THE ENGINEERING AND MINING JOURNAL.

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NOTE.—Communications relative to the editorial management should be adressed to Mr. ROTHWELL. The articles written by Mr. Raymond will be signed with a star.

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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.

OPEN-HEARTH STEEL AND AMERICAN FERRO-MANGANESE.

There can be no doubt as to the important part which the open-hearth steel process is destined, within a few years, to play in the development of the steel industry of this country. Hitherto the rapid adoption of open-hearth steel processes has been much checked by two serious drawbacks to the economical production of steel in this way, and the great advantages in some particulars which the Martin process possesses over the Bessemer have been allowed to pass unenjoyed.

One chief advantage of the open-hearth process lies in the fact that a large proportion of old iron, in the shape of scrap or worn-out rails, can be used to advantage, while the Bessemer process requires the use of new materials throughout; or if any old material is used, the percentage of it employed is very small in comparison with the total product. A second great advantage is that the product can be made of any quality desired in respect of hardness. The bath of molten steel can be kept fluid for hours, leisurely studied, and altered by the addition of the requisite elements to suit any purpose for which the product is intended. In the Bessemer process, on the contrary, the time during which the metal can be kept in a fluid state after the termination of the "blow" is too short for any such manipulations. A test sample cannot be taken and examined before the contents of the vessel have to be emptied. The appearance of the flame issuing from the mouth of the converter at the end of the blow gives the only indication as to the amount of carbon remaining in the iron, to which, of course, is to be added the carbon introduced in the spiegeleisen, to give the total carbon in the product. The skill displayed in managing the blow in such a way as to get so uniform a product for rails as that produced by our Bessemer works is wonderful, still a difference of 1 to 2 per cent. of carbon in successive blows is the rule rather than the exception. In this respect the Martin process offers very decided advantages, which are more particularly appreciated when the steel is to be used for boiler-plate, or other purposes than rails.

The disadvantages of the Martin process have been, first, the excessive cost of furnace repairs per ton of ingots produced; secondly, the necessity of using high grades of ferro-manganese, hitherto an expensive article, in order to keep the carbon low enough to permit the use of old material, containing appreciable amounts of phosphorus, and still to keep the mechanical qualities of the steel nearly or quite up to the standard of the best Bessemer metal, made of new and expensive pig-iron.

Our present object is, however, not to discuss at length the comparative advantages of the pneumatic and open-hearth processes, but to call attention to the manner in which the drawbacks to the latter process are being overcome. To this end we would refer those interested to an Institute paper on the manufacture of ferro-manganese in blast-furnaces, by Mr. W. P. WARD, formerly one of the editors of this journal. Mr. WARD has displayed metallurgical skill, energy and considerable pluck in bringing to a successful solution the problem of manufacturing in this country (and by a cheaper process than that employed abroad) the necessary article, *cheap* ferro-manganese. The paper which appears elsewhere in our columns, as read before the February meeting of the Institute, gives considerable information on the subject of his experiments, and a comparison with the results obtained in similar experiments in Austria. The author also predicts the early and easy reduction of the excessive cost of furnace repairs in the Martin process, by the plan of water-cooling, which has been recommended by Mr. HOLLEY. If both of these objects can be, or are already accomplished, there can be no doubt that the open-hearth process will soon be employed to manufacture a large portion of the steel used in the country, while the cheap production of steel of the exact quality required for any particular use, will cause this material to supplant wrought-iron for many purposes besides rails.

THE LOWE GAS PROCESS,

The favorable expressions we have heretofore indulged regarding this system, as employed in the manufacture of illuminating gas, appear to be justified by its recent operations, and it is gratifying to report its introduction into a number of new places. Works are nearly finished in Lancaster, Pa., which will start in May, and a little later in the season it will be in operation in Indianapolis, Ind.

The new Company, in Baltimore, Md., are putting down 100 miles of mains and erecting extensive buildings and tanks with a capacity of a million feet per day. As the old organization is controlled by the management of the New York Companies and has had a substantial monopoly of the business, it will be interesting to watch the contest at that point. That the new enterprise is very popular appears from the fact, that the Company have already secured 8,000 consumers pledged for their gas at $2.00 per thousand (in place of $3.00 now charged.) As the article now furnished is not of a high quality and the new Company promise 18 candle-power, we congratulate the citizens there and suggest that our own people should investigate on their own behalf. The owners of the Lowe process claim that these new works will show results superior to any heretofore attained, because the plan itself will be more perfect than the earlier ones, while the pipes will be entirely new and clean. At Utica and Philadelphia the gas had to encounter the dirt and condensation deposited in the old pipes by the coal gas during years of use and owing to its peculiar quality of dissolving and carrying the ingredients therein contained, much annoyance was temporarily occasioned by stoppage of burners until the mains were gradually cleansed by its passage, after which no further trouble occurred. There is one point of special importance to consumers which has been so thoroughly settled in regard to the new process as to deserve mention. An inherent quality in coal gas renders it impossible for its manufacturer, even when stimulated by an exceptional excess of "conscience" to deliver to his distant customer the standard 16 candle light. This is because the illuminating hydro-carbons are sensitive to low temperatures, and coming in contact with the cold mains, condense. Both practice and experiment prove that the Lowe gas possesses a very positive advantage in this respect. To finally demonstrate the fact, two methods were employed by two experts of eminence, investigating independently and without knowledge of each others experiment. The first exposed the gas in a 50 feet coil of ½ inch lead pipe packed in a cask of ice, snow and salt, at a temperature of 12° below zero. The value of the gas was obtained by the photometer before entering the still, and, after being held therein a sufficient time, was again tested and found to have lost *less than one-half of one candle in power*. The second, selecting a cold winters day, drew one sample of gas from the holder and another from a street lamp, at a distance of 5 miles from the works and just at twilight, thus obtaining gas that had lain for 12 hours in the chilled pipe. Analysis was then made to obtain the percentage of the hydro-carbon, these being as before stated the most condensible constituents. The result showed a shrinkage of only 18-100ths of one per cent. These tests so fully confirming each other are an additional evidence of the excellence of the new gas.

THE GODERICH SALT REGION.*

By T. Sterry Hunt, LL.D., F.R.S.

(*Concluded.*)

In calculating the results of mining rock salt it is necessary to know its specific gravity, and upon this point there are found great discrepancies, the determinations by different observers worthy of confidence varying from about 2·00 to over 2·25, so that Prof. Henry Wurtz has been led, from a comparison of a great number of observations, to conclude that these differences correspond to different degrees of chemical condensation. In the present case I sought to fix with as great care as possible the specific gravity of selected specimens of pure rock salt from the white layers of the second bed (Division VIII) of the section. For this purpose freshly distilled oil of turpentine, having a specific gravity of 0·863, was used, and the determinations were made at 15°C. Two fragments of the transparent colorless salt, weighing respectively a little over four, and ten and a half grammes, gave each a specific gravity of 2·172; a third fragment of about ten grammes, 2·168; and a fourth of nearly five grammes, 2·133. This last was imperfectly transparent and was seen, under a small magnifying power, to contain numerous little cavities filled with brine, to which its lower specific gravity is to be ascribed. We may, I think, accept 2·172 as the density of the pure pellucid rock-salt of this bed, but for the purposes of calculation in mining, the lowest figure, or more conveniently 2.125, being two and one-eighth times the weight of water, may be safely assumed for the great mass of salt.

A layer of rock-salt one foot in thickness with a specific gravity of 2·125, will contain for each acre of superficies (4840 square yards) 2873 tons of 2000 pounds, or 2582 gross tons of 2240 pounds; which gives for the layer of white salt 10¾ feet thick, 27,751 gross tons, equal to 1,110,280 bushels (estimated at 56 pounds each) to the acre. As regards the loss in mining from pillars left behind, etc., the average in coal mining in England is estimated at twenty per cent., and as the finely broken salt is, unlike the coal, merchantable, the loss in mining solid undisturbed ground at Goderich, should not exceed this. If then, we suppose eighty per cent. of the salt from the white layer of 10¾ feet, to be got in a merchantable shape it will be equal for each acre to a little over 22.200 tons or 880,000 bushels—so that the produce from mining twenty acres of this layer would be equal to the entire salt production of the United States in 1870.

It is scarcely necessary to enlarge upon the vast economical importance of such a salt-deposit as this, or upon its value to the industry and commerce of the country. In place of the comparatively laborious and costly process of manufacturing salt from brines, in a region remote from coal, where wood is yearly increasing in price, we have offered to the miner a deposit practically inexhaustible in extent and, in large part, of exceptional purity, while the finer qualities of salt may here be cheaply obtained for the supply of the vast and

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

populous regions which are readily accessible by the great lakes. The opening of such mines would yield, at lower rates, salt, somewhat less pure, which would be well adapted for the wants of the chemical manufacturer, and the agriculturist.

In conclusion, it remains to notice some points relating to the geology of this deposit, and to the occurrence of salt in North America. To the east of the Rocky Mountains, previous to its discovery at Goderich in 1866, rock-salt had been found only in two localities; one of these being in Western Louisiana, on the gulf of Mexico, and the other at Saltville, Washington County, in Southwestern Virginia. This latter deposit, where rock-salt is associated with gypsum and marls, although situated in the midst of paleozoic rocks, is, by Prof. Lesley, regarded as probably of tertiary age, and as occupying a very limited basin. The sources of the brines in the salt-wells of the Ohio valley, and of Saginaw, in Michigan, are supposed to be near the base of the carboniferous series. The Michigan salt-group of Winchell being above the Devonian sandstones but beneath the limestone which there underlies the coal measures. Rock-salt has never, so far as I am aware, been detected in the borings at this geological horizon.

The saliferious formation of New York was called by Vanuxem the Onondaga Salt group, but to prevent confusion with the Onondaga limestone (a subdivision of the overlying Upper Helderberg group) the synonym of the Salina formation, from the town of Salina (named for its salt-works) near to Lake Onondaga, is to be preferred. The Salina formation has a position in the Geological column in the upper part of the Silurian series. It rests conformably upon the magnesian limestone of the Niagara formation, and in western Ontario upon a similar rock, which, although apparently an upward continuation of the Niagara, has for paleontological reasons been separated from it and designated the Guelph formation. At its north-eastern outcrop in Montgomery county, New York, the Salina is only a few feet in thickness, but westward along its northern outcrop it rapidly augments in volume and attains in Wayne County a volume of 700, and even, in parts, it is said, of 1000 feet. Where it crosses the Niagara river this thickness is reduced to less than 300, and in Ohio, according to Newberry, to less than twenty feet, while Winchell found in northern Michigan only thirty-seven feet of strata representing the Salina formation. Here, however, the formation is characterized, as in New York and in Ontario, by the presence of gypsum. In its greater development, in New York, it consists, in the lower portion of variegated red and green marls, overlaid by gray or drab dolomites and shales, with beds of gypsum, sometimes accompanied by native sulphur in small quantities. Cyrstalline plates of specular iron ore, as pointed out to me by Dr. Goessmann, are also sometimes found in druses in the dolomites of this formation.

Overlying the Salina formation are found the water-lime beds, which are dolomites like the underlying strata, and contain the remains of *Eurypterus* and some other crustaceans. This division united with the Lower Helderberg by Vanuxem, is separated alike from it and from the Salina by Prof. James Hall, who, however, shows that the Water-lime is more closely related to the Salina, from which it is not always easy to distinguish it. The Lower Helderberg, consisting at its base of dark blue non-magnesian limestone, with tentaculites, succeeded by divisions characterized by pentameri, spirifers and crinoids, indicates conditions of deposition which were very different from those of the two preceding periods and did not extend further westward than the center of the State of New York, beyond which the Lower Helderberg limestones are absent, and those of the Upper Helderberg rest directly on the water-lime beds, sometimes within and sometimes without, the interposition of a thin stratum of silicious rock representing the Oriskany Sandstone. This appears to have been spread over portions of Ontario, but to have been partially removed by erosiom before the deposition of the succeeding limestones.

Of the extension of the Salina formation southward beneath the overlying strata, nothing is known until we reach Central Pennsylvania where, immediately beneath the well characterized Lower Helderberg (Lewiston) limestone appears a series of thin bedded, more or less argillaceous, limestones, 580 feet thick, which have been referred to the Water-lime formation. These rest upon 375 feet of fossiliferous limestone and shales, which, in their turn, repose upon the strata of the Clinton formation. Mr. Ashburner of the Second Geological Survey of Pennsylvania, to whose recently published valuable section we are indebted for these details, suggests that these 375 feet may "represent equally or conjointly" the Niagara and Salina formations of New York, [*Trans. American Philosophical Society* Feb. 16, 1877), It is clear that the conditions which gave rise to the gypsiferous, saliferous and non-fossiliferous beds of the Salina, did not extend to this region.

No rock-salt has as yet been discovered in the Salina formation in New York, which is nevertheless regarded as the source of the brines of Syracuse and its vicinity. Hopper shaped cavities, supposed to be due to the removal, by solution, of crystals of salt, are however found in marls at the outcrops of this formation, both in New York and farther westward, in Ontario. It is not perhaps generally known that the numerous salt-wells of the Syracuse region, though occurring along the outcrops of the Salina formation, do not penetrate into it, but are sunk in a deposit of stratified sand and gravel, which fills up a valley of erosion, measuring nearly four miles from North to South by two miles from East to West. The marls belonging to the base of the formation crop out to the northward, and are found in the various borings beneath the ancient gravel-deposit, which is itself covered by thirty or forty feet of more recent loam or sand. The bottom of the basin is very irregular, the marls being met with at depths of from 90 to 180 feet in some parts, and at a depth of 382 feet in the middle of the basin, the greatest depth of which, according to Mr. Geddes, is not less than 414 feet below the surface-level of Onondaga lake, and 50 feet below the level of the sea. (*Trans. New York State, Agricultural Society*, 1859.)

We have seen that the outcrop of the Salina formation, passing from New York, with a thickness estimated at less than 300 feet, crosses the Niagara River above the cataract, and enters the province of Ontario, where its distribution has been carefully studied by Mr. Alex. Murray, of the Geological Survey of Canada. By reference to their geological map, on which the Water-lime beds are included with the Salina formation, and represented by the same color, the series may be traced between the underlying Guelph and the over-lying Upper Helderberg (Corniferous) formation, nearly westward from the Niagara River to Brantford, and thence north-northwest to Southampton at the mouth of the Saugeen River on Lake Huron, a distance of about 180 miles. From this point, its outcrop stretches southward along the lake for fifty miles to Goderich, where the higher beds of the series disappear, being overlaid to the eastward by the limestone of the Upper Helderberg. Beneath the waters of the lake the outcrop of the Salina turns again to the northward, and reappears in the Duck Islands south of the Grand Manitoulin, and at the Straits of Mackinac. The arrangement of the strata north and east of Goderich shows the existence of a shallow synclinal dying out to the southward, and enclosing a tongue of the over-lying limestones. These, from Goderich, extend for a distance of about forty miles to the eastward, and about the same distance to the northward, Ainsleyville and Teeswater lying nearly in the centre of the synclinal which is surrounded east, north and west by the Salina series.

The belt of this series, of which we have thus traced the distribution, has a breadth throughout the whole distance, varying from eight to sixteen miles, and includes in its upper part beds having the character of the Water-lime (affording in some places, near Lake Erie, the characteristic *Eurypterus*) underlaid by dolomite strata, with gypsum, which is mined in several localities. Some greenish marly beds are found, but nothing is seen corresponding to the great mass of variegated marls which appear at the base of this formation in central New York and in the Goderich borings; neither are there any brine springs known along its outcrop. The whole thickness of these nearly horizontal strata along the northeast border of the Upper Helderberg limestone is, probably, not great, but northwestward, towards Lake Huron, there is evidently a rapid thickening and development of saliferous strata in the formation, as is shown in the vicinity of Goderich. The results of the borings at Teeswater, Ainsleyville, Carronbrook and Mitchell (already mentioned) prove, however, that the eastern limit of this development lies between these places and the lake shore. Much farther exploration by borings would be necessary before it would be possible to determine whether the salt found farther south in Bosanquet, Warwick and Dawn, belongs to the same area as that of Goderich and its vicinity, or whether, like the sal tof Syracuse, it occupies a separate salt basin at the same geological horizon as these.

In strata underlying the saliferous rocks already noticed as occurring at the base of the coal measures there exists in Michigan another salt-bearing horizon which, it may be conjectured, belongs to the Salina formation. A well bored to a depth of 1,198 feet in Port Austin, Huron Co., Michigan, on the western shore of Lake Huron, nearly opposite to Goderich, has yielded a strong, though somewhat impure brine, marking 88 of the salometer, which has been analysed by Dr. Goessmann. This boring is sunk in the Devonian (Portage and Chemung) sandstones of the region between which and the Salina formation there intervene, on the Canadian shore of Lake Huron, about 400 feet of strata belonging to the Hamilton shales and 200 of the Upper Helderberg limestone. It would appear that we have at Port Austin a considerable diminution in thickness either of the over-lying formations or of the Salina formation itself. This latter supposition would agree with the greatly diminished thickness found by Prof. Winchell for this formation at its outcrop near Mackinac, where it is reduced to less than forty feet. A farther discussion of this subject will be found in my report already referred to (Geol. Survey of Canada for 1869). Since that time rock-salt has been detected in Huron county, in a boring at Caseville, and farther northward in a boring begun in the same strata at Alpena on Thunder Bay, sixty miles or more west of north from Huron county. These occurrences of rock-salt were made known by Prof. Winchell in 1874, but details with regard to them are still wanting. The existence of brines in the counties of Macomb and Josco, which have a geological position similar to those of Huron and Alpena, has also been announced.

The Lower Helderberg rocks seen overlying the Salina in Eastern New York disappear entirely to the west of Onondaga county, and the Oriskany sandstone, regarded as constituting a division between these and the Upper Helderberg is not found continuously to the west of Cayuga Lake, beyond which, except where isolated patches of the Oriskany intervene, the Waterlime beds are directly overlaid, throughout New York and Ontario, by the Upper Helderberg limestones. These, in New York, are divided by Prof. James Hall, into a lower member, the Onondaga, described as a gray subcrystalline coralline limestone, and an upper member, the Seneca or Corniferous, consisting of compact limestones, dark in color, often bluish or blackish, containing few corals, and generally less fossiliferous, but abounding in chert or hornstone, which sometimes exceds the limestone in amount.

In Ontario these divisions of the Upper Helderberg have not been clearly made out, partly for the reason that the strata are much concealed by clays, but the whole mass of limestone, from the Waterlime below to the overlying Hamilton shales, has been included on the Geological map of Canada under the name of Corniferous, and has a thickness estimated at about 200 feet. On the Maitland river, near the town of Goderich, is a section in which gray coralline limestones, supposed to represent the base of the Upper Helderberg, repose, with the intervention of a few feet of yellowish sandstone, upon grey bituminous dolomites which have been regarded as the summit of the Waterlime formation. (Geology of Canada, 1863, page 377). The distribution of the Upper Helderberg limestones to the north and east of this has already been described. It will be remembered that at Clinton, thirteen miles southeast from Goderich, it was necessary to sink to 1180 feet, or 216 feet deeper than at Goderich, before reaching the rock-salt. This may probably be taken as representing approximately the thickness of the overlying Corniferous limestone.

We now come to the consideration of an unexpected result of the examination of the cores from the Goderich boring, namely, the occurence beneath 278 feet of beds, chiefly dolomite, which, according to the Geological Survey underlie the Corniferous limestone, of not less than 276 feet chiefly of grey non-magnesian coralline limestone, abounding in chert and seeming like a repetition of the Corniferous. Beneath this lower fossilliferous limestone, it will be noted, are dolomites with gypsum, succeeded by variegated marls, with an aggregate thickness of not less than 364 feet, before reaching the saliferous strata which have been penetrated 520 feet without reaching the underlying Guelph formation. Prof. James Hall, who has kindly examined such specimens of the corals as I had obtained from this limestone (Division III of the Section) recognizes in them two species of *Favorites*. *F. Winchelli* and *F. Emmonsii*, together with a section of *Acreoularia* or *Diphyphyllum*.

It might be supposed that these coralline limestones of Division III correspond to the Onondaga (the lower member of the Upper Helderberg), and that the dolomites of II are but a locally intercalated mass, separating this from the proper Corniferous—the superior member. These dolomites have, however, been supposed to be continuous with those which, near the shore of Lake Erie, hold the fossils of the Waterlime formation, and are there overlaid, in parts, by the Driskany sandstone, thus occupying a position inferior to the whole of the Upper Helderberg series. Moreover, there is not, so far as known, any interposed mass of coralline limestone along the belt of magnesian strata, believed to represent the Salina and Waterlime formation, which has been traced from Lake Erie to Lake Huron.

A second hypothesis may be suggested to explain this seeming anomaly. If we suppose that at the time when the saliferous and magnesian strata of the Salina and Waterlime formations were in course of deposition in cut off basins the outer ocean already contained the fanna of the Upper Helderberg time, we may admit that the intercalated mass of coralline limestone of Division III was

deposited by a temporary influx of the waters of the open sea, inte a part of the evaporating basin.

The existence of such a saliferous deposit as the Salina and the great variations in its thickness over adjacent areas, point to local irregularities of surface which render either one of the above hypotheses not antecedently improbable. In the first we suppose an intercalation of magnesian deposits in the midst of the non-magnesian coralline limestones of the Upper Helderberg series; and in the second, the interposition of a non-magnesian coralline limestone among the dolomites of the Salina and Waterlime series. Further observations will be required before it is possible to determine which one, if either of these hypothesis is admissible. It is to be hoped that the mining operations projected for the working of the rock-salt at Goderich, may furnish more extended paleontological evidence, which will be eagerly sought for by geologists.

THE MANUFACTURE OF FERRO-MANGANESE IN BLAST FURNACES.*

By Willard P. Ward, Cartersville, Georgia.

Having been engaged during the past year in the manufacture of ferro-manganese in a blast-furnace, I have imagined that some further information on this subject may be of interest to that large number of members of the Institute who are engaged in the iron and steel industries.

The great question of the economical production of good steel, ingot-metal or homogeneous-iron (we scarcely know now what to call it) from good materials, and at reasonable prices, has, thanks to the intelligence and energy of a few American engineers, been successfully solved in this country. Nearly all first-class railroads, and many that would not rank so high, have adopted the bessemer rail. Martin boiler plates are rapidly gaining ground, in competition with the best charcoal-bloom iron. To use a hibernianism, the brightest side of the iron trade is the steel trade. What is now required is a process to utilize this immense number of old iron rails which are so rapidly being thrown out, and make from them, mainly, good steel rails. Water-cooling will probably furnish the means of reducing the excessive cost of repairs in the Siemens-Martin process; and cheap ferro-manganese will prove the key to the solution of the rest of the problem. On these points, which have been so ably treated in papers read before former meetings of this body, I will not enlarge.

A year ago I furnished a short paper on the same subject as the present one. I believed myself to have been the first to solve the question of making ferro-manganese in a blast-furnace; but it appears from a paper by Prof. Blake that something of the same kind had been done in Austria several years before. The tone of his paper is such as to lead the superficial reader to imagine that the Austrian experiment was a metallurgical success; but if it be so regarded in Austria, the term has a very different meaning there from here.

At all events, an American metallurgist had worked out the problem unaided, and I think with somewhat better success, as will appear upon comparison of the data of the two processes.

The furnace in which my work was done was 34x7½ feet, with one three inch tuyere; the fuel, charcoal, and the blast (furnished by an overshot-wheel driving wooden tubs), insufficient at all times, and very unreliable and weak in the summer time.

The first experiments were made to produce spiegeleisen. Much difficulty was experienced at first in getting an iron-ore sufficiently free from phosphorus. A large bank of brown hematite was, however, found which contains not over 0·005 phosphorus and over 50% of iron. The manganese ore employed was a manganite, or a mixture of manganite and pyrolusite, containing about 35% of metallic manganese and 12 to 15% of iron, the remainder, except some combined water and oxygen, being silica.

After a few months work on 8 to 10% spiegel, I determined to endeavor to raise the percentage of manganese in the product; to accomplish which the proportion of manganese ore in the charge was increased, the burden lightened and more limestone used. The results obtained were satisfactory; and by following this plan, the ferro-manganese was brought up to 67·2%. The necessary conditions for the production of these high alloys, in order to prevent undue loss of manganese in the cinder, are, that the temperature be high enough to reduce and melt the charge, and that the fusing point of the cinder be nearly the same as that of the alloy produced. The plan reported by Prof. Blake as used in Austria, of adding very large quantities of limestone, would not at all answer our requirements.

He says that the following charges are used, the percentage of manganese in the product being in each instance affixed:

15 limestone, 85 manganese ore } gives 25% Mn.

28·6 limestone, 71·4 manganese ore } gives 29% Mn.

42 limestone, 57 manganese ore } gives 35% Mn.

It is an interesting question, how much limestone would be required at this rate, to make a product containing 67% of manganese!

The alumina in so highly basic a charge as the last given would doubtless act as a base; in which case the cinder would already be a sub-silicate, far below a singulo-silicate, the ratio of the oxygen of the bases to the oxygen of the silicic acid being as 15 to 10. Now if more lime were added, as Prof. Blake suggests, would we not soon get to a good material for Siemen's furnace-roofs instead of a good blast-furnace cinder?

Reckoning from the anlyses given, the composition of the cinder from the charge of 42 limestone to 57 manganese ore would be about

Silica	23·1	Protoxide of Iron	11·6
Lime	33·5	Alumina	6·1
Protoxide of Manganese	25·7		100·00

The large percentages of the metallic oxides (iron and manganese) would render this cinder more fusible than it otherwise would be, but it seems extremely doubtful to me whether it would melt at all in a small charcoal furnace.

Let us now examine the economical use of the manganese in the ore. The Reschitza works use, it is said, 1400 kilograms of ore to produce 50 kilogrames of 35% ferro-manganese.

1400 kilos-Mn. ore contain 37·2% Mn_2O_3=25·89% Mn.
or 362 kilos-Mn.
50 kilos. ferro-manganese 35% contain 17.5 " "

Lost..... 344·5 kilos. Mn.

That is, 4·5% of the manganese contained in the ore appears in the metal, and 95·5% is lost in the cinder! This can scarcely be called a metallurgical success in any country. At my furnace according to the average of three months work, 270 lbs. manganese ore, containing 35% Mn. yielded 100 lbs. ferro-manganese containing 55% Mn.

270 Mn. ore containing.....35% Mn=94·5 lb. Mn.
100 lb. ferro-manganese.. 55% " 55· " "

Lost in the cinder.... 39·5 lb. Mn.

That is 58·1% of the total manganese in the ore appears in the ferro-manganese, or *more than twelve times as much as was utilized by the Austrian method.*

Of late at the Diamond furnace there has been about ¼ of coke used with the charcoal and now a Weimer blowing engine is to be put up of sufficient size to furnish ample blast and up to 4 lb. to the square inch pressure. With these improvements it is believed that better results can be obtained than those above cited.

One more point to which I would call attention is that even a smaller percentage of manganese appears in the cinder in making rich alloys than in making poor ones. The analyses of the product of this furnace have already been given in my former paper. The same characteristics are still maintained; the carbon seldom if ever reaching three per cent.

There is one other point in the data given of the Austrian process to which I wish to direct attention, viz.: the fact that so much iron is carried off in the cinder. Our slags scarcely show a trace of iron; what little there is, probably coming from small included particles of ferro-manganese. I have seen when the cinder was stiff, and flowing badly from the furnace, large pieces of metal carried off in the cinder, and I think it more than probable that this was the case at Reschitza, as the cinder could certainly not have been an easy one to work.

The hearth of the Diamond Furnace is built of natural sandstone found on the furnace property. The boshes are also built of the same material. The lining of the furnace above the bosh is of brick made from a very silicious clay which occurs near the furnace. One lining has lasted over two years on ferro-manganese and spiegeleisen; and hearths last on an average about four to five months. I believe this sandstone is the best refractory material I have ever seen for the purpose. It is very nearly pure silica. Rock lying near the surface in the quarry is usually pretty hard, but deeper in the ground it becomes softer until a material having little more consistency than sand is reached. Dr. Little, the State Geologist of Georgia, informs me that he has observed this deposit of sandstone and traced it for a long distance; at some points it is a hard rock and even a quartzite, at other places very soft and passing over into an itacolumite. The material we use and prefer is that of medium hardness, as being less apt to shale off in heating up the furnace, and easier to work than either the very soft or the hardest variety. One great difficulty we experienced was to find material to stand in the "half-charge," say for the four or five feet below the tunnel-head plate. We have tried brick, the same that stand well in the lower part of the lining. They soon become disintegrated by the action of the carbonic-oxide. We have tried the sandstone, which stands so well in the hearth; but it soon gives out, owing, I think, to the cooling off of this portion of the stack when fresh charges are put on. We now use cast-iron segments. These plates are ten inches wide on one side and four inches the rest of the way, filled up on the outside with brick and clay.

This "half-charge" has stood well. Some of the segments have melted a little on the face, but if all that cast flange were to burn out, we would still have a wall of alternate plates of cast-iron and brick between.

The clay which we use contains very coarse grains of sharp sand, naturally intermixed, without which the clay would be very elastic. Brick made from this clay burn red yet are sufficiently refractory to stand for over a year in the arch of the combustion chamber of the hot-blast.

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

THE REPORT OF PROFESSOR WURTZ ON JAPANESE PORCELAIN—CORRECTION.

To the Editors—*Sir:* I beg your leave to point out an error into which you have inadvertently fallen, in your kind notice of my Exhibition Report on the Japan porcelain and porcelain minerals. You quote a number of paragraphs, as all taken from the "Exhibition Catalogue." Only about the first half of these are taken, not from any of the Exhibition Catalogues, but from the *Japanese Official Catalogue*, a document not accessible to the public generally, or to any, without considerable difficulty. The other paragraphs quoted by you, commencing with the sixth, on to the end, are entirely new matter, derived at my request from the Japanese manufacturers present at the Exhibition, by Dr. G. Wagener, a gentleman attached to the Japanese Imperial Commission, as Foreign Adviser to the "Kuwangiyo-Riyo" or Board of Agriculture, Industry and Commerce. Justice to Dr. Wagener, if not to the report itself, demands that this be corrected. Respectfully, Henry Wurtz.

AGLAITE—A NEW MINERAL SPECIES.

School of Mines, Columbia College, New York, April 5, 1877.

To the Editor: Sir—I take this opportunity to present the subjoined completed analysis of the mineral from Chesterfield and Goshen, Mass., in regard to which I inserted a preliminary notice in the *American Chemist*, Vol. I., page 300:

	Per cent.		Atomic Proportions.
Water	3·01	H	4·20
Potassa	8·38	R	4·02
Soda	2·57		
Lithia	·09		
Lime	·48		
Magnesia	·75		
Manganous oxide	·18		
Ferric oxide	1·66	R'	3·06
Alumina	24·38		
Silica	58·11	Si	12·
	99·61	O	37·20

This yields the empirical formula:

$$(H, Na, K)_8 Al_3 Si_{12} O_{37}$$

It thus appears to be a new mineral species, with interesting relations to Pihlite and Cymatrlite, and I propose for it the name of Aglaite from $\alpha\gamma\lambda\alpha o\varsigma$, brilliant, on account of its high lustre. Very respectfullly,

Alexis A. Julien.

Reduction of Coal Miners' Wages in Illinois.—The wages of the coal miners employed in the Northern Illinois Coal and Iron Company's mines in La Salle and in the Illinois Valley and Kenosho Mines, have been reduced 25 cents a ton, and henceforth 95 cents will be paid for mining in the third vein, and 75 cents for mining in the second vein.

HEAT REQUIREMENT AND GAS ANALYSIS AT CEDAR POINT FURNACE, PORT HENRY, N.Y.*

By T. P. Witherbee.

The following calculation of heat requirement covers the working of the furnace from January 25 to February 14 inclusive. A short time previous to the first date the furnace had been working rather badly, so that 300 lbs. of ore and 500 lbs. of limestone was taken off. Within the time mentioned the quality of the iron passed through all grades from white to No. 1 and finally changed to glazy white iron until increased ore charges had their effect.

The analyses of materials used were made from samples weighing several tons, crushed fine, mixed and "halved down" in the usual manner. The ratio of the gases was found from an average of over 70 analyses with the Orsat apparatus. Blast temperature was taken with the Siemen's copper ball pyrometer every two hours. The temperature of escaping gases was taken with a Gauntlet pyrometer, checked by a mercurial thermometer.

The following table gives materials used per pound of pig :

Materials.	Components.		Iron.	Slag.	Gas.
Anthracite Coal. 1·393	C	1·154	·035		1·119
	Nitrogen & oxygen	·018			·018
	Ash	·180		·18	
	Volatile matter	·041			·041
		1·393			
Magnetic Ore. 1·89	Fe_3O_4	1·274	·923		·351
	SiO_2, Al_2O_3, CaO	·616	·040	·530	·046
		1·89			
Magnesian Stone. 7·15	Water	·001			·001
	CO_2	·314			·314
	Mgo	·093			
	CaO	·268		·399	
	SiO_2	·038			
		·714			
			·998	1·109	1·89

The heat requirement and production was calculated from the following data, according to the formulas of Bell and Gruner :

Total carbon	1·154	Carbon in CO_2 of flux	·0853
Less carbon in pig	·035	CO_2 = ·825 = ·361	m
		CO = 2·285	
Leaving for combustion	1·119	C in CO_2	·225
		C in CO	·979
		Total C in gas	1·204 = p.

Oxygen of the blast	1·281
" " ores and fluxes in gas	·624
Total oxygen in gas	1·905

WEIGHT AND COMPOSITION OF BLAST AND GASES PER UNIT OF IRON.

Blast.		Gases.	
Oxygen	1·281	CO_2	·825
Nitrogen	4·166	CO	2·285
Moisture ·0062	·034 (calculated)	N	4·166
	5·481	Moisture	·019
			7·295

HEAT PRODUCTION.

C to CO	·979 × 2473 = 2421	
C in CO to CO_2	·1397 × 8080 = 1129	
Total from 1·119 C =	3550 = 3171 per unit = 39·2 %	

HEAT DISTRIBUTION.

At tuyers C to CO	·9957 (89 %) × 2473 =		2462
In zone of reduction C to CO	·1233 (11 %) × 2473 = 305	× 5607 = 783	1088
" " " " C in CO to CO_2	·1397		
			3550
Carried in by blast	5·481 × ·239 × 704 (1267° F.)		922
Total calories			4472

HEAT REQUIREMENT.

For reduction			
Of iron	·923 × 1887 = 1741		
" Si	·04 × 8000 = 320		2064
" P	·0004 × 5747		
" S	·0003 × 2500	3	
For fusion			
Of iron		330	
" cinder	1·109 × 570 = 632		962
For decomposition			
Of limestone	·715 × 373° = 267		
" water in blast	·034 × 3400 = 115		649
" CO_2 of flux	·0853 × 3134 = 267		
For evaporation of water in materials	·019 × 606 =		12
For carried off by gases	7·295 × ·237 × 137° (247° F.) =		237
For carbon impregnation	·035 × 2400 =		84
For radiation from walls, carried off by tuyer water, expansion of blast, etc., by difference			464
			4472

Heat production as estimated by Mr. Bell would be:

C to CO	1·119 — ·0853 = 1·0337 × 2473 = 2556	
Cin CO to CO_2	·225 × 5607 = 1261	
		3817

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

which exceeds the amount by Gruner's method 267 calories, or 7 %. From the known condition of the furnace it is evident that the calculation of Mr. Bell is nearest right.

Of the ·1233 of C burned in zone of reduction ·0853 would be burned by the CO_2 of flux, and ·038 by CO_2 from reduction of the ore, *i.e.*, 69 % in the first place and 31 in the latter. The first gas analysis was made at Cedar Point about five months ago, at which time a much heavier burthen was carried than now, the ratio of CO_2 to CO averaged considerably above ·40, many times above ·50 and even up to ·68. The experiments were not, however, sufficiently numerous to entitle the higher numbers to much confidence, although it is difficult to see how an error could have been made.

A word in regard to the working of the Orsat apparatus. No difficulty is found in absorbing the CO_2, three passes being sufficient, but with the CO trouble begins. When the solution is first prepared absorption is about *nil*, and only improves as the copper dissolves. At first it required over a hundred passes to entirely take up the CO. After using a fresh solution a few days, a record was kept of the cubic centimeters absorbed by each five passes until final absorption, which is given in the following table. It will be seen that the first five passes take up nearly or quite $\frac{2}{3}$, but the remainder resists absorption. The table, if extended further, would show that after improving until 15 immersions sufficed the absorption power began to fail.

TABLE SHOWING C.C. OF CO. ABSORBED FOR EACH FIVE PASSES, ETC.

Analysis No.	1	2	3	4	5	6	7	8	9	10	11	Total No. of passes	CO_2	m
13	9·5	5·	4·	3·	2·5	1·5	1·5	1·	·5	0	·5	55	7·	·379
14	11·	7·	5·	2·5	1·5	1·	1·					35	7·	·379
15	12·	7·	4·	4·	1·	5·	0	·5				40	7·	·386
16	9·	6·5	4·5	2·	2·	1·5	1·	1·	·5			45	8·	·449
17	10·5	6·5	2·	3·	2·	1·	1·	·5				40	6·5	·353
19	11·	6·5	4·5	3·	1·5	1·	·5	·5	·5	0*	**·5	65	7·	·379
20	14·5	7·	4·	2·5	1·	1·						30	6·5	·341
21	13·	7·5	4·5	2·5	1·	1·	·5					35	6·5	·341
23	15·	7·5	4·	2·	·5*	·5	·5					35	6·5	·346
24	15·	6·5	3·5	2·	1·	·5	·5					35	7·	·379
26	15·	7·5	4·	1·5	1·	·5						30	7·	·373
27	14·5	7·5	3·5	1·5	1·	·5						30	6·5	·359
28	16	7·5	3·5	2·	·5	·5						30	7·	·367
29	17·5	7·	3·	1·5	·5							25	7·	·373
30	17	8·5	3·	1·	·5*	·5						30	6·5	·335
31	17	7·5	3·	1·5	·5	·5						30	6·5	·341
32	16	7·5	3·	1·5	·5							25	7·	·373
34	19·5	7·	2·5	1·	·5	·5						30	6·5	·335
35	19·5	7·	3·	1·								20	6·5	·335
37	18·5	7·	3·	1·								20	6·5	·346
38	19·	5·5	2·	·5	·5							25	6·	·337
39	20	7·	2·5	1·	*	·5						30	6·	·304
40	19·5	7·	3·	·5	·5	·5						30	6·	·335
41	24·5	5·5	1·5									15	6·5	·324
42	23·5	5·5	1·5									15	7·	·355
43	22·5	6·	1·5	·5								20	6·5	·335
44	21·5	6·	1·5	·5								20	7·	·373
45	22	6·	2·	·5	·5							25	6·5	·335
46	23·5	5·5	1·	·5								20	7·	·373
47	21·5	6·5	1·5	·5								20	7·	·367
49	24·5	5·	1·	·5								20	7·	·352
50	24·5	5·	1·5									15	7·	·361
51	23·5	5·	1·5									15	7·	·361
52	22·5	6·	1·5	·5								20	6·5	·341
53	22·5	6·	1·5	·5								20	7·	·361
54	22	7·	1·5	·5								20	7·	·352
55	23	6·	1·	·5								20	7·	·361
56	23	5·5	1·5									15	7·	·367
57	22	6·5	1·5	0	·5							25	7·	·361
58	21	6·5	1·5	·5								20	6·5	·346
59	20·5	6·5	1·5	·5								20	7·	·379
60	24·5	5·	1·	·5								20	6·5	·335
61	24·5	4·5	1·	·5								20	6·5	·341
62	19·5	6·5	2·	1·								20	6·5	·353
63	19·	6·	2·5	·5	·5							25	6·5	·359
64	19·5	6·5	2·5	1·								20	6·5	·319
65	19·5	6·5	2·	1	5							25	6·5	·346
66	24	5·	1·									15	8·	·419
67	24	4·5	1·	·5								20	8·	·433
68	25·5	5·	5·									15	6·5	·362
69	24	4·	1·									15	5·5	·279
70	21·5	6·	2·	1·								20	6·	·314
71	21·	6·	1·	1·								20	6·	·319
												Average including analysis not in table		·361

MEMORANDUM.—The total number of c.c. given in each analysis will not in every case show the correct amount of CO to give the proper value of m, which is owing to the position of the aspirator at each particular time, the numbers given for rate of absorption being ***relative*** and not comparable with CO_2 in every case.

The CO cylinder has been modified in several ways to see if its operation could not be improved. First the bell glass was filled with glass tubes, each having a piece of copper wire inside. That was a complete failure, probably owing to the tubes having accidentally become coated with grease and wax, so that the liquid was repelled, and the surface of contact diminished instead of increased as intended. Then the bell glass was lined with fine copper gauze, and several disks of the same material put in the upper end to strain the gas through, under the disks a thin layer of glass marbles came next, and then alternate layers of disks and marbles until it was full. Absorption was completed by this plan in five passes, but it required careful handling to prevent trapping in the gas and was abandoned.

The best results were obtained by filling with marbles about 5 mm. diameter inside the gauze lining, ten to fifteen passes being sufficient, and no danger of mechanical loss of gas. The above experiments were made with the same liquid that had begun to fail with the old way of mounting, *i.e.*, simply a roll of copper gauze inside the bell glass.

Since the heat requirement here given was calculated the ore charges have been increased, which is shown by the gas analysis, m being now ·388, while ·40 indicates good work at this furnace.

The ratio of the gases, taken in connection with the heat requirement, is found to be a good indication of the working of the furnace, but taken alone the equation $\frac{CO_2}{CO} = m$ must not be considered a metallurgical returning board. Now that gas analysis is so easily made, it is hoped that the working of anthracite furnaces may be fully shown up and thus allow results to be compared after "all disturbing causes are eliminated," which Mr. Bell shows to be necessary.

RAILROAD TO THE SAN JUAN COLO. MINING REGION.—The grading and tieing of the San Juan division of the Rio Grande Railway is nearly completed. This road extends from Leata, Colorado, across the mountains into Rio Grande, in the San Luis parks. Track-laying will be begun in May, and trains will be running to the vicinity of Fort Garland before June.

MEXICAN MINES.

"The richest mines in Chihuahua (and there are none better in the world)" said in 1832 Don Juan Nepomeceno Sanches, the celebrated miner and superintendent of the Marquis de Bustamente, "are situated in the district of Batopilas."

"There is no document in Batopilas," he says, "by which we can fix with certainty the date of their discovery, as all the documents preserved in the archives were destroyed some years ago. The first that was discovered was named La Nevada, on account of the native silver which extended at times the entire length of the vein. Since then this mineral has passed through several periods of *bonanza* and has produced the most beautiful masses of all sizes of native silver—which with reason have merited the approbation of the world—some of them occupying a distinguished place in cabinets of natural history."

The principal mines that have given bonanzas are the Nevada, Pastrana, Dolores, Cata Arbitrios, Vallinas, Roncesvalles, Escritores, Martines, Cansio, Carmen and San Antonio. The first of these was in bonanza eighteen years between 1730 and 1760, the second fourteen years in the beginning of this century. The vein of Pastrana is considered best of all, as much for its richness as for its size, reaching in parts eight yards in width. Then follows San Antonio for the same reasons. Besides the mines named there are a multitude of veins to the north, east and west, with which none in Mexico can compete for richness. The metal is divided in four classes – the first, massive silver, which flattens under the hammer without breaking; the second resembles nails or wires closely twisted together, and yeilds regularly one-half and even two-thirds the weight of the stone; the third is a metal with the nails less compact, and the fourth is the poorest, with but few traces visible.

The first class yields from 40 to 48 marcos (eight ounces each) to the aroba (25 lbs.), being 94 per cent. pure silver. No other mineral district in the world will produce the same result. The Pastrana, San Antonio and Carmen for a long period during their bonanza yielded about 40,000 ounces each per week A pillar in the second named was valued at $60,000 which when tumbled down produced more than that amount.

Some idea may be formed of the vastness of production when the fact is stated that the Pastrana yielded its owner in eighteen years the enormous sum of forty million dollars.

The mine Carmen, gave to Marquis de Bustamente twenty million dollars in a few years. San Antonio gave to Don Christobal Perez, its owner, a fortune of ten millions or more, and so on of all the other mines named—a ton of first class ore yielding from fifteen to thirty thousand dollars per ton, second class from two to fifteen thousand dollars.

A recent discovery is the Todos Santos mine, opened Feb. 1876, which has proved one of the richest in the district. On the 1st of April following, a mass of pure silver was taken from it weighing 301 pounds. From this a piece weighing 71 pounds was brought to this city and was on exhibition at Tiffany's. A letter received within a few days announces the fact that it is in bonanza. One day in February 37 arobas (925 lbs.) of pure silver and three tons of second class ore were taken from the vein. This mine is close to the Pastrana.

The Batopilas Mining Company, better known as the San Miguel or Wells & Fargo, mines are owned and have been worked for thirteen years by five gentlemen connected with express companies of this city. They have run a tunnel thorugh eighteen veins about fifteen hundred feet, among them being the Carmen, San Antonio and Dolores.

It is the magnificent estate formerly of the Marquis Bustamente, once president of Mexico, that these gentlemen own in connection with their mining operations. The hacienda has accommodations for many hundreds of operatives, for the superintendents and other officers, and the numerous animals employed. The portion enclosed is surrounded by a stone wall capable of resisting attack of any except an army with heavy siege material. Within this, besides other stores, the company keeps a heavy deposit of silver always in reserve. Paying for every thing on the spot in the coined metal of the country, they bring away for division among the proprietors only the excess over the reserve we have mentioned and the cost of production. Yet the transportation of this excess and of their supplies and operatives is sufficient to justify the maintenance, with indifference to the patronage of the public at large, of their line of stage coaches which ply between Batopilas and the point in Texas where they connect with the railway system of the United States.

The portion of the estate enclosed as above referred to is not less than thirteen acres. In it are the works which convert the ores into bullion. Borne from the hill above on the backs of mules, it goes through the gates as ore or rock, and comes out silver bars. The tunnel completed by the present owners, driven in to the hill 1,500 feet, cuts eighteen veins, cost seven years' work and about $210,000. Labor is cheap in Mexico. The peon, formerly held in a sort of feudal servitude, now free, works well for his food, and a real (10 to 12½ cents) per day. The cost of the tunnel was repaid from the profit of the first thirteen weeks' work.

The product of silver in Mexico from 1790 to 1830 was $708,000,000. The fact is indisputable that the mines of Batopilas have yielded immense sums in the past, and yet the amount may be considered small when compared with what, to mineralogical law, remains unextracted.

One great fact in the history of silver mining cannot be controverted. Wherever in any part of the world silver mines have been worked, they are worked now—unless arrested for some explainable cause. The mines of the Andes have been worked for three centuries. Those of old Spain from the middle ages, and are in working condition now. In Hungary the same mines worked by the Romans before the birth of Christ still yield their steady increase. Those of Freiberg in Saxony, worked from the eleventh century, know no diminution. In Bohemia, Tyrol, Norway and Sweden, in the Ural and Atlas Mountains, and wherever else discoveries of silver have been made, we believe, without exception, the mines continue to be worked and are generally more productive now than at any time in their past history.

The mines of Batopilas require very little machinery or labor, the vast wealth stated as being taken from them being obtained by the use only of the Mexican arastras, costing about $25 each, with adobe furnaces costing about the same amount. These comprise all the machinery and fixtures in common use, and are still run by water power obtained from the Batopilas river.

STOCKHOLDER.

PRICES OF OLD BED LAKE CHAMPLAIN IRON ORE, AT CLEVELAND, O.—Messrs. Willard and Bingham, of Cleveland, quote as follows for delivery at any Lake Erie port. A reduction of 50 cents per ton will be allowed to those desiring to purchase on vessel at Ogdensburg, N. Y.

Lump ore (for mill fix),	$6.25	per gross ton,	4 months' interest added.
" "	6.00	"	cash.
Blast furnace ore,	5.50	"	4 monts's interest added.
"	5.25	"	cash.

LIST OF DONATIONS TO THE MUSEUM OF THE AMERICAN INSTITUTE OF MINING ENGINEERS.

	PRESENTED BY
GERMANY.	
1. Collection of specimens from the different lead and salt works of the Prussian Government, with cases, maps, drawings, statistics, etc.	The Imperial Minister for Trade and Commerce, through Dr. Herman Wedding, Royal Counselor of Mines, Berlin.
2. Case containing ores, fuels and sections of rolled iron.	The Luxembourg Mine and Saarbuckeen Furnace Co., Burbach. through the same.
3. Case containing ores, fuels, pig and rolled iron; suite of hydraulic forgings and boiler head.	Mr. A. Borsig, Berlin, through the same.
4. The Siegerland collection exhibit of iron ores and spiegel iron, together with maps, drawings, etc.	The exhibitors, through Mr. William Bruegman.
5. Ores and spiegel iron.	The Westphalian Union, through Messrs. Thos. Prosser & Son., New York.
6. T rail test and two glass cases, containing steel turnings from large cannon.	Fried. Krupp, Essen, through Mr. Alfred Novrne, Engineer.
7. Case containing iron tests.	Fried. Wilh. Hütte, Troisdorf, through Messrs. Peter Wright & Sons, Philadelphia.
SWEDEN.	
8. Magnetic iron ores, ingot, bar and manufactured steel, gun barrel tests, and a valuable series of samples, covered by the tests of David Kirkaldy, of London.	Mr. Christian Aspelin, Director of the Fagersta Steel Works, Westanfors, Sweden, through Mr. C. Juhlin Dannfelt, Royal Swedish Commissioner, and Mr. E. Bruesewitz, Royal Mint, Stockholm.
9. Ores, fuels, fluxes, slags, pig and bar iron, and steel, together with suite of rock specimens and a map illustrating the geology of the iron districts of Sweden.	The Jernkontoret (Iron Masters' Association), embracing the following works, &c.: Osterby-Strombacka Bruksegare. S. Löfoenskold, Nissafors. P. M. Larsson, Rällsa. A. von Stockenström, Aker. Ankarsrums Bruksegare. Bjorneborgs Bruksegare. Larsbo-Norns Aktiebolag. Hofors-Hammarby Bruksegare. Stora Kopparbergs Bergslag. Grefoe C. von Hermanson, Ferna. Laxa Bruks Aktiebolag. Carl Ekman, Finspong. Avesta-Garpenbergs Aktiebolag. New Gellivare Company. C. A. Rettig, Kilafors. Surahammars Bruks Aktiebolag. Schisshyttans Bruks Aktiebolag. Ramnäs Bruks Aktiebolag. Albert Robson, Aspa. J. O. Sundstrom, Charlottenberg. Kohlsoa Bruksegare.
10. Ores, pig and bar iron.	through Prof. Rich. Akerman.
11. Ores, pig, and bar iron and steel.	Uddeholm Works, through the same.
12. Wheels and axles, bar iron, and railway axle tests.	Bofors Works, through the same.
13. Flags, drapery, etc.	Surahammer Works, through the same.
	Royal Swedish Commission.
RUSSIA.	
14. Collection of ores, charcoal fluxes, cast iron and specimens covered by assays and ordnance tests, together with drawings of blast furnace, from the Alexandrowski and other works in the district of Olonetz.	Gen. C. de Bielsky, Com. Genl., and Prof. L. Necholsky, Commissioner.
15. Steel gun ring, disk turned from end of cannon, conical shell, etc., from the Perm Gun Foundry.	The same.
16. Thirty-two specimens of copper ores, slags, black copper, and purified copper from the Bogoslof Copper Smelting Works.	The Same.
17. Twenty-two specimens of iron ores, graphites and coals, with analyses, collected by the Russian Government.	The same.
18. Twenty-seven specimens of copper-ores and their rocks, from the mines of Turnisk and Trolofsk, in the district of Bogoslovsk, Ural Mountains.	The same.
19. Twenty specimens of the iron ore, etc., from the mines and quarries of Mt. Blagodat, used in the Imperial Russian Works of the district of Goroblagodatsk.	The same.
20. Cast iron and slag from the Verkhni-Turinsk Works.	The same.
21. Zinc ores, galena, fire-clay, sheet zinc, etc., from Poland.	The same.
22. Series of copper and iron ores, slags, etc., together with specimens of pig and bar iron, black copper, matte, pure copper, crucibles, fire-brick, etc., illustrating the metallurgy of copper and iron as practiced at the Demidoff Works.	Prince Paul Demidoff, through Gen. C. de Bielsky, Com. Genl., and Messrs. David Thomson & Co., Agents, New York.
23. Specimens of the coals of South Russia.	Capt. Scmetschkin, Imp. Russian Navy.
SPAIN.	
24. Coal, iron ore and galena.	Col. Juan J. Marin, Eng. Corps., and Don Alvaro dela Gandara, Royal Spanish Commissioners.
PORTUGAL.	
25. Ores of copper, antimony, tin, lead and zinc, together with samples of marbles and building stones.	Prof. Lorenço Malhiero, Portuguese Commissioner.
AUSTRIA.	
26. The Carinthian collection of iron and lead ores, together with specimens of pipe, wire, bullets, etc., made from lead obtained by the Carinthian process.	A. Jugoviz, Kagenfurth, through Dr. Migerka, Austrian Commissioner General.

Italy.	
27. The manganiferous iron ore from Monte Argentario, Tuscany.	Messrs. Rae Bros., Leghorn, through Messrs. Robert Taylor & Co., Agents, Philadelphia.
Belgium.	
28. Specimens of zinciferous galena.	Count d'Oultremont, Commissioner.
England.	
29. Model of blast furnace, with group of Whitwell hot-blast stoves and drawings illustrating the same.	Thomas Whitwell, Esq., Stockton-on-Tees.
30. Case of models, illustrating the Siemens regenerative gas furnaces, together with specimens of steel, iron, glass, etc., produced in these furnaces.	Dr. C. Wm. Siemens, London, through Messrs. Richmond & Potts, Agents, Philadelphia.
31. Case containing sections of submarine cables.	Messrs. Siemens Bros., London, through Mr. Richard Borchers.
32. Case containing samples of bleaching and potters' clays.	Messrs. Robert Dunn & Co., St. Austell, Cornwall, through Messrs. Dunn Bros., Philadelphia.
33. Cases containing samples of coal and iron.	Wigan Coal & Iron Co., through Messrs. Peter Wright & Sons.
34. One steel armor plate two inches (2″) thick, one do. eight inches (8″) thick, one do, eleven inches (11″) thick, one do. twenty-two inches (22″) thick, together with two pieces of heavy steel turnings and signs.	Messrs. Charles Cammell & Co., Sheffield, through Messrs. W. Bailey Lang & Co., Agents, New York.
Victoria.	
35. Collection of ores and publications.	Sir Redmond Barry, President of Commission.
South Australia.	
36. Iron and copper ores and building stones.	S. Davenport, Esq., Commmissioner.
Tasmania.	
37. Ores and other minerals.	H. P. Welch, Esq., Commissioner.
Queensland.	
38. Ores and building stones.	A. Mackay, Esq., Commissioner.
Canada.	
39. Suite of rocks and ores of Canada.	Prof. A. R. C. Selwyn, Director of the Geological Survey of Canada.
40. Iron sand, bloom and bar iron.	Moisie Iron Co., Montreal.
41. Large case of graphite in its natural and varied manufactured forms, together with one large mass weighing four thousand eight hundred and seventy pounds (4,870 lbs.), in separate cases.	Dominion of Canada Plumbago Company, Ottawa, Ont.
Nova Scotia.	
42. Collection of ores.	Dr. Honeyman, Commissioner.
New Zealand.	
43. Ores and coals.	New Zealand Commissioners.
Brazil.	
44. Fuels, ores, building stones, bloom iron, etc.	Dr. J. M. de Silva Coutinha, Commissioner.
Mexico.	
45. Argentiferous galena.	Prof. Mariano Barcena, Commissioner.
United States of America.	
46. Case containing samples of coals, ores, pig iron and slag.	Rockhill Coal and Iron Company, Philadelphia.
47. Samples of fuel, ore, pig and manufactured iron, martin steel, wire, etc.	Messrs. Cooper, Hewitt & Co., New York City.
48. Bessemer Converter bottom and fire brick.	A. J. Haws, Esq., Johnstown, Pa.
48½. Samples of fire brick	Scioto Fire Brick Co., Sciotoville, Ohio.
49. Case containing collection of coals, ores, limestones and clays found along the line of the P. & R. R.R. and lines controlled by the same, together with counter containing samples of manufactured iron from the P. & R. R.R. Co.'s rolling mill.	Philadelphia & Reading Railroad Co.
50 Large mass iron ore, together with specimens of ore and limestone.	Shelby Iron Co., Alabama.
51. Set of oil-well tools.	Messrs. Blakslee Bros., Foxburg, Pa.
52. Case containing collection of test specimens of wrought iron and steel made by the Henderson process and covered by tests of David Kirkaldy, London.	James Henderson, Esq., Hamburg, Pa.
53. Ores, fuels and fluxes, together with drawing of blast furnace.	Bay Furnace, Onata, Lake Superior.
54. Large case containing fuels, ores, fluxes, pig and manufactured iron.	Lehigh Valley Centennial Committee (William Firmstone, Esq., Chairman), representing the following companies: Bethlehem Iron Co., Carbon " " Saucon " " Crane " " Lehigh " " Thomas " " Glendon " " Andover " " Coleraine " " Pennsville " " Emaus " " Lehigh Valley " " Allentown " " Durham Iron Works, Catasauqua Manufacturing Co., Allentown Rolling Mill Co.
55. Ores, coal, limestone and sections of rolled iron.	Union Rolling Mill Company, Buffalo, N. Y.
56. Coal, bar and sheet iron, and large map of the Mahoning Valley block coal basin.	Mahoning Valley Centennial Association (Homer Hamilton, President), Youngstown, Ohio.
57. Cast of Colorado Canon.	Maj. J. R. Powell, U. S., G. & G. Sur.
58. Two large maps of Pennsylvania Anthracite region.	R. P. Rothwell, Esq., New York.
59. Iron ore.	Lake Superior Iron Co.
60. Case of samples of steel.	Messrs. Sax & Kear.
61. Case containing specimens of marbles, slags of copper and pure copper.	Messrs. Pope, Cole & Co., Baltimore, Md.
62. Table made of anthracite coal.	P. B. Cunningham, Esq., Allent'n, Pa., through Messrs. Dreyer, Simpson & Co.
63. Lead, iron and zinc ores from Missouri.	Missouri State Board of Centennial Managers.
64. Bog iron ore.	The Katahdin Iron Company, Bangor Maine.
65. Show cases containing specimens of crucible steel and tools and other articles made therefrom.	Messrs. Miller, Metcalf & Parkin, Crescent Steel Works, Pittsburgh, Pa.
66. Frame containing complete samples of the Mt. Savage fire bricks.	Union Mining Company, Alleghany, Md.
67. Specimens of the minerals of the State of Arkansas.	W. E. Rowell, Esq., State Centennial Agent.
68. Case containing ores, limestone, etc.	Chester Iron Company, Philadelphia, Pa.
69. Collection of coals, iron and copper ores from Tennessee and North Carolina.	Gen. John T. Wilder, Chattanooga, Tenn.
70. Case containing samples of coal for the manufacture of illuminating gas.	Penn Gas Coal Company, Philadelphia, Pa.
71. Steel tyres, ingot, axle and twisted rail.	Midvale Steel Works, Philadelphia, Pa.
72. Case containing coal, from Clearfield County, Pa.	Kittaning Coal Company, Philadelphia, Pa.
73. Section of arch of St. Louis bridge; also steel links and column.	Keystone Bridge Company, Pittsburgh, Pa.
74. Samples of Connellsville coal and coke.	Messrs. J. N. Cochran & Co., Uniontown, Fayette County, Pa.
75. Chrome ore and steel.	Chrome Steel Co., Brooklyn, N. Y.
76. Witherbee's Patent Tuyere;	American Society Civil Engineers.
77. Ores and coals from Kentucky and the Hanging Rock region.	Messrs. Traber & Aubrey, Cincinnati, Ohio.
78. Sandstone from Valley of the Red Bank, Pa.	William P. Shinn, Esq., Pittsburgh, Pa.
79. Coals, ores and building stones from Wisconsin.	Professor Sweet, State Geological Survey.
80. Coals and ores from Kentucky.	Prof. J. R. Proctor, State Geological Survey.
81. Minerals along the line of the Central Pacific Railroad.	Mr. I. L. Scupham, Gen. Agent of the Central Pacific Railroad.
82. Specimens of Siemens-Martin steel, test bars, specimens of flanging, etc.	Otis Iron and Steel Co., Cleveland, Ohio.
83. Specimens of block coal from Staab Mine. Spencer Co., Indiana.	John S. Alexander, Esq., Philadelphia, Pa.
84. Magnetic iron ore.	Hussey & Howe Mining Co., Plattsburg, New York.

DEPOSITS.

1. One steel armor plate eight inches (8″) thick, one do. nine inches (9″) thick, one do. fourteen inches (14″) thick, together with signs and railing.	Messrs. John Brown & Co., Sheffield, through Messrs. Naylor & Co., Philadelphia, Pa.
2. Case of tests, Landore Siemens steel.	British Admiralty.
3. Models of Pernot furnace plant.	Messrs. Cooper, Hewitt & Co., New York City.
4. Model of Lucy furnace plant.	Lucy Furnace Co., Pittsburgh, Pa.
5. Case containing collection of manganiferous iron ore, limestone and pig iron.	Woodstock Iron Co., Anniston, Ala.
6. Case containing sections of rolled iron, together with test specimens.	Passaic Rolling Mill Co., Paterson, N. J.

ABSTRACTS OF LECTURES ON MINING.—No. XXXV.

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

From the London "Mining Journal."

Throughout the greater part of the metalliferous mines of Europe the system of overhand working is now very largely adopted. In the North of England a very similar method is employed, working upwards from the main lines of level, which are, as it were, the principal keys by which the mining ground is unlocked. The levels are arched, or timbered, and in many cases will remain, after having served an exploratory purpose, as means of entrance and exit, and for the passage of the mineral. The method of working is to put up a rise, or small shaft, from the levels, which may be considered to be at or near the base of the productive ground—the limestone—and another level is then driven in the plate just above the limestone, which limits the productive ground above. At certain distances asunder, usually about 15 fathoms, the ground will be divided between sets or pares of men, and the stopes will be commenced by starting away from the small rise, so that the ground is cut away in stopes of 4 to 6 fathoms long. The men stand on the attle, or deads, which they have thrown underfoot, to do their work, and if the attle be not sufficient a few transverse timbers with boards on them are placed so as to enable the men to get at the ground; these, generally speaking, are merely temporary. They will pass up to their work through the small rise (from which stopes go off on each side), generally by means of projecting timbers, and the ore will be thrown through the rise into the level below. Sometimes you may see a set of headings of this kind badly ventilated, because they are not connected with another set of workings, but they should be worked together and communicate with one another. There will be many points to look at in connection with the men; thus, for example, if the rock is traversed by transverse joints the workings will require very great attention, and it may raise the question as to whether it can, indeed, be done by overhand work; here and there, under such circumstances, the vertical props will come in most advantageously.

A great deal in the structure of the country has to be looked to. In an inclined lode, for example, there is a great probability that in some kinds of country you may have joints, or small veins, or a tendency to open parallel to the lode. The lecturer had known a case in the county of Wicklow where there was tendency of the rock thus to detach itself even to a distance of over 20 fathoms. Another structure often occurs in crystalline rocks, as granite, and is still more marked in partially stratified rocks, as schists, clayslates, etc.—that where the joints are slightly inclined to the lode, and where there is consequently a tendency to come away as "scales" of ground. In such cases great care is required, first to put in a sufficiency of transverse props; and, secondly, as far as possible to fill up with attle all the space from which the valuable ore is extracted.

We must now look to a few cases in which the lodes present more difficulty than ordinarily. It may be that they are exceedingly soft and watery, as was the case some years ago at East Wheal Rose, which was then one of the most lucrative mines in Europe. The lode 2 to 3 feet, or in parts 6 to 7 feet wide,

were for the greater part made up of triable quartz, with a quantity of fluor, etc., and so pervious to water that if left for a time it would run of itself, so that the ends of the levels, etc., had to be left well breasted up. Sometimes it was found convenient to work only half the lode at a time, the other half being breasted up. Again, we may refer to the very remarkable instance of the South Tamar Mine, which was very productive up to the year 1857, and was then overwhelmed by an influx of water from the tidal river Tamar, and destroyed in a few minutes. A serious danger here was a soft cross vein dipping to the south, made principally of soft and friable clay-slate, what miners would ordinarily call flookan. On driving two or three shallow levels towards it, it was obvious that it might prove a dangerous thing, but when they had got down to 70 fathoms they thought they might safely go through it. All due precautions as to timbering, etc., being taken the level was driven through, but there was immediately a tremendous rush of water and silt, which drove the men from their working places, and filled the mine to a great extent. This proved, however, to be merely an accumulation of silt from the measures, which was, therefore, pumped out, and the men set to work again. Several other levels were put through, till on one occasion, fortunately when all the men were out of the mine, the river broke in. These cases show the difficulties which may have to be encountered in working lodes of only a moderate width. Then there is the magnitude of the lodes to deal with, which gives rise to great difficulties where large spaces are worked away between the walls of the lode, leaving these to feel the pressure of the ground at the sides, so that they are liable to give way. As a general rule there is nothing so satisfactory among methods of working as to fill up the spaces between the walls as soon as possible with the attle, and it is to this filling that we must chiefly look for the securing of the workings. Take as an illustration Balleswidden Mine, in Cornwall, with levels driven 10 fathoms asunder, and with a lode 15 to 18 feet wide from wall to wall, composed of granitic material, some of which looks almost detrital; other parts are like granite, with a series of strings running through it; and there are many cross joints, which render the working somewhat dangerous. The working was carried out in a series of overhand stopes, 6 fathoms long and 1 fathom high, the attle being stacked on timber or stullings below. It was difficult to support the walls, in consequence of the joints, but notwithstanding the great width stull pieces were put in. This method was carried out very well till you approached the level above, when extra precautions had to be taken, an extra quantity of timber put in, and an arch of ground left below the upper level. In cases where the ground is of a very strong and sturdy character this method of working becomes very expensive. In the Laxey Mine the lode runs from 11 to 16 feet wide, and it may be left standing open for a great distance in length and height with merely a few pieces of timber across in places, the walls being of such a character as to render this extremely safe. But there are lodes in the same country of such soft material that nothing of the kind can be attempted, and it would be needful to fill the old workings up to the place where the men are at present engaged. The lecturer had seen in the South of Spain cases where strong veins of granite could be left open as much as 20 feet wide.

We have to remark that however strong the walls may be when first opened, exposure to air and water, if such be present, will always by degrees injure their power of resisting pressure. Where the material worked is of great intrinsic value it is obvious you can go to a much greater expense in timbering, etc., and therefore some of the most remarkable cases are to be seen in the quicksilver mines, as in those of Almaden, in Spain, where the lode is from 10 to 15 varas in width (nearly 10 to 15 yards), this dips at an angle very much like the majority of our metalliferous lodes, and is worked by a succession of levels, 30 varas asunder. Strong arches are put in, which are intended to be permanent, and are on a larger scale than any seen in this country, in some of the Bohemian mines as much as 20 feet wide. The intermediate ground between the levels thus arched is worked away as follows. A winze, or sinking, is put down 4 varas in breadth from one arch to the other, and when this is completed a wall of masonery is built up in the space thus excavated between the arches. An intermediate space of the same breadth as the winze is left, and then a second sinking is commenced soon after the first has advanced a little, and built in like manner, then a third, and so on. Afterwards the intermediate pillars of ground are worked away between these buttresses of masonry, and thus you have the mine presenting you with an alternation of these open spaces and solid pieces of masonry. Another remarkable instance is that of the Comstock lode, in America, where the ore bodies alternate with masses of dead material. These ore lodes are sometimes several hundred feet in length (not unfrequently 50 to 80 feet). Mr. Attwood had told the lecturer that he had seen 200 feet standing open in this manner, and worked in one forebreast, Runs, or caves, sometimes occur, and a very costly scale of timbering had to be introduced. Mr. Hague, in his admirable report, has given very good drawings and descriptions of this timbering. In the Gould and Curry Mine, for example, the work is carried out by overhand stopes well timbered below. The expenses incurred in this particular mine for timbering in one year amounted to more than $160,000, and in the next year to $147,000 so that obviously the timbering is on a scale which could only be adopted where the mineral is very valuable.

A short time ago the lecturer had the opportunity of seeing the Beckwith lode, in the Isle of Man, which was 40 feet wide, and where the method of working consisted in taking out the ore in cross-cuts, and putting in timbering not altogether unlike those on the Comstock method. Levels were driven on each side of the lode, partly for exploration, and partly because there was a good rib of ore in those parts. A cross-cut was put through between the two sides, and the ground between this level and the next above worked away by a system of overhand stopes, by putting in timbers over the first. Half the lode was worked at a time, and usually one space of this kind was allowed to come to rest as to the pressure before another piece was commenced. The method comes to be very near to the method by which some of the large deposits of ironstone of the Ulverstone district are worked away. These latter are not lodes, but are sometimes so much like lodes that they might be mistaken for them, and they are worked on a plan very similar to that of the Beckwith Mine. The hematite in some parts is extremely hard, in others soft, and when it is exposed to air for a time it gives way, and exercises considerable pressure, from the manner in which it is placed, and the fibrous nature of some parts of it. At first sight the amount of timber used seems very expensive, and at present no means have been devised for avoiding this expense. Sometimes they are worked to a certain extent from above downwards, and as you start with so great an uncertainty this appears to be the best method which can be adopted. If the shaft is sunk near the edge of the deposit a well timbered cross-cut is necessary; then levels are driven out on either side to explore the deposit. The levels are timbered, and require great care in driving the laths overhead, from the fact that the ground above has been worked and packed with all sorts of material, and you may also meet with the timbers of the old levels. The levels are 9 or 10 feet square, partly exploratory, but also, from their great size, working out a large quantity of mineral. When you have taken out all you can on one horizon the timber will begin to go, and unless you constantly renew it you will have the whole of the overhanging material breaking down and destroying the levels. A more recent plan, intended to avoid driving so many levels one above another, is to divide the work into sets of three, and driving out on the third stage only, then putting up a cockloft, or rise, and working the other stopes, throwing the ore down the rise.

The large *Spitaler-gang*, at Schemnitz, used to yield large quantities of silver ores, and was 20 to 30 feet wide, and caused great difficulty on account of its large size, and it was found necessary to introduce a system of working much like that just referred to. A level is driven on the footwall side as a commencement, a small piece of wall being taken away for purpose of drainage. Then the ground will be worked away in a series of cross-cuts, 6 to 9 feet wide, according to the character of the lode at that point; the first cross-cut will be followed by three spaces of equal breadth, then a second cross-cut will be put in, and so on. When these cross-cuts are filled up with stone the intermediate ground will be worked, first the middle of the three spaces, and then the two sides. If a mass of poor ground be met with it will generally be left in its place, the level being twisted round it. In the cross-cuts planks, or longitudinal laths, are laid in the level, and on these the timber is placed, then when the whole material from the cross-cut has been removed it is built up with stone, so with the others. If the lode does not yield sufficient stone for the purpose it is obtained in a very simple manner. A small level is driven into one wall, usually the hanging wall, and then a number of transverse openings are made, supported by timber, then some of the timber is knocked away, and the roof begins to fall, and you have, in fact, and underground quarry. This plan has been adopted also in the Comstock mines, and in the fine lode belonging to the London Lead Company, in Durham. In this manner you rise to the level above. And now you see the object of commencing by putting in strong laths, for when you get up to the stage above you can support the planks by means of timber, and thus protect the men underneath. By this plan the whole of the material can be removed as a rule, and the men are protected by the timber around them, and the great thing to be looked to—the collapse of the sides—is prevented. The principle of opening the ground in small portions at once, and filling up as we go on, is one which cannot but be applied with great advantage when we get beyond the limits of lodes of small dimensions.

NOTES ON A METALLURGICAL CAMPAIGN AT HALL VALLEY, COLORADO.*

By J. L. Jernegan, M. E., La Grange, Columbia.

In the summer and fall of 1875, the author was present during a short smelting campaign at the Hall Valley works, and having had occasion to make a number of chemical analyses of the ores, fuel and fluxes, deems that the results of the same, and also an account of the smelting operations, may be found of interest to members of the Institute.

The mines and reduction works of the Hall Valley Silver-Lead Mining and Smelting Company (limited) are situated at Hall Valley, Park County, Colorado. The smelting works are located about half way from the mouth to the head of the above-named valley, and the mines high up on the mountains, near its head. The three principal mines of the company are the Whale, Leftwick and Coldspring. They are all on different veins, running parallel to one another, with a general trend from south-west to north-east. The country rock is gneiss, in places granitoidal. The general features of these lodes are quite similar to each other, all of them carrying a gangue chiefly composed of heavy spar, the principal metalliferous minerals being argentiferous galena and gray copper. Besides the minerals already mentioned, there occurs, more or less frequently, native silver, copper pyrites, iron pyrites, malachite, azurite, copper vitriol, cerusite, anglesite, quartz, chalcedony and siederite. In general terms, the ore may be stated as being composed of a large percentage of heavy spar, quartz and argentiferous galena, with small amounts of silver-bearing gray copper, the other minerals only occurring in very small quantities. The average assay of the pure galena in silver is about 30 oz. per ton, and that of the gray copper about 300 oz. Besides the ores of Hall Valley, ores from the adjoining mining districts of Geneva and Montezuma, also sometimes find their way to the Hall Valley works for reduction. The ores of these outside districts are all very similar to the Hall Valley ores, their predominating gangue being heavy spar, and thus offer no advantage as mixtures with the latter. The ores from the Geneva District coming to the works are mostly from the Revenue Mine. They carry a great deal of heavy spar and quartz, but are often much richer in silver than the Hall Valley ores, owing to a larger percentage of gray copper, and oftentimes the presence of a richer silver mineral, called bismuth silver.

The ore, on coming from the mines, which are connected with the reduction works by a tramway four and one-half miles in length, is delivered to the dressing works for the purpose of concentration. It is first broken into pieces by passing it through a Blake's crusher, then crushed fine by a pair of Cornish rollers, after which it is classified according to size on a system of shaking sieves. The classified ore is then subjected to concentration, according to specific gravity on double plunger jigs. This system of wet concentration is very imperfect, and gives very unsatisfactory results with the Hall Valley ores, causing as it does a heavy loss in the silver contents of the ore, owing to the impossibility of separating the rich argentiferous gray copper from the heavy spar by means of the difference between their specific gravities, the same being too slight; and yet it is of the utmost importance that the ore should undergo thorough concentration previous to its treatment in the blast-furnace, otherwise a large percentage of the very intractible heavy spar would have to be smelted. A large percentage of heavy spar in the ore not only causes in smelting the formation of a slag which is stiff, pasty, and at the same time difficult of fusion, but also imparts to it such a high specific gravity, that it prevents a good separation of matte from slag.

It is a fact well known to metallurgists that sulphate of baryta is only partially decomposed in the blast-furnace, only a portion being slagged off in the form of silicate of baryta, while another portion is reduced to sulphate of barium, and enters the matte, and which, if present in that product in large quantities, causes it to crumble on exposure to the atmosphere; while yet another portion remains entirely undecomposed, and enters the slag and matte as a sulphate. Heavy spar, when fluxed with fluor spar, is melted very easily.

A more thorough system of concentration, i. e., better classification, and the employment of Rittinger's continuously working percussion table for the working over of the slimes and tailings from the jigs, in conjunction with a system of pointed boxes (*Spitzkasten*) for their classification, would undoubtedly effect a larger saving of the precious metals, and at the same time rid the valuable minerals, to a certain extent, of their accompanying and worthless gangue, than that accomplished by their present imperfect method of treatment.

There appeared some time since, in several of the technical papers both of Europe and this country, a description of a process by an Austrian engineer, for

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

the separation of gray copper from heavy spar, which should it prove by continued experiment on a large scale to be both practical and economical, would be of the greatest benefit in the treatment not only of the Hall Valley ores, but also of those of several other mining districts of Colorado, where there are ores carrying these two minerals together. The process is founded on the behavior of heavy spar and gray copper when subjected to the action of heat, under the effects of which, when sufficiently high, heavy spar decrepitates into minute rhombohedrons, the gray copper remaining unchanged. This operation having been accomplished, the two minerals are then separated from one another by means of screening. The separation, of course, is not perfect, but, judging from the experiments carried out in Europe, it appears far more complete than that which can be effected by wet concentration.

The two following analyses are of the dressed ore. I, is the first class product from the jigs, and is a mixture of ores from the Whale and Leftwick mines; II, is also concentrated ore from the same mines, but with more gangue material than the first, which is explained by the concentration not having been carried so far as with the former.

DRESSED ORES.

	I.	II.
Galena	80.78	68.02
Heavy spar	11.22	19.38
Iron sesquioxide	trace	0.08
Alumina	"	trace
Quartz	8.00	10.62
	100.00	98.10

The following are some twenty-six determinations of the amount of silica and sulphate of baryta contained in various lots of ore from the Whale, Leftwick and Coldspring mines, and also from mines of the Geneva District. Those containing the very highest percentages of silica were from Geneva, and were of such a character as not to allow of wet concentration. With a few exceptions, all of these lots of ore had been concentrated on the double plunger jigs, before the samples for analysis were taken.

No.	SiO_2 per cent.	BaO,SO_3 per cent.	No.	SiO_2 per cent.	BaO,SO_3 per cent.
1	1.00	7.00	14	14.00	12.00
2	1.00	7.00	15	14.80	9.00
3	1.00	7.30	16	15.00	16.00
4	1.40	21.00	17	15.20	13.00
5	1.50	2.50	18	15.50	6.50
6	1.80	5.20	19	15.80	27.00
7	3.00	25.00	20	16.00	17.50
8	3.50	2.00	21	16.50	14.00
9	4.00	8.00	22	21.00	29.50
10	5.50	12.30	23	21.50	27.00
11	5.80	7.70	24	21.80	8.20
12	6.30	12.20	25	27.50	32.50
13	9.30	10.20	26	55.50	14.30

In the Fall of the year 1874, Mr. Howard Painter, M. E.,* was offered, and accepted the position of engineer in charge of the mines and smelting works of the Hall Valley Silver-Lead Mining and Smelting Company. Shortly after taking charge Mr. Painter blew in one of the three large blast-furnaces —known as Kast's modification of the Pilz furnace—and commenced smelting the raw ore in accordance with the well known method of iron precipitation. A very porous and friable bog iron ore, found on the company's property, was used as the precipitating medium for the sulphide of lead in the ore. In the very high furnaces of the Hall Valley Works, which are 23 feet in height from the center of tuyeres to top of shaft, this iron ore, by reason of its porosity and very friable nature, proved to be readily reducible to the metallic state long before reaching the zone of fusion. This circumstance very naturally caused the formation of large accretions on the sides of the shaft, which commenced to form eight to ten feet above the tuyeres, and extended nearly down to them. For this reason, it was not many days after the furnace had been started, that it became necessary to blow out. Though this short campaign was not productive of any very good results, it at least led to the conclusion that if the Hall Valley ores were to be successfully treated in these high furnaces, much less of this poor quality of iron ore would have to be used in the future in smelting, otherwise the same difficulty as heretofore would invariably occur.

*Deceased in San Francisco, May 15th, 1876.

In order to overcome the necessity of using such large quantities of this iron ore, an entire change in the method of reduction was determined upon by substituting the combined method of roasting and reduction for the iron precipitation process. The adoption of this method would effect a great saving in the use of iron ore, and it was deemed probable, that, by subjecting the ore to an oxidizing and slagging-roasting previous to its treatment in the blast-furnace, not only the sulphur of the galena, etc., would be expelled, but also that at least a portion of the sulphuric acid of the heavy spar would be driven off by the formation of silicate of baryta during the slagging period. An analysis of the roasted ore, which will be given later, shows, however, that only a very small percentage of the sulphate of baryta is decomposed. Both Plattner and Kerl give two analyses of a roasted ore from Pontgibaud, wherein it appears that a small portion of the sulphate of baryta contained in the ores of that locality is decomposed in the roasting furnace, the baryta combining with silica to form a silicate. (Plattner's *Vorlesungen ueber Allgemeine Huettenkunde*, Vol II, p. 89, Kerl's *Handbuch der Allgemeinen Huettenkunde*, Vol. II. p. 217). The two analyses cited herewith are given for sake of comparison with the analyses of the Hall Valley roasted ore. The comparison will be found of interest, for reason of the apparent similarity of the two ores.

ROASTED ORE FROM PONTGIBAUD.

		I.	II.
	Zinc oxide	0.6	0.7
	Lead oxide	1.5	3.4
	Iron sesquioxide	0.7	3.1
	Baryta sulphate	7.4	7.2
	Lead sulphate	6.7	7.1
	Lead sulphide	1.4	5.7
	Silica, quartz and feldspar	24.1	16.5
Combined with Silica.	Lead oxide	34.1	37.2
	Zinc oxide	3.3	3.4
	Iron protoxide	16.3	11.0
	Magnesia and alkalies	1.3	1.5
	Lime and baryta	1.0	1.1
	Arsenic and antimony	trace	trace.
		98.4	97.9
	Total metallic lead	37.0	39.0

In the Summer of 1875, a roasting furnace was erected. This furnace is a long, single-hearth reverberatory, measuring 46 feet in length over all, and 9 feet wide. Roasting was begun as soon as the furnace was finished, and continued until all ore on hand at the works was roasted.

A roasting charge consisted of about 1800 lbs., of finely crushed ore. The furnace held five charges at a time, or 4½ tons. Charges were drawn about every three hours, consequently each charge remained in the furnace 15 hours, and there would be about 7 tons ore roasted per 24 hours, with a consumption of about 2½ cords of wood.

The well roasted and thoroughly slagged ore was black in appearence, with a slight vitreous luster, and porphyritic in texture, in consequence of numerous unchanged particles of heavy spar scattered irregularly throughout the fused mass. When not well roasted, bright metallic looking particles of lead sulphide were visible. The following are analyses of the roasted ore. I, is probably a better average of the roasted product than II or III, and also carried out with greater facilities and more care. I will state here that the silica and sulphate of baryta were determined and weighed as one substance and then separated by means of hydrofluoric acid, so there can be no doubt as to the presence of the baryta in form of the sulphate. II, is of ore known to carry a higher percentage of lead than the average of the ore roasted. The lead and silver were determined by assay, 5 per cent. having been added to the lead for loss by volatilization. The iron and alumina are merely estimates. The percentage of sulphur given is probably much too high, as it was determined by fusing the ore with bicarbonate of soda and nitrate of potassa, dissolving in water, and titriring with a standard solution of barium chloride. The sulphuric acid of the sulphate of baryta would naturally combine with the soda, to form sulphate of soda, which would be dissolved in water and precipitated by means of the barium chloride, and thus give too high a result. In III, only the silica and sulphate of baryta were determined.

HALL VALLEY ROASTED ORE.

		I.	II.	III.
	Silica	22.71	15.00	16.00
	Baryta sulphate	18.36	11.50	16.50
	Lead sulphide	3.14	.....	
Combined with Silica,	Lead oxide	39.10	58.94	
	Copper oxide	1.71	not determined.	
	Silver oxide	0.21	0.21	
	Alumina	8.11	0.38	
	Iron protoxide	3.59	7.00	
	Manganese protoxide	trace	trace.	
	Lime	0.42	.....	
	Baryta	.....	trace.	
	Magnesia	trace	.....	
	Sulphur	.....	6.97	
		97.35	100.00	
	Total lead	39.02	55.00	
	" silver	58 oz.	58 oz. per ton.	

The first mixture of ores roasted amounted to 43,895 pounds, which after roasting weighed 36,000 pounds, assaying 71 oz. silver perton, and 41 per cent. lead. The loss in weight by roasting was 7,895 pounds, or about 17 per cent. The second mixture amounted to 28,983 pounds, and weighed after roasting 24,000 pounds, showing a loss in weight by roasting of 4,983 pounsd, or about 17 per cent. The average assay in silver was 60 oz. per ton, and 48 per cent. in lead.

As soon as a sufficient amount of roasted ore had accumulated, operations were commenced for its reduction in the blast-furnace.

Analysis II of the roasted ore was taken as the basis upon which to calculate the charge. It was determined to so flux the roasted ore with iron ore and limestone that the slag formed should approach a singulo-silicate in its chemical composition. Complete analyses were, therefore, made of the roasted ore, limestone, iron ore, and ash of the coke, in order to acquire a thorough knowledge of everything going into the furnace. These analyses will be given later. The fuel used was Connellsville coke. The limestone came from South Park, near the town of Fairplay. The iron ore was burnt in tree heaps before use, in order to free it from its water of hydration. The following make-up of the charge was decided upon, to be changed at any time, of course, should circumstances require it. At first, a small quantity of metallic iron was used in place of iron ore, as long as the small supply on hand lasted, after which iron ore was substituted in its place.

BLAST-FURNACE CHARGE, FIRST RUN.

	Per ton ore. Pounds.	Per cent.
Roasted ore	2,000	58.71
Limestone	380	11.15
Burnt iron ore	360	10.56
Scrap iron	166	4.90
Old slag	500	14.68
	3,406	100.00
Coke	500	
	3,906	

The proportion of coke to charge is about as 1 to 7. The slag added to the charge was of three separate lots brought from the smelting works at Alma. They contained respectively 52·, 46·8 and 45· per cent. silica. The slag actually produced in practice from the smelting of this charge was sampled and the silica determined and found to amount to 32.70 per cent., therefore very close to what was desired.

One of the blast-furnaces was blown in, and ran for several days on the above charge, producing a thin fluid slag containing 32·70% silica, assaying only 1 per cent. in lead, and 5·7 oz. in silver per ton. The matte separated well from the slag, was of a bronze-like color, and appeared to be principally composed of proto sulphide of iron. It assayed about 7 oz. silver per ton. The bullion carried about 150 oz. per ton.

In spite of the good quality of the slag, on the third or fourth day after blowing-in, the furnace commenced to work very poorly. Very little lead was being reduced, and the charges commenced sinking irregularly, seeming to hang somewhere high above tuyeres, since the crucible was perfectly clear and all the tuyeres bright. The furnace was therefore blown-out after having run about 96 hours. Upon examination after blowing out, the furnace was found to have a large accretion extending all around the shaft, about 8 feet above tuyeres, leaving only a small annular space, measuring some two or three feet in diameter, for the charges to pass through. The cause of its formation was attributed to the reduction of the iron ore in the charge to the metallic state before reaching the zone of fusion, which prevented it entering the slag as a silicate of the protoxide, the soft spongy iron thus formed adhering to the walls and thereby forming a nucleus for the growth of a large mass.

It was therefore determined at the second trial to use much less iron ore, and produce a slag containing 40 per cent. silica, so as to give the iron every possible opportunity of forming a silicate, and thus prevent its reduction, as far as possible, to the metallic state.

In order to see how the blast-furnace charge used in the first trial-smelting would compare with a charge accurately calculated in accordance with stochiometrical principles from analysis I of the roasted ore (which in all probability is a better average than II) we will proceed to make the calculation. This calculation will also prove of interest by enabling us to judge whether there was more iron ore used than was actually necessary and whether or not it was owing to the basic fluxes that the poor working of the furnace could be attributed.

For sake of convenience in the calculation we will again give analysis I of the roasted ore not in the form of rational results, but empirical, since the latter are those which will be necessary in carrying out the calculation.

ROASTED ORE.

Silica	22·71	Alumina	8·11
Lead oxide	42·04	Lime	0·42
Copper oxide	1·71	Baryta	12·05
Silver oxide	0·21	Sulphuric acid	6·31
Iron protoxide	3·59	Sulphur	2·94
			100·09

Total metallic lead ..... 39·02

The following formula will represent approximately the chemical composition of the slag desired, viz. A singulosilicate.

$$2Al_2O_3\ 3SiO_2 + 2\ (BaO, MgO, CaO, FeO, MnO)\ SiO_2.$$

We will first proceed to calculate the necessary amount of silica to form such a slag with the different bases given in the analysis of the roasted ore.

Assuming that the sulphate of baryta is completely decomposed, and the baryta enters into chemical combination with the silica; then to determine how much silica the baryta requires, we have the proportion:

2 eq. BaO : 1 eq. SiO_2:: per cent. BaO: x.
153 : 30 :: 12.05 : x.

+ equals 2.36, therefore 12.05% BaO requires 2.36% SiO_2.

For the protoxide of iron we have:

72 : 30 :: 3.59 : x x=1.49; hence 3.59% FeO takes up 1.49 SiO_2.

For the alumina we must take 2 eq. Al_2O_3 to 3 eq. SiO_2, we then have:

102.4 : 90 :: 8.11 : x x=7.12; so 8.11% Al_2O_3 takes 7.12% SiO_2.

For lime we have:

56 : 30 :: 0.42 : x x=0.22; therefore 0.42% CaO saturates 0.22% SiO_2.

Hence we find that

12.05 % BaO saturates 2·36 % SiO_2	8.11 % Al_2O_3 saturates 7·12 % SiO_2
3.59 " FeO " 1·49 " "	0.42 " CaO " 0·22 " "
	11·19 % silica.

The silica in the roasted ore saturated by bases in same amounts to 11·19% of the total quantity, which still leaves 11·52 % to be fluxed by the addition of limestone and iron ore; this is equivalent to 230.4lb per ton roasted product.

The ash of the coke must also be taken into consideration. We will allow of a consumption of ¼ ton coke per ton of roasted ore smelted. The coke on analysis was found to contain 10.72 % ash, of the following composition:

COKE ASH.

Silica	46·64	Lime	6·00
Iron sesquioxide	22·00=19·80 FeO	Magnesia	1·00
Alumina	25·00		100·64

Following the same method as before, we find;

19·80 % FeO saturates 8·25 % SiO_2	6·00 % CaO saturates 3·21 % SiO_2
25·00 " Al_2O_3 " 21·97 " "	1·00 " MgO " 0·75 " "
	34·18 % silica.

Therefore the silica in the ash of the coke saturated by bases in same amounts to 34·18%, which consequently leaves 12·46% SiO_2 unsaturated, or 26·71lb. SiO_2 per ton of coke, but since it is assumed that only ¼ ton of coke is consumed per ton of roasted ore smelted, there can only be 6·67lb SiO_2.

Hence we have for one ton roasted ore:

Free SiO_2 in 1 ton of ore ..... 230·40lb
" " ¼ " coke ..... 6·67 "

Free SiO_2 with 1 ton of ore ..... 230·07lb., to be saturated by bases in limestone and iron ore.

An analysis of the limestone, which came from South Park, near the town of Fairplay, afforded:

LIMESTONE.

Silica	2·50	Clay and sand	2·00
Iron sesquioxide	1·00 = 0·90 FeO.	Organic matter	0·35
Alumina	1·00	Carbonic acid	41·14
Magnesia	6·50	Water	2·61
Lime	43·26		100·36

By the same method of calculation we find:

1·00 % Al_2O_3 requires 6·87 % SiO_2.
0·90 " FeO " 0·37 " "

1·24 % Silica.

There are 1·24 % SiO_2 saturated by the iron protoxide and the alumina, leaving 1·26% SiO_2 yet to be saturated. This will require exactly 1·68% MgO, so that the limestone after all silica is saturated (not taking into consideration the small amount of clay and sand) is represented by:

CaO=43·26%
MaO= 4·82 "

48·08

Now one of lime in forming a singulo silicate takes up 0·53% SiO_2, and one of magnesia combines with 0·75% SiO_2; consequently 1·43 lime is equal to one magnesia, but there are 4·82% MgO, which are equal to 6·89% CaO. The entire limestone is then equivalent to:

4·82% MgO=6·89% CaO.
43.26 " CaO.

50·15% lime, which is equivalent to 1003 lbs. free CaO in a ton of limestone.

An analysis of the burnt iron ore afforded:

BURNT IRON ORE.

Iron sesquioxide	93·00%=83·70 FeO,=65·10Fe.
Alumina	0·40 "
Silica	7·00 "
	100·50

The 0·50% Al_2O_3 requires 0·44 SiO_2, leaving 6·56% SiO_2 unsaturated; this will require exactly 7·87% FeO; so that the burnt iron ore after all silica is saturated, is represented by:

FeO=75·83%=65.10% Fe,

This is equivalent to 1516·6 lbs. free protoxide of iron, or 1302 lbs. of free metallic iron per ton of burnt iron ore.

There are 237·07 lbs. free silica per ton of roasted ore and ¼ ton coke to be neutralized by the addition of limestone and iron ore; then saturating with lime to iron as 1 to 1:

1 eq. SiO_2:2 eq. CaO: :118·535 lbs. :lbs. CaO.
30 : 56 : :118·535 : +., +=221·29.
1 eq. SiO_2 :2 eq. FeO: :118·535 : lbs. FeO.
30 : 72 : :118·535 :+., +=284·45.

It will therefore require 221.29 lbs. lime, and 284·45 lbs. protoxide of iron to saturate the silica in one ton of roasted ore and ¼ ton coke. There are 1003 lbs. free lime in one ton of the limestone, and 1516·6 lbs. free protoxide of iron in the burnt iron ore, consequently it will require 0·22062 ton limestone, and 0·18755 ton iron ore, or 441.24 lbs. limestone, and 375·1 lbs. iron ore; together 816·34 lbs. fluxes per ton roasted ore and ¼ ton coke.

This would give a slag of the following composition:

	LBS. IN ORE & COKE.		LBS. IN LIMESTONE.		LBS. IN IRON ORE.		TOTAL.	PER CENT.
SiO_2 =	479·19	+	11·85	+	35·00	=	526·04	= 30·88
Al_2O_3 =	175·60	+	4·74	+	2·50	=	182·84	= 10·73
BaO. =	241·00	+				=	241·00	= 14·15
FeO. =	82·42	+	4·26	±	418·50	=	505·18	= 29·60
CaO. =	11·61	+	205·05			=	216·66	= 12·72
MgO. =	0·53	+	30·81			=	31·34	= 1·92
							1703·06	100·00

Silica	30·88 =	16·46 Oxygen in acid.
Alumina	10·73 =	5·02
Baryta	14·15 = 1·47	= 17·45 Oxygen in bases.
Iron protoxide	29·60 = 6·57	
Lime	12·72 = 3·63	=12·43
Magnesia	1·92 = 0·76	
	100·00	

TO BE CONTINUED.

MINERAL PRODUCTION OF COLORADO—REPORT FOR 1876.

Special Correspondence of Engineering and Mining Journal.

(*Continued.*)

BOULDER COUNTY

produced $547,085.20 coin value in 1876, or less than was claimed for her in 1875. The silver district of Caribou produced less than $60,000 as against $259,000 coin value in 1875. The increase in the tellurium districts nearly made up the loss, however. Important events of the year were the successful operations of Boyd's Smelting Works from and after May, the establishment of concentration works and the sale of the Mining Company Nederland's property to Senator Jerome B. Chaffee for $70,100. The latter event was important, because it insures the continuous working of the mine, and also of the mill as soon as summer arrives. The company obtained this mine and mill on a three million sale in 1873, and lost it on a sheriffs sale September 15, 1876. The only work done on the mine during the first nine months of the year was by a small force of miners taking out their "back pay." Since then the new owner has been having the mine developed. It is now 580 feet deep. The No Name and other mines are again being steadily developed. The most important recent undertaking at Caribou was the building of the silver mill of the New Jersey Company, which owns the Native Silver Mine. This mill was completed December 15, since when it has been running continually without interruption or breakage, and most satisfactorily. Its daily capacity is 10 tons ore. It is mainly supplied from the Native Silver Mine, which has a large quantity of ore in reserve worth from $100 to $400 per ton. The mill is in the town of Caribou, and its water supply is obtained, by means of a ditch nearly a mile in length, from neighboring springs. It contains a very large Blake crusher, 10 stamps, weighing 749 pounds each, a five-hearth furnace, 5 agitating tubs, 5 settlers carrying two tons to the charge and 12 silver and 7 copper precipating tubs. The process of chloridizing, roasting and leaching is like that of the Clear Creek Company's mill of Georgetown—the latter having Bruckner cylinders instead of a reverboratory furnace. Both mills were built under the supervision of D. W. Brunton, who is now so successfully superintending the Caribou mill just described. It is claimed that from 90 to 95 per cent of the silver contained in the ore is saved. Nearly all of the bricks turned out are from 940 to 995 fine. This establishment, by reason of its close proximity to the mines and good results, is destined to be of great benefit to the district. The leading stockholders of this company embrace ex-Governor Curtin of Pennsylvania, and ex-Senator Cuttel & Brothers of New Jersey, etc.

The only silver bullion shipped from Caribou district in 1876 was during the first half of the year. This, to the amount of $59,000, came from the North Boulder cholorination and lixivition mill, since idle by reason of lack of ore in the company's and other mines.

The Consolidated Caribou Belt Company, organized in Montreal, Canada, is about to build very large wet concentration works two miles below Caribou. These are apparently all that the district needs to bring it into a most prosperous condition, for the ores are generally of low grade, although found in large quantities. This company is driving a tunnel, now 599 feet long, into the Caribou belt of lodes. By the aid of a Wood steam drill 3½ feet are made daily.

A new and successful method of treating telluride ores is declared to have been projected by a Mr. Willard, who has spent large sums of money in experimenting. The point claimed to have been gained is cheapness, so that the low grade ores can be treated profitably. The works are at Jamestown, near Gold Hill. Many tests were made on Smuggler, John Jay and other ores.

The telluride belt, twenty miles in length by four or five in width, extends from a point east of Long's Peak, south across Middle Boulder creek into the borders of Gilpin County. Among the famous mines are the Smuggler and John Jay on the north, the Cold Spring, Red Cloud, Victoria, Cash, and Slide on Gold Hill, the Melvina not far away, the American, Grand View and others at Sunshine, and the Dunraven, Keystone, Mountain Lion and Magnolia in Magnolia.

The Smuggler is thought to be the greatest of these, and has been producing wonderfully since December, or soon after it was purchased for $50,000. It

was discovered in April, 1876. The Melvina has shown the largest proportionate profit of any mine in the country since its discovery in the summer of 1875. In fifteen months 151 tons and 70 pounds sold for $84,600, an average of $560 per ton, and the total outlay was less than $8,000. The vein, where richest, is a soft clay and is about eight inches wide. Small quantities of ore sold at from $10,000, to $18,000 per ton. The American has been the largest producer, and is among the most profitable mines of the country.

Boyd's Smelting Works at Boulder have been running steadily since May and pay good prices. It is supposed that they have turned out over $100,000 in bullion. Several ore dressing works and ore buyers are doing business in this section. Some new processes have been introduced. A Frue vanning machine has been concentrating telluride ores at Boulder for several months. The Boston and Colorado Works of Black Hank have an ore buying agency and sampling works at Boulder, lately established at a cost of $10,000. The American lode sends its richest ore to Omaha.

A twenty-five stamp mill has been built two miles below Caribou, and is supplied by some new gold lodes there.

Altogether Boulder County has a brighter look for 1877 than during any former year, and the same may be said of all parts of Colorado. F.

NOTES.

THE MENOMINEE, L. S., IRON REGION.—The railroad which is now being constructed to this region, leaves the Chicago and Northwestern at Powers, 42 miles north of Menominee, and 22 miles west of Escanaba. It is a little over 24 miles from Powers to Quinnesec, the western terminus, and it is expected that the road will be completed to this point by the 15th of August. The Breen and Breitung mines are intermediate points, distant from Powers respectively 12 and 18 miles. The whole country possesses the advantage of being covered by an excellent growth of hard wood. Large deposits of ore are known to exist in the vicinity of the Breitung mine. The Quinnesec mine "has been proven to be very valuable," and large deposits of ore exist in the vicinity of Lake Antoine, a short distance north. Quinnesec will be the point from which supplies will be distributed to the Upper Menominee and Michigamme and preparations are being already made for building warehouses of large storage capacity.—*Menominee Herald.*

CARBONATE OF LEAD BONANZA.—We have seen many elegant designs of frostwork, fretted brilliants, dazzling crystals, and rich nuggets that have been taken from our Granby mines, but nothing quite so unique and beautiful as some glittering stalactites, white as snow, composed of almost theoretically pure carbonate of lead, that were first found in a drift in Douglas & Morgan's diggings two or three weeks ago. The lead is what is known as a dropped opening—that is, a low cave. When this fairy chamber was opened by the miner's pick, the upper ceiling, as far as the eye could reach, spanning a room twenty by thirty feet, was plastered with a stucco coat of magnificent blue mineral ten to twelve inches in thickness. In places, this magnificent putty coat, had been thrown down during some riot in the earth's bowels, and the floor of the room was strewn by great masses of the rich ore. Where this plastering yet remained on the upper ceiling, it was studded with beautiful pendants, white as alabaster, and glittering in the lamp-light like gems. And these pendants, long, slender and tapering, like diminutive icicles, some of them the size of your finger, but much longer, others no larger than a pipe-stem, and other little juveniles not larger than a knitting-needle, and an inch long, were no common, cheap carbonate of lime, such stalactites as are put up in the vulgar and coarse, common caves, but the purest crystalized mineral, fit to decorate a princess' boudoir. A great many of these beautiful specimens were hacked and broken off, but some were taken off with care.

A piece of stalactite carbonate of lead was sent to Prof. Williams, at Rolla, who analized it, and found it to contain:

Carbonate of lead	98.453 pr.ct.	Sulphate of lead	.107 pr.ct
Carbonate of lime	.259 "	Oxide of iron	.654 "
Carbonate of magnesia	.303 "	Insoluble matter (clay)	.205 " —99.981

Specific gravity, 6.099 at 19° C.

Mines, Metals and Arts.

SAGINAW SALT BORING.—Bay City, Mich., April 1.—Last November the Michigan Salt Association commenced sinking a salt well at McLean & Sons' mill in this city, to ascertain if there was salt rock below the strata, from which brine is now taken. Their efforts have been crowned with success. A new layer 115 feet in thickness has been reached at a depth 2,085 feet below the surface. The yield is abundant and the strength is all the most sanguine hoped for. As soon as the surface water is all pumped up it is confidently expected the salometer will indicate 90 per cent. The rock discovered is known as the Waverly group, and is the same as the Goderich rock. Salt men have been apprehensive of comparative failure in supply of brine from the old rock in the near future, and the new discovery causes great joy. The well cost $4,000.—*Inter-Ocean.*

MINING IN MEXICO.—We learn from private sources the following items concerning Mexican mining matters: The merchants of Mazatlan, finding that business was dull, have thrown some money together and propose resuscitating the old mines of Panuco, about 90 miles to the southeast of the city. There are only 24 shares in the company. They have elected Don Antonio Paredes as superintendent, formerly the right-hand man of Bradbury, at Rosario. They have sent Cornish men here to buy pumping machinery, which went back on the last steamer. The mines have a brilliant record up to 1823, when the civil war caused their abandonment. The Durango Mining Company, at San Dimas, is still pushing its tunnel slowly along. Have been going ahead as for the last 12 years. The tunnel is now in about 1,200 feet.—*Mining and Scientific Press, March 24.*

PHŒNIX COPPER MINING CO.—ANNUAL REPORT.—We extract the following table from the *Portage Lake Mining Gazette* of the 22d inst., which shows very clearly the business of the company for the past four years:—

	1873.	1874.	1875.	1876.
Shipped and smelted	690,555 lbs.	1,796,390 lbs.	1,786,910 lbs.	1,824,810 lbs.
Yield per cent	75 46	77 85	78 58	76 52
Ingot Copper	521,081 lbs.	1,398,140 lbs.	1,404,276 lbs.	1,396,530 lbs.
Sold at per lb cents	30 62	22 67	22 65	20 54
Received for Silver *a*	$ 898 09	$ 2,950 49	$ 6,204 69	$ 2,120 42
Total Receipts	181,446 32	312,667 38	338,492 76	275,120 83
Total Expences	240,131 90	287,699 79	284,677 25	252,034 54
Net for Year	*b* 58,685 58	24,967 59	53,815 51	23,086 29
Surplus January 1	64,002 25	5,316 67	20,284 26	84,099 77

a 681½ ounces in 1873; 2,249½ ounces in 1874; 4,732¾ ounces in 1875; 1,840½ ounces in 1876.
b Loss for the year.
d Surplus Jan. 1, 1877, $107,186.06, out of which $1 per share ($20,000) dividend was paid Jan. 20.

The following statement shows the operations of the company in its mines, on the Phœnix and Robbins Veins during the past year:—

Sinking:	Incline Shaft	161.2 feet.	Stoping:	Second Level	38.07 fms.
	Crocker "	160 "		Third "	83 "
	Winzes "	434.1 "		Eighth "	155.98 "
	Total	755.3		Ninth "	257.29 "
Drifting:	Eighth Level	53.7 feet.		Tenth "	1,174.49 "
	Ninth "	6.7 "		Eleventh "	657.15 "
	Tenth "	212 "		Total	2,365.98 "
	Eleventh "	536.2 "	Drifting:	Fifth Level	52.7 feet.
	Twelfth "	551.1 "		Sixth "	511.1 "
	Total	1,359.7		Total	568.8 "
Cross-Cutting:	Eighth Level	76.2 feet.	Stoping:	Fourth Level	145.52 fms.
	Tenth "	10.9 "		Fifth "	260.53 "
	Eleventh "	29.2 "		Sixth "	75.21 "
	Twelfth "	10.4 "			480.99
	Total	126.7			

DROWNING OUT OF THE SUGAR LOAF MINE, HAZLETON, PA.—This extensive mine has caved in under the swamp, flooding both the Sugar Loaf and South Sugar Loaf mines. There will probably be great difficulty in preventing the ingress of the water.

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 March 31.

Tons of 2,240 lb.	1877. Week.	1877. Year.*	1876. Week.	1876. Year.*
Wyoming Region.				
D. and H. Canal Co.	37,548	463,196	32,267	321,307
D. L. and W. RR. Co.	37,650	459,549	34,864	257,507
Penn. Coal Co.	17,605	214,699	26,329	218,117
L. V. RR. Co.	20,224	222,772	19,309	172,414
P. and N. Y. RR. Co.	1,151	11,279	318	1,296
C. RR. of N. J.	31,070	280,953	29,798	147,273
	148,245	1,652,448	142,885	1,120,914
Lehigh Region.				
L. V. RR. Co.	36,775	540,454	58,844	356,045
C. RR. of N. J.	33,625	274,222	13,650	162,100
D. H. and W. B. RR.	156	1,516	1,617	9,912
	70,556	819,192	74,111	528,057
Schuylkill Region.				
P. and R. R. RR. Co.	94,490	948,850	114,191	446,972
Shamokin & Lykens Val.	5,980	85,483	5,593	52,817
	100,470	1,034,333	119,784	499,789
Sullivan Region.				
Sul. and Erie RR. Co.	229	3,028	1,116	14,367
Total	316,503	3,509,001	337,896	2,163,127
Increase	—	1,345,874	—	—
Decrease	21,393	—	—	—

*Year beginning January 1st.

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 March 30, and years from Jan. 1.

Tons of 2,240.	1877. Week.	1877. Year.	1876. Week.	1876. Year.
From				
Alexandria and Georgetown	—	1,298	—	4,162
Philadelphia	—	60,359	10,762	49,072
Baltimore	500	17,102	4,054	20,532
Other places	569	40,293	9,997	83,537
Great Britain	—	707	320	2,126
Nova Scotia	—	644	—	190
Total	1,069	120,403	25,133	119,628

Perth Amboy business:

	Tons.
Received for the week	19,071
Shipped for the week	20,816
On hand March 31	142,650

The Exports of Coal from Baltimore for the week ending March 30, were 936 tons, and since Jan. 1st, 7,25 9 tons as against 9,136 tons for the corresponding period of 1876.

The production of Bituminous Coal for the week ending March 31 was as follows:

Tons of 2,000 lb., except where otherwise designated.

	Week, Tons.	Year, Tons.
Cumberland Region, Md.		
Tons of 2,240 lb	25,895	154,444
Barclay Region, Pa.		
Barclay RR. tons of 2,240 lb	5,948	93,140
Broad Top Region, Pa.		
Huntingdon and Broad Top RR	3,408	35,925
*East Broad Top	1,239	10,694
Clearfield Region, Pa		
*Snoe Shoe	723	11,864
*Tyrone and Clearfield	27,957	281,863
Allegheny Region, Pa.		
*Pennsylvania RR	4,003	44,062
Pittsburg Region, Pa.		
*West Penn. RR	4,267	43,238
*Southwest Penn. RR	844	18,557
*Penn & Westmoreland gas coal, Pa. RR.	10,300	186,097
*Pennsylvania RR	7,822	85,227

*For the week ending March21.

The Production of Coke for the week ending March 21.

Tons of 2,000 lb.	Week.	Year.
West Penn. RR	1,640	20,096
Southwest Penn. RR	10,261	139,033
Penn & Westmoreland Region, Penn. RR.	1,331	18,461
Pittsburg, Penn. RR	1,425	34,421
Total	14,657	212,011

COAL TRADE REVIEW.

NEW YORK, Friday Evening, April 6, 1877.

Anthracite.

Business has slightly improved through the fears of some buyers that an arrangement may be entered into by which prices will be temporarily advanced. The large majority, however, do not think that such an arrangement can be made, and if it should be, do not think it can last longer than they can do without making important purchases.

The sensation of the week was the adjourned meeting of the representatives of the large coal mining and carrying companies, which was held at the office of the Delaware and Hudson Canal Co., at one o'clock on the 4th inst. Mr. Gowen, of the committee appointed to devise some plan for the improvement of the coal trade, presented a minority report embracing his well-known scheme of pooling the whole competitive production, and selling it through one head office. This report was discussed and finally dismissed, by a resolution declaring that it is not feasible at present. Messrs. Dickson and Sayre, of the same committee, presented the majority report. It provided for the appointment of a committe of one from each of the leading companies, which should meet monthly and agree upon the quantity of anthracite coal to be brought to tide-water during the month following, and, as far as might be, establish the wholesale price. By this plan the percentage of the month's production to be furnished by each company was to be arranged between the representatives of the different companies at the present conference, as well as methods for detecting fraud or over-production by any company.

After the reports had been discussed, a committee, composed of six gentlemen, representing the six large companies, was appointed to perfect the proposed plan for the limitation of tonnage to be brought to tide-water, and to report at a meeting which convened at 11 o'clock yesterday morning. This committee reported the following as the proper quota of each region:—

Philadelphia & Reading	25½
Lehigh Valley	18
Delaware & Hudson	15½
Delaware, Lackawanna & Western	15½
Central New Jersey & Lehigh and Wilkes-Barre	15½
Pennsylvania Coal	10

and that each interest be left to sell at any price or in any manner it may desire, and that the committee of three be requested to prepare a proper monthly allotment of tonnage, based upon an assumed product to competitive points for the year 1877, of eight millions of tons, and to report a proper plan to provide for adequate security being given to guard against any interest over shipping its proper quota.

Messrs. Gowen, Dickson and Sayre are the committee to put the whole scheme in a business shape, to attach penalties, find means of imposing them, and report at a full meeting, to be held in this city next Tuesday.

The basis upon which the allotment of tonnage is to be made is 8,000,000 tons, but the object of the agreement is to limit the quantity brought in competition to the actual requirements of the market, be they more or less.

The programme for 1876 based the tonnage on 8,500,000 tons as follows :—

	Per cent.	Tons.
Philadelphia and Reading RR	25.57	2,173,450
Delaware and Hudson Canal Co	18.18	1,545,300
New Jersey Central RR	15.98	1,358,300
Lehigh Valley RR	15.80	1,343,000
Delaware, Lackawanna and Western RR	13.65	1,160,150
Pennsylvania Coal Co	10.82	919,700
		8,500,000

The percentage of each company during 1874 and 1875 differed but little from the above figures.

It will be observed that in the percentages now proposed, the allotments to the Lehigh Valley and Delaware, Lackawanna & Western Railroad companies, (the two that have opposed combination), have been increased, while all the others have been decreased, although the Philadelphia & Reading has only been reduced .07 of 1 per cent.

Our views on the evil effects of combinations of this kind at this time, and on the impossibility of combination securing for the companies that prosperity, which is so desirable, and which is nominally the object of these countless conferences, are too well known to need repetition here. We see nothing in the last words or acts of the companies to induce us to change our opinion that such an arrangement to regulate production and prices would be injurious to the trade at large, and to the companies in particular. Of course it is quite possible these half dozen gentlemen may come to some agreement such as that proposed. They have made the first step, and have decided that the business should be divided among them in the above proportions; but they are not yet as far advanced as when in August last they found it impossible to hold the combination together. Then they had a quota, for each agreed upon, and a penalty of $1 50 a ton for exceeding the quota, and a long list of iron-clad stipulations to keep the honorable gentlemen up to their agreements.

We do not know just what change may have been effected in the conscience of some of the companies, but it must need be a radical one, to induce this childlike faith in each other's promises, which the officers of would have us believe they now hold. Only three short months ago, Mr. Gowen, in his admirable report to his stockholders, describing the ruinous effect the late combination had upon his company, stated that " this company (P. & R. RR. Co.) had frequent cause to complain in previous years of violations of the spirit of the agreement, but during the summer of the past year the great over-production by one of the companies, *persisted in, after repeated promises and pledges, to comply with its engagements*, etc. But Mr. Gowen's faith, hope and charity are boundless; he not only wipes out all record of past offences, and is ready to accept with implicit faith new promises, but, with the glowing faith of a martyr in some future reward, he is ready to offer his company a ready sacrifice to the fetich, Combination.

Three months ago the President of the Philadelphia and Reading Railroad Co. furnished the following convincing argument:—

"The great injury resulting from the workings of the association during the year is best explained by the following table, showing the fluctuations in the business of both companies during the three months immediately preceeding, and the same period immediately following, the dissolution of the agreement between the associated companies :

FOR JUNE, JULY, AND AUGUST.	
Profit from railroad traffic	$700,051 74
Profit from other business	26,444 98
	$726,496 72
Deduct—	
Loss on Coal and Iron Company	$487,047 54
Loss on canals and barge lines	114,462 70
	601,510 24
Total profit of both Companies	$124,986 48

FOR SEPTEMBER, OCTOBER, AND NOVEMBER.	
Profit from railroad traffic	$1,537,877 21
Profit from canals, colliers, and barges, and other business	226,190 86
Profit of Railroad Company	$1,764,068 07
Profit of Coal and Iron Company	168,364 63
Total profit of both Companies	$1,932,432 70

And this amount of $1,932,432.70, as the profits of three months of active competition at low rates and prices, is obtained after charging off $140,978.65 for depreciation of stock and materials at the end of the year."

And in another statement we learn that the average price of mining coal under the combination during the first eight months of 1876 was $1 69 per ton, and since the break of the combination the cost has been about $1 per ton. The chief economies were effected by the increased production of the mines, and by reductions in wages, which the prospect of steady employment rendered possible. Let the companies again combine to restrict production, (which means to keep the mines idle one-quarter to one-third of the time) and to increase prices—which is the ultimate object—and wages must be increased.

The cost of production will increase more than the selling price, and the net results will again be such as President Gowen has so clearly shown they were under the last combination. We refer more particularly to the Reading Company, because, except on the supposition of obligation for financial or other favors from those controlling some of the other companies, it seems incredible it should enter into any such arrangement as that proposed. It has sold already, at free competition prices nearly all the coal the Coal & Iron Company would be allowed to send to tide water under this arrangement. It could therefore hope for no advantage, except in tolls, on say one half its business, while the cost would be largely increased by restricted tonnage ; its efforts to build up a foreign trade would be thwarted and the advantages already gained at some sacrifice would have to be relinquished. While we have no idea that any permanent working combination will be formed, we believe that if it were, its effect would be to drive the labor from the coal fields, and it would thus place the compauies at a disadvantage when the increased demand, so long waited for, does come.

There seems to be no provision made for the Pennsylvania Railroad Company in the proposed arrangement so it is to be presumed it will be unrestricted. The Pennsylvania Coal Company has a contract with the Erie Railroad Company to ship a certain amount of coal, and we understand a penalty of 50c. per ton for any deficency in in this amount, while if it ships it it becomes liable to the combination penalty for exceeding its quota. On the whole the combination question is just approaching its difficulties and it remains to be seen whether they will prove insurmountable. There is a very long way from an agreement to restrict tonnage to a practical effective combination.

Though President Gowen's proposition to pool the coal and sell through one office, was voted down as not feasible, it seems to us to be the only combination which realy aims at a permanent practical economy. The others are simply devices to attain temporary objects—If in reality the object were as stated, simply to restrict tonnage and not control prices, what is the need of combination, the companies can any of them stop producing when they cannot dispose of their coal.

The production of anthracite coal for the week ending March 31, was 316,503 tons, as against 301,644 tons for the previous week, and 337,896 tons for the corresponding week of 1876. The total production since January 1, has been 3,509,001 tons, as against 2,163,127 tons for the corresponding period of last year; showing an increase of 1,345,874 tons. This increase, however, will probably be considerably reduced during the next five or six weeks, and if a combination be formed to limit production, it will be extinguished entirely.

Bituminous.

Numerous contracts for Cumberland coal are reported, aggregating with sales reported for two or three weeks back from 150,000 to 200,000 tons. Clearfield is quiet so far as large orders are concerned. The freight and toll questions appear to be the absorbing topics. The Pennsylvania Railroad Company is reported to have reduced its tolls 20c. per ton on Clearfield coal for shipment from Baltimore. The Chesapeake & Ohio Canal Company will meet on the 10th inst. to consider whether it shall make a reduction in its tolls in view of the private drawback of 20c. per net ton which the Baltimore & Ohio Railroad Company has made to the New Central Company and others. Some Baltimore & Ohio Railroad officials are in this city and will meet the representatives of some of the Cumberland coal companies with the view of securing tonnage that is now destined for the canal.

Gas Coals.—These continue to be very quiet as we predicted several weeks ago would be the case under the policy of high tolls specified in the arrangement between the Pennsylvania Railroad Company and the Baltimore & Ohio Railroad.

New York and Philadelphia.

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

	Lump.	Steamer.	Grate.	Egg.	Stove.	Chestnut.
Wyoming Coals.						
‡Lackawanna and Scranton at Hoboken and Rondout	2 90	2 90	2 90	2 95	3 35	3 25
Wilkesbarre at Port Johnston	2 90	2 90	2 90	2 95	3 35	3 00
Plymouth, R. A	....	....	2 90	2 95	3 45	3 10
Susque: Coal Co., (S. H. Brown & Co.,) At Amboy	2 75	2 75	2 75	2 80	3 25	2 85
Kingston at Hoboken	2 90	2 90	2 90	3 00	3 30	3 15
Pittston at Newburgh:						
A. S. Swords	2 80	2 80	2 85	2 85	3 30	3 25
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 65	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 65	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	3 60	2 65	3 25	2 75
Schuylkill red ash	....	....	....	2 75	3 35	2 75
Lorberry	....	....	3 60	3 60	3 60	3 00
Lykens Valley	....	....	4 15	4 15	4 15	3 30

‡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.

Lakawanna coal delivered to carts in New York or Brooklyn, 50 cents per ton additional.

Wholesale Prices of Bituminous Coal.

Manufacturing and Steam Coals.

Per ton of 2240 lb.	At the Shipping Ports.	Alongside in New York.
Cumberland at Georgetown and Alexandria, Va	3 25@....	4 50
Cumberland, at Baltimore	3 40@3 50	4 70
Clearfield f. o. b. Canton, Baltimore	3 50@....	5 00

Pennsylvania Semi-Bituminous Coals.

At the mines, per 2,000 lb., 90c.@$1 f. o. b. at Greenwich, Phila., for eastern and foreign shipments, per 2240 lb. $3 25@3 35 for sound ports, 3 50@3 65. f. o. b. at South Amboy, N. J., per 2,240 lb., $4 10@4 75, Discharged, in New York, per 2,240 lb., $5 00@5 15.

Foreign Gas Coals.

	Sterling.	Am cur'cy,
Newcastle, at Newcastle-on-Tyne	9/6@11/	6 50@ 7 00
Liverpool House Orrel, at Liverpool	26/	13 00
Ince Hall Cannel "	42/	18 00
" Gas Cannel "	28/	13@14
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	....
Sydney, International and Reserve mines at Sydney	2 00	5 50
Pictou, Albion and Vale mines, at Pictou	2 25	5 75

Retail Prices in New York.

Anthracite.

Per 2000 lbs.	Grate and Egg.	Stove.	Chestnut.
Pittston coal, in yard	$3 90	$4 20	$3 90
Lackawanna coal, in yard	3 50	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				$18 00
Liverpool House Cannel	"	"	"	18 00
American	"	"	"	11 00
Cannelton Block, or splint,	"	"	"	10 00
American Orrel	"	"	"	11@14
Red Bank Cannel	"	"	"	10 00
Cumberland	"	"	"	7 00

Buffalo. April 2, 1877.

Specially reported by LEE & LOOMIS.

Market dull, with limited sales. Anthracite prices unchanged. Per ton of 2,000 lbs. delivered on cars:—

	Lump.	Run of Mine.	Nut.	Slack.
Connellsville Coke	$5 00			
Brookfield Coal	4 15			
Briar Hill	4 00		2 85	
Youghiogeny	4 00			
Monterey	3 50	3 15		2 40
Catfish				
Stoneboro			2 75	2 40
		broken		
Sterling Cannel	5 00	4 75	4 50	
			nut & slack	
Reynoldsville	3 50	3 15	2 65	2 40
Cameron		3 15		2 40

In New York city funds.

Boston. March 31, 1877.

COAL—There was a little firmer feeling yesterday on the news of the revival of the combination. The shrewdest heads in the business, however, believe that any association of producers, except to extend markets abroad and at home by low prices, will be ruin to the trade; and that the confiidence which had begun to be restored by the present low prices will be utterly destroyed again.

Freights are quoted at $1 40 @ 1 50 from Philadelphia, $1 10 @ 1 20 from New York, and $1 50 @ 1 60 from Alexandria and Georgetown.

We quote Boston wholesale prices as follows:—

Anthracite, broken	4 50@4 75	Cannel, English	16 00
do egg	4 50@4 75	do Buckeye	10 00
do stove	5 00@5 25	Lingan	4 75@5 00
Cumberland	5 75	Pictou	5 50
Clearfield	5 25	Penn	6 25
Westmoreland	5 50	Youghiogheny	5 00@6 00
Caledonia	4 50@4 75		

—*Commercial Bulletin.*

Chicago, Ill. March 29, 1877.

Specially reported by Messrs. RENO & LITTLE.

Trade for this month has been good.

Lackawanna Stove	$8 00	Erie and Brier Hill	$6 00
" Chestnut	8 00	Wilmington and Ill.	3 50@4 25
" Grate and Egg	7 50	Blossburgh	7 00

Cleveland, O.

Specially reported by Messrs. LAMBIE & BATES.

Per ton of 2000 lbs. f. o. b. vessels.

WHOLESALE.

	1 to 10 tons.	10 tons upw'd.
Brier Hill lump	$4 25	$4 00
" " nut	3 75	3 50
Massillon and Mineral Ridge lump	4 00	3 75
" " " " nut	3 75	3 50
Straitsville Lower Vein, Hocking & Shawnee, l'p.	3 60	3 35
" " " " nut	3 40	3 15
Del Carbo lump	3 75	3 50
" " nut	3 50	3 25
Rich Hill lump	3 50	3 35
" " nut	3 25	3 00
Columbiana, lump	3 25	3 00
" nut	2 75	2 50
Lacka'a., Wilkesbarre and Pittston egg and grate,	7 00	6 75
" " " stove	7 50	7 25
" " " chestnut	7 00	7 25

Lehigh to be $1 25 per ton higher.

All sales to be strictly cash with order or C. O. D.

Cincinnati, O. April 21 877.

Specially reported by the Consolidated Coal and Mining Co.

	Per bush.	per ton 2,000 lb.
Youghiogheny lump afloat	8c.	$9 10
" nut "	6c.	1 64
" slack "	5c.	1 32
Camden, W. Va. "	6½c.	1 75
Kanawha, " "	8c.	2 10
Peytona cannel "	15c.	4 26
Youghiogheny lump delivered	12c.	3 33
" nut "	10c.	2 75
" slack "	7c.	1 89
Camden, W. Va. "	10c.	2 78
Peytona cannel "	18c.	5 14
Kanawha "	12c.	3 33
Youghiogheny coke "	8c.	4 00
Wilkes-Barre Anthracite delivered, all sizes	——	8 00
" " " on cars "	——	6 70
Lehigh anthracite delivered	——	8 75
" " on cars	——	7 50

Louisville, Ky. March 29, 1877.

WHOLESALE.

Pittsburg	7c. per bush.	Pine Hill	9c. per bush.
Raymond City	7c. "	Kentucky	8½c. "

RETAIL.

Pittsburg	12c. per bush.	Pine Hill	11c. per bush.
Raymond City	11c. "	Kentucky	10c. "
Indiana Cannel	17c. "	Honeywell Can'l	10c. "
City Make Coke	10c. "	Anthracite	$8 50 to $9 per ton.

New Orleans, La. March 26, 1877.

Specially reported by Messrs. C. A. MILTENBERGER & Co.

Domestic Gas Coals.

Westmoreland and Penn. at Greenwich, Philadelphia	$4 70	$6 00
" " at S. Amboy	5 50	6 00
Red Bank Cannel Pa. at Philadelphia	8 00	8 50
Youghiogheny, Waverly Co., at Balt	4 25	5 65
Despard, West Va.	4 50	6 00
Murphy Run, West Va., at Baltimore	4 50	5 86
Fairmount, West Va., " "	4 40	5 70
Newburgh Orrel, Md. " "	4 50	6 00
Cannelton Cannel, W. Va.	10 00	10 00
" Splint, " at Richmond.	6 00	7 00
" Gas Coal at Richmond	4 15	5 65
Peytona Cannel W. Va at Richmond		10 00

Pittston, Pa. Apr. 27, 1877.

Pennsylvania Coal Company's Coal in yard, ton of 2000 lb.

Retail.

Lump, Egg and Stove	$2 25
Chestnut	2 00
Pea	1 00

Delivered, fifty cents per ton additional

Richmond, Va. March 6, 1877.

Specially reported by S. H. HAWES, Dealer in Coal.

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

Kanawha Cannel	$9 00	New River Bituminous	$4 25
Coalburg Splint	5 70	Clover Hill Coal	3 50
Lewiston "	5 70	James River Bitum	3 25
Kanawha Gas Coal	4 90	" " Carbonite	5 00

Sandusky, O. March 31, 1877.

The retail prices for this market for present delivery are:—

Per ton of 2,000 lbs.

Anthracite.

Chestnut and Stove	$7 00	Furnace	$6 75

Bituminous.

Massillon	$3 75	Shawnee	$3 00
Del Calbo	3 50	Blossburg	6 00
Hocking Valley	3 50		

St. Louis, Mo. March 31, 1877.

Reported by JAS. J. SYLVESTER, Secretary of the Anthracite Coal Association.

Retail prices, delivered. Ton of 2,000 lb.

ANTHRACITE.

	per ton.		per ton.
Lackawanna	$9 00@10 00	Schuykill	9 00@10 00
Wilkes-Barre	9 00@10 00	Lehigh	10 00@10 50

BITUMINOUS.

Blossburg	9 00	Big Muddy	3 00
Pittsburg	4 50	Illinois Coals	2 50@3 00
Indiana Block	4 00	Connellsville Coke	6 50

Toronto, Canada. March 31, 1277.

Scranton and Lackawanna, Grate and Egg	$5 50
" " " Stove	6 00
" " " Chestnut	5 75
Lehigh Lump	7 00
Soft coals (Briar Hill and Massilon) screened for house use	6 00

Toledo, Ohio. March 28, 1877.

Specially reported by Messrs. GOSLINE & BARBOUR.

We quote coal as follows on cars at Toledo for rail shipment:

Ton of 2,000 lb.

Straitsville lump	$2 75	Hocking Valley nut	2 35
" nut	2 35	Massillon lump	3 00
Shawnee lump	2 75	Cumberland	5 50
" nut	2 35	Blossburg	5 50
Hocking Valley lump	2 75		

	Grate.	Egg.	Stove.	Chestnut.
Pittston	$6 00	$6 10	$6 60	$6 35
Wilkes-Barre	6 00	6 10	6 60	6 35
Lackawanna	6.00	6 10	6 60	6 35
Lehigh	6 75	6 85	7 35	7 10

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.

Hamilton, Ont. March 29, 1877.

Prices as quoted below give the present state of our market for coals that are in demand:

Grate	$5 95	Briar Hill screened	6 00
Egg	5 75	" " unscreened	5 50
Stove	6 50	Blossburgh	6 00
Nut	6 50		

Montreal. April 2, 1877.

Specially reported by Messrs. ROBERT C. ADAMS & Co.

Wholesale per ton of 2,240 lb.

A large stock of bituminous coal remains on hand in the city, and prices much below cost are being accepted for it. The demand is very light. The Grand Trunk Railway will award contracts for about 180,000 tons on the 7th inst., and the Gas Co. are about closing for a large quantity of Cape Breton coal.

The mild winter has left a fair supply of Anthracite on hand, though a few dealers will be about sold out. Quotations are:—

Scotch Steam	$4 50	Cape Breton Steam	$3 75
Pictou	4 25	Newcastle Smiths	6 50

Anthracite at retail, per 2,000 lb, delivered.

Egg	$6 50	Chestnut	$7 00
Stove	7 00		

Philadelphia, Pa. April 6, 1877.

Purchasers of coal seem to have concluded that prices have reached bottom. For a few days past orders have been freely given and the promise of some activity for some time to come was very fair. The attempts to form a combination which culminated to-day in some appearance of success have, however, acted as a brake, and confusion now reigns supreme, the anticipations for higher prices causing a reluctance to sell amongst many at the current rates and a resistance among buyers to pay an advance. It is a great misfortune that the experience of the last few months will have to be repeated again. The formation of a combination at this time with a considerable amount of coal sold ahead presents some practical difficulties which can hardly be overcome. By far the surest cure to overproduction is the crowds of men from the coal region which have attained sufficient proportions to warrant the expectation, that with the decrease in the production which must naturally result from it, and the increased consumption caused by low prices, added to the weeding process, causing the abandonment of expensive collieries, a permanent improvement would in course of time be reached. Certainly there would be less rejoicing amongst those who believe only in a combination to restore prosperity to the coal trade if they could foresee what must surely follow this new attempt to regulate the trade artificially. Freights continue firm at last quotations with quite a scarcity of vessels.

Freights

Representing the latest actual charters up to April 5

Per ton of 2240 lb.

PORTS.	From Philadelphia.	From Baltimore.	From Georgetown.	From Elizabethport, Port Johnson, South Amboy, Hoboken and Weehawken.
Augusta, Me.	....	1 75	....	....
Albany	....	....	....	....
Alexandria	....	....	....	....
Annapolis, Md.	65	....	....	....
Bangor, Me.	....	....	....	....
Bath, Me.	....	1 50	....	1.15-1.25
Baltimore	65@85	....	....	....
Boston, Mass.	1 50	1 50	160@170	1.20-1.25
Bridgeport, Ct.	....	1 35	1 40	50
Bristol, R. I.	....	....	....	80
Beverly, Mass.	1 50	....	....	....
Cambridgeport, Mass.	1 50	....	....	....
Charleston, S. C.	....	....	....	....
Darien, Conn.	....	....	....	....
Fall River	1 20	1 40	1 45	80
Gloucester	....	....	....	....
Flushing, N. Y.	....	....	....	....
Georgetown, D. C.	....	....	....	....
Hoboken	80@90	....	1 25	35
Hudson	....	....	....	....
Jersey City	....	....	1 25	35
Lynn, Mass.	....	....	....	1 30†
Middletown	....	....	....	90
Mystic	..	....	....	....
Newark	....	....	....	....
New Bedford	....	....	1 50	85
Newburyport	....	1 65	....	1 40
New Haven	....	1 35	1 40	50
New London	....	1 35	1 45	65@70
Newport	....	....	....	80
New York	80@90	1 15	....	35
Norfolk	....	....	....	75
Norwalk	....	....	....	50
Norwich	1 25	....	....	....
Pawtucket	....	....	....	70
Philadelphia	....	....	....	....
Portland	....	1 50	....	1 25
Portsmouth, N. H.	....	1 65	....	1 40
Providence	1 25	1 40	1 45	80
Poughkeepsie, N. Y.	....	....	....	....
Richmond, Va	70	....	....	....
Rockport, Mass	....	....	....	....
Salem, Mass.	....	1 50	....	....
Savannah, Ga	....	....	....	....
Stamford	....	....	....	60
Stonington	....	....	....	75
St. Johns, N. B.	....	....	....	....
Troy	....	....	....	....
Taunton	....	....	....	....
West Chester, N. Y.	....	....	....	....
Washington	80@85	....	....	....
Weymouth	....	....	....	....
Wilmington, Del.	....	....	....	....
Wareham	....	....	....	....
Yonkers, N. Y.	....	....	....	....

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

IRON MARKET REVIEW.

New York.

FRIDAY EVENING, April 6, 1877.

American Pig.—The business has been confined to a few hundred tons on the basis of $19@$20 for No. 1 pig iron. The condition of the trade is worse than it has been for months, and is almost unanimously so pronounced. The outlook is by no means encouraging, and the tendency of the price of iron is still downward, with indications of prices being reached which will accord with the views of the most extreme bears. The quotations are as follows: No. 1 foundry $19@$20; No. 2 foundry $18@$19; and forge $17@$18—the highest figures in each case being quite extreme, while some of the lower ones could be shaded.

Scotch Pig.—The business has been confined to small lots with prices but barely maintained. We quote Eglinton at $24.50; Coltness, $26.25; and Glengarnock, $25@$26.

Messrs. John E. Swan & Brothers, of Glasgow, under date of March 23, say: "The number of furnaces in blast is 115 as against 119 a year previous. The stock of iron in Connal & Co's stores is steadily increasing, being 129,013 tons as against 62,604 tons at the corresponding date in 1876. The total shipments from Dec. 25, 1876, to March 17, 1877, were 73,972 tons as against 78,673 tons for the like period of 1875-6. Quotations of No. 1 iron are as follows; Gartsherrie, 61/; Coltness, 64/ 6d.; Summerlee, 60/; Langloan, 62/; Glengarnock, 59/; and Eglinton, 55/ 6d. Freight rates are as follows: To New York, 2/; Boston, 9/; New Orleans, 5/; Baltimore, 8/; Philadelphia, 7/ 6d.; Montreal, 10/; and San Francisco, 25/."

Rails.—We only learn of a sale of 400 tons of iron rails to go to Texas. We continue to quote iron rails, at mills, at $33@$37, and steel at $48.50@$50.

Old Rails.—In the absence of business we continue to quote at $19.

Scrap.—There is no further business reported in this article. We quote No. 1 wrought at $26 nominal.

Baltimore, Md. April, 4. 1877.

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

The dullness noted in our market still continues, so that we have to report light sales during the past week—with no changes in prices—we quote :

Baltimore Charcoal	$29@31	Mottled and White	$16@17 00
Virginia Charcoal	28@32	Charcoal C. B. Blooms	60@62 00
Anthracite No. 1	21@22	" " Billitts	65@67 00
" " 2	20@21	Refined Blooms	45@50 00
Anthracite No. 3	19@20		

Boston. March 31, 1877.

PIG continues easy, and prices tend downward, though nominally unchanged. We quote $23 50 @ 24 for No. 1, $23 for No. 2, and $22 @ 23 for gray forge. Scotch pig is dull. We quote Coltness $28, Glengarnock $26 50, and Eglinton $26. The foreign markets are reported by cable firm early in the week, and then easy.

BAR is dull, quoting $47 @ 48 for refined, and $38 @ 39 for common. Nails are in light demand. Rails have quieted down.—*Commercial Bulletin.*

Chattanooga, Tenn. April 2, 1877.

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

PIG IRON—Business during the past week has been quite active, with a fair demand for all grades of standard brands at last quotations. "Rising Fawn" furnace has undergone repairs, and is ready to resume operations. We look with pleasure for the usual supply of this much desired brand once more upon our market.

BAR IRON—The demand is increasing. Prices remain very low, which fact causes continued depression of feeling amongst the manufacturers.

MUCK BAR—Fair demand for small lots at special prices.

OLD CAR WHEELS, OLD RAILS AND SCRAP—Little doing except in old rails, considerable of which has changed hands at an average of $18 75 per ton. I quote same as before:—

Tennessee, Alabama and Georgia Charcoal, No. 1 Foundry	$20 00@22 00
Tennessee, Alabama and Georgia Charcoal, No. 2 Foundry	19 00@20 00
Tennessee, Alabama and Georgia Charcoal, Gray Forge Foundry	16 00@17 00
Tennessee, Alabama and Georgia Coke, No. 1 Foundry	20 00@21 00
Tennessee, Alabama and Georgia Coke, No. 2 Foundry	18 00@19 00
Tennessee, Alabama and Georgia Coke, Gray Forge Foundry	16 00@17 00
Charcoal or Coke, white and mottled	15 00
Tennessee, Alabama and Georgia Cold Blast (car wheel)	22 00@28 00
Old rails	18 00@19 00
Old car wheels	16 00@17 00
Wrought scrap, No. 1	17 00
Wrought scrap, No. 2	12 00
Cast scrap	10 00
Muck bar	33 00@32 00

Iron Ores.

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

Cincinnati, O. April 3, 1877.

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

Below please find closing quotations of our pig iron market, viz.:—

CHARCOAL.

Hanging Rock No. 1 Foundry	$25 00@	....—4 mos
" " 2 "	24 00@	....—4 mos
" Soft Silver Grey	22 00@23	00—4 mos
" Mill	21 00@22	00—4 mos
Tennessee, No. 1 Foundry	23 50@24	00—4 mos
" " 2 "	22 50@23	00—4 mos
" Mill,	2100@22	00—4 mos

STONE COAL.

Ohio, No. 1 Foundry	22 50@23	00—4 mos
" " 2 "	21 50@22	00—4 mos
" Soft Silver Grey	21 00@21	50—4 mos
" Mill,	20 50@21	00—4 mos

COKE.

Ohio & W. Va. No. 1 Foundry	25 00@	....—4 mos
" " " 2 "	24 00@	....—4 mos
" " Mill,	21 00@22	00—4 mos

CAR-WHEEL.

Hanging Rock, C. B	38 00@45	00—4 mos
Tennessee, "	28 00@32	00—4 mos
Missouri, "	30 00@33	00—4 mos
Alabama, "	28 00@33	00—4 mos

Cleveland, O. April 2, 1877.

Specially reported by Messrs. C. E. BINGHAM & Co.

Per gross ton, on four months' time. Subject to change in market. Discount for cash 4 per cent.

FOUNDRY IRON.

No. 1, Lake Superior Charcoal	$26 00@....
No. 2, " " "	25 00@....
No. 1, Anthracite	24 00@....
No. 2, "	23 00@....
No. 1, Bituminous	24 00@....
No. 2, "	22 00@....
American Scotch, No. 1, Cherry Valley	24 00@....
" " B—1, " "	23 00@....
" " No. 2, " "	22 00@....
No. 1, Massillon	24 00@....
B—1, "	23 00@....
No. 2, "	22 00@....

CAR WHEEL AND MALLEABLE IRON.

No. 3, Lake Superior Charcoal	26 00@....
No. 4, " " "	27 00@....
No. 5 & 6, " " "	27 00@....

BESSEMER IRON.

Nos. 1 & 2, Lake Superior Charcoal	26 00@....

FORGE IRON.

No. 1, Grey	21 00@....
White and Mottled	19 00@....

Louisville, Ky. April 3, 1877.

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

The market is quiet. Buyers complain of small trade, and are not disposed to stock up. We revise quotations as below.

The usual time, four months, is allowed on quotations below.

FOUNDRY IRONS.

No. 1 Hanging Rock, Charcoal	$24 50@25 50
No. 2 " " "	22 00@23 00
No. 1 Southern Charcoal	21 50@22 00
No. 2 " " "	20 50@21 00
No. 1 Hanging Rock, Stonecoal and Coke	23 00@24 00
No. 2 " " " " "	21 00@22 00
No. 1 Southern Stonecoal and Coke	20 00@21 50
No. 2 " " " "	20 50@21 00
"American Scotch"	23 00@23 50
Silver Gray	19 00@21 00

MILL IRONS.

No. 1 Charcoal, Cold-short and Neutral	20 00@21 00
No. 1 Stonecoal and Coke, Cold-short and Neutral	20 00@20 50
No. 2 " " " " " "	19 00@19 50
No. 1 Missouri and Indiana Red-short	24 00@24 50
White and Mottled, Cold-short and Neutral	16 00@17 00

CAR-WHEEL AND MALLEABLE IRON.

Hanging Rock, and Cold Blast	37 00@40 00
Alabama and Georgia "	28 00@35 90
Kentucky Cold-blast	28 00@40 00

Milwaukee, Wis. March 30, 1877.

Specially reported by Messrs. R. P. ELMORE & Co.

There is no change in the price of coal or pig iron. Should there be any change we will notify you of such. There is no possibility of there being such before the opening of navigation.

Lake Superior No. 1 Charcoal	$26 00
" " " 2 "	25 00
Lake Superior No 1 Anthracite	25 00
" " " 2 "	24 00

Pittsburgh, Pa. April 6, 1877.

Specially reported by A. H. CHILDS.

No. 1 Foundry	23 00@24—4 mos
" 2 "	22 00@23 "
Gray Forge	20 00@22 "
White and Mottled	18 00@19 "
Cold blast Charcoal Western	40 00@45 "

Richmond, Va. March 31, 1877.

Specially reported by ASA SNYDER, Esq.

Charcoal pig irons are inactive. There are very light receipts and few sales. Quotations remain as previously.

Virginia Cold Blast Charcoal Pig Iron			$27 to $33
" Warm " " "			24 to 28
" " " Coke " "		1 X	23 to 24
" " " " " "		2 X	21 to 22
" " " " " "		3	20 to 21
" Anthracite	1 X		— to —
" "	2 X		— to —
" "	3		— to —

St. Louis, Mo.

Specially reported by Messrs SPOONER & COLLINS, Commission Agents for all kinds of Iron.

CHARCOAL.

Missouri No. 1 Found'y.	$23@25
" " 2 "	22@23
" Gray Mill	22@23
H. Rock No. 1 Found'y.	25@26
" " " 2 "	23½@24
" " Gray Mill	23@24
Tenn. No. 1 Foundry	23½@24
" " 2 "	22½@23
" Gray Mill	22½@23

COKE.

Alice H. R. Ex No. 1 F'y.	26 50
" " 2 "	25 50
B, " 1 "	24 50
" 2 "	23 50
Forge	23 50
Chat., Tenn. No. 1 Fd'y.	25 00
" " " 2 "	23 50
" Forge	22 50
" White Mtl'd	21 00

STONE COAL.

Missouri No. 1 Fd'ry.	25@24
" " 2 "	23@23
" Gray Mill	22@26
" White & Mt'd	21@22

COLD BLAST CHARCOAL FOR CAR WHEELS.

All Numbers

Hanging Rock	35@46
Tennessee	30@33
Kentucky	30@33
Missouri	28@30
Georgia	58@30
Alabama	28@30
Assorted Bar Iron $2 25, rates.	
No. 1 Wrought Scrap 95c. cwt.	
Heavy cast " " 70 "	
Light " " 40 "	

Montreal. March 27, 1877.

Pig iron is being offered at low prices for delivery upon opening of navigation, but we have heard of no sales. We continue to quote: Pig Iron—Gartsherrie, $22 to 22 50; Summerlee and Calder, $21 to 21 50; Eglinton and Clyde, $19 50 to 20; Hematite, $26 to 27; Bars—Scotch and Staffordshire, $2 to 2 10; best do. $2 20 to 2 30; Swedes and Norway, $4 75 to 5 50; Lowmoor and Bowling, $6 to 6 50.

METALS.

NEW YORK, FRIDAY EVENING, April 6, 1877.

Considerable disappointment is expressed at the quiet business that continues to be done, where a very fair spring trade was anticipated. The worst feature is that the outlook is not at all encouraging.

Gold Coin.—During the week under review the price of gold has ranged from 104¾ to 105⅛ and closed at 105.

Bullion.—Silver continues about the same as last week. A few days ago it rallied to 53¾d. in London, but this advance has been in part or wholly lost today. It is not likely to advance much if at all, under the large offerings by the English government of exchange on India. The quotation in London is 53½d. @53⅝d.; in San Francisco 8 per cent. discount, and in this city 116¾ per ounce fine. Gold bars range in quotations from par to ¼ per cent. premium.

Copper.—There appears to be a little more business in ingot, the sales for the week aggregating about 500,000 pounds at 19¼@19½c. closing at 19½ c. as the nominal asking price. There have been some negotiations toward making an export sale of 10,000,000 pounds of copper, and most of the companies appear to be willing to join in the movement, although some hope for a higher price for gold and higher quotation for copper in England to enable them to secure better prices for their copper, and are withholding. The latest cable advices quoted Chili Bars at £70 10/ and Best Selected £77 10/.

Tin.—We learn of no further business in pig tin. Yesterday's cable advices quoted straits in London at £70 10/ and in Penang $19.80 per picul. Shipments from the Straits settlements to the United States for the latter half of March were: by sail 250 tons and by steamers 150 tons. We quote, in gold, per pound, as follows: Straits, 16¾@17c.; L. & F., 16½c.; Refined 16¼@16½c.; and Banca, 19c.

Tin Plates.—The market is quiet and weak. We quote, in gold, per box, as follows: Charcoal tins, $6.75, and ternes, $6; coke tins, $5.87½, and ternes $5.50.

Messrs. Robt. Crooks & Co., of Liverpool, under date of March 21, say of tin plates: "There is no change of importance to note either in prices or prospects. A dull, heavy feeling prevails, but, in spite of this, holders will not at present make further concessions."

Lead.—The sales have only been in a small way at 6½c. with the great majority of the lead held at 6¾c.

Spelter and Zinc.—Spelter continues to be very quiet at 6¾@6½c. Sheet zinc, with but little business, is quoted at 7⅜@7½c. currency.

Antimony is quiet at 12½@12⅝c. gold.

Quicksilver.—This article is quoted at £7 5/@£7 10/ per flask in London, and 41c. gold, per pound, in San Francisco.

The San Francisco *Commercial Herald*, of March 29, says of quicksilver: "The steamer Australia for Australia carries 198 flasks, valued at $6,560. The Teutonia for Mazatlan carried 325 flasks, valued at $10,959. Price, 41c. with small sales."

FINANCIAL.

New York Stocks.

NEW YORK, FRIDAY EVENING April 6, 1877.

The meeting of the coal companies has had the effect of sustaining prices of the coal shares, the quotations closing very near the highest point of the week. There does not appear to be much confidence among speculators that a combination can be maintianed even if formed, and the promising indications of its accomplishment lend but little strength to the stocks, while it is believed that utter failure now, or a disorganization of the union at a later day, will be used by the bears in making another attack upon them.

Delaware, Lackawanna & Western Railroad.—Over 200,000 shares of this stock have changed hands at from 60¼ to 57¾, closing at one per cent. below the higher figure.

Delaware & Hudson Canal Company.—20,000 shares of this stock have changed hands at from 48⅛ to 50¼, closing at 49¼. The canal will be opened for business on the 10th inst., and lock tenders have been ordered to report on the 9th inst. The rates for boating will be seventy cents per ton. This Company will hold its annual meeting on the 8th of May.

Consolidation Coal Company.—But very little is being done in this stock, the transactions for the week only amounting to 250 shares. The closing quotation of 20 is the lowest price for this stock which we have ever reported.

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

Albany and Susquehanna R. R. Co.—Coupons of the Consolidated Mortgage and 2d Mortgage Bonds, also Interest on the Registered Bonds both paid by the Delaware and Hudson Canal Co.

Chesapeake and Ohio Canal Co.—Coupons of the Maryland loan.

Delaware and Hudson Canal Co.—Coupons of the Debenture loan of 1878 and Bonds of 1894, also Interest on the registered bonds of 1894.

Delaware, Lackawanna and Western Railroad Company.—Coupons and Interest of the Morris and Essex Railroad Company, Newark and Bloomfield Railroad Company, and first Mortgage Bonds of the Syracuse, Binghamton and New York Railroad Company.

Newark and Bloomfield Railroad Company.—Coupons, paid by Delaware, Lackawanna and Western Railroad Company.

Oxford Iron Company.—Coupons.

Piedmont Railroad Company.—Coupons.

Syracuse, Binhamton and New York Railroad Company.—Coupons of the First Mortgage Bonds paid by Delaware, Lackawanna and Western Railroad Company.

Vulcan Iron Company.—Coupons.

The National Tube Works' Company, of Boston, Mass., has declared a dividend of $3 per share payable on demand.

Connellsville Gas Coal Company.—$500 of the six per cent. registered bonds of this Company were sold at auction during the week at 41 per cent., also 250 shares of the stock of the same Company at 25 per cent.

Portsmouth, Ironton and Huntington Railroad of

Ohio.—A certificate of incorporation has been filed for this road to run from Portsmouth to the mouth of Symmes Creek, opposite Huntington, Va. Capital stock $500,000.

Columbia and Port Deposit Railroad.—Workmen have been busy laying the track of this road from Octoraro, Pa., northward, and lately united the tracks below Peach Bottom, Pa. This road was projected nearly thirty years ago.

New Brunswick Rubber Company.—28 shares of the stock of this Company par $100, were sold at auction during the week at 107 per share.

Novelty Rubber Company.—50 shares of the stock of this Company were sold at auction during the week at 34¼ per cent.

North Pennsylvania Iron Company.—$1,250 of the eight per cent. bonds of this Company, were sold at auction during the week at 40 per cent., also 50 shares of the stock of the same Company, par $100@1per cent.

Miscellaneous Sales and Quotations.

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

STOCKS.

	Quotations. High-est.	Low-est.	Clos-ing.	Sales Shares.
American Coal Co	—	—	20	—
*Cambria Iron Co	—	—	60	—
*Pennsylvania Salt Manf'g Co.	—	—	66	10
*Westmoreland Coal Co	—	—	—	—
*Buck Mountain Coal Co	—	—	—	—
St. Louis, I. M. & S.	—	—	8	100
Spring Mountain Coal	—	—	50	—

BONDS.

D., L. & W. 7s, Convt., 1892	—	—	—	—
" " 2d mtge., 1881	—	—	106	—
N. J. C., 1st mtge., new	105¾	104	104¼	31,000
" " 1st mtge., cons	53	51	50⅞	34,000
" " Convt	—	—	46	—
L. & W. B. Coal Co., cons	29½	25¼	28⅛	191,000
Am. Dock & Imp. 7s	45	—	45	2,000
D. & H. C. Co., 1st m., 1884	95½	95⅜	95⅛	5,000
" " " " reg., 1891	96¼	95¾	96¼	12,000
" " " " 7s, 1877	—	—	97⅜	—
" " " " reg. & con., 1894	88	—	88	1,000
St. L. I. M. & S., 1st mtge	95⅛	93	93	21,000
Ches. & Ohio, 1st mtge	—	—	21	—
*L. V. RR., con. mtge., 6s, 1923	—	—	—	—
" " 2d mtge., 7s, 1910	106¾	105	105	8,000
" " reg. & con., 1898	106	—	105	6,000
" " 1st mtge., 6s	—	—	—	—
*P. RR., 1st mtge., 1880	—	—	104¼	—
" Gen. mtge. reg., 1910	106	—	—	1,000
" Con. m. 6s. con. & reg. 1905	95	94⅜	94½	6,000
*P. & R. RR., 7s, 1893	—	—	104	—
" " con. m. 7s, con. 1911	93½	—	93⅜	4,000
" Deb. 6s, 1893	39	—	35	2,000
" New convt. 7s	50	49½	50	24,100
" " con. mtge. 7s, reg.	93½	—	93½	37,000
" " 6s, 44-80	101½	—	101	10,000
*P. & R. C. & I. Co. Deb. 7s	50	—	50	31,000
*P. & R. C. & I. Co., Tamaqua T.	55	—	55	58,000
*L. C. & N. Co. 6s, 1884	101	—	101	7,300
" " RR. loan '97	100	99⅜	99¼	9,600
" " Con. mtge. 7s	—	—	—	—
" " Convt. gold, 1894	—	—	98	—
" " Gold Loan, 1897	88	87¾	87¾	2,000
*Schuylkill Nav., 6s, 1897	—	—	85	—
*Pa. and N. Y. Canal, 7s	105	—	—	16,000
Pa. Canal Co	65	—	65	1,000
Susquehanna Coal Co. 6s	—	—	70	—

Totat transactions for the week $520,000

Philadelphia Stocks.

Philadelphia, Friday Evening, April 6, 1877.

The quotations of the Philadelphia coal shares all close lower. The transactions aggregate about 180,000 shares.

Pennsylvania Railroad.—The marked decline in this stock has been the feature of the week, the quotations ranging from 79 to 74 %, and closed at 77½ %. The *Ledger* of the 3d inst. says : "One of the most unsatisfactory features connected with the large operations in this stock is the fact that the 'bears' seem to have very thoroughly aroused apprehension among holders as to its reliability as an investment. As will be seen by running over the list of sales, but a small amount comparatively is on time. A very large proportion of the sales are cash and regular way, which may be taken as pretty good evidence that the stock is in hand. Indeed, it has been for a fortnight past easy to borrow."

Reading Railroad.—About 20,000 shares of this stock have changed hands at from 27 to 25¼ %, the final price being the lowest quotation of the week.

The amount of interest and floating debt whose postponement is arranged for by the plan lately submitted by this Company, is as follows :

General mortgage bonds....	$19,686,000	
Half interest for three year..		1,771,740
Improvement bonds	9,364,000	
Half interest for three years..		842,760
Debenture bonds.....	11,666,300	
All interest for five years.....		4,083,205
Floating debt 90% various periods about....		7,425,000
Total.....		$14,122,705

The first mortgage bonds amount to $5,573,500, on which the annual interest is $360,930, and the consolidated or second lien bonds to $18,617,000 on which the interest is $1,223,510; interest on these two classes of bonds the Company purposes paying in full.

It is also stated that interest on the Philadelphia and Reading Coal and Iron Company's first and second mortgage bonds will be paid in full.

Lehigh Valley Railroad.—The extreme quotations of this stock have been 83¼@80 closing at 83 %. The sales amount to 2,500 shares.

Coupons and Interest are due on the bonds of the following companies during the present month:

Cumberland Valley Railroad Company.—Interest. This Company will also pay a dividend during the present month.

Hungtingdon and Broad Top Mountain Railroad and Coal Company.—Coupons of the First Mortgage Gold Bonds.

Lehigh Coal and Navigation Company.—Interest on loan of 1884.

Little Schuylkill Railroad Company.—Interest on the seven per cent. mortgage loan of 1877.

Morris Canal and Banking Company.—Interest on Boat loan, paid by Lehigh Valley Railroad Company.

North Pennsylvania Railroad Company.—Coupons of the chattel mortgage bonds.

Pennsylvania Railroad Company.—Interest on the General Mortgage and First Mortgage six per cent. registered Bonds of 1910.

Pennsylvania and Delaware Railroad Company.—Coupons.

Philadelphia and Reading Railroad Company.—Coupons of the Loan Mortgage, also of the seven per cent. bonds of 1893.

United New Jersey Railroad Company.—Interest ou the registered bonds of 1894.

Western Pennsylvania Railroad Company.—Interest on the First Mortgage six per cent. and general seven per cent. bonds paid by the Pennsylvania Railroad Company.

Westmoreland Coal Company.—Interest.

Cambria Iron Company.—Interest. This Company has also announced a dividend of six per cent. payable on demand.

Pennsylvania Salt Manufacturing Company.—Interest.

Allegheny Valley Railroad Company.—Interest on the seven per cent. bonds.

East Extension.—Coupons of the bonds of 1910.

Danville, Hazleton and Wilkesbarre Railroad Company.—Interest on the First Mortgage sevens.

Junction Railroad Company.—Coupons of the Second Mortgage bonds of 1900.

Little Schuylkill Railroad Company.—Interest on the First Mortgage sevens of 1877.

Northern Central Railroad Company.—Interest on the Third Mortgage six per cent. bonds of 1900, also on the six per cent. registered, bonds of 1900, payable in currency.

Oil Creek Railroad Company.—Coupons of the First Mortgage seven per cent. bonds of 1882.

Perkiomen Railroad Company.—Coupons of the First Mortgage six per cent. bonds of 1897.

Sunbury and Erie Railroad Company.—Coupons of the First Mortgage seven per cent. bonds of 1877.

Wilmington and Reading Railroad Company.—Coupons of the First Mortgage seven per cent. registered bonds of 1900.

Philadelphia and Reading Coal and Iron Company—Interest on the seven per cent. bonds of 1892.

Nescopec Coal Company.—The semi-annual dividend period of this Company, falls due during the present month.

Westmoreland Coal Company.—The dividend period of this Company comes due during the present month.

Copper Stocks.

Boston, Thursday Evening, April 5, 1877.

Specially reported by Wilson W. Fay & Co., Bankers and Brokers, Room 7, Travellers Building, 31 State street.

There is nothing new in the market worthy of comment, and probably will not be, as long as ingot copper sells at 19¼ to 19½c. for of course it is a well known fact, that not more than two or three mines on the Lake can pay expenses with copper under 20c. per pound. War in the East, would of course start the price at once, and this is the string that the most sanguine are playing on at the present moment. Calumet is very quiet and steady at 180, it is so well held that little stock finds its way on the market. Copper Falls 3 bid, the company have just taken out some 10 tons, worth somewhere in the neighborhood of $3000, but if they should take out 50 tons it is doubtful if the stock would feel any effect from it, in the present state of the market. Duncan has declined from 6¼ sales, to 5⅝, and looks decidedly weaker than it did one week ago. We do not see much demand for it, except by parties whose interest it is to keep it well up. Quincy has a rather weak back, but a strong seller in a party, who commenced selling at 42½ and has presistently sold it down to the present price. In the small coppers nothing doing.

The Copper Shipments from the Lake Superior district for the season ending the 30th ult., amounts to about 2,000 tons.

Gold and Silver Stocks.

New York, Friday Evening, April 6, 1877.

The business of the week has been larger than for several weeks past, the sales aggregating 70,580 shares, as against 48,260, last week. Of the business done, however, 38,325 shares were confined to Hukill and Seaton, which have been quite weak, the former having declined from 4¼, the closing quotation a week ago, to 3⅝ ex-dividend, the closing quotation to-day, while the latter has declined from 4½ to 3¾, the closing quotation to-day. The other prominent stocks have been Bertha, Cleveland and Merrimac,—which have been fairly steady during the whole week. Alpha in which there has been transaction of but 600 shares has declined from 16½, last week, to 13½, the closing quotation to-day. Overman has declined from 70½ 62½,

The decline in Seaton and Hukill is attributed to over-speculation on the part of some of the members of the board. The announcements of dividends and continuous encouraging reports from the mines should have tended to hold the stocks at least firm. These stocks are steadily going into the hands of investors as are those of some of the other dividend paying companies. The decline of Overman is attributed to a report that the streaks of ore found in the winze on the 1,200 feet level had all disappeard. Both the California and the Consolidated Virginia shares are in fair request on the San Francisco market. The ore yield of the former is quite large, averaging about 750l tons per day. One-third coming from the 1600 level, and the balance from the 1500 and 1550 levels. The Company expects to commence stoping on the 1600 level of the Consolidated Virginia very soon. The near approach of the Sutro Tunnel to the lode is beginning to attract a great deal of attention. It is rumored that some of the large owners in the prominent mines are endeavoring to negotiate a purchase.

The following are the quotations of stocks dealt in on the New York Mining Stock Exchange. The sales this week amount to 12,500 shares, an increase as comparred with last week of 10,500 shares, more than 11-12 of the entire transactions being in Lacrosse. The closing quotations in Gold Stocks remain about the same, while those of Copper, with but one exception show an advance :

Atlantic Copper Mining Company, 200 shares at $7.00.
Quincy Copper Mining Company, 50 shares at $38.
Wilson direct process Iron Company, 25 shares at 25c.

Closing quotations:

	Bid.	Asked.
American Flag Gold Mining Company,	07	08
Bobtail Gold Mining Company	1 45	1 50
Bobtail Tunnel Company	3 50	4 00
Lacrosse Gold Mining Company	28	30
New York & Colorado Gold Mining Co.	....	3 00
Smith & Parmlee Gold Mining Co.	10	15
Eureka, of Grass Valley, Cal., G. M. Co	2 50	3 00
Allouez Copper Mining Company	6 50	10 00
Atlantic " " "	6 75	7 00
Calumet & Hecla Copper Mining Co.	180 00	....
Central " "	34 00	37 00
Franklin " "	11 00	12 00
Madison " "	25	35
Mesnard " "	37½	62½
Minesota " "	....	....
National " "	50	1 00
Osceola " "	24 00	28 00
Pewabie " "	2 50	3 50
Quincy " "	36 00	38 00
Ridge " "	3 00	4 00
Rockland " "	....	....

United States Assay Office.—Statement of business for the month ending March 31, 1877:

Deposits of Gold.	
Foreign Coin	$205,000 00
" Bullion	37,000 00
U. S. Bullion	400,000 00
" " (Re-deposits)	19,000 00
Jeweller's Bars	65,000 00
Total Gold Deposits	$726,000 00
Deposits of Silver.	
Jeweller's Bars	13,000 00
Foreign Coin	2,000 00
" Bullion	20,000 00
U. S. Bullion (contained in Gold),	6,000 00
" " (Re-deposits)	16,000 00
" " Colorado	200,000 00
" " Lake Superior	1,000 00
" " Montana	40,000 00
" " Nevada	45,000 00
U. S. Bullion New Mexico	25,000 00
" " Utah	275,000 00
" " Arizona	4,000 00
Total Silver Deposits	$647,000 00
Aggregate Deposits	$1,373,000 00
Gold Bars stamped	$234,389 71
Siver " "	804,344 17
	$1,038,733 88
Transmitted to U. S. Mint, Philadelphia, for Coinage, Gold	$726,604 28
Transmitted to U. S. Mint, Philadelphia, for Coinage, Silver	14,889 13
	$741,493 41

The Philadelphia Mint Coinage for March was as under:

	Pieces.	*Value.*
Double Eagles, gold	22,650	$453,000
Trade Dollars, silver	50,000	50,000
Half " "	936,000	468,000
Dimes " "	2,570,000	257,000
Total	3,587,650	$1,237,000

The Hale and Norcross Company are struggling with the water, there being all that the pumps can raise. Another breakdown of the pumps of the Savage is reported and water has risen to within a few of the 1900 feet level. The Chollar-Potosi is yielding, from the upper works, 100 tons per day, averaging $27 per ton. The Justice is producing 400 tons of ore per day, keeping the mills steadily working. The water is being drained from the bottom of the main incline below the 1000 feet level. In the Ophir mine a strong flow of water has been struck which will necessitate a re-arrangement of its pumping system.

The Hurricane Mining and Smelting Company, of Oreana, Nevada, is producing an average of four and a half tons of bullion per day.

The New Coso Mine of Inyo County, California, shipped about $75,000 in bullion during the month of March.

COAL TRANSPORTATION AND MINING STOCKS.

[New York and Philadelphia.]

	Amount of Cap. Stock.	Shares issued.	Date, percentage and amount of last dividend.	QUOTATIONS. *g* Sat. H'gst.	Sat. L'st.	Mon. H'gst.	Mon. L'st.	Tues. H'gst.	Tues. L'st	Wed. H'gst.	Wed. L'st.	Thurs. H'gst.	Thurs. L'st.	Fri. H'gst.	Fri. L'st.	Clg Bid.	SHARES SOLD.
‡Consolidation Coal Co.	$10,250,000	102,500	Jan. 1, '77, 2½ .. $256,250	....	....	26	25	....	....	....	....	....	....	....	....	20	250
‡Delaware and Hudson Canal Co.	20,000,000	200,000	Aug. 1, '76, 4.... 800,000	49¾	48¼	50¾	49⅛	50⅛	49	49½	48⅜	49¾	48⅞	50⅛	48⅜	49⅛	20,093
‡Delaware, Lackawanna and W. RR. Co	26,200,000	524.000 *c*	April 20, '76, 2½. 647,230	59	58¼	60¼	58	60⅛	58¼	59	57¾	59⅜	58¼	60	58½	59⅛	200,235
§Lehigh Coal and Navigation Co.	10,448,550	208,971 *c*	Sep. 3, '76, 1½. 156,728	43¾	43½	45	43¾	45⅛	44¾	44½	42¾	44	42¾	....	....	42½	13,585
§Lehigh Valley Coal Co.	27,042,900	540,858 *c*	April 15, '77, 1½ 405,643	81	81	81	80	83¾	82	82	81	83	83	....	....	83	2,557
‡Maryland Coal Co.	4,400,000	44,000	Jan. 31, '76, 1½. 66,000	....	....	8	....	8	....	8	....	....	....	....	....	8	....
‡New Jersey Central RR. Co.	26,000,000	260,000	April 20, '76, 2½ 515,000	8⅞	8⅛	9	8⅝	9	8½	8⅞	8½	8½	....	....	....	8½	2,581
‡Pennsylvania Coal Co.	5,000,000	100,000 *c*	Feb 1, '77, 5.... 250,000	....	....	....	....	....	....	....	....	....	....	....	....	....	....
§Pennsylvania RR. Co.	68,868,700	1,377,376 *c*	Feb. 26, '77, 2.. 1,377 374	79	76½	78½	74	79	76	77⅛	76	79⅛	77	....	....	77½	157,645
§Philadelphia and Reading RR. Co.	34,278,755	685,575 *c*	Jan. 18. '76, 2½. †856,954	26¾	25¾	27	26	27	26¾	26¾	25¾	26½	25¾	....	....	25¼	19,129

Total sales of coal stocks for the week ..116,074

MINING STOCKS, New York.

Name of Company.	Location.	Feet on Vein.	Capital Stock	*a* No. of Shares.	Total Assessments Levied.	Date and Amount of Last Assessment per Share.	Total Dividends paid.	Date and Amount of Last Dividend per Share.	These quotations are in currency, and in the absence of final bid, prices are based on the latest sales as they occur during the operations of each day. Sat.	Mon.	Tues.	Wed.	Thurs.	Fri.	SHARES SOLD.
Alpha Cons. G. S.	Nevada,	300	$ 3,000,000	30,000	$ 180,000	Aug. 12, '75, $1.	....	.....	....	$17 25	$16 00	$16 12½	....	$13 50	600
Am. Flag G. Mg. Co.	Colo.	5,300	600 ,000	60,000	**	.....	....	.....	....	....	....	....	....	....	....
Belcher. G S.	Nevada,	1 040	10,400,007	104,000	864,400	Feb. 24, '77, $1.	$ 15,397,200	April 10, '76, $1.	....	7 25	....	7 25	....	7 00	600
Bertha Gold Co.	Virgi'a,	645 acs.	300,000	30,000	**	.....	....	.....	$ 8 25	8 50	8 37½	8 37½	$ 8 50	8 62½	4,000
Best and Belcher, G. S.	Nevada,	545	10,080,000	100,800	236.992	Feb. 6, '77, $1.	....	.....	29 25	....	....	28 50	....	....	400
Bobtail G. M. Co.	Colo.	2,500	1,136,630	227,326	**	.....	....	.....	....	....	....	1 50	1 55	....	350
Bobtail Tunnel Co.	C lo.				**	.....	....	.....	....	....	....	....	3 50	....	300
Bullion, G. S.	Nevada,	943½	10,000,000	100,000	2,202,000	Jan. 15, '77, $r.50.	....	.....	15 00	14 50	....	....	14 00	13 50	1,000
Caledonia, G. S.	Nevada,	2,188	10,000,000	100,000	1,310,000	Feb. 10, '77, $1.	....	.....	7 12½	7 12½	....	....	6 25	5 25	700
California, G. S.	Nevada,	600	54,000,000	540,000	....	.....	11,880,000	March 15, '77, $2.	....	48 50	49 00	....	48 00	....	270
Centennial, G	Califor.	66 acres	1,000,000	100,000*b*	....	.....	....	.....	....	....	....	....	....	....	....
Chollar Potosi, G. S.	Nevada,	1,400	2,800,000	28,000	1,282,000	June 26, '76, $5.	3,080,000	Feb. 10, '72. $1.	56 87½	....	57 00	56 75	53 00	....	400
Cleveland, G.	Colo.	3.715	250,000	25,000*b*	**	.....	....	.....	6 00	6 12½	6 25	6 25	6 37½	6 25	4,600
Cons. Hercules & Roe.	Colo.	16 500	1,000,000	100,000	**	.....	120,000	.....	....	....	....	....	....	....	....
Cons. Imperial, G. S.	Nevada,	468	50,000,000	500,000	375,000	March 10, '77, 25c.	....	.....	1 37½	....	....	....	1 37½	....	600
Con. N. Slope & E. C. T.	Colo.	15,000	500,000	10,000	....	.....	....	.....	....	....	....	....	....	....	....
Cons. Virginia, G. S.	Nevada,	710	54,000,000	540,000	411.200	June 11, '73, $3.	25,920,000	Dec. 11, '76, $2.	....	46 00	....	....	45 25	44 00	135
Confidence, G. S.	Nevada,	130	2,496,000	24.960	243.840	March 18, '73, $1.	78,000	May 1, '65, $8.33⅓	7 50	7 62½	7 37½	....	....	....	400
Crown Point, G. S.	Nevada,	600	10,000,000	10 ,000	1,273,370	Jan. 10, '77, $1.	11,588,000	Jan. 12, '75, $2.	....	....	....	7 50	7 25	7 00	300
Douglas Mining Co.	Colo.	21,000	1,000,000	1 ,000	**	.....	....	.....	....	....	....	....	....	....	....
Eureka Cons. G. S. L.	Nevada,	..	5,000,000	50,000	100,000	May 26, '76, $1.	1,000.000	Aug. 5, '75, $1.	....	....	....	....	18 25	....	100
Eureka G. Mg. Co.	Colo.				....	.....	....	.....	....	....	....	....	....	....	....
Exchequer, G. S.	Nevada,	400	10,000,000	100,000	280,000	Sept. 23, '76, $1.	....	.....	5 50	....	5 75	....	....	....	700
Gould and Curry, G. S.	Nevada,	621	10,800,000	108,000	2,134,000	Jan. 23, '77, $1.	3,934,800	Oct. 10, '70, $10.	13 00	....	....	13 00	12 25	11 25	600
Grant, G. S.	Nevada,	1,000	10,000,000	100,000	....	.....	....	.....	....	....	....	....	....	....	....
Granville Gold Co.	N. Car.	9,000	1,000,000	100,000	**	.....	....	.....	2 37½	2 50	2 50	2 50	2 50	2 62½	2,800
Hale & Norcross, G. S.	Nevada,	400	11,200,000	112,000	2,354,000	Jan. 22, '77, $1.	1,598,000	April 10, '71, $1.	4 75	4 50	4 25	4 37½	4 00	3 50	1,100
Henry Tunnel Co.	Nevada,	3,000	2,000,000	80,000	**	.....	....	.....	5 62½	....	....	....	5 37½	....	700
Hukill, G. S.	Colo.	3,288	1,000,000	100,000*b*	**	.....	30,000	April 10, '77, 10c.	4 25	4 25	4 37½	4 12½	3 87½	3 62½	21,725
Indian Queen, S.	Nevada,	1,000	3,000,000	60,000*c*	....	.....	60,000	.....	....	....	....	....	....	....	....
Julia Cons., G. S.	Nevada,	3,000	11,000,000	110,000	220,000	Jan. 4, '77, $1.	....	.....	....	....	....	....	....	....	....
Justice, G. S.	Nevada,	2,100	10,500,000	105,000	1,502,500	Sept. 14, '76, $5.	....	.....	....	....	....	....	....	....	....
Kentuck, G. S.	Nevada,	95	3,000,000	30,000	270,000	Dec. 3, '74, $1.	1,252,000	March 8, '70, $5.	....	....	4 00	....	....	....	100
Kossuth, G. S.	Nevada,	2,700	5,400,000	108,000*c*	405,000	Aug. 15, '76, 50c.	....	.....	....	....	....	....	....	....	....
Lacross G. M. Co.	Colo.	3.900	1,000,000	100,000	**	.....	....	.....	....	....	....	28	30	....	11,600
Leopard, G. S.	Nevada,	1,500	5,000,000	50,000	50,000	March 31, '76, $1.	162,500	Dec. 15, '76, 50c.	....	....	4 37½	....	....	....	100
Lucerne Mining Co.	Colo.	4,200	5,000,000	500,000*b*	**	.....	....	.....	1 50	1 37½	1 62½	1 37½	1 37½	1 50	1,300
‡Mari, L. & M. Co., pre.	Cal.	44.387 ac	5,000,000	50,000	1,350,000	Feb. 17, '77, $1.	....	.....	....	....	4 00	....	....	4 00	....
" " " com	"		10,000,000	100,000	1,350,000	Feb. 17, '77, $r.	....	.....	....	....	4 00	....	....	4 00	....
Mer. & Min. Tun. Co.	Colo.	30,000	500,000	50,000	**	.....	....	.....	....	....	....	....	....	....	....
Merrimac, S.	Mass.	1,500	500,000	50,000*b*	**	.....	55,000	April 10, '77, 10c.	6 62½	6 62½	6 75	6 75	6 62½	6 75	8,900
Mexican, G. S.	Nevada,	600	10,080,000	100,800	100,800	Sept. 5, '76, 50c.	....	.....	....	....	....	....	....	....	....
Morning Star.	Nevada,	1,600	8,000,000	80,000	....	.....	....	.....	....	....	....	....	....	....	....
N. Y. & Colo. G. M. Co	Colo.		1,000,000	50 000	**	.....	20,000	March 1, 17, 20c.	....	....	....	....	....	....	....
Northern Belle, S.	Nevada,	1,600	5,000,000	50,000	....	.....	1,100,000	March 12, '77, $1.	....	....	....	....	....	....	....
Ophir, G. S.	Nevada,	675	10,080,000	100,800	2,034,400	May 14, '75, $2.	1,394,400	March 9, '64, $4.	....	....	....	....	21 00	....	100
Original Comstock, G. S	Nevado,	....	10,000,000	10,000	....	.....	....	.....	....	....	....	....	....	....	....
Overman, G. S.	Nevada,	1,200	3,840,000	38,400	2,222,280	Oct. 21, '75, $3.	....	.....	....	....	....	....	62 50	....	100
Pleasant View, G.	Colo	1,200	200,000	20,000*b*	**	.....	....	.....	....	....	....	....	....	....	....
‡Quicksil M. Co., pre.	Cal.	8500 acs.	4,291,300	100,000	**	.....	....	.....	21 00	21 75	20 00	20 25	....	20 00	600
" " " com.	"	"	5,708,700	"	....	.....	....	.....	15 00	14 12½	14 00	14 12½	....	13 00	600
Raymond and Ely, G. S.	Nevada,	5,000	3,000,000	30,000	540,000	Dec. 5, '76, $1.	3,075,000	Sept. 10, '73, $3.	....	....	5 50	....	....	....	200
St. Joseph Lead Co.	Misson.	2600 acs.	1,000,000	100,000	....	.....	250,000	.....	6 25	5 87½	5 87½	5 75	5 75	....	1,200
Santiago, G. S.	Nevada,	2,000	11,200,000	112,000	....	.....	....	.....	....	....	....	....	....	....	....
Savage, G. S.	Nevada,	800	11,200,000	112,000	2,970,000	Jan. 27, '77, $1.	4,460,000	June 11, '69, $3.	....	....	....	....	....	....	....
Seaton, G. S.	Colo.	1,700	500,000	50,000	**	.....	5,000	April 10, '77, 1 c.	4 26½	4 50	4 50	4 37½	4 25	3 62½	16,600
Seg. Belcher, G. S	Nevada,	160	640,000	6,400	244,800	April 11, '76, $5.	....	.....	....	....	....	....	....	....	....
Sierra Nevada G. S.	Nevada,	3,650	10,000,000	100,000	1,600,000	Feb. 15, '77, $1.	102,500	Jan. 16. '71, $1.	....	....	....	....	....	....	....
Silver City, G S.	Nevada,	3,900	6,310,000	63,100	15,775	Nov. 16, '76, 25c.	....	.....	....	....	....	....	....	....	....
Silver Hill, G. S.	Nevada,	5,400	10,800,000	108,000	864,000	Feb. 6, '77, $1.	....	.....	....	....	....	....	....	....	....
South Comstock, G. S.	Nevada,	1,500	10,000,000	100,000	54,000	Jan. 30, '77, 25c.	....	.....	....	....	....	....	....	....	....
South. California, G. S.	Nevada,	1,500	5,000,000	50,000	....	.....	....	.....	....	....	....	....	....	....	....
Southern Star. G. S.	Nevada,	1,500	6,000,000	600,000	....	.....	....	.....	1 25	....	....	....	....	....	50
Trenton, G. S.	Nevada,	..	10,000,000	100,000	....	.....	....	.....	....	....	....	....	....	....	....
Union Cons., G. S.	Nevada,	850	10,000,000	100,000	260,000	March 3, '76, $1.	....	.....	....	....	....	....	....	....	....
West Belcher, G. S.	Nevada,	1,000	10,000,000	100,000	....	.....	....	.....	....	....	....	....	....	....	....
Yellow Jacket, G. S.	Nevada,	1,200	12,000,000	120,000	2,838,000	March 2, '77, $1.	2,184,000	Aug. 10, '71, $2.50.	....	....	....	....	....	....	....
Young America, S.	Nevada,	1,000	3,000,000	30,000	6,000	Oct. 23, '76, 20c.	....	.....	....	....	....	....	....	....	....
	Total Assessments levied to date, $32,054.357					Div'ds pd. to date, $88,726.400								Total sales.....	77.220

Boston.

									Fri.	Sat.	Mon.	Tues.	Wed.	Thurs.	
Allouez, C.	Mich.	..	$1,000,000	20,000*c*	$ 940,000	May 9, '76, $5.	....	.....	....	6 00	6 25	6 25	6 00	6 00	.. ...
Calumet and Hecla, C	Mich.	2¾ mile	2,000,000	80,000*d*	$1,200,000	.....	$ 11,450,000	Feb. 15, '77, $5.	....	180 50	180 25	180 62½	180 25	180 50	.....
Central, C.	Mich.	..	500,000	20,000*d*	100,000	June, '62, 65c.	1,160,000	Feb. 6, '77, $7.	....	34 00	34 50	35 00	34 50	34 00	.....
Copper Falls, C.	Mich.	..	1,000,000	20,000*d*	535,000	May 10, '76,	100,000	Nov., '71, $1.	....	3 00	3 00	3 00	3 00	3 00	.....
Dana, C.	Mich.	..	500,000	20,000*d*	68,000	Jan., '73, 50c.	....	.....	....	10	10	10	10	10	.....
Dawson, S.	Canada.	..	1,200,000	60,000*f*	....	.....	....	.....	....	14	14	14	14	14	.....
Duncan, S.	Canada.	..	1,200,000	60,000*f*	75,000	July, '76, 41 2-3.	....	.....	....	5 87½	5 75	5 75	5 50	5 62½	.....
Franklin, C.	Mich.	..	500,000	20,000*d*	360,000	June, 68, $5.	585,00	Nov., '71, $1	....	11 25	11 25	11 00	11 00	11 00	.....
Humboldt, C.	Mich.	..	500,000	20,000*d*	100,000	Sept. 28, '76, 15c.	....	.....	....	20	20	20	20	20	.....
International, S.	Canada.	..	1,200,000	60,000*f*	....	.....	....	.....	....	68¾	68¾	62½	62½	62½	.....
Mesnard, C.	Mich.	..	500,000	20,000*d*	160,000	April 12, '65, 50c.	....	.....	....	37	38	40	40	40	.....
Madison, C.	Mich.	..	500,000	20,000*d*	123,000	Sept. 11, '74, 10c.	....	.....	....	25	25	25	25	25	.....
Minesota, C.	Mich.	..	1,000,000	20,000*e*	436,000	June 10, '69, $1.	1,820,000	March 15, '76, 50c.	....	1 25	1 00	1 00	1 00	1 12½	.....
National, C.	Mich.	..	500,000	20,000*e*	195,000	Oct., '75, $1.	360,000	Oct., '73, $1.	....	95	95	90	90	90	.....
Osceola, C.	Mich.	..	1,000,000	40,000*d*	880,000	May 1, '76, $2.	....	.....	....	23 50	24 00	24 00	24 00	24 00	.....
Petherick, C.	Mich.	..	500,000	20,000*d*	165,533	March 22, '76, 50c.	....	.....	....	25	23	22½	23	23	.....
Pewabic, C.	Mich.	..	500,000	20,000*d*	185,000	June, '68, $3.	460,000	July, '73, $1.	....	3 50	3 50	3 50	3 50	3 50	.....
Phœnix, C.	Mich.	..	1,000,000	20,000*e*	817,500	Sept., '70, $3.	20,000	Jan. 20, '76, $1.	....	....	....	....	....	....	.....
Quincy, C.	Mich.	..	*h* 200,000	20,000*b*	....	.....	2,130,000	Feb. 15, '77, $4.	....	38 25	37 75	37 50	37 25	37 00	.....
Ridge, C.	Mich.	..	500,000	20,000*d*	200,000	.....	90,000	Feb. 8, '75, $1.	....	3 00	3 00	3 00	3 00	3 00	.....
Rockland, C.	Mich.	..	500,000	20,000*d*	495,000	Jan., '74, $1.	....	.....	....	25	25	25	25	25	.....
Star, C.	Mich.	..	500,000	20,000*d*	265,000	March 30, '76, 50c.	....	.....	....	25	20	20	20	20	.....
Superior, C.	Mich.	..	500,000	20,000*d*	340,000	March, '74, 25c.	....	.....	....	10	10	10	10	10	.....
	Total Assessments levied to date, $7,640,033					Div'ds paid to date, $18,175,000								Total sales.....	—— shares

G. Gold. S. Silver. L. Lead. C. Copper. *a* The par value of shares is $100, unless otherwise designated. *b* Par value $10. *c* Par value $50. *d* Par value $25 each. *e* Par value $15. *f* Par value $20. *g* Quotations represent the latest prices bid. Prices asked will have a * affixed. For readiness of comparison the quotations of Philadelphia Stocks the shares being $50 each, are based upon a per centage value, or 100, equal to shares of $100. *h* Full paid. *i* On the four old companies. † This company declared a dividend of 3½ per cent. on its preferred stock in July, 1876. ‡ New York Stock Exchange quotations. § Philadelphia Stock Exchange quotations. ** Non-assessable.

The Keystone Gold Mining Company of Amador County, California, is turning out about $40,000 in bullion per month.

The Grover Gold Mining Company of Amador County, California, is producing about $30,000 in bullion per month.

The Buckeye Quicksilver Mine is located in Colusa County, California. This mine produces about 160 flasks of Quicksilver per month.

The Gwin Gold Mine, located in Amador County, California, is yielding on an average 110 tons of ore per day, from the 1,200 feet level, which averages about $18 per ton.

The McCrackin Mine, located in Mojave County, Arizona, is yielding $1,000 in bullion per day from ore taken from the 90 feet level. The dumps are all full of ore and waiting for more machinery, which is in contemplation. The ore is all good, but should be assorted for milling and for smelting, as some of the strata carry antimony and lead.

The Hope Silver Mining Company, of Phillipsburg, Montana, made a recent shipment of bullion amounting to $10,000.

Recent Bullion Shipments of Nevada mines have been made as follows: Grand Prize Mine $5,380; Leeds Mine $7,757; Northern Belle Mine $10,200; Leopard Mine $4,500; Manhattan Mine $11,000; Modoc Consolidated Mine $4,300.

Salt Lake Ore and Metal Market.

Telegraphic advices from Salt Lake City, dated March 30th, gave the following price for base bullion and argentiferous lead ores. The market is inactive:

Argentiferous Lead (Base Bullion).—$74 per ton for lead. $1.20 per ounce for silver. $20 per ounce for gold. The quotation for silver is based upon the silver contents in the lead of 70 ounce per ton of 2,000lb.

A letter to the *Inter-Ocean*, dated Salt Lake City, March 24, says: "I am able to quote a market price for bullion from a sale of ten cars made to-day by Benjamin W. Morgan to the Pennsylvania Lead Company of Pittsburg: Lead, $74.50 per ton; silver $1.20 per ounce; gold, $20 per ounce. The shipments of ore and bullion for the week ending the 24th were as follows: 17 cars to Omaha; 11 cars to Newark; 5 cars to St. Louis; 2 cars to New York; 5 cars to Pittsburg; 11 cars lead ore to Hilliard; 6 cars lead ore to Pittsburg. Bullion, 834,137 pounds; ore, 347,219 pounds; grand total, 1,181,356 pounds.

A new discovery is said to have been made in Red Butte Canyon, not over five miles from this city, and quite near Camp Douglas."

A letter dated March 30th, says:—The snow roads in the canyons are very soft indeed, and hauling on them is next to impossible. There are large amounts of ore on the dumps of the producing mines in the Cottonwood districts, which will move as early as the roads can be got in order. A car load of bullion was sold to-day, price $1.10 per ounce for the silver and $74 per ton for lead. Bullion is accumulating at some of the smelters', which a slight advance in the price would be apt to start.

A large lot of ore from the Huhn and Hunt mine, located at Pioche, Nevada, recently sold on the dump for $21 per ton, the parties purchasing paying for the hauling to Riverside, Utah, at which place it will be smelted with other ore, it making a good fluxing material.

Gas Stocks.

New York,, Friday Evening, April 6, 1877.

We are reported a few transactions in the stocks of the Manhattan and New York Companies, at from 220 to 223 for the former and 132 to 133 for the latter, a little firmer feeling is noticeable in these stocks.

We lower the quotation of the New York Metropolitan, and the Peoples' of Brooklyn. The Mutual Company has declared a dividend of 2½ payable on demand, this stock closes at 98,, bid ex-dividend The rest of the market is without feature, and quotations, with these exceptions, remain as given in our last.

Coupons and Interest are due on the bonds of the following companies during the present month:

Cedar Rapids Gas Light Company.—Coupons.

Hyde Park Gas Light Company of Chicago, Illinois. Coupons.

Memphis Gas Light Company.—Coupons.

Nebraska City Gas Light Company.—Coupons.

Northwestern Gas Light and Coke Company.—Coupons of the bonds of this Company are due during the present month.

Yonkers, New York, Gas Light Company.—Coupons.

Clinton, Iowa, Gas Light and Coke Company.—Coupons.

Manhattan Gas Company.—40 shares of the stock of this Company were sold at auction during the week, at from 220.

Metropolitan New York Gas Company.—$2,240 of the scrip of this Company were sold at auction during the week at 102¼ per cent.

Schuylkill, Pennsylvania.—The local authorities of this place are agitating the subject of lighting the streets with gas.

Hagerstown, Maryland.—The question of lighting the streets of this place with gas is to be submitted to a vote of the inhabitants of the town at the coming municipal election.

The Cumberland, Maryland, Gas Difficulty.—The streets of the City of Cumberland are in darkness, the resolution of the Common Council of the 20th ult., as published in our issue of the 24th of March not having been complied with by the Gas Company, the mayor has ordered the discontinuance of the use of gas by the City.

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Office of the Hukill Gold and Silver

Mining Company, No. 17 Broad St., New York, March 31, 1877. The Trustees of the Hukill Gold and Silver Mining Company have this day declared their regular MONTHLY DIVIDEND OF ONE PER CENT. on the capital stock of the company, payable on and after April 10, at the office of the company as above.—Transfer books will close April 7, and reopen April 11. WILLIAM H. CURTIS, Secretary.

Office of the Seaton Consolidated

Gold and Silver Mining Company, 60 Broadway, New York, March 31, 1877. The Trustees of this company have declared a DIVIDEND OF ONE PER CENT. on its capital stock, payable on the Tenth day of April.—Transfer books will be closed on the 5th, and reopen on the 11th day of April.

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