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THE ENGINEERING AND MINING JOURNAL.

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

CONTENTS.

THE absence of the editor, on account of unavoidable professional engagements, during the past week, and the enormous amount of work involved in making our Annual Reviews complete and in all respects reliable, has occasioned delay in the appearance of this number of the Journal. We doubt not, however, its value will compensate for this.

ERRATA.—In the portion of Prof. MUNROE'S paper on the "MINERAL WEALTH OF JAPAN," published in our last issue, note the following corrections:

Page 424, second column, line 27 from bottom, for "several amounts" read "small amounts."

Page 425, second column, line 23 from bottom, for "divided" read "derived."

Page 427, second column, line 37 from top, for "carried" read "covered."

Page 427, same column, last paragraph, for "the universal wealth of Japan,' read "the mineral wealth of Japan."

AMERICAN INSTITUTE OF MINING ENGINEERS.

OFFICIAL BULLETIN.

THE February meeting of the Institute will be held in New York City, beginning Tuesday evening, February 27. The place of meeting will be subsequently announced. Members will please give early notice to the Secretary of their intention to read papers at this meeting.

LAFAYETTE COLLEGE, EASTON, Pa. THOMAS M. DROWN, Secretary.

"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.

VOLUME TWENTY-THREE.

THE new year opens upon many memorable events, accomplished or foreshadowed. Wars and rumors of wars, Presidents and rumors of Presidents, hard times, soft money, politicians bull-dozing each other, and everybody inquiring who really received the highest award for "combined sympathy, purity, fullness, volume and perfection of tone" from the late illustrious musical jury—in fact, a very chaos of history in embryo. But one event stands out clearly in the confusion—a serene, undoubted, universally welcome fact—to wit, that the ENGINEERING AND MINING JOURNAL enters herewith upon its twenty-third volume; and to the contemplation of this comforting, reassuring fact we invite all restless and despairing souls. Next to the study of the unerring courses of the stars (which is uncomfortable business in this weather), nothing can be better calculated to restore tranquillity and hope to a disturbed mind. But to get the full effect of this reinvigorator, one must do with it as with any other medicine—take it. Take the ENGINEERING AND MINING JOURNAL! is from our enlightened stand-point, the true lesson of all the political, social and industrial movements which now perturb the world.

Meanwhile, to the host of readers and friends who need no exhortation of this kind, we beg to extend herewith our hearty holiday greeting. Those of them who have companied with us for well-nigh a dozen years will require no inducements in the way of glittering promises for the future to encourage them to continue that relation. The larger number who have recently inscribed themselves upon our lists must also be content with their experience hitherto, as an earnest of what is to come. It is a pleasant reflection to us that while, like all other periodicals, our paper has felt the pressure of the times, the number of its subscribers has kept steadily increasing; and we feel a just pride in being able to declare that we have not permitted the depression of business to be shown by any deterioration of the style or contents of the JOURNAL. On the contrary, there has never been so much labor and money expended on its columns as since the panic of 1873. We look for pecuniary remuneration to the better times which are coming; but the remuneration of cordial appreciation from those whom we attempt to serve, we enjoy as we go along.

We wish we could prophesy immediate relief and prosperity to our large constituency in the coal, iron and steel trades. But our readers know our views on those subjects; and not even the influences of this festive season can exhilarate us to a higher pitch than that of steadfast courage and a moderate expectation of slow improvement. If they wish to be deluded by premature and exaggerated announcements of rising prices, they must listen to other advice than ours. We shall continue to give, as heretofore, a full and impartial record of the markets and our opinions, impartially based on all the attainable facts. The sanguine element is one which everybody can supply for himself, according to his constitution and circumstances.

To the American Institute of Mining Engineers, with which since its first meeting this journal has been associated, we extend our special congratulations. We owe to the Institute some of the most valuable contributions which have adorned our pages, and we are justified in saying that the Institute owes to the ENGINEERING AND MINING JOURNAL something of its rapid progress at home and much of its fame abroad. We trust that prosperity will not undermine the vigor or disturb the harmony of the Institute, and that it may continue to furnish to the mining and metallurgical professions contributions as valuable and original as heretofore.

To the fraternity of gas engineers we shall doubtless have much to say during the coming year. Without advocating any particular process, we are in favor of letting facts be known; and that kind of conservatism which consists in "squelching" them will receive no quarter from us. In less than twelve months some of the officers and directors of comfortable old gas companies will rub their spectacles in earnest, but they shall have no ground for complaint that they were not warned of what was coming.

To our patrons and friends, one and all, once more our cordial New Year greeting. And thus we begin our Twenty-Third Volume. *

REVIEW OF THE COAL TRADE OF THE UNITED STATES FOR 1876.

ANTHRACITE.

THE year just closed has been one of the most eventful, as well as one of the most disastrous, in the history of our coal trade. The general revival of business which so many have been expecting and predicting for three years past, but which in our annual review of the coal trade a year ago we stated could scarcely be expected for some time to come, has not been realized, and the situation has been still further aggravated by the unhappy complications arising out of the Presidential election. The clouds of adversity which have hung over the coal trade for the past three years are gradually lifting in the West, though to all appearances the storm has not yet passed in the East, nor will it, we fear, without still further increasing the number of wrecks which already mark its progress.

Since the Autumn of 1873 the whole business of the country has been settling down to a lower, more solid and more honest basis. The great natural resources of the country, and the prodigious energy and hopefulness of our people, tended to postpone the day of reckoning for the extravagance, wastefulness and dishonesty which grew out of the lavish expenditures of our civil war. The reaction or reform which set in three years ago has gained one position after another—whether in business, or government,—though it has necessarily brought with it great disappointments, sad revelations, and much suffering and want among our laboring classes. Powerful combinations among special classes of labor or in special branches of trade postponed for a time the inevitable decline in wages or profits; but no one industry can hold out against a general reaction such as that we are passing through. The coal trade is one of the most notable instances of this. During the war, with coal commanding the most extravagant prices and with a scarcity of labor, the workmen, by their trade-unions, were enabled to enforce higher wages than were obtained in other industries, and they continued to demand and receive these long after coal had ceased to command remunerative rates. To regulate an unprofitable trade, and to gain that strength by union of forces which was necessary to compete successfully with the Miners' Unions, the great Anthracite Coal Combination was formed. The policy of this remarkable "trade union" was to increase the price of coal to such a point as would leave a fair profit to the mining and transporting companies. Incidentally, the wages of the workmen, which were abnormally high, were reduced somewhat, though only after a severe struggle, in which the united strength of the companies barely gave success. Even after this reduction, miners' wages were much higher than those of any other class of labor.

The success of the Combination in reducing wages and advancing the price of coal was so exceedingly satisfactory for the time, that it was encouraged to continue a policy exactly similar to that of the miners, and in both cases the final results were alike. The extra high wages demanded by the miners brought about such an influx of laborers from other fields that there was not work for them all more than five or six months in the year; yet they pretended that it was their right to demand such wages that five months' work would suffice to maintain them in idleness—enforced idleness it may be—for the remaining seven months. The companies united to put up the price of coal in order to be able to pay these exorbitant rates to the miners (it is so much easier to get the disorganized public to pay fifty cents per ton more for their coal than to get the organized miners to accept ten cents per ton less for their labor), and to provide for large dividend and interest accounts. The result in this case was a price that restricted consumption and invited competition from bituminous coal, and the mines, which were opened with a capacity of nearly twice the maximum market demand, had to stand idle more than one-half the time, thus necessarily increasing the cost of getting the coal, and making it still more dif-

ficult to "live" at any prices that could be obtained for it. The consumption of anthracite steadily decreased under this policy, and the temptation of high prices, combined with the pressing financial needs of some of the companies, finally proved stronger than the bond of mutual interest which held them together. This effort to control the production and cost of anthracite was abandoned in August last, since which time the other extreme has been adopted, and considerable coal has been sold at public auction at the lowest prices ever obtained in this market, and at a decline of from $2 to $2.50 per ton from the Combination rates.

From a programme price of $5.18 per ton to an average auction price of $2.91 per ton was a shock that tried the strongest constitutions, and for a time quite stunned some of the companies; but when subsequent sales indicated a decline rather than an advance from these prices, it was seen that the measure of economy in the production and handling of coal that had formerly been considered as the utmost possible limit, must now find a stricter interpretation, or sudden and sure destruction awaited the companies. Wages at the mines and on the roads were reduced without opposition from the men; in some cases salaries were reduced also, and many dear, superfluous necessities were dispensed with. By these means the cost of getting and marketing coal was no doubt largely reduced, but the fact nevertheless remains that the prices obtained since the rupture of the Combination have been ruinous to the large companies, and sufficient to prevent actual loss at only a small number of the most advantageously situated and best managed collieries. If, as claimed by the heads of the great companies, the Combination prices were only sufficient to provide for the interest and moderate dividend account of the companies, it must be very evident where the present prices will lead to. The longest purse and the best credit cannot long supply such a drain. That the companies' statement to which we have alluded is not without foundation, we estimate, from the best authorities obtainable, that the capital stock, bonds and other forms of indebtedness of the coal and coal transportation companies, and of the companies whose bonds they have endorsed, or whose properties they have leased (the rental being considered as the equivalent of interest on bonds), amount to nearly, if not quite, $550,000,000, which, at seven per cent., would require an annual net profit of $38,500,000 on the business done. Since these roads do other business than carrying coal, it would not be fair to charge the whole of this amount to this one item, yet it must earn by far the larger part of it. It will not be excessive to estimate a net profit of thirty millions of dollars from the mining and transportation of anthracite (say $1.60 per ton on the basis of the production of the past year) as necessary to provide seven per cent. interest on the capital now invested, directly or indirectly, by the mining and transporting companies in this industry. In the olden times (and we are rapidly approaching that basis for estimating) twenty-five cents a ton formed a very fair profit on coal mining. The net profit on transporting coal a distance of about 160 miles can scarcely exceed, in ordinary times, 4c. a ton a mile—or 40c. for the entire distance. Where, then, is the balance to come from, or what will be the effect upon the coal trade generally, and on the securities of our great coal companies in particular, if it be not obtained? The solution of these conundrums has been the most important question in the trade for several years past, and it will certainly be the most prominent one during the coming season.

It is a very simple matter to point out that there is too much capital invested in the anthracite trade, or to indicate that the purchasing of vast quantities of high-priced coal lands fifty or one hundred years before they are wanted or can be used, and the leasing of large areas of undeveloped coal property at enormous minima rentals, as well as the ambitious design of seeking to control various outside industries, through onerous leases or guarantees of bonds, form elements of a suicidal policy, which, however fascinating and popular while business is brisk and prices are increasing, is a very "Dead Sea apple," turning to dust, bitterness and disappointment when the inevitable reaction sets in and values decline. It is easy to point out these unpopular truths and yet recognize the enormous value of anthracite coal lands; for doubtless these, when available for immediate exploitation, are worth much more than $1,000 or $1,200 an acre, which at present are considered high prices. The difficulty is not that our coal companies have purchased worthless property, but that they have purchased and leased at these high prices much more than they can possibly use or require for many years to come, and the interest account will overwhelm them. They are misers who have hoarded gold, and now in this struggle for existence they are sinking under the load of their accumulated treasures.

Great facility in acquiring money, whether it be by earning it or by borrowing, invariably produces extravagant habits in companies as in individuals. Even where the management is strictly honest (and, unfortunately, there have been instances of the contrary even in the coal trade), the period of large expenditures is never marked by rigid economy. In the case under review, extravagant prices were paid for lands, for machinery, for all classes of supplies, and for labor. The abundance of money which was circulated during and after the war made the whole nation extravagant, and enabled nearly every industry to exact enormous profits from the spendthrift public. The great financial panic of 1873, though by no means the initial step in the reaction, was so sudden a bursting of the bubble of inflation, and so loathe were our hopeful, successful people to believe in the end of the pleasant condition of things that had for years existed, that few could realize the extent and duration of the reaction which was then setting in. The coal trade would naturally have been one of the first industries to feel the effects of the suspension of general manufacturing and the curtailment of the demand for iron, and the prices of bituminous coal quickly showed this. The anthracite trade, however, was then controlled so effectually by the late Coal Combination that prices were not only maintained, but even increased, through 1874 and 1875, and but slightly reduced in 1876. The steady decline of consumption under this treatment was plausibly accounted for by other causes than the high prices, but the steady increase in the consumption of bituminous coal, while that of anthracite was diminishing, showed clearly that it was due to the policy governing the latter industry.

It must not for a moment be supposed that the Coal Combination was originated or conducted as a heartless and extortionate monopoly. Like every oppressive tyranny, whether in trade, in politics, or in religion, it had a most laudable origin. For several years previous to 1872 the market had been overstocked with coal, and prices had declined to such a figure that the great majority of individual operators were ruined; but, as the transportation yielded a fair profit, the railroad companies encouraged this large output. As the mine owners failed, the output of their collieries ceased, and the transportation companies suffered. To provide against this contingency, money was loaned needy operators to enable them to continue producing, and, of course, it was always hoped and expected that business would revive and become profitable. There was a limit to the amounts individual coal operators could borrow in those days—just as there is in the case of their successors to-day; and when that limit was attained the creditor transportation company had to buy in the colliery to save (?) itself. The miners combined in a rich and powerful Union, resisted all reductions in wages by long continued and expensive strikes. They had the divided operators at their mercy, and demanded such exorbitant wages as largely contributed to the ruin of their employers, and to the later organization of the Coal Combination. The combination of the men to obtain exorbitant prices for their labor, and to control production by means of total "suspensions" of work, resulted in the introduction into the coal-fields of far more men than the trade could give full employment to, and consequently to enforced idleness during a portion of the year. It increased the cost, and therefore the selling price of coal, retarded the natural increase in its consumption, ruined the independent operators, and eventually built up a combination of the large companies that has overthrown the Union. The men who have long been receiving a rate of wages higher than that in any other industry, in reality earn less than if they had secured the more constant employment which a lower rate of wages would have brought. Yet the Unions were not without their advantages: they secured for the miners rights and privileges they would not have obtained while disorganized, and not the least of these advantages was the enactment of the "ventilation law" in Pennsylvania—a measure which has proved to be of great benefit to all parties. Union among the laboring classes seems to be necessary, in the present condition of society, for their protection and for the attainment of their rights. The danger is in the natural instinct—natural to employers as well as employed—to use their strength for tyrannical and oppressive ends. The miners' excesses brought about the reaction that destroyed the Unions; the Combination's excesses were the cause of its downfall. The influence of the Combination on the coal trade in arbitrarily increasing the selling price of coal has already been noticed; it exercised, however, other and even more important influences, some of which were beneficial, others injurious. It regulated and steadied the price of coal, so that contracts could be made by manufacturers with assurance as to the cost of so important an item as fuel, and it kept the price moderate throughout the long strike of 1875, when, had it not been for its action, the most violent and injurious fluctuations might have been expected. By its strength it insured the supply of the market notwithstanding strikes, and enabled furnaces and manufacturers to dispense with the large "stocks" they had previously been obliged to carry, to provide against sudden strikes. It was, in its early days especially, conducted with great moderation and justice, and is probably as favorable an instance of trade combination as can be cited. During and after the panic of 1873 and 1874 it stood between the coal trade and that ruinous condition of affairs which has now overtaken it. This was undoubtedly a great, an inestimable benefit to those engaged in the trade at that time; but since it merely postponed for a season the inevitable day of reckoning, and in so far retarded the settlement of values to that lower plane which they have necessarily to reach before the revival or upward course can commence, it is at least doubtful whether this temporary postponement was an advantage to the country at large, or even to this industry. It seems indeed a hard and ungenerous thing to say, but it is nevertheless a sentiment widely endorsed by shrewd and far-seeing business men, that it would have been a positive advantage to the country, and to every industry, had the weak and embarassed members failed in a general collapse three years ago, rather than have tided over from year to year, increasing their indebtedness, disturbing trade, and retarding the revival of a sound and healthy business on the new plane of values. The Coal Combination more than any other interest opposed and retarded, without being able to overcome, the new order of things. It prevented a decline in wages in the coal regions, which was and is an absolute necessity, and yet it did not benefit the miners, for in keeping up wages it increased the number of men, and at the same time diminished the amount of work to be done. It maintained an extravagant basis of values in the cost of conducting the business of this great industry, which is the inevitable concomitant of ability to command high prices. It postponed the evil day till now, when we might confidently look for the initiation of a general business revival.

we are confronted with a condition of things which nips as with a sharp frost the slowly openning bud of returning confidence, and sets back the spring-time which must precede the harvest of active trade.

These are no novel features of trade or of coal combinations, for the same story has been repeated over and over again during the past two hundred years. The great Anthracite Coal Combination did not spring fully developed from the fertile brain of its originator, like Minerva from the brain of Jove; it was a very human child, the offspring of accidents and expedients; it was constantly being amended, modified, extended; and yet, though this was the product of the very highest class of intellect, one is struck by the sameness of the story as we peruse the history of former efforts in the same direction. Take for example some of the old English coal combinations:

ANCIENT COAL COMBINATIONS.

Coal appears to have been mined in England in the days of the Roman occupation of the island, but probably the earliest authentic specific record of coal being mined is in the year 1180. As early as the year 1665 the annual production of coal was between five and six hundred thousand tons. This quantity seems to have overstocked the market, and on the 27th of April, 1665, there was held a meeting of the coal dealers at Newcastle, when an agreement was signed by twenty-two coal owners that they would mine no more coal till the large stocks then on hand were disposed of, and twenty-five coal owners signed an agreement at the same time "for raising the price to 13/ per chaldron" (53 cwt.). We have no record as to the practical working of this combination, but about one hundred years later, in 1771, we learn "there was formed a combination among the coal owners who shipped their coal by the three rivers, the Tyne, the Wear and the Tees, to raise the price of coal to consumers by restricting the quantity supplied. This combination, known as "the limitation of the vend," lasted, with but a few temporary interruptions, until 1845.—It is clear they had no newspapers in those days.—"A committee appointed from among the coal owners held its meetings regularly in Newcastle, and fixed the price at which coals of various qualities might be sold when sea-borne for consumption within the kingdom. They also assigned the quantity of coal which, during the space of a fortnight following each 'issue' or order, individual collieries might ship.

"Upon opening a colliery, the first thing to be determined was the 'basis' or rank which that colliery was to take. The Coal Trade Committee appointed one referee, and the coal owner another. These men, taking into account the extent of the coal field secured, the size of the pits, the number of steam-engines employed, and other matters which indicated the amount of capital, fixed the proportionate quantity which the colliery would be permitted to furnish toward the general supply.

"This system necessarily led to various schemes for securing the largest possible 'basis.' The proprietors burthened themselves in various ways, as by securing a royalty extending over five to ten times the surface which they intended to work, as by sinking pits at great cost, which they had no idea of using, as by building twice the number of cottages which they required for the colliers, and by wasteful expenditure in every direction.

"This Newcastle Committee met twenty-six times in the year, and according to the prices in London determined the quantity which might be issued during the following fortnight.

"The restrictions enforced by the 'limitation of the vend' did not apply to coal shipped to foreign ports. The consequence of this was that coal was frequently sold to foreign markets 40 cents under the prices in the London market, and English coal could sometimes be purchased in St. Petersburg at half the price of the same coal in the river Thames."

The competition of the coal from the Midland Counties seems to have broken down this plan of "regulating trade."

Our Combination was more enlightened, and shorter-lived, than this old prototype; but the spirit and the tendency of all such organizations are sufficiently alike to be able to predict with great certainty the final result in every case.

One of the most notable features of the Combination was the effort to bring the producer and consumer together, and thus save the commissions and expenses of "middle men." Unquestionably this has, theoretically, many advantages. It seems as though the middle interest should be entirely superfluous; and if twenty or thirty cents a ton could thus be saved, it would be a very important consideration. Experience has shown, however, that there are great difficulties in dispensing with these factors. The salaried agents of the companies are never quite as successful salesmen as those who depend directly on the quantity sold for their income. Moreover, consumers, as a rule, have very little knowledge of the qualities of the various coals, and are influenced to a great extent by what their coal agent tells them; and instances are not wanting where these ready reasoners, who have a special coal to sell, have been able to make "the worse appear the better cause." Then, again, consumers prefer dealing with individuals to buying from companies, and in many ways the large company is at a disadvantage in getting business. While the individual operators cannot afford to carry on the details of retailing or of the general trade in coal, they find it cheaper and more satisfactory to confine their attention to the one department of production, and leave to the middle interest the business of disposing of the product. The advantages which, theoretically, are to be gained by bringing the producer and consumer together are not generally realized in practice, though there can be no question but that the policy of the great companies having retail yards in the large cities has been very advantageous.

The Reading Coal and Iron Company greatly reduced the retail price of coal in Philadelphia by establishing yards there, and the Pennsylvania Coal Company has long acted as a very just and reasonable governor to the retail prices in this city by offering its coal direct to consumers at moderate prices. Some of the other companies have also done good service by establishing yards in this and most of our other large cities. There must necessarily be a limit somewhere to the ramifications which it is prudent to allow a business to assume, for there is a limit beyond which the ability and talents of a man (and there must be one man at the head), however great or brilliant he may be, become so diffused and diluted, as it were, that the business is not as perfectly managed as if each department were entirely independent of the others. It is still an open question just where this limit should be placed, but the indications point to a reduction rather than an extension of the ramifications of a business, though this is due, in part at least, to the present limited financial resources of those engaged in this industry.

No more notable event has occurred in the coal trade during the year, or indeed during its history, than the arraignment and conviction of the members of the Ancient Order of Hibernians, commonly known as the Molly Maguires. The history of this infamous band of assassins has already been given in these columns, showing how, without even the incentives of revenge or of gain, they deliberately murdered inoffensive citizens against whom some of the members of the society had some petty grievance; how they terrorized over the entire mining districts of Pennsylvania, until no man's life or property was secure from their nefarious acts. That numerous members of this band escaped punishment for so many years was due to the difficulty of convicting in the face of easily manufactured *alibis*, and, humiliating as it is to admit it, owing to political influence.

The extermination of this gang is due to Mr. FRANKLIN B. GOWEN, the President of the Philadelphia and Reading Railroad Company, who employed the detective and so ably conducted this difficult and dangerous prosecution. JAMES MCPARLAN, the detective who lived with these cut-throats for months, holding his life in his hand, is one of the most heroic characters of which we have any record. Mr. GOWEN, in his argument before the court in one of these trials, paid a glowing and well-deserved tribute to this courageous officer. It is to Mr. GOWEN himself, however, that the credit of exterminating this gang is principally due, and no citizen of the State has ever done his country a greater or more worthy service than that performed by him. The courage, ability, and perseverance Mr. GOWEN has shown in this matter have given him the highest possible claims on the gratitude and honor of his countrymen everywhere, and particularly of those interested in the production of coal, the miners and owners of mines, and his name will be forever identified with this great service.

We have now briefly traced the great events which, in the anthracite trade, have marked the year just closed. We have noted that from prices which, though not nearly as high as they have frequently been in this market, were exceedingly profitable to the companies, rates have fallen so low that, if continued, they must result in the bankruptcy of those producing a large part of the present supply. What, then, is the outlook for the future?

When a private mine-owner fails, his mine is either abandoned—when its production ceases—or it is sold out at a low price, and the new owner, having less capital in the business, can produce coal cheaper than his predecessor. On the other hand, experience shows that when a railroad company fails it simply goes into the hands of a receiver, and works on untrammelled by interest or dividend charges. So long as its business covers running expenses it can afford to run, and therefore forms the most dangerous competitor for companies that have the interest to pay on their indebtedness, and whose stockholders clamor for dividends. No one will deny that the price of coal should be such as to make a liberal return on the investment necessary for the legitimate prosecution of the business. Mining investments are always attended with more or less risk, and they should be, and usually are, more remunerative than those of any other class.

We naturally feel a friendly sympathy for honestly conducted concerns that are in difficult financial positions, and would rejoice were the large investments, which were made in good faith, remunerative; but we serve the interests of the whole trade; nay, more than that, we are looked to by every interest using coal, by the whole country in fact, to point out the prospects for the future, while recording the events of the past or present. What, then, are these prospects?

We can see no prospect of high-priced coal, for the coming year at least. Our capacity for the production of anthracite is diminishing; but little "dead work" was done at the mines during the first six months of the year, and much less during the last six months. Taking this into account, the *apparent* cost of mining at the present time may mislead, for it is not charged with a fair proportion of dead work. The consumption, stimulated by the exceedingly low prices now ruling, and by the gradually reviving business of the country generally, will undoubtedly increase considerably: we would not be surprised to see it exceed that of the year under review by two million tons. With the equalization of demand and productive capacity, the price will doubtless improve; but this can take place only gradually. There is no prospect of such a condition of affairs as would lead to high prices without the intervention of another coal combination, and there is little ground for anticipating a revival of this heroic remedy for the ills of the trade.

The most economical collieries will continue to force their output, because the larger this is, the less will be the cost of production. The prices, which will doubtless improve somewhat in the Spring, will leave a small margin for lightly encumbered and economically managed works. Wages and salaries will be further reduced. Supplies of all kinds will cost less, and prices of coal which a few months ago would have been ruinous, will, under the new order of things, prove fairly remunerative. The bottom in cost of production has not been reached in the anthracite or in some of the bituminous fields. The experience of the past three years has fully demonstrated that no high rates can long be obtained for anthracite against the open competition of bituminous coal, and the prices at which this latter can be placed on shipboard will be exceedingly low for some time to come, while the quantity which can be supplied is capable of great and rapid increase.

The present actual cost of mining, and the extent of the reduction which has

been made during the year may be seen by an inspection of the following statement, which gives the exact figures as taken from the books of three collieries, and which we designate as A, B and C, in Schuylkill County.

COST OF MINING COAL—Per Ton of 2,240 lb.

	NOVEMBER, 1876.			NOVEMBER, 1875.		
	A	B	C	A	B	C
Mining Contract account	$0·493	·118	·151	1·024	·392	·266
Mining Labor "	·071	·147	·214	·389	·197	·284
Outside " "	·152	·128	·128	·267	·198	·189
Breaker " "	·240	·193	·189	·304	·241	·216
Inside Supply "	·192	·166	·131	·241	·273	·070
Outside " "	·062	·123	·048	·029	·075	·168
Breaker " "	....	....	....	·020	·015	·009
Improvement "	....	·221	·224	....	·141	·178
Cost per ton on cars, exclusive of royalty, interest, etc.	$1,210	$1,096	1,085	2,274	1,532	1,380

Reduction in cost of mining varies, then, from 30 cents to $1.05 per ton. If we add to above figures the ground rents or royalties, which amount to, say, twenty-five cents per ton, and the "lateral tolls" which the operator pays, and which amount from twenty-one to fifty-two cents per ton (both items being practically unchanged in the two years), adding the present freight to South Amboy, say $1.12 to $1.50 per ton, we get the actual cost at South Amboy (without profit to the operator, or interest on investment) $3.30 to $3.63 per ton, while the present selling price varies according to size from $3.25 to $3.75 per ton, or an average of about actual cost. It is claimed, however, that several of the Schuylkill collieries put their coal in the cars at a cost of from 66c. to 80c. per ton, or 40c. to 50c. per ton less than in the cases cited. There are also collieries in the Lehigh Region that can put coal in the cars at say 70c. per ton, exclusive of royalty; but in many of these cases the low figures are secured probably only by a partial or total suspension of the dead work, which should be kept constantly in progress in every well-managed colliery.

Since wages and some other items in cost will perhaps be further reduced, it is probable that the present prices, which provide little or nothing for interest or profit, may yet become remunerative. And it also shows that for some time to come there is little prospect of any great advance in prices.

THE COURSE OF THE ANTHRACITE COAL TRADE DURING THE YEAR.

The year opened, as it has for several years past, on a rather demoralized market and very moderate demand. The unprecedentedly mild winter reduced the nominal demand for domestic use, and the long hoped for revival in manufacturing business not taking place, added to the large stocks of coal and a lurking suspicion that the Combination would not survive another season, caused large concessions from circular prices to be freely made from the beginning of the season.

So rapidly did stocks accumulate during the month of January—though the output was at the rate of only 15,000,000 tons a year—that on the 20th of that month it was resolved by the governing board of the Combination to suspend production for a period of five weeks, commencing February 7. Even under this arrangement there was an average amount of about 70,000 tons a week sent to market. At the same time prices were reduced from 20 to 70 cents per ton– a move that, though loudly called for by consumers, was looked upon by the trade as a breach of faith on the part of the Combination, which had announced in December that there should be no reduction in prices before March. This undoubtedly lessened faith in the strength of the Combination, and added to that total disbelief which contributed so greatly to its ultimate dissolution.

This reduction in price precipitated events in the trade which otherwise might have been postponed for some time, and early in February the failures of Messrs. E. A. PACKER & Co., E. B. ELY & Co., BRAHMAN & HARTWELL, and some less important concerns were announced.

On the 18th of February the Combination programme (which was published at the time in the ENGINEERING AND MINING JOURNAL) for the year's business was adopted; but by the middle of March there were indications of internal discord in that body; and as business continued dull, it was decided to extend the period of suspension of mining previously adopted: a measure that somewhat increased business towards the close of the month.

Though no formal reduction in miners' wages was announced, the companies, by "docking" more freely, and in various ways requiring more or better work, or the same work with a less expenditure on their part,—more bricks with less straw,—succeeded in reducing the earnings of the men, and this led in the Schuylkill region to a brief strike, in which some 1,200 men took part for a week. It soon became evident to the miners that they had better submit, so they went to work, and have not since struck, though wages have been considerably reduced.

By the middle of April trade had somewhat improved, but stocks were again accumulating, prices were being undercut, and it became evident that the Lehigh Valley Railroad Company did not intend to be controlled by the dictates of the Combination, although nominally in that compact, and though the operators situated on its line agreed to regulate their output in accordance with the orders of the Board of Control. By the end of May it was estimated that there were 1,000,000 tons of coal in stock, and business continuing dull it was decided to curtail production by mining alternate weeks from June 5th to the end of July. The failure of J. D. HEISENBUTTEL was announced the latter part of May.

The dullness which had marked the trade from the commencement of the year seemed to increase rather than diminish, and the Combination sought to stimulate it into something like life by administering the convenient tonic of a proposed advance in prices. Early in June it was announced that prices would be advanced 5 cents per ton for July, and 15 cents per ton for August. As coal was, however, at the date of this announcement, selling quite freely at concessions of from 40 cents to $1 per ton from circular rates, the decree produced little or no effect on trade; and from the general belief that it could not be strictly enforced, it tended to hasten the end which was now becoming apparent to many in the trade. During July the Lehigh Valley RR. Company exceeded its quota of shipments to such an extent that, failing to get redress otherwise, the other companies to the contract resolved that unless that company promptly equalized its quota by stopping shipments till that result was attained, the several members of the Combination should be absolved from their engagements and the compact cease to exist. The grace allowed was one month, and as the offender not only made no reparation, but repeated the offence, and as during the month it transpired that some of the other members of the Combination were privately selling coal at prices much below the circular rates, the end was evidently approaching, and was so announced in our regular market report. On the 22nd of August came to an end the most powerful and successful combination to regulate the coal trade that ever existed in this country. The announcement of its dissolution was accompanied by that of an auction sale of 500,000 tons of coal, in which the several companies contributed the following quantities: the Philadelphia & Reading, 200,000 tons; the Delaware & Hudson, 110,000 tons; the Lackawanna & Western, 110,000 tons, and the Pennsylvania Coal Company, 80,000 tons.

The sale took place on the 29th of August, and the prices realized were the lowest, up to that time, obtained in this market. The natural effect of the collapse of the power that had so long given strength and stability to the coal trade was total demoralization, and the prices at this and subsequent sales were named without any regard to cost of production, and in fact probably resulted in a considerable loss to the vendors. Those companies that did not participate directly in the auction sales, disposed of a considerable amount of coal by private sale; the prices being based on those obtained at the auction. Many consumers and dealers believing that the bottom had been reached in prices, and anticipating their wants, purchased largely, so that a considerable amount of coal was disposed of during the two months next following this first auction sale. One effect of the low prices obtained was an immediate reduction of from 10 to 20 per cent in the rates of all wages at the mines—a movement that was submitted to by the men without opposition.

In September, and again in October, the Pennsylvania Coal Company, the Delaware, Lackawanna & Western Railroad Company, and the Delaware & Hudson Canal Company each disposed of 100,000 tons of coal at auction, the Reading preferring to place its coal at private sale; the prices being nevertheless based upon the auction rates. There was a slight advance in the prices realized at these sales over those of August, but the increase was not sufficient to give much strength or tone to the market—though the quantity disposed of during these months at private sale was very great. After the end of October the demand created by the great decline in prices seemed to be in great part supplied, and the trade became exceedingly dull. The Delaware & Hudson Canal Company abandoned the auction system of disposing of its coal, and in November the Pennsylvania Coal Company sold 68,000 tons, and the Delaware, Lackawanna & Western Company 100,000 tons. Though this quantity was small, the prices obtained were below even those of the first sale, reaching in fact a lower point than ever before touched in this market at public auction; but one of the large companies is said to have disposed of 18,000 tons of stove coal at a figure below the average of the prices obtained by the Delaware, Lackawanna & Western Company at this sale.

In December the Pennsylvania Coal Company and the Delaware & Hudson Canal Company (represented by Messrs. WARD, TALBOT and OLYPHANT) reduced the retail prices of coal at yard in this city to $4.20 per ton for stove and $3.90 per ton for egg, grate and chestnut sizes. These prices induced large purchases, though the general state of trade remained exceedingly dull. In December the quantity of coal sold at auction was but 147,000 tons—97,000 by the Pennsylvania Company, and 50,000 by the Delaware, Lackawanna & Western Company. The prices obtained were slightly in advance of those secured in November, but still very low. The production during the last four months of the year was at the average rate of 27½ million tons a year. Had it not been for the break in prices, there is no doubt it would have been less than earlier in the season, and the decline in production would have amounted to 3,000,000 tons, instead of 1,643,509 tons, as shown in our table of production to have been the case. Since the failure of the Combination there have been sold at auction 1,420,000 tons of coal, for which an average price of $3.18¼ per ton f. o. b. at New York shipping ports was obtained. (In this we assume 125,000 tons sold for delivery at Port Richmond to have brought a price at New York equivalent to the average of the first auction sale.) In reality the rate obtained would not quite equal even this low figure, for it is notorious that the prices at some of the sales, low as they were, were partly fictitious, having been "bolstered" by the vendors.

It is very questionable whether this system of marketing coal does not exert an injurious influence on the trade. It is assumed by many that coal is sold at auction only because it cannot be otherwise marketed, and the sale thus exerts a depressing effect upon the trade, and where the quantity offered is large, the prices obtained are probably always lower than if the same coal

had been disposed of at private sale. There can be no doubt, however, that it may prove a very convenient substitute for energy and business ability in the sales department of a company; or if but a comparatively small quantity be offered with the view of fixing upon a price on which to base private sales, and it be understood that these shall invariably be higher than the auction prices, it is possible the system of auction sales may be advantageous. Though they are generally very unpopular in the trade, it by no means follows that they are an unmixed evil, or even that they may not, when prudently managed, form a beneficial "governor" for regulating the movement of the coal trade.

The following are the average prices obtained upon the basis of equal quantities for each size of coal at the several auction sales :

	Aug. 29.	Oct 21.	Oct. 25.	Oct. 26.	Nov. 21.	Nov. 22.	Dec. 20.	Dec. 21.	
	Four companies.	Penna. C. Co.*	D. L. & W. RR.	D. & H. C. Co.	Penna. C. Co.*	D. L. & W. RR.	Penna. C. Co.†	D., L. & W. RR.	General Av'ge.
Lump	$2 50	$2 92½	..	..	$2 67	..	..	..	$2 70
Steamer	2 78	2 95	$2 96¼	$3 03	2 65⅛	$2 77⅛	$2 82½	$2 85¾	2 85⅛
Broken	3 01	2 94	2 82⅓	3 07	2 62½	2 69½	2 82⅓	2 82¾	2 85
Egg	2 84	3 10	2 92½	3 00	2 59	2 67½	2 82⅛	2 90½	2 86
Stove	3 60	3 86	3 85	4 04	3 29	3 58	3 44	3 65¾	3 66
Chestnut	2 71	3 76	3 81¼	..	3 58	3 27	3 08¾	3 20¾	3 34½
Average	$2 91	$3 25⅛	$3 27⅓	$3 28	$2 90	$3 00	$3 00	$3 09	$3 09

* At Newburg. † At Weehawken.

PRICES OF ANTHRACITE.

During the past year the following have been the list prices, f.o.b. at New York shipping ports, compared with those of 1875, although for the greater portion of the time they were only nominal :

	Lump.		Steamer.		Grate.		Egg.		Stove.		Chestnut.	
	1875.	1876.	1875.	1876.	1875.	1876.	1875.	1876.	1875.	1876.	1875	1876.
January	$5 85	$5 05	$5 65	$5 15	$5 75	$5 25	$5 90	$5 65	$6 40	$6 10	$5 35	$4 95
February	5 55	4 65	5 65	4 65	5 75	4 75	5 90	4 95	6 40	5 50	5 35	4 70
March	5 55	4 60	5 65	4 70	5 75	4 80	5 90	4 90	6 40	5 55	5 35	4 70
April	4 60	4 60	4 70	4 70	4 80	4 80	4 95	4 90	5 40	5 50	4 40	4 70
May	4 80	4 65	4 90	4 75	5 00	4 85	5 15	4 95	5 60	5 55	4 60	4 85
June	4 90	4 70	5 00	4 80	5 10	4 90	5 25	5 00	5 70	5 60	4 70	4 90
July	5 00	4 75	5 10	4 85	5 20	4 95	5 35	5 05	5 80	5 65	4 80	4 95
August	5 00	4 90	5 10	5 00	5 20	5 10	5 45	5 20	5 90	5 80	4 90	5 10
September	5 65	3 25	5 15	3 25	5 25	3 50	5 65	3 50	6 00	4 15	4 95	3 75
October	5 05	3 25	5 15	3 30	5 25	3 40	5 65	3 50	6 10	4 25	4 95	3 75
November	5 05	3 15	5 15	3 20	5 25	3 30	5 65	3 40	6 10	4 25	4 95	4 00
December	5 05	3 00	5 15	3 00	5 25	3 00	5 65	3 00	6 10	3 75	4 95	3 75
Average for 12 months	5 10	4 21	5 20	4 28	5 30	4 38	5 53	4 50	5 99	5 13	4 94	4 51

From the above it appears that the average price for 1876 was $4.50 per ton, as against $5.34 in 1875, $5.26 in 1874, and $4.81 in 1873, the latter being determined from the Scranton auction sales. As one-half of the coal sold during 1876 was disposed of in the last four months, the actual average would be less than it appears, while the actual prices received all through the year have been much more "off" from circular rates than at any time since the formation of the Combination.

In addition to the regular price-lists, there were issued from April to August, inclusive, contractors' circulars, which were 20c. per ton lower than the regular circulars ; the following prices were fixed for consumers :

	Lump.	Steam.	Broken.	Chestnut.
March	$4.20	$4.30	$4.40	$4.30
April	4.20	4.30	4.40	4.30
May	4.25	4.35	4.45	4.35
June	4.30	4.40	4.50	4.40
July	4.35	4.45	4.55	4.45
August	4.40	4.50	4.60	4.50

Prices at Port Richmond, Philadelphia, were 35c. per ton less than the above.

BITUMINOUS COAL TRADE.

Although the total production of this coal throughout the entire country may approximate that of 1875, yet, owing to the much lower prices received, the net result of the year's business has been less satisfactory than it then was; and this notwithstanding that considerable reductions in wages, in cost of transportation and in other items were effected in most of the coal fields.

THE CUMBERLAND REGION.

The financial and production exhibits of this region for the year just closed is, probably, worse than that of any other bituminous district in America. The production in round numbers amounts to but about 1,850,000 tons, as against 2,342,773 tons in 1875, 2,410,895 tons in 1874, and 2,674,101 tons in 1873. Whereas the anthracite trade, under the very injurious policy of the Combination, lost 17·4 per cent. of its business since 1873, it will be observed that the Cumberland trade has fallen off 31 per cent.; 21 per cent. having been lost this year. This loss of trade is partially due to a failure on the part of the companies to abandon extravagant management and rates of wages which are nearly double what they are elsewhere; but it is more particularly owing to the exorbitant rates of freight which the Consolidation Coal Company has charged on coal going over the only outlet from the field.

The companies, realizing the fact that relief must be obtained from this oppressive monopoly, or that the whole of the companies except the Consolidation would become bankrupt, introduced into the Maryland Legislature a bill to reduce the limit of charges to be made by the Cumberland and Pennsylvania Railroad. This bill was resisted in its progress by the representatives of the Consolidation Coal Company, but finally passed the House on February 28, and the Senate March 7, receiving the approval of the Governor on March 14. The reduction demanded by the bill was 1c. per ton per mile, leaving maximum legal charges of 2c., 3c. and 4c. per ton per mile, according to distances. While the bill was pending, a sale of this road was made to the Consolidation Coal Company, which already owned nearly all the stock. The indenture of sale bears date of March 2, although no notice of sale was given by either the Consolidation Coal Company or the Cumberland & Pennsylvania Railroad Company until April 13, or after the adjournment of the Legislature for two years, which took place on April 3d. Under cover of this sale, the Consolidation Coal Company, claiming the right to operate the road under its own charter, has continued to impose the old rates of freight. On April 18 the mining companies petitioned the Governor to direct the Attorney-General to bring proceedings against the Consolidation Coal Company for forfeiture of charter on grounds of abuse of chartered powers. On May 13 the American Coal Company filed complaint against the Consolidation Coal Company asking for an injunction to restrain the Company from charging higher rates of transportation than those provided in the law amending the charter of the Cumberland & Pennsylvania Railroad, and to set aside the alleged sale of said road as illegal. This case was heard before the Circuit Court of Allegheny County and afterwards by the Court of Appeals, which is now reserving its decision. A similar course was followed in the case of the State *vs.* the Consolidation Coal Company.

The great loss of trade, and the inability of the mining companies to meet the existing and prospective competition, brought about an active interest in securing some further and more liberal outlet for the production of that region. Articles of incorporation were filed on December 27 for the purpose of building a narrow gauge road to be known as the George's Creek and Cumberland Railroad, and engineers are now at work surveying the route. The estimated cost is but about one-fifth of the amount of capital now represented in the Cumberland and Pennsylvania Railroad and branches. The proposed route will be but twenty miles in length, as compared with an average of about twenty-five miles by the Cumberland and Pennsylvania Railroad. If a very liberal addition be made to the estimates, and the cost be placed at $1,000,000, with freights at 1½c. per ton per mile, or one-half of the lowest charge now made for transportation by the present road, a sufficient business would be immediately guaranteed to make the investment quite remunerative. There is not a doubt expressed of the ability of the projectors to secure the necessary capital to prosecute this work. Were the road completed and the wages reduced, it would diminish the cost of coal delivered at Georgetown to not over $2.50 per ton, which would enable this limited coal field to be worked to its full capacity, thus giving full employment to all the miners now there, attracting men from other fields, and securing great prosperity to this particular locality. Taking this view of the case, every encouragement should, and doubtless will, be given to this scheme by the local capitalists, while from the vastly increased business that the Chesapeake and Ohio Canal would receive, its stock and bond holders will likewise find their interests advanced by securing the building of the road.

Nearly all the companies in the Cumberland region, except the Consolidation Coal Company, notified their miners that on and after April 10, wages would be reduced to 55c. per ton for ordinary mining, 65c. per ton for heading work, and all other classes of labor in the same proportion. This reduction was opposed by the men. On April 12 the Consolidation Coal Company gave a similar notice to its miners, but withdrew it on the 14th, thereby defeating the general movement, and on the 29th the Phœnix and Franklin Companies resumed. This was followed by a general resumption at the old rates about May 1st. At present there is a move to reduce wages to the basis of 45c. per ton for general mining.

The Chesapeake and Ohio Canal tolls, including Cumberland wharfage and shipping expenses, were reduced at the opening of the season to 46c. per ton, or 5c. per ton less than the rate in 1875. Boat rates have varied from 75c. to $1 per ton, with 90c. as an average rate. In May a drawback of 18c. per ton was allowed by the Baltimore and Ohio Railroad on all coal for re-shipment eastward from Baltimore.

A Baltimore and Ohio Railroad interest has secured a very large amount of the stock of the Consolidation Coal Company, and is said to endorse, if not dictate, the present policy. It was intimated during the year that when a sufficient quantity of the stock should be secured, the road and mines of the Consolidation Coal Company would be leased to the Baltimore and Ohio Railroad Company at a rental equivalent to a guarantee of a liberal dividend on the stock and payment of interest on the indebtedness of the Consolidation Company. Had this been done, it would have realized, to those who had purchased the stock, a very handsome profit, as it would have greatly advanced its market value, but it would have saddled on the Baltimore and Ohio Company an unprofitable investment. The reputed sagacity of the gentlemen supposed to hold the stock gives color to the rumor, for it is scarcely credible that they would buy the stock as an investment at the prices ruling at the time. Were the Baltimore and Ohio Railroad to secure control of the Cumberland and Pennsylvania Railroad, its object would be to divert trade from the canal to its own line. This would insure beyond a doubt a second outlet to the canal, and leave the Baltimore and Ohio Company with an unprofitable road on its hands. The policy of high transportation rates that has so reduced the business of the Cumberland and Pennsylvania road has been followed to a certain degree and with similar results on the Baltimore and Ohio road, whose coal business has fallen off, since 1873, 909,735 tons, or 36 per cent.

The prices for Cumberland coal during the year have been from $3.30@$3.60 at Georgetown, and $3.50 to $3.80 at Baltimore.

THE CLEARFIELD REGION.

Thanks to the liberal fostering policy of the Pennsylvania Railroad and to the energy and business ability of the leading operators in this region, Clearfield coal has widened and strengthened its position in the Eastern market

during the past year. The output of the mines increased about 260,000 gross tons over that of 1875, and is greater than ever before; the increase has nearly all come to tide-water. This feature is the more remarkable when we consider the unprecedentedly low price at which anthracite has been sold during the latter half of the year, and the low rates at which Cumberland and Richmond coals were offered during the entire season. The fact, though highly creditable to the leading spirits in this trade and to the Pennsylvania Railroad Company, was only possible by the excellent quality of the coal, which has made it a highly popular steam fuel, and has firmly established it as one of the standard coals coming to this market.

The business of this region during 1876, though successful as regards output, was unprofitable in prices, and undoubtedly many of the mines were worked at an actual loss, yet we do not see how much, if any, advance on these prices can be secured on tide-water trade in the year 1877, in the face of a probable reduction in the price of Cumberland coal, the natural rival of Clearfield. There is a prospect of the local and line trade improving with the better demand for iron and greater activity in other industries, and in this direction more improvement in prices may be expected than in the tide-water trade.

There were shipped from Greenwich wharves, Philadelphia, during the year about 600,000 tons of Clearfield coal, and during the same period about 120,000 tons were sent from South Amboy. Of the Philadelphia shipments 350,000 tons were consigned to points outside of Delaware Bay, being distributed mainly to rolling mills, cotton mills, railroads and coal dealers of the New England States, and about 25,000 tons to foreign countries, mainly the West Indies. The balance of the shipments were consumed along the Delaware River and its branches, and for the steamers running out of Philadelphia, the four largest consumers being: the American Steamship Company, running six steamers to Liverpool; the Red Star Line, running four steamers to Antwerp; the Winsor Line, running four steamers to Boston; and W. P. Clyde & Co.'s several lines.

The South Amboy shipments were distributed about as follows: 70,000 tons to steamship lines, and the balance (50,000 tons) to manufacturers and dealers in New York harbor, on the North River, etc.

The deliveries from Canton, Baltimore, amounted to about 25,000 tons, which were consumed in Baltimore and Norfolk.

But two new collieries were opened in this field in 1876, although the producing capacity of the others has been considerably increased over 1875, so that the capacity of the region for 1877 may be considered as in excess of that of previous years.

That the Pennsylvania Railroad Company will foster and protect its present business there is no doubt, but it is equally certain that the company will not attempt to grasp for more additional trade, the officers believing that the natural increase of demand and the revival of business generally will gradually afford their road a fair share of the semi-bituminous coal trade.

The Pennsylvania Railroad Company, although regulating its freight tariffs of 1876 to meet the general curtailment of values, has very wisely declined to compete in its rates with the great reduction in anthracite prices, preferring to leave the bituminous business to its own merits, relying on its excellent qualities as a steam generator to maintain its demand.

The most prominent and progressive firms in the Clearfield trade, and to whom may be attributed the successful introduction of Clearfield coals with the large consumers in the East, and the steamship companies running from New York, Boston and Philadelphia, are Messrs. Berwind, White & Co., who mine and sell what is known as the "Eureka" coals, the reputation of which stands very high in the American market. Robert Hare Powell & Co., possessing also ample facilities of every kind, have been very successful in establishing a high reputation for their "Stirling" coal.

These two firms, it is estimated, have handled upwards of 300,000 tons of the entire quantity of 550,000 tons sent to tide-water, in addition to a large local trade.

Messrs. Harned, Ogle & Co. have also, with their "Ocean" coal, secured an enviable name, the coal being very good.

The Kittanning Coal Coal Company, although possessed of a good quality of coal and excellent facilities, has not pushed business in this unprofitable market during the year; its coal has an established high reputation, and, doubtless, waits the better times to force the market.

The four firms mentioned, with the Webster Coal Company, Kendrick & Co., H. Fisher, Miller & Co., compose all the operators of what is termed the large or Moshannon vein who enter into competition for the New England and New York trade.

Powell & Co. have two large collieries in Clearfield County; Berwind, White & Co., three collieries actively employed; Kittanning Coal Company, two collieries; Harned, Ogle & Co., one large producing mine; Webster Coal Company, Hendrick & Co., Fisher, Miller & Co., each one.

There are several other operators who, however, confine their sales mainly to local trade.

R. B. Wigton is also a large operator from this region, and has sent to market a large amount of his "Morrisdale" coal, though we have not heard of its introduction with steamship companies, or for locomotive purposes to any extent.

THE KANAWHA COAL FIELD AND COAL TRADE.

The Kanawha region having now, thanks to the fostering policy of the Chesapeake & Ohio Railroad, come prominently before the public as a great source of coal supply, we have deemed it of interest to give quite full details of the present condition of mining there, and to show by statistics the rapid development this district has undergone within the past three years.

We include, under a single title, the mining fields on the New River and Kanawha.

Coal shipments commenced upon the line of the Chesapeake and Ohio Railroad soon after its opening in the summer of 1873. The earlier shipments came in small quantity, and when consigned beyond Richmond were wagoned from the depot, across the city, to the James River upper wharves. Since the completion of the Church Hill tunnel in February, 1874, coal deliveries have been made from the Chesapeake and Ohio lower wharves directly from the cars into sea-going vessels. The arrangements for this trans-shipment include the later improvements, and are considered by competent judges to be very complete. Since their first construction it has been found necessary to enlarge these wharves to meet the increasing business in the transportation of coal and oil.

The development of the coal interests of the Chesapeake and Ohio Railroad, though much retarded by the continued pressure of the times since its opening, has progressed steadily, and has now come to promise large results in the early future. From a commencement of four coal companies in 1874, the number has increased to eighteen in 1876, of which one company operates three mines, and two others two each. Three new companies have recently opened mines and are about ready to ship. Others are organizing for work, of which one will break ground at once.

The coal tonnage of the Chesapeake and Ohio Railroad from its opening is given in the annexed tabulated statement:

STATEMENT OF COAL SHIPMENTS OVER THE C. & O. RR. DURING THE FISCAL YEARS ENDING OCTOBER 1, 1874, 5 & 6. (Tons 2,240 lb.)

Character of Coal.	Total Shipments.			Increase.		Percentage.	
	1874.	1875.	1876.	1875.	1876.	1875 over 1874	1876 over 1875.
Cannel	28,783	30,635	39,295	1,852	8,660	6	28
Splint and Bituminous	100,283	126,899	164,914	26,616	38,015	26	30
Coke, Main Line	1,240	5,476	7,435	4,236	1,959	341	36
" Branch Line	5,600	15,500	18,800	9,900	3,300	177	21
Total	135,906	178,510	230,444	42,604	51,934	30	30
GENERAL DESTINATION OF ABOVE.							
Shipments from James River wharves to Eastern cities	36,385	59,324	95,599	22,939	36,275	63	61
Coal delivered at Richmond and on line of railroad	92,681	98,210	108,610	5,529	10,400	6	11
Coke, Main Line	1,240	5,476	7,435	4,236	1,959	341	56
" Branch Line	5,600	15,500	18,800	9,900	3,300	177	20
Total	135,906	178,510	230,444	42,604	51,934	30	30

It will be observed from this statement that the larger percentage of increase during 1876 occurs in east-bound shipments from the James River wharves, attesting the growing favor with which the New River and Kanawha coals are received in the eastern markets, and especially the cannel, splint, and gas coals. This trade is assuming still larger proportions under the management of the Chesapeake and Ohio Coal Agency recently established in New York City, their orders now exceeding the present ability of the mines to ship, from want of labor, which, however, is now coming in from the other coal districts.

The coal measures of West Virginia are well known to the readers of this Journal, both from its own correspondence and from official reports. It will be pertinent, however, to state that the Chesapeake and Ohio Railroad traverses these deposits for over 100 miles, with an immense coal acreage on either side extending to the limits of this formation in Kentucky westward, and to the foothills of the Alleghany Mountains eastward. The deep valleys of the New and Kanawha Rivers (along which the road is located) pass obliquely across these fields in their greatest width, and expose the richest varieties of their coals. Together with those of the tributary streams, these valleys afford unusual facilities for access and for mining and drainage. In no mineral region of the United States are coal mines opened at less first cost, and in few can coal be so cheaply mined.

The coal measures of this district are locally known under two main subdivisions, viz.: the bituminous and smith coals of New River, and the cannels, gas, splint and locomotive steam coals of the Kanawha. The New River coals comprise the "lower measures," described in M. F. MAURY'S State Centennial Report of West Virginia, as "friable, rich, bituminous, exceedingly pure, and seams very free from partings"; and, it may be added, they supply approved steam and coking coals, which are in especial demand for metallurgical uses. These coals, from the previous inaccessibility of the region, have been known commercially only since the completion of the Chesapeake and Ohio Railroad.

The beds of the Kanawha have supplied for years past the industrial wants, even of blast-furnaces, of the Kanawha County, and no small portion of the Ohio Valley.

Instead of describing, in general terms, a field so well known, it is preferred to enumerate the several mines actually operated through both districts on the line of the Chesapeake and Ohio Railroad, adding a few details:

No. 1.—Quinnimont Mine, 297 miles from Richmond. The New River section here comprises seven coal seams, aggregating, as now known, about 20 feet in thickness. The Quinnimont Furnace, one mile distant, works the 4-foot vein

(so-called) for the supply of its coke ovens, 80 in number; and in addition ships an excellent smith's and steam coal.

No. 2.—New River Coal and Coke Company, 308 miles from Richmond, has two openings in what are considered the Sewell and Nutall seams. This coal has been tested in the C. & O. stationary engines and shops, with excellent results. Regular shipments are about commencing from these mines.

No. 3.—Longdale Coal and Iron Company, Sewell mine, 312 miles from Richmond; seam 3½ to 4½ feet thick, and in position above the Quinnimont. Coal mined exclusively for coke ovens built here for the supply of the company's blast-furnace, 130 miles distant in Alleghany County, Virginia. Besides other arrangements for coke burning, there are 30 ovens of the Connellsville bee-hive pattern, with successful modifications (by the Company's officers) in flues, &c. The coke from these ovens is classed among the very best of the district, and attracted marked attention among the best cokes exhibited at the Centennial, receiving awards, etc.

At the Sewell mines, the New River coal section shows in outcrop 8 seams, with 22 feet aggregate thickness.

No. 4.—Nutall Mine, 316 miles from Richmond, working the 4-foot seam (below the Sewell). This mine supplies a large portion of the coal of the Old Dominion Steamship Line between Richmond and New York, and other steamers; and it is certified by the officers of those lines to be preferable to any other they have used, including George's Creek, Cumberland. An excellent coke is shipped from this mine to the Huntington car-wheel foundry, and to furnaces eastward, and is found to be superior to the cokes from any other section used by them.

No. 5.—Hawk's-nest Coal Company, 324 miles from Richmond; commencing to mine in the Nutall seam, which is here about 60 feet above the track of the Chesapeake and Ohio Railroad. This company will begin to ship regularly during January.

All mines enumerated thus far are upon the right, or railroad, side of New River. On the opposite slopes the coal seams at corresponding elevations are thicker (six and seven instead of four and five feet), and they appear still to increase in the interior country. One of the largest and most valuable of these coal properties, opposite Dimmock and Sewell stations (A. A. Low & Bro.) has been recently examined preliminary to regular operations at no distant date.

The characteristics of the New River coals are indicated in the annexed analyses, compiled from the State "Centennial" Report and other sources, which are fully sustained in furnace results, blast and cupola:

COALS.

MINE.	Carbon.	Volatile Matter.	Ash.	Sulphur.	Water.	CHEMIST.
Nutallburg	69·00	29·59	1·07(?)	0·78	0·34	C. E. Dwight.
Sewell	72·32	21·35	5·07	0·20	1·03	J. B. Britton.
Quinnimont	75·89	18·19	4·68	0·32	0·94	J. B. Britton.
New River Co.	74·60	21·93	1·43	1·40	·61	P. de P. Ricketts.

COKES.

Nutallburg	91·22	....	7·53	0·92	....	C. E. Dwight.
Sewell	93·00	....	6·73	0·27	....	J. B. Britton.
Quinnimont No. 1	93·85	....	5·85	0·30	....	J. B. Britton.
Quinnimont No. 2	91.72	2·71	5·09	0·48	....	J. B. Britton.
Quinnimont No. 3	91·14	*1·56	6·65	0·42	0·23	J. W. Mallett.
Connellsville	87·46	....	11·36	0·09	0·49	J. B. Britton.

*H, 0·38 O, 1·17 N, 0·01

No. 6.—The Gauley-Kanawha Coal Company, 327 miles from Richmond, has opened for shipment in the 10-foot vein (as locally termed) of the Gauley section, in which at least eight veins have been examined. This section includes at least one of the bituminous seams of the New River series, with the gas and cannel coals of the Kanawha approximately marking the transition between the two.

The Gauley-Kanawha Company has built a narrow-gauge track three miles in length from the mines on Gauley Mountain, to the Chesapeake and Ohio Railroad at Hawk's-Nest Station. It is understood that the necessary arrangements have been made for the full equipment of their branch road and the commencement of regular shipments by March next.

No. 7.—Cannelton Coal Company, 343 miles from Richmond, on the Kanawha River, mine regularly three of the seven workable seams above water level, referred to in the State Centennial Report as having an aggregate thickness of 38½ feet, from which about 200 tons per day are taken. Of the three mines, the most important is the Cannel, from which large shipments of that valuable enricher have been made to Eastern cities for gas purposes since 1873. The cannel deposit proper varies from 1 to 4 feet in thickness, with a softer or semi-cannel coal above, averaging about 5 feet 6 inches for the entire seam. No. 2 (the Coal Valley seam, 7 feet thick) is mined for gas coal; and No. 5, near the summit, for block coal.

The present capacity of the Cannelton mines is rated at 300 tons per diem, and the actual shipments are frequently well up to these figures.

The Cannelton Mines are in the Kanawha slopes on the opposite bank to the railroad, to which their coals are still ferried. A bridge crossing is contemplated, although the ferry arrangements are excellent.

No. 8.—The Coal Valley Coal Company, 343 miles from Richmond, on the railroad side, mines about 100 tons per day from the 7-foot gas coal seam, so well known locally, and has supplied the Richmond Gas Works for two years past, in addition to more distant shipments to the Eastern cities.

No. 9.—The Straughn Mine, 344 miles from Richmond, is also operating in the Coal Valley (7-feet) seam, shipping about 90 tons per day of an excellent gas coal to the Eastern markets, and supplying the railroad with good engine fuel.

No. 10.—The Upper Creek Coal Company, 345 miles from Richmond, mine the 5-feet seam below the Coal Valley. This mine has not been long opened. It supplies about 40 tons per day of fair locomotive engine coal, and promises to be a good gas coal.

No. 11.—Paint Creek Mines, 348 miles from Richmond (GORDON & SEAL and JOHN S. DODDRIDGE). These coals are of the best varieties of the Kanawha splint. The production per day is about 50 tons.

No. 12.—Kanawha Semi-Cannel Company (BREWER SMITH), 349 miles from Richmond, in the 8-feet splint seam, of which 4 feet 4 inches is worked for grate and domestic uses; a popular coal in the Richmond and other markets.

The coal sections of Paint, Armstrong, Morris and the adjoining Creek valleys are ranked among the finest of the Kanawha district. Several valuable coal properties have been opened in this vicinity, and two (the Maury and Caperton-Riggs tracts) were worked prior to 1862.

No. 13.—Blacksburg Mine, 351 miles from Richmond (J. R. SMITH, lessee) supplies about 80 tons per day of one of the best gas-coals of the Kanawha Valley. The vein is 3½ feet average thickness, and the quality of the coal is given below.

No. 14.—A. B. Ault, 352 miles from Richmond, mines in the 3-feet seam producing about 20 tons per day of a bituminous coal for domestic and engine uses.

No. 15.—Coalburg Mines, 353 miles from Richmond (STUART M. BUCK & Co., lessees). There are two mines, one recently opened and preparing to ship, producing in all about 200 tons per day. These coals have long been known in the Western markets, and are in special demand for locomotive engines, iron works (including blast furnace) and for choice family fuel. This coal is hard strong and bright, kindles readily, has an unusually small percentage of ash, and bears distant transportation with inconsiderable breakage. On this account it is used largely (together with the coal of the adjoining Lewiston and Coalmont Mines) by many railroads, and more especially by the Virginia Midland, the Atlantic, Mississippi & Ohio, and the Kentucky Central Railroads as a locomotive coal.

One of the Coalburg veins has given excellent results for gas-coal; but with the demand for splint coal, the lessees have preferred to concentrate their mining force upon those shipments.

No. 16.—Houston or Eutopia Company, 355 miles from Richmond, in the 3-ft. seam, producing about 20 tons of gas and engine coal.

No. 17.—Coalmont Mine, near Lewiston, 356 miles from Richmond (O. H. WELSH, lessee) opened in the 5-foot seam here called the "Coalburg vein," and 3½ feet available for first-class splint coal. The Coalmont coal has the fine qualities of the Coalburg both for household and engine service.

No. 18.—Lewiston Company, Lewiston Station. This company, in addition to their old mine and the "Phillip's opening," have commenced work in the next lower or "Coalburg" seam of this section, and have a gas-coal seam on the same property. At present they mine exclusively splint coal of the best quality, producing about 150 tons per day. It ranks No. 1 in the engine service of the Chesapeake & Ohio Railroad, and is in demand for furnace work and as a grate coal.

No. 19.—Brownstown Mine, 360 miles from Richmond (NORTON & ENGLISH). The branch track and incline of this company have recently been completed to an opening in the cannel seam of a fine coal section at this point. The thickness of the cannel (in the outcrop) is 34 inches. The splint and bituminous seams below are but partially exposed.

No. 20.—Peytona Mine, on Coal River, about 12 miles across the intervening ridge from the Chesapeake & Ohio Railroad, present outlet by the Coal River slack-water navigation to St. Alban's Station, and shipping both east by rail and west by river. The cannel coal of this mine is too well known to require special mention beyond directing attention to its high figures in the analyses and tests of the annexed tabulated statement of the leading coals which are mined in this field:

ANALYSES AND TESTS OF KANAWHA COALS.

Location.	Vol. Matter.	Fixed Carbon.	Ash.	Water.	Chemist or Authority.
Cannel Coals:					
Peytona	46·00	41·00	13·00	.....	Manhattan Gas L. Co. and Professor Chandler.
Cannelton "Selected,"	46·50	43·20	10·20	.....	C. M. Cresson.
" "Average,"	46.50	41·30	12·20	.....	C. M. Cresson.
Semi-Cannel, Caking and Gas Coals:					
Cannelton	35·10	62·90	2·00	.....	Ford.
Coal Valley "Lower Seam,"	35·20	61·66	1·87	1·33	State Report.
Coalburg "Main Seam,"	40·50	56·50	1·50	2·00	Levette.
Splint and Bituminous Coals:					
Paint Creek "Gray Splint,"	30·13	63·74	6·13	.....	Doremus.
Coal Valley "Top Seam,"	38·32	57·20	4·30	0·18	Richmond City Gas Co.
Gauley, Kanawha	30·00	65·00	4·50	.....	Manhattan Gas-light Co.
Coalburg "Splint,"	32·50	62·00	1·50	·41	Levette.
" "4-ft. Seam,"	33·26	62·61	1·81	2·32	Riverside Iron Co.

WORKING TESTS.

Location.	Cubic feet of gas per ton of coal.	Candle Power.	Chemist or Authority.
Peytona "Cannel,"	13,200	42·79	ManhattanGas-Light Co.
Cannelton "	12,025	45·60	Manhattan Gas-light Co.
"	10,000	64·54	
" "Caking,"	11,334	16·14	Ford.
Coal Valley "Lower Seam,"	10,080	17·0	Richmond Gas Works.
Blacksburg	10,304	17·0	Richmond Gas Works.
	10,752	16·0	Metropolitan Gas-light Co.
Coalburg	10,707	17·8	South Boston Gas-light Co.
"	11,244	16·9	Brookline, Mass.
Coal Valley	11,771	17·10	Waltham Gas Co., Mass.
Straughans	10,349	·17	Richmond Gas Works.

The tests above quoted, were from various quantities of coal, ranging from 10 tons up to the working average, in one case of 5,000 tons.

The Kanawha field is fortunate in having an outlet by water as well as rail, and a large part of its production goes to market by the Kanawha and Ohio rivers. In the year 1875 the amount which was thus shipped was about 200,000 tons. Our returns for 1876 are not yet in, but the increased output of the region has been principally on the line of the Chesapeake & Ohio Railroad, and has gone over that route to market.

Though the amount of this coal coming East is yet comparatively small (nearly ¼ million tons), its rapid increase, while the production of nearly all other coal fields has been diminishing their output, is, when taken in connection with the great distance these coals have to come, the very highest evidence of their excellent quality and growing popularity. That the liberal policy of the Chesapeake & Ohio Railroad, though probably not immediately profitable, will ultimately build up a trade that will add largely to the revenues of the road, cannot be questioned in the face of the above facts.

THE RICHMOND, VA., COAL FIELD.

Little progress has been made during the year in the development of this field. The Midlothian colliery has sent several cargoes of coal to the Eastern market where it has been very well received, and there is no doubt but that with suitable shipping facilities and reasonable rates of transportation from the mines to the shipping port—which is in this particular case, we believe, only eleven miles—would enable these mines to put coal f.o.b. at a remarkably low figure. Under these conditions, and with full output it is probable that less than $2 a ton f. o. b. would not only cover all expenses but would leave a fair profit to the mine owner. It seems, therefore, that this field must become a much more important element in the coal trade than it has thus far been. There are no prospects of any immediate development, the whole region apparently waiting for some coming man who will infuse life into it and utilize its very evident natural advantages. At present it remains in its wonted condition of suspended animation.

THE WESTERN COAL FIELDS.

We cannot at this early day give any full statistics or review of the more distant coal fields of the country, but our advices indicate, in a general way, that production has declined in some, increased in a few, and that prices have almost everywhere been so low as to leave but small margin of profit to the miner. In Ohio the production, according to Inspector Roy, has declined about 30 per cent. The Indiana fields, the principal of which is that near Brazil, have probably increased their output. The advantage which the Brazil mines have in the Chicago market, of nearly 200 miles in railroad freights, over the Hocking Valley, Ohio, which formerly was one of the chief sources of its supply, has in these times of low prices resulted in the increased use of the Brazil block coals at the cost of their Ohio rivals.

Kansas and some of the other Western States are building up an important industry in their coal mining, and with the revival of business the total production of the West will increase at a very rapid rate.

The coal fields of Utah are likely to receive much greater attention in the near future than they have yet attracted. Though they are undoubtedly post carboniferous in their age, at least one of them, the San Pete, produces an excellent coal, as is shown from the following analyses, recently made for us by J. B. BRITTON of Philadelphia. This coal cokes exceedingly well, and produces an article which, selling at $25 per ton, is taking the place of Connellsville coke, which now costs $28 a ton at the smelting works of the Territory:

San Pete.	Coal.	Coke.
Volatile matter	49·91	2·70
Fixed Carbon	48·21	94·05
Ash	1·88	3·25

The coal contained sulphur ·547; phosphorus, a trace; the coke contained, sulphur ·356; and phosphorus, a trace.

These facts are of the utmost importance in more respects than may appear at first sight. Utah is possessed of magnificent deposits of iron ore, and there can be no doubt that a coke of the quality indicated, will soon find use in iron smelting. The Utah Coal and Coke Comany is now making arrangements for the completion of the road from Springville to their coal mines, a distance of about 55 miles. With its completion we look for very rapid progress in the development of the coal production of this Territory, and to the establishment there of iron works at no distant day.

The Pacific Coast coal mines have had to contend with the low prices of English and Australian coals, the former in particular having been brought to San Francisco in large quantities as ballast. We have not the returns for December, but the following table, which we take from our esteemed contemporary, the *Commercial Herald* of San Francisco, makes a comparison of the receipts from the different sources of supply for eleven months in each of the last two years, and the receipts from Mt. Diablo mines during eleven months in each of the last five years.

These statements show that while the total receipts have increased about 65,000 tons, the English, Vancouver (B. C.), Seattle (W. T.), Bellingham Bay (W.T.) and Coos Bay (Oregon) have contributed about 121,000 tons more than in 1875, and the Mt. Diablo mines have sent 29,854 tons less than in the previous year; indeed the production of this field seems to have decreased steadily during the past five years, while Oregon, Washington Territory and Vancover's Island have steadiiy increased.

Prices in San Francisco have declined, during the eleven months, as follows: Anthracite nominally, $1; Sydney, $1.25@$1.50; Mt. Diablo, 50c.; Coos Bay, $2; Seattle, 50c.@$1; Bellingham Bay, 50c.; English, $1.

COAL TRADE OF SAN FRANCISCO.

RECEIPTS FROM MOUNT DIABLO MINES.

	1872.	1873.	1874.	1875.	1876.
January	14,671	13,907	15,145	14,181	8,653
February	13,627	10,447	13,589	14,344	9,047
March	16,030	12,178	14,258	12,355	8,876
April	13,062	11,525	15,048	13,732	7,256
May	14,778	14,714	17,287	10,903	10,137
June	13,789	16,606	17,866	10,185	10,632
July	13,821	14,378	17,790	11,618	10,989
August	15,981	17,040	19,261	12,038	11,170
September	15,033	16,355	20,922	10,356	9,548
October	17,938	15,758	17,616	11,347	7,556
November	14,592	15,280	18,414	10,528	7,769
Totals	163,322	158 188	187,596	131,587	101,733

Imports from January 1st to December 1st.

	Tons, 1876.	Tons, 1875.	Increase.	Decrease.
Anthracite	10,950	12,286	.....	1,336
Australian	124,163	125,133	.....	970
Coos Bay	35,090	29,937	5,153	.....
Cumberland	12,421	10,228	2,193	.....
English	97,099	45,637	51,462	.....
Mt. Diablo	101,733	131,587	.....	29,854
Vancouver Island	87,119	55,407	31,742	.....
Rocky Mountain	163	53	110	.....
Seattle	81,609	57,511	24,098	.....
Bellingham Bay	19,635	10,945	8,690	.....
Chili	3,150	.....	3,150	.....
Totals	573,162	478,724	94,438	.....

GAS COALS.

Business in these coals opened up earlier than usual by sales of about 250,000 tons of Penn and Westmoreland coals and 50,000 tons of Youghiogheny at $6 per ton, delivered in New York and vicinity. The competition for this business was practically between the Baltimore & Ohio and the Pennsylvania Railroad Companies, but the officers of the latter, who comprehended the necessities of the trade, by prompt action secured the great bulk of the business before the former company had time to realize the situation. The Baltimore & Ohio road has never shown itself a friend of progress or enterprise, and its policy has discouraged rather than fostered the establishment of mines and works upon its line. In this instance, having been outwitted by its bold and enterprising rival, it made a desperate, late effort to secure some portion of this business, and by granting concessions of 20 cents per ton in freights to Baltimore, about 30,000 tons additional were sold to come over this route. The decline in water freights during the Summer and early Autumn secured the sale of about 15,000 tons more at prices varying from $5.25 to $5.65 per ton, delivered here.

The excellent gas coals mined in West Virginia, on the line of the Baltimore & Ohio Railroad, have been almost totally excluded from the Eastern market by the high freight tariff policy of this road, and the mines have for the past two or three years been able to work to only a small part of their full capacity, and almost exclusively for the supply of the local market along the line of the road. One would suppose that the enormous falling off in the coal trade over this road, to which notice is called elsewhere, would attract the attention of the managers of the Company, and especially when the fact is contrasted with a steadily-growing coal trade over the Pennsylvania Railroad.

During the season about 12,000 tons of Kanawha caking coals were sold for gas purposes in this market, at prices ranging from $5.50 down to $5.25 per ton. The spring contracts for cannel coal amounted to about 50,000 tons, a quantity much in excess of that sold in former years, and of which nearly 40,000 tons were from the Cannelton mines. The price realized for this coal was $10 per gross ton in New York.

The imports of foreign cannel for gas purpose have altogether ceased, while we are enabled to report, in addition to about 2,500 tons of gas caking coal sent to Canada, 3,000 tons of Cannelton cannel for gas purposes.

The imports of Provincial coals into this market have amounted to about 20,000 tons of Block House and 2,000 tons of Glace Bay, which were sold at an average price, delivered here, of $4.50, currency, per ton. This business has been favored by unusually low freights, some vessels having been taken as low as $1.30 per ton.

The imports of Newcastle coals for gas purposes have amounted to about 5,000 tons, the prices realized having been from $5 down to $4.25 per ton. This coal was brought in on ship's account, and the prices obtained could no

be considered satisfactory, for they yielded but a nominal freight of 5s. to 7s. per ton to the vessels carrying it.

The gas companies are carrying considerable stocks of coal, and the indications are that they will not be so ready to anticipate their wants, by making contracts for large quantities of coal early in the season, as they were in 1876, but will rather delay purchases as much as possible with the hopes of securing greater concessions in prices. The certainty of securing supplies which the present condition of the labor question and the competition between the railroads assures, as well as the probability of continued low prices, makes it unnecessary for gas companies, or any other manufacturing company, to carry the large stocks of former years, or to make contracts ahead for as large amounts as in the past.

COASTWISE FREIGHTS.

These have been unusually low this year. From this port (New York) to Boston during January, the rates ranged from $1.75 to $2 per ton, while by the latter part of February they were reduced to $1.25, followed by a further reduction to $1 about the middle of March, and 90 cents in the middle of July. This low rate ruled until the middle of September, when it was advanced to $1.25 per ton, ranging between that figure and $1.50 during the balance of the year. The rates to other ports declined in the same proportion. From Georgetown to Boston the rates ranged from $2.50 to $2.70 per ton, until early in March, when a reduction to $1.65 took place, the rates continuing between that figure and $1.45 until the end of September, when a gradual advance set in reaching as high as $2.30 early in November, followed by a slight decline during the last month or six weeks of the year. The rates from Georgetown to New York during the actual shipping season ranged from $1.15 to $1.35, and were mostly at $1.25. The rates from Philadelphia to Boston during the principal shipping season ranged from $1.15 to $2.

Present indications do not point to much higher average rates during 1877, though should the business of the country revive, as we have reason to expect, the demand for coal will increase, and freights will probably be maintained at better rates than during the greater part of 1876, though it is not likely they will attain the maximum rates then paid.

UTILIZATION OF WASTE COAL.

Not many years ago leases of mines were made in the anthracite regions, in which chestnut coal paid but half the royalty required for the larger sizes, and nothing was paid for anything smaller than chestnut; and indeed even this was sold at so low a price as scarcely to pay the freight to tide-water. With the introduction of "base burning" stoves it was found that the smaller sizes were more convenient than the larger, and the difference in the price began to diminish. Chestnut coal that was usually quoted at $1 per ton less than stove, the next larger size, has, in the last two years, increased in favor, till now, in the Northern and Western markets, it is quoted the same as stove, and in this market is quoted by the various companies at from fifty cents per ton below, up to the same price as stove coal. Pea coal, the next size below chestnut coal, which was formerly universally thrown away at the mines, going to the "culm" or "waste banks," is now brought to this market and quoted the same as lump, steamer, grate and egg sizes, and at the mines no size larger than pea coal, and in some cases even a smaller size ("buckwheat") is used for steam-making.

A still more radical step has been taken by some of the companies; and the coal dust which encumbered the space about the mines and the shipping wharves is now being manufactured into compressed blocks.

We have frequently noted in these columns the efforts of Mr. L'OISEAU to manufacture a patent fuel from anthracite coal dust cemented together with about 6 per cent. of common clay, and those who visited the Philadelphia Exhibition had an opportunity of satisfying themselves of the technical success which he has attained in his important works at Port Richmond.

Another method has been adopted by Mr. J. J. ENDRES at Rondout, on the Hudson River. The coal dust is brought by the Delaware and Hudson Canal Company from Honesdale and from the mines, and is compressed in large rectangular bricks, 10 inches × 6 inches × 4½ inches; the cement used is pitch, the effect of which is to make the coal burn with something of the flame and intensity of a bituminous coal. The results obtained with these blocks in steam generation are highly satisfactory, and almost, if not quite, equal to those obtained from the best broken anthracite and bituminous coals. During the year 1876 about 25,000 tons of these fuel blocks were produced by the "Anthracite Fuel Company" of Rondout, N. Y., under the direction of Mr. ENDRES and the energetic business management of Mr. L. L. CROUNSE.

Mr. JOHN E. WOOTTEN, the engineer of the Philadelphia and Reading Railroad Company, during the past year has succeeded in burning, under boilers, the culm or anthracite coal dust, in its natural state, without forming it into artificial blocks, or using any mixture. The method employed—which was described in the ENGINEERING AND MINING JOURNAL, Vol. XXI., p. 420—consists of forcing air with steam into a closed ash-pit and up through a perforated fire bed into the fuel. This device has been so successful that, it is said, coal slack thus burned gives results almost as good as those obtained by the use of the large sizes of coal. If it be found that this simple and inexpensive device can be generally applied to the burning of the culm, which forms such unsightly mounds in our anthracite fields, it will effect an immense economy, for it is well known that from 20 to 30 per cent. of all our anthracite is, at present, wasted as "culm" or "coal dirt" at our "breakers."

COAL PRODUCTION OF THE UNITED STATES.*

THOUGH coal has been mined in this country for more than a century, no systematic effort was ever successfully made to ascertain the total amount produced. The production of the Cumberland Basin, Md., and the shipments from the anthracite fields of Pennsylvania, have been placed upon record, thanks to the intelligence and foresight of Mr. C. SLACK in the former case, and to the late Mr. B. BANNAN in the latter. For some of the years between 1822 and 1842, the production of the Richmond Basin was reported by Mr. R.C. TAYLOR, but since that date till we undertook this work it was impossible to obtain any statement of the production of this field. A few of the newer fields, such as that of Mt. Diablo, Cal., have been fully reported, and a few of the newer States have also had this service performed by some intelligent private individuals; but no reliable statistics of coal production have ever been collected either by the State or General Government, if we except the returns for the years 1869–70 of the Census report. During the year 1875, by great exertions, we succeeded in obtaining, and July 3d, 1875, gave in this Journal, what, "though not an accurate statement of our coal production," was "by far the most full and reliable that had ever been published." Though that report showed the production of bituminous coal to be 23,630,094 gross tons, or about *six million tons more than had ever before been reported*, it was in reality two and a half million tons below the actual output. Our more full returns for 1875 gave many figures for 1874 which we had been unable to obtain for the former report. Our corrected returns for 1874 and 1875, which we give herewith, though not absolutely correct, are probably safely within five per cent. of the total production of bituminous coal; and as our reports of anthracite are full and accurate, our total will not be in error more than 2½ per cent. of the whole production of the country, and possibly it comes much nearer than this. The full details of these statistics will be embodied in our work on "Statistics of Coal," the publication of which has been considerably delayed by the professional engagements of the author, which have not afforded the time necessary for its final revision.

COAL PRODUCTION OF THE UNITED STATES.

IN TONS OF 2,240 POUNDS.

STATES.	Census Report. June 1st, 1870.	Years ending Dec. 31, 1874.	Years ending Dec. 31, 1875.	Percentage of each State's production of the whole. 1875.
Alabama, bituminous	9,821	45,000	60,000	0·13
Arkansas, "	....	5,000	9,000	0·02
California, post-carboniferous coal	....	214,600	166,100	0·35
Colorado, " " "	4,018	150,000	150,000	0·32
Illinois, bituminous	2,343,003	3,000,000	* 3,500,000	7·37
Indiana, "	390,955	812,000	800,000	1·69
Iowa, "	235,256	1,500,000	1,500,000	3·16
Kansas, "	29,410	250,000	275,000	0·58
Kentucky, "	134,449	360,000	375,000	0·79
Maryland, "	1,624,843	2,410,895	2,342,773	4·94
Michigan, "	25,134	12,000	12,000	0·02
Missouri, "	555,295	714,000	750,000	1·58
Nebraska, "	1,272	1,300	1,300	....
Nevada, post-carboniferous coal	....	1,000	1,000	....
Ohio, bituminous	2,256,504	3,810,344	4,346,653	9·15
Oregon, Post-carboniferous coal	....	43,200	28,800	0·06
Pennsylvania, anthracite* and bituminous†	20,936,422	32,667,386	31,143,509	65·54
Rhode Island, anthracite	12,500	17,000	11,000	0·02
Tennessee, bituminous	119,123	350,000	360,000	0·76
Utah, post-carboniferous coal	5,178	30,000	35,000	0·07
Virginia, " " "	55,181	73,100	79,200	0·17
Washington, " " "	15,932	27,100	88,900	0·16
West Virginia, bituminous	543,641	1,000,000	1,100,000	2·32
Wyoming, post-carboniferous coal	44,543	260,000	278,000	0·59
N. Carolina, Georgia, and Indian Terri., bitum.	....	60,000	100,000	0·21
Total anthracite	13,985,960	21,684,386	20,654,509	43·48
Total bituminous	15,231,668	25,330,539	26,031,726	54·78
Total post-carboniferous coal	124,952	799,000	827,000	1·74
Total of all kinds	29,342,580	47,813,925	47,513,235	100.00
* Anthracite	13,973,460	21,667,386	20,643,509	43·44
† Bituminous	6,962,962	11,000,000	10,500,000	22·10

It is impossible, at this early date, to estimate, with any degree of accuracy that would warrant publication in these pages, the production of each State in 1876. Our reports indicate great changes, some States having considerably increased their output; others—such as Ohio and Maryland—having largely decreased it. The total production in 1876 was less than in 1875, and the deficiency may amount to two million tons, which would make it 45½ million gross tons; but these figures are subject to changes which even the numerous reports we have already received do not enable us to estimate.

To our *confrères* of the Press and others using the statistical information which we give, we beg two favors: 1st, that they avoid, as far as possible, the introduction of typographical errors or other alteration of our figures; 2d, that they credit us with the information they use.

After years of painstaking labor, and with the courteous assistance of railroad and mining companies, we have compiled the only full and, to a certain degree, accurate statistics of our coal production which have yet been collected, and we desire that they shall be generally adopted in place of the wild guesses (based on insufficient, or not based on any, returns) which have heretofore been circulated, and which are frequently quoted in both home and foreign official documents. By the co-operation of the Press these correct reports can at once be generally adopted, and the magnitude of this industry, and of many others which it, in fact, measures, will be recognized to the advantage of the whole country.

To the great majority of our brethren of the Press there is no need of making

* Compiled by RICHARD P. ROTHWELL.

THE ANTHRACITE COAL PRODUCTION OF PENNSYLVANIA—IN TONS OF 2,240 POUNDS.

Years	THE WYOMING REGION. Luzerne County.			THE LEHIGH REGION. Carbon, Columbia and Luzerne Counties.			THE SCHUYLKILL REGION. Schuylkill, Northumb'd, Columbia, Dauphin and Lebanon Counties.			LOYALSOCK REGION. Sullivan Co	ALL THE REGIONS.					Years
											Total			Increase or Decrease.		
	Shipm'nts.	Consumpt'n & sales at mines.	Production.	Shipm'nts.	Consumpt'n & sales at mines.	Production.	Shipm'nts.	Consumption & sales at mines.	Product'n.	Prodt'n, incld'g 5 p.c't. consumpt'n at mines.	Shipments to tide.	Consumpt'n & sales at mines.	Product'n	Amounts.	Per cent.	
Before 1820	.....	10,000	10,000	.....	3,000	3,000	.....	5,000	5,000	.....	.....	18,000	18,000	.....	.....	Bfre 1820
1820	.....	800	800	365	300	665	.....	500	500	.....	365	1,600	1,965	.....	.....	1820
1821	.....	1,000	1,000	1,073	400	1,473	.....	800	800	.....	1,073	2,200	3,273	1,308	66·7	1821
1822	.....	1,200	1,200	2,240	500	2,740	.....	1,000	1,000	.....	2,240	2,700	4,940	1,667	50·9	1822
1823	.....	1,300	1,300	5,823	700	6,523	.....	1,200	1,200	.....	5,823	3,200	9,023	4,083	82·6	1823
1824	.....	1,700	1,700	9,541	900	10,441	.....	1,500	1,500	.....	9,541	4,100	13,641	4,618	51·2	1824
1825	.....	2,000	2,000	28,393	1,100	29,493	5,306	1,700	7,006	.....	33,699	4,800	38,499	24,858	182·2	1825
1826	.....	2,700	2,700	31,280	1,500	32,780	16,835	2,500	19,335	.....	48,115	6,700	54,815	16,316	42·4	1826
1227	.....	4,000	4,000	32,074	2,200	34,274	29,493	3,400	32,893	.....	61,567	9,600	71,167	16,352	29·8	1827
1828	.....	6,200	6,200	30,233	3,000	33,233	47,181	5,300	52,481	.....	77,414	14,500	91,914	20,747	29·2	1828
1829	7,000	9,800	16,800	25,110	4,000	29,110	78,293	9,000	87,293	.....	110,403	22,800	133,203	41,289	44·9	1829
1830	47,000	16,200	58,200	41,750	5,100	46,850	89,984	14,600	104,584	.....	173,734	35,900	209,634	76,431	57·4	1830
1831	54,600	24,300	78,300	40,966	6,200	47,166	81,854	23,000	104,854	.....	176,820	53,500	230,320	20,686	9·9	1831
1832	84,500	37,200	121,700	75,000	7,700	82,700	209,271	34,500	243,771	.....	368,771	79,400	448,171	217,851	94·6	1832
1833	111,777	50,000	161,777	123,000	9,100	132,100	250,588	47,745	298,333	.....	485,365	106,845	592,210	144,039	32·1	1833
1834	43,700	9,308	53,008	106,244	22,630	128,874	226,692	48,285	274,977	.....	376,636	80,223	456,859 d	135,351	d 22·9	1834
1835	90,000	18,900	108,900	131,250	27,562	158,812	339,508	71,297	410,805	.....	560,758	117,759	678,517	221,658	48·5	1835
1836	103,861	21,499	125,360	148,211	30,680	178,891	432,045	89,433	521,478	.....	684,117	141,612	825,729	147,212	21·7	1836
1837	115,387	23,654	139,041	223,902	45,900	269,802	523,152	107,246	630,398	.....	862,441	176,800	1,039,241	213,512	25·9	1837
1838	78,207	15,876	94,083	213,615	43,364	256,979	433,875	88,076	521,951	.....	725,697	147,316	873,013 d	166,228	d 16·0	1838
1839	122,300	24,460	146,760	221,025	44,205	265,230	454,538	90,908	545,446	.....	797,863	159,573	957,436	84,423	9·7	1839
1840	148,470	29,397	177,867	225,318	44,614	269,932	467,796	92,625	560,421	.....	841,584	166,636	1,008,220	50,784	5·3	1840
1841	192,270	37,685	229,955	143,037	28,035	171,072	607,005	118,973	725,978	.....	942,312	184,693	1,127,005	118,785	11·8	1841
1842	252,599	49,257	301,856	272,546	53,146	325,692	551,504	107,543	659,047	.....	1,076,649	209,946	1,286,595	159,590	14·2	1842
1843	285,605	54,836	340,441	267,793	51,416	319,209	687,312	131,964	819,276	.....	1,240,710	238,216	1,478,926	192,331	14·9	1843
1824	365,911	69,523	435,434	377,002	71,631	448,633	853,465	162,158	1,015,623	.....	1,596,378	303,312	1,899,690	420,764	28·5	1844
1845	451,836	84,493	536,329	429,453	80,308	509,761	1,093,796	204,540	1,298,336	.....	1,975,085	369 341	2,344,426	444,736	23·4	1845
1846	518,389	95,902	614,291	517,116	95,667	612,783	1,249,154	231,093	1,480,247	.....	2,284,659	422,662	2,707,321	362,895	15·5	1846
1847	583,067	106,118	689,185	633,507	115,298	748,805	1,598,278	290,887	1,889,165	.....	2,814,852	512,303	3,327,155	619,834	22·9	1847
1848	685,196	123,335	808,531	670,321	120,658	790,979	1,672,191	300,994	1,973,185	.....	3,027,708	544,987	3,572,695	245,540	7·9	1848
1849	732,910	129,725	862,635	781,656	138,353	920,009	1,650,101	292,067	1,942,168	.....	3,164,667	560,145	3,724,812	152,117	4·3	1849
1850	827,823	144,869	972,692	690,456	120,830	811,286	1,769,691	309,696	2,079,387	.....	3,287,970	575,395	3,863,365	138,553	3·7	1850
1851	1,156,167	198,861	1,355,028	964,224	165,847	1,130,071	2,308,525	397,066	2,705,591	.....	4,428,916	761,774	5,190,690	1,327,325	34·4	1851
1852	1,284,500	218,365	1,502,865	1,072,136	182,263	1,254,399	2,536,653	431,231	2,967,884	.....	4,893,289	831,859	5,725,148	534,458	12·1	1852
1853	1,475,732	247,923	1,723,655	1,054,309	177,124	1,231,433	2,555,450	429,315	2,984,765	.....	5,085,491	854,362	5,939,853	214,705	3·7	1853
1854	1,603,478	264,574	1,868,052	1,207,186	199,186	1,406,372	3,066,208	505,924	3,572,132	.....	5,876,872	969,684	6,846,556	906,703	15·3	1854
1855	1,771,511	288,756	2,060,267	1,284,113	209,310	1,493,423	3,551,893	578,959	4,130,852	.....	6,607,517	1,077,025	7,684,542	837,986	12·2	1855
1856	1,972,581	316,613	2,288,194	1,351,970	216,315	1,568,285	3,571,800	571,488	4,143,288	.....	6,896 351	1,103,416	7,999,767	315,225	4·1	1856
1857	1,952,603	308,511	2,261,114	1,318,541	208,330	1,526,871	3,373.797	533,060	3,906,857	.....	6,644,941	1,049,901	7,694,842 d	304,925	d 3·8	1857
1858	2,186,094	341,031	2,527,125	1,380,030	215,285	1,595,315	3,236,843	504,947	3,741,790	.....	6,802,967	1,061,263	7,864,230	169,388	2·2	1858
1859	2,731,236	420,610	3,151,846	1,628,311	250,760	1,879,071	3,448,708	531,101	3,979,809	.....	7,808,255	1,202,471	9,010,726	1,146,496	14·6	1859
1860	2,941,817	447,156	3,388,973	1,821,674	276,895	2,098,569	3,749,632	569,944	4,319,576	.....	8,513,123	1,293,995	9,807,118	796,392	8·8	1860
1861	3,055,140	458,271	3,513,411	1,738,377	260,757	1,999,134	3,160,797	474,119	3,634,916	.....	7,954,314	1,193,147	9,147,461 d	659,657	d 6·7	1861
1862	3,145,770	462,428	3,608,198	1,351,054	198,604	1,549,658	3,432,584	504,591	3,937,175	.....	7,929,408	1,165,623	9,095,031 d	52,430	d 0·6	1862
1863	3,759,610	545,144	4,304,754	1,894,713	274,733	2,169,446	3,911,683	567,194	4,478,877	.....	9,566,006	1,387,071	10,953,077	1,858,046	20·4	1863
1864	3,960,836	565,799	4,526,635	2,054,669	293,564	2,348,233	4,161,970	594,562	4,756,532	.....	10,177,475	1,453,925	11,631,400	678,323	6·2	1864
1865	3,255,658	463,059	3,720,717	1,822,535	260,323	2,082,858	4,356,959	622,498	4,979,457	.....	9,435,152	1,347,880	10,783,032 d	848,318	d 7·3	1865
1866	4,736,616	677,342	5,413,958	2,128,867	304,413	2,433,280	5,464,209	781,390	6,245,598	.....	12,329,692	1,763,145	14 092,837	3,309,805	30·7	1866
1867	5,328,322	760,950	6,089,272	2,062,446	294,421	2,356,867	5,161,671	737,834	5,899,505	.....	12,552,439	1,793,205	14,345,644	252,807	1·8	1867
1868	5,930,813	855,886	6,846,699	2,507,582	358,238	2,865,820	5,335-737	762,210	6,097,947	.....	13,834,132	1,976,334	15,810,466	1,464,822	10·2	1868
1869	6,058,369	1,211,174	7,279,543	1,929,523	384,466	2,313,989	5,653,855	1,128,291	6,782,146	.....	13,651,747	2,723,931	16,375 678	565,218	3·6	1869
1870	7,554.9 9	1,259.115	8,814,024	2,990,878	498,486	3,489,364	4,728,242	788,070	5,516,312	.....	15.274,029	2,545,671	17,819,700	1,444,022	8·8	1870
1871	6,713,773	953,356	7,667,129	2,249,356	319,408	2,568,764	6,234,974	885,366	7,120,340	23,122	15,220,125	2,159,230	17,379,355 d	440,345	d 2·5	1871
1872	9,191,171	1,507,352	10,698,523	3,610,674	592,150	4,202,824	6,126,468	1,004,741	7,131,209	51,527	18,977.390	3,106,693	22,084,083	4,704,728	27·1	1872
1873	10,047,241	1,663,842	11,711,083	3,263,168	538,279	3,801,447	6,294,454	1,040,879	7,335,333	33,058	9.636,351	3,244,570	22,880,921	796,838	3·6	1873
1874	9,513,642	691,722	10,204,764	3,868,749	270,812	4,139,561	6,810,087	476,706	7,286,793	36,268	20,225.774	1,441,612	21,667,386 d	1,213 535	d 5·3	1874
1875	10,519,998	526,000	11,045,998	2,731,311	136,565	2,867,876	6,393,441	319,672	6,713,113	16,522	19,660,486	983,023	20,643 509	1,023,177	d 4·7	1875
1876*	8,120,000.	400,000	8,500,000	3,800,000	170,000	3,970,000	6,200,000	300,000	6,500,000	3 ,000	18,130,000	870,000.	19,000,000	1,643,509	d 8·6	1876
Total	125,913,797	17,262,077	143,175,872	59,585,696	8,436,531	68,022,227	130,245,548	18,930,688	140,176,236	190,497	415,927 258	44,637,574	360,564,832			

* Figures of production for 1876 are merely approximate, the returns not yet being revised.

our second request; their courtesy would naturally make it impossible for them to do otherwise than "credit" such important information; and their friendly and generous appreciation of the ENGINEERING AND MINING JOURNAL, so often expressed to our great encouragement, will make it their pleasure to assist us in this arduous, though unremunerative, work. But it is chiefly on other than personal grounds we ask the favor. All who have to do with statistical information know that the first and one of the most important factors in the value of such statements is the authority upon which they rest; the "credit" is, therefore, much more in the interest of those who use, than in that of the compiler of the information.

THE PRODUCTION OF ANTHRACITE IN PENNSYLVANIA.

In connection with this review it will be interesting to note the production of Pennsylvania anthracite from year to year since the opening of this trade. Without entering into the early history of anthracite coal mining, which would exceed the space at our command, the above tabular statement, which we take from our work on "Statistics of Coal," will show the marvellously rapid and enormous development which this industry has undergone. Our estimates for the production previous to 1820 are based upon the early records of the different fields, as contained in a great number of works, among which is a report of S. J. PACKER, Esq., Chairman of a Committee of the Senate of Pennsylvania in 1834; Col. H. B. WRIGHT'S "Historical Sketches of Plymouth, Pa.," in which some interesting original documents relating to the coal trade are quoted; an interesting paper by W. J. BUCK, Curator of Records, Pennsylvania Historical Society, in which several of the old Pennsylvania manuscripts are quoted; the valuable work of the late R. C. TAYLOR on Coal Statistics, and that of BENJAMIN BANNAN, Esq., on Coal, Iron and Oil; the history and early reports of the Lehigh Coal and Navigation Company, and many other books and pamphlets.

The use of anthracite coal commenced in the Wyoming Valley as early as 1768, and in the Schuylkill and Lehigh regions about the year 1800. The total production from these dates to 1820 can only be estimated.

The production from 1820 to 1833 inclusive is based, as to shipments, on the published reports of the transportation companies, and, as to consumption at the mines, on the data collected by Mr. PACKER'S Committee in 1834, and other contemporary records.

Our estimates for *shipments* from 1834 to 1863 inclusive, are those published by the late Mr. BANNAN (after making correction of several clerical errors) and by R. C. TAYLOR, and are based on the published returns of the transportation companies. Our estimates of "consumption and sales at the mines" during those years are based upon the proportions given by Mr. PACKER in 1834, and by Mr. BANNAN at later dates, of the "shipments" and "home consumption." Mr. BANNAN mentions the fact that previous to 1864 he did not include the "home consumption" in his statistical reports, and he entitles his tables throughout as "shipments" only. We have endeavored to supply this omission from the best obtainable data, and to give, consequently, the total production of coal.

From 1864 to 1873 inclusive we have adopted Mr. BANNAN'S figures (after correction of clerical errors) for both shipments and home consumption. The proportion the latter bears to the former was arbitrarily fixed by Mr. BANNAN upon data not given, and we find in fact that it varies considerably: from 1864 to 1868 inclusive it was 14.3 per cent., in 1869 it was 19.9 per cent., in 1870 it was 16.6 per cent., in 1871 14.2 per cent., while in 1872 and 1873 it was about 16½ per cent. The reason this proportion is so large is explained by the fact that Mr. BANNAN included in "home consumption" the coal delivered by the transportation companies at certain points along their lines not remote from the coal-fields.

In our own returns of 1874, 1875 and 1876, which have been compiled with the greatest care (the figures for 1876 are *approximate* only, it being yet too early to make the final corrections, but the totals given will not be materially modified by these), we limit the "consumption at the mines" to coal not transported by the railroads or canals, and consequently consumed by the miners, the engines, the locomotives in the coal-fields, and such towns as are partially or wholly supplied by wagons direct from the collieries. We have full and accurate reports of several of these items, and our information leads us to the conclusion that five per cent. of the shipments as now given by us will represent the "consumption at the mines." This statement will explain the fact that while Mr. BANNAN'S tables give since 1864 the correct total production, as nearly as we can now ascertain it, his division into shipments and home consumption, being made upon a different basis from ours since 1873, cannot be compared with these.

The above, then, is the first and only statement that has ever been made of the total anthracite production of Pennsylvania. From an inspection of it we note the marvellously rapid development of this trade, and we also observe the severity of the check which it has received during the last three years under the combined influence of the financial crisis and the Combination high prices. It is the first instance in the history of the trade where the produc-

tion of anthracite has decreased during three successive years, and, what is still more discouraging, the actual amount of this decrease has been growing greater year by year. Had it not been for the great decline in prices which followed he dissolution of the Combination, there can be no doubt the production during 1876 would not have exceded 17,500,000 or 18,000,000 tons. As it is, the actual decrease is the greatest the trade has ever suffered in one year.

The amount of the production in 1876, which is given as 19,000,000 tons, is, it is true, merely approximate, but it will not be varied materially by our final revision—probably less than one per cent.; so that for purposes of general comparison it may be safely adopted.

REVIEW OF THE IRON TRADE FOR 1876.

THE course of the iron trade during the past year very much resembled that of 1875. Prices have gradually declined, but not so rapidly as the cost of production, so that the iron business in all its branches has been carried on with greater profit in some instances, and at a less loss in others than in the preceding year. For this state of affairs the iron trade of the East is indebted, in part to the dissolution of the Anthracite Coal Combination, which not only brought about cheaper fuel, but also brought competition between the railroads upon which many of the furnaces and mills transport their supplies and manufactured products. Wages in this industry, excepting perhaps among the puddlers, are reduced to as low a basis as can be anticipated, but at the anthracite mines there yet remains room for further reductions, and when the valuations of the railroads upon which the iron trade is dependent for transportation shall have been reduced in accordance with the general shrinkage in values, upon which they can expect to earn but a fair profit, then, with the improvements that have been introduced in mining, smelting, and the general manufacture of iron, there can be no doubt that the cost of production will be as low as at any time during the history of the trade, and there is no just cause why it should not be even lower, although the present cost is considerably higher.

The following table of prices will give a comprehensive view of the condition of trade during the past year:

NEW YORK QUOTATIONS OF IRON DURING 1876

Date.	American Pig Iron.			Scotch Pig Iron.			Rails.			Wrought Scrap.
	No. 1.	No. 2.	Forge.	Coltness.	Eglinton.	Glengarnock.	Iron*	Steel*	Old	
	$	$	$	$	$	$	$	$	$	$
Jan. 1..	23	21	20	33	29½@30	31	42@48	65@70	22½	30@31
" 29..	23	21	18@20	32½@33	29½@30	31	45	62@65	21	30
Feb. 26..	23	21	18@20	32 @33	29½@30	30 @31	42@45	60@63	20	30@31
March 25..	23	21	19@20	32½@33	29 @29½	31	40@43	62@64	22½@23	31@32
April 29..	22	20	18@19	31½@32	28½@29	30 @30½	40@43	60@63	21½	30
May 27..	22@23	20@21	18@19	30 @31	28 @28½	29½@30	39@43	58@61	22 @23	28
June 24..	22	20	19@20	30	27½@28	28 @29	39@42	58@63	21½@22	28@29
July 29..	22	20	19@20	28¾	26¼	27½	39@42	56@61	21¼	28
August 26..	22	20	19@20	28 @29	26¼@27	28	38@41	55	21½@22	28
Sept. 30..	22	20	19@20	28½	27	27¼	3 @41	52@54	20½@21	27
Oct. 28..	22	20	19@20	28½@29	26 @26½	27½@28	36@42	52@54	21	26@27
Nov. 25..	21@22	19@20	19@19½	29	26½	27¾	36@40	50@54	20	26
Dec. 30..	21	19@20	18½@19	29	26	28	35@36	48@5	19@20	25½@26

*At mills.

The iron trade, having no combination to maintain prices, was the first industry to feel the effects of the financial crisis of 1873; and since it was one of the most largely inflated—over-blown—its collapse was correspondingly painful and disastrous. Ground between the upper and nether millstones of high-priced ores, coals and transportation, and low-priced iron, its profits soon became impalpable, and not a few of our Eastern furnaces "blew out" permanently. It was a struggle for existence, and the fittest survived. The permanency of low prices induced vast reforms and economies in furnace management; and though the price has constantly fallen, as shown in the accompanying table, yet there is no doubt the business at the present time leaves either more profit or less loss, as the case may be, than it did a year ago. The cost of making iron has been reduced to a point that even two years ago was by many deemed impossible, and still in many cases the limit of economy has not been reached. The cost (exclusive of interest on capital) of making iron at some of the best furnaces on the Lehigh, is to-day probably not over $16 per ton for the average of all numbers; but this is still some $3 per ton more than it cost just before the civil war in 1861-2, and the indications are that "bottom" in cost will be found at least as low as at any former period in the history of this trade. The natural effect of the increase in knowledge of the science of iron making, the adoption of mechanical and other improvements, and of the larger scale upon which this business is now conducted, should be to reduce the cost of production, and such, we have no doubt, will be the result in this instance. There is, however, another and very potent argument for believing in a still further reduction in cost: it consists in the competition of other and more favored districts. The Western furnaces have not only almost completely absorbed the entire Western trade by underselling Eastern works, but they are even absorbing a large part of the Eastern demand. While the Anthracite Combination existed it was impossible to compete with these Western works, and many of them are so situated that they will always be able to make at less cost than can Eastern works, and will therefore hold their Western market; but when the situation is clearly understood, that it is simply a question of lower cost or final abandonment of the business by our Eastern works, we believe the means for securing the desired end will be found. The cost of the excellent magnetic ore and fluxes of New Jersey can be greatly reduced by the introduction of improvements at the mines. The cost of fuel, now very low, is likely to continue so, and the necessity for greater economy in the administration of our iron-works will be more and more generally recognized. The present selling price of $20.50 per ton for the best brands of No. 1 iron in New York is calculated to inspire economy, and even with this price the demand is very limited.

The great distances to which the raw material or the manufactured iron has to be transported in this country, and the discrimination in sea freights which are always against us, place us at a disadvantage in competion with England, and this is particularly the case with the cheaper forms of iron. We cannot expect to do a large export business in pig iron, though even in that we may be able to supply such near-by markets as Canada, Mexico, Central America, and the West Indies. The growth of our iron trade must, however, be accompanied by the opening of foreign markets to our steels and manufactured irons, and in this direction considerable progress has been made during the past year. Machinery in a great variety of forms, hardware, tools, and many other manufactures of iron and steel are already becoming important items in our export lists; and the fact that we are sending them to markets where England has the advantage in freights, and even to England itself, is a most gratifying and convincing proof that we shall soon secure for American goods many of the markets which have heretofore been supplied from Great Britain.

The very obvious, axiomatic conclusion, that when the production and productive ability of a country exceed its home consumption there can be no permanent revival or briskness in trade except the surplus production can be exported, is now generally accepted; and since our productive capacity in pig and some other kinds of iron has far outrun the demand for consumption, the question has been and is now simply one of reducing our cost of manufacture so that our surplus may, in one form or another, find a foreign market. It is not directly a question of free trade or of protection, but one of cost of production. If the effect of protection is to reduce cost, as its ultra advocates assert, we shall have no difficulty in attaining—and, indeed, we should long ago have attained—that point at which the markets of the outside world would open to us.

The facts in the case are exceedingly simple. Protection, by the large profits it enabled our iron-masters or manufacturers to earn, largely contributed to the rapid and substantial development of a great industry. The country did not grudge, and does not regret, the amount of these profits: they did much to build up the iron trade. That excessive profits led to extravagance and wastefulness was a result as inevitable in the iron trade as in every other calling. Furnaces and works were built without regard to the economies, and so long as competition in prices came from without, it was natural to hear loud demands from such works for more protection. Now, however, that the industry has overgrown its home-market, the competition is from within, not from without; and since "more protection" cannot help, but two courses remain, either to increase prices through combination, as lately in the anthracite trade, or, by practising the most rigid economy, to reduce the cost of production to a point that will widen the market to the limits of our productive capacity. An effort was made during the past year to organize an iron trade combination, but this failed. The more disagreeable but only true remedy for our troubles—economy—was applied, and is now producing good results. That it will finally put our iron industry in a position to control a large foreign market, we cannot doubt.

AMERICAN PIG.—The course of prices and business in this article has been very uneventful during the year under review. The market opened with a regular quotation of $23 for No. 1 foundry iron, and closed at $20.50@$21. The decline was uninterrupted: all efforts to improve prices scarcely succeeded in arresting for a brief period the decline which recommenced as soon as the market was left free. From the opening of the year until the middle of February a very fair business was done, when the demand fell off with the result of weakening the market. This condition of affairs lasted until the middle of March, when 250 tons of North River iron was reported as sold at $22.50, while there were rumors of numerous forced sales, the particulars of which were kept private, and sales of good brands at concessions. This resulted in the Thomas Iron Company openly quoting, during the last week in March, at $22 for No. 1 foundry and $20 for No. 2, and doing a very large business on that basis. It was but a short time, however, before there were rumors of concessions on these prices, although some of the companies claimed to be still holding on the basis of $23 for No. 1 foundry iron. This condition of affairs suggested in the minds of some of the makers a combination to control prices, but this movement took no definite shape, although it was discussed with the more prominent producers. Early in June, owing to considerable sales of forge and No. 2 foundry irons, these brands became somewhat scarce, and the former, in particular, became much firmer, and continued so during the balance of the year. In July, the Allentown Iron Company, which was carrying a very large stock of iron, blew out all its furnaces, but there were about an equal number blown in by other companies, so that the production was not materially changed. There continued to be but a very light business until the end of August, when the Anthracite Coal Combination broke. This, for a time, quite unsettled the market, as buyers were anticipating considerable concessions in the prices of iron, believing that large concessions in freights and the price of coal would enable makers to grant them. However, business soon took a start, and considerable sales were made without any ben-

eficial effect on prices, as there was a general inclination to put furnaces in blast, and many were actually blown in. By the latter part of September the "pool" that had been sustaining Philadelphia & Reading Railroad stock had failed in its efforts, and there were rumors that the company was financially embarrassed, and that some 60,000 tons of iron, which the company was reported to be carrying, might be forced upon the market. This had at the time, and still continues to have, though to a less degree perhaps, a depressing effect. A very fair business continued to be done, and the prospects were improving up to the time of the Presidential election in November, although just previous to that time the Allentown Iron Company was reported to have sold No. 1 iron at $21, when the market took the quotation of $21@$22 for No. 1 foundry. After the election, which brought with it political trouble and uncertainties, the greatest stagnation of the year—if not since the panic of 1873—ruled until the end of the year, at which time $21 was a full quotation for No. 1 iron, with rumors that $20 @$20.50 had been accepted, and that round lots could again be purchased at these rates. At the present writing the outlook is so unsettled that it is impossible to predict, with any degree of certainty, what will follow in the early future. Should the Presidential question receive an early settlement generally satisfactory, there can hardly be a doubt that a larger business will follow, although there will scarcely be much improvement in prices until the demand reaches the available capacity of production. This was clearly indicated by the strong inclination shown to put in blast idle furnaces immediately after the dissolution of the Anthracite Coal Combination, which brought about lower prices for coal and transportation, thereby offering a small margin of profit to makers.

SCOTCH PIG.—The business in this article is hardly worthy of note, except it be for the indications of its early disappearance as a competitor with our own irons. The imports at the Atlantic ports amount to but a few hundred tons per week, and are disposed of in many cases, undoubtedly, to supply an imaginary want. Many consumers who, but a few years ago, thought that they could not use any other iron, are now getting as good, and in many cases better results from American irons, which cost from five to seven dollars per ton less than Scotch.

With this vast difference in cost, and with indications of still cheaper domestic iron, the prospects for Scotch iron are very discouraging. During the earlier portion of the year some important lots of iron were sent here on consignment, but as this resulted in breaking the market, with consequent loss to the consignors, it was discontinued, and probably will not be renewed, unless it be to give the appearance of a large export demand at Glasgow, with the object of advancing speculation there in the article. This line of tactics should by this time be so well known as to make it quite ineffective.

The course of prices of this article, like that of American iron, has been, almost without interruption, downward. Our quotations Jan. 1st were: Eglinton, $29.50@$30; Coltness, $33; and Glengarnock, $31; while the closing quotations were: Eglinton, $26; Coltness, $29; and Glengarnock, $28, showing a decline of from three to four dollars per ton. The lower prices here are the result of a decline in Glasgow of from 5s. to 10s. per ton, according to brand. Freights have been exceedingly low and only nominal, thus delivering the iron here at but a slight advance above the cost in Scotland, and at prices that would have brought it into active competition with our domestic irons in New York in particular, were it not for the protective duty of $7 gold per ton that is now imposed.

RAILS.—At this writing it is impossible to say what quantity of either iron or steel rails have been made and marketed, although it will probably exceed that of 1875. According to the *Railway Gazette*, which is the highest authority on the subject, there were about 2,230 miles of railway built in the United States from January 1st to December 30, as against 1,426 miles for the corresponding period of 1875, showing an increase of 904 miles this year. This, of course, indicates a largely increased consumption by new railroads. The business of the old lines has been larger this year than in 1875, partly owing to the Centennial Exhibition and largely to the very low rates of freight which the war between the main lines gave rise to, so that the actual requirements of the old lines for rails were larger than during the previous year. It is probable, however, that the small profit realized on the business done may have restricted the purchases which would otherwise have been made, and that the mills gained less than the amount of increase in the business of the roads would seem to indicate. The inquiries for rails are numerous, but, as was the case a year ago, they are largely by roads which desire to pay in full or in part with bonds, or by those which desire long credits and are unable to give sufficient security.

The quotations of iron rails have declined from $42@$48 per ton at the mills on the opening of the year, to $35@$36 at the present time, and some sales were made late in the year at even lower figures than these. Although a great decline has taken place during the year, yet the profits have been no less than in 1875, owing to the diminished cost of production brought about by greater economy in several departments of the business.

The decline in the prices of Bessemer steel rails, which at the opening of the year were quoted at the works at $65@$70, while closing at nominal quotations ranging from $48 to $50 per ton, is much more striking than that in iron. During the year the eleventh mill was put in operation, giving an estimated capacity to the whole United States of between 500,000 and 600,000 tons, although the quantity sold has probably not exceeded 300,000 tons. By the perfection of mechanical appliances, our Bessemer plant has had its productive capacity increased more than four-fold in a few years, resulting in a capacity for the whole country, as will be seen above, far in excess of our present requirements, and bringing with it the invariably accompanying results—such great competition as to give little if any profit to most of the makers. Although the cost of making Bessemer steel has been greatly reduced during the year under review, yet the minimum has not yet been reached. The item in which, perhaps, the greatest reduction can yet be made is the cost of Bessemer ores, and the utilization of deposits more advantageously situated.

The prospects of the rail market in 1877 are not sufficiently indicated to enable us to predict how much it may improve. An early and increased demand for steel rails is probable, and should our political difficulties be satisfactorily settled, there is every prospect of a considerable increase in the general business of the country, and consequently in that of rails also.

OLD RAILS.—These have declined during the year from $22.50 to $19@$20 per ton. A considerable inquiry has existed from mills making an inferior bar iron, while the cost for re-rolling has been too high to enable re-rolled rails to enter into competition with new rails, especially where durability was made an important consideration.

SCRAP IRON.—The business in No. 1 wrought scrap, in the Eastern market, has been rather limited, owing to the inability of the Eastern mills to compete with those of the West, whose products have been offered in this market at very low prices. The quotations at the opening of the year were from $30@$31, while at the close they were $25.50@$26.

METAL AND STOCK REVIEWS.

OUR Annual Reviews of Metals, and of Stocks, Bonds, etc., will appear in our next number, the crowded state of our columns excluding them this week.

ON THE CONSTANCY OF MOTION AND POTENTIAL ENERGY.

TO THE EDITOR: SIR—With reference to a communication by Prof. Henry Wurtz, in your number for December 13th, I beg to say that it is the first and only writing of the Professor's that I have ever seen.

My paper on the "Constancy of Motion," in the December number of the *Popular Science Monthly*, I wrote, borrowing of none. If others have preceded me in the work of trying to identify force with motion, I am glad to hear it, although ignorant of their labors. When Prof. Wurtz publishes his completed researches, I shall read them with much interest.

Yours respectfully, GEORGE ILES.

MONTREAL, December 23, 1876.

NOTES.

COLORADO COAL DISCOVERY.—The Greeley *Sun* reports the discovery of a new coal bank on Crow Creek, 20 miles from town. Vein, 3 feet thick, crops out on the hillside.

THE MATTHIESSEN & HEGELER ZINC WORKS at La Salle, Ill., employ about 400 workmen. A uniform reduction of 20 per cent. in the wages of all the hands was announced on the 16th inst.

CAST-IRON ROOFING TILES.—The Gröditz Ironworks, belonging to the Lauchhammer Company, is now producing cast-iron plates, weighing 2 lb. to 2½ lb. each, for roofing purposes. Twenty of these metal tiles go to a square metre (39⅜ inches), their weight (54 lb.) being about equal to that of slates, and about half that of earthen tiles. The metallic tiles fit into one another so closely that a pair of small nails are enough to keep them in position.

THE CONSOLIDATED ARGENTA MINE is located in the Tintic District. This mine is one of the best claims on the Crismon Mammoth lode, and lies in close proximity to the famous Crismon mine. It contains 3,800 linear feet, and is developed by a seven feet tunnel, more than 400 feet long, which is being driven to cut the two veins at a depth of 800 feet below the surface. The company expect to reach the ore within a distance of 150 feet from the present face of the tunnel.

DISCOVERY OF ELECTRO-MAGNETISM.—A writer in the *Telegraphist* claims for a Professor Romagnosi, a countryman of Volta's and Galvani's, priority over Oersted in the discovery of electro-magnetism. The discovery of Oersted, to whom a statue has just been erected in Copenhagen, bears date 1819; Ampère made his researches public in 1820; but a distinct statement of Romagnosi's discovery is contained in a work published in Paris in 1803, and a tablet in the Collegio Alberoni, Piacenza, records the same discovery, to which it gives its actual date, 1802.

MINERAL OIL FUEL.—The neighborhood of the naphtha springs of Bakou has suggested the idea of using mineral oil as fuel for the Russian flotilla stationed in the Caspian. It is more than a year since the first experiments were tried, and a steamer, a schooner, and a gun-boat are already heated by this means. The result has proved so satisfactory that the boilers of four other vessels are being altered to adapt them to the new system; and, for the future, naphtha will probably be more extensively used by vessels in the south of Russia.

IMITATING NICKEL PLATING.—As nickelizing is replacing silvering in some cases, so there are some where nickelizing may be itself replaced for many articles of small value, such as pins, particularly if they contain copper. The manipulation is very simple. Coarse rasped or granulated zinc is boiled for some time in a mixture of three parts by weight of sal ammoniac and ten of water, the objects immersed and stirred up with a zinc rod. The deposit is silvery bright, and resists mechanical action as good as a coating of nickel. The process can be recommended for goods which are meant for a second coating of some other metal, since any other is easily deposited upon zinc.

THE SHUMAR SMELTING WORKS, located at Shauntie, Southern Utah, continues to run on two-thirds ore from the Horn Silver mine, San Francisco district, with very good success; the ore, however, has to be calcined or roasted previous to its being smelted. These works now turn out one car-load of bullion every twenty-four hours, which is one of the inducements for the extension of the Utah Southern Railroad further south. With another furnace, together with the works at Millford, and all running well, there would be turned out here somewhere in the neighborhood of four car-loads of bullion daily. To run these works and supply the different mining camps would take at least two car-loads of merchandise daily, to say nothing of the Mormon settlements along the line of the road. Then there are the great iron, coal and copper mines south of us, the extensive discoveries of silver at Leeds and Pinto Creek, the building of new towns and the necessary supplies required from Salt Lake City, all arguing strongly for the extension of the road. Last winter this district was without candles, and work on many of the mines had to be suspended for over two weeks until the supply arrived. During that time not a candle could be found in Beaver City. Reduce the price of transportation and the smelting companies could pay a better price for ores, thereby giving an impetus to mining and increasing the yield of bullion.—Correspondence Salt Lake *Tribune*, Dec. 23.

FUEL.*

THE CALORIFIC INTENSITY OF FUEL.

In a practical point of view, calorific intensity means the highest temperature which fuel is capable of producing when burnt by atmospheric air under the most favorable conditions.

But there is also a hypothetical point of view from which the subject of calorific intensity may be regarded. The first point to be considered is the possibility of deducting the highest temperature which the combustion of a given substance may develop, from the calorific power of that substance.

CALORIFIC INTENSITY OF WOOD-CHARCOAL.

Suppose 1 gramme of carbon in the state of wood-charcoal, and 2⅔ grammes of oxygen—that is the exact proportion in which these elements combine to form carbonic acid—be brought together, both at 0° C, and combine; and suppose, further, that the whole of the heat evolved is expended in raising the temperature of the carbonic acid, and that the *pressure* to which this gas is subjected remains *constant*. Then, if the specific heat of carbonic acid (under constant pressure) were the same as that of water, the hypothetical temperature after combustion would be found by dividing the number, given as the calorific power of wood-charcoal, by the weight of the carbonic acid produced, namely, 1+2·67=3·67 grammes. But, as the specific heat of carbonic acid is not the same as that of water, it will be necessary to multiply 3·67 by the number expressing the specific heat of carbonic acid, in computing its temperature after combustion. It must be borne in mind that in the case just considered it was assumed that the *pressure* of the carbonic acid *remained constant*; and consequently that, owing to increase of temperature, its *volume* is expanded. But, if the *volume* had remained *constant*, the *pressure* of the carbonic acid would have greatly increased; and the heat absorbed in expanding would have become *sensible*, instead of *latent*.

Hence, if in the hypothetical computation of temperature, the carbonic acid produced by combustion is supposed not to be allowed to expand, as the temperature rises, the computation will give a much higher number than in the case first considered. In the following computations it will be assumed that at all temperatures, gaseous carbonic acid, steam and nitrogen obey BOYLE and MARIOTTE's law, and that the specific heat of each, under constant pressure, is the same at all temperatures.

I. Assuming that by the combustion of carbon in the particular state of wood-charcoal by oxygen gas, only carbonic acid is produced,—that the heat developed is wholly expended in raising the temperature of the carbonic acid, that the carbonic acid is allowed to expand under the ordinary atmospheric pressure—that is to say, remains under *constant pressure*—and that at all temperatures the specific heat of gaseous carbonic acid under a given *constant pressure* is the same,† the hypothetical maximum temperature of the carbonic acid resulting from the combustion, at 0° C., of wood-charcoal, by the equivalent proportion of oxygen gas required, is thus deduced:

Let t=the hypothetical maximum temperature.
p=the calorific power of wood-charcoal=8080.
s=the specific heat of carbonic acid=0·2164.

Then,

$$T=\frac{p}{3\cdot67s}=\frac{8080}{3\cdot67\times0\cdot2164}=10183^\circ\text{ C.}$$

Since the ratio between the weight of the substance burnt and that of the product of combustion is constant, t remains the same whatever the weight of substance burnt.

II. Assuming all the conditions stated in I, with one exception, namely, that the *volume* instead of the *pressure* remains constant, t will be greater than in I in the ratio of 1 : 1·265; this being the ratio between the quantity of heat required to produce a given increase of temperature in gaseous carbonic acid, when the *volume* remains constant, and that required when the *pressure* remains constant. In this case therefore, t=10,183×1·265=12,881° C.

III. Let it now be supposed that the combustion of wood-charcoal at 0° C. is effected by atmospheric air (assumed to consist *wholly* of oxygen and nitrogen) containing the exact quantity of oxygen required to form carbonic acid. One part by weight of oxygen in atmospheric air is mixed with 3·35 parts by weight of nitrogen, so that the weight of nitrogen to be heated in the conversion of 1 part by weight of wood-charcoal into carbonic acid in the case in question, is 3·35×2·67=8·93.

Now, let S^1=the specific heat of nitrogen=0·244. Then

$$T=\frac{p}{3\cdot67s+8\cdot93s^1}=\frac{8080}{(3\cdot67\times0\cdot2164)+(8\cdot93\times0\,244}=2718^\circ\text{ C.}$$

IV. Making the correction for *constant volume*, as in II., we obtain T=2718×1·265=3438° C. On comparing the *calorific power* with the *calorific intensity* of wood-charcoal, carbonic oxide and hydrogen, it should be noted that the weight of the product (steam) of the combustion of hydrogen is much greater than that (carbonic acid) of the combustion of wood-charcoal or carbonic oxide, and that chiefly on this account the temperature to which the steam produced is capable of being raised by the very large amount of heat evolved by the combustion of hydrogen is lower than that to which the carbonic acid produced is capable of being raised by the much smaller amount of heat developed by the combustion of either wood-charcoal or carbonic oxide. But when combustion is effected, not by *oxygen* gas, but by *atmospheric air*, the nitrogen of the latter, as well as the product of combustion, has to be heated; and in this case the very high calorific power of hydrogen is so much in its favor that the hypothetical maximum temperature deducible is nearly as high as in the case of wood-charcoal, though not so high as in the case of carbonic oxide, in which the weight of nitrogen to be heated is relatively very small.

These considerations help to explain why hydrogen produces a greater *useful effect*, as a fuel, than wood-charcoal or carbonic oxide, notwithstanding its lesser *calorific intensity*.

But whether, in view of the losses of heat by radiation, conduction, and the escape of heated gases, the hypothetical maximum temperature can ever be attained in the combustion of fuel, in actual practice, by atmospheric air, is doubtful. Dissociation, or the severance of the chemical union between two or more elements, which takes place at high temperatures by the effect of heat alone, must also interfere with the production of the hypothetical maximum temperatures.

As examples of dissociation may be mentioned the resolution of carbonic acid into carbonic oxide and oxygen, at 1,000° C., or 1,200° C., and of water into its elements at 2,500° C.

* Condensed, principally, from "Percy's Metallurgy," London, 1875.

† The specific heat of liquid water being taken as equal to 1 (and assuming that the specific heat of gases is constant for all temperatures) then, according to REGNAULT, the specific heat of the following gases is—

Oxygen	0·2182	Carbonic acid	0·2164
Nitrogen	0·2440	Sulphurous acid	0·1553
Air	0·2377	Olefiant gas	0·3694
Hydrogen	3·4046	Marsh gash	0·5929
Carbonic oxide	0·2479	Steam (vapor of water)	0·4805

That the specific heat of air is constant has been experimentally demonstrated by REGNAULT from—30° C. to 2·0° C.; but as regards carbonic acid this is not exactly the case, for REGNAULT found its specific heat to be 0·18427 from—30° C: to+10° C., 0·20246 from 10° C. to 100° C., and 0·21692 from 10° C. to 200° C.—Comptes rendus, 1853, xxxvi. 686; Mém. de l'Académie des Sci. 1862, xxvi. 298 and 327.

WHARTON'S NICKEL AND COBALT EXHIBIT AT THE PHILADELPHIA EXHIBITION.

Special Correspondence of the Engineering and Mining Journal.

THE display of ores, mattes, reduced metals and salts of cobalt and nickel made by J. Wharton of Philadelphia, was the only one shown at the Exhibition in the American Department. As an exhibit illustrating the progress which has been made in the metallurgy of these metals, it was very interesting. The comparatively recent application of nickel and cobalt to plating purposes has stimulated the production of these metals, and has necessitated that they should be formed in much larger masses than heretofore.

The small cubes of these metals which are formed by compressing the metals from a spongy condition and at a high heat cannot be used conveniently by the plater. Notwithstanding the great infusibility of these metals, Mr. Wharton has succeeded in melting and casting them in masses, weighing several pounds each. The ore containing the nickel and cobalt which is used by Mr. Wharton is obtained from the Gap Mine in Lancaster County, Pennsylvania. It occurs in considerable abundance and frequently in masses of large size, as was attested by several large pieces shown at the Exhibition. The mass of the ore is a nickelliferous pyrrhotite, containing from 2 to 3 per cent. of nickel, and about 5 per cent. of cobalt. The pyrrhotite is frequently covered in places by a thin coating of millerite (Ni S) having a radiated fibrous structure, and a velvety crystalline surface. Quite a number of good specimens of this millerite were shown in Mr. Wharton's collection. The ore at the Gap Mine is first roasted in heaps to remove some of the sulphur, and it is then smelted in a cupola furnace to produce a concentrated matte. The matte is then shipped to Camden, N. J. where the complete separation of the nickel and cobalt from the other elements associated with them is effected. These manipulations and processes are kept secret as far as possible, but it is known in general that the methods employed are wet processes for extraction and precipitation, very similar to those used in England and on the continent of Europe.

The after treatment of the reduced metals, by which they are cast in a comparatively pure state into plates or ingots is probably the most novel part of the process. Four sizes of these plates were shown, the largest of which was about 12 inches×10 inches×0·5 inches, and the smallest about 6 inches×5 inches×0·5 inches. These look as though they had been cast in sanded iron moulds. They are intended for nickel-platers' uses. A round polished rod of nickel, about two feet long and ¼ inch in diameter, bent into a crook at one end, was also shown to illustrate the malleable qualities of the metal. This, as well as a similar square bar, were wrought out from the ingot metal. A quantity of small cubes and also of the granulated pure metal were shown, the latter made by pouring the molten metal into water. A thin sheet of the metal which had been rolled out showed some cracks at the untrimmed edges. A 6-inch horse-shoe magnet of nickel, supporting several steel rings and a quite sensitive magnetic compass needle, illustrated very well the magnetic properties of the metal.

The use of nickel in plating other metals was shown by various specimens of nickel on iron and brass. An alloy of three-parts nickel and one part copper, which was shown, is used by the U. S. Government in making their 3 and 5 cent coins. The finished coins do not, however, contain the metals in those proportions. Plates of ingot cobalt 12 in.×5 in.×0·5 in. are used in the same manner as nickel for plating. Its color is unlike that of the nickel when polished, showing in certain lights a decidedly pink color, while the latter metal, when burnished, is like polished steel. The cobalt is said to plate much better than the nickel, showing itself more adherent and less liable to oxidize.

Besides these metallic products, Mr. WHARTON manufactures a considerable number of both nickel and cobalt salts and oxides. The nickel salts exhibited were the ammonia nickel sulphate used in plating, nickel sulphate, nickel nitrate, and nickel chloride. These salts and also the anhydrous oxide have a dark green color. The cobalt salts are nearly all red, as are the ammonia sulphate, the sulphate, the chloride and the nitrate which were shown. The oxide, which is used in giving a dark blue color to glass and other silicious ware, has a dark, steel lustre. Blue vitriol and copperas are formed as by products in the extraction of the nickel and cobalt, and specimens of them were also shown.

ARTIFICIAL GOLD.—A new substitute for gold has come into use in France. It consists of 100 parts by weight of pure copper 14 zinc or tin, 6 magnesia, 3·6 sal ammoniac, 1·8 burnt limestone, 9 cream of tartar. The copper is first melted, then the magnesia, sal ammoniac, limestone, and cream of tartar in powder, are gradually added separately. The whole is kept stirred for half an hour, the tin or zinc being dropped in piece by piece; stirring goes on till they melt. The crucible is, last of all, covered, and the mass kept in fusion for thirty-five minutes. The scum being removed, the metal is poured into the moulds. The alloy is fine grained and malleable, and takes a high polish. It does not oxidize easily.

PHOSPHOR BRONZE AT THE PHILADELPHIA EXHIBITION.

Special Correspondence of the Engineering and Mining Journal.

Two quite fine displays of different articles which are made of phosphor bronze are shown at the Exhibition. One of these, that made by the Phosphor Bronze Company of London, Eng., is particularly interesting, as showing the actual service which certain articles exhibited have stood.

A bearing for a main roll in the plate-rolling mill of the Bolton Iron and Steel Works is but partially worn after eight months of constant day and night service. Where the ordinary bronze was used in the same place, the bearing frequently lasted not more than three weeks. A pinion bearing, from the same mill, has lasted 27 months without being nearly worn out, while the bell-metal bearings formerly used lasted 15 months. An eccentric strap from Barclay, Grey & Lawrence's Rice Mill, at London, had been in use 18 months, with a superficial wear in depth of ¼ inch, while gun metal, under similar circumstances, is completely destroyed in three months. A plunger from the same mill had been working 60 strokes a minute under a pressure of three tons to the square inch for 572 days without being entirely worn out. Hardened steel plungers, used in the same place, have usually stood not more than two months' wear. Some worm wheels used in Macgaw & Co.'s works at Lambeth, London, have stood eighteen months' wear, brass lasting only a few weeks. Although very tough and hard, the phosphor bronze does not strike fire as steel does, and in consequence of these properties it is employed in making carpenter and other tools for use in laboratories, powder works, and magazines. A set of such tools, including chisels and gouges, are shown in the same exhibit. For making art castings it seems to be well adapted, running, when in the fluid state, very freely, and like the best tin bronze, being perfectly free from blow-holes. Its color is more copper-like than bell-metal.

The Phosphor Bronze Smelting Works of 2038 Washington Avenue, Philadelphia, make quite a varied display of their productions in Machinery Hall. They show quite a number of ingots of the metal as prepared by adding phosphorus to copper alloy. The affinity between the copper and phosphorus is so great that to unite them it is only necessary to drop the solid phosphorus in small lumps into the molten copper, when they instantly unite. Sheets of the rolled metal, which are displayed, are said to be much less liable to corrosion by sea water than copper plates. Both large and small bearings are shown, some of the latter having done service under car axles which have run 500,000 miles.

Bevel gear wheels and valves and valve seats are also included in the exhibit. The ductility of the metal is illustrated both by wire and wire cables made from it, and also by boiler tubes which have been drawn without weld. The electrical conducting power of this metal is about three times that of good wrought iron.

PHILADELPHIA, October 31, 1876.

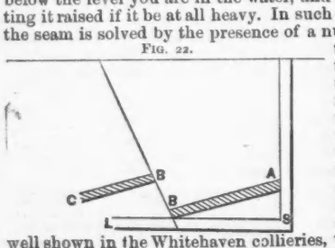
ABSTRACTS OF LECTURES ON MINING.—No. XXIV.

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

(From the London "Mining Journal.")

WHEN we look on a plan or section of any class of mine we see that a large proportion of the workings consist in more or less horizontal openings, to which the name levels is commonly applied. A number of other terms are also given to the levels, according to the purposes they have to serve, and to the district. Among these workings one very important class is that of the adit levels, which open upon some valley, and which are therefore pushed forward free of water, and drain the whole ground above them. The commencement of a large number of mines consists in the driving of one or more levels of this kind. When there are indications of mineral on a hill-side the simplest way is taken to explore it—namely, by means of an adit level; this would drain the groundabove for subsequent working. If there is indication of ore lower down, a second adit would be driven below the first, and you would then be said to have a shallow adit and a deep adit level. Where the ground is of a mountainous character there may be a number of successive adits, sometimes too close together, seeing that this class of work is very expensive compared with the working of the ground between the levels. An adit level of this kind has often been called the key of the mountain, or the key of the district, because it not only intersects and explores the veins, but also drains the ground above. In Derbyshire the name of sough is given to such a level; in North Staffordshire the term gutter, when driven for the purpose of unwatering a colliery district. The French use the term *galleries d'ecoulement*, and the German *Stolln*. The inner extremity of any level is called the end, in the West of England, and the forebreast in the North, the corresponding German term being *Ort*: the other extremity where it comes out is termed the mouth; sometimes at the mouth is a piece of open cutting, and then the true mouth would be some little distance onward from the tail, or part where the water runs off. When the levels are placed near the bottom of the gallery special precaution must be taken to prevent them being flooded. In southern countries, too, the possibility of winds blowing a miasma from marshy ground must be borne in mind. For galleries below the drainage level other terms are used, as drift, road, heading, and waydrift in collieries, in German *Strecke*, in Austria and Hungary *Lauf*. Another important class of galleries are the cross-cuts, which come into play in the collieries, especially in faulty ground; and, again, when a shaft is being sunk to intersect a lode at a certain point cross-cuts are driven out from the shaft to the lode at intervals. In working an inclined seam, for instance, as soon as you get below the level you are in the water, and then comes the great difficulty of getting it raised if it be at all heavy. In such cases the problem of how best to work the seam is solved by the presence of a number of faults. Thus, in Fig. 22, if the shaft were sunk only to A, and then the bed, A B, worked down the incline, the water would need to be specially raised. If, however, the shaft be sunk to S, and then a level, S L, driven to intersect the seam, the coal can be worked up the incline, and the working can be readily drained: similarly the level can be continued to intersect the next portion of the seam, B C. Instances of this kind of working are well shown in the Whitehaven collieries, where the intervention of a succession of faults enables the coal to be worked. The term stone-drift is commonly given to such galleries in coal mines, and a different set of men will be employed to drive them. Other terms for the cross-cuts are cut-outs, drifts, branch (Somersetshire), tunnels, and on the Continent *galleries à travers bancs*, and *Querschlag*.

FIG. 22.



the levels spoken of so far may be taken to be as nearly horizontal as convenient; in other cases of galleries the rise or dip may be very great, to as much as 8°, 10°, or 15°. Such are called in Lancashire upthrows or downthrows, and, if a special apparatus for lowering the coal be employed, jig brows; in other cases cross headings, as being across the main heading; and in Yorkshire bord-gates.

These levels, adit, &c., vary in size and dimensions according to the purpose for which they are required, and the material in which they are driven. Irrespective of the large tunnels which may be formed in connection with some mines, we may group these working under seven heads:—1. Exploring levels and timber ways.—2. Ventilating levels, or airways.—3. Main levels, or roads, or rolley ways.—4. Galleries occasionally driven for introducing water into mines to work machinery, as notable at the Ecton Mine: these may be regarded as adits driven down hill.—5. Drainage levels, or adits, which are at the same time intended for working roads.—6. Special adits intended for the drainage of large districts.—7. Special levels, driven in some cases to serve as canals for the use of the mine.

There may be a great difference in the form of the levels between those in metalliferous mines and those in stratified rocks. With a lode occupying something of its usual position—that is, approaching to verticality—the walls of the level will correspond as far as possible with the walls of the lode. As a general rule such levels will be higher than they are wide, being from 2½ to 4 feet wide, and of a height convenient to walk upright in. If the floor has to be arched for the conveyance of water, or the roof has to be supported by timber or otherwise, the size of the level will have to be varied accordingly. If you are working only narrow strings, the question has to be considered whether the lode shall be taken in the middle of the level or one side, and this depends on several circumstances. In stratified rocks the levels are mostly rectangular in form, and often wider than they are high; this depends on the nature of the ground above and below. Where the roof is good the width may be such as to admit of a double roadway. If the seams be very small, as in Somersetshire, then the question arises as to whether it is best to cut away the roof or the floor; which will, again, depend on the nature of the ground—1. As regards the exploring levels one can scarcely give any definite dimensions, but it has been generally recognized of late years that very little is gained by making levels for any purpose very small, unless under special circumstances. For example, in cutting the galleries for blasting in the Holyhead quarries, as described in a previous lecture, the smaller they can be conveniently worked the better. Again, in costeaning pits, if you only want your levels to remain open for a very short time, it is not necessary to have them larger than just to enable the men to conveniently get through—from 2½ to 4 feet high. Small levels may be necessary for many other temporary purposes, as for instance, in the cutting through a piece of ground to rescue men it will be essential to do it as rapidly as possible; usually in such cases the workmen will be placed one after another, for the purpose of removing as fast as possible what the one in front has excavated.—2. Ventilating drifts will generally be made of the same dimensions as the other classes of drifts. In some cases they are made far too small to carry a proper volume of air through. In Yorkshire they use what are termed durk drifts, and a special smaller class of wagons—durking wagons—are employed, chiefly for the purpose of exploring the ground; these levels are 4 feet high by 3 feet wide. In general the dimensions of the levels will depend much on the nature of the ground, on the expense, and on the length of time the level will have to stand; 5 feet high by 3 feet wide is an average size.—3. These main levels were different in former days from what they are now, especially where the rock was hard, and before the introduction of gunpowder. They were about 4 or 4½ feet high, and were made narrower at top and bottom—coffin-shaped—to fit the human body as closely as possible, and to economize work. The so-called Roman workings, some old works in Wales, and the so-called Dane's levels in Ireland, were examples of those ancient levels. At the present day, partly owing to the greater advantage obviously gained by having plenty of room, and especially owing to the use of gunpowder, the dimensions of the levels have increased, during the last 30 or 40 years, till it is usual to find them 6 or 7 feet high, and 4 to 4½ feet wide: and where it is necessary afterwards to put in timber, of even larger dimensions. Where there is great pressure above and at the sides the levels may be pressed in, and thus made smaller: this is an important consideration where they also serve for ventilation. It is almost impossible to say what height the levels in stratified beds ought to be; it depends partly on the height of the seam, and also on the nature of the roof and the floor. As a general rule it is undesirable to have them less than 5 feet high, though if you have a seam of 4 feet, with hard roof and floor, you might try to make it answer. When, as in Durham, Yorkshire, etc., you get seams of coal of 8 or 10 feet, it is usual to remove the whole height for the purpose of the main levels. The question of width will depend on the strength of the roof: you cannot in some cases drive them more than 5 or 6 feet wide without going to great expense for timbering or masonry. In other cases you may have a width of 4 or 5 yards, and thus have the convenience of a double roadway. From the roads bords may be opened, sometimes 5 or 6 yards wide, without danger of the ground falling, the pillars between being left at least as large as the workings. Transverse to these, again, you may have other galleries, commonly called headways, which are, generally speaking, not more than 2 yards wide.—5. These will generally be of the same character when intended for working, as well as for conveying water, as those above, except that when large quantities of water have to be carried the levels must be made larger than usual, in order that a chamber below may be arched over for the water, while the men walk along the top of the arch.—6. These large adits are sometimes of very great importance, and require much larger dimensions; they may be from 8 to 12 feet high, with a width of 5 to 8 feet. These dimensions are necessary to allow of a suitable arch being introduced below, and for the introduction of proper supports for the roof.—7. A class of large levels for use as canals came much into fashion late in the last century by the efforts of Brindley and other engineers: they were also adopted on the Continent, and it was thought to be a means of introducing great economy into the haulage. Amongst other places they were introduced into the Duke of Bridgewater's collieries in Lancashire. They are still retained in the Wellesley mines, but in most instances they have been superseded by rails. A moot question is that as to what should be the gradient of these levels; in a great many cases it is made far more considerable than it ought to be. In driving the levels, unless the men are carefully looked to, they will drive with too great a gradient; the gradient should be just sufficient to carry off the water. With regard to the term horizontal several lawsuits have occurred, in which it was argued on the one side that it meant perfect horizontality, on the other that it was only approximate; so that it is best to be precise in our use of the term. The softer the ground, and the more easy it is to cut, the more will the men have to put on an extra gradient, to run the water off from them. In driving the two parallel levels out from the pit bottom the

common rate of gradient is about 3-16th inch per yard, which is equal to 1 in 200 nearly. In collieries it does not do to carry the drift too horizontal : a slight gradient is allowed to enable the full wagon to run down to the pit bottom with greater facility. When the levels have to be carried very great distances, as in the adits for draining large districts, a much nearer approach to horizontality is maintained. In some Hungarian mines the adit levels are driven with great care for distances of 300, 400, or even 800 fathoms ; for these a gradient of 1 in 480 is adopted. In the valley of Allendale, in Northumberland, where Mr. Beaumont is driving a large adit to unwater a series of mines, the gradient is only 1 in 660 Still more remarkable cases are met with in the Forest of Dean ; according to the grants, you have from the bottom of the shaft, or from the adit mouth, to drive your "cut-out" with a gradient of $\frac{1}{4}$ inch per yard, but, having intersected the seam, you have then the right to drive as level as you can. Accordingly, the miner is put on his mettle to keep his level as horizontal as possible, and so carefully is this done that they will keep the water almost stagnant by the side, the gradient being not more than 1 in 1000.

The lecturer then referred to some of the great adits which had been cut for the drainage of large districts, being in many cases taken up by the Governments of the countries. One of the most remarkable of the last century is the Francisci level at Schemnitz, which passes under the main greenstone range for a distance of 1,571 Austrian fathoms without the intervention of any shafts; this is being further carried out at the present day by means of the Joseph adit, begun in 1782. Since the introduction of dynamite the work has been pushed forward more rapidly ; it is interesting, since it will be of a greater length than the St. Gothard tunnel. The county, or Gwennap, adit in Cornwall drains a large tract of ground about Redruth, the distance in height drained not being generally more than 30 or 40 fathoms ; with its branches it is said to attain a length of 30 miles.

One of the most remarkable new ones is the Earnest August adit, near Clausthal, which, extending to a distance of 18 miles, was carried out in 13 years, and is a very good specimen of workmanship. One is now driving in America (the Sutro tunnel) to unwater the Comstock lode, at the great depth of 2,000 feet from the surface. It cuts the lode after about 4 or 5 miles, and is intended to be driven on the lode as far as it may hold good above. They are driving a large head 8′ × 10′ and up to August last had advanced 10,500 feet from the mouth. Wherever mining districts are largely worked they are usually connected with a mountain or plateau, where adit levels of this kind can be used; and these have been carried out by a company, as in the Comstock lode, protected by Acts of Parliament, so as to secure a certain percentage if successful, or by the Government, as in Saxony, &c.

NOTES.

PHYSICAL AND CHEMICAL PROPERTIES OF RUTHENIUM.—MM. Deville and Debray find that ruthenium, heated in oxygen, is not transformed like osmium, into an acid product, volatile at 100° C. ; it gives an oxide RuO_2, sublimating at a red heat. Subjecting ruthenium, well cleared of osmium, to the action of a mixture of nitre and potash it is converted into a soluble orange-yellow ruthenate. At 0° C. crystallized ruthenium has a density of 12·261. A new ruthenium acid, which does not seem able to combine with bases, is described, as well as ruthenious acid, RuO_3, which gives orange-yellow solutions with potash ; and heptaruthenic acid, Ru_2O_7, which gives with potash a black salt, with a deep green solution. Hyperruthenic acid, RuO_4 (Claus), the characteristic feature of which is its volatility, has, even at temperatures below 100° C., a great tension, and decomposes at 108° C. with detonation.

HYGIENIC INFLUENCE OF COMPRESSED AIR.—SIEBE, the well-known German hydraulic engineer, states that he has for some years observed the effect of compressed air on the workmen who are compelled to breathe it while they are working under water, and finds that their general health is greatly improved by it, and that the chest in particular is very greatly strengthened. Indeed, individuals afflicted with pulmonary complaints are stated to have been cured by a course of sub-aqueous work. The explanation is to be looked for in the large dose of oxygen taken into the lungs under the pressure of the condensed air. Acting on the hint thus given, a Milanese medical man, Dr. Farlanini, has set up an "air cure" for consumptive patients. The idea, however, is very far from new : a French physician opened an aerotheraptic establishment some years ago, and there are three or four air-baths in operation in England.

SPONGY PLATINUM.—The production of spongy platinum, says the *Metallarbeiter*, is a task more easy in appearance than reality. The principal requirement of spongy platinum is that it should be spongy, but this obvious requirement is very frequently overlooked, and hard and useless masses of platinum are produced through overheating the sponge and running together the finer particles. Into a concentrated solution of muriate of ammonia drop a similar solution of platinum chloride ; a yellow precipitate is formed, which is washed three or four times with hot water to free it from the sal ammoniac. This precipitate, when properly cleaned, and while still moist, is dropped on a very thin platinum wire stretched several times across a small ring of copper, and is then allowed to dry thoroughly. After drying, it is slightly heated over a spirit lamp, contact with the flame of which is to be avoided. As above remarked, only very careful heating over the spirit lamp will give satisfactory results.

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 Dec. 30.

Tons of 2,240 lb.	1876. Week.	1876. Year.*	1875. Week.	1875. Year.*
Wyoming Region.				
D. and H. Canal Co.	39,909	2,006,509	57,713	3,056,479
D. L. and W. RR. Co..	38,288	2,205,969	31,425	2,941,560
Penn. Coal Co	12,614	1,086,475	24,624	1,368,208
L. V. RR. Co.	5,880	955,347	14,631	936,921
P. and N. Y. RR. Co.	560	26,802	546	88,246
C. RR. of N. J.	46,866	1,422,279	43,830	1,549,931
Penn. Canal	—	407,522	—	299,267
	144,097	7,910,963	172,769	10,240,612
Lehigh Region.				
L. V. RR. Co	33,507	2,839,553	38,010	2,286,224
C. RR. of N. J.	23,736	1,407,753	24,805	857,209
D. H. and W. B. RR.	402	41,736	651	69,887
	57,645	4,289,042	63,466	3,213,320
Schuylkill Region.				
P. and R. R. RR. Co.	51 621	4,935,401	13,347	4,780,693
Shamokin & Lykens Va.	7,434	939,223	3,828	1,190,775
	59,055	5,874,624	17,175	5,971,468
Sullivan Region.				
Sul. and Erie RR. Co.	157	30,710	1,104	15,736
Total	260,954	18,105,339	254,514	19,441,136
Increase	6,440	—	—	—
Decrease	—	1,335,797	—	—

* 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.

The decrease of shipments of Cumberland Coal over the Cumberland Branch, and Cumberland and Piedmont Railroads amounts to 467,974 tons, as compared with the corresponding period in 1875.

Belvidere Delaware RR. report.	Week.	Year 1876.	Year 1875.
Receipts of coal at Coal Port (Trenton)	—	274,679	188,713
" " " South Amboy	9,378	485,772	318,725
Shipments at Coal Port (Trenton)	—	284,423	195,365
" South Amboy	7,145	501,281	335,751

Perth Amboy business :

	Tons.
Received for the week	15,654
Shipped for the week	13,493
On hand Dec. 30	99,372

Receipts of Coal at Boston, for the week ending Dec. 29, and years from Sept. 1, 1875 and 1876.

From	Week. Tons.	Previously. 1876. Tons.	1875. Tons.
Alexandria and Georgetown	962	18,270	50,902
Philadelphia	2,180	299,332	321,202
Baltimore	1,346	50,774	59,385
Other places	3,051	107,092	126,087
Great Britain	200	1,959	704
Nova Scotia	168	13,348	12,616

The Production of Bituminous Coal for the week ending Dec. 30, was as follows :

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

Cumberland Region, Md.	Week, Tons.	Year, Tons.
Tons of 2,240 lb.	136,647	1,800,755
Barclay Region, Pa.		
Barclay RR., tons of 2240 lb.	5,090	357,159
Broad Top Region, Pa.		
Huntingdon and Broad Top RR.	1,127	159,789
*East Broad Top	1,133	64,420
Clearfield Region, Pa.		
*Snow Shoe	890	49,020
*Tyrone and Clearfield	17,178	1,135,218
Allegheny Region, Pa.		
*Pennsylvania RR.	4,072	201,618
Pittsburgh Region, Pa.		
†West Penn. RR	3,980	192,686
*Southwest Penn. RR	859	54,792
*Penn. & Westmoreland gas coal, Pa. RR.	22,114	855,500
†Pennsylvania RR.	8,265	294,762

* For the week ending Dec. 14.

† Two weeks.

The Production of Coke for the week ending Dec. 14.

Tons of 2000 lb.	Week.	Year.
West Penn. RR.	2,383	53,170
Southwest Penn. RR.	12,488	509,031
Penn. & Westmoreland Region, Penn. RR.	1,783	56,985
Pittsburgh, Penn. RR.	3,536	152,751
Total	20,190	771,937

COAL TRADE REVIEW.

NEW YORK, FRIDAY EVENING, Jan. 5, 1877

Anthracite.

THERE has been but very little business done during this week. The inquiry has not improved, prices continue weak, and shipments are greatly interfered with by the accumulation of ice in the harbors.

A meeting of some Lehigh operators, for the purpose of fixing upon a plan of combination to control only the production of anthracite coal, was held in Mauch Chunk last week. An agreement was prepared for signatures, and another meeting, in furtherance of this movement, was held to-day at Mauch Chunk, at which about twenty of the leading coal operators of the Lehigh, Mahanoy and Wyoming regions were present. The question of reducing wages was postdoned, and it was informally agreed to resume work on Monday at the old wages. A committee, consisting of G. B. Linderman, Charles Parrish and John Leisenring, was appointed to inquire into the matter of restricting tonnage, with full power, after conference with the large companies, to control or suspend shipments.

What will be the result of this effort it is impossible to say, but at present indications there will be numerous obstacles to prevent its accomplishment. A combination to simply control production would be more impractical than the late one. At least moderate maximum prices would have to be established, or those who were willing to sell their coal promptly and meet the wants of business, thereby creating an increased demand for their products, would soon complain if their output were limited to enable some other companies to dispose of coal at extortionate rates. Our views of combinations are so fully expressed in our Annual Coal Trade Review in this number, that we shall omit further notice of this proposed one until its policy becomes better defined.

Bituminous.

Tide-water business, excepting from South Amboy, is temporarily suspended, owing to the accumulation of ice at the various shipping ports, and even at South Amboy some disturbance has arisen from this cause. Such being the case, there is but little to be said of this class of coal. The Consolidation Coal Company is reported to have reduced its miners' wages to 50c. a ton. The Baltimore & Ohio Railroad Company has diverted 500 of its coal "hoppers" to the grain trade. It appears from our standpoint that an encouragement sufficient to employ these in the coal trade would be more profitable.

New York.

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

	Lump.	Steamer.	Grate.	Egg.	Stove.	Chestnut.
Wyoming Coals.						
‡Lackawanna and Scranton at Hoboken and Rondout	3 00	3 00	3 00	3 00	3 80	3 80
Pittston at Weehawken	3 00	3 00	3 00	3 10	3 60	3 35
Wilkesbarre at Port Johnston	3 00	3 00	3 00	3 00	3 75	3 25
Plymouth, R. A.	....	....	3 00	3 00	3 85	3 35
Susque. Coal Co. at Amboy W.A.	3 00	3 00	3 00	3 00	3 75	3 25
Kingston at Hoboken	3 00	3 00	3 00	3 00	3 75	3 25
Lehigh Coals.						
Old Company at Port Johnston	3 75	....	3 25	3 25	3 75	3 25
Old Company's Room Run "	3 75	....	3 25	3 25	3 75	3 25
Sugar Loaf, Hobok. & Amb. "	3 75	....	3 25	3 25	3 75	3 50
Lehigh Coal Exchange "	3 75	....	3 25	3 25	3 75	3 50
Honey Brook Lehigh	2 75	....	3 25	3 25	3 75	3 25
Beaver Meadow at South Amboy	3 75	....	3 25	3 25	3 75	3 25
Schuylkill Coals at South Amboy.						
Schuylkill white ash	3 00	3 00	3 00	3 05	3 80	3 35
Schuylkill red ash	...	....	....	....	....	....
Lorberry	....	....	....	....	....	....
Lykens Valley	....	....	....	....	....	....
North Franklin red ash	....	....	....	....	....	....

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

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

Freight by the boats of the companies from Hoboken, Port Johnston, Weehawken, Rondout, South Amboy and Perth Amboy to New York City and vicinity 50c.

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

Wholesale Prices of Bituminous Coal.

Domestic Gas Coals.

Per ton of 2240 lb.	At the Shipping Ports.	Alongside in New York.
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 85
Fairmount, West Va., " "	4 40	5 70
Newburgh Orrel, Md. " "	4 50	6 00
Cannelton Cannel, W. Va.	....	10 00
" Splint, " at Richmond.	6 00	7
" Gas Coal at Richmond.	4 15	5 65
Peytona Cannel W. Va. at Richmond	....	10 00

Manufacturing and Steam Coals.

Cumberland at Georgetown and Alexandria, Va.	3 50@3 75
Cumberland, at Baltimore	3 65@3 80
Clearfield f.o.b. Canton, Baltimore	3 40@....
	5 20
	5 45
	5 00

Pennsylvania Semi-Bituminous Coals

At the mines, per 2,000 lb., 90c. 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 60. Discharged, in New York, per 2,240 lb., $5 00 @5 20.

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	2 00	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 & Vale mines, at Pictou.	2 25	5 75

Retail Prices in New York.

Anthracite.

Per 2000 lb.	Grate and Egg.	Stove.	Chestnut.
Pittston coal, in yard	$3 90	$4 20	$3 90
Lackawanna coal, in yard	3 90	4 20	3 90
Wilkes-Barre, delivered	5 00	5 30	4 60
Lehigh & 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

Baltimore, Md. Jan. 3, 1877.

Specially Reported by Messrs. E. STABLER & Co.

ANTHRACITE.

Wholesale or Trade Prices per 2240 lb.

Wilkes-Barre "Boston" Vein, and Plymouth White Ash.

	In cars at depot.		In cars at depot.
Lump	$3 85	Egg	$4 10
Steamboat	4 10	Stove	4 60
Broken	4 10	Nut	4 10

Shamokin, red or white ash.

Egg	4 30	Stove	4 60

Lykens Valley, red ash,

Egg and stove	5 35

From wharf or yard, wholesale, 50@75c. additional.

By retail, all kinds and sizes, per 2240 lb. $6 00@7 50

BITUMINOUS.

George's Creek, Cumberland f. o. b. at Locust Point	3 75@4 00
West Virginia Gas f. o. b. at Locust Point	4 50
Youghiogheny Gas, f. o. b. at Locust Point	4 50
Swanton	4 00

Boston, Mass. Dec. 30, 1876.

COAL—Since the sales of last week there has been a little better feeling among the trade. The demand at retail continues good, and it is now believed that householders did not this year lay in a whole winter's stock to so great an extent as usual, the sudden collapse of the combination leading many to suppose that they could get their coal at continually lessening prices. Since the great decline in anthracite, the movement among manufacturers for the discontinuance of its use and the substitution of bituminous has come to a close, and the tide is now rather setting the other way. From the Government tables of our foreign commerce, it appears that the exports of coal this year were slightly less than last, while the imports were considerably heavier. The latter fact is owing to the low freight rates which have ruled on steamers coming to America.—*Commercial Bulletin.*

Buffalo, N. Y. Jan. 3, 1877.

Specially Reported by Messrs. LEE & LOOMIS.

Deliv'red at	Elmira.	Ithaca.	Syracuse	Rochester.		Oswego
	Afloat.	Afloat.	Afloat.	Afloat.	ret. del.	f.o.b.
Grate	$4 20	$3 45	$3 60	$4 30	$5 55	$4 55
Egg	4 20	3 55	3 70	4 40	5 65	4 65
Stove	4 60	4 05	4 20	4 90	6 15	5 15
Nut	4 60	4 05	4 20	4 90	6 15	5 15

Delivered at	Erie.	Buffalo.		
	f.o.b.	Afloat.	f.o.b.	ret. del.
Grate	$5 05	$4 55	$5 05	$5 80
Egg	5 15	4 65	5 15	5 90
Stove	5 65	5 15	5 65	6 40
Nut	5 65	5 15	5 65	6 40

Chicago, Ill. Jan. 2, 1877.

Specially reported by Messrs. RENO & LITTLE.

Lackawanna Stove	$8 00	Erie and Brier Hill	$6 00
" Chestnut	7 75	Wilmington & Ill.	3 50@ 4 25
" Grate & Egg.	7 50	Blossburgh	7 00

Cincinnati, O. Jan. 2, 1877.

Specially Reported by Messrs. A. BUCHANAN & Co.

Per ton of 2000 lb.	Bush.	Ton.
Youghiegheny, or Pittsburgh, afloat	@7c.	——
Pomeroy coal	@5c.	——
Kanawha "	7½c.	——
Ohio River Coal	5½c.	——
Cannel coal, according to quality	@16c.	——
The following are the retail prices delivered		
Youghiogheny	10@11c.	——
Pomeroy	9c.	——
Cannel	@22c.	——
Kanawha	10c.	——
Anthracite, per ton	$9 00@9 50	——
Coke, at yard	10c.	——
Coke, hard and soft, delivered	— @9c.	——

Cleveland, O. Jan. 2, 1877.

Specially reported by Messrs. LAMBIE & BATES.

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

Per ton of 2000 lb. 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 25	7 00

Lehigh to be $1 25 per ton higher.

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

Indianapolis, Ind. Jan. 2, 1877.

Specially reported by Messrs. COBB & BRANHAM.

The prices have been ruling low thus far in the season, but we anticipate better margins on our coal after the Holidays. Trade has been brisk thus far.

Wholesale on board cars, and retail delivered to consumers.

Per ton of 2000 lb., bushel of 70 lb.

BITUMINOUS.

White River, per ton	$2 75	Peytona cannel, per ton	$5 75
Brazil Block, "	2 75	Indiana Cannel	4 50
Highland, grate, "	2 50	Hocking Valley	4 25
Block coal, nut, per car	18 00	Youghiogheny	4 50
Highland " "	18 00	Blossburg (smithing)	6 50
Block Slack "	17 00	Piedmont "	6 50
		Gas coke, per bushel	10

ANTHRACITE (Lackawanna and Wilkes-Barre.)

Broken	$6 70	Nut	$6 70
Egg	6 70	Stove	6 70

Lehigh Anthracite.

Broken	$7 60	Nut	$7 30
Egg	7 60	Stove	7 70

Retail, per bushel, delivered.

Sand Creek	15c.	Block Nut, steam	8c.
White River	13	" Slack, "	7
Brazil Block	13	Peytona Cannel	—
Highland grate	12	Virginia "	27
Block Nut, domestic use	11	Youghiogheny	16
Highland Nut, " "	11	Blossburg	26
" " steam	8	Piedmont	26

GAS COKE (measured.)

Crushed	14c.	Lump	12c.

ANTHRACITE,

Wilkes-Barre and Lackawanna (all sizes)	$7 50 per ton.
Lehigh, retail	8 50 per ton

Louisville, Ky. Jan. 2, 1877.

Specially reported by Messrs. BYRNE & SPEED.

WHOLESALE.

	per bushel		per bushel
Pittsburg	6½c.	Pine Hill	—
Raymond City	6½c.	Kentucky	7c

RETAIL.

	per bushel		per bushel
Pittsburgh	10c.	Peytona Cannel	18c.
Raymond City	10c.	Buckeye "	
Pine Hill	13c.	City-made Coke	8c
Kentucky	9c.	Anth., per ton, $10 00 to 10 50	
Screened Pittsburgh per load			$3 50
Screened Raymond City			2 50
Pine Hill (Kentucky)			2 25
Cannel			4 50
City-made Coke			4 00

Milwaukee, Wis. Jan. 2, 1877.

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

Trade is quite as good as we can expect at this season. The supply of coal is small, but as yet there is no change in price.

Retail price per ton of 2000 lb.

Lehigh Lump	$ 8 00	Briar Hill, select	$7 00
Lehigh Prepared	9 00	Blossburgh	7 00
Lackawanna (all sizes)	8 00	Cannel	6 00
Pittston	8 00	Pittsburgh	6 50
Scranton	8 00	Oak Hill	6 00
		Steam coal	4@5 00

New Orleans, La. Jan. 1, 1876.

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

Coal has advanced still further since our last, the upper rivers being in the same condition, with no immediate prospect of a break up in the ice. Stock light. We quote:

Pittsburg coal, wholesale, by boat-load, per bbl	50c.
" steamboats, per bbl	60c.
" to manufacturers, per bbl	65c.
" to families	75c.
" shipments, per hhd	$6 50
Anthracite, wholesale, per ton	7@8 00
" retail, "	11 00
Virginia Cannel, retail, per bbl	1 25
Scotch " "	....
Mt. Carbon, wholesale, per bbl	...
" " retail, "	....
St. Bernard wholesale, per bbl	—c.
" steamboat	50c.
" retail, "	70c.

Pittston, Pa. Jan. 2, 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. Jan. 2, 1877.

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

Per ton of 2240 lb., f.o.b.

Kanawha Cannel	$9 00	New River Bituminous,	$4 40
Coalburgh Splint	5 70	Clover Hill Coal	3 50
Lewiston "	5 70	James River Bitum	3 30
Kanawha Gas coal	4 90	" " Carbonite,	5 00

St. Louis, Mo. Jan. 2, 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	Schuylkill	9 00@10 00
Wilkes-Barre	9 00@10 00	Lehigh	10 00@10 50
BITUMINOUS.			
Blossburg	9 00	Big Meadow	3 00
Pittsburg	4 50	Illinois Coals	2 50@3 00
Indiana Block	4 00	Connellsville Coke	3 50

Toledo, Ohio. Jan. 2, 1877.

Specially reported by Messrs. GOSLINE & BARBOUR.

We quote as follows for retail delivery:

Ton of 2,000 lb.

Lackawanna lump	$6 75	Lehigh lump	$7 75
" egg	6 75	" egg	7 75
" stove	7 00	" stove	8 00
" chestnut	6 75	" chestnut	7 75
Soft Coal.			
Hocking lump	4 00	Brier Hill	5 75
" nut	4 00	Blossburg	8 00
Willow Bank lump	4 50	Cumberland	8 00
" " nut	4 00		

Hamilton, Ont. Dec. 30, 1876.

Specially reported by H. BARNARD, Dealer in Coal.

Retail, per ton of 2,000 lb.

Grate	$5 75	Smithing	6 00
Egg	5 75	Bituminous, retail	5 50
Stove	6 00	" steam	4 00
Nut	5 75	Coke	6 75
Lehigh Lump	6 50		

Montreal, Canada. Dec. 30, 1876.

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

Wholesale per ton of 2240 lb.

Scotch Steam	$5 25	Cape Breton Steam	$4 50
Pictou "	5 00	Newcastle Smiths,	6 50

Anthracite at retail, per 2000 lb., delivered.

Egg	$6 50	Chestnut	6 75
Stove	7 00		

Rates of Transportation on Anthracite Coal to Tide Ports.

PHILADELPHIA AND READING RAILROAD CO.
General Office, 227 South Fourth Street.
PHILADELPHIA, Dec. 18, 1876.

From and after this date, and until further notice, shipments of anthracite coal can be made through by rail to South Amboy, via Richmond Junction, at the following rates, per ton of 2,240 pounds, in company's cars:

From Schuylkill Haven	$1 52
" Tamaqua	1 67
" Pine Grove	1 72
" Port Richmond	65

An additional charge of twenty-five cents per ton will be made on chestnut and pea coal, unless the shipper signs the usual release.

The release now in force will apply to this trade.

(By order of the Board of Managers),
DAVID DROWN, Secretary.

Lehigh and Wyoming Coals. per ton of 2240 lb	From Penn Haven.	From Mauch Chunk.	From Hazleton**	From Upper Lehigh.	From Ashley and Sugar Notch.
To ‡ Newark, N. J. (117 miles), via Central Railroad of New Jersey	1 62	1 48	2 04	1 95	2 18
‡ Mauch Chunk, Pa., via Central Railroad of N. J.	14	...	58	49	72
‡ Philipsburg, N. J., (46 miles)	60	46	1 00	91	1 14
Elizabethp't, (114 m.) Pt. Johns., Hoboken & South Amboy, N. J., shipping and wharfage 35c. add.	1 26	1 12	1 68	1 59	1 82
High Bridge, N. J.	1 95	1 75	2 43	2 34	2 52
Elizabeth, Cranford, Westfield & Elizabethport, for consumption,	1 89	1 75	2 31	2 22	2 45
Jersey City, N. J., (121 miles) and New York, via L. V. RR	1 59	1 47	2 01	1 92	2 15

From *Mauch Chunk* to *New York* (121 miles), (towing limits) and Jersey City† via Lehigh Valley RR. $1 47

From *Mauch Chunk* to *Philadelphia* (93 m.) via L. V. and L. and S. RR. and North Penn. RR 1 25

For way points between *Mauch Chunk* and *Phillipsburg*, on the New Jersey Railroads 1 00

From *Phillipsburg, N. J.* to *Hoboken* (84 m.) for shipment via Delaware, Lackawanna and Western RR., Morris and Essex Division 65

From *Phillipsburg, N. J.*, to *Newark* (75 m.) via Delaware, Lackawanna and Western RR. 1 01

** Rates on line coal from Hazleton are 10c. per ton above these figures.

‡ The cost of unloading is to be added to these rates. No charge less than 40c. per ton will be made for any distance. Tolls from Mauch Chunk to Phillipsburg for way points will be $1 15 per ton.

† Transportation on Coal destined for re-shipment from this point from boat to boat is 20c. less, if discharged upon the wharf 10c. less than the above rate.

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

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

Geneva, Ithaca and Sayre Railroad.—The rates of transportation on coal from Coxton, Pa., per ton of 2,240 lb., from and after the first of November, will be as follows:

To East Waverly, N. Y.	$1 75
" Ithaca, and for C. Lake RR. (local)	1 64
" " for C. Lake RR, and via Erie Canal (shipment)	1 57
" To Van Etten, for U. I. and E. RR.	1 61
"Geneva (local) for S. P. and S. and L. O. S. Railroads, and for N. Y. C. and H. R. RR., except Auburn and Cayuga	2 06

To Geneva, for Buffalo and Towanda	1 87
" " " Rochester and Charlotte	2 01
" " " Auburn and Cayuga	2 50
Total rate to Buffalo	3 11
" " " Rochester	2 78

REGULATIONS.

A charge of fifteen cents per ton will be collected of each consignee on all coal not unloaded within twenty-four hours after its arrival, and an additional charge of ten cents per ton for every twenty-four thereafter; Sundays and legal holidays excepted.

No allowance will be made for coal lost from cars on account of bro ken doors or o'her defects existing when the cars are loaded.

Seventeen cents per ton will be charged, at Ithaca Docks, for shipping Coal direct from cars to vessels, and 12 cents per ton additional from stock, making a total charge on what is shipped from stock of 29 cents per ton.

All freights will be collected weekly, by drafts on shippers, from Coxton to destination.

Freights on Bituminous Coals from the Mines to Tide Water Shipping Ports.

From the Mines to Cumberland and State Line (say an average of 20 miles), the legal charge is 2 cents per ton of 2240 lb. per mile.

From State Line to Amboy (346 miles) $4 per ton of 2000 lb. On coal shipped beyond this point there is a drawback of 75 cents per net ton.

From Cumberland to Baltimore (178 miles) $2.02 per ton of 2240 lb., or $1.80 per net ton (¼ cent per ton per mile for use of hoppers over C. & P. RR.).

From Cumberland to Georgetown (152 miles) by canal, $1.10. Tolls, 46 cents.

From the Mines to Piedmont, 4 cents per ton of 2240 lb. per mile on distances less than 4 miles, and 3 cents per ton per mile on distances over 4 miles, and 2 cents per ton per mile on distances over 10 miles.

From Piedmont to Baltimore (206 miles) $2.34 per ton of 2240 lb., or $2.08 per net ton.

From Osceola to Greenwich, Phila. (say 248 miles) per T. & C. RR., per ton bituminous coal of 2000 lb., less drawback of $1.46. $2.15; rate per gross ton, $2.60.

From Osceola to South Amboy, N.J., (317 miles) per 2000 lb., $4.03, less drawback, $1.03; rate per net ton, $3; add 12 per cent. for gross ton, 36 cents, terminal expenses, shipping, 20 cents; rate per gross ton, $3.56.

IRON MARKET REVIEW.

New York.

FRIDAY EVENING, Jan. 5, 1877.

American Pig.—The Thomas Iron Company reports sales of two lots of gray forge of 1,000 tons each at $19. With this exception business has been unusually dull. We quote No. 1 foundry at $21; No. 2, $19@$20; and forge, $18.50@$19.

Scotch Pig.—Arrivals are small and business quite dull. We quote Coltness $29; Eglinton, $26; and Glengarnock, $28.

Rails.—We are reported sales of 600 tons of iron rails for Eastern delivery at $35.50 here, and 15,000 tons of steel rails, Western delivery, terms private. We quote iron rails at mills at $34@$36 and steel $48@$54.

Old Rails are without business and nominal at $19@$20.

Scrap.—In the absence of business we quote this nominally at $25.50@$26.

Baltimore, Md. Jan. 2, 1877.

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

There has been no transactions in pig iron the past week worthy of note, and trade remains dull. We quote prices as follows:

Baltimore Charcoal	$29@32	Anthracite No. 3	$19@20 00
Virginia Charcoal	28@32	Mottled and White	16@17 00
Anthracite No. 1	22@23	Charcoal C. B. Blooms	60@62 50
" No. 2	20@21	Refined Blooms	50@55 00

Boston, Mass. Dec. 30, 1876.

PIG is very quiet, but prices are not quotably lower. The production is plainly on the increase, while the consumption is, if anything, diminishing, and many look for another break in prices after the 1st of January. We quote No. 1 $22, and gray forge $19. The market for imported irons is very quiet, and prices are unchanged. In New York the receipts of this kind show quite an increase of late. The decline in gold is of considerable benefit to importers, while freights rule very low, quoting as follows: From Glasgow to New York, 2s. a ton; to Boston, 9s.; to New Orleans, 5s.; to Baltimore, 8s.; to Philadelphia, 7s. 6d.; to Providence, 9s.; to San-Francisco, 22s. 6d.; to Quebec, 9s.; to Montreal, 10s. Foreign advices note a firm market abroad, though the recent improvement has not all been sustained.

BAR is very quiet, quoting $48 for refined and $39 for common. Large negotiations for rails are pending in New York—2,500 tons iron at $40 delivered, and 2,000 tons steel at $50 at mill.—*Commercial Bulletin.*

Chattanooga, Tenn. Jan. 2, 1877.

Specially reported by J. F. JAMES. pig iron broker, etc., 233 Market Street.

No change to report in the condition of our market since last report. Demand unusually light, with only a few small sales to note.

Prices remain unchanged.

Tenn. Ala. and Ga. Charcoal, No. 1 foundry	$20@ 21	White and Mottled	14@ 15
" " " " No. 2 foundry	18@ 19	Tennessee and Georgia cold-blast car wheel	21@ 25
" " " " gray forge	16@ 17	" " gray forge	16@ 18
" and Georgia coke, No. 1 foundry	18@ 19	Old Rails	cash 19@ 20
" " " No. 2 foundry	17@ 18	Cast Scrap	" 10
" " " gray forge	15@ 16	Wrought Scrap, No. 1	" 18@ —
		" " " 2	" 12@ —

Cincinnati, Ohio. Jan. 2, 1877.

Specially reported by Messrs. TRABER & AUBERRY, 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	$24 00@25 00	4 mos
" No 2, "	23 00@	4 mos
" Mill	21 00@22 00	4 mos
Tennessee, No. 1, Foundry	23 00@24 00	4 mos
Tennessee, No. 2, "	22 00@22 50	4 mos
" Mill	21 00@	4 mos
Missouri, No. 1, Foundry	@	4 mos

STONE COAL.

Ohio, No. 1, Foundry	21 50@24 00	4 mos
" No. 2, "	21 50@22 00	4 mos
Ohio Mill	20 00@21 00	4 mos
Missouri, No. 1 Foundry	25 00@	4 mos
" No. 2, "	24 00@	4 mos
" Mill	23 00@	4 mos

CAR-WHEEL.

Hanging Rock, C. B	40 00@45 00	4 mos
Tennessee "	25 00@32 00	4 mos
Missouri "	30 00@33 00	4 mos
Alabama "	25 00@32 00	4 mos

BLOOMS.

Charcoal	55 00@ 65 00	cash

SCRAP IRON.

Cast	50c.@ 85	cash
Wrought	1 00@1 40	cash

Cleveland, Ohio. Jan. 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 50@....
No. 2, " " "	26 00@....
No. 1, Anthracite	24 50@....
No 2, "	22 50@....
No. 1, Bituminous	24 50@....
No. 2, "	22 50@....
American Scotch, No. 1, Cherry Valley	@....
" " B—1, " "	@....
" " No. 2, " "	@....
No. 1, Massillon	24 50@....
B—1, "	23 00@....
No. 2, "	21 00@....

CAR WHEEL AND MALLEABLE IRON.

No. 3 Lake Superior Charcoal	26 50@....
No. 4 " " "	27 00@....
Nos. 5 and 6 "	26 50@....

BESSEMER IRON.

Nos. 1 and 2 Lake Superior Charcoal	26 50@....

FORGE IRON.

No. 1, Gray	22 00@....
White and Mottled	24 00@....

Philadelphia, Pa.

(Weekly report of the Philadelphia Iron Market, furnished by Messrs. JUSTICE, COX, Jr., & Co., Iron Merchants, 333 Walnut Street, Philadelphia. Week ending Jan. 4, 1877.)

AMERICAN PIG IRON.—There is little to be said this week on the iron trade of this city. The very severe weather we are having at this writing, and have had for two weeks, has about stopped what little business that would otherwise struggle to the surface after the new year came in. There is nothing new to report in regard to prices; we hear of low offerings, but it generally turns out to be outside lots. Standard irons are generally held firm, with some inquiry for mill irons, which have become scarce again. We report sales of 500 tons Checkies, and 200 tons Montgomery at full quoted prices. We quote No. 1, $21 to $22; No. 2, $19.50 to $20; forge, $18 to $20 as to brand.

MANUFACTURED IRON.—There is more inquiry for plate i on than we have had for some time; it is rumored that at least two mills have taken orders that will keep them running for over two months. Bars seem in more demand, but nothing better as to price. The reduction in wages at our Philadelphia mills will, it is hoped, allow them to compete with the Western mills, and result in some orders. We quote tank 2⅞ to 7 cents per lb.; skelp, 2¼ to 2¼ cents per lb.; bars, 2 1-10 to 2¼ cents per lb.

NEW RAILS.—We have nothing new to report, the many promises for the new year are still held back. We quote steel, $50 to $52; iron, $38 to $40.

OLD RAILS.—In the absence of business we quote $21 to $22.

SCRAP.—Wrought, $24 to $27; cast, $14 to $19.

Louisville, Ky. Jan. 2, 1877.

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

Four months allowed on quotations below.

HOT BLAST—CHARCOAL.

No. 1 Foundry, from Hanging Rock Ores	$24 00@25 00
No. 2 " " "	22 00@23 00
No. 1, Mill, from " "	20 00@21 00
No. 1, Foundry, from Alabama, Georgia and Tennessee ores	22 00@23 00
No. 2, Foundry, from Ala., Geor'a and Tenn. ores	21 00@22 00
No. 1, Mill, from " " " " "	20 00@21 00

HOT BLAST—STONE COAL AND COKE.

No. 1, Foundry, from Hanging Rock Ores	22 00@23 00
No. 2, " " " " "	20 00@21 00
No. 1, Mill, " " " " "	20 00@21 00
No. 1, Foundry, from Ala. Ga. and Tenn. Ores	21 00@22 00
No. 2, " " " " "	20 00@21 00
No. 1, Mill, " " " " "	20 00@21 00
No. 1 Foundry, from Missouri Ores	— @ —
No. 2 " " " "	— @ —
No. 1 Mill, from Missouri Ores	23 00@25 00

COLD BLAST—CHARCOAL.

Car Wheel from Hanging Rock Ores	35 00@43 00
" " Tennessee "	26 00@28 00
" " Alabama and Georgia Ores	28 00@40 00
" " Kentucky Ores	28 00@42 00

Milwaukee, Wis. Jan. 2, 1877.

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

Pig iron trade is slow, no change worthy of note either in price or sales.

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

Pittsburg, Pa. Jan. 2, 1877.

Specially reported by A. H. CHILDS.

The market continues very quiet, with but little metal changing hands. Many of the mills have been stopped during the holidays, and some will not start up again for a week or two. In the meantime prices have undergone but little change, although the tone of the market is weak.

No. 1 Foundry	24 00@25—4 mos
" 2 "	22 00@23 "
Gray Forge	20 00@22 "
White and Mottled	17 50@19 "
Warm blast Charcoal	.23 00@28
Cold blast Charcoal Western	40 00@45

Richmond, Va. Jan. 1, 1877.

Specially reported by ASA SNYDER, Esq.

The market for charcoal pig iron is very dull, without change as to quotations. The very small stock and diminished production are the basis for the firm expectation of an early advance.

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. Jan. 2, 1877.

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

Our market has been very dull the past week. Most mills and foundries have closed up for the present. Prices remain unchanged.

CHARCOAL.		STONE COAL.	
Missouri No. 1 Found'y.	$25	Missouri No. 1 Fd'ry.	25@24
" " 2 "	22@23	" " 2 "	.23@23
" Gray Mill	22@23	" Gray Mill	22@20
H. Rock No. 1 Found'y.	25@26	" White & Mt'd	21@22
" " 2 "	23½@24		
" " Gray Mill	23@24	COLD BLAST CHARCOAL FOR CAR WHEELS.	
Tenn. No. 1 Foundry	23½@24		
" 2 "	22½@23	*All Numbers.*	
" Gray Mill	22½@23		
COKE.		Hanging Rock	35@46
Alice H. R. Ex No. 1 F'y.	26 00	Tennessee	30@33
" " 1 "	25 00	Kentucky	30@33
B, " 1 "	24 50	Missouri	28@30
" 2 "	23 50	Georgia	28@30
Forge	23 50	Alabama	28@30
Chat., Tenn. No. 1 Fd'y.	25 00	Assorted Bar Iron $2 25, rates.	
" " 2 "	23 50	No. 1 Wrought Scrap 95c. cwt.	
" " Forge	22 50	Heavy cast " 70 "	
" " White Mt'l'd	21 00	Light " 40 "	

Montreal, Canada. Dec. 26, 1876.

We quote: Pig Iron. Eglinton and Clyde; $19 50@20.00; American $21.00@22.00; Summerlee and Calder $20.75@21.25; Langloan & Gartsherrie $22.00@22.50; Hematite $26.00@27.00. Bar, per 100 lbs., Scotch and Staffordshire $2.00@2.05; best do., $2.20@2.30, Swedes and Norway $4.75@$5.00; Lowmoor and Bowling, $6.@6.50.—*Monetary Times.*

METALS.

NEW YORK, FRIDAY EVENING, Jan. 5, 1877.

As was expected, the whole list has been exceedingly quiet during the week, with no indications of an immediate revival.

Gold Coin.—During the week under review gold has ranged from 107⅛ to 106½, and closed at 106¼.

Bullion.—An advance has taken place in the price of silver. The quotations are as follows: London, 57@57½d.; New York, 123@123¼; and San Francisco 9 per cent. discount. The dealings are comparatively limited. Prices will probably advance, however, unless Germany should re-enter the market with large offerings, as the diminished production usual to the season coupled with other causes tend to this result.

Copper.—The business has been confined to dealings in a small way at 19⅜@19¾c. London quoted, on Dec. 30, Chili bars, £76, and Best Selected, £83.

Tin.—There is nothing doing in this. Straits, in London, is at £75 10/@£76. We quote here: Straits, 17¼c., gold; L. & F., 17¼c.; Refined, 17½c.; and Banca, 19¼c.@19½c.

Tin Plates are very quiet and quoted as follows: Charcoal tins, $6.75@$7, and ternes, $6.12½@$6 25; coke tins, $6, and ternes, $5.50@5.62½.

Lead.—The business in this article has not been worthy of note. Ordinary lead at 6·10c.@6·15c., currency. Missouri soft is quoted at 5·85c.@5·7½c. in St. Louis, with freights to this city at 50c.

Spelter and Zinc.—Owing to advanced rates of freights from the West, the quotations of spelter have advanced to 6½@6¾c. currency, although no business

of importance is being done. Sheet zinc is dull at 8¼@8½c. currency for Domestic.

Antimony is quoted at 13¼c@13¾c. gold.

Quicksilver is quoted at £8 5/ in London ; 50c. in San Francisco; and 53@54c in this city.

FINANCIAL.

New York Stocks.

NEW YORK, FRIDAY EVENING, Jan. 5, 1877.

The year has opened on a somewhat better market for the coal shares, the general list closing at advanced quotations which have been fairly maintained during the operations of the week. To the rumors predicting a revival of the combination of the companies and to the covering of the short interest, which was large, is due no doubt, part of this improvement. Thestock of the New Jersey Central Railroad is weak. This company, it is thought, is finding it very difficult to raise the necessary funds to meet maturing obligations. The January interest disbursements of all kinds in this city, it is thought, will amount to $51,000,000, and the addition of those at Philadelphia, Boston and Baltimore will swell the total sum to fully $100,000,000. The distribution of this large amount of money has the effect of imparting a healthy undertone to the market. The transactions for the week aggregate 95,000 shares.

Chesapeake and Ohio Railroad Company.—The report of this company covering the business of the year ending with September 30, 1876, showed the earnings to have amounted to $1,599,512.55 and the operating expenses $1,243,035 95, leaving net earnings of $356.476.60.

Coupons and Interest are due on the bonds of the following du ing the present month :

Albany and Rensselaer Iron and Steel Company.—Coupons.

Albany and Susquehanna Railroad Company.—First mortgage coupons paid by Delaware and Hudson Canal Company.

Allegheny Valley Railroad Company.—Interest on bonds issued to State of Pennsylvania, also coupons on seven three-tenths bonds.

American Dock and Improvement Company.—Coupons paid by Central Railroad of New Jersey.

Baltimore and Ohio Railroad.—Interest on preferred stock, also coupons of 1880.

Boston, Hartford and Erie Railroad Company.—Coupons guaranteed and paid by Delaware and Hudson Canal Company.

Central Railroad of New Jersey.—Interest on consolidated bonds.

Chesapeake and Ohio Canal Company.—Coupons are due.

Chesapeake and Ohio Railroad Company.—Coupons on the gold and currency bonds are due during the present month.

Consolidation Coal Company.—Seven per cent. coupons, also coupons on its convertible bonds.

Crown Point Iron Company. Coupons.

Cumberland Coal and Iron Company.—Coupons on first mortgage bonds paid by Consolidation Coal Company.

Delaware and Hudson Canal Company.—Interest on first mortgage registered bonds of 1884 and 1891.

Eureka Coal Company.—Coupons.

Evansville and Crawfordsville Railroad Company.—Coupons.

Green Falls Railroad Company.—Coupons paid by Delaware and Hudson Canal Company.

Grand Tower Mining, Manufacturing and Transportation Company.—Interest.

Holliday Coal Company.—Coupons.

Mahoning Coal Railroad Company.—Coupons.

Maple Grove Coal Company.—Coupons.

Milwaukee Iron Company.—Coupons are due.

Morris and Essex Railroad Company.—Coupons on bonds of 1900, also interest, both paid by Delaware, Lackawanna and Western Railroad Company.

Newark and New York Railroad Company.—Coupons paid by New Jersey Central Railroad Company.

New Jersey and New York Railroad Company.—Coupons paid by New Jersey Central Railroad.

Peytona Cannel Coal Company.—Interest on bonds.

Pittsburgh and Connelsville Railroad Company.—Interest on loans of Balti nore City, also coupons on first mortgage bonds, both paid in Baltimore.

Quicksilver Mining Company. Coupons.

Straitsville Cannel Coal Company.—Coupons are due.

Swedes Iron Company.—Coupons.

Thomas Iron Company.—Coupons.

Union Coal Company.—Coupons paid by Delaware and Hudson Canal Company.

United New Jersey Railroad and Canal Company.—Coupons.

Wilmington and Reading Railroad Company.—Interest due.

Cumberland and Penn Railroad.—Coupons paid by Consolidation Coal Company.

Dade Coal Company. Coupons

Delaware, Lackawanna and Western Railroad Company.—Coupons.

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

Union Pacific Railroad Company.—Coupons on first mortgage gold bonds, also on the Southern Branch bonds. On $30 coupons two-thirds will be paid in gold, the remaining one-third to be funded.

Monongahela Navigation Company.—Coupons on the bonds of this company are due.

Philadelphia, Wilmington and Reading Railroad Company.—The annual meeting of this company will be held at Wilmington, Del., Jan. 8th.

Cheever Ore Bed Company.—This company will hold its annual election on the 9th inst.

Central Petroleum Company.—This company will hold its annual meeting on the 8th inst.

*Globe Nail Company, Boston.*This company announces a dividend of 10 per cent.

Scotia Coal Company.—The annual meeting of this company will be held on the 10th inst.

Glendon Iron Company.—This company announces a dividend of $3 per share.

The Moingona Coal Company announces a dividend of $2 per share.

National Tube Works Company.—This company announces its regular quarterly dividend of $3.50 per share.

The Fairchance Iron Company of Fairchance, Pa., will hold its annual meeting in this city on the 10th inst.

Quotations and Sales of Stocks and Bonds.

For the week ending Jan. 5, 1877.

STOCKS.

	Highest	Lowest	Closing	Shares sold.
Pennsylvania Coal Co	—	—	250	—
Consolidation Coal Co	—	—	35	—
Spring Mt. Coal Co	—	—	†60	—
American Coal Co	—	—	*54	—
Maryland Coal Co	—	—	9	—
De', Lack., and West. RR. Co.	76½	71¾	75¾	71,110
New Jersey Central RR. Co.	37¾	36	36¾	16,710
Delaware and Hudson Canal Co.	74½	69¾	73½	2,774
Quicksilver Mining Co. pref'd	—	—	18½	—
" " " Common	14	14	13½	70
Mariposa Land & Min. Co. pref'd	8¾	7¾	7½	4,300
St. Louis & Iron Mountain RR.	13	13	11	52
Total Shares sold				95,014
Sales for the week previous				61,463
Increase				33,551

*Nominal. † Asked.

BONDS.

	Inter'st	Sales.	Price.
Del., Lack. & West. 2d M	M. & S.	....	.... @108¼
" " " 7's Con'ble	J. & D.	....	.... @106½
Cent'l RR. of N.J., 1st M, New	F. & A.	14,000	110 @111
" " " 1st Cons.	.....	....	... @ 89
" " " Convert'le	M. & N.	4,000	82 @ 83
Lehigh & W.-B'e, Con. Guar'd.	.....	5,000	.... @ 63
Am. Dock & Imp. Mt. Bonds	J. & J.	5,000	.... @ 70
Del. & Hud. Can., 1st M., 1891	.....	30,000	101 @104
" " " 1884	.. ....	3,000	99¾@100
" " " 1877	.....	....	.... @101½
" " " Coup. 7's, 1894	.....	9,000	97 @ 98
" " " Reg'd 7's, 1894	.....	.....	.... @ ....
St. L. & Iron Mountain, 1st M	F. & A.	13,000	.... @102½
" " " 2d M	M. & N	.....	.... @ 70
Chesapeake & Ohio 6's, 1st M.	.....	3,000	.... @ 26
" " Ex. Coupon	.....	.....	.... @ 20
Mariposa Gold Loan con. 7s	.....	.....	.... @100⅝
Total sales		$86,000	

Closing quotations, in the absence of sales, represent the latest prices bid.

Philadelphia Stocks.

PHILADELPHIA, Thursday Evening, Jan. 4, 1877.

The quotations of the stocks dealt in on this market have been well maintained during the business of the week, the list closing higher. The transactions aggregate about 73,000 shares.

Philadelphia and Reading Railroad.—It is stated that this company has issued a $10,000,000 "blanket" mortgage, covering the assets of the bankrupt rolling mills, furnaces and other possessions not heretofore mortgaged by the company. The new issue is styled an "Income Bond," bearing 7 per cent. interest, and the interest to be payable out of any surplus earnings that may remain after paying all demands arising out of the present funded debt. It is understood that a considerable amount of these bonds have already been placed as collateral, at the rate of 40 cents on the dollar, for loans effected in this city to provide for the Company's January interest. The company on the 1st inst. fully met all of the matured interest falling due on its bonds as well as the interest on the bonds of its leased lines, promptly paying all which were presented.

A second hearing was recently held before the Attorney-General and the Secretary of Internal Affairs of Pennsylvania on the question whether proceedings in the nature of a *quo warranto* should not be begun against this company and the Philadelphia & Reading Coal and Iron Company for violation of charter. Decision was reserved.

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

Lehigh Coal and Navigation Company.—Interest on the six per cent. registered loan of 1884.

Lykens Valley Coal Company.—Principal and interest on bonds paid by the Pennsylvania Canal Company.

Mahonoy and Broad Mount Railroad Company.—Interest on bonds of this company are due and payable by Philadelphia and Reading Railroad Company.

North Pennsylvania Railroad Company.—Interest on 6 per cent. and general mortgage 7 per cent. bonds.

Pennsylvania Railroad Company.—Coupons.

Pennsylvania Canal Company.—Coupons on the 1st and general mortgage bonds.

Perth Amboy and Woodbridge Railroad Company.—Coupons paid by Pennsylvania Railroad Company

Philadelphia and Reading Railroad Company.—Coupons.

Philadelphia and Erie Railroad Company.—Coupons paid by Pennsylvania Railroad Company.

Reading Coal and Iron Company.—Coupons.

Summit Branch Railroad Company.—Coupons.

Susquehanna Coal Company.—Coupons.

Western Pennsylvania Railroad Company.—Coupons paid by Pennsylvania Railroad Company.

Delaware Division Canal Company.—Coupons.

Susquehanna Canal Company.—Coupons.

Shamokin Valley and Pottsville Railroad Company.—Coupons.

Tide Water Canal Company.—Interest paid by Susquehanna Canal Company.

Saltsburg Coal Company.—Coupons paid on the 1st mortgage bonds.

East Pennsylvania Railroad Company.—The Philadelphia and Reading Railroad Company will pay a dividend of $1.50 per share to the stockholders of this company.

Schuylkill Navigation Company.—The dividend period of this company will occur during this month.

Buck Mountain Coal Company.—The dividend period of this company occurs during this month.

Fulton Coal Company.—The dividend period of this company occurs during the present month.

Nescopec Coal Company.—The regular quarterly dividend of this company falls due this month.

Emaus Iron Company.—The dividend period of this company will occur during the present month.

Minehill and Schuylkill Haven Railroad Company.—This company has declared a dividend of $1.75 per share payable on demand.

The Little Schuylkill Navigation Railroad and Coal Company announces a dividend of 3½ per cent., payable on demand.

The East Mahonoy Railroad Company announces a dividend of $1.40 per share, payable January 15.

Company Meetings.—The following companies will hold their annual meetings on Jan. 8th :

Danville, Hazelton and Wilkes-Barre Railroad Company.

Mine Hill and Schuylkill Railroad Company.

North Pennsylvania Railroad Company.

Pennsylvania Oil Creek Petroleum Company.—The annual meeting of this company will take place on the 9th inst.

Cambria Iron Company.—The annual meeting of this Company is announced to take place on the 16th inst.

Quotations and Sales of Stocks and Bonds.

For the week ending Jan. 4, 1877.

STOCKS.

	Highest	Lowest	Closing	Shr s
Lehigh Valley RR. Co	48½	47½	48	692
Pennsylvania RR.	49	47½	48¾	41,394
Reading RR.	20¼	19	19⅜	18,467
Lehigh Coal and Nav. Co	32⅛	30¾	31¾	12,430
Penn. Canal	—	—	—	—
Buck Mountain Coal Co.	—	—	*25	—
Fulton Coal Co.	—	—	—	—
Locust Mountain Coal Co	—	—	—	—
Westmoreland Coal Co	—	—	*85	—
St. Nicholas Coal Co	—	—	—	—
Cambria Iron Co	—	—	14	—
Crane Iron Co	—	—	*25	—
Emaus Iron Co	—	—	—	—
Pennsylvania Salt Manufact. Co.	—	—	62	10
Total shares sold				72,993
Sales for the week previous				62,769
Increase				10,224

* These quotations are nominal.

BONDS.

	Sales.	Price
H. and B. T. RR. 1st mortgage, 7s	$ —	— @107
" " " 2d " "	—	— @103
" " " 3d " cons	—	— @ 35
Lehigh Valley RR. Con. mtg. 6s	1,000	— @ 98
" " " 7s, 1910	—	— @115⅝
" " " 6s Reg.	4,000	108 @110
" " " 6s coup.	2,000	— @110
Pennsylvania RR. 1st mtge. 6s	2,000	— @106½
" " gen. " cou. 1910	1,000	— @109
" " gen. " 6s, reg.	—	— @107½
" " Cons. M. 6s reg.	4,000	— @106
Phil. & Reading RR. Con. M. 7s Reg.	10,000	97½@102½
" " " 6s, 49-80	—	102¾@103
" " " 7s 1893	—	— @105
" " new convertible 7s	5,000	— @ 65
" " 6s 1880	—	— @103½
" " Cons. M. 7s coup	10,100	96½@101½
" " debenture 6s	—	— @ 60
" " 6s gold coupon	—	— @ 95
Phil. & Reading C. & I. Co. Deb. 7s	3,000	— @ 55
" " Heifenstein tract	—	— @ 65
Lehigh Coal & Nav. Co., 6s '84	700	— @103
" " " RR. 6s, '97	—	— @102
" " " con. 7s	—	— @ 80
" " " 6s gold loan	5,000	98½@ 99
" " " Conv. gold loan	—	— @101¼
Penn. Canal, 6s	—	— @ 73
Penn. and N. Y. Canal, 7s	—	— @109
Ches. and Del. Canal, 6s	—	— @ 85
Susquehanna Canal, 6s	—	— @ 68
Delaware Division Canal, 6s	—	— @—
Susquehanna Coal Co. 6s	—	— @ 78
Buck. Mount Coal Co. 6s	—	— @—
Penn. Gas Coal Co. 6s	—	— @—
Honeybrook Coal Co. 7s	—	— @—
Total amount of sales	$47,800	

Closing quotations, in the absence of sales, represent the latest prices bid.

Copper Stocks.

Specially reported by Messrs. WILSON W. FAY & CO., Bankers and Brokers, Room 7 Traveller Building, 31 State Street, Boston.

BOSTON, THURSDAY EVENING, Jan. 4, 1877.

THE market closes to-night firm but intensely dull. Calumet is very strong at 176 bid, with no stock offering. Duncan has been very quiet, with little stock changing hands; the market has fluctuated only between 5 and 5¼. International Silver is a trifle stronger at 11-16 bid. National is in demand at 1⅝. Pewabic is stronger at 3¼ bid. In the small coppers, nothing doing.

Gold and Silver Stocks.

NEW YORK, FRIDAY EVENING, Jan. 5, 1877.

THE gold quotations of mining shares at the close of the market in San Francisco to-day were as under. The market is very much depressed, and all of the quotations are lower. It is reported that the Consolidated Virginia Mining Company has passed its January dividend; it is certain that the output of the mine for the past month, and indeed for several months past, have not been nearly sufficient to pay the customary dividends of $2 per share. The trouble with water, the extreme heat, the break-downs and caves, and the non-connection between the lower levels have seriously interfered with the product of this mine, and it seems probable that, until the full working capacity of the mine is perfected, a reduction, or even a total suspension, of dividends may become necessary.

Alpha	19	Justice	1143/4
Belcher	10	Kossuth	1¼
Best & Belcher	373/4	Kentuck	7
Bullion	16	Leopard	4½
Consolidated Virginia	36	Mexican	161/2
California	41	Northern Belle	24½
Chollar	78	Overman	109
Confidence	9	Ophir	19½
Caledonia	113/4	Raymond & Ely	3
Crown Point	6½	Silver Hill	73/4
Exchequer	7	Savage	8½
Gould & Curry	101/4	Segregated Belcher	80
Hale & Norcross	53/4	Sierra Nevada	9
Imperial	13/4	Union Consolidated	9
Julia Consolidated	43/4	Yellow Jacket	143/4

Mining stocks in New York closed to-day as follows:

Bertha	73/8	Granville	4¼
Cleveland	9¼	Grant	7½
Douglass	293/8	Lucerne	2

Gas Stocks.

NEW YORK, FRIDAY EVENING, Jan. 5, 1877.

GAS stocks are very dull and tending lower. The only changes in the quotations, as compared with our issue of the 30th ult., are given below. Mutual, $99; New York, $132; Manhattan, $235; and Brooklyn, $175 per share, all bid prices.

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

Champaign Urbana, Ill., Gas Light Co.—Coupons.
Kankakee, Ill., Gas Co.—Coupons.
Lawrence, Mass., Gas Co.—Coupons.
Metropolitan Gas Light Co.—Coupons.
Omaha, Neb., Gas Co.—Coupons.
Milwaukee Gas Light Co.—Coupons.
Sioux City, Iowa, Gas Light Co.—Coupons.
Providence, R. I., Gas Co.—This company announces a dividend of $1.75 per share.
Suburban Gas Light Co., Tremont, N. Y.—The regular semi-annual dividend of this company will be paid during the present month.
Brookline, Mass., Gas Light Co.—The dividend period of this company will occur during the present month.
East Boston Gas Light Co.—The dividend period of this company will occur during the present month.

PHILADELPHIA & READING RAILROAD COMPANY.
OFFICE, 227 SOUTH FOURTH STREET,
PHILADELPHIA, December 12th, 1876.

NOTICE is hereby given to the Stockholders of this Company, that the Annual Meeting and Election for President, six Managers, Treasurer, and Secretary, will take place on the second Monday, 8th of January next, at 12 M.
DAVID J. BROWN, Secretary.

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

CONTENTS.

AMERICAN INSTITUTE OF MINING ENGINEERS.

OFFICIAL BULLETIN.

THE February meeting of the Institute will be held in New York City, beginning Tuesday evening, February 27. The place of meeting will be subsequently announced. Members will please give early notice to the Secretary of their intention to read papers at this meeting.

LAFAYETTE COLLEGE, EASTON, Pa. THOMAS M. DROWN, Secretary.

"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.

THE LYKENS VALLEY MINE FIRE.

The Short Mountain and Lykens Valley Mines, which produce from 150,000 to 200,000 tons of coal a year, have been on fire since January 1st, and the Lykens Valley Coal Company, which operates the collieries, has already suffered a heavy loss. There is a difference of opinion as to how the fire originated. One theory is that a spark from a miner's lamp started it; another that the heat from one of the pumping engines in the mine was responsible. The fire spread with remarkable rapidity, ascending to the top of the Short Mountain slope, nearly 500 yards from the supposed point of origin, in six or seven hours.

Those who read the paper on "Fires in Mines and the Means of Extinguishing Them" which recently appeared in these columns, will scarcely be surprised at this new "accident" from underground engines. Our experience with mine fires makes us somewhat incredulous when we hear of the fire "being under control," or of the probability of putting it out with fire-engines. The water from two small streams is being turned into the mine, and this of course will extinguish the fire in the lower levels; but the great danger lies in the fact that the underground workings are connected, it is said, for a distance of some eight miles; and as much of the coal lies above water level, and the bed is worked to the out-crop which is fallen in in a great number of places, it will be impossible to drown out the fire, or, we fear, to extinguish it in any other way than by the tedious process which consists in closing off the district on fire and preventing with the utmost care any admission of air. The extinction may be hastened by the admission of carbonic acid or steam, or both; but the first and most pressing necessity in the case is to fence off the part on fire, and any effort to extinguish the fire which interferes with this, will probably be found to have been ill-advised.

It is said that 80 or 90 mules have perished in the mines, but no men have been lost. These collieries are very extensive, and if the efforts to confine the fire to a limited district be not promptly successful, the loss may run up into the millions of dollars. Telegraph advices yesterday (11th) state that "the firemen are still at work combating the flames, but their progress is very slow. The work of extinguishing the fire is not progressing as favorably as was hoped. What is gained one day is lost the next. Fire which is extinguished on the surface, smoulders underneath and breaks out again when least expected."

MINING STATISTICS IN COLORADO.

THE permanent prosperity of the new State of Colorado will be due in the future, as that of the Territory has been due in the past, to the fortunate combination of agricultural and mineral resources. The necessity of giving to the mining and metallurgical industries of the State that most fundamental and far-reaching assistance which comes from the spread of accurate information throughout the community, appears to be fully recognized by the citizens of Colorado, and we note with pleasure, as a proof of this wise foresight, the inclusion in the statistics concerning the production and reduction of ores, and establishes the office of Commissioner of Mines.

The second section provides that this officer shall be appointed by the Governor and Senate, shall be known to be competent, shall be "a practical miner," shall have his office at the capital of the State, and shall hold office for four years unless removed for good cause. The term "practical miner" in this section is somewhat vague, and may give trouble hereafter. If it means that the Commissioner shall be practically acquainted with the art and business of mining, it is not enough. A more important qualification would be a practical acquaintance with milling and smelting. If it means that he shall have worked as a laborer in some mine, it is likely to exclude thoroughly qualified and suitable candidates; and on the other hand, while such a preparatory experience would doubtless be an advantage to a person qualified in other respects, it is of itself by no means a proof of competency. We suggest also that the power of removing the Commissioner for good cause should be explicitly vested in the Governor, unless this legally follows from the language used in the bill—which we doubt.

The third section provides for a seal, "expressly for the use of his office." No doubt a seal is "the correct thing," but would it not be well to define its use and weight? Is it to be merely an ornament, or is it to give the certificates and documents which bear it a *prima facie* authority as evidence in the courts of the State, etc?

The fourth section provides that the Comissioner shall collect statistical information, examine processes employed in the State, and "inquire into the merits of other processes, demonstrated by practical experience elsewhere to be the most successful" etc., etc. The intention of this provision is good enough, but the limitation introduced defeats that intention. When a new process has been "demonstrated by practical experience to be the most successful," nobody will care to have a superfluous Commissioner "inquiring" about its merits. He ought to inquire concerning methods that are *alleged* to be successful.

The fifth section gives authority to the Commissioner, or his duly authorized deputy, to visit and examine any mine for the purpose of ascertaining its condition and the means of egress from it. It seems to us that this authority might be abused. To "ascertain the condition" of a mine may mean to find out whether it is likely to pay a dividend; and since mines are private property, an inquisition of this kind should be strictly guarded against. At least, it should be made the cause for the summary removal of the Commissioner, or any of his deputies, if information so obtained should be used in speculation or communicated to others without the consent of the proprietors. We are inclined to think also that the Commissioner should be prohibited from reporting on mines for sellers or buyers and for private fees. Certainly the seal aforesaid should not be affixed to such reports, and if they are permitted at all, they should be signed by the Commissioner as a private person, and bear the weight only of his individual reputation, not his official position.

The sixth section makes it the duty of the Commissioner to notify owners, lessors or lessees of mines when he finds the same to be dangerous by reason of insufficient egress, defective timbering, etc. It is not made the duty of the parties, so far as we can see, to correct the evils complained of; no penalties are affixed to their neglect: and the notice of the Commissioner appears to be a mere *brutum fulmen*, without force, except that probably, if the operator of a dangerous mine should be sued for damages resulting from such causes, the fact that he had been thus notified beforehand would go to establish culpable neglect on his part. But there is another objection to this section. It lays down no rules by which the dangerous condition of a mine may be determined, makes no distinction between coal and metal mines. All this is left to the discretion of the Commissioner. In many cases, moreover, a mine must necessarily, for a certain period at least, be in a dangerous condition. While a tunnel or a shaft is in progress, for instance, there is but one means of egress; and all that the State can properly do is to restrict the number of men employed under such conditions. It seems to us that the law should provide for proceedings in the courts when there is a difference of opinion between the inspecting officer and the mining operator. In such a case let the Commissioner bring a suit, or submit the matter to arbitration in some way, and let the operator be forced to make such repairs or take such precautions as may be judged advisable. With regard to collieries (of which there are already a considerable number in the State), the question of ventilation is more important than that of egress or timbering; and this should be included among the duties of the inspecting officer.

The seventh section requires correspondence to be conducted by the Commissioner, and letters, reports and papers to be kept on file in his office. This is very well, unless it means that the files shall be open to public inspection, in which case it is not calculated to secure the best results. It ought to be possible for such an officer to receive and use discreetly confidential communications. Moreover, a large amount of valuable information can be obtained if the parties furnishing it are assured that it will not be published until after a certain time, when its scientific value will not be impaired, although its effect upon private business will no longer be unfavorably felt. Again, if the Commissioner is a professional mining engineer or metallurgist, he can undoubtedly obtain,