that Province, for the following notes. He writes: "It was only during the last months of 1876 that preparatory works were commenced on the River Famine, in the township of Wotford, by a Mr. Reese, and on the River Gilbert in the seigniorie of Rigaud, Vaudreuil Co., by the Gilbert and Chaudiere Gold-fields Company, the St. Onge Company, and a few other miners. The St. Onge Company alone has commenced to mine in the superficial gravel and to extract gold. During about two months and a half (in October, November, and December), they employed twenty men, and washed up about seventy ounces of gold. I may add that in the St. Francis division auriferous deposits have been discovered in several places, notably on the River Ditton in the County of Compton, where the Hon. Mr. Pope has carried on exploratory works on his own land for several years. I am also informed that several parties of miners have, in the course of the past year, made explorations in Chesham, Emberton (formerly the south half of Ditton), Ditton, and other townships in the County of Compton, and they report having found undoubted indications of the existence of the precious metal."

The Report of the Commissioner of Mines of Nova Scotia again shows an improvement in the yield of gold, the amount obtained in 1876 having been 12,039 ounces against 11,208 in 1875, an increase of 831 ounces. The average value of Nova Scotia smelted gold is given in the report at \$19.22 per ounce, so that the above amount would be worth \$231,389.58. The average number of men employed in gold mining was 371, and the yield per ton of quartz crushed was 15 dwts. 13 grs., against 15 dwts. 4 grs. in 1875.

SILVER.

The Lake Superior region is the only one in the Dominion in which silver mines have been worked during the year. The Duncan Mine has continued to improve. About \$35,000 worth of ore were ready for shipment in the autumn, and a considerable quantity had been sent off earlier in the season. A stamp-mill was erected under the direction of Prof. W. M. Curtis, the skillful manager of the mine, which is said to have been producing from \$4,000 to \$6,000 worth of silver a month during a part of the winter. Very rich ore is said to have been struck lately in the central shaft at a depth of about 360 feet. Colonel Wilson has continued operations with a small force of men at the 17 K mine. Promising discoveries of silver veins have been made near Pigeon River by Messrs. W. A. Kindred & Brother, who have sunk a shaft to a depth of 40 feet at a place called Elizabeth, 1¼ mile north of the American boundary. A large quantity of land has been taken up in the neighborhood, and some of the owners had commenced prospecting towards the end of the season. Some work was done during the summer at the Hebert & Emmons Mine, four miles from Prince Arthur's Landing. The Silver Islet Mining Company has amalgamated with the Ontario Mineral Lands Company. The capital of the united body is \$1,000,000, in 40,000 shares of \$25 each. Captain Frue has retired from the active management of the Silver Islet Mine, and Mr. Carl O. Wederkinch has taken his place. The large stamp-mill of the company is said to have done a good business during the year, producing between \$300,000 and \$400,000 worth of silver, but the amount has not been officially stated. The boring with the diamond drill was to have been continued during the winter until an additional depth of 400 feet (or 1,400 in all) had been tested. Eighteen miners have been employed. At the Little Pic Silver Lode, Mr. Peter McKellar carried on work with a party of miners during the summer, and produced a quantity of valuable silver ore, principally in the form of argentiferous galena. Mr. A. F. Aurere continued his fishing and mining operations at the Slate Islands.

The silver ore reported to have been discovered at Thirty-one Mile Lake, sixty miles up the Gatineau River, Mr. Vennor says proved to be partly silvery mica-schist and partly iron pyrites in a greenish hornblende rock.

TO BE CONTINUED.

LECTURES ON MINING.—No. XL.

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

WORKING THICK COAL SEAMS.

Besides the methods of working stratified deposits described in the last lecture, which are subject to great variations, in consequence of the varying character of the roof, etc., reference must be made to the methods of working seams of exceptional thickness, the methods we have already considered being applicable to seams up to 8 or 10 feet, or in some up to 12 or 15 feet. Suppose that above the coal there is a brittle, easily fractured shale, and that it is very apt to come down when the coal is removed, if the coal be strong it may be well to leave 12 or 14 inches of coal as a roof, otherwise an immense amount of timber is required. This coal so left will in most cases have to be sacrificed for ever, and the question whether it is advisable to do so must be decided according to circumstances. Then, again, there is the very frequent case of coal seams being surmounted by a series of threads of small coal interspersed with shale, called "rashins," and this is very apt to come down in large bodies, to the height of 4 or 5 feet, and then it becomes a very serious question, inasmuch as it is necessary to take down the whole of such measures above the roadways, and in some cases above the working places too. The lecturer knew of cases where a seam of coal had a good roof in one place, whereas the same seam at a few hundred yards distance had 3 or 4 feet thick of this dirt above it. If you have above this a good rock material, it becomes an important point to give that a sufficient amount of bearing to sustain itself over the workings, and it can generally only be efficiently done by cutting the ground away, and using proper support in the shape of pillars or pack walls. Coal seams vary not more in their character and thickness than in the reliance which can be placed on the material which overlies them. The floor, as a general rule, is far more uniform, being usually of a more or less indurated clay, sometimes highly silicious, as in that forming the well-

known "ganister" of West Yorkshire. The floor is distinguished from the other measures by containing the rootlets of stigmara, and it may extend to 3 feet in thickness. If very much indurated it causes great expense in cutting it away, and may cause thrust and creep of the pillars when they come down on it, but in general such a floor gives less trouble than a soft one.

We pass then to the subject of working thick seams, which have generally been attended with a great amount of risk, and waste of mineral. There are very few districts in which the seams of coal attain a greater thickness than that we have been considering: among the thickest are in North Staffordshire some seams 10 to 15 feet thick; the main band, at Whitehaven, is 11 feet; that at Church Greely, in Leicestershire, from 9 to 14 feet. Of thicker seams may be mentioned the 10 yard seam of Dudley, which may be said to have furnished the most important tract of coal in one seam in the world; and also the thick band of anthracite in the United States, which has much the same thickness. Perhaps the most curious instances occur in the patches of coal in the South of France, where the original deposition seems to have been attended with some peculiarities, and where the seams have been much disturbed; sometimes they are of very great thickness. Some of these bedded deposits have given rise to great difficulties in working—e. g. some ironstones in the United States presented so many difficulties, from their great thickness and their contorted position, that the top was removed and the mineral worked as an open-cast. In the Derbyshire and Yorkshire coal field some beds of ironstone in shale occur. In Derbyshire above the black shale seam, which is coincident with the well-known Silkstone seam of Yorkshire, is a bed of shale with ironstones 16 feet thick, then come shales without ironstone 12 feet, and then above that again shales with ironstone 21 feet. Near the outcrop these shales were originally worked as open-casts, but as they passed deeper beneath the surface a method was adopted that reminds you much of the bell pits. Commencing at the lower end of one of these series a level is driven, the material being removed. From the level a series of small chambers, about 7 feet by 9 feet, are opened, having an arched form if the ground is at all weak. A small rib is sometimes left by the side of the roadway, if the work is of sufficient size to require the roadway to continue open some time. The attle, or refuse, from the chambers will be thrown under foot as the work rises up to the top of the band; and, where the ground is favorable, even the partitions between the chambers will be worked away. After the upper ground has settled, usually in from a year to a year and a half after first working, the lower band is worked away in the same manner. Where the depth is not considerable it is best to open out the ground by a number of small shafts, rather than to have larger workings. So much of the ground is taken away that it is necessary to leave a given area in a limited time. It is a curious sight in connection with these works to see a single engine provided with a number of drums, and working the machinery at 10 or 12 different shafts. The difficulties of attempting to remove a bed of this kind are more felt in the case of coal than in anything else, for if the coal is pyritous it is very apt to undergo spontaneous combustion. In North Bohemia this is very noticeable in the case of lignites, and in Central France it was so noticeable that at the end of last century, when coal was little known, a commission was appointed to inquire into the best means of working it. In the field of the Saone and Loire, at Blanzay, there is a seam 30 to 40 feet thick, with a parting near the middle, leaving 4 or 5 meters of coal above. The workings commence in the upper seam by driving a series of openings about 2½ meters wide, leaving a certain amount of roof coal. If the seam is much inclined, there may be room only for a couple of these pillars; if it is flat, for a number of them. About the years 1838-40 a method was introduced into this district, similar to our long wall, by which slices were taken off the pillars. A year or a year and a half was allowed for the settlement of the ground, and then the lower part was worked by a similar method. Accidents were frequent and much coal lost, so that six years ago the lecturer found that the method was greatly supplemented by others. At St. Etienne seams of extra thickness are worked on a system which has been gradually introduced, and which consists in placing in the mine a quantity of stone or rubbish, which is obtained from underground or surface quarries, and generally introduced by a separate set of men during the night. A level is driven on the hanging side, and is connected with a level on the opposite side, the latter being generally 15 meter higher, for the convenience of shooting down the rubbish; on this rubbish the men stand to take another slice of coal, which they lower down into one level which is maintained for the purpose, the other gradually rising as the work proceeds. At Blanzay and Montceau, when the lecturer visited them he found that the method of working them by slices was getting the upper hand. A level was driven right through, 2 meters high, and by means of it a height of 4 meters was taken as a horizontal slice ("tranche"); by means of the same level a second tranche, of 4 meters, was commonly taken above the first, and a third one below. The method varied somewhat as to whether it was done by laying out the ground into pillars, 9 or 10 meters square, or on a method approaching our long work. The upper tranche is worked by means of a small rise or an inclined plane. It will be seen that this method much resembles the new method of working the ironstone in Furness, where by taking a slice above and below the fault of too many cross-cuts and great waste of timber is avoided. The whole is timbered very closely overhead, and often at the sides. The "remblaisiers" come in as soon as the colliers leave on an evening, and pack up all the places full of material ("remblais") which they bring in, putting in the necessary timber. All this time the men working the upper seam are not far off, and consequently working the lower seam is a somewhat dangerous operation, for there is goaf above, and the ground is in movement, the timber is cracking and breaking, but the men know the ground so well that they advance at a certain rate, and every day have a tolerably green roof overhead. The accidents are said to be fewer than under the old system, where no precautions were taken as to filling up the spaces. The system entails considerable expense, but there are the advantages of freedom from accidents, greater proportion of coal obtained, and a greater proportion of round coal.

Great dissatisfaction has been expressed with the system of working the 10-yard coal of South Staffordshire in our own country. In Jukes' description of the coal field it will be seen that this thick seam is really composed of a number of small seams, sometimes with a mere nominal parting, at other times with a thin separation of dirt. As compared with the thick coal of France it is evenly and regularly developed, without disturbance, over large areas, and it has really a considerable amount of strength, though it is subject to spontaneous combustion when exposed for some time to the action of the air. The great drawbacks to the system employed in working it are two—first, the loss of life has been so great as to be quite a disgrace to the system; and, second, the amount of coal lost to the country is a matter of national importance. A small error only is generally worked at once, and all manner of liberties have been taken with the surface. From the shaft a gate road is driven out of smallish dimensions, 8 or 9 feet high, driven usually in the lower part of the body of the coal. In all systems it is found desirable before working far from the shaft to open out a few yards to the dip, which may serve as a temporary storage for water in case of accident

to the engines, etc. Having reached a convenient distance from the shaft, the workings are opened out as a "side of work," leaving a rib of a few feet in thickness between the opening and the main road. The entrance to the working is very narrow, the chamber is rectangular, and consists of an alternation of pillars and openings, 8 or 10 yards square. The men strike with their picks upwards, as they rise standing on the slack they make, or on staging. There is very great risk of some of the coal coming down on the men, in consequence of the partings; the stalls are made extraordinarily wide, trusting to the strength of the coal; owing to all these circumstances the getting of the upper seams is very risky. The men listen for the slightest sound, and on hearing a crack take to their heels through the entrance, or "bolt hole." Although there are large reserves of coal in the pillars, they are apt to be much injured. Some years ago they used to reckon on getting 11,000 or 12,000 tons out of a quantity of 30,000 or 40,000 tons by the first prospect, and it is difficult to say how much they could get from the pillars. The slack is apt to take fire, therefore the bolt holes are kept narrow, to reduce the quantity of air to a minimum, and are afterwards dammed up.

In Smith's *Miner's Guide* it was proposed to apply the long wall method, working the coal in five successive lifts, taking them out in a succession of stopes. This method has not been tried, but the method of working the coal in two lifts, by the long wall system, has been tried, and one has the satisfaction of learning that the result has been to diminish the number of accidents, to increase the total quantity of coal obtained, and also the proportion of round coal. A pack walling is put in just behind the foremost working (of the lower part), and just behind the wall the second part is worked immediately in front of the gob.—*London Mining Journal*.

CORRESPONDENCE.

COLORADO MINES.

TO THE EDITOR: SIR—Since my last I have to chronicle unusually stormy and disagreeable weather, much to the discomfort of miners and retarding of work; however, work has progressed, and discoveries have been made, one of which adds more testimony to disprove the allegation that this is "a low grade camp." Assays show one hundred and fifty and two hundred and eighty ounces of silver contained in galena.

A tunnel has been started and is now under cover going in on the lode, which is from five to seven feet wide, and carrying a large pay streak of iron and copper pyrites, with galena mixed.

The best pay is in the galena, and it is beginning to come in so as to show that the prospect is a good one.

Work on the Reggins is still progressing by driving a working gallery and three stopes, pay ore showing in all the faces. The lower level has been barren for about fifteen feet, but last week ore came in, and now it looks as well as ever. About one ton per day is being taken out by two men below.

The Yellow Jacket tunnel is in about eighty-five feet, and has had ore all the way, except about fifteen feet. The ore continues about as first found, its value consisting chiefly in gold.

The Mary Murphy continues to show good paying ore in the shaft, and when down to fifty feet will have drifts started on the lode. This mine shows itself for a width of fifty feet on the surface, and it is the intention to run a cross-cut from the bottom of the shaft and find the walls, in doing which the best of reasons are evident that other and equally good pay bodies will be found. Should this prove to be the fact, and as stated the reasons are so obvious that no one acquainted with the case doubts for a moment but that it will be so, then we will have another of the few "monster" lodes that have been discovered in Colorado within the past few years.

The Virginia and Shoo-Fly are being driven ahead as fast as men and powder can do it, and in both cases with satisfactory results, the Shoo-Fly especially improving in quantity as cover is attained. Some new ore has been found in the Clinton that looks exactly like the Shoo-Fly, which leads the owners to hope that they too may have as good a grade of ore as that contained in the latter. If this is found to be correct and the quantity is maintained, then they have one of the best mines in Colorado; the crevice is from three to five feet, and the pay streak heretofore has run from twelve to twenty inches.

The Hively has not been worked for the past month, as the owners are East endeavoring to secure the aid of capital for erecting concentration works at the mine.

It is to be hoped they may be successful, and let me add that there is room for several more of the same sort; at least five groups of mines in this camp would to-day afford an ample supply of ore for an ordinary plant of this kind. As soon as the snow disappears from the higher levels, all our "mining family" are expected to return, and trust they may be able to bring a great many more with them, for there is no longer any doubt as to the fact that we have as good ground for prospecting as any camp in Colorado.

Our miners are much elated over the report of the extension of the A. T. & S. F. Railway to the South Arkansas this summer; when this is accomplished, then we are only thirty miles from rail, and all down grade, over a smooth and dry valley, where a wagon road can be constructed that will admit of a maximum quantity being drawn by any power attached.

Work will be resumed on the Hortense, Continental, Boulder, Tilden, Lizzie, Black Knight, Bob Lee, and many others, as soon as it is possible to get in with supplies.

ALPINE, COLO., April 15, 1877.

Yours truly,
WUNSLIN A. WHYLE.

THE COLORADO SCHOOL OF MINES AND THE MINING COMMISSION.

TO THE EDITOR: SIR—Considering the growth of this community, you may be inclined to think that Colorado is already pretty well off in the way of institutions and officials connected with the mining industry. I may state here, however, that our School of Mines has but seven pupils, and that, while the office of Mining Commissioner exists, there is as yet no incumbent, and no appropriation to pay any person to whom the place may be offered. This peculiar condition of affairs is scarcely creditable to our State, and I think you will agree with me that attention should be called to the subject. The School of Mines is located a mile and a half from Golden City, in the same building as Jarvis Hall, an Episcopal seminary for boys. To instruct its seven pupils there are nominally five professors. Not a single scholar, however, is following any particular course of study. It is doubtful whether the faculty have ever outlined one. Three of the professors, it is said, have never, since their appointment last spring, set foot inside the school. The branches which, according to the prospectus of the school, these absentees should teach are metallurgy, mining engineering, and the mechanical preparation of ores, all of which are, it seems to me, quite necessary to a mining school; yet I doubt if a course of lectures on either subject has ever been delivered in the school.

Hitherto, although it has been known to many that this institution was not in a very flourishing condition, criticism has been withheld in the hope that time would bring a larger number of students and a better state of finances. I am afraid, however, that from the first a mistake has been made, and that the longer attention is diverted from the subject, the more complete will be the failure. The State, I believe, really needs and can support a Mining School, but while it is located at an out-of-the-way place like Golden City it cannot hope to attract patronage. The attempt to imitate the condition of a large and flourishing institution by publishing a long list of instructors in all the branches of natural and applied science has also injured the school greatly. Citizens of the State quickly ascertained that in reality there was but one resident professor, and that he devoted only half his time to the students, the other half being spent in managing the metallurgical department of the Golden Smelting Works, and that at least three of the other lecturers were never called on even to assist in examinations or to consult about courses of study. Knowing this, no conscientious man, no matter how desirous he might have been of aiding a home enterprise of the kind, could recommend the school to friends. Its connection with a church college, however slight, is also to its disadvantage.

Our Mining Commissioner Bill was pressed through the Legislature this spring, after a severe contest, and, except to the Jefferson County delegation (sometimes called the School of Mines ring), has given almost general dissatisfaction. As the bill has been very thoroughly and ably discussed in the columns of the local press, there is no occasion for going over the ground here. It is now nearly three months since the final amendments passed both houses, and fully a month since the Governor signed the bill, yet we are still without a Commissioner. Of the numerous applicants for the place at first, hardly a single one now exhibits any interest in the position or desires to obtain it. This is due not only to the forgetfulness of our Legislature to appropriate any money for the payment of the salary, but because our politicians have wrangled over the office so long that it is redolent of the lobby, and hardly worth the acceptance of a competent man.

So much interest has been taken by the public in our State to forward the mining interests that it is discouraging to see public offices and institutions created for the general benefit either prostituted to personal ends or degraded to the level of a farce. We have excellent material for a State Mining School that would be a credit to Colorado, and a financial success, if common sense had been observed in locating it. Our Mining Commissioners might be of great benefit to the State (if we ever have one) if allowed to hold his office where people could find him.

We are also (and have been for the past six years) provided with a State Geologist, but no report, geological or otherwise, has ever issued from his office. Again an attempt is to be made, I believe, to incorporate instruction in mining and metallurgy into the curriculum of the Boulder University. This will have the effect of weakening the Golden School (if that were possible), and will scarcely be of material assistance to the University.

I appreciate the fact that it is a simple matter to find fault with existing circumstances, and at the same time very difficult to suggest correct remedies. Especially is this the case where the troubles originate mainly in mistakes of legislation. At the same time, public sentiment is capable of carrying out or rather forcing much in the way of reform, and I think a little exhibition of criticism on the subjects I have touched upon will not be without effect.

E. G. M.

BOULDER, COLO., May 6, 1877.

MINING NEWS.

Staff Correspondence of the Engineering and Mining Journal.

COLORADO.

Having just made a trip through Boulder County, stopping at the various camps on the tellurium belt, and finally landing at Caribou, I find many new items to chronicle, and much of interest in regard to the old enterprises.

In every district the mines are more or less flooded in consequence of the unusual wetness of the season. Hence the production is temporarily decreased in quantity, and many mines, not supplied with proper pumping or bailing facilities, are completely drowned out. This condition of affairs, however, cannot last long. Except at the mines on and near the Range no more snow will fall this year, and a few weeks more will suffice to drain off the surface water which is giving all the trouble.

I can, perhaps, open my *resumé* of the condition of the industry in this part of Colorado in no better way than by mentioning the mines, mills, and furnaces in operation. The following list of mines embraces all of any prominence that are at work:

The *Caribou* is being worked wholly for development. When abandoned by the miners who held the lien upon it, every available ton of ore had been taken out, and during their hold of the property not a foot of exploration was done. It will take fully six months to put the mine in shape for steady production. The shaft is being pushed down steadily, and has already reached a depth of over 700 feet. There is still some talk of the Holland Company repurchasing.

The *Native Silver Company*, better known as the *New Jersey Company*, is working a force of between fifty and sixty men, and while the mine is producing about six to eight tons daily the shafts and levels are going ahead rapidly. The mill gives great satisfaction. A recent clean up, covering the work of several months, is reported to have shown an average saving of over 95 per cent.

The *No Name* is being opened below the 200 foot level, and is shipping some ore. The *Spencer*, for its development, is yielding better than any mine in the district.

At *Ward the Ni-Wot* is working a small force of men and producing ore that mills about 4½ ounces per cord, from which a small profit is being made. There is considerable ore in sight in the lower and newer workings of the mine.

At *Jamestown*, the *Balarat* and *Smuggler* are the only two mines at work. The latter, as noted elsewhere, is doing finely.

On *Gold Hill the Slide and Melvina* are the two main working properties. The latter shows well in rich ore, and, if worked continuously, will add heavily to the bullion yield of the county this year. The *Slide* is now opened for ore 800 feet along the vein, and has become one of the finest telluride mines in the State. But very little stopping has been done as yet on this lode.

The *American* at *Sunshine* keeps up a regular shipment of ore, and is being steadily pushed downward. The superintendent informs me that the last few months' work in the lower levels, and especially that of the last three weeks, has made excellent showings of ore.

The *Grand View Mine* in the same camp is also a steady producer, and is showing remarkably well for recent work done. This mine, not long ago, was regarded as utterly valueless. The rich pocket struck at the surface had been exhausted, and the shaft had been sunk a long distance on a barren and worth

less vein. The perseverance of the owners finally brought the mine into pay again at a depth of 240 feet. The general character of the ore found below does not materially differ from that mined above.

At Magnolia the *Keystone* and *Rebecca* are the only mines of prominence now working. The former, under lease, is yielding some very rich ore.

A new discovery of telluride ore has recently been made southwest of Magnolia and within eight miles of Black Hawk. The deposit is a rich ore, but its location has heretofore been kept a secret, so that little is known of its extent and value. This discovery adds about ten miles to the recognized length of the Colorado telluride belt.

Recent information from the *Santa La Sana* property on the North Boulder is very satisfactory. The main vein (the Mexico), though being opened rather slowly, is showing a very fine body of ore. No stoping is being done, and almost none heretofore has been done, so that the mine is rich in reserves. The company is purposing this year to erect a mill.

This part of the State is now very well supplied with ore markets. Caribou ore is treated wholly at the New Jersey mill. In Four Mile and the main Boulder Canons there are four concentration works. At Boulder Boyd's Smelting Works are steadily running, and the Church Boss have a shipping mill. These are the legitimate reducers. In addition the County is struggling with the Brett, Williard, and Olsted processes, each of which proposes, when it gets into operation, to pay enormously for ores containing over \$5 per ton.

Attention has already been directed in your columns to the success of the New Jersey Company's leaching works. This mill is doing most excellent work. The Frue vanners, of which about 10 are up or to be up shortly at different points in the mountains, are also giving much satisfaction with pyritous and tellurated ores. Mr. Rust is running a couple of the machines at Boulder. Mr. Boyd is shipping from \$15,000 to \$20,000 in bullion monthly from his mill. The Boyd works treat all ores raw, in a cupola furnace. He buys all ores, free or sulphureted, and runs them down without any previous oxidation.

The following in regard to the Smuggler, I clip from a careful correspondent of the *Courier*: "The Smuggler mine is the great object of interest here, as it is, with the exception of the Balarat, the only mine being worked at present, and employs sixty men, of whom thirteen are ore sorters. Through the courtesy of the company's assayer I was enabled to see the returns from the smelting company of ore shipped in the month of April, as follows:

Nineteen tons 2d class ore, average net yield \$400 per ton.....	\$7,600
Total expense of mine for month.....	4,500
Net profit.....	\$3,100

Besides the 3d class ore there was produced 50 tons which will net \$40 per ton, equal to \$2,000. From the main ore room, in which there are eight men sorting ore under the supervision of Mr. W. H. Stevens, I went into a cross-cut tunnel known as the Smuggler tunnel. It is 120 feet long from the ore room, at which distance the Smuggler vein has been struck at the junction. There is a shaft sunk from the surface to the tunnel, a distance of sixty-four feet. The shaft is continued on down sixty feet further, making the total depth of main shaft 124 feet from the surface. Fifteen feet from the bottom there is a drift run north. The north drift in the bottom of the shaft is in sixty-two feet, and the south drift is being underhand stoped from the tunnel level. On the above level 100 feet from the shaft a winze is being sunk, which is at present thirty feet down and is being vigorously worked. Seventy-five feet from the winze another cross-cut tunnel is run in to the vein, which is known as the Wamego tunnel. One hundred and twenty-five feet from the Wamego another winze is being pushed rapidly downward, and is at present down twenty feet, and is being worked both night and day. Twenty-five feet from the last winze another cross-cut tunnel has been run in to the vein, a distance of 123 feet from the outlet. At the mouth of this latter tunnel there is an ore room in which there are four sorters. Into this lower ore room all the ore from the lower part of the mine is sent. Returning through the Sweetheart tunnel I observed that a drift had been run in 150 feet from the tunnel. There is a continuous drift of 550 feet, and with one or two exceptions there is good pay in every drift and every stop. Returning through the first tunnel I entered the large ore room and examined the ore, of which there were a great many sacks piled up ready for shipment. The mineral contained in the ore is sylvanite and some arsenical and iron pyrites, which assorted nets about \$400 per ton."

From the Southern Mines: A toll road has at last been built through the box canon of the Animas River into Baker Park.

The pending litigations over the *Pride of the West* mine have been decided by the Secretary of the Interior in favor of the present holder of the property.

The *Jacarilla* dry placer diggings across the line in New Mexico are being explored again this year, and fresh attempts made to save the gold, which is found in a coarse condition, and saves to a high percentage in ordinary boxes.

From the Northern Mines: A rich strike of free gold ore is reported from the Ajax location, Sunshine.

A miners' association has been formed at Sunshine. Its objects are for the purpose of aiding all interests connected with mines and mining, and for the free interchange of thoughts respecting metallurgy and kindred sciences.

Of the northern Colorado coal mines the Starr, Rob Roy, Mitchell, Davidson, and Golden mines are working and shipping from 250 to 300 tons daily. The Rob Roy is the largest producer and its coal is by far the finest mined north of the Arkansas Divide. The mine is in fine shape and capable of yielding 300 tons daily. At the Boulder Valley mine, whose stopes houses together with about 50 feet of the entrance to the mine were destroyed by the striking miners some weeks ago, the damages have not been repaired yet. The property is under a strong guard, however, and the buildings are being rebuilt.

NEVADA.

The *Pioche Record* reports the discovery of a good body of ore on the 10th level of the Raymond & Ely mine, which promises to develop into a large deposit. The Alps mine is also stated as improving in several places. Shipments of ore from this mine to the mill in Conder Canon for the week ending May 5th aggregated 220 tons.

General prospects in Pioche are better at present than for some time past. The bullion shipments are ranging from \$15,000 to \$25,000 per week, and a large number of the miners are taking out pay ore.

The following is the text of what is known as the "One Ton Tax Bill," which passed at the last session of the Nevada legislature. It is a curiously devised means of adding heavily to the burden of mines without in any way benefiting the State:

"An Act providing for the taxation of mines that produce one ton or less a day of ore or mineral bearing material, and to encourage the prospecting of undeveloped mines.

"Section 1. All mining claims producing not more than one ton of ore a day

mineral bearing material containing gold, silver, copper, nickel, bismuth, antimony, or other valuable metal, shall be assessed and taxed for State and County purposes in the following manner: From the gross yield or value of all ores or mineral material of whatever character, there shall be deducted the actual cost of extracting said mineral from the mine; the actual cost of assorting and transportation to the place of reduction or sale; the actual cost of reduction or sale, and the remainder shall be the net proceeds, and shall be taxed as provided for in this act.

"Sec. 2. All bullion produced from any mine that extracts not more than one ton of ore or mineral bearing material a day, shall be assessed and taxed at its full market value after deducting the actual cost of mining, assorting, hauling, and reducing.

"Sec. 3. On claims of this class producing not more than one ton a day, there shall be no allowance made for expenses incurred prior to the quarter in which the assessment is made.

"Sec. 4. This act to take effect on and after the first day of April, eighteen hundred and seventy-seven."

THE GILPIN COUNTY GOLD DISTRICT.

The bullion product of the Central City gold mines for April has amounted to about \$152,000, making the yield since the beginning of the year a little over \$600,000. Of this total \$80,000 in round numbers was produced by the stamp mills, of which 16 are running, carrying 600 heads. The balance represents the minerals melted.

Since the beginning of the year the number of stamps in operation has remained about constant. Taking about 550 as the mean, and calculating on 100 days' work from January 1 to May 1, and three-quarters of a ton as the effective results per head in 24 hours, it appears that 42,000 tons of ore have been crushed. The total value of bullion produced having been \$380,000, the mill-yield per ton was a fraction over \$9. This figure is probably rather above than below the true one, for in many mills one ton of ore is crushed per head per day. It is low enough, however, to surprise many who have regarded it impossible to work such low grade ores, and especially those of Central City, which for years have been classed as very refractory.

The mines of Gilpin County were never in a better condition than at present. The following carefully prepared summary from the *Register* will be found to cover all the more important properties:

The four great lodes—Bobtail, Gregory, Gunnell, and Kansas, whose combined yields have exceeded \$16,000,000, still maintain the lead as the great producers of Gilpin County. The first named supplies 95 stamps with ore, and keeps the usual force of men employed. Work will soon be renewed on other parts of this lode and on neighboring veins. The two parts of the Gregory now worked supply 90 stamps. The bottom of the Briggs Mine, 840 feet deep, shows better ore than prevailed above, and the ore reserves cannot be exhausted in five years.

The Gunnell is as extensively worked as ever. The Grand Army shows some improvement. Some very rich specimens are coming from the property worked through the 700-foot shaft, indicating a continuation of the rich bonanza that has produced so largely. The Cornish pump would be at work bit for the late storms. Meanwhile the old Knowles pumps hold the water level. The University property is in poor rock, but the lessees are hopeful of "making it" in good time. John Scudder is at work on the East Gunnell. Explorations on the Coleman Mine on the Gunnell have failed to find any ore. The entire property has been prospected by shafts and drifts to a depth of 400 feet. Unless this property is sold to the adjoining companies it must remain idle, as it has not ground enough to warrant further expense. A patent has been applied for with a view to passing the title to those who may want to buy.

The Monmouth-Kansas supplies its fifty-two stamp mill with ore of good quality besides smelting ore. Work has been resumed on the old Harper claim, and the water is being removed. There is some talk of starting up the Stalker claim on this lode. Mackey's shaft on the Burroughs, west extension, is now nearly 600 feet deep. The ore is of low grade. The Ophir and Gilpin claims on the Burroughs are operated by lessees.

Mackey is working the entire Kent County lode. West of the 550-foot shaft, the ore body is large and exceedingly rich. This lode supplies the Clayton twenty-five stamp mill, also operated by Mackey, and is made to pay good profits. Many thousands of dollars were expended in sinking the shaft, in the purchase of pumps and hoisting machinery, and in rebuilding the shaft-house.

The new owners of the Comstock lode are putting up an engine for hoisting power. This mine has a record that but few mines can boast of. It was first opened last fall. While worked on a small scale by means of a windlass and afterwards a whip, the product in five months, ending April 10, 1877, was \$30,500, and of this sum the net profits amounted to \$20,700, or over 67 per cent. The ore returns from 8 to 15 ounces gold per cord.

A grand consolidation of Quartz Hill property, including the Illinois, Confidence, Borton, and Roderick Dhu lodes, is being perfected by the Hon. Bela S. Buell in Rochester, New York. This is one of the largest schemes yet projected for the development of this famous hill. These combined properties have produced many hundred thousand dollars. It is proposed to do all of the hoisting by means of the Illinois hoisting machinery, which is the most powerful in the country except that of the Gunnell. Mr. A. N. Rogers will probably be the manager of the consolidated property.

The party of Cornishmen who have been so profitably working the Pyrenees lode for over a year have now leased the Nimrod, which is on the same vein. Levels are being extended east and west on the Pyrenees at the bottom of the 220-foot shaft. Here is a vein of solid mineral two feet wide, the ore having improved recently. One man broke a ton and a half of smelting ore in one day this week. One-fourth of the ore vein is smelting ore that sells for \$50 or \$55 per ton. The average yield of mill ore for a year past has been seven and a half ounces per cord.

On either side of Chase Gulch considerable work is being done on Casto Maryland and Bates hills. The Centennial is highly spoken of. The Maryland is worked under lease in two localities, one of which is paying well and the other promises to. Some work is being done on parts of the Bates. The Belden tunnel is in 450 feet. Slow progress has been made lately, owing to the hardness of the rock.

The O. K. mine has fine-looking ore in sight in all the levels, and throughout the lower portion of the 300-foot shaft. The new engine will permit of much more extensive operations than heretofore. Few mines have as large ore reserves as this.

Besides the claim on the California, several other previously idle mines have been started up during the past three months. Among them are two properties on the Gardner and Missouri. Thomas Hardesty is getting a large amount of good mill dirt from the bottom. The Gibson is also producing both mill and smelting ore.

Some very rich ore has been sold recently from the Clarissa Mine near the head of Virginia Canon. The Specie Payment gives a handsome profit, and so does the lode worked by the Helmer brothers.

In the silver belt near the divide of Clear Creek County, the Searle, Aduddel, and Clifton are all producing ore that sells at the smelting works for from \$30 to \$50 per ton. The Williams is steadily improving. Mr. Drake and son obtain \$100 per ton for the ore.

The water in the Clark-Gardner has been lowered 90 feet, uncovering some good ore which will be taken to the mill. The Philadelphia Gardner will soon be in paying condition.

Alex. Taylor's Eureka lode on Eureka hill is in pay again. After sinking over

250 feet in cap a large crevice has opened out in the bottom, much to the gratification of the plucky owner.

The Central City district was the worst used mining camp in Colorado in the early days, and, more than any other, suffered from the speculator in wildcat and the kid-gloved mining superintendent. Five years ago the depression in business was so great that the district was well-nigh deserted by miners. To-day not a district in Colorado is yielding so steadily. Increased developments in the mines have sufficed only to demonstrate their worth.

NOTES.

THE NEVADA BANK is now, May 12, loaning only \$15 on consolidated Virginia and California stocks, against \$20 up to a few days ago.

SILVER DISCOVERY IN PENNSYLVANIA.—The *Ledger* of the 18th inst. says: "It is reported that a silver mine has been discovered in Upper Mount Bethel, Northampton County."

FATAL COLLIERY EXPLOSION.—POTTSVILLE, PA., May 22.—By an explosion of fire-damp in the Mine Hill Colliery at Minersville this morning, two boys were burned to death.

THE LYKENS VALLEY MINES GETTING READY TO RESUME WORK.—Orders have been issued for the reopening of Short Mountain and Lykens Valley mines, which were filled with water to extinguish the unfortunate fire that broke out on the first of last January. Various estimates are placed of the time required to take out the water. It is reasonably certain, however, that no coal can be shipped before some time next fall.—*Lykens Register*.

THE ECONOMY OF ELECTRICAL ILLUMINATIONS.—According to the estimates of Messrs. Siemens & Halske, of Berlin, the cost of electric illumination is but one-fifth of that of gas. It is to be observed, however, that the extreme intensity of the light ill adapts it for illuminating factories where delicate work is made, although it is most satisfactory in such industrial establishments as machine shops, foundries, etc. The considerations of the increased danger of fire in the electric light is, in the end, an economical consideration that frequently decides in favor of gas-light.—*Polytechnic Zeitung*.

THE MISSOURI LEAD MINES.—The *Granby Miner* of the 19th inst. says: "The heavy rains of the past week have greatly retarded mining operations throughout the Southwest. The Joplin papers report some good strikes of mineral, but in general operations are dull in the Joplin mines. The White Lead Works have suspended operations for a few weeks, owing to the fact that the cloth bags used in corroding were found to be insufficient, and were readily eaten up by the sulphur. Seven shafts in the Broadway mines yielded 250,000 tons of mineral last week. It is estimated that \$20,000 is paid out in Joplin each week for mineral. The receipts of pig lead in St. Louis are considerably lower now than last year for the same time. The mines of Granby, though deeper than any others, are in better condition to stand the floods. The number of first class pumps now here, most of them new and all in use, are equal to the emergency. There being thirty-two pumps at work, in every shaft or diggings where used the recent heavy flood was easily controlled, and the miners kept on with their work as usual." The *Neosho Times* gives accounts of another mineral bonanza struck on Cedar Creek, six miles west of Neosho. In a shaft sunk twenty-four feet deep mineral was found from a depth of seven feet to the bottom, in pieces varying in size from a partridge egg to a peck measure. Ten or fifteen thousand pounds were taken out of the bottom.

OUR SOUTHERN GOLD MINES.—The *Dahlonega Signal* of the 18th inst. says: "This week has been an active one among the miners. A large amount of ore has been taken out, and most of the mills are reporting an increased yield, while several rich 'finds' are reported, reminding us of the early excitement in gold digging here years ago. On the 16th inst. a blast in the lower level leading from the bottom of the shaft of the Findley Mine towards the old 'Findley Vein' revealed one of the richest 'leads' yet found in that property. It is running parallel to the old vein, but some ten feet from it, and in an entirely different formation; being a hard blue hornblende rock, streaked with white quartz, which is threaded with webs of gold; some of the specimens shown us being the finest ever seen here. In addition to the gold the rock carries what experts here say is tellurium. This mine is running 24 stamps regularly on a grade of ore fully up in quality to the best mill ores. The company is gradually extending its cut to the top of the hill near the celebrated 'Sand Vein.' The hydraulic ram, which gave considerable trouble at first, is now working well, and gives an ample supply of water on top of the hill to wash the ore to the mill. The old mill of the Hand Company is to be increased with 10 stamps, and other necessary repairs done to make it equal to the best mills and up to the latest improvements. The new mill is to contain 20 stamps, with all the late improvements, and is to be situated just below the dam, on lot 1052. The Benning Mine is improving very fast in the yield of gold, last month being nearly as good as the best, with all the drawbacks from rainy weather, from which cause the company lost several days both at the mine and mill."

A correspondent in the Gainesville, Ga., *Southron* of the 22d inst. says: "We have in daily and successful operation within a circle of six miles, taking Dahlonega as the pivot, nine first-class stamp-mills of the most modern and approved styles. The Findley mill, twenty-four stamps, weighing each 150 pounds, with a capacity of crushing 80 tons a day; the Hand Company's mill, twenty stamps, weighing each 700 pounds, capacity 70 tons a day; the Benning, ten stamps, weighing 600 pounds, capacity 30 tons daily; Weaver & White's mill, ten stamps, capacity 30 tons; the Battle Branch mill, ten stamps, capacity 30 tons; the Lawrence mill, five stamps, capacity 10 tons; Jack Huff's mill, five stamps, capacity 10 tons; the Pigeon Roost Company's mill, five stamps, capacity 10 tons; McIntosh & Company's mill, 5 stamps, capacity 10 tons; all of which run regularly and profitably throughout the entire winter, with the exception of a very few days of the unprecedented cold weather of December and January. The Hand Gold Mining Company has within the past eighteen months completed an undertaking which required a vast amount of skill and energy, bringing the water of the Yahoola River in a canal or aqueduct, upwards of twenty miles, to bear on all the extensive mining property in and around Dahlonega. This canal is some 300 feet above the level of the river bed below the town. The water is conducted from the main canal by lateral or branch ditches to Benning, Hand Gold Mining Company's, and Findley mines, which are operated by it. On the line of this aqueduct there is about 1,200 feet of wrought iron pipe 36 inches in diameter, which conducts the water from east to west across the Yahoola River, in the form of an inverted siphon. The center pipe, at the lowest point immediately over the river where the pressure is greatest, is made of 3/4 inch boiler plate, double lapped and double riveted, and so perfect is its construction that under a perpendicular pressure of 220 feet it does not lose a drop of water. There is besides this about two miles of other tubing which, though under a less pressure, is as well and substantially constructed. The value of this aqueduct to the country is inestimable, as it controls more mining territory, and is considerably higher than any other water possibly attainable, except at a ruinously great cost. Besides the mills above mentioned as being supplied with water from this aqueduct, there is a very large surplus (enough to supply 25 or 30 smaller ones) which the company is selling."

HARD TIMES AND WAGES FOUR DOLLARS A DAY.—Mr. Alexander MacDonald, M. P., is reported at a recent meeting of miners in England to have advised young men to go to the Western States, California, and Nevada, where they can earn \$4 and \$5 per day. He did not state that when \$4 a day is paid it is in mines so

hot as to seriously endanger the men, and make their labor exceedingly arduous, so much so, in fact, that miners who can earn even half that amount elsewhere will not go there. The following extract from the Virginia City, Nev., *Chronicle* shows the actual condition of the men of the district to which Mr. MacDonald advised the young English miners to go. Our English exchanges will do a service by circulating the information. We want no more miners here at present, for those we have are unable to get employment, though we hope it will be otherwise in the course of another year. If the "young English miners with a little money" want to engage in agriculture, then we can offer them plenty of room, and a certain future of competence for those who are industrious and frugal:

"*Hard Times in the Silver State.*—The shadow of hard times seems to be slowly creeping over the Comstock, and the man who stands in the sunshine to-day may be under the cloud to-morrow. Hundreds of miners who have been out of employment for months go about willing to perform any kind of labor for anything in the shape of money. A few months ago they were striving to see their wives and children presentably clothed and supplied with the little luxuries of life. To-day they think only of keeping them fed. They have no longer credit at the grocer's, and the butcher will not furnish them meat without the ready cash. Scores of these men are walking the streets aimlessly, or lingering about the mines begging for work. A miner falls down the shaft and is dashed to pieces. A hundred rush to fill the place, content to have their faces fanned by the ill wind that has blown him into eternity. They stand about the gambling tables watching the ebb and flow of other people's fortunes. A man with a dollar in his pocket is deliberating whether to buy flour for his family or put the money on the board to double up. He pushes it over a card, and sees it make its way into the dealer's till. Then he walks away with teeth tightly clinched. You may see such sights nightly at any of the gambling houses. Strong, able-bodied men call daily at the dwellings of citizens, asking for food or the chance of a night's lodging. The funds of the Relief Committee are exhausted."

RECENT PROGRESS WITH THE ELECTRIC LIGHT.—Some recent inventions in France by M. Jablochhoff seem likely to carry us far toward the attainment of lighting by electricity. In the first place, when an intense light is needed, M. Jablochhoff substitutes, for the complicated and costly electric regulators hitherto employed, a very simple and ingenious electric "candle." This candle is made, however, not of wax or spermaceti, but of a paste of sand, or pounded glass, mixed with some adhesive material, and, instead of a wick of yarn, it is traversed through its length by two rods of carbon, slightly separated from each other by the insulating material in which they are imbedded. These carbon wicks are exposed at the bottom of the candle, so that they can be connected with the wires which bring the current. When the electric arc is once formed at the top of the "candle," by connecting the ends of the carbons for a moment by a piece of metal and withdrawing it slowly, these carbon wicks consume gradually, with intense light, which is increased by the melting and incandescence of the insulating envelope. This invention dates back nearly a year. The first practical trial of this system was made recently at the Magasin du Louvre, and the experiments were attended with perfect success. The Marengo Hall was the apartment lighted, and six electric candles were sufficient to shed around a very bright light, which was softened by being transmitted through opal glass globes. Some idea of the comparative value of gas and the electric light under notice may be formed when we state that the Marengo Hall is ordinarily illuminated by means of one hundred argand gas burners of the largest size. A more recent one, reported to the French Academy of Sciences about a month ago, provides for lights suited to ordinary use. The inventor transmits the powerful current from a magneto-electric machine through the primary helices of a number of inductive coils, the current in this case not, however, being continuous, but rapidly reversed in direction by the action of the machine itself. Every reversal of the primary current produces, of course, a spark between the terminals of the secondary or fine wire helices of all the induction coils in the circuit, and these sparks he utilizes in a new and ingenious way. He places between the terminals a piece of kaolin (the clay of which porcelain is made), in such a position that the thick flaming spark produced by the coil passes over its surface. The result, according to the statement in the *Comptes Rendus*, is a magnificent luminous band, emitting a light as soft and steady as any that is known, and varying in intensity according to the dimensions of the coil and the strength of the primary current, from the brightness of a single candle to the brilliance of a chandelier of fifteen or twenty burners. The kaolin slowly wastes away, its surface in the track of the spark being worn off at the rate of about one millimetre (1-25 of an inch) per hour. If these reports are to be relied upon, it is manifest that a great step has been made, and that illumination by electricity may soon become as common as gas-lighting.—*New York Times*, May 21.

IMPORTANT DECISION IN THE SUPREME COURT AFFECTING MINING PROPERTY IN NEVADA.—Washington, May 7, 1877.—The Supreme Court, before its final adjournment for the Term, to-day handed down an important decision, affecting vast speculative interests at the New York and San Francisco mining stock exchanges. The case is entitled *Forces vs. Gracey* and others, the others including the Consolidated Virginia or Bonanza Gold Mining Company of Nevada. It came up on an appeal from the Circuit Court of Nevada, where action was brought to enjoin the collection of taxes in Storey County, the same being imposed by the law of that State upon property of the Consolidated Virginia Mining Company, the appellant in the case, Gracey, being a stockholder and a subject of Great Britain. The payment of the tax was resisted on the ground that the title to the land from which the ore is taken is in the United States and is not, for that reason, liable to State taxation. It will thus be seen that the suit is one of vital interest to all the mining operations in the United States, and especially in Nevada, as it affects the main source of revenue of that State. The opinion of the Court was delivered by Mr. Justice Miller, and was substantially to the effect that, while Congress permitted individuals to take the ores from the land and recognized the possessory or proprietary rights of the miners as established among themselves, it had not parted with the title to the land except where it was sold in accordance with law. If the tax of the State of Nevada were levied on this property as belonging to the United States, it would be void; if it were levied on property of the miner, it might be collected without affecting or embarrassing the title of the United States, and there was no ground for interference with the processes of the State in the collection of the tax. After making a few extracts from the State law of Nevada to show what it is that is taxed—namely, the ores, tailings, and mineral-bearing material—after deducting the actual cost of extracting the ores, and other expenses, the opinion proceeded to say that the ore thus detached became personal property, the ownership of which was in the man whose labor, capital, and skill had discovered and developed the mine and extracted the ore. It was then free from any lien, claim, or title of the United States, and was rightfully subject to taxation by the State like any other kind of personal property. The United States had not any interest in the tax or in the sale of the property taxed; such possessory claims were the subject of bargain and sale and constituted very largely the wealth of the Pacific coast States. They were property in the fullest sense of the word, and the ownership, transfer, and use were governed by law and recognized by the States. These claims might be sold, transferred, mortgaged, and inherited without infringing on the title of the United States. They might also be made subject to a lien for taxes, and the claim, such as it was, recognized by the statute be sold to enforce the lien. There was nothing in principle or in any interest which the United States had in the land to prevent it.

The opinion of the Circuit Court dismissing the bill was affirmed. Mr. Justice Field, being disqualified as a shareholder in one of the Nevada mines, took no part in the decision of the case. The victory is an important one to the State of Nevada, whose coffers will now overflow with the delinquent money due from the mines, said to amount to several millions of dollars, enough it is believed to exempt the land of the State from taxation and run its government for many years.

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 May 19, and years from Jan 1st.

Tons of 2,240 lb.	1877.		1876.	
	Week.	Year.	Week.	Year.
Wyoming Region.				
D. & H. Canal Co.	48,720	795,819	48,597	694,030
D. L. & W. RR. Co.	57,824	785,053	28,797	476,325
Penn. Coal Co.	24,627	372,733	22,902	343,497
L. V. RR. Co.	22,139	374,739	14,528	329,805
P. & N. Y. RR. Co.	1,262	18,023	313	9,395
C. RR. of N. J.	39,844	540,837	40,530	425,600
Penn. Canal Co.	13,623	78,021	14,795	65,365
	208,039	2,966,625	170,462	2,344,017
Lehigh Region.				
L. V. RR. Co.	93,370	1,041,234	38,425	719,937
C. RR. of N. J.	35,446	541,293	37,448	383,203
D. H. & W. B. RR.	294	6,197	511	13,309
	129,110	1,588,724	76,384	1,116,509
Schuylkill Region.				
P. & R. RR. Co.	160,607	1,986,319	119,785	1,359,322
Shamokin & Lykens Val.	19,299	195,589	24,324	261,738
	179,906	2,181,908	144,109	1,621,060
Sullivan Region.				
Sul. & Erie RR. Co.	262	4,757	1,843	22,539
Total	517,317	6,742,014	392,798	5,104,125
Increase	124,519	1,637,889		
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 of Coal at Boston, for the week ending May 18, and years from Jan. 1.

Tons of 2,240 lb.	1877.		1876.	
	Week.	Year.	Week.	Year.
From				
Alexandria and Georgetown	1,140	7,808	1,980	11,698
Philadelphia	14,764	103,858	11,647	139,521
Baltimore	400	38,106	7,535	38,576
Other places	6,269	82,765	7,225	87,635
Great Britain	490	1,197	102	3,509
Nova Scotia		3,669		199
Total	23,063	297,403	28,489	281,438

Perth Amboy business: Tons.

Received for the week	34,873
Shipped for the week	30,087
On hand May 19	134,597

The decrease of shipments of Cumberland Coal over the Cumberland Branch, and Cumberland and Piedmont Railroads amounts to 25,826 tons, as compared with the corresponding period in 1876.

The Receipts of Coal at Rondout, N. Y., by the Delaware & Hudson Canal for the week ending May 23 were 286 boats, carrying 36,840 tons.

Belvidere Delaware RR. report for week ending May 15	Week	Year.	Year.
Coal for shipment at Coal Port (Trenton)	1,103	6,846	54,396
" " " South Amboy	17,885	244,671	171,931
Coal for distribution	4,148	67,217	54,183
Coal for Company's use	1,226	29,459	19,393

The shipments of coal over the Erie Canal for the week ending May 12 was 14,799 tons, and for the same period in 1876, 5,342 tons.

The production of Bituminous Coal for the week ending May 12, was as follows:

Tons of 2,000 lb., except where otherwise designated.	Week.	Tons.	Year.	Tons.
Cumberland Region, Md.		41,769		447,555
Barclay Region, Pa.		5,399		132,244
Broad Top Region, Pa.				
Huntingdon and Broad Top RR.	†			
*East Broad Top		843		18,167
Clearfield Region, Pa.				
*Snow Shoe		684		17,319
*Tyronne and Clearfield		23,251		479,321
Allegheny Region, Pa.				
*Pennsylvania RR.		3,645		72,022
Pittsburg Region, Pa.				
*West Penn. RR.		3,966		72,326
*Southwest Penn. RR.		669		16,800
*Penn & Westmoreland gas coal, Pa. RR.		14,528		281,005
*Pennsylvania RR.		7,046		139,665
† For the week ending May 14.				
‡ This report was not received this week.				

The Production of Coke for the week ending May 14.

Tons of 2,000 lb.	Week.	Year.
West Penn. RR.	407	26,521
Southwest Penn. RR.	12,968	218,634
Penn & Westmoreland Region, Penn. RR.	1,158	31,072
Pittsburg, Penn. RR.	2,074	53,914
Total	16,507	330,141

COAL TRADE REVIEW.

NEW YORK, Friday Evening, May 25, 1877.

Anthracite.

The representatives of the several coal interests held an adjourned meeting in this city on Monday, when, as

usual of late, nothing of importance was done. Although there have been reports to the contrary, the failure of the last meeting was shown by the quick announcements of auction sales; the Pennsylvania Coal Company announcing 70,000 tons for sale on the 29th inst., deliveries to be made before the 15th prox., and the Delaware, Lackawanna & Western Railroad Company announcing 150,000 tons to be sold on the same day, deliveries to extend over one month. These actions clearly indicate that these companies have but little faith in any united action being taken by the producers. It is supposed that these sales are to be used to bulldoze Mr. Gowen into a compliance with the wishes of some of the other managers, but if such is their object it is not unlikely that this plan will be abandoned after considerable losses have been entailed upon the companies making the sales, only to find Mr. Gowen firmly holding to the position he has taken. The object of the last two meetings was to bring about a suspension of production. There is no doubt that, if similar quantities of coal to those now advertised for sale should be offered a month hence, and the sales should be left to natural influences, by that time, if not earlier, we would see a pretty general suspension of mining at least. If the sales announced should be free of the "washing" that has characterized so many of those that have been made since the combination broke, we shall, without doubt, see prices much below any that have ever been recorded in the Anthracite trade.

Since the meeting on Tuesday, trade has been more demoralized than ever, very low prices being rumored, and buyers quite unwilling to purchase. It is thought that after the auction sales next week there will be more purchases made, but as dealers and manufacturers are already well supplied, and if they are to have 220,000 tons additional forced upon them next week, the question naturally arises, Who will take the coal? Besides, the sales of next week, it is supposed, will be only the first shots in a ruinous war of prices, and should a retreat not be shown before or on the day of the sale, lower prices may be anticipated, and buyers will as quickly see this as others.

The prospects of Lehigh and Schuylkill coals entering the Western markets through the Erie Canal have been receiving much consideration during the past week, and the shipments that have already been made have so alarmed the Anthracite Coal Association as to bring about a reduction in its prices of about 30c. per ton; its quotations at Buffalo, per ton of 2,000 lb., being as follows:

	Afloat. F. O. B.	Afloat. F. O. B.
Grate	\$3.45	\$3.85
Stove	\$3.70	\$4.10
Egg	3.45	3.85
Nut	3.60	4.00

The prices afloat would give f. o. b. here, per gross ton, about \$2.85 for grate and egg; \$3.10 for stove; and \$3 for chestnut. If these prices can be maintained after the auction sales next week, the Western market will then, if not already, be found a very desirable one. There is one encouraging feature to this trade: that the low prices will greatly increase consumption and extend the markets for anthracite coal.

The production of coal last week reached the large sum of 517,317 tons, as against 472,196 tons for the week previous, and 392,798 tons for the corresponding week of last year. The total production from June 1 to May 19 was 6,742,014 tons, as compared with 5,104,125 tons for the like period of 1876; showing an increase this year of 1,637,889 tons. A continuation of the present rate of production until July 1 would place the production of this year to that time about 3,000,000 tons ahead of the shipments to that date in 1876. With these figures before us, it is very evident that some of the companies must suspend, whether others will or not.

Bituminous.

These coals are without a feature, there being no business worthy of note doing. The shipments of Cumberland coal last week were slightly in excess of the previous week and the corresponding one of last year. The shipments from Jan. 1 to May 19 were 25,826 tons less than for the corresponding period of 1876. Although the shipments of Clearfield from January 1st are ahead of the corresponding period of last year, yet the ground is being steadily lost again.

Gas Coals.—These are only being moved in a small way, with occasional contracts for quantities much below the usual amounts taken in previous years.

Wholesale Prices of Bituminous Coal. Domestic Gas Coals.

Per ton of 2,240 lb.	At the Shipping Ports.	Alongside in New York.
Westmoreland and Penn. at Greenwich, Philadelphia	\$4 50	\$5 50
" " at S. Amboy	5 00	5 50
Red Bank Cannel Pa. at Philadelphia	8 00	8 50
Youghiogheny, Waverly Co., at Balt.	4 50	5 05
Despard, West Va.	4 50	6 00
Murphy Run, West Va., at Baltimore	4 50	5 86
Fairmount, West Va.	4 40	5 70
Newburg Orrel, Md.	4 50	6 00
Cannelton Cannel, West Va.		10 00
" Splint " at Richmond	6 00	7 00
" Gas Coal at Richmond	4 14	5 65
Peytona Cannel W. Va. at Richmond		10 00

Manufacturing and Steam Coals.
Cumberland at Georgetown and Alexandria, Va. 3 00@3 15 4 40
Cumberland, at Baltimore 3 15@3 25 4 70
Clearfield f. o. b. Canton, Baltimore 3 25@ 4 50
Clearfield "Eureka" at mines per ton 2,000 lb., 75c.; f. o. b. Baltimore and Philadelphia per ton of 2,240 lb., \$3.25; f. o. b. South Amboy, \$4.25; alongside at New York, \$4.50.

	Sterling.	Am. cur'y
Newcastle, at Newcastle-on-Tyne	8/6@10/6	5 50@ 6 00
Liverpool House Orrel, at Liverpool	25/	13 00
Ince Hall Cannel	35/6	18 06
" Gas Cannel	25/6	10@10 50
Scotch Gas Cannel, at Glasgow, nominal	25/	7 50
Gold.		
Block House, at Cow Bay, N. S.	1 75	4 75
Caledonia, at Port Caledonia	1 50	4 25
Glace Bay, at Glace Bay	1 50	4 25
Lingan, at Lingan Bay	1 75	
International mines at Sydney	1 75	4 50
Pictou, Vale mines, at Pictou	2 25	

New York and Philadelphia.

Wholesale Prices of Anthracite Coal f. o. b. at the Tide Water Shipping Ports per ton of 2,240 lb.

	Lump.	Steamer.	Grate.	Egg.	Stove.	Chestnut.
Wyoming Coals.						
Lackawanna at Rondout	2 90	2 90	2 90	3 05	3 25	3 10
Wilkesbarre at Port Johnston	2 90	2 95	3 05	3 10	3 35	3 00
Plymouth, R. A.			3 05	3 10	3 45	3 10
Susquehanna Coal Co., (S. H. Brown & Co.) At Amboy	2 85	2 85	2 90	3 00	3 60	2 25
Susquehanna coal at Philadelphia	2 75	2 75	2 60	2 65	3 25	2 75
Kingston at Hoboken	2 90	2 95	3 05	3 10	3 35	3 15
Pittston at Newburgh:						
A. S. Swords	2 85	2 85	2 85	2 90	3 25	3 20
Penn. Coal Co.	3 10	3 10	3 10	3 20	3 60	3 25
Wyoming at Perth Amboy	3 00	3 00	3 10	3 10	3 40	3 35
Lehigh Coals.						
Old Company at port Johnston	3 75		3 25	3 25	3 65	3 25
Old Company's Room Run	3 75		3 25	3 25	3 65	3 25
Sugar Loaf, Hobok. & Amb.	3 75		3 25	3 25	3 65	3 35
Lehigh at Perth Amboy	3 75		3 25	3 25	3 40	3 35
Honey Brook Lehigh	3 75		3 25	3 25	3 65	3 25
Beaver Meadow at South Amboy	3 75		3 25	3 25	3 65	3 25
Mount Pleasant at Hoboken	3 75		3 15	3 15	3 50	3 30
Cross Creek at Elizabethport	3 75		3 25	3 25	3 75	3 25
Schuylkill Coals at Port Richmond, Philadelphia.						
Schuylkill white ash	2 75	2 75	2 75	2 75	3 10	2 75
Schuylkill red ash					2 85	2 75
Lorberry			3 50	3 50	3 00	3 00
Lykens Valley			3 75	3 75	3 00	3 00

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

	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.

Retail Prices in New York.

Per 2000 lbs.	Grate and Egg.	Stove.	Chestnut.
Pittston coal, in yard	\$3 90	\$4 20	\$3 90
Lackawanna coal, in yard	3 25	4 00	3 90
Wilkes-Barre, delivered	5 00	5 30	4 60
Lehigh and Locust Mountain, del'd	5 50	5 50	5 00
Schuylkill Red Ash, del'd	5 25	5 50	4 75

The Cost of delivery for Pittston and Lackawanna coal ranges from 40 cts. to \$1 10 per ton, according to distance from the yard.

Bituminous.

Liverpool House Orrel, delivered, per ton of 2000 lb.	Price
Liverpool House Orrel	\$18 00
American	18 00
Cannelton Block, or splint	11 00
American Orrel	10 14
Red Bank Cannel	11@00
Cumberland	9 00

Baltimore, May 20, 1877.

Specially reported by Messrs. E. STABLER, JR., & CO.

Wholesale Prices.

AFLOAT BY CARGO PER TON OF 2,240 LB.	
Lump and Steamboat	\$3 40
Stove	3 40
Broken	3 25
Chestnut	3 40
Egg	3 30
In cars in dealers' yards or on switch, 15c. per ton additional.	
Lykens Valley Red Ash.	
AFLOAT BY CARGO.	
Broken	\$3 98
Egg	4 13
Stove	4 13
Chestnut	3 36
BY RAIL IN CARS.	
Broken	\$4 15
Egg	4 30
Stove	4 30
Chestnut	3 80
From wharf or yard to the trade, 50c. per ton additional.	

George's Creek, f. o. b. at Locust Point.....\$3 50 to \$3 60
Clearfield, " " Canton..... 3 30 to 3 40

Coal continues easy, but a large trade is being done in the aggregate at the low prices. The general belief is that the talk of shutting down production entirely during June and July is a stock-jobbing device.

The bark Weymouth, from Sillith, England, this week, brought 250 tons; the schooner Belle, of Rome, from Langan, C. B., 240 tons. In Nova Scotia coal there have been further contracts for gas companies at \$1.75 per ton, gold, delivered at the mines.

We quote Boston wholesale prices as follows: Anthracite, broken 4 40@4 76 Cannel, English..... \$16 00
do. egg..... 4 40@4 75 do. Buckeye..... 10 00

Commercial Bulletin.

Buffalo, May 18, 1877. Specially reported by LEE & LOOMIS.

We send you herewith amended quotations for bituminous coal in this market. Prices are somewhat lower and trade extremely dull.

Table with columns: Lump, Run of Mine, Nut, Slack. Lists various coal types and prices.

In New York city funds.

Table with columns: Anthracite, per Ton of 2,000 lbs. Wholesale. Aftoat, F. O. B., Ret. Del.

Specially Reported by MESSRS. PALEN & BURNES.

Per Ton of 2,000 lbs. on Cars. Best Connellsville Coke \$5.15 Cameron, Nut and Slack 2.50

Chicago, Ill. May 17, 1877. Specially reported by MESSRS. RENO & LITTLE.

The following are the prices to-day for coal:

Table with columns: Lackawanna Stove, Chestnut, Grate and Egg, etc. Prices listed.

Cincinnati, O. May 20, 1877. Specially reported by the Consolidated Coal and Mining Co.

APLOAT. DELIVERED. Per per ton bush. 2,000 lb.

Table with columns: Youghiogheny lump, nut, slack, Camden, W. Va., Peytona Cannel, etc.

Cleveland, O. May 21, 1877. Specially reported by MESSRS. LAMBE & BATES.

Per ton of 2,000 lbs. f. o. b. vessels. WHOLESALE.

Table with columns: Briar Hill (Church Hill), Straitsville Lower Vein, Hocking Valley, etc.

The following are the prices established by the Coal Exchange until further notice:

RETAIL TRADE. 1 to 10 tons. up w'd.

Table with columns: Briar Hill lump, Massillon and Mineral Ridge lump, etc. Retail prices.

Lehigh \$1.25 per ton higher. All sales to be strictly cash with order or C. O. D.

Hamilton, Ont. May 22, 1877. Specially reported by H. BARNARD.

The present state of our market is as follows: Grate.....\$5 00 Lehigh Lump.....\$6 25

Indianapolis, Ind. May 22, 1877. Specially reported by MESSRS. COBB & BRANHAM.

Wholesale on board cars, and retail delivered to consumers. BITUMINOUS.

Table with columns: White River, Brazil Block, Highland, etc. Prices listed.

ANTHRACITE (Lackawanna and Wilkes-Barre).

Table with columns: Broken, Egg, Sand Creek, etc. Prices listed.

Retail, per bush, delivered.

Table with columns: Block Nut, domestic use, Highland Nut, etc. Prices listed.

GAS COKE (measured.) Crushed..... 14c. Lump..... 12c.

Wilkes-Barre and Lackawanna (all sizes).....\$7 50 per ton.

Louisville, Ky. May 23, 1877. Specially reported by MESSRS. BYRNES & SPEED.

Below find latest quotations: WHOLESALE.

Table with columns: Pittsburg, Raymond City, etc. Prices listed.

RETAIL. Pittsburg..... 11c. per bush.

Table with columns: Raymond City, Indiana Cannel, etc. Prices listed.

Milwaukee, Wis. May 21, 1877. Specially reported by MESSRS. R. P. ELMORE & CO.

Retail price per ton of 2,000 lb.

Table with columns: Lehigh Lump, Lehigh Prepared, Lackawanna, etc. Prices listed.

Montreal. May 23, 1877. Specially reported by MESSRS. ROBERT C. ADAMS & CO.

Our market for bituminous coal has been depressed by the arrival of the spring fleet of timber ships, many of which bring Scotch coals as ballast.

Wholesale per ton of 2,240 lb. ex-ship.

Table with columns: Scotch Steam, Picton, Anthracite at retail, etc. Prices listed.

Philadelphia, Pa. May 24, 1877. Specially reported.

Fresh orders are very scarce. The accumulation of old orders, most of them at limited rates of freight, are assisting shippers now—that the rates are weaker.

There seems to be no rest in the coal business with the excitement and expectations of something going to turn up.

Pittston, Pa. May 23, 1877. Pennsylvania Coal Company's Coal in yard, ton of 2000 lb. Retail.

Lump, Egg and Stove.....\$2 25 Chestnut..... 2 00

Delivered, fifty cents per ton additional

Richmond, Va. May 24, 1877. Specially reported by S. H. HAWES, Dealer in Coal.

Per ton of 2,240 lb., f. o. b.

Table with columns: Kanawha Cannel, Coalburg Splint, Lewiston, etc. Prices listed.

San Francisco, Cal. From the Commercial Herald of May 17, 1877.

COAL—Imports from January 1st to May 1st:

Table with columns: Anthracite, Australian, Coos Bay, etc. Tons listed.

Coast supplies from Seattle and other Northern mines are free and so very free and liberal as to cause considerable cutting of prices in order to make prompt sales upon arrival.

The parties in interest, however,

strive to keep actual cargo sale prices entirely sub rosa, but we think \$6@8 for fine and coarse about the correct quotations. English Steam upon the spot may be quoted at \$8@8.25, which shows a slight improvement.

Sandusky, O. May 23, 1877. Specially reported by C. E. BLACK, Agt. Con. Coal & Mg. Co.

We quote coal on cars at Sandusky, as follows: Per ton of 2,000 lbs.

Anthracite. Grate, Egg, Stove, Chestnut.

Table with columns: Wilkes-Barre, Lackawanna, Lehigh, etc. Prices listed.

Bituminous. Massillon.....\$2 90 Straitsville..... 2 65

Del Carbo..... 2 65 Shawnee..... 2 65

Hocking Valley..... 2 25 Bloesburg..... 2 25

Toledo, Ohio. May 22, 1877. Specially reported by MESSRS. GOSLINE & BARBOUR.

There is no change in prices of coal at Toledo to note.

Ton of 2,000 lb. Straitsville lump.....\$2 75

Hocking Valley nut..... 2 35

Massillon lump..... 3 00

Shawnee lump..... 2 75

Cumberland..... 5 50

Bloesburg..... 2 35

Hocking Valley lump..... 2 75

Grate, Egg, Stove, Chestnut.

Pittston.....\$6 00

Wilkes-Barre..... 6 00

Lackawanna..... 6 00

Lehigh..... 6 75

For retail delivery, from 50c to \$1 per ton in addition to above prices is charged.

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 May 24. Per ton of 2,240 lb.

Large table with columns: PORTS, From Philadelphia, From Baltimore, From Georgetown, etc. Lists various ports and freight rates.

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

Rates of Transportation on Anthracite Coal to Tide Ports.

Table with columns for destination (e.g., Port Richmond, Harrisburg, Allentown) and rates from different sources (Pine Grove, Tamaqua, Schuylkill Haven).

From Tamaqua, to Catawissa, McAuley, Mainville, Rupert, and Daville, via Catawissa and Williamsport Branch Railroad.

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 Canal, 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 and March 31 in the "Coal Trade Review."

For freights on Lehigh & Wyoming Coals we refer to our issue of May 19.

For freights on coal via Geneva, Ithaca and Sayre Railroad we refer to our issue of May 12.

Towing.

Rates of Towing from New York to places on the Hudson River. Boats of 200 tons capacity and upwards. Per ton of 2,240 lb.

Table listing towing rates to various locations like Manhattanville, Verplanck's Point, West Point, etc.

Special Rates will be made for Sangerics and Catskill. East River and Sound Ports, from the foot of Twenty-third Street to the following points, and return, per ton of 2,240 lb.

Table listing towing rates to locations like New Haven, South Norwalk, Southport, etc.

Rates via the Hudson River are furnished to us by A. B. VALENTINE, No. 41 Jay Street. Rates via the East River are furnished by the Eastern Transportation Line.

IRON MARKET REVIEW.

New York.

FRIDAY EVENING, May 25, 1877.

American Pig.—We are reported sales by the Thomas Iron Company of about 2,500 tons of iron at \$19, \$18 and \$17 respectively for No. 1 foundry, No. 2 foundry and forge. In addition to this, we are reported sales of 700 tons of other brands of No. 1 foundry at \$19@20, and 1,000 tons at very low price. The business, both here and in Philadelphia, has been quite good during the past week, yet there is no more firmness to prices. We continue to quote No. 1 foundry, \$18.50@19; No. 2 foundry, \$17.50@18; and forge, \$16.50@17.50.

Scotch Pig.—The business doing in this article has been very limited, and only in retail lots. During the past month there has been about 1,500 tons received at this port and shipped to Canada in bond. We continue to quote Eglinton at \$25.50; Glengarnock, \$27@27.50; and Coltness, \$28.50@29.

Messrs. John E. Swan & Bros. (Limited), of Glasgow, under date of May 11, reported 113 furnaces in blast as against 110 a year previous; 135,359 tons of pig iron in Conal & Co.'s stores as against 63,254 tons at the corresponding date in 1876; shipments for the week ending May 5, 11,915 tons as compared with 12,570 tons during the corresponding week of last year; total shipments since December 25, 148,642 tons against 152,692 tons for the like period of 1875-6. The quoted No. 1 pig iron as follows: Gartsherrie 65; Coltness 68; Summerlee 60; Langloan 64; Glengarnock 61; and Eglinton 57/6. The quoted freights as follows: to New York 2; Boston 9; New Orleans 5; Baltimore 8; Philadelphia 7/6; Montreal 10; and San Francisco 25. The quoted Middlesbrough pig iron f. o. b. at maker's wharves in the Lees, as follows: No. 1 foundry 46; No. 2 44; No. 3 42/6; No. 4 41/6; and gray forge 41/.

Rails.—There is no new business reported. We quote steel rails at mills at \$46@50, and iron \$33@37.

Old Rails.—No further business is reported. We continue to quote nominally at \$19.

Scrap.—We note a sale of 150 tons of No. 1 wrought on private terms, and quote at \$24.50.

Baltimore, Md.

May 23, 1877.

Specially reported by Messrs. R. C. HOFFMAN & Co. The iron market continues dull and sales light. We note no change in prices, which remain as follows: Baltimore Charcoal... \$29@31; Mottled and White \$16@17; Virginia Charcoal... 28@32; Canal C.B. Blooms \$8@60; Anthracite No. 1... 21@22; Billets... 60@63; Anthracite No. 2... 20@21; Refined Blooms... 43@45; Anthracite No. 3... 19@20; Scrap Blooms... 43@45.

Boston.

May 15, 1877.

Pig is easy at the latest decline. Confidence has been completely unsettled by the break, and no one is now buying except to supply immediate wants. We quote \$22.50@24 for No. 1, \$22 for No. 2, and \$21@22 for gray forge. Scotch pig is firm, but very dull. We quote \$27@30 for store lots, these being the best figures that could be actually obtained.

Bar is dull, quoting \$46@47 for refined, and \$37@38 for common. Nails are in light demand at the reduction.—Commercial Bulletin.

Buffalo.

May 21, 1877.

Specially reported by Messrs. PALEN & BURNS. Below please find present quotations for pig iron in this market. There seems to be but very little doing, and most of the consumers are purchasing in small lots to supply immediate wants. We are having more inquiry of late for a first class American Scotch iron to take the place of imported brands. As present freights by canal are lower than ever before we are enabled to supply our Cherry Valley Black Band iron (which is considered equal in quality to Scotch) at a much lower price than the latter iron can be sold for. Consumers would be wise in testing the merits of this home brand.

Table listing iron prices for No. 1 Foundry, B. 1, No. 2, Gray Forge, L. S. Charcoal No. 1, etc.

Chattanooga, Tenn.

May 22, 1877.

Specially reported by J. F. JAMES, dealer in pig iron, ores, etc. The market here remains in about the same condition as last reported. Charcoal irons of standard brands in fair demand with light stocks. Besides the usual average shipments South of f car load lots I have to report sales amounting to 600 tons for the week. No change to note in prices.

Table listing iron prices for Tenn., Ala. and Ga. Charcoal, No. 1 Foundry, etc.

Iron Ores.

Table listing iron ore prices for Red Hematite, I. o. c. at mines, Brown Hematite, etc.

Cincinnati, O.

May 22, 1877.

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

The following are the closing quotations of our pig iron market:

Table listing pig iron prices for Hanging Rock No. 1 Foundry, Soft Silver Gray, Tennessee, No. 1 Foundry, Ohio, No. 1 Foundry, etc.

Cleveland, O.

May 18, 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.

Table listing iron prices for No. 1, L. S. Charcoal, No. 2, Anthracite, No. 1, Bituminous, etc.

Louisville, Ky.

May 22, 1877.

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

The market is practically unchanged. Fair demands for working purposes, but few purchasers for the future. The usual time—four months—is allowed on the quotations below.

Table listing iron prices for No. 1 Hanging Rock, No. 2 Southern Charcoal, No. 1 Hanging Rock, Stonecoal and Coke, etc.

Montreal.

May 15, 1877.

We quote Pig Iron—Gartsherrie, \$19 to \$19.25; Summerlee, \$18.50 to \$19; Eglinton and Clyde, \$18 to \$18.50; Langloan, \$19.25 to \$19.75; Coltness, \$20.25 to \$21; Hematite, \$26 to \$27; American, \$19 to \$19.50. Bars—Scotch and Staffordshire, \$1.90 to \$1.95; best do., \$2.20 to \$2.25; Swedes and Norway, \$4.50 to \$5; Lowmoor and Bowling, \$6.25 to \$6.50.—Monetary Times.

Pittsburgh, Pa.

May 15, 1877.

Specially reported by A. H. CHILDS. 4 mos. No. 1 F'dry... \$22 00@24 00; Mottled & White... \$17 50@20 00; Gray Forge... 19 00@22 00; Cold " Western 40 00@45 00.

Philadelphia, Pa.

[Weekly Report of the Philadelphia Iron Market, furnished for THE ENGINEERING AND MINING JOURNAL, by JUSTICE COX, JR., & Co., Iron Manufacturers, 333 Walnut Street, Philadelphia. Week ending May 24, 1877.]

PIG IRON—The sales of pig iron have been much larger the past week than for some months, but nothing better as to price. We report sales of about 5,000 tons in lot, varying from 20 to 1,000 tons. And quote No. 1, \$19 to \$20; No. 2, \$7.50 to \$8; Gray Forge, \$17 to \$19.

MANUFACTURED IRON—The demand for bars continues about as at our last, and mills in this neighborhood are running about full; nothing better as to price. We quote: bars 2 to 2-1/2-10c. per lb. There is nothing new to report in either Plate and Tank iron; most mills are fairly busy. We quote 2 1/2 to 7c. as to brand and quality. The orders placed for Skelp last week will keep the mills so fortunate as to get them busy for some time. We quote 2 1/2 to 2 3/4 c. per lb.

STEEL RAILS—We have nothing new to report in steel rails. The demand keeps up, and most mills continue busy on old orders, or what few small ones they get from time to time. We quote: \$47 to \$50 at mills.

IRON RAILS—The demand for light sections continues heavy; rails are not selling. We quote: \$34 to \$36 at mills.

OLD RAILS—This has been quite an active week in

COAL TRANSPORTATION AND GENERAL MINING STOCKS.

Main table with columns: Name and Location of Company, Feet on Vein, Capital Stock, Shares (No., Par Val.), Assessments (Total levied to date, Date and amount per share of last), Dividends (Total paid to date, Last Dividend, Rate per Ann.), Highest and Lowest Quo. per Share in Currency (May 19-25), and Sales.

g. Gold. s. Silver. L. Lead. c. Copper. ** Non-Assessable. Total Assessments levied to date \$40,777,090 Total Sales of Coal Stocks for the week 480,312 shares. Total Dividends disbursed to date 112,395,400 Total Sales of Mining Shares for the week 62,265 "

Cambria Iron Company. 60 shares @ \$60 1/4 per share. Pennsylvania Salt Manufacturing Company. 38 shares @ 66 per cent. The St. Nicholas Oil Company has declared a dividend of 6 per cent. The Little Schuylkill Navigation Company gives notice that its 7 per cent. mortgage bonds secured will fall due October 1, 1877, and will be paid upon presentation, the interest ceasing upon that date.

Copper Stocks. Reported by Wilson W. Fay & Co., Bankers and Brokers Room 7, Traveler Building, 31 State Street. BOSTON, THURSDAY EVENING, May 24, 1877. The market closes very dull; no animation or life left in it. Calumet is fairly steady, at \$175 bid, without sale. Central strong at 38 bid, and no stock offering under 40. Copper Falls, 1 1/2 bid. Duncan Silver after declining to 1 1/4 is now 2 11-16 bid with some de-

gree of strength. International has sold as low as 25, but closes .30 to .35. Quincy is 38 bid, with a sale today at that figure. The bidding prices for the week will show all further particulars.

Salt Lake Ore and Metal Market. SALT LAKE CITY, UTAH, May 25. Argentiferous Lead (Base Bullion).-\$60 to \$65 per ton for lead. \$1.19 per ounce for silver. \$20 per ounce for gold. The quotations for silver are based upon the

silver contents in the lead of 70 ounces per ton of 2,000 lb.

The *Inter-Ocean's* correspondent under date of the 18th inst. says: "The bullion market is very much depressed and prices are entirely nominal. Ores are very dull indeed, and prices are exceedingly low. Several of the Eastern refiners are owners of smelters here, and their bullion goes forward as fast as made, but the others are only shipping to complete sales made some time ago, and old contracts. The depressed state of the lead market is seriously affecting the mining interests of the Territory, and, if much longer continued, will have the tendency to reduce our production for the year very materially. There are many low-grade mines that cannot be worked if lead has to be sold for less than 70 cents per ton, equal to about 6½ cents a pound in New York. The shipment of ore and bullion for the week ending May 12, were as follows: To Pittsburg, 8 cars; to Omaha, 12 cars; to St. Louis, 8 cars; to New York, 4 cars; to Chicago, 8 cars. Lead ore: To Pittsburg, 15 cars; to Melrose, Cal., 7 cars; to Hilliard, 7 cars. Total bullion, 832,965 pounds; lead ore, 602,050 pounds; grand total, 1,435,015 pounds. The great suit of the Montreal and Old Telegraph mines, involving property valued at from one to two million dollars, was decided this morning by the jury in favor of the Old Telegraph Company. This case is one of great importance, and has already been in the courts two or more years. The question involved the validity of the United States patent against other questions or claims, and the decision was in favor of the United States title."

SILVER QUOTATIONS IN LONDON.

The quotations of silver in London for the week ending May 25, are given in the following table:

May 10th.....54½d.	May 23d.....54d.
" 21st.....54½d.	" 24th.....54 1-16d.
" 22d.....54½d.	" 25th.....54d.

The total amount of silver coin issued by the U. S. Government from April 20th, 1876, to date is \$31,738,400.

Gold and Silver Stocks.

NEW YORK, FRIDAY EVENING, May 25, 1877.

The business in the American Mining Board has been very quiet and featureless, although the transactions have been greater than they were during the previous week. The Polar S. and Moose mines have not yet been accepted by the board, although the stocks have not yet been offered. It is thought that the first offers of these stocks will be made on Monday. The Comstock stocks have held the majority of the business. Seaton has ranged from 1½ to 2%, closing at 1½, with sales of 2,880 shares. Leopard, with sales of 8,400 shares, has ranged from 1 to 1¼, closing at 1¼. A meeting of the board was held during the week to consider a consolidation with the New York Mining Stock Exchange, and to discontinue calling railroad and general stocks.

We condense the following from the *Gold Hill News* of the 16th inst. The Bonanza Mines still maintain their output of ore. The south drift on the 1650-foot level of the Consolidated Virginia is being pushed ahead to connect with the deep winze. The heat in this drift is very great, and the progress necessarily slow. The upraise from this level is up 60 feet, the entire distance in good ore. The flow of water in the C. & C. shaft is easily handled by the pumps. The northeast drift on the 2,000-foot level of the Crown Point Mine is being steadily driven, the face in ledge material that is constantly improving in character. At a recent meeting of dissatisfied stockholders of this company an elaborate report was read relative to the affairs of the company, in which the following statements were made: "Since January 12, 1875, eight assessments have been levied, aggregating \$750,000. During 1876, 66,941 tons of ore were reduced, the product being \$1,078,718. The total paid for milling was \$567,109, leaving a balance to the company of \$411,519. To this add \$500,000 drawn during that year in assessments, and the total working expenses of the mine amounted to \$911,519; and in addition to this the management contracted an indebtedness of \$135,000, making the total expenditure during 1876 of at least \$1,046,519. In 1876 Yellow Jacket levied assessments amounting to \$350,000; Bullion (first since 1872), \$250,000; Overman, \$340,000; Caledonia, 260,000; and Imperial, \$350,000. These companies did not mill any ore in 1876. Mr. McKee desecated at length upon the alleged iniquities of the present Board of Directors, and expressed his belief that the stock will become utterly valueless if immediate measures be not taken to check the present extravagant outlay."

Chollar-Potosi is yielding 100 tons of ore per day. This company has levied an assessment of \$2 per share, delinquent on the 15th prox., the first since June, 1876. This making the total amount levied \$1,338,000. The combination shaft is being pushed steadily downward at the rate of three feet per day, which, considering the immense size of the excavation, is an unusually rapid rate of speed. The new shaft of the Yellow Jacket Mine, which is being sunk 2,600 feet east of the old works and shaft of the company, is a highly important move in the right direction. It will cut the ledge at a depth of nearly 3,000 feet below the surface, and through it the mines, from Exchequer to Crown Point, can be worked for much less than one-half the present cost. The Belcher Mine is yielding 80 tons of ore per day, keeping the Santiago mill steadily crushing. The main incline is making steady progress downward, the flow of water still continuing quite strong. The various workings in the Sierra Nevada Mine are increasing in richness as they progress. The diamond drills are prospecting in different parts of this mine, with very favorable indications in some parts. The water in the Savage Mine is being gradu-

ally lowered in incline, the strong head having been entirely overcome, and the pumps, when run in conjunction with those of the Hale & Norcross, being able to lower the water with much greater ease than at any time in the past. The Sutro Tunnel is in 16,762 feet. Face of header in hard rock which blasts and works disadvantageously. Occasional small streaks of quartz and clay are met with.

In view of the general distrust prevalent in San Francisco, the following from a letter, relating to the North Consolidated Virginia Mine, which we take from the *San Francisco Stock Report* of the 11th inst., is in marked contrast to some of the reports of the companies which have lately been published:

"We have received in assessments on 93,000 shares of stock \$209,250. From the sales of the capital stock there has been received \$21,280, making a total of \$230,530. Our machinery and all surface improvements have cost \$65,000, and we have expended in the construction of the shaft and a drain tunnel about \$175,000. The shaft is in all respects a superior one, and the machinery will in all probability prove serviceable to a depth of 1,700 or 1,800 feet, excepting, perhaps, the lift engine. The total depth of shaft on the 20th ult. was 1,280 feet, the last 80 feet passing through low-grade ore, assaying from five to eight dollars per ton, and which is improving as we descend. . . . The Trustees and President do not receive, nor have they ever received, any pay or emoluments whatever. Permit me to hope that the present assessment will be paid promptly. Should it not be, and operations be suspended by reason of such default, the injury to the mine will be incalculable, and in my judgment you will lose the fruits of your patience and investment."

We glean the following from our exchanges published near the respective mines:

The *Columbia Gold and Silver Mine*, located on the Comstock Lode near the Daney, was sold at Sheriff's sale on the 17th inst. to satisfy a lien. It was bid off by J. B. Winters for the sum of \$18,396.96, he having a mortgage on the property amounting to \$13,353.34, besides \$2,670.98 accrued interest, which had to be satisfied before the claim of lienholders.

The *American Basin Silver Mine* is located in the Star District, Nev. A very fine body of ore has recently been struck in this mine, from which considerable milling ore is being extracted and shipped.

The *Hite Gold Mining Company*, of Sierra Co., California, has declared a dividend of 20c. per share.

The *Empire Gold Mining Company*, of Sierra Co., California, has declared a dividend of \$1 per share, amounting to \$10,000.

North Fork Gold Mining Company.—The ledge of gold-bearing sulphurets recently discovered in this mine, which is located at Forest City, California, is proving a perfect bonanza. Up to the 9th inst. the company had taken out in the neighborhood of \$100,000. In one day's work this week over \$20,000 worth of the precious metal was taken out.

The *Monarch Silver Mine*, which is located in the Central District, Nev., is producing some very rich ore in small amounts.

The *Placer Mines in Oregon*, located near the Virtue & Pocahontas Mines, have recently produced very extensively, and considerable excitement exists.

The *Sulphur Bank Quicksilver Mining Company*, of Lake County, Cal., turned out 1,056 flasks of quicksilver on April account.

The *Modoc Consolidated Silver Mine* had shipped \$44,578 in bullion, to the 13th inst., on May account.

The *New York Hill Gold Mining Company*, located at Grass Valley, California, shipped about \$6,000 in bullion on April account.

The *Gwin Gold Mine* is located in Calaveras County, California. Excellent rock has been struck in the 1300-foot level of this mine. The mills have started up again, and work is being pressed forward with unusual energy and vigor. The pay chute is bounded both sides—or on both ends, rather—by a zone of barren quartz which has to be penetrated before good ore is reached. The rock now being mined is fully as good as any previously found, the ledge being seven feet wide.

The *Rye Patch Silver Mine* of Nevada is shipping bullion at the rate of \$1,000 per day.

The *Leopard Silver Mine* is located in Cornucopia District, Nevada. A rich strike is reported to have been made on the 600-foot level of this mine. The Company had been running parallel with the new ore body for some time, and by diverging a little from the main course of the drift the ore was struck. This company has levied an assessment of 50c. per share, amounting to \$25,000, delinquent on the 3d of June; this is the first assessment since March, 1876, and a total amount of \$75,000 which has been collected on this account.

NEW YORK MINING STOCK EXCHANGE.

The sales for the week amount to 16,351 shares, an increase of 3,469 shares as compared with our last.

Lacrosse has been the most active, with sales of 8,800 shares at from 36@30c., closing at 29. The opening price for the week was 34c.

The sales in copper stocks have been very limited, with prices about the same; closing quotations show a downward tendency.

Sales.

Allouez.....	100 shares @ \$5
Atlantic.....	1,051 " @ \$7½ @ \$8
Central.....	150 " @ \$40

Closing Quotations.

Allouez..	3 50	Mesnard..	1 00
Atlantic..	7 37½ 7 62½	National..	25 50
Cal'tHecla	175 00	Oscocla..	19 00 23 00
Central..	39 00 42 00	Pewabic..	1 00 2 00
Franklin..	8 00 12 00	Quincy..	37 00 40 00
Madison..	15 25	Ridge....	2 00¼ 4 00

Gas Stocks.

NEW YORK, FRIDAY EVENING, May 25, 1877.

The market for gas stocks is very weak, and we lower many of the quotations, notably those of the Brooklyn Companies.

The *New York Gas Co.* will hold its annual meeting on the 4th of June.

The *Fishkill (N. Y.) Gas Co.* has made a contract to light the streets of Mattewan for the ensuing year, as follows: Twenty-seven gas lamps at the rate of \$33.33 1-3 each, and nine kerosene lamps at the rate of \$31.00 each, for one year.

Reduction in the prices of Gas at various places have been recently announced, as follows:

Annapolis, Md.....	\$3 00	Hagerstown, Md....	3 50
Baltimore.....	2 50	Martinsburg, W. Va..	3 00
Cumberland, Md....	2 70	Winchester, Va.....	3 50
Frostburg, Md.....	3 00	*Harrisburg, Pa....	1 50
Frederick, Md.....	3 60	*Reading, Pa.....	1 50
Georgetown, D. C..	2 75		

* These rates to go into effect on the first of June.

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.	Rate per an.	Am. of last.	Date of last.	Dividends.		Quotations.	
						Bid.	As'd		
Mutual, N. Y.....	\$								
" Gold Bonds	5,000,000	\$100	10%	2½	Apr. '77	90	94		
N. York "	90,000	1,000	7%	3½	Feb. '77	107	107		
Metrop. "	4,000,000	100	10%	5	Nov. '76	130	134*		
" Certf.	2,500,000	100	10%	5	Sep. '76	130	135		
" Bonds	1,000,000	100	7%	3½	" "	100	103*		
Harlem "	500,000	1,000	7%	3½	Dec. "	102	—		
Manhat. "	1,850,000	50	8%	4	Feb. '77	100	102		
Brooklyn, B'klyn.	4,000,000	50	15%	15	Dec. '76	200	205		
Nassau, "	2,000,000	52	15%	15	Nov. '76	—	165		
" Certf.	1,000,000	25	15%	4	Jan. '76	—	82		
People's, "	1,000,000	1,000	7%	3½	Nov. '76	95	—		
" Certf.	1,000,000	10	10%	3½	Jan. '76	—	51		
" B'ds	300,000	1,000	7%	3½	July '76	84	90		
Metrop. "	325,000	100	7%	3	Feb. '77	90	96		
Wms'rg "	1,000,000	50	10%	3	Oct. '76	120	130		
" Certf.	1,000,000	100	7%	3½	July "	100	112		
Citizen's "	1,200,000	20	10%	2½	Jan. '76	—	90		
" Certf.	320,000	1,000	7%	3½	Oct. "	98	102		
J. C. N. J.....	750,000	20	10%	5	July '75	160	—		
Cent. Westch N.Y.	466,000	50	7%	4	July "	85	90		
Subur'n "	295,000	50	7%	3½	Oct 1 '76	90	100		

* Ex-Dividend.
‡ Paid irregularly.

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

Postage or expressage on samples must always be prepaid.

Communications, samples, etc., to be addressed to **ENGINEERING AND MINING JOURNAL, (P. O. Box 4404.) 27 Park Place, New York.**

Western Office, **ENGINEERING AND MINING JOURNAL, Denver, Colorado.**

ANSWERS.

SAMPLES.

36. J. A. J. C., Alpine.—The samples sent consist of braunite (sesquioxide of manganese) associated with small specks of galena, in a quartz gangue. There is probably no silver in it, or, if there is, it will be found in connection with the galena and not with the manganese.

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ADVERTISERS' INDEX.

Table listing various categories such as Air Compressors, Assaying Tools and Chemicals, Auction Sales, Blasting Powder, Blowers, Books and Periodicals, Cement, Coal, Gas Process, Hoisting Machinery, Hot Blast Stoves, Hotels, Hydraulic Jacks and Punches, Injectors, Locomotives, Machinists' Tools & Machinery, Mineral Wool, Mining, Crushing, Stamping, and Smelting Machinery, Oil, Patents, Power Hammers, Pumps, Railroads and Transportation, Roofs, Girders, etc., Rubber and Belting, Smelting and Refining Works, Steam Engines, Steel Works, Tubes and Pipes, Ventilators, Water Wheels, Wire Rope, and Miscellaneous.

Table listing names and page numbers for various categories including Swords, Williams, Coal and Ore Separators, Engineers and Chemists, Fire Brick, Gas Process, Hoisting Machinery, Hot Blast Stoves, Hotels, Hydraulic Jacks and Punches, Injectors, Locomotives, Machinists' Tools & Machinery, Mineral Wool, Mining, Crushing, Stamping, and Smelting Machinery, Oil, Patents, Power Hammers, Pumps, Railroads and Transportation, Roofs, Girders, etc., Rubber and Belting, Smelting and Refining Works, Steam Engines, Steel Works, Tubes and Pipes, Ventilators, Water Wheels, Wire Rope, and Miscellaneous.

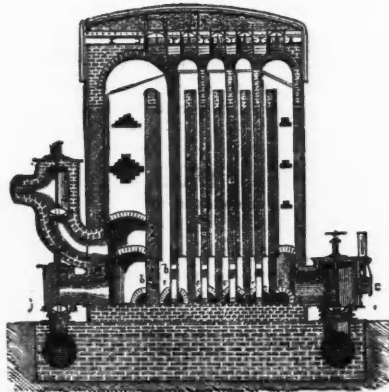
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70,000 TONS

PITTSTON COAL,

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Delivery will be made, if desired, in Company's boats, at New York or Brooklyn, at a charge of Sixty Cents per Ton additional to the sale price.

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150,000 TONS SCRANTON COAL.

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New York, May 22, 1877.

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150,000 TONS OF COAL,

from the Lackawanna Regions, of the usual sizes, deliverable at Hoboken, during the month of June, 1877. The sale will be positive; each lot put up will be sold to the highest bidder.

No Bids, in any form whatever, being made for account of, or on behalf of the Company.

The conditions will be fully made known at the time of sale.

TERMS—FIFTY CENTS PER TON, payable in current funds, on the day of Sale, and the balance within ten days thereafter, at the office of the Company.

- SAMUEL SLOAN, President.

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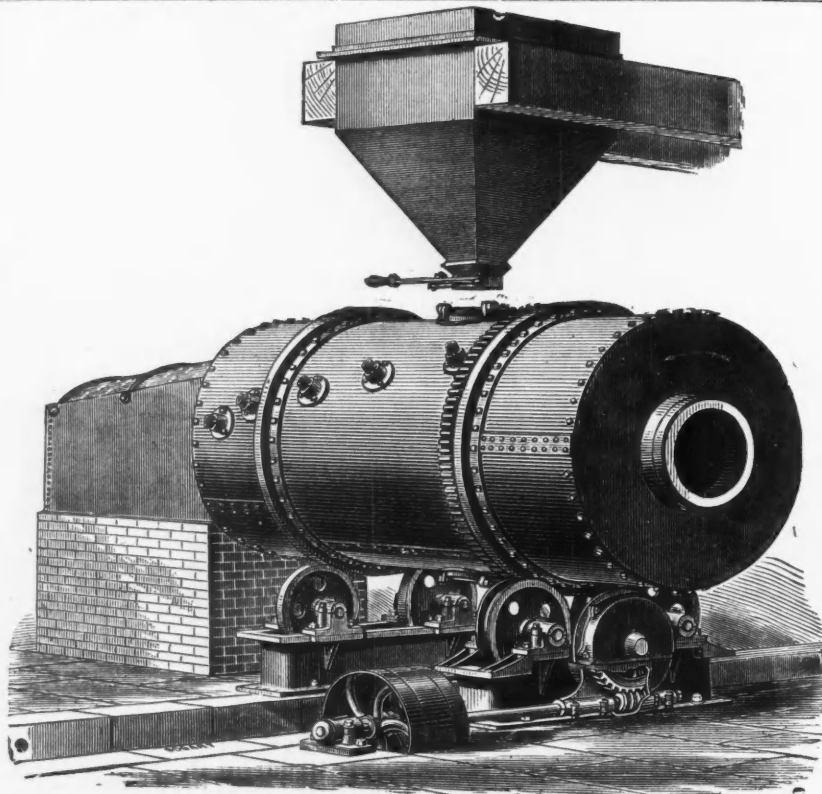
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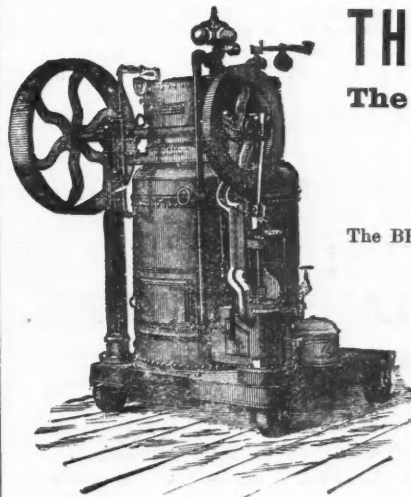
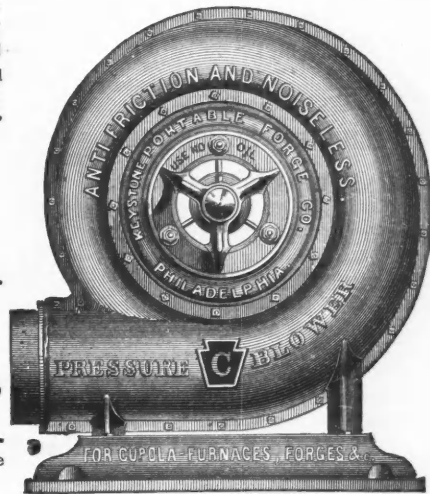
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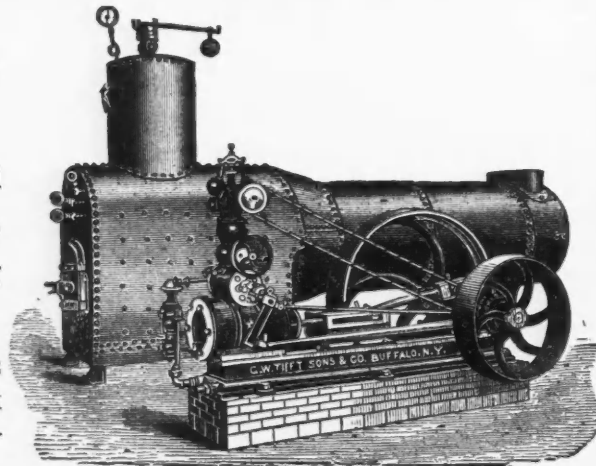
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