THE ENGINEERING AND MINING JOURNAL.

VOL. XVI.—No. 12.—FOURTH SERIES. NEW YORK, TUESDAY, SEPTEMBER 16, 1873. PRICE 10 CENTS PER COPY.

Blast Furnaces.

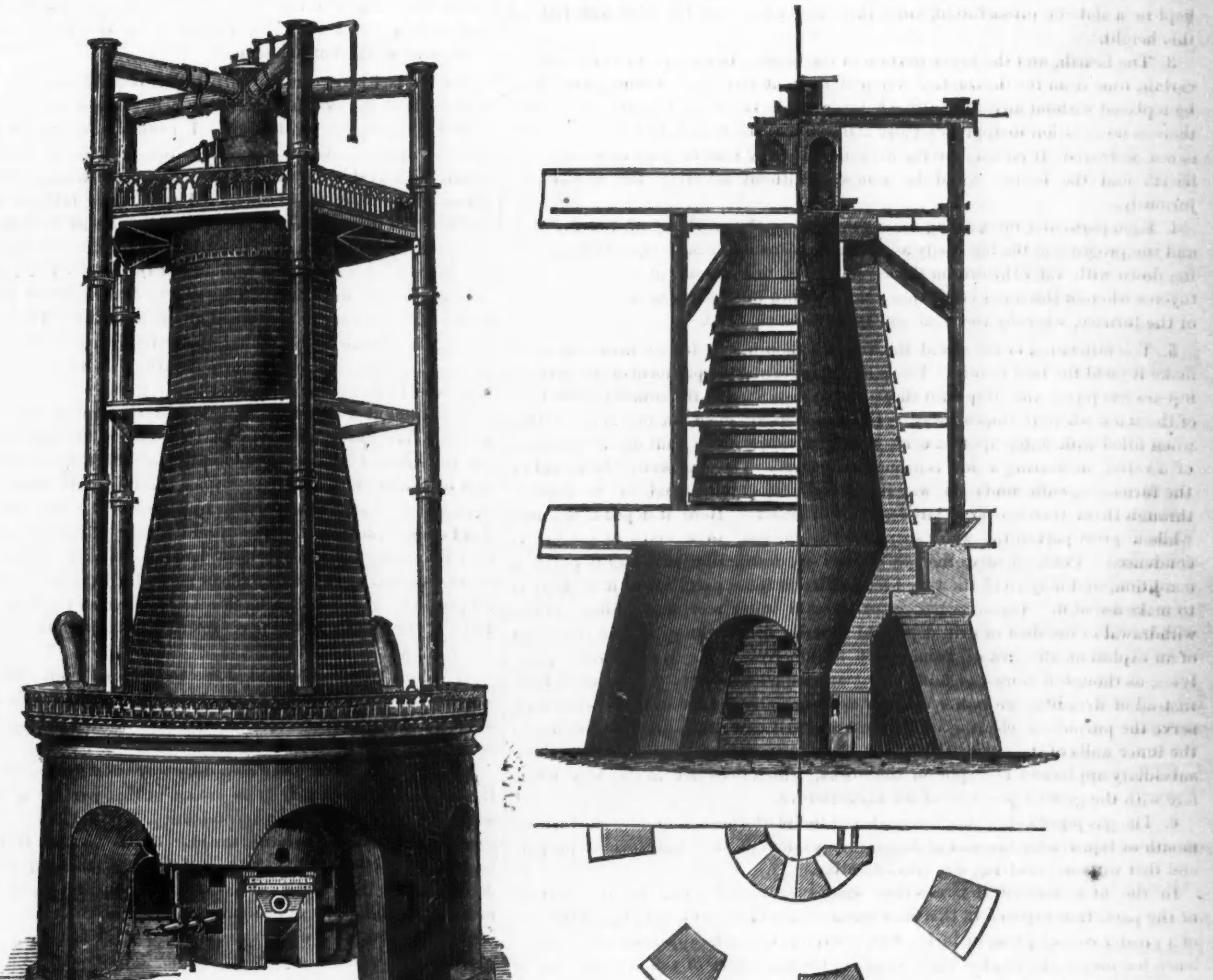
*Büttgenbach's System of Constructing Blast Furnaces.** By FRANZ BÜTTGENBACH, Neusser Hütte, Prussia.

HAVING been requested by the Iron and Steel Institute, of which I have the honor to be a member, to prepare a report upon the blast furnace system, known as the Büttgenbach system, for the meeting to be held at Liege, in August, 1873, I have the honor of sending the following description:

In 1859, I undertook the management of the Neuss Smelting Works, situate on the Lower Rhine, Rhenish Province, and there I found a blast furnace, then just recently erected, which had not yet been in active operation.

An engineer, late of the Siegen district, who had seen all the blast furnaces of that part of the country set up against steep hills, supplied with raw materials brought up to the required level by means of carts and wheelbarrows, and having steam boilers and air-heating apparatus mostly on a level with the furnace mouth, when charged with the duty of sketching out a plan for the work above-mentioned, in his inability to free himself from the influence of this (old-fashioned) notion, actually projected, and caused to be built on a level plane, a stack of masonry measuring 40 ft. square at its base, by 40 ft. in height, rising perpendicularly.

At the center of this stack was placed the blast furnace, its hearth being accessible only by means of very narrow embrasures; upon the platform of the furnace mouth two steam boilers had been erected, as well as a draught flue, the idea being probably that the descent was to take place contrary to the natural tendency of the gases.



THE BUTTGENBACH FURNACE.

This stack being altogether too bulky for me to attempt to remove it bodily, I simply contented myself with clearing away as much of it as possible round about the hearth, and in such condition as I then brought it to, our blast furnace has been continuously at work ever since 1860, under my management. The difficulty of working with a furnace similarly blocked in, but more especially the fact, resulting from the experiences of two or three years' operations, that the fire-proof facings had completely worn away, impelled me to attempt the construction of a blast furnace, the heart of which should be readily accessible on all sides, and

* Read before the Iron and Steel Institute at Liege.

following up this idea, I built up at our works a blast furnace 50 ft. high, and 17 ft. in diameter at the boshes. In justice to my brother, a metallurgical engineer, I must not here omit to state that, in elaborating, and finally determining upon my plans, I had the advantage of his suggestions and valuable advice.

In 1867, a model of the above-mentioned blast furnace was exhibited in Paris, and I had the satisfaction, not only of being complimented upon my idea by a great number of engineers of every nationality, qualified to express an opinion on the subject, but of having conferred upon me, likewise, the distinction of an honorable mention on the part of the jury of the Exhibition. The articles contributed to the *Revue Industrielle* of the Exhibition of 1867, by Professor JORDAN, who occupied the Chair of Metallurgy at the *Ecole Centrale* in Paris, have brought my system into notice in France. Since 1867, six French ironmasters have adopted my system, and have constructed nine blast furnaces from my plans, and in accordance with my suggestions. Both in Germany and Austria my system has likewise been introduced with success at several iron works. The fundamental idea of this mode of construction, and the advantages of the system may be summed up as follows:

1. The mason work of the stack is quite independent of the blast furnace proper. Each ring or course of bricks constituting the hearth, boshes, and inside wall, is readily accessible, and free from any casing, except as regards a small portion, measuring from 3 ft. to 4 ft. in height, at the widest section of the blast furnace. Consequently, the whole of the above several parts are completely bare, and easily reached for any purpose required, even while the furnace is in active operation. This feature conduces to the duration of the furnace, for in case of need any injured part can be repaired, even when the furnace is at work.

2. The inside wall and the upper part of the boshes being cooled by the atmosphere having access thereto, they remain in their normal condition without wear, and do not become unduly heated at any time, being, therefore, indefinitely kept in a state of preservation, since there never occurs a fusion of materials at this height.

3. The hearth, and the lower portion of the boshes, being apt to suffer after a certain time from the destructive action of the materials in a melting state, may be replaced without any difficulty whatever while the work is going on, so that there is no occasion to apprehend any extinction of the fires so long as the in-wall is not destroyed. If putting out the fires should at any time become necessary, the hearth and the boshes could be renewed without affecting the in-wall injuriously.

4. Each particular brick being accessible during the working of the furnace, and the progress of the fire easily ascertained, corrosions can be obviated by cooling down with water thrown on the several parts, or by means of water vessels or tuyeres wherein the water circulates, placed within these parts as far as the inside of the furnace, whereby the wear and tear can be checked.

5. The utilization of the gas at the furnace mouth can be so managed as to make it yield the best results. The pillars supporting the platform of the furnace top are gas pipes, and drop into sheet-iron vessels fixed to the summit of the base of the stack where it slopes away. These vessels are open on one side, so that when filled with water up to a certain height, they can be shut down by means of a valve, measuring a few centimetres square. The gas issuing forth out of the furnace mouth finds its way into these resceptacles, and in its passage through them travels over a large surface of water. Here it deposits the dust while a great part of the water suspended in the gas, in a state of vapour, is condensed. Consequently, the gas reaches its destination in a highly purified condition, and may yield the very best results in those parts where it is desired to make use of it. The arrangement of the said water receptacles allows of the withdrawal of the dust or grit, deposited while in full working, and in the event of an explosion, the area of from 5 to 6 millimetres of the water column paralyses, as though it were a gigantic valve, any injurious effects. In point of fact, instead of dreading, we rather wish for explosions from time to time, since they serve the purpose of clearing off the dust and grit that may still be clinging to the inner walls of the pipes. Moreover, there is an advantage of confining these subsidiary appliances to a spot on the works, which does not in any way interfere with the general progress of the manufacture.

6. The gas pipes being supporters also of the platform surrounding the furnace mouth or top, render the said platform independent of the blast furnace proper, and that without involving any special outlay.

In the first days of this erection, critics expressed a fear that the chilling of the parts thus exposed in this blast furnace, would be achieved only at the cost of a greater consumption of fuel. But, contrary to such apprehensions, experience has amply shown that blast furnaces, the brickwork of which at the core is in direct contact with the outer air, use less fuel than do those that are protected by strong mason work, or shut in by means of a second inner casing with a lining of sheet iron; and the opinion expressed by me from the very beginning explains this result. For, in point of fact, a blast furnace should form at its lower part a smelting crucible, and it is generally known that every expedient available is brought into use for the purpose of cooling the walls of this portion of the structure. The boshes are a kind of retort wherein the ore is reduced by means of its contact with the fuel and the in-wall is like unto the neck of a retort, and in which the ore is prepared by the action of a moderate heat and contact with the reducing gases.

If the ore sinking into the in-wall section acquires a spongy condition, and continues in this condition without undergoing semifusion, it is quite obvious that the effect produced by the gas must be infinitely greater, and that the ore must descend into the zones of the boshes and of the hearth in a much better state of preparation than if the heat of the in-wall had partially converted it into cinder, so that the reducing gas must pass on, incapable of action upon such ore, except superficially. The ore, thus brought into a better state of preparation, must of necessity require less fuel in order to its perfect fusion.

Moreover, in the event of cinder being formed at the in-wall zone, it will adhere to the walls and produce concretions, which always impede the proper working of a blast furnace. When the ore sinks with regularity the smelting process is facilitated, whereby a further saving of fuel is effected.

The truth of the foregoing assertions has been fully established by the experience of eight years' working at our works. Accretions have never been noticed, and the proportion of fuel required for the furnace, constructed upon the new principle, has always been from 10 to 15 per cent. smaller, *cœteris paribus*.

When good coke has been used, excellent No. 1 foundry pigs have been produced from ores yielding 35 per cent., the consumption of coke being in the ratio of 11 parts to 10 parts of pig, at a temperature of 350 deg. Centigrade, under blast, while in the case of white pig it is one part less of good coke to every part of pig. Touching the fears entertained of undue chilling in severe seasons, the following facts have served to dispel them *in toto*.

The blast furnace at the Neuss Works has more than once been suddenly blown out for several weeks, owing to causes quite foreign to its working capabilities. Three of these suspensions occurred during the war in the year 1870-1871, owing to the want of fuel, and no preparatory arrangements were made before any of the said suspensions of work. They lasted during a space ranging between three and ten weeks respectively. I did not touch the blast furnace during any of the stoppages referred to, the most prolonged of them occurring at a time when the thermometer registered 10 to 17 deg. Centigrade, and yet when work was resumed the furnace did its work again with surprising regularity. On the last occasion, however, I was obliged to raise up the tuyeres, in consequence of the thickening of the bottom stone.

For the last two years the furnace has been blown from 1 metre and 50 centimetres above the original level. It behaves admirably, producing as much as 50,000 kilogrammes in 24 hours. I cannot conceive of any blast furnace constructed upon a different principle being capable of withstanding the effect of events such as those detailed above, and yet remaining fit for work. The blast furnace I am describing has entered upon the eighth year of its existence, and the condition of its core is such, as yet, that one will readily admit the almost certainty of its lasting out double or three times the said number of years, considering that the bricks of the in-wall and of the boshes have, up to the present, lost nothing of their thickness. This may be easily verified, for all the bricks coming to the outer air may be examined at any moment. Their thickness may be unerringly ascertained by piercing the walls with a small pin drill. The walls, be it borne in mind, are but weak, measuring no more than 2 ft. thickness at the base, and 18 in. at the summit of the in-wall.

This thickness they have not lost during an existence of eight years. Experience has shown, moreover, that the core of the furnace being exposed to the air, the internal heat produces hardly any effect upon the bricks, either by dilation or contraction. Hearth, boshes, and in-wall were originally fastened together in the Neuss blast furnace by means of flat iron binders occurring at the third course alternately. This precautionary measure appears superfluous. It is over four years ago since I have had the binders removed at the hearth and boshes, as well as at the in-wall, in part; for I perceived that they served no useful purpose, since the cooling down of the bricks prevents expansion altogether. Indeed, the furnace in the parts referred to is just the same as on the day of its erection.

At Vienna I have exhibited at the Deutscher Pavillon für Bergbau und Hüttenwesen (No. 8635), a model of this blast furnace, in which I have shown the deductions made from an experience of the working, during a period of eight years, of the first blast furnace of its kind.

The chief alterations introduced by way of improvement consist in a diminution of the stack to a very great extent, at that part of it which supports the in-wall, this diminution being accompanied, however, by so considerable a sloping away from the center towards the rise of the boshes that the space around the hearth and the boshes has been still further enlarged, so that it may be considered as perfectly isolated. I have also introduced a peculiar description of closed hearth, which admits of ordinary working, as well as working with a closed hearth. I have been using this method for the last six years with the very best results. Its application is very simple indeed, and free from the objectionable features of other known methods, since the work of the bottom of the furnace can be performed, in case of need, without depending upon the mouth of the tuyere for running off the slag.

The hearth is closed in by a cast-iron tymp placed in the usual position. This tymp arch is cooled by a current of water passing through a coiled iron pipe fixed in the cast-iron. In the center of this plate there is an aperture or orifice measuring ¾ in. running almost over the entire height, and the cooling pipes are situated as near this kind of slit as may be. This slit is closed up by means of ordinary clay, and the upper portion of the slit is placed 2 in. or 3 in. higher than the center of the line of the tuyeres. The slag of the blast-furnace, ascending above the damstone and reaching the level of the tuyeres, runs off easily through a hole driven by means of a light steel bar into the said slit; and, since the level of this hole may be altered at will, a means is thus afforded for changing the level at which the slag is run off, over a range of 24 in., which is a very great advantage in itself; but, in addition to that, there is this further facility, namely, that nothing hinders one from tapping the melted ore at this same slit. I shall not dwell at length upon the advantages of such an arrangement, but will simply state that during the six years, since I have been making use of it, I have been unable to find any fault with it, and that in my practice it has always possessed all the advantages of the closed breast.

In the said model, I have also applied three rows of tuyeres made of gun metal overlying one another, in such wise, that the upper row is 2½ metres above the first. These tuyeres reach into the interior of the blast furnace as deeply as the blast tuyeres. By means of this plan, the walls of the hearth are kept in perfect preservation, and in case of accidents, the blast may be introduced through the said tuyeres, which affords advantages that ironmasters will be able to appreciate without any further explanation of mine.

Practice has shown that this kind of blast furnace, being readily accessible on all sides and at any moment, is far more easily managed than any other system; which fact practical men will readily admit. Over and above the advantages above enumerated, there is another, namely, that the construction of such a blast furnace must evidently be, and is, in point of fact, much less costly than that of any furnace built upon another principle. It takes much less time to build, to dry, and to fire: in fact, it is a practical elucidation of your English proverb, "time is money." Let me add, too, that there is nothing to prevent the application of my system to blast furnaces of all shapes and sizes, and that the largest section would just be the one best adapted for illustrating its great advantages, no less, speaking relatively, than its saving qualities.

In conclusion, I must say, that, to my mind, this system is the most advanced in simplicity of blast furnace construction.

Interesting Experiments in Spectroscopy.

SPECTRA OF IRON AND SOME OTHER METALS.

SECCHI wished to ascertain whether the line 1474 K, seen in the corona of eclipses really belonged to iron, as has been asserted. Fifty Bunsen couples were used, giving a powerful force. The voltaic arc of iron was got in various ways—(1) With two iron cones; (2) with one at the positive pole, and a carbon cone at the negative; (3) with drops of iron in a little hollow of a carbon point forming positive pole. He used a direct-vision spectroscope, and with a heliostat reflecting the sun's rays between the electric poles he could have the solar spectrum and that of the electric arc superposed. He examined carefully the lines in the superposed spectra, and also those in the iron spectra alone; also tried various kinds of iron, but in no case did the line in question appear; and he concludes, that if it belongs to iron, it is developed in circumstances of temperature still unknown. He makes some further remarks on the spectrum of the arc from the carbon points which, projected on a white screen with a Duboscq apparatus, had a size of about 10 centimetres, so that its different parts could be well examined separately. He notes some differences from what MORREN and others have observed in the carbon vapour spectrum. Experimenting as to whether any other metals gave the finely fluted spectrum of carbon, he found that aluminium gave it admirably.

In a letter from M. NORDENSKIOLD, from Mossel Bay (lat. 79° 54', N.), where the Swedish Expedition passed the winter, he states, among other interesting facts, that Lieut. PARENT and Dr. WYKANDER had been studying the aurora and its spectrum with an excellent apparatus, and had determined seven different spectral lines, which Dr. WYKANDER thinks are exactly the spectrum of the lower part of the flame of a candle or of a petroleum lamp. This seems to indicate some relation between the aurora and the fall of cosmic dust containing carbon, hydrogen, metallic iron, along with snow (as described in a previous letter). It may explain anomalies observed in auroral spectra in different places and at different times. The vegetation of Algæ seems to attain a maximum in the darkness and cold of an Arctic winter. The botanist considers they can live without light, and at a temperature of — 2° C. The photographer found that a sensitised plate kept twelve hours on the sea bottom, where Algæ were flourishing, underwent no change. In walking along near the coast one observes a bright luminous trace on the snow. This is produced by myriads of small crustacea at a temperature of — 10° C.

On the Application of Portable Engines for Mining Purposes.*

By MR. JOHN RICHARDSON.

PORTABLE engines with multitubular boilers and self-containing machinery have of late years been used for winding and pumping in Cornish mines with advantage. Messrs. Robey have, during the past 14 years, successfully carried out this application in several different ways. The new engine, of the same power as the old class of winding engine, saves a very large amount of space, and consequent cost of buildings. Beyond this, engines of the new type, being combined with their boilers, require scarcely any foundation, and only one man to drive and stoke. They, moreover, work at a much higher speed than the winding drum, and are connected to it by a gearing of 6 or 8 to 1, instead of the engine having only double the speed of the drum, or being coupled direct to it at the same speed. It also compares well with the old type as regards economy of working, having jacketted cylinders, and using high-pressure steam from a multitubular boiler. In many other respects the new type of engine presents great advantages over the old style, especially with regard to economy of fuel, the multitubular boiler using a very inferior description of fuel. In most cases slack or small coal only is used, whilst in some instances the fuel burned is composed of two-thirds of the refuse ashes from the stationery boilers, mixed with one-third coal. Two kinds of this engine are in use for mining purposes, the first is self-propelling as well as portable, and is principally used for sinking trial pits. It has a winding drum on either side of the boiler running loose on the main axle, which also carries the driving or travelling wheels. When the engine is travelling the drums are made fast, and revolve with the wheels, but when set to work the drums are disengaged, and are thrown in or out of gear with the engine by a clutch and lever. The second engine is of the semi-portable kind, and may be employed not only for temporary purposes, but as a permanent engine. It has a double winding drum mounted on a shaft at one side of the boiler, the shaft having one bearing on the engine and the other in a wall-box built into the engine house wall. These engines are employed in raising loads of from 1 to 4 tons from various depths, and at speeds of from 250 to 600 ft. per minute. Another arrangement consists of a semi-portable engine fitted with two sets of drums and clutches, specially arranged for working with a tail rope at the bottom of a shaft. An engine on this principle is at work in the Ravenhead Colliery, St. Helen's, at a depth of 310 yards from the surface, hauling along a level 1,100 yards in length, by means of a tail rope. In another modification a pair of engines is employed, carrying either a single drum or a pair, on a shaft between them. This arrangement is designed for countries where the means of transit are bad, and where heavy weights cannot readily be got into position.

*Abstract of paper read before the Institution of Mechanical Engineers at Penzance.

The Duty of Cornish Engines.

THE slipshod way in which the weekly reports of what is called the "duty" of the Cornish engines are made up, has often attracted the criticism of engineers, as it did that of the President of our Institute of Mining Engineers at its last meeting. A "Mechanical Engineer" writes to *Engineering* on this subject as follows:

"It astonishes one who has lately seen a good many Cornish engines, that the reports of these engines are still wholly based on their duty per hundredweight of coal. It appears to me that there are three totally distinct questions involved in this subject of duty, each of which ought, I think, to be treated quite separately. To mix them in one tends only to mislead and confuse. When it is stated that a given engine performs a duty of so many millions of pounds raised one foot per hundredweight of coal, it is only the beginning and end of the following questions:

1. A certain weight of coal has to evaporate a certain weight of water.
2. This water, in the shape of steam, has to be used in a particular engine, and exerts so many indicated horse powers.
3. The power thus exerted by the engine has to drive the pump or pumps which lift the water from the mine.

The first is the every-day boiler question: a given weight of coal, the name of which is seldom stated in the Cornish reports, has to evaporate with a given boiler, so much water. Why do not the Cornishmen, if they want to know whether their boilers are good or bad evaporators, simply find out how many pounds of water they evaporate per pound of coal, giving at the same time the percentage of refuse in the coal used? They could then compare the results with others. The second is the engine question; how many pounds of water required for each indicated horse power exerted? All that is necessary after measuring the water into the boiler is to indicate the engine with the usual indicators. The Cornishmen would then find out whether they had bad or good engines. The third question is one of pumps only. By determining how many indicated horse powers are required for pumping a certain quantity of water a certain height, they would ascertain the efficiency of their pumps. The quantity of water ought, of course, to be measured, and not calculated from the contents of the pumps. How, in Cornwall, they can possibly hope to find out the reasons why the duty of their engines has for so many years been so much lower than formerly, without reporting *separately* these questions, I fail to see. The duty in two mines even using the *same* coal may not be the same, the one having a bad boiler, a good engine, and pumps out of order, and the other a more modern boiler, an inferior engine without a steam jacket, and good pumps. To be able to judge of the quality of the coal they are now paying so much for in Cornwall, they ought, at least, to ascertain now and then the weight of ashes, dirt, and cinders they get from a given weight of coal.

Perhaps, Mr. Editor, some enterprising Cornishman would allow you to report on his fuel, boilers, engine, and pumps. The results, favorable or unfavorable, would in your hands be certainly very instructive to the mining engineers of this most interesting county."

Exploration for Coal in Canada.

THE efforts which Canada is putting forth in the matter of coal exploration are directed to the little known but enormous region which, during the last few months, has been tacked on to the Territory under the title of the Northwest Territory, and Prof. BELL, of the Canadian Geological Survey, has been instructed to devote himself to the work. The Professor is to make a thorough and conclusive enquiry into the extent and quality of the coal formation of the vast regions which he is about to explore. Coal is known to exist through a considerable extent of the Territory; it has even been burned near places where it has cropped out of the surface, but no attempt has been made to ascertain the depths of the coal seams or the breadth of the country which they cover. For the purposes of his arduous task Prof. BELL has purchased in New York a diamond drill, which is to be worked by a portable steam-engine. A rather considerable outlay will, no doubt, be incurred in working this drill; but it is expected to be far less, after all, than would be necessary with other systems. It is obvious that the enquiry which the Professor has undertaken is destined to have an important influence upon the construction and working of the proposed Canadian Pacific Railway; it is desirable, of course, that the great line should be carried as near the coal beds of the Territory as possible. The survey which Prof. BELL has undertaken will extend over two years; but the Professor will prudently return to the more settled parts of Canada for the winter.

Protection of Puddlers from Heat.

A PLAN has been adopted in some parts of Wales for the protection of puddlers from the heat of the furnaces, which is described as follows:—Two screens cover the front of the furnace on either side of the puddling door, while the middle screen nearly covers the puddling door, leaving the hole exposed. The outer screens are fixed by hooks to the top of the ordinary furnace front plates, and the middle screen is supported by a counterbalance weight, in order to permit it at pleasure either to be lifted, to uncover the puddling door when a ball is to be removed, or to be replaced, to cover the door. The heat from the furnace is received upon and absorbed by screens, which are kept cool by jets of water projected upon their outer sides, by a horizontal water pipe near the top of the screens. The water runs down the screen in a continuous stream, and is conducted by troughs at the bottoms of the screens, and by pipes, to the bosh or water box used for cooling the puddler's tools, no more water being required than is usually necessary for supplying the said puddler's bosh or water box. This method of protecting the puddler is said to be so effectual as to keep him comparatively comfortable, and enable him to do more work than can be done under other circumstances.

Cold Rolled Shafting.

MESSRS. JONES and LAUGHLINS, of Pittsburgh, Pennsylvania, are exhibiting at Vienna samples of the manufacture which they have made a speciality, cold rolled iron for shafting, piston rods, the finger bars, knife backs, and guard bars for reaping and mowing machines, &c. The use of this material for these, and other purposes, has long been general in the States, and it is maintained by the manufacturers, and the assertion is borne out by numerous experiments and long experience, that the process adopted increases the strength, the hardness, and the elasticity of the metal in a very marked degree. The manufacture is an exceedingly simple matter, the bars are rolled hot to within about one-eighth of an inch of their ultimate size, are then placed in acid, to remove the surface impurities, and are finally reduced to the ultimate dimension by the special process of cold rolling. The bars thus made have a highly polished and perfectly smooth surface, and are as true as if turned in a lathe.

TABLE I.

	Iron rolled while		Ratio of increase due to cold rolling.	Average rate of increase per cent.
	Hot.	Cold.		
1. *Transverse Strains:* Bars supported at both ends, distance of bearings 30 in., load applied in the middle.				
Weight which gave a permanent set of one-tenth of an inch to 1½ in. square bars....	lb. 3,100	lb. 10,700	3.451	162½
Round bars 2 in. in diameter,	5,200	11,100	2.134	
Round bars 2½ in. in diameter,	6,800	15,600	2.294	
2. *Torsion:* Weight giving a permanent set of one degree, applied at a distance of 25 in. from the center of the bar.				
Round bars, 1¾ in. in diameter, and 9 in. between the points of attachment........	750	1,725	2.300	130
3. *Compression:* Weight giving a permanent set of one-hundredth of an inch to columns 1½ in. long and ⅝ in. in diameter........	13,000	34,000	2.615	161½
Weight giving a permanent set to columns 8 in. long, and ¾ in. in diameter:				
Puddled iron..............	21,000	31,000	1.476	64
Charcoal bloom iron.........	20,500	37,000	1.804	
4. *Tension:* Weight per square inch, giving a permanent set to rods ¾ in. in diameter:				
Puddled iron..............	37,250	68,427	1.837	95
Charcoal bloom iron.........	42,439	87,396	2.059	
Breaking weight per square inch for the same rods:				
Puddled iron..............	55,760	83,156	1.491	72
Charcoal bloom iron.........	50,927	99,203	1.950	
5. *Hardness:* Weight required to produce equal indentation..........	5,000	7,500	1.500	50

It may be found of interest to publish a summary of the principal experiments which have been made to test the properties of the iron, though none of the tests are of very recent dates. The first series of experiments were conducted by Mr. W. Wade, of the United States Ordnance Department, and a summary of about sixty tests is given in the preceding Table No. I. The cold rolled iron was in each case compared with precisely the same class of bar iron produced in the usual way.

The second series of experiments was made by Mr. John C. Whipple, Chief Engineer of the United States Navy, for tensile strength, and the following Table gives the abstract of results obtained.

TABLE II.

Quality of Iron.	Sectional area of bar tested.	Breaking weight of bar.	Breaking weight per square inch.	Increase of strength in Polished iron.
	sq. in.	lb.	lb.	lb.
Polished iron..........	.1824	19,125	104,852	
Black iron............	.4249	22,750	53,541	51,311
Polished iron..........	.1712	16,875	93,100	
Black iron............	.4515	27,000	59,797	33,403
Polished iron..........	.1589	13,125	82,600	
Black iron............	.4249	22,750	53,541	29,059
Polished iron..........	.1844	20,750	112,527	
Polished iron..........	.1855	21,250	114,555	

The following results were quoted in the report by the Franklin Institute of Philadelphia on the twenty-sixth exhibition of American manufacturers.

TABLE III.

1. *Tensile Strength:*	lb. per sq. in.
No. 1. Inferior quality, broke at..........	49,510
Same bar, cold rolled..........	66,862
No. 2. Ordinary bar, broke at..........	57,350
Cold rolled..........	92,623
2. *Resistance to Torsion:*	
No. 3. Round black bar, 1 5-16 in. diameter. Length of lever 25 in.; twisted with a strain of 587½ lb.	
Cold rolled, same quality, 1¼ in. diameter. Length of Lever 25 in.; twisted with a strain of 1000 lb.	

Experiments were also made by Sir William Fairbairn confirming the previous results, and showing a comparison of the cold rolled with turned bars. A brief summary of these tests is subjoined:

TABLE IV.

Condition of Bar.	Area of bar.	Breaking weight of bar in pounds.	Breaking weight per square inch.		Strength: Untouched Bar being Units.
			lb.	tons.	
Untouched (black).....	.85873	50,346	58,628	26.173	1.000
Rolled cold	.7854	69,295	88,230	39.388	1.500
Turned...............	.7854	47,710	60,746	27.119	1.036

The whole of the tests which have been made, and of which the foregoing are extracts, tend to show conclusively that the strength of the bars is increased by the process of cold rolling adopted by Messrs. JONES and LAUGHLINS, whilst the long and extensive use of this shafting in the United States appears to justify the claims of the manufacturers that their cold rolling is superior in all respects to turned shafting.

The Mechanical Ventilation of Mines.

IN October last, the Darfield Main Colliery, situated about four miles from Barnsley, England, caught fire by some slack being in too close proximity to the furnace, which led to the whole of the works being flooded. Since that time, a considerable number of men have been engaged in getting the water out and repairing the shaft. To ensure the safety and maintain the ventilation in the shaft a very powerful fan has been constructed and put down by Messrs. EASTON and TATTERSALL, of the Alexandra Foundry, Leeds. It has, so far, worked most admirably. It is 40 ft. in diameter, and is connected and driven by a high pressure horizontal engine, made by the same firm. In fact, there are two engines, one being kept in reserve in case of an accident. The fan is the most powerful one yet seen in Yorkshire, and, whilst at work at Darfield, has been visited by a large number of colliery owners and mining engineers, who consider it the best yet introduced for ventilating collieries at a comparatively moderate cost. Its performance is in the highest degree satisfactory, as the following summary shows:

Revolutions per Minute	Water Gauge.
20..........	6-10
30..........	1 2-10
40..........	2 2-10
50..........	3
55..........	3 7-10
59..........	3 8-10
61..........	4 1-10
65..........	5 1-10
66..........	5 2-10

The Leeds' fan, as it is termed, has made considerable headway, it appears, and several of them are now being put down at the Denaby Main and other collieries in South and West Yorkshire; the invention being pronounced one of the great mining successes of the year. Messrs. EASTON and TATTERSALL have also completed an engine to be worked by compressed air; the air cylinders, being patented by the firm named, are of rather peculiar construction, the valves consisting of an elastic tube, through which runs a currrent of water. The engines used for compressing the air also wind the coal.—*Colliery Guardian.*

THE COAL TRADE.

NEW YORK, Sept. 11, 1873.

Business in anthracite continues very brisk, and there is no doubt that the remainder of the season will repay the dealers and producers for the uncertainty they experienced in the opening months of transportation.

In bituminous coal there is a prospect almost equally good. The Chesapeake and Delaware canal will be repaired by the 18th, and transportation will then be resumed on a heavy scale. Prices are now quoted at $7.50 to $8; and it is said the Consolidation Company is the only one which has any coal to sell. Prices, it is thought, may keep steadily up throughout the season. The strike in the West Pennsylvania mines continues, and is making an amount of trouble that ought to convince the alarmists that coal owners and dealers rarely, if ever, look to a strike as a happy deliverance. The *Pittsburgh Commercial* says: "The trouble between the miners and operators is bearing fruit. The price of our own coal has been advanced to such a figure that anthracite can be shipped here and sold at less cost (considering its heat-giving properties) than the bituminous from our own hills. A great deal of hard coal has been used here, by the wealthy, not as a matter of economy, but to avoid the dust and soot. A prominent banker, who has been figuring on the price, has laid in his winter supply of anthracite, and says he will actually save money by the operation. Doubtless many others will follow his example. This is certainly 'carrying coals to Newcastle.'" According to the same paper, a meeting of the River Coal exchange, August 28, resulted in the re-adoption of the resolution passed at the last meeting of the Exchange, as follows:

Resolved, That the owner or owners of each coal mine be ready at any time to meet the miners employed at their respective works, and that we regard seventy-six pounds to the bushel over one and a half inch screens, twelve feet bar by five feet wide, at four cents per bushel, as the standard measurement and price for coal mining.

The following additional resolution was unanimously adopted:

Resolved, That we utterly decline furnishing barges to any persons loading coal at an advance over the old prices; or who acknowledge the justice of paying for the nut coal; also that we utterly decline purchasing coal loaded by parties as aforesaid and offered for sale.

Concerning the disasters of the canal the *United States Railroad and Mining Register* says:

We said nothing last week about "the destruction" of this great work by the recent rains, because we did not believe in it. Newspaper reports are always grossly exaggerated. The report went abroad that the canal was utterly wiped out; the damage being stated at first at $2,000,000, and then $500,000. Certainly there was a great destruction of boats and barges, swept through the breaches and overwhelmed in the St. George's marsh. But the canal, far from being destroyed, will pass boats as usual before the end of the month, perhaps by the 20th. The locks are intact. The slopes of the deep cut are practically uninjured. Nothing but the earth banks have been swept away, and to repair the breaches is merely a question of how much force can be concentrated with the highest efficiency. About a thousand men are at work on the repairs, and four steam dregs are clearing out the canal bed. The great dam of the back reservoir (of 500 acres), 30 feet high, is perfect. A breast of water 6 feet deep rushed through the waste weir 50 feet wide at one end of the dam, down a wooden chute of 30 feet, and by the impact of the cascade thus formed, a hole was ploughed out of the hard pan bottom in front of the dam, which spread sideways around the end of the dam, removing an entire corn-field and letting out the whole contents of the reservoir. The wave passed into and along the canal, undermining and sweeping away the piers of the high bridge (90 feet above the canal water face), and, flowing down the canal, delivered itself through breaches in the berme bank out upon the marshes. The reservoir will probably not be reconstructed, as enough water can be kept in the upper level of the canal by the powerful steam pumps located at the west end. The whole cost of restoring the canal this month to its usual condition will not exceed $100,000, and is estimated by the officers in charge at about $50,000.

The practical question raised by the disaster is this: Shall the projectors of the ship canal be invited to abandon their project and join in another, viz., to spend $20,000,000 in making the Chesapeake and Delaware a ship canal? Shall the canal company ally themselves with the Pennsylvania Railroad Company, with the Philadelphia, Wilmington and Baltimore Railroad Company, or with the Baltimore and Ohio Railroad Company? No doubt one or other of these coalitions is in the immediate future. And there can be little doubt that the result of the coalition will be the cutting down of the high level, and the widening of the canal bed, for the use of the largest ships. The trade interests of Baltimore, Philadelphia and New York are all engaged in the solution of the problem of what is now best to be done, and into whose hands the execution of the work is to fall.

Anthracite Coal Trade for 1872 and 1873.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending, 1873, Sept. 6, compared with the week ending Sept. 7, 1872.

COMPANIES.	1872.		1873.	
	WEEK.	TOTAL.	WEEK.	TOTAL.
Phila & Reading R.R†	93,663	3,230,163	109,249	3,583,554
Schuylkill Canal	18,731	557,894	20 737	494 921
Lehigh Valley R. R.	55,228	2,318,472	72,378	2,428,309
Lehigh & Sus. R. R.	28,427	1,15_,999	35,779	1,346,155
" " Canal	21,477	505,897	27,5_8	465,436
Scranton North	18,319	491,334	28,469	630,039
" South	40,298	1,472,303	39,122	1,459,711
Penn. Coal Co., rail	25,751	806,953	29,516	840,260
" " " canal	48	4 076	740	5.427
Del. & Hud. C. Co. Canal	40,178	947 096	52,564	959,202
" " East	11,462	389 204	7 583	280,613
" " West	9 231	266,074	14,522	361,767
" " South	8,623	258,716	1,890	138,163
Shamokin	9,284	374,617	12,706	425,844
Trevorton	..	....	....	....
Lykens Valley Coal Co.	....	....	....	....
Wyoming North	....	....	....	....
Wyoming South		....	....	..
P. N. Y. C. & R. R. Co.	18,421	441,807	18,352	524,835
Williamstown Col'y	....	......	....	....
Big Lick Col	....	......	....	....
Total	390,973	13,207,680	470,645	13,947,199
1872			390 973	13,207 680
Increase			79,652	739,518
Decrease				

These figures are for the week and fiscal period commencing Nov. 30

† Lessocoal transported for Company's use and Bituminous coal.

Bituminous Coal Trade, 1872 and 1873.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending Sept. 6, 1873, compared with week ending Sept. 7, 1872.

COMPANIES.	1872.		1873.	
	Week.	Year.	Week.	Year.
C. & O. Canal	16,549	437,477	6 483	397.491
B. & O. R. R.	21,536	852,894	32 967	996.379
Penn. S. Line	....	......	4,650	60,619
H. & B. T. R. R.	....	200,282	....	294,289
*Harrisburg & D	9,187	332,972	6,433	232,390
*L. V. R. R.	645	20,937	589	22,200
P. & N.Y.C. & R. Co.	7,206	263,707	4,950	221,452
Cumberl'd Branch Canal.	5,631	147 843	2,164	81,097
" Railroad	651	12,720	3,124	64 449
Total	61,406	2,268,892	61,360	2,370,366
	61,360		....	2,268,892
Decrease	46			
Increase	....		....	101,474

Penn. and N. Y. R. R.—Coxton, Pa.

Coal tonnage for week ending Sept. 6, 1873.

	Week. Tons. Cwt.	Total. Tons. Cwt.
Anthracite received:		
From Lehigh Valley R. R.	12,983 13	352,715 12
" Lack. & B. R. R.	1,414 10	27,248 10
" Pleasant Valley R. R.	3,405 08	118 964 16
" Sul. & Erie R. R.	543 13	25,906 03
Total	18,352 04	524,835 04
Same time last year	9,119 04	441,807 07
Increase	9,233 .0	83,027 17
Decrease		
Distributed:		
To Lehigh Valley R. R.		23,568 01
To Lack. & B. R. R.	80 05	1,258 16
To S. Central R. R.	5,194 07	114,837 04
To Ithaca & A. R. R.	3,347 01	104,892 05
To Erie R. W. Pockets for shipm't.	7,624 09	192,435 01
To Erie Railway, Watkins direct.	589 15	8,049 06
To individuals on line of road	634 19	21,1_1 15
To points at & above Coxton for use of Co	341 13	20,110 13
To points between Waverley and Elmira	541 15	38,561 03
Total	18,352 04	524,835 04
Bituminous received from BARCLAY R. R.		
Shipped north from Towanda	4,853 03	219,634 03
Shipped south from Towanda	74 02	1,691 15
Northern Central R. R.	23 00	126 04
Total	4,950 05	221,452 02
Same time last year	7,206 06	263,706 16
Increase		
Decrease	2,256 01	42,254 14
Distributed:		
To Erie Railway	4,612 18	199 259 05
To So. Central R. R	215 05	19,934 15
To Ithaca Valley R. R.	25 00	376 06
Lehigh Valley, R. R.	49 05	884 07
To individuals on line of Railroad.	47 17	879 05
To points on line of road for use of Company	....	118 04
Total	4,950 05	221,452 02
Grand totals transported		
Anthracite	18,352 01	524,835 04
Bituminous	4,950 05	221,452 02
Total	23,302 09	746,287 06
Same time last year	16,325 10	705,514 03
Increase	6,976 19	40,773 03
Decrease	......	

Delaware Lackawanna & Western Rail Road Company.

Coal transported on the Delaware, Lackawanna, & Western Railroad for the week ending Saturday, Sept. 6, 1873.

	WEEK. Tons. Cwt.	YEAR. Tons. Cwt.
Shipped North	28,469 00	630,098 11
Shipped South	39,122 00	1,459,612 04
Total	67,591 00	2,089,710 15
For the Corresponding time last Year:		
Shipped North	18,519 05	491,334 04
Shipped South	40,298 03	1,472,303 00
Total	58,817 03	1,963,637 04
Increase	8,773 12	126,073 11
Decrease		

Philadelphia & Reading Railroad and Branches.

COAL TONNAGE

For the Week ending Saturday, Sept. 6, 1873.

BY RAILROAD.—ANTHRACITE.

PASSING OVER MAIN LINE AND LEB. VAL. BRANCH.

	Tons. Cwt.
From St. Clair.	39,133 12
" Port Carbon.	4,466 10
" Pottsville.	7,793 01
" Schuylkill Haven.	25,435 08
" Pine Grove.	6,371 17
" Tamaqua.	14,747 15
" Harrisburg.	
" Dauphin.	6,303 07
Total	109,249 00
FOR SHIPMENT BY CANAL.	
Passing Frackville Scales	8,288 11
" Mill Creek "	973 10
" Schuylkill Valley Scales	703 16
" Mt. Carbon "	1,408 14
" Cressona "	6,844 16
" Pine Grove "	92 02
" Tamaqua "	2,500 06
Total	20,811 15
SHIPPED WESTWARD VIA CATAWISSA AND WILLIAMSPORT BRANCH AND NORTHERN CENTRAL RAILROAD.	
Via Catawissa & Williamsport Br.	865 12
" N. C. R. R. passing Locust Gap.	1,466 08
" " " Shamokin.	4,371 10
" " " Herndon.	....
Total	6,703 10
SHIPPED WEST OR SOUTH FROM PINE GROVE.	
Via Schuylkill & Susquehanna R. R.	1,692 11
" Lebanon & Pine Grove Branch	925 08
Total	2,617 19
CONSUMED ON LATERALS.	
From Frackville Scales.	658 11
" Mill Creek "	165 06
" Schuylkill Valley Scales.	991 15
" Mt. Carbon "	903 00
" Cressona "	474 03
" Pine Grove "	46 04
" Tamaqua "	523 11
Total	3,710 10
LEHIGH AND WYOMING COAL.	
Received via Silverbrook Junction, Sent East	11,292 00
" Cat. & Wpt. Br. Sent West	....
" " Rupert, Cat. & Wpt. Br.	....
" " Allentown E. Penn'a br.	73 09
" " Alburtis, " "	
" " Oreland, G. & N. Br.	1 381 19
" " Willow Street R. R.	281 00
Total	13,053 08
BITUMINOUS.	
From Harrisburg.	6,423 03
" Connecting R. R., G. & N. Br.	
" Junction R. R.	10 00
Total	6,433 03
COAL FOR COMPANY'S USE.	
Anthracite	5,022 12
Bituminous	460 04
Total.	5,482 16

RECAPITULATION.

	Total for Week.	Corres-p'g week last year.	Increase and Decrease.
Passing over Main Line and Leb. Val. Branch	109.249 00	93 661 08	i 15,585 12
For Shipment by Canal	20,811 15	19,147 14	i 1,664 01
Shipped Westward via Northern Central R. R.	6,703 10	6,253 10	i 450 00
Shipped West or South from Pine Grove	2,317 19	1,550 09	i 1,067 10
Consumed on Laterals	3,710 10	4,094 16	d 384 06
Lehigh and Wyoming Coal	13,053 08	1,608 06	i 11,445 02
Total Anthracite paying freig't	156,146 02	127,318 03	i 28,827 19
Bituminous	6 433 03	9,186 15	i 2,753 12
Total of all kinds paying freig't	162,579 05	135,504 18	i 27,074 07
Coal for Company's use	5,482 16	6,445 19	d 963 03
Total Tonnage for Week	168,062 01	141,950 17	i 26,111 04
Previously this year	4525578 01	4296929 18	i 228 649 03
Total to date	4693640 02	4438879 15	i 254,760 07
SHIPPED BY CANAL.			
From Schuylkill Haven	18,037 00	15 847 15	i 2,189 05
" Port Clinton	2,700 00	551 00	i 2,149 00
Total Tonnage per Week	20,737 00	16,398 15	i 4,338 05
Previously this year	474,187 15	545,758 00	d 71,570 05
Total to date	494,924 15	562,156 15	d 67,232 0

Statement of Coal Transported over Cumberland and Pennsylvania Railroad

During the week ending Saturday Sept. 6, and during the year 1873, compared with the corresponding period of 1872.

WEEK.

	C. & O. C'l Tons. Cwt	B. & O. R R. Tons. Cwt.	Pa. S. Line Tons. Cwt	Total. Tons. Cwt.
1873	6,483 05	32,967 00	4,650 03	44,106 18
1872	16,549 07	21,536 18	....	38,086 05
Increase		11,430 02	4,650 03	6,020 03
Decrease	10,066 02	.....	....	

YEAR.

	C. & O. C'l	B. & O. R R.	Pa. S. Line	Total.
1873	397,491 00	996,378 18	60,618 18	1,454,488 16
1872	437,477 09	852,894 03	....	1,290,371 12
Increase	....	143,484 15	60,618 18	164,117 04
Decrease	39,986 09	....	....	....

Cumberland Branch R. R.

WEEK.

	To C. & O. Canal. Tons. Cwt.	To B. & O. R. R. Co Tons. Cwt.	Total. Tons. Cwt.
1873	2,164 07	3,173 12	5,287 19
1872	5,631 17	650 18	6,282 15
Increase		2,472 14	.....
Decrease	3,467 10	......	994 16

YEAR.

	To C. & O. Canal.	To B. & O. R. R. Co	Total.
1873	81,097 01	64,449 05	145,546 06
1872	147,812 17	12,719 15	160,562 12
Increase		51,729 10	
Decrease	66,765 16		15,016 06

Report of Coal Transported over Lehigh Valley Railroad

Report of coal tonnage for the week ending Sept. 6, 1873, with Totals to date, compared with same time last year.

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	TOTAL. Tons. Cwt.
Total Wyoming	19,389 13	839,267 05
" Hazleton	52,450 01	1,021,427 16
" Upper Lehigh	25 11	4,227 11
" Beaver Meadow	13,799 01	491,750 16
" Mahanoy	14,459 13	367,781 14
" Mauch Chunk	60 15	799 00
Total	97,124 02	3,125,444 02
Same time last year	74,388 15	2,936,334 00
Increase	22,735 07	189,110 02
Decrease	......	
Forwarded East from Mauch Chunk by rail	72,368 03	2,428,308 16
Same time last year	55,277 17	2,318,471 17
Increase	17,110 11	109,836 19
Decrease		

DISTRIBUTED AS FOLLOWS.

Local East of Mauch Chunk	1,586 08	57,730 00
Forwarded East for use L. V. R.	987 09	39,845 18
Delivered to Furnaces and Manufacturing Companies	13,369 18	524,583 14
Delivered to Cat & Fog. R. R.	176 09	4,847 12
" " East Penn R. R.	256 09	6,921 03
" " North Pennsylvania Railroad	5,048 14	233,018 02
" " Port Del.	8,156 13	143,816 04
" " East Amboy Railroad		
" " Morris and Essex Railroad	3,911 15	71,698 10
" " Bel. Del. Railroad	27,32 03	778,110 03
" " Central Railroad	11,669 10	421,725 19
Delivered at and above Mauch Chunk for use of L. V. R. R.	1,306 00	51,376 14
To P. & N. Y. R. R.	12,985 13	352,718 12
To Northern Central R. R.	631 12	12,827 14
To D. H. & W. R. R.	559 11	15 180 11
To L. & S. R. R. at Packerton for rail	176 10	16,017 19
To Individuals at Mauch Chunk	13 15	1,903 09
To Individuals above Mauch Chunk	387 19	10,772 07
To L. &S. R. R., at Penn Hav., for railroad		1 541 10
Do. for canal	6,928 16	127,191 07
To Lehigh Canal Mauch Chunk	2,676 14	49,232 11
To Catawissa Railroad		50 00
To L. & B. R.R. at Lack. Junc.		19,116 02
Total	97,124 02	3,125,444 02

Report of Coal Transported over Central R.R. of N. J. (Lehigh and Susq. Div.)

Week ending Sept. 6—Compared with same time last year

REGION SHIPPED FROM.	TIDE. tons ct.	LOCAL. tons ct.	CANAL. tons ct.	TL WEEK tons cwt.	TL. DATE tons.cwt.
Wyoming	21726 19	6718 04	4076 16	31521 19	1209886 01
Upper Lehigh.		2499 02	920 02	3419 04	134183 18
Beaver Meadow	4333 15	1855 18	2210 01	8819 14	208300 06
Hazleton		204 16	4961 18	5166 14	130770 13
Mauch Chunk.	1142 15	2211 07	7191 07	10545 09	378417 05
Total	27223 09	12489 07	19760 04	59473 00	2050563 03
Prev'ly reported	949336 01	659117 12	382339 10	1991090 03	
Total to date	976559 10	671907 19	402093 14	2050563 03	
Same time 1872	811508 17	583952 06	324615 15	1720076 18	
Increase	165047 13	87954 12	77481 19	330486 05	
Decrease					

DISTRIBUTION.	WEEK 1873.	WEEK 1872.	YEAR 1873	YEAR 1872,
Forwarded East by Rail to Tidal points	27223 09	19930 02	976556 10	811508 17
Forwarded East by Rail to Local points	7017 05	9789 11	301033 19	282278 17
Forwarded East by Rail use Central Division	1473 17	1542 10	63685 06	53234 16
Forwarded East by Rail use L. & S.	35 08	141 10	7878 19	5976 13
Delivered at and above Mauch Chunk	1299 09	938 19	53682 04	33141 05
Delivered at Coalport & Hazard for Canal	19760 04	12723 12	436183 17	365239 15
Delivered to L. V. R. R. at Packerton	464 14	153 07	17264 19	10101 04
Delivered to L. V. R. Rd at Sugar Notch	1162 02		67501 00	
Delivered to L. & B. R. R. at Plymouth Bridge	1006 12	3880 18	129769 09	153595 11
Total	59173 00	46150 09	2050563 03	1720076 18

Report of Coal Transported over the Lehigh Canal

For the week ending Sept. 5, 1873.

REGIONS SHIPPED FROM	TIDE. tons. ct.	LOCAL tons, ct.	TL WEEK tons cwt.	TL. DATE tons, cwt.
Mauch Chunk Region	4,946 16	3,851 13	8,798 09	147,294 18
Mauch Chunk Region Hazardville	1,465 11	293 13	1,759 04	15,663 01
Beaver Meadow Region	787 05	4,782 18	5,570 03	83,161 18
Mahanoy Region		980 11	980 11	14,232 01
Hazleton Region	879 18	5,241 09	6,122 07	122,285 14
Upper Lehigh Region	100 10	868 15	969 05	18,408 03
Wyoming Region	966 16	1,408 03	2,374 19	61,621 17
Wyoming Region, Hazardville	963 11		963 11	2,765 19
Total	10,110 10	17,404 02	27,518 12	465,436 01
Previously reported	158708 09	279,89 10	437,917 09	
Total to date	168818 19	296817 02	465,436 01	
Corresponding week last year	192534 13	313262 07	505 897 00	
Increase				
Decrease	23,815 14	16,645 05	40,460 19	

DISTRIBUTION.	WEEK 1873.	WEEK 1872.	YEAR. 1873.	YEAR. 1872.
Consumed on line of Lehigh Canal	2,610 01	2,107 04	48,208 16	48,632 02
Passed into Morris Canal to Tidal Points		389 12	1,925 16	4,035 07
Passed into Morris Canal to Local Points	1,511 07	741 01	19,933 18	15,839 08
Passed into Del. & Rar. Canal to Tidal Points	10,110 10	6,649 07	186,993 13	188,529 06
Passed into Del & Rar. Canal to Local Points	287 18	377 17	7,007 07	10,194 01
Consumed on line Delaware Div. Canal	1,651 17	1,079 00	28,337 09	31,558 17
Passed through to Bristol	11,337 19	10,132 13	192,160 01	207,018 00
	27,518 12	21,476 14	465,436 01	505,897 00

Pennsylvania Coal Company.

Shipments of Pittston Coal for the week ending Sept. 6, 1873.

	1873. WEEK.	1873. YEAR.	1872. WEEK.	1872. YEAR
By Railway	29 515 14	840,380 02	26,751 16	806,953 07
" Canal	239 16	5,426 17	481 17	4,075 12
	29,755 10	845,806 19	27,233 13	811,028 19
Increase, 1873.	34,858 00			

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, Sept. 6, 1873.

	WEEK.	SEASON
North	58,760 08	1,823,388 08
South	1,890 02	128,063 00
Total 1873	60,650 10	1 951,451 08
Corresponding time in 1872:		
North	50,643 04	1,763,853 02
South	8,622 17	258,755 15
Total, 1872	59,265 01	2,022,608 17
Increase North	8,117 04	59,535 06
Decrease North		
Increase South		
Decrease South	6,732 15	120,692 15
Increase	1,384 09	....
Decrease	......	61,157 09

Northern Central Railway, Shamokin Division.

Below is the return of Coal sent over the Shamokin Division of the N. C. R. W., for the 7 days ending August 30, 1873.

		Tons. Cwt.
Cart		
Kest	12,708 18	
		12,708 18
Same time last year		9,284 08
Increase		3,422 10
Decrease		
Total amount shipped to date		420,843 12
Same time last year		374,646 14
Increase		51,196 18
Decrease		

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, Sept. 6, 1873.

	WEEK.	SEASON.
By Delaware and Hudson Canal	52,564	959,202
By Railroad, East	7,583	280,613
" West	14,522	301,767
" South	1,890	138,063
Total 1873	76,559	1,739,645
Corresponding time in 1872:		
By Delaware and Hudson Canal	40,178	947,096
By Railroad, East	11,462	389,204
" West	9 231	266,074
" South	8,623	258,750
Total	69,494	1 861 130
Decrease	121 485	

Prices of Coal by the Cargo.

(CORRECTED WEEKLY.)

SCHUYLKILL.	AT NEW YORK R. A.	AT NEW YORK W. A.	AT PHILADELPHIA R. A.	AT PHILADELPHIA W. A.
Lump	$—	$—	—	4 50
Steamer	—		—	4 50
Broken	—	—	4 70	4 61
Egg	—		4 75	4 00
Stove	—	—	4 95	4 80
Chestnut	—		3 85	3 85
Pea	—		—	—
LEHIGH.				
Freight to New York 50 cents.				
Lump, (on board)	—			—
Broken	—	—		—
Egg	—	—		— —
Stove	—	—		—
Chestnut	—	—		— —
Pea	—	—		—
SPECIAL COALS.*				
Honey Brook, Le'h W.A.	5 80@5 05			— —
Spring Mountain " "	5 80@5 10			— —
Sugar Loaf " "	4 00@5 90			— —
Room Run " "	5 05@5 75			— —
Hill & Harris " "				—
Shamokin " "	4 10@4 70			— —
Lykens Valley " "	4 70@6 05			— —
Broad T " "				— —

Company Coals.

Sept. 1873.

	L.	Str.	Gra.	Eg.	Sto.	Chest
*Scranton at E. Port	—	—	—	—	—	— —
Pittston at Newburgh	4 90	4 10	5 00	5 10	5 40	4 90
*Lackawana at Rondout	5 15	5 25	5 35	5 40	5 70	5 10
Wilk'b're at Pt. John's	4 95	5 05	5 15	5 30	5 50	4 95
Old Co. Lehigh at Pt. John's	5 90	5 75	5 75	5 85	5 10	—
New York Coal Exchange	5 93	5 75	5 75	5 85	5 10	—

For freights to different points see "Freights"

*To contractors only.

Prices at Baltimore—Sept. 1873.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$5 65@6 00
Pittston and Plymouth, do.	5 40@5 75
Shamokin Red or White Ash, do.	5 60@6 00
*Lykens Valley Red Ash, do.	@6 30
By retail, all kinds per ton of 2,240 lbs.	7 25@8 25
*George's Creek and Cumberland f. o. b. at Locust Point for cargoes	4 85@5 00
West Va. and Youghigheny gas f. o. b. at L. Point	6 50
Kanawha Cannel, coarse	@

*Freight to New York $2 15.

BITUMINOUS COALS.

Kittaning Coal Co.'s Phœnix Vein, f. o. b. at Phila......$
Lemon " " "

Cumberland Vein Coal......
Tyreonnel f. o. b. $7 00

Prices at Georgetown, D.C., and Alexandria, Va.

Sept. 1873.

George's Creek and Cumberland f. o. b. for shipping $4 60@4 75

Prices at Havre de Grace, Md.

Sept. 1873.

Wilkesbarre and other White Ash for Cargoes	$5 25@5 50
Lykens Valley	5 50@5 75
Shamokin Red or White Ash	6 00@6 50

Bituminous Coals (Cumberland).

Georgetown, F.o.b.	$4 60
Baltimore "	5 00
New York "	7 50
South Amboy	6 80

Prices of Foreign Coals.

Sept. 1873.

Duty 75 c. per ton.

Corrected weekly by ALFRED PARMELE, No. 22 Pine street, N. Y.

Liverpool Gas Caking	— —@— —
" " Cannel	17 00@— —
" House "	20 00@22 00
" Orrel.	20 00@— —

Per ton 2,240 lbs., ex-ship.

PRICES FROM YARD.

Liverpool House Orrel, screened	$20 00@22 00
"Cannel, "	22 00@25 00

Per ton 2,000 lbs. delivered.

Prices of Gas Coals.

Sept. 1873.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr., 41-43 Pine st., N. Y

	Coarse	Slack
Block House, f. o. b. at Cow Bay	$2 50	$1 25
Gowrie	2 00	0 00

Corrected by Bird, Perkins & Job, 27 South street.

	Coarse.	Culm of Coal,
Pictou......Lett	$3 00	1 50
Sydney	3 25	1 00
Lingan	2 75	1 00
Caledonia	2 75	1 25

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty on all slack coal or Culm: 40c. per ton of 28 bushels, 80 pounds to the bushel. On all bituminous coal or shale: 75 cents per ton of 28 bushels.

AMERICAN.	Nominal quo Currency.
Westmoreland......f. o. b.	$9 00 @7 00
Fairmount Gas Coal Co. of N. Y......"	6 50 @7 00
Despard Coal Co......"	6 50 @7 00
Penn......"	6 50 @7 00
Newburg Orrel Gas......"	6 50 @7 00
West Fairmount Gas Coal......"	6 50 @7 00
Redbank Cannel, at Pa......"	12 00 @0 00
AT PHILADELPHIA.	
Westmoreland......"	7 50 @0 00

Freights.—Sept. 1873

TO EASTERN PORTS.	Cumberland. From Georgetown.	Cumberland. From Baltimore	Anthracite. From Philadel'a.	Anthracite. From Eliz. Port, Port Johnston, Weehawken, and Hoboken.	Anthracite. From Newburgh.	Anthracite. From Rondout...
Amesbury		—		— —	— —	— —
Bangor		—		2 00	—	2 15
Bath		3 00		2 05	—	2 20
Boston		3 0		1 90*	2 00	2 05
Bridgeport		2 6		1 00	1 10	1 15
Bristol		—		1 35	— —	1 50
Cohasset Nar'ows		—		— —	— —	—
Derby		—		1 25†	— —	1 40
Dighton		—		— —	— —	— —
East Cambridge		—		1 95	2 00	2 05
Fall River		2 75		1 30	1 45	1 50
Hackensack		—		—	— —	— —
Hartford		3 25		1 50	1 65	1 75
Hoboken		—		50	— —	—
Jersey City		—		50	— —	—
Lynn		—		— —	— —	—
Middletown		—		1 25	1 35	1 40
Mystic		—		1 20	1 30	1 35
New Bedford		2 8		1 40	1 45	1 55
Newburyport		3 12		2 05	2 10	2 20
New Haven		2 60		1 00	1 10	1 15
New London		2 60		1 20	1 25	1 35
Newport		— —		1 30	1 45	1 50
New York		2 15		50	— —	65
Norwalk		2 75		1 00	1 10	1 15
Norwich		2 75		1 30	1 35	1 45
Pawtucket		2 70		1 40‡	— —‖	1 55
Portland		3 00		1 70	—	1 95
Portsmouth, N.H		3 25		2 00	— —	2 15
Providence		2 75		1 30	1 45	1 50
Rockport		—		— —	— —	—
Saco		—		—	—	—
Sag Harbor		—		1 20	— —	1 35
Salem		3 00		1 95	— —	2 10
Stamford		— —		1 00	1 10	1 15
Stonington		—		1 25	—	1 40
Taunton		—		1 70	— —	1 85
Warren		— —		1 30	— —	1 50
TO RIVER PORTS						55
Albany		▪				50
Catskill						50
Cocksackie						65
Coeyman's						50
Cold Spring		▪				20
Fishkill						40
Haverstraw						40
Hudson		2 60				65
New York vessels						45
Nyack						30
Poughkeepsie		▪				30
Rhinebeck						—
Rondout						40
Saugerties						50
Sing Sing						55
Stuyvesant						50
Tarrytown						60
Troy						20
West Point						50
Yonkers						

* 3 c. per bridge per ton in addition to freight.
† New Haven rate and towing 25 c. extra per ton,
‡ Towing from Providence and return, extra,
‖ And Towing.

St. Thomas	$— —	Gold
Martinique	— —	"
Demerara	— —	"
New Orleans	— —	
Mobile	— —	"

Foreign and Provincial Freight

Sept, 1873.

Foreign.

Newcastle and Ports on Tyne, per keel of 21 1-5 tons £
Liverpool, 5 per cent primage

TO NEW YORK.

Provincial.

Sydney	
Lingan	$ 5
Cow Bay	4 60
Port Caledonia	4 00
Little Glace Bay	4 00

TO BOSTON.

	4 00
Sydney	3 50
Lingan	3 60
Cow Bay	3 50
Port Caledonia	3 50
Little Glace Bay	3 50

TO MONTREAL.

Caledonia	3 75 gold

TO CUBA.

Caledonia	9 50 gold.

Rates of Transportation to Tide Water.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Schuylkill Haven Lump and St., net, $1 60; Br., Egg and Ch., $1 65; Stove, $1 75 Shipping at Pt. R., 2?c., for use at Phil., $2 18 from Pt. Carbon,

MAUCH CHUNK TO ELIZABETHPORT.

L. V. Railroad from Mauch Chunk to Phillipsburgh	$0 72
C. R. R., N. J., Phillipsburgh to Elizabethport	66
Shipping expenses at Elizabethport	25
Wharfage	10
Total	$2 23

MAUCH CHUNK TO PORT JOHNSTON.

L. V. R.R., or L. & S. R. R. from M. C, to Phillipsb'g	$0 72
C. R. R., of N. J., Phillipsburgh to Pt. Johnson	1 06
Shipping expenses	25
Wharfage	10
Total	$2 23

TO HOBOKEN

L. V. R. R., Mauch Chunk to Phillipsburgh	72
Morris & Essex R. R. Phillipsburgh to Hoboken,	6
Shipping expenses	25
Wharfage	00
Total	$2 23

TO SOUTH AMBOY.

L. V. R. R.	
B. & D. R. R. } Cam. & Am. R. R. }	1 1
Shipping Expenses,	35
Total	$2 23

PENN HAVEN TO ELIZABETHPORT.

L. V. R R. Penn Haven to Phillipsburgh	84
C. RR. of N. J. Phillipsburgh to Elizabethport	1 06
Shipping expenses	15
Wharfage	20
Total	$2 35

MARKET REVIEW.

NEW YORK, Sept. 11, 1873.

IRON—Late cable advices quote a further advance of of 3 shillings on Scotch Pig, but prices here show no particular variation, except that there is some stiffening of values; the decline in Gold, however, may have a tendency to weaken values again by enabling importers to lay Iron down cheaper than at the higher premium; the stock is now mostly held by one party, which includes the recent arrival of 550 tons Glengarnock, purchased by the present holder at $45 per ton, all of which is held on speculation. American Pig continues irregular; we quote No. 1 $43@$45, No. 2 $36@$40, and Gray Forge $30@$33; we hear of no sales. New English and American Rails are without business. Old English are somewhat firmer abroad; we quote D. H. $49, and T. $47. Scrap is quiet and nominal; 950 tons No. 1 Wrought, out of yard, sold at a private price. Refined Bar from store continues quiet and nominally steady at our quotations. Russian Sheet is steady, with a sale of forty packs at 17¼ @17½ cents gold.

LEAD—Pig has been very quiet, at about previous prices, say 6¾@7 cents for foreign, and 6¼@7 cents for domestic, gold, without sales of any moment. Manufactured is steady at our quotations.

Withdrawals from bond for consumption 4th, 5th, 6th and 8th September—

Spain........ pigs.1,270

COPPER—New Sheathing Copper is steady at 38 cents for 12 oz. and over, and Yellow Metal 27, cash. Chili Bars are quoted up to £86 at London, but the market here is depressed. We note sales of 150,000 lb. Ingot, prompt delivery, at 26½@26¾ cents (closing at 26½@26¾), and further parcels amounting to 850,000 lb. are reported for future delivery, at 27@27¼ cash.

REGULUS ANTIMONY—Is steady at previous quotations, with sales in lots as wanted, 13¾ cents gold.

STEEL—There is no change to note in either domestic or foreign.

SPELTER—Foreign remains quiet here, but cables received yesterday mentioned a rise of £1 10s. per ton, and the limits for Silesian have been raised to 7¼@7½ cents gold, as to brand. American (Western) is also held for higher prices, with a fair demand for consumption.

TIN—Pig is still neglected, except as wanted for consumption, though holders continue firm at previous asking prices, say 31¼@31½ cents for Straits, 34½@35 for Banca, 28@28¼ for L. & F., and 29¼@30 for Refined—the sales are ten tons English L. & F. at 28@28¼ cents; ten tons do. Refined, 29¼@30; 300 pigs Straits, 31¼; and fifty do. Banca, 34½, all gold—latest London quotation for L. & F., 129s. Plates are rather steady at previous quotations, with a fair amount of sales—the transactions are 250 bxs. Charcoal Tin, at $10.62½; 300 do., ½ x 10 x 14, a prime brand, $10.75; 2000 do. "Dean" Charcoal Terne, to arrive, $9.75; 400 do. "S. T. P.," $10; a small parcel Coke Terne, $8.12½, all gold; 1000 ½ x, to arrive, and 2000 do. I. C. Coke Tin, to arrive on private terms. We learn that the cable quotations are for Charcoal 36s., Charcoal Terne, 33s., and for Coke 27s.@29s.

Withdrawals from bond for consumption 4th, 5th, 6th and 8th September—

Tin from England bxs.2,150

WHITE & HASKELL's Monthly Metal Circular gives the following figures of Imports, Stocks, &c. :—

	Slabs.	Tons.
Import in August, Straits.	3,073	125
" " English.		75

From the East Indies, there are on way,

	Slabs.	Tons.
Straits	10:543	420
Billiton	1,200	37

due in all September, October and November.

Stocks in importers' and speculators, hands :—

	Slabs.	Tons.
Straits, &c	9,117	395
English L. & F.		37
Total, New York and Boston	9,117	425
Against August 31, 1872	7,000	330
" August 31, 1871.	1,100	34
" August 31, 1870.	1,300	49

ZINC—Mosselmann Sheet is steady at the old price from Agents' hands. Manganese black oxide 3½, do. gray 5½.

Messrs. BIGELOW & JOHNSTON review the market for the month ending August 30th, as follows :

NEW RAILS.

IRON—Foreign, $64@65 gold; *American, $74@78 currency; import at New York this month, none; previously since January 1, 41.449 tons; total to dato, 41,-449 tons; †same time, 1872, 128,933 tons; same time, 1871, 115,891 tons.

STEEL—Foreign $108@112 gold; American, $120@125 currency; import at New York this month, 16,741 tons; previously since January 1, 48,343 tons; total to date, 65,084 tons.

OLD RAILS.

Double Heads, $48 currency; T or Flange, $46 currency; U or Bridge, nominal: import at New York this month, 181 tons; previously since January 1, 9,101 tons; total to date, 9,282 tons; same time, 1872, 31,747 tons; same time, 1871, 26,550 tons.

SCRAP IRON.

No. 1 wrought, $40@42, currency.

PIG IRON.

American Forge, $30@33, currency; No. 1 Foundry, $43@45, currency; No. 2 Foundry, $38@40, currency; Scotch No. 1 Foundry, $44@50, currency; import of Foreign this month, 5,453 tons; previously since January 1, 39,148 tons; total to date, 44,601 tons; same time, 1872, 72,181 tons; same time, 1871, 52,266 tons.

NEW RAILS.—In *Foreign* Iron there is as yet no movement, and prices remain about as last quoted. In *American* some transactions of magnitude are reported, but as yet they are not fully authenticated. No terms have transpired, but it is understood that a long term of credit was involved in the transaction. The imports of Steel continue on a larger scale, and it is notable that this article constituted the sole import of Rails this month.

OLD RAILS.—With the exception of some few stray lots on the spot, this article remains in the same dull condition previously noted. Prices in England, though lower, are above the ruling quotations here.

SCRAP IRON.—Very dull.

PIG IRON.—There has been a fair business in Scotch, but prices do not respond to the advanced quotations reported by cable. In American there is little doing, and prices are weak.

* These prices represent as nearly as possible the range, according to location of mill.

† These figures included Steel.

METALS.

NEW YORK, Sept. 11, 1873.

IRON.—Duty: Bars, 1 to 1⅛ cents ℔ lb; Railroad, 70 cents ℔ 100 lbs.; Boiler and Plate, 1¼ cents ℔ lb; Sheet, Band, Hoop, and Scroll, 1¼ to 1⅝ cents ℔ lb; Pig, $7 ℔ ton; Polished Sheet, 3 cts. ℔ lb; Galvanized 2⅛; Scrap Cast, $6; Scrap Wrought, $8 per ton. All less 10 per cent. No Bar Iron to pay a less duty than 35 per cent. ad val.

	Store Pries.
Pig, Scotch—Coltness ℔ ton	— —@51 00
Gartsherrie	— —@48 00
Glengarnock	45 00@46 00
Eglinton	45 00@— —
Pig, American, No. 1	42 00@45 00
Pig, American, No. 2	36 00@40 00
Pig, American, Forge	30 00@33 00
Bar Refined, English and American	— —@— —
Bar Swedes, assorted sizes (gold	— —@137 50
	Store Prices, Cash.
Bar, Swedes, 1⅛ to 5 x ⅜ & ⅞ 2 sq. & 6 to 12 x ⅜ & ⅛	175 00@ — —
Bar, Refined, ⅜ to 2 in. rd. & sq. 1 to 6 in. x ⅜ to 1 in.	82 50@ 85 00
Bar, Refined, 1⅛ to 6 by ⅜	87 50@ — —
Bar, Refined, 2⅛ to 2⅞ round 1 & 1⅛ by ¼ & 5:16	90 00@ — —
Large Rounds	92 50@117 50
Scroll	102 50@135 00
Ovals and half-round	110 00@130 00
Band	102 50@105 00
Horse Shoe	117 50@ — —
Rods, ⅝ to 3-16 inch	92 50@135 00
Hoop	— —@160 00
Nailrod	— @ 9
Sheet, Russia, as to assortment (gold)	17 @ 17½
Sheet, Singles, D. and T. Common	—5¾@— 7
Sheet, D. and T. Charcoal	—7 @— 8⅛
Sheet, Galv'd, list 10 per cent, discount	— —@— —
Rails, English (gold), ℔ ton	65 00@ — —
Rails, American, at Works in Pennsylvania, currency	75 50@ 77 00

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 4 cents ℔ lb; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ℔ lb	— @— 38
Copper Bolts	— @— 46
Copper Braziers, 16oz. and over	— @— 40
Copper Nails	— @— 45
Copper, Old Sheathing, &c. mixed lots	26⅛@— 27
Copper, Old, for chemical purposes, 14@16 oz.	— @— —
Copper, American Ingot	26⅝@— 27⅛
Copper English Pig	— @— —
Yellow Metal, New Sheathing & Bronze	— @— 27
Yellow Metal Bolts	— @— 32
Yellow Metal Nails, Sheathing and Slat'g	27 @— 30

LEAD.—Duty: Pig, $2 ℔ 100 lbs.; old Lead, 1½ cents ℔ lb Pipe and Sheet, 2½ cents ℔ lb.

Spanish (gold)	6 75 @7 00
German, do.	6 75 @7 00
English do.	6 75 @7 00
Foreign, Refined	7 25 @7 37½
Domestic do.	6 37½@6 50
Bar (net)	9 25 @ —
Pipe (net)	— — @10 50
Sheet	— — @10 50

STEEL.—Duty: Bars and ingots, valued at 7 cents ℔ lb or under 2¼ cents; over 7 cents and not above 11, 3 cents ℔ lb; over 11 cents, 3½ cents ℔ lb, and 10 ℔ cent ad val. Store prices.

English Cast (2d and 1st quality) ℔ lb	— 18½@— 23
English Spring (2d and 1st quality),	— 9½@— 10½
English Blister (2d and 1st quality)	— 14 @— 18½
English Machinery	— 14½@— —
English German (2d and 1st quality)	— 12½@— 14½
American Blister "Black Diamond"	— — @— 11½
American, Cast, Tool do.	— — @— 17
American, Spring, do.	— — @— 11
American Machinery do.	— 11½@— 12
American German, do	— 9 @— —

TIN.—Duty: Pig, Bars, and Blocks, 15 ℔ cent. ad val.; Plate and Sheets and Terne Plates, 25 ℔ cent.; Roofing 25. ad val.

	Gold ℔ lb.
Banca	34½@35
Straits	31½@31⅝
English	— @28¾

PLATES.

Fair to Good Brands.	Gold.	Currency
I. C. Charcoal, ℔ box	$10 62½@11 00	$12 50 @12 75
I. C. Coke	8 50 @ 9 00	9 25 @10 25
Coke Terne	7 50 @ 8 50	8 50 @ 9 75
Charcoal Terne	9 75 @10 00	11 50 @12 00

SPELTER—Duty: in Pigs, Bars & Plates, $1.50 p. 100lb

Plates, Foreign (gold) p. 100 lb.	7 25 @—7 50
Plates, Domestic p. lb.	8⅝@—11

ZINC—Duty: Pig or Block, $1.50 per 100 lb.; Sheet 2¼c. per lb

Sheet	per lb.—10⅛@10⅜

San Francisco Stock Market.

BY TELEGRAPH.

NEW YORK, Sept. 11, 1873.

We have advices from the San Francisco Stock Board, dated September 4th and 9th. Excepting an advance of $2 in Kentuck and $8 per share in Raymond & Ely, the list has declined, Yellow Jacket and Crown Point each being $10 lower than per last report. The following dividends with their dates of payment are announced: Eureka G. V. $1 per share, September 6th; Belcher $5, September 10th; Raymond & Ely $3, September 10th; and Crown Point $3, September 12th.

	Sep. 4.		Sep. 9.
Savage	45	—	42
Crown Point	93	—	86
Yellow Jacket	57	—	47½
Kentuck, "New Issue"	10	—	10⅞
Chollar Potosi	38	—	37
Gould & Curry "New Issue"	14	—	12
Belcher "New Issue"	71	—	68
Imperial	5	—	4⅝
Raymond & Ely	70	—	73
Meadow Valley	15¼	—	15½
Eureka G. V	19	Bid.	20
Ophir	—	—	—
Hale and Norcross	—	—	—

MISCELLANEOUS.

THE ENGINEERING AND MINING JOURNAL.

ROSSITER W. RAYMOND, Ph. D.
JOHN A. CHURCH, E. M. Editors.

PUBLISHERS' ANNOUNCEMENT.

THE ENGINEERING AND MINING JOURNAL *is projected in the intent of furthering the best interests of the Engineering and Mining public, by giving wide circulation to original special contributions from the pens of the ablest men in the professions. The careful illustration of new machinery and engineering structures, together with a summary of mining news and market reports, will form a prominent feature of the publication.* It is the Organ of the American Institute of Mining Engineers, and is regularly received and read *by all the members and associates* of that large and powerful society, *the only one of the kind in this country.* It is therefore the best medium for advertising all kinds of machinery, tools and materials used by Engineers or their employees.

SUBSCRIPTION—$4 *per annum in advance;* $2 50 *for six Months.*

ADVERTISEMENTS—*The rates are as follows: Inside pages,* 25 *cents per line each insertion; the outside or last page,* 40 *cents per line. Payment required in advance.*

NEWSDEALERS *will be supplied through the agency of the* AMERICAN NEWS COMPANY, *No.* 121 *Nassau street, New York City.*

COMMUNICATIONS *of all kinds should be addressed to the Secretary. The safest method of transmitting money is by checks or Post-office orders, made payable to the order of* WILLIAM VENTZ. *Correspondence and general communications of a character suited to the objects of* THE ENGINEERING AND MINING JOURNAL *will always be welcome.*

The Postage on THE ENGINEERING AND MINING JOURNAL *is twenty cents a year, payable quarterly in advance, at the office where received.*

THE SCIENTIFIC PUBLISHING COMPANY.
WILLIAM VENTZ, SECRETARY.
27 Park Place,
P. O. Box 4404. NEW YORK CITY.

CONTENTS FOR THIS WEEK.

ONE of the British technical papers criticises the action of the Iron and Steel Institute in leaving its own country to find a place of meeting, first in Belgium and then in America. We cannot agree with our contemporary; the first business of a society is, of course, to visit its own districts of production, and trips to foreign countries cannot, of course, be indefinitely continued. But we think they may be made once in a while with the greatest advantage to all concerned. Leaving that question, it is certain that no better field for the meeting of an association of iron and steel manufacturers could be found than Belgium. Blast furnaces, iron mills, and coke works are packed together in the country about Liege like crucibles in a barrel. The following list of places to be visited shows how much there was to see: The Steel Works of MM. F. de Rossius, Pastor and Co., at Angleur; the collieries and blast-furnaces of Ougrée; the zinc works of MM. Oesciger, Mesdach and Co.; the ironworks of Ougrée; the coke furnaces of MM. Witry and Co.; the blast-furnaces, works, and collieries of the Société Solessin; the collieries and coke-ovens of Horloz, MM. Braconnier; the coke-ovens of MM. Taskin, Londot and Co., and of Baron d'Adelsward, at Tilleur; the collieries of the Gosson-Lagasse; the collieries, blast-furnaces, coke-ovens, and coal-washing works of the Société de l'Espérance, at Seraing; the collieries, coke-ovens, and coal-washing works of the Société of Marihaie; the coke ovens and coal-washing works of MM. De Wendel; the establishment of the Société John Cockerill and Co., at Seraing; an excursion to the famous zinc mines and works of the Vieille-Montagne and Angleur, and visits on the way back to the establishments of MM. Jowa-Delheid and Co., the rolling-mills of the Espérance Society, of MM. Fetu and Deliége, and MM. Marcellis and Co.; the collieries and the workmen's habitations at Micheroux; the lead and zinc mines of the Bleyberg, and of Moresnet; and, lastly, the baths and washhouses of Outre Meuse, and the Eastern Society of Economic Alimentation.

The Great Meeting at Liege.

PRIVATE advices from Mr. RAYMOND confirm the universal tenor of the reports in English and continental journals, which describe in terms of the highest praise, not unmixed with astonishment, the overwhelming magnificence and enthusiasm of the reception tendered by the authorities, engineers, manufacturers and citizens generally of Belgium, to the British Iron and Steel Institute, on the occasion of its recent meeting at Liege. The city itself was resplendent with illuminations, fire-works and waving banners; concerts and banquets alternated with festive excursions to the numerous points of interest in the vicinity. A dinner with the King of Belgium and a royal reception of great cordiality and brilliancy testified the interest which LEOPOLD II. entertains for those industries which constitute the true glory of his kingdom. The final *fête* and ball at Spa, also graced by the informal presence of the King and Queen, pleasantly terminated a week of unbroken jubilee.

In the midst of so much social festivity, the regular business of the meeting, it must be confessed, was not so thoroughly attended to as it would have been, had the members and guests of the Institute been less jaded with pleasure and less late at breakfast. The Institute would be itself made of iron and steel, could it regularly "unbend" every evening till the small hours, and then be found, rigid but elastic, at nine in the morning, ready for a forenoon of intellectual tension. Mr. LOWTHIAN BELL, indeed, was steadily in his place, whether at the head of an excursion, or the head of a table, or the head of a meeting; but even he confessed to fatigue before the arduous week came to an end; and the rest of the members allowed themselves frequent vacations from the hall where the serious transactions took place.

The principal result of this circumstance was a noticeable flagging of debate, which was, moreover, due in part to the limited time left by the hospitality of the Belgian entertainers for the formal business of the meeting. Many highly important and interesting papers were passed without further comment than a few appreciative words from the President, and a vote of thanks from the assembly. Indeed, it can scarcely be said that any paper read at the meeting was adequately debated. Nevertheless, the communications themselves were of a high order of value, as our readers may infer from the extracts which we shall print in our columns, so far as space will permit.

It gives us sincere pleasure to record the cordial reception which the President of the American Institute of Mining Engineers met at the hands of the English association and its Belgian hosts. The applause of the audience, and the cordial words of President BELL in acknowledgment of President RAYMOND's address, testified unmistakably to a genuine feeling of esteem entertained by the members for the representatives of American technical science and industry.

Still more agreeable is it to record, that the invitation of the American Institute of Mining Engineers to the British Iron and Steel Institute, to hold a meeting in America in the Autumn of 1874, was received most favorably. The Institute, by a unanimous vote, amid general applause, returned thanks for the invitation, and directed its Council to inquire into the feasibility of accepting it. The question turns upon the number of members who will be able to cross the ocean at that time—a matter of no small importance to men so deeply engaged in momentous industrial enterprises. If a sufficient number declare their willingness, the invitation will be accepted. The definite answer will be given before the February meeting of the American Institute, it being considered advisable to consult by circular all the members of the British society before sending a reply. Mr. RAYMOND judges from private conversations held at Liege with many prominent members, that the probability is strongly in favor of the acceptance of our invitation, and of a numerous attendance of our English brethren. We trust that, in that case, the invitation will be extended, not in vain, to the engineers and iron manufacturers of Belgium, who have so recently shown how well they appreciate the international importance of this great industry, and the well-earned fame of its leading representatives.

It is perhaps not possible for us to rival the extraordinary splendor of the *fêtes* at Liege; but we shall certainly be able to extend to our honored guests a hearty American welcome, which will leave them, neither on its social nor on its professional side, any cause to regret the troublesome journey. We cannot annihilate the Atlantic Ocean; but we hope to make them feel, after they have crossed it, that they are not far from home, after all.

EDITORIAL CORRESPONDENCE.—III.

A General View of the Exposition.

VIENNA, August 14, 1873.

THERE seems to be an impression, sedulously cultivated by some of the newspaper correspondents, that the Vienna Exposition, and particularly the representation of America in it, is a great failure. This is by no means the case, unless every thing which comes short of absolute perfection is to be branded as a failure. It is with the desire of attempting a brief and fair statement of the excellencies and shortcomings of the Exposition, and of our part in it, that I take up once more a subject scratched already by so many pens.

In extent, magnificence and industrial importance, the Vienna Exposition is hardly to be overrated. Money has been spent upon it like water, not only by the Austrian Government, but also by the individual exhibitors. The splendor and costliness of many of the show-cases, for instance, surpasses all previous exhibitions, and can scarcely be matched by the permanent shops of Paris, Vienna or New York. Temples in marble, in plate glass, in polished woods and metals, greet the eye on every side, outshining often the articles they enclose. The building and all its accessories testify to an unbounded expenditure of money, with bewildering results in variety and beauty.

The exhibition of the crude and manufactured products, particularly of European nations, appears to be adequate and comprehensive. Certainly it brings into a clear light the growing solidarity of industrial progress throughout Christendom. From remote and unsuspected quarters come wares that vie in delicacy, completeness and modern-ness with the manufactures of leading nations. Nothing is more impressive in this respect than the superb contributions of the provinces of the Austrian Empire—Bohemia, Styria, Carinthia, etc.,—and the kingdom of Hungary. Japan, China and Egypt make, it is true, an interesting display; but their exhibitions smack of the "side-show" business, and of the retail pedlar. It is otherwise with the Austrian provinces; they set forth in conscientious detail a picture of their industrial and social condition which may well surprise the complacent Anglo-Saxon and the brilliant Gaul. In fact, so great is the facility of communication afforded by these modern times, and so wide-spread is the interchange of ideas consequent upon rapidly circulated books and papers and upon such world exhibitions as the present, that "specialities" are on the wane; and whatever the skill of one land is able to produce, the skill of some other, and perhaps some far distant, land will speedily reproduce. This somewhat commonplace remark may be well illustrated by the exhibitions of textile fabrics, carvings, leather, glass-work and jewelry, at this Exposition. These things were once the marks of special accomplishment in different nations. Now they are sent hither from all quarters of the world; and it is hard to decide whether the glass of Venice and Prague, or the porcelain of Sèvres or Meissen, surpasses the similar products of less celebrated localities.

Some of the peculiarities which lend bewildering magnificence to the Exposition may, from another point of view, be considered as drawbacks. The most important benefit of such international exhibitions lies in the opportunity which they afford to persons interested in any branch of industry, for the comparative study of whatever the world can offer in that branch. The arrangement, or lack of arrangement, at Vienna, renders this almost impracticable. Neither the products of one region nor the products of one industry are put together. There is a delusive appearance of classification, it is true; banners announce the names of different countries, and placards allude to Group This and Group That; but single exhibitors are ensconsed in the rotunda, or in secluded courts, or in pavilions about the immense grounds, without reference to any kind of classification. I have ransacked a hundred acres in vain to find a machine which I know is here, and which I came to see. From every department this complaint is repeated; and it is to be hoped that all future managers of such colossal undertakings will take warning by Vienna, and sacrifice something of Vanity Fair display to gain a solid advantage for earnest and fruitful study.

I might enlarge on this fundamental and all-pervading error; but when all is said, the facts remain, that the Great Fair is overwhelmingly beautiful and interesting. The first sight of it is like a vision of the Arabian Nights; and after weeks of patient and ever-new investigation, the initial impression will be only confirmed and deepened.

The representation of the United States is by no means the utter failure it has been called. We might indeed have made a more brilliant show; but our halls are neither empty nor unworthily filled. The American machinery has attracted much attention, and nearly all of it has been promptly sold. It includes many characteristic specimens of American ingenuity, among which the "sand-blast" may be mentioned as perpetually the center of an admiring crowd. The exhibition of sewing-machines is excellent—and what is there, of which an American can be more justly proud, than of this invention? Scarcely any thing, since steam-machinery and the telegraph, has been more potent in the industrial world. Nor need we blush at the big map of the Northern Pacific Railroad, with the exhibition of natural products from the regions it traverses. These, and the splendid specimens of cotton from the South, are after all the basis of our world-wide invitation to labor; and so they are interpreted by the peasants of Europe, who wander in a maze of astonishment through the glittering array of many a transept, to pause before these simple and tangible evidences of our fruitful land, and to dream of easier lives and happier homes beyond the sea. There is no longer such magic in the treasures of India and Cathay as in the rewards which America holds out to the strong arm of labor.

In a word, and without pretending to offer proof in detail, the United States is better represented here, both in men and in products, than the history of its Governmental action would lead one to expect. Much has been retrieved by the faithful labor of many private citizens, whose service goes unrewarded, except by their own consciousness. This is particularly true of most of those who have represented our country upon the juries, and in various conventions and committees.

R. W. R.

The Iron and Steel Association at Liege.

THE British Iron and Steel Institute met at Liege, Belgium, August 18, and had a most satisfactory meeting. For the Belgians it was evidently an event which had been awaited with impatience. An unusual occasion, it was celebrated with unusual brilliancy. On the first day there was the reception at the railway, the "Wine of Welcome" offered by the Burgomaster of Liege at the City Hall, a visit to the University, and in the evening a *fête*, grand concert and fireworks. The next day there were three groups of excursions, which are detailed in another part of the paper, and in the evening another illumination and grand serenade concert. The third day, a grand excursion, in which 450 members took part, to the works of JOHN COCKERILL & CIE., and a banquet for 700 persons in the evening. For the fourth day, six new excursions were reserved, and the unfinished ones of the second day were also in order, while the evening afforded a harmonic concert. On the fifth and last day four excursions were offered. This is what the Belgians had prepared for their guests. We have said nothing about the regular work of the society, which was sandwiched in the above, and, by all accounts, suffered somewhat from the overpowering attractions of the *fêtes*.

We do not propose to go into a minute description of the festivities offered by the Belgians, nor of the debates which the papers received, but we hope to present our readers with the papers as embodying those facts which careful thinkers in the profession of metallurgy wish to present to their fellow-workers, and perhaps, also, with some of the views expressed upon them by members. We begin this week with Mr. BUTTGENBACH's paper describing his peculiar furnace, illustrated, also, by the cuts prepared for the *Journal of the Iron and Steel Institute.*

Mr. LOWTHIAN BELL, the President, delivered an able address, from which we extract the following:

Prior to the year 1828 the pig iron made in this country was almost exclusively smelted with charcoal, and, as a matter of commercial importance, when estimated by its extent, so long as the forest and not the mine is the source of the furnace fuel, no nation can long occupy a very prominent position in the iron trade of the world. In all Belgium there were at that time, I believe, not above half a dozen coke furnaces, and I trust I may be pardoned if I remind a meeting held in Liege, that to a fellow countryman of our own, JOHN COCKERILL, is due the honor of building the first coke blast furnace in this country. This was the origin of the important establishment at Seraing, which, under the subsequent highly intelligent supervision of Mr. GUSTAVE PASTOR, has become one of the famous works of the present age. More than thirty years ago, the Stockton and Darlington railway was open for public traffic, and the powers of the locomotive had been tested, but apparently not sufficiently so to satisfy the minds of many in our own land, that this new system of transport was destined to revolutionize the industry of the world. In proof of this, instances were then not wanting of powerful individuals succeeding by their influence in debarring whole communities from the benefits of railway communication. More enlightened views directed the councils of the Belgian authorities, for they appear to have been early impressed with the national importance of connecting their great centers of commerce with each other, and of facilitating the means of conveying the produce of their mineral fields to the various points where it was to be consumed. Belgium, guided by this policy, was the first Continental power which sought to introduce a general system of railways throughout its territory, and the late King Leopold, a name held in high esteem by all Englishmen, honored with marked distinction and favor George Stephenson, under whose direction the first lines in this kingdom were constructed.

But the rulers who preside over the destinies of this country have wisely seen, that in order to turn to the best account the elements of national prosperity placed at their disposal, those engaged in the mines and manufactures must be suitably educated for the proper discharge of their various duties. For this purpose, throughout the country, we find located schools of the highest order of excellence for the teaching of practical science. Amongst these it may be permitted to mention:—The Ecole des Mines, at Liege; the Ecole des Ponts et Chaussées, at Ghent; the Ecole des Arts et Manufactures et des Mines, at Louvain; the Ecole des Mines, at Mons; the Ecole des Mineurs, at Charleroi. The last one named in this list, it should be especially remarked, is devoted to the education of men in the position of our underviewers and foremen of departments. Besides these, there are numerous others for communicating instruction in advanced industrial science, both theoretical and practical, and next year will be added to the University of Brussels chairs for teaching the usual branches of learning afforded in mining schools. The existence of such establishments as those to which I have alluded, will account for the fact of their being found in the Belgian iron works, so many scientifically educated managers and directors, and that the manufacturing operations under the superintendence, so far as my observation enables me to judge, are conducted in a manner dictated by sound principles of economy, as the same are understood at the present day. Attached to these seats of learning, there have been, and are, teachers of unquestionable capacity. The name of M. ADOLPHE LESOINNE, Professor of Metallurgy, at the University in this town, is associated with the most indefatigable labor to render his course of lectures of the highest practical utility to the students; and my personal intercourse with M. KRANS, of Louvain, has led me to infer that the Professors, generally, entertain a high sense of the importance of their mission, by the care with which they themselves study the constant changes introduced into the processes they have undertaken to explain.

I have more than once had occasion to observe that hitherto a systematic study of the principles upon which our processes are founded, has received more attention at the hands of scientific investigators on the Continent than in our own country. In illustration of this, I may mention that so early as 1844 M. Valerius, a native of Belgium, published his work on the manufacture of iron, which was followed, seven years afterwards, by a second, of great excellence, on that of pig iron, chiefly in relation to the smelting establishments in this immediate neighborhood; and for the last sixteen years there has appeared at Liege the *Revue Universelle des Mines et de la Metallurgie*, a periodical which enjoys as high a reputation as an older one of the same character—I mean the *Annales des Mines* of Paris.

Assembled as we now are, away from the home of the Institute, at one of the localities, and within a few hours' journey of others, in the three great ironmaking States of Continental Europe—viz., Belgium, France, and Germany—it may be interesting to consider, very briefly, of course, some of the peculiar circumstances effecting the production of this metal as compared with those of our own country. The history of the expansion of the iron trade during the last twenty-five or thirty years, indicates with remarkable clearness the nature of those social changes which have followed the introduction of improved modes of transit and of extended international communication. A community of a purely pastoral and agricultural character is more or less shut out from the world, when the physical difficulties attending the export of its produce are such as to check its commerce with the rest of mankind. The life of its inhabitants is necessarily of the simplest kind, and the money value of the fruits of their labor, and of the labor itself, will be found very small when compared with that of a people occupying a more fortunate position. When manufacturing industry is introduced to a limited extent into such a society as the one I have just named, the artisan is more or less affected by the prevailing condition of the surrounding population—living is cheap, and wages are low. At a time (1870) when animal food was selling in England at 7d. to 8d. per lb., its cost at Fullonica, in Italy, I found to be only 5½d.; but the field laborers received only 1s. to 1s. 2d. per day, blast furnace keepers a little above 4s., and slagmen 2s. 10d. At Irun, in Spain, the miners in the iron mines were content to work for 2s.; and at Bilboa, where butcher-meat (1872) was sold at 4½d. per lb., furnace keepers had 4s. 6d., best blacksmiths, 3s. 6d. per day, and puddlers 6s. per ton, rates which were less than two-thirds of those current in England at the same time. It is unnecessary to multiply instances all pointing to the same result, otherwise figures might be given showing, generally speaking, cheap food and low earnings by the men in the ironworks of Norway, Sweden, and Austria.

It might, at first sight, seem immaterial what a man's wages were, provided the cost of the necessaries of life correspond with the rate of his pay. It is, however, a remarkable fact that, as a rule, however low priced provisions may be in these cheap countries, labor is paid for on such a scale as to compel the greater portion of the working population to subsist on very miserable fare. Thus, the ordinary diet of the countryman in the south of Spain, with his fifteen pence per day, consists of *gaspacho*, to furnish which he boils in water one kilo of bread and one ounce of olive oil, and this serves for all his meals for one day. Very few of the workmen of the superior class partake habitually of animal food, and, as a consequence, we find inability for any great physical exertion, which necessitates the employment of an increased number of hands, compared with that required under a different condition of things. I met with a notable instance of this at a blast furnace near Malaga, making about 35 tons of iron per week, at which four men were constantly engaged at the hearth, whose united wages amounted to only 6s. 10d. per day, or an average of 1s. 8½d. each. In such cases no thought is bestowed on economizing labor, which partly accounts for the presence of those four men, and for the seven who, I ascertained, were required for filling the furnace in question. Thus we have, for the cause just mentioned, about twice as many workmen engaged in turning out about as much iron in one week as some of our English furnaces are able to do in twelve hours. Great Britain presents the very antithesis to a community living under the circumstances I have named. Its mineral wealth led to the organisation of manufacturing undertakings, in which coal or iron ore entered largely, and there was, and is maintained within its dominions, a population far in excess of the food-producing powers of its soil. To supply this deficiency, recourse had to be made to foreign nations, whose means and position enabled them to afford the necessary assistance. It is true, for many years an artificial barrier was raised against the unrestricted importation of the necessaries of life, on the ground that the owners of land, farmers, and agricultural laborers, would be overwhelmed in common ruin by what was designated as unfair competition. The experience, however, of thirty years of free trade has proved that every section of society in the British Isles, whether territorial, agricultural, or industrial, has largely profited by the change in national policy. With all this help from without, human food is unquestionably dearer with us than in any other part of the world, but, on the other hand, wages are such as to enable our laboring class to live in a manner never dreamt of by an inhabitant of many districts where living is within reach upon much easier terms. With regard to the three nations whose iron-making capability I propose briefly comparing with that of Great Britain, we should probably not be wide of the mark in supposing that fifty years ago they resembled pretty closely Spain and Italy at the present day, *i.e.*, agriculture was practically the only pursuit of their inhabitants, and the produce of the husbandman's labor was disposed of at very low prices. The formation of railways, and the extension of steam navigation, have enabled the farmers of Belgium, France and Germany to forward their crops at a small expense to more distant markets than was within the power of their predecessors. These same railways have also afforded facilities for rendering available the natural resources, mineral and otherwise, of these respective countries, and hence there has rapidly sprung into existence a vast number of industrial establishments, metallurgical as well as others. These two sources of outlet have sensibly affected the value of the fruits of the soil, and, as an example, I may quote one instance of a German province in which, compared with 25 years ago, butcher-meat and butter show an increase in the one case of 50 to 80 per cent., and in the other of nearly 85 per cent.

TO BE CONTINUED.

Volatilization of Metallic Iron.

In order to determine experimentally whether this metal could be sublimed off at the highest temperature obtainable in a porcelain furnace (regarded as fully 3,000 degs.), Dr. Elsner, the director of the Royal Porcelain Manufactory at Dresden, placed a piece of wrought-iron in a closed crucible of unglazed porcelain in the kiln for several hours. On examining the crucible when cold, it was found that some portion of the iron had been volatilised and condensed upon the under surface of the lid of the crucible, in the form of small needle-shaped crystals.—*Journal of the Iron and Steel Institute.*

Anthracite Coal Burners in New England.

The Boston *Advertiser* gives a description of some new locomotives placed on the Eastern, which have proved a blessing to travellers by preventing the usual rain of cinders. They were made at the Baldwin Locomotive Works, and have many peculiarities of design. The cab is two stories high, and the boiler is eight feet longer than in the usual pattern, extending back to the rear of the frame, so that the fireman's post is in the tender. On top of the boiler, in the two story cab, is provided a seat on either side, one for the engineer and the other for the fireman when he is not otherwise engaged, and as one firing or supply of coal in the fire-box will run the machine thirty miles, his duties are not nearly so onerous as heretofore, when he was almost constantly at work. The engineer's seat is on the right hand side above the running board, where he is entirely surrounded by glass, and is completely protected from the weather. At his side are all the various appliences for controlling the machinery, including the reverse, throttle, variable exhaust, pump, Westinghouse brake, injector and whistle levers, oil valves running from a large tallow cup to the steam chests and blower valve, while in front are the gauge cocks and glass water gauge. This enables him to manage any and all portions of his engine with hardly a motion of his body, while, being at so great an elevation, he has a largely extended view of the road ahead. The cab is of black walnut, finished in cherry and ornamented in gold. The frame and running work is painted a dark chocolate, with green and gold striping, except the wheels, which are in red and green. All the machinery of the engine is of highly polished steel and iron, the finish being fully equal to the best stationary engine work. The boiler is jacketed in Russia iron with brass straps, and the Westinghouse compressed air reservoir, which is usually concealed behind the fire-box, is placed just behind the forward trucks, and is finished in the same material. The fire-box is eight feet long, fitted with water grates and a peculiar dumping attachment. It has a grate surface of twenty-five square feet, against fifteen in the other engines. These grates also pitch forward at an inclination of nine inches in their entire length, which both facilitates combustion and aids the ashes to work out. On top of the boiler are two domes, a sand-box and bell. The drivers are five feet in diameter, and the cylinders are seventeen inches in diameter, with twenty-four inch stroke. The machines each weigh thirty-five tons.

We do not see why gas generators cannot be applied to locomotives. They are well known to be the most economical mode of using fuel, and they permit the use of the poorest fuel that cannot be burned in any other way. The apparent difficulty to be overcome is the necessity of regular work, in order to keep them in good condition. But generators have so far been used only in metallurgical works where a regular supply of gas has been a necessity, and we have no doubt that a little study would make them perfectly applicable to the different conditions of locomotive service. In fact, it is not too much to anticipate that they can be made to supply a large or small amount of gas, and therefore of steam, at need, and with a rapidity of transition unknown now. Their shape and construction would make them more durable than the fire-boxes of locomotives, and they should occupy no more room.

A Coal Cutting Machine in Indiana.

The Brazil *Echo* describes a coal cutting machine working in one of the Block Coal Mines of that place. It is called the Little Giant and consists of a five horse power steam engine, worked by steam carried into the mine by means of an iron pipe, terminating in a few feet of rubber hose which is attached to the steam chests and allows of the free motion of the machine. It is the intention to use compressed air in place of steam as soon as the present experiments are completed. The cutting arrangement is an iron rim of four feet in diameter, which has on its periphery movable steel teeth, placed at points about twelve inches apart. These teeth can be taken out and ground when they become dull. This rim lies on small wheels which support it and allow a free motion, and has cogs on a shaft turned by the engine. By this means the power is applied near the circumference of the wheel, instead of at the center, as in the ordinary circular saw, whereby there is not so much loss in leverage. The principal reason for this arrangement is, however, to get a deeper cut in the coal. This cutter can be put into a depth of three feet and a half, or seven-eights of its whole diameter, whereas the ordinary saw can cut barely to one-half its diameter. The machine runs on a movable track, and is fed by means of a screw working in cogs. The track is put down along the side of the coal at the proper distance from it, and when a cut has been made the whole length the machine is put on trucks and wheeled to the next room, where the track is laid as before, and so through a whole coal mine.

IN OPERATION.

By this time Mr. Brown had changed the teeth, the machine was moved up to the coal on a track running perpendicular to the wall, steam was turned on and things commenced moving. Presently the teeth began chipping away at the hard block, the cutter sank in over the rim, up to the center, and finally all but half a foot of its entire diameter was buried in the solid mass. Having now reached the track that ran lengthwise along the coal, the feed was shifted so as to run the machine on this track. Operations were somewhat embarrassed by props which had been set up without reference to the machine, so that a clear run of any considerable length could not be obtained. We timed it, however, for a distance of eighteen inches, which was cut in two minutes and a half, thus giving a yard in five minutes. The cut is an inch and three-eighths wide, but can be regulated to suit the coal. The cuttings are about as fine as coarse sawdust. When the whole length of the room is cut the machine is moved to another, and men come in and remove the coal that has been cut.

As to the cost, Col. ZIMMERMAN assured us that it would pay. He estimates that one machine by being run on the "double shift," that is night and day, will cut one hundred tons of coal in twenty-four hours. Two men are required to run the machine, who can be employed at probably $2 50 and $3.00 a day respectively. This would make the wages amount to $11 per one hundred tons of coal. Allowing 50 cents a ton for getting out the coal after it is cut, and it probably can be done for considerable less, we have a total cost of 61 cents per ton. Add to this say four cents a ton for wear and tear, etc., and the cost is 65 cents. As it is now, the mining costs $1.00 per ton, and in some cases even more. Here is a saving of 35 cents a ton, which in a mine that turns out two hundred tons per day, amounts to the snug sum of $70 a day. As the machine will not cost more than $700 to $800 it is plain that it would be a profitable investment. But there is another saving not to be overlooked, that of the waste in mining. By the ordinary method of mining the miner cuts away an average of one-seventh of the coal in making the "bearing in." This is sold at a nominal price as "slack" or "nut coal" after having been double screened. The machine cuts away only an inch and a half, which in a vein four feet thick, would be only the one thirty-second part of the whole amount of coal ; thus saving about a ninth in the amount of coal mined. This is no inconsiderable item. In a mine with capacity for taking out two hundred tons per day it would amount to more than twenty tons. It is evident, therefore, that the machine will pay. And we may add that the machine now in use is the first one of the kind that has ever been built. Doubtless improvements may be made on it, as there have been on all machines. Time will be saved, too, in the handling of it. After once becoming familiar with it it may safely be computed that not half the present amount of time will be required to shift it from room to room in the mine. And now a word as to

THE INVENTOR

before we close. S. H. BROWN was formerly a citizen of this place and followed the business of architect and builder. He has for some time past lived in Indianapolis, engaged in making patterns for a machine shop. He is apparently about thirty years of age, of a quiet gentlemanly deportment and a matter-of-fact way, in strong contrast with the fiery enthusiasm of inventors of the perpetual-motion class. The Colonel maintains that his extraordinary cerebral development, (he wears a seven-and-a-half hat we believe,) has something to do with his inventive talents.

Much of the credit of the invention of the machine is due to NIBLOCK, ZIMMERMAN & ALEXANDER, who have spent considerable money in experimenting in the matter. Their attention was attracted to the subject of a coal cutting machine something over three years ago, at which time Mr. Brown undertook the invention of one. The first experiment was made on the principle of an endless chain with cutters attached, but this method was not, for some cause, found practicable. Another machine was afterwards gotten up which had a sort of curved saw with a peculiar elliptical motion. This cut the coal but seemed to require too much power to be of practical use, and was abandoned. Finally the efforts of the inventor and his associates were rewarded with the machine now under consideration, and which, they are sanguine, combines the true principle and will prove an entire success. Meantime we will keep our readers posted in regard to subsequent developments.

The Paleozoic Fishes of Ohio.

THE rocks of Ohio are well known to contain some of the most remarkable cemeteries of ancient fishes in the world. At the late meeting of the American Association, Prof. J. S. NEWBERRY, Chief Geologist of Ohio, exhibited some beautifully-preserved fossil fishes from the Devonian and Carboniferous rocks of that State. Among them was a jaw 18 inches long, and very massive, which belonged to a great bucklered fish called by him Dinicthys, or terrible fish, which resembled Coccosteus of the European old red sandstone, but was a hundred times as large. In the largest specimens of this fish the jaws were 2 feet long, the teeth of the upper jaw 7 inches long, one plate from the back 2 feet square. The specimen exhibited was the jaw of a new species of this genus, in which the jaws shut over each other like the blades of shears. This came from the Huron shale, Lorain County, Ohio.

Dr. NEWBERRY also exhibited a series of exquisitely-preserved small-scaled fishes from the cannel coal of Ohio. In these fishes every scale and fin-ray is shown, and the whole fish is coated with a thin film of sulphide of iron, and thus "gilded." Shark teeth and spines, scales and teeth of large ganoïds, and skeletons of many carnivorous salamanders are found, all preserved in the same beautiful manner.

In describing the formations which contain these fossil fishes, Dr. NEWBERRY said : "Each of these great geological systems, Silurian, Devonian, Carboniferous, etc., was composed of strata formed by invasions of the land by the sea, each invasion forming the record of one great submergence, the lime-stones which form each system being the deposit from the sea when the submergence was most complete. The sediment of the Lower Silurian sea contained no fish remains, but of all the classes of invertebrate animals in abundance. The rulers of this sea were gigantic cuttle-fishes, of which the shells are now called *orthoceras*.

In the Upper Silurian sea, fishes existed in Europe, but none have yet been found in the sediment of this sea in America. When the waters of the Upper Silurian sea were withdrawn into the basins which have always been ocean, perhaps a million of years elapsed before they came back to the Devonian sea. In that sea were hosts of fishes, many of them of large size, clad in scale and plate armor, and provided with formidable jaws and teeth. These plated fishes were the rulers of the Devonian sea.

In the sea of the Carboniferous age, sharks were the largest and most powerful of fishes, and were the tyrants of the ocean, as now. In the bays, lakes, and rivers of the carboniferous continent were many small scaled ganoïds, like those exhibited. The garpike is the modern representative of these."

Lake Superior and Missouri Iron Ores.

THE receipts of iron ore at this port, for the year 1873, will be very largely in excess of 1872, consequent upon the increased number of furnaces. In 1872 the receipts of ore aggregated 149,060 tons. For the first seven months of 1873 the receipts foot up 181,475 tons, as will appear by the following table ;

Ore received.	1872. Tons.	Jan. 1 to Aug 1, 1873. Tons.
From Missouri	67,430	77,485
From Lake Superior	81,630	103,920
Total	149,060	181,475

Thus it will be seen that we have already received, in 1873, 32,415 tons more ore than was taken during the whole of 1872.

In this connection we append the following from the *St. Louis Dispatch* :

"It is reported on pretty good authority, that the Pittsburgh and Wheeling iron manufacturers, recognizing the impossibility of competing with Missouri in the production of her ores, are quietly buying up all the mineral lands offered for sale as the only method of protection left to them. A Wheeling company lately bought one of the richest mines yet opened in this State, and is now shipping direct to that point, for manufacture there, from ten to twenty car loads of ore daily."

The exorbitant prices demanded for ore by the Missouri producers, would no doubt render it desirable for Pennsylvania manufacturers to purchase and work mines on their own account. If they have the capital to do so, why should they not? The important fact still remains, that the ore must be brought to the fuel, and that while our coal fields hold out we need have no anxiety as to "competition" either in Missouri or elsewhere.—*Pittsburgh Commercial.*

Coal Mining in China.

AN interesting official report has just been published, giving an account of the coal district of New-chwang in China, which district, it is stated by the British consul resident there, is likely to become, at no distant date, "the outlet of extraordinary mineral wealth." The coal mining district is divided into two sections—the one called Hua-tzu-ling, and the other Pen-si-hu. At the former place, there are as many as seventy or eighty different colliery establishments, giving employment to a considerable number of men. The principal mine is said to be about 400 feet in length. The miners lead a wretched life. The labor is very severe, and they work without other clothing than a covering for the loins. They are mostly paid by the number of baskets they bring up from below ; and a strong man can only earn about 1s. 2d. in the course of a day. They have no fixed engagements, but are allowed to come to or leave work as they please. In some of the mines, however, they are engaged for specific periods—say for the entire season—at fixed wages, calculated at the rate of seven pai a day (4½d.), independently of the amount of work they are able to perform. The mines of Pen-si-hu are larger and more numerous than those at Hua-tzu-ling. The coal, however, is worked at the former district as in the latter, by a great number of different and independent firms, some of them even only having one shaft, and employing as few as ten or a dozen hands. But there are several large establishments. The largest is termed the Chu sing-fu, and employs over 2,000 men. Seven pits or shafts, with separate entrances, are worked by the proprietors of this mine. They are all near each other, on the same hill side, and are almost identical as to size and construction. The average length is said to be 500 feet There is often, though not always, a mat shed or small house, covering the mouth of the pit. The latter consists of a single shaft, which runs down at a slant of about 45 degs. None of the shafts are perpendicular, and all the coal is carried up along the inclined plane by a class of men to whom this duty is specially allotted. Their load is packed into two baskets, which are attached to the ends of a short carrying pole, borne upon the left shoulder. The shaft of the Chu-sing-fu establishment is nearly 7 feet high the entire way, and at the bottom a man is easily able to stand erect. The breadth is about the same number of feet. The shaft is solidly supported on all sides by the trunks and branches of trees, which are cultivated for this particular purpose on the hills around. Strong perpendicular beams of fir on both sides support an equally strong roof of the same material ; while below the wood is so arranged as to form steps along the whole of the incline to the bottom. In returning from below with the load, each miner makes use of a strong curved stick, which he carries in his right hand, to catch the projection of the steps above ; and in this manner he is enabled to support and pull himself along in his laborious journey to the top. One man's load weighs from 66 lb. to 93 lb., and it is stated that a strong man is able to accomplish thirty trips in the course of a day. The land on which these coal mines are situated belongs to two Chinese, who rent it to the firm engaged in the mining for a fixed annual payment. The latter firm works the mine, and deals with the local coal merchants, whom they supply wholesale with the best coal at the rate of something like 9s. 6. per ton. In addition to rent, a land tax of £7 4s. per annum goes to the Imperial Exchequer, but there are no duties of any kind leviable upon the coal, either at the mine itself, along the road, or at the markets whither it is sent.

The present manager of the Chu-sing-fu Mine, it is stated, does not possess the least geological knowledge. He simply understands the management of mines; and when he wishes to open a new shaft he calls in a "paer tou," or specialist, who professes to thoroughly understand the subject, and who advises him as to the site and direction to be selected. Coal-mining here does not seem to be unusually successful. The present manager of the above-mentioned mines states that he has had heavy losses. It is satisfactory that accidents of any kind amongst the miners appear to be extremely rare. In addition to the collieries in this district, there are several iron mines in operation. The method adopted of working the metal differs in no material respect from those employed in Europe; but it is mentioned that the inferiority of their implements places them at a disadvantage as compared with the workmen of more advanced countries. The moulds used, after the ore has been subjected to the furnace for the first time, are of clay.

MINING SUMMARY.

California.

BEAR RIVER TUNNEL SCHEME.

From the *Mining and Scientific Press* of August 30:

A good example of the manner in which deep and narrow ravines become filled up and finally converted into alluvial valleys, and river bottoms, is presented at many points where hydraulic mining is now being prosecuted in California. One of the most notable instances of this kind is found along Bear river, and its principal tributaries. For more than twenty years these streams have been the receptacles of the tailings from the rich and extensive mining region drained by them. Originally they were steep and narrow gorges, having, however, but a moderate descent. Owing to this latter feature, the debris from the mines began early to make lodgement along them, so early that much of the auriferous gravel on their banks was covered up before it could be washed; and only a comparatively small portion of their beds was ever worked out. In this respect these were different from most other streams throughout the mining regions of California, nearly all of which have a steep grade, and consequently a swift current that bears off the sediment brought into them, and deposits it a long way below.

For some years at first the winter freshets sufficed to sweep away the greater part of these tailings lodged here during the rest of the season. But being afterwards augmented by the rapid extension of the hydraulic washings, they at length accumulated to such a degree that a portion of the lower stratum remained undisturbed, having perhaps first obtained a permanent foothold during an extremely dry winter. After this the greatest floods failed to clean out these streams altogether, the ordinary winter freshets serving only to reduce the volume of their contents by carrying off the lighter and more worthless material, while the coarser sand, gravel and shingle, including most of the gold and quicksilver, impacted into a solid mass, was left behind. The highest stages of water occurring during the past twelve years have been insufficient to lay bare their beds at more than a few places, nearly all situated some distance below the seat of active hydraulic operations. For a long time past these creeks and rivers have been so filled up that the falls and rapids along them have completely disappeared, the gravel occupying their channels, and which had a descent of about fifty feet to the mile, being graded as evenly as the bed of a railroad.

When left to the operations of natural causes the formation of the alluvial bottoms is conducted after this manner. Floods occurring from time to time, bring down and leave along the banks of the streams a quantity of sediment. Having subsided, the reduced volume of water makes for itself a channel through this sediment, keeping it till another overflow occurs, which may, and often does, fill up this channel, or wash out additional ones, making, meantime, new deposits over the entire face of the flat, or so much thereof, as may have been submerged. And so this procedure is kept up one year after another, until this alluvial wash accumulating gradually raises the surface higher and higher, and enlarges the area of these valley lands till the passage way that the water has made for itself becomes so broad and deep that the stream seldom any more overflows its banks, and the process of land-making is arrested, or proceeds here very slowly, the great mass of the debris being thereafter carried on and left at points further down.

Where these ravines are filled up with hydraulic slums the mode of procedure is somewhat different. In extremely wet winters, the floods sweep away the top layers of gravel, lowering the surface from side to side, but leaving the great body smooth and untouched. During the rest of the year the water, reduced to a comparatively small volume, runs in a number of narrow channels, which readily filling up with sand, clay and gravel, are abandoned for new ones, and in this manner the entire surface of the deposit is gradually raised, being at the same time kept at a uniform level. Sometimes as many as half a dozen rivulets will be seen meandering along these flats with much scattered water flowing between them.

For the past ten or twelve years the annual increment of tailings in these streams has reached from ten to thirty feet, while the reduction caused by high stages of water has gone on at about two-thirds that rate. With dry winters their bulk has been reduced but little, while with extremely wet ones a large proportion of them has been run out. Latterly the water has acted upon them with diminished force owing to their becoming so much impacted and spread out over so great a surface.

In linear extent the tailings occupy the bed of the main Bear river for a distance of more than sixty miles, reaching all the way from Elmore Hill, a little above Dutch Flat, to the mouth of the river. In some places they are not over 100 feet wide on the surface, while at others, where the river channel is spread out or coves have been formed by inflowing streams, they expand to a width of four or five hundred feet. In depth they are equally variable, being more than 100 feet deep at some places, while they are not over 20 or 30 feet deep at others. Above Colfax, the section richest in gold, they are estimated to have an average depth of 60 feet and a width of 200; this applies to Greenhorn Canyon, Steep Hollow, Missouri Canyon, and other tributaries of Bear river as well as to the main trunk itself.

After leaving the foot-hills, Bear river, like all the streams descending from the Sierra, flows with a less accelerated current and through a broader channel, whereby extensive bars and flats have been formed along it from these hydraulic washings. As only the more comminuted particles of clay and sand have been floated this far down, we have in these the elements for a good soil, portions of these new made lands, as well as others adjacent, that have been enriched by the overflows of Bear river, having been cultivated with success. Mingled with this sand there is of course a great deal of gold, none of which can ever, perhaps, be gathered with profit, owing to its unpalpable fineness and to its being mixed up with such a disproportionate amount of barren matter. Did the gold exist here in much larger quantity and under otherwise more favorable conditions it could not be collected to advantage by any of the means or methods now in use, because of a lack of sufficient fall along this portion of the river to admit of sluice washing. As a rule, the further we go below the mines the smaller the quantity of precious metal contained in these slums. After leaving the vicinity of the large hydraulic claims the amount of free gold, as well as of quicksilver, amalgam, sulphurets and black sand diminishes at the rate of two or three per cent. for every five miles we make down stream.

But much as the tailings up near the mines abound in these valuable substances, the same trouble is encountered here that confronts us further down, there being a lack of sufficient fall to admit of uninterrupted sluice washing on a large scale. Fortunately, this difficulty is not irremediable. The North Fork of the American river separated from Bear river by a narrow divide, runs in a bed nearly 800 feet lower than that of the latter stream, rendering it possible, by the construction of a tunnel through this divide, to pass these tailings out of Bear River and dump them into the North Fork, where they can nevermore be the cause of any trouble, the gold being extracted from them while on their passage from one stream to the other.

This project has been talked of and the necessity of its execution long foreseen; but not until the present summer has any party determined to carry it out practically. In the month of April last a company was organized in this city for the purpose of determining by careful examination the quantity and value of these tailings, the proper site for a tunnel, the cost of its construction, outfitting, etc. After three months spent in the field, a corps of able engineers and experts having reported favorably on the scheme, both as regards feasibility and resultant profits, this company will proceed at once with the work, the first step being to settle the style of drilling machine to be employed in driving the tunnel, in connection with which all needed drafts and surveys have been made, and other preliminary work completed.

According to the report of the Company's Mining Engineer, there are 50,000,000 cubic yards of these tailings now resting in the bed of Bear river, and its branches above the site of the proposed tunnel, and all of which will have to be passed through it. These tailings, it is calculated, will yield about 65 cents to the cubic yard, making an aggregate product for the whole mass of nearly $30,000,000, aside from the quicksilver and sulphurets they contain. The quantity of quicksilver mixed up with this material is estimated at 400 tons, most of it existing in the form of amalgam. It is believed that the tunnel can be completed and the entire work be outfitted and placed in running order within eighteen months from the time the machine drills are set up, it being the intention of the engineer to drive the excavation from eight different faces—six from a shaft—and two inclines to be sunk along the line of the tunnel, one from each end of it.

This tunnel will be 12,540 feet long, will be 12 feet wide and nine feet high and will be run on a six-inch grade—that is, it will have a fall of six inches to every 12 feet. It will set in four feet below the bottom of Bear River and come out 300 feet above the North Fork, making a descent of 394 feet on its passage through the divide. The site fixed on for this tunnel is at Cape Horn, a noted locality on the Central Pacific Railroad. A flume reaching from side to side will be laid down along its entire length. This will be paved with large cobble stones, except a few hundred feet at the upper end which will be laid with blocks. A similar structure will be laid down in Bear River through which to pass the tailings, this being advanced up stream as fast as these are run out. The principle gold saving apparatus will be placed below the tunnel along the North Fork, it being intended that this shall be of the most ample and perfect kind. It is the purpose of this company to save everything of value, the quicksilver and sulphurets as well as the flour gold and black sand, to which end no pains or necessary expenses will be spared. The flumes, gates, dams, &c, are to be built of massive timbers and to be anchored into the bed rock with iron bolts in such a manner that no flood can move them.

It is calculated that the entire cost of this work, tunnel, flumes, gold saving appliances, etc., included, will amount to about $600,000, and that the gross annual revenues will be about one and a half million dollars for the first year, two and a quarter for the second, and four and a half for every year thereafter, this increased product being due to the greater richness of the gravel as work is advanced up stream. It would require ten years to exhaust the stock of material on hand if no accessions were meantime made to it. With new supplies constantly coming in it will require nearly twice that time to approximately clean out these channels, there being, of course, no such thing as keeping them entirely free from tailings as long as mining itself is continued. There can, therefore, be an end of these operations only when the business of hydraulic washing shall itself cease, an event not likely to happen in this century nor yet in the next. It is matter for public congratulation that an outlet for these tailings is likely to be furnished at an early day, as they had already accumulated to a troublesome extent and if suffered to go on unchecked, must have soon seriously obstructed many mines tailing into these streames. The work is said to be in excellent hands, the company having it in charge being made up of some of our most sterling business men, and of practical miners interested in the section of country to be benefited by their proposed operations. That the enterprise is entirely feasible, admits of no doubt, nor is there any question but it will prove immensely profitable to those concerned in carrying it out.

American Institute of Mining Engineers.

OFFICIAL BULLETIN.

Announcements to Members and Associates.

I. The ENGINEERING AND MINING JOURNAL, which is the Organ of the Institute, and contains its proceedings, transactions and notices of meetings, will be sent to each Member and Associate on the payment of his annual dues. Back numbers cannot, as a rule, be sent.

II. Dues are payable in advance at the annual (May) meeting. Remittances should be made, as far as possible, by P. O. Order, payable to the Secretary.

III. The first volume of Transactions of the Institute is in course of preparation and will be sent, as soon as issued, to all members not in arrears.

IV. General meetings are held on the fourth Tuesday of February, May and October. Authors of papers are requested to notify the Secretary, in advance of meetings, of the subject and length of their papers.

THOMAS M. DROWN, Secretary.

1123 Girard street, Philadelphia, Pa.

Advertisements.

The special advantages of the ENGINEERING AND MINING JOURNAL, as a medium for advertisers, are so great and so widely known that it may seem almost needless to call attention to them. It is extensively circulated among the engineers of the country and takes a position in this respect before any other publication of the kind. It has a large and constantly increasing circulation among miners and mine owners, and men connected with mining operations generally. As it is the only paper in the country that makes this subject a specialty it has this field entirely to itself, and is the only direct and reliable means of reaching this class of persons. Being kept on file by almost every subscriber, it is doubly valuable as a permanent means of keeping an advertisement before the public. It is the Organ of the AMERICAN INSTITUTE OF MINING ENGINEERS, and is regularly received and read BY ALL THE MEMBERS AND ASSOCIATES of that large and powerful society, THE ONLY ONE OF THE KIND IN THIS COUNTRY. It is therefore the best medium for advertising all kinds of machinery, tools and materials used by engineers or their employees. It is the recognized organ of the coal trade, and is taken extensively by the trade throughout the country, and presents the very best means of reaching that very important class of men.

The rates of advertising, compared with those of other weekly industrial publications, are very low, especially when the class of consumers among which its large circulation is almost entirely confined, is taken into consideration.

Rates of Advertising.

Back Page............................40 cents a line.
Inside Pages..........................35 cents a line.

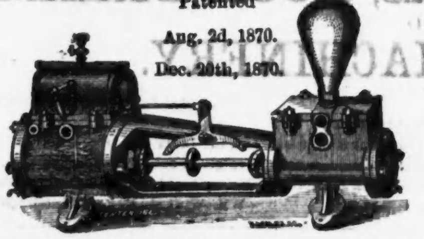
Engravings may head advertisements at the same rate per line, by measurement as the letter-press.

MISCELLANEOUS.

THE SELDEN DIRECT-ACTING STEAM PUMP

A. CARR, Manufacturer & Proprietor.

Patented Aug. 2d, 1870. Dec. 20th, 1870.



Combining simplicity and durability to a remarkable degree. Its parts are easy of access, and it is adapted to ALL PURPOSES for which Steam Pumps are used.

AS A MINING PUMP

It is unsurpassed. Also,

Steam, Gas and Water Pipe, Brass Work. Steam and Water Gauges, Fittings, etc. etc.

CARR PATENT STEAM RADIATOR.

Send for Price-List and Circulars.

Address A. CARR,

feb15.72:24 43 Courtlandt Street, New York.

EDWARD SAMUEL,

Iron Broker and Commission Merchant,

332 WALNUT STREET, PHILADELPHIA.

Solicits consignments and orders to purchase or sell American or Foreign Raw or Manufactured Irons.

Dec. 31:tf

THOMAS M. DROWN,

ANALYTICAL CHEMIST AND CONSULTING METALLURGIST.

1123 GIRARD STREET, PHILADELPHIA.

J. W. HARDEN & SON,

MINING ENGINEERS,

430 *Walnut Street, Philadelphia.*

Coal and Iron Ore properties reconnoitred and reported on. General plans, Working drawing, and Estimates of Mining structures and Machinery supplied. Periodical underground Surveys made and kept up. Geological and Geographical Surveys made. April 22.1y

---

RICHARD P. ROTHWELL,

MINING ENGINEER,

ROOMS 107, 108, 109,

71 Broadway, New York.

COAL AND IRON A SPECIALITY.

P. O. Box 2487 N. Y.

MAYNARD & VAN RENSSELAER,

Mining and Metallurgical Engineers, Experts in Iron, Analytical Chemists,

24 Cliff Street, New York.

GEO. W. MAYNARD. SCHUYLER VAN RENSSELAER

To INVENTORS AND MANUFACTURERS

The Managers of the 42d Exhibition of the American Institute, of the City of New York, beg to announce, that the Exhibition Buildings on 2d and 3d Avenues and 63d and 64th Streets, will be open for the reception of heavy Machinery August 18th and for other articles, September 1st 1873. The Exhibition will be formally opened September 10th.

For particulars, address "General Superintendent, American Institute, New York."

May 27-Sept. 10

ISIDOR WALZ, Ph.D.

ANALYTICAL AND CONSULTING CHEMIST.

No. 18 EXCHANGE PLACE, NEW YORK.

WOOD ENGRAVING

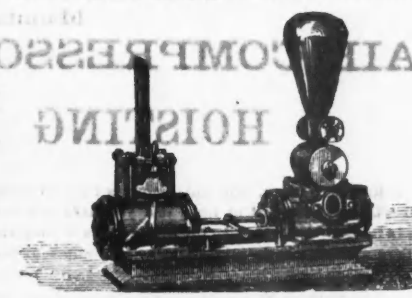
EXECUTED AT THE OFFICE OF

The Engineering and Mining Journal

27 PARK PLACE, NEW YORK CITY.

STEAM PUMPS.

Niagara Steam Pump Works.



This Pump has taken the first premium at every Fair in the United States where there has been a practical test.

CHARLES B. HARDICK,

No. 23 ADAMS STREET, BROOKLYN, N. Y.,

Sole Manufacturer of

HARDICK'S PATENT DOUBLE-ACTING

Patented in England, Belgium and France. Send for circular. feb-13-1y

---

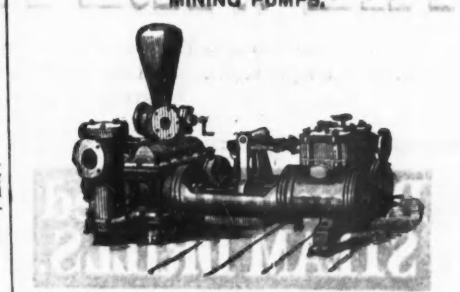
HYDRAULIC WORKS.

MANUFACTORY,

BROOKLYN, N. Y.

Steam Pumping Engines, Single and Duplex, Worthington's Patent, for all purposes, such as Water Works Engines, Condensing or Non-condensing; Air and Circulating Pumps, for Marine Engines; Blowing Engines; Vacuum Pumps, Stationary and Portable Steam Fire Engines; Boiler Feed Pumps, Wrecking Pumps,

MINING PUMPS.



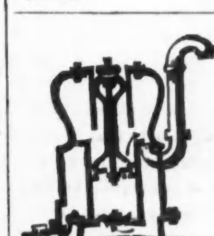
Water Meters, Oil Meters; Water Pressure Engines.

Steam and Gas Pipe, Valves, Fittings, etc. Iron and Brass Castings.

Send for Circular.

H. R. WORTHINGTON,

jan2-1y 59 Beekman street, New York.



MINING PUMPS.

Well Pumps,

AND PUMPS FOR ALL PURPOSES.

Simple, cheap, and effective.

J. D. WEST & CO.,

40 Cortlandt St., N. Y.

J. CLAYTON'S

Patent Fly Wheel

STEAM PUMP,

AND

STEAM ENGINE COMBINED.

These pumps are the cheapest first-class pumps in the market.

All sizes made to order at short notice.

JAMES CLAYTON, 24 & 26 Water st.,

Nov18-tf Brooklyn, N. Y.

Office: 50 & 52 John street, New York.

COAL SHIPPERS.

THE NEWBURGH ORREL COAL COMPANY

Mines at Newburgh, Preston Co., W. Va.

Company's Office, No. 52 S. Gay St. Baltimore, Md.

C. OLIVER O'DONNELL.............................President.

CHAS. MACKALL.............................Secretary

This Company offer their very superior Gas Coal at lowest market prices.

It yields 10,096 cubic feet of gas to the ton of 2,240 lbs. of good illuminating power, and of remarkable purity; one bushel of lime purifying 6,792 cubic feet, with a large amount of coke of good quality.

It has been for many years very extensively used by various Gas Companies in the United States, and we beg to refer to the Manhattan, Metropolitan, and New York Gas Light Companies of New York, the Brooklyn and Citizens' Gas Light Companies of Brooklyn, N. Y., the Baltimore Gas Light Company of Baltimore, Md., and Providence Gas Light Company, Providence, R. I.

The best dry coals shipped, and the promptest attention given to orders. sep21-1y

---

Philadelphia and Reading COAL & IRON CO.

OFFICE, No. 9 PINE STREET.

E. A. QUINTARD, Agent.

NEW YORK, March, 1873.

OFFER

Hard and Free Burning White Ash Coals,
Schuylkill Red Ash,
Alaska Red Ash,
Shamokin White Ash,
Shamokin Red Ash,
North Franklin,
Lorberry, and
Lykens Valley Coal,

ON BOARD, AT PORT RICHMOND,

PHILADELPHIA,

OR

DELIVERED IN NEW YORK,

AND AT

ALL PORTS ALONG THE SOUND AND HUDSON RIVER.

Circulars of Prices will be issued on the 20th of each month

COXE BRO.'S & CO., CROSS CREEK COLLIERY, Miners and Shippers of the Celebrated

Cross Creek Free Burning Lehigh Red Ash COAL.

FROM THE BUCK MOUNTAIN VEIN.

OFFICES;

Philadelphia, No. 206 South Fourth street.

Drifton, Jeddo P. O., Luzerne Co., Pa.

Agent in New York, SAMUEL BONNELL, Jr.,

Room 43, Trinity Building,

feb-1 111 Broadway

DETMOLD & COX,

ANTHRACITE AND BITUMINOUS

COALS.

Office, 40 Trinity Building, New York. jan 22-1y

STEPHEN S. LEE & SON,

Miners and Shippers of

GEORGE'S CREEK COAL.

SWANTON MINES.

No. 49 West Lombard street,

may28-tf BALTIMORE.

MARYLAND COAL CO.,

Miners and Shippers of the best George's Creek Cumberland Coal.

Office No. 12 Trinity Building.

W. W. BRAMHALL, Secretary & Treasurer.

A. CHAMBERLIN, President.

jan23.1y JOHN K. SHAW, Vice President.

THE DESPARD COAL COMPANY OFFER THEIR Superior DESPARD COAL to Gas Light Companies throughout the country.

MINES IN HARRISON COUNTY, West Virginia.

Wharves, Locust Point, Company's Office, No. 29 South st. } Baltimore.

AGENTS;

PARMELEE BROTHERS, No. 32 Pine street, New York. BANGS & HORTON, No. 31 Doane street, Boston.

Among the consumers of Despard Coal we name Manhattan Gas Light Co., New York; Metropolitan Gas Light Co., New York; Jersey City Gas Light Co., Jersey City, N. J.; Washington Gas Light Co., Washington, D. C. Portland Gas Light Co. Portland, Maine.

Reference to them is requested.

"IRON" (WITH WHICH IS INCORPORATED the MECHANIC'S MAGAZINE,) a Journal of Science, Metals, Patents and Manufactures, Engineering, Building, Railways, Telegraphy, Shipbuilding, Factory News, etc., etc.

Subscription, 30 s. per annum, post paid.

To be had of all Newsvenders and from the office: 80 Cannon street, London, England.

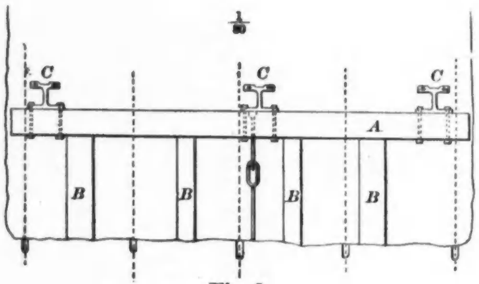


Fig. 8.

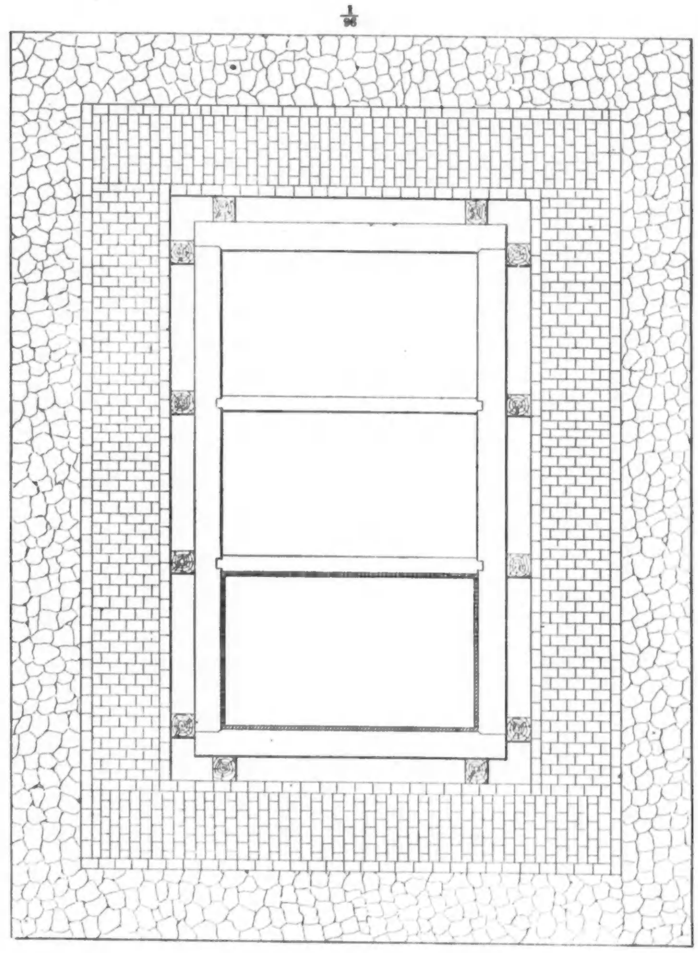


Fig. 6.

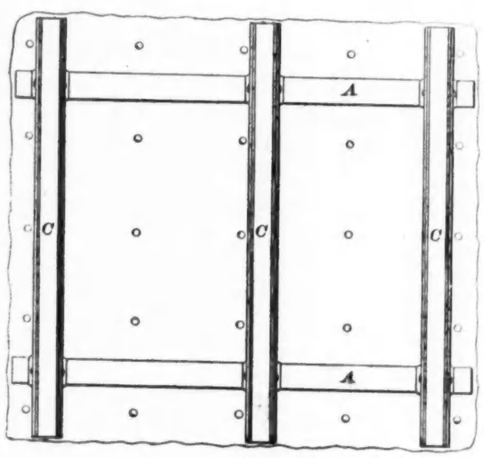
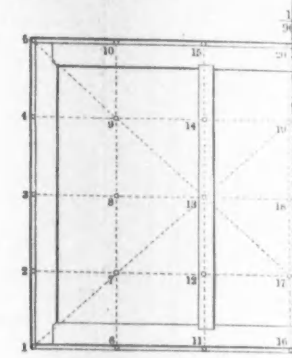
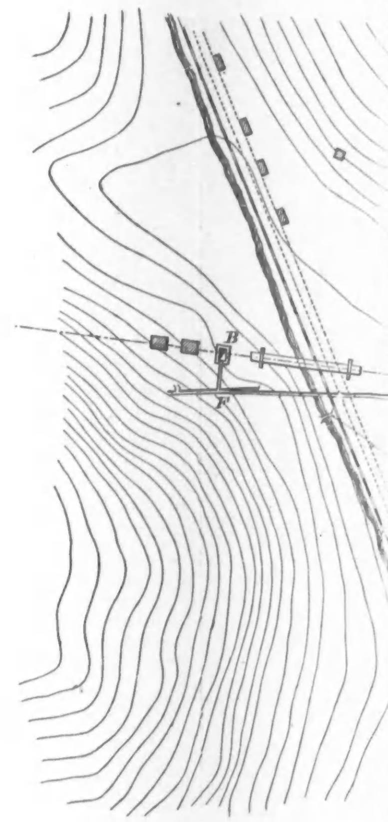


Fig. 9.



Fi

1/4800
Fig. 2



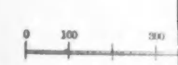
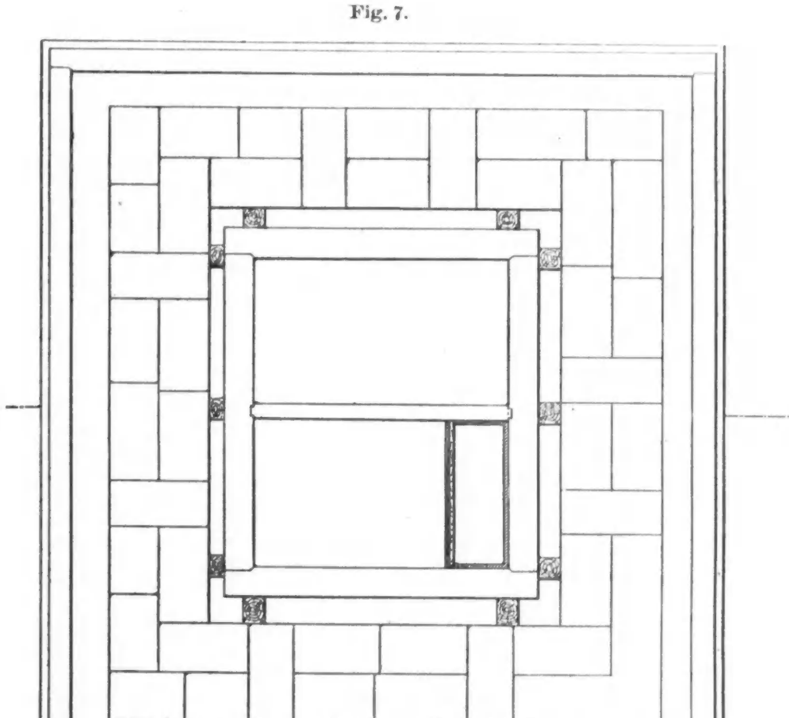


Fig. 7.



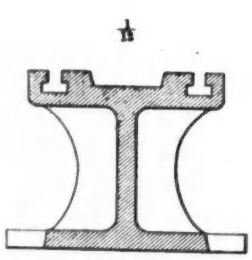


Fig. 10.

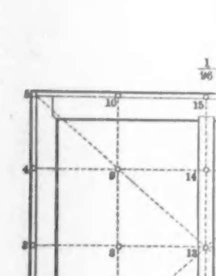


Fig. 5

1/96

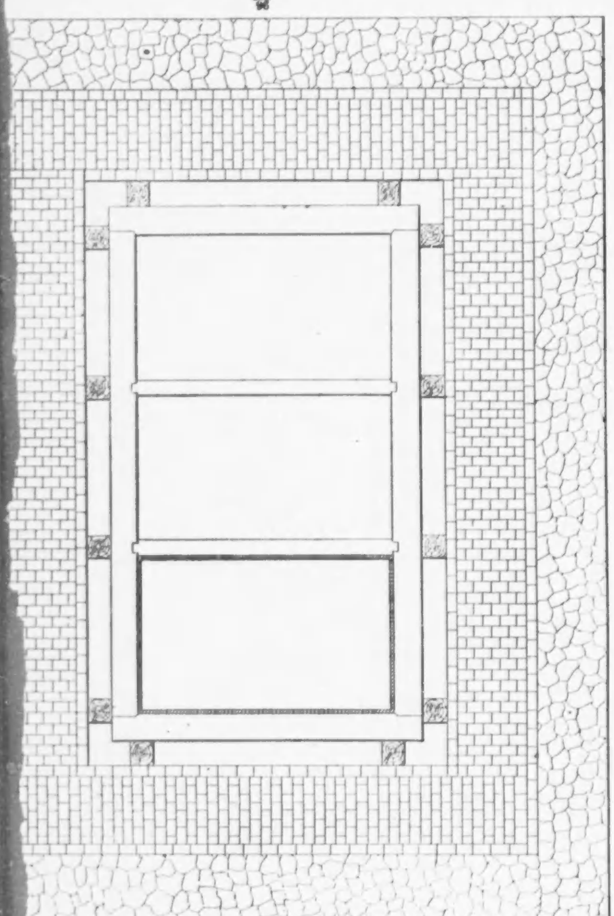


Fig. 6.

1/96

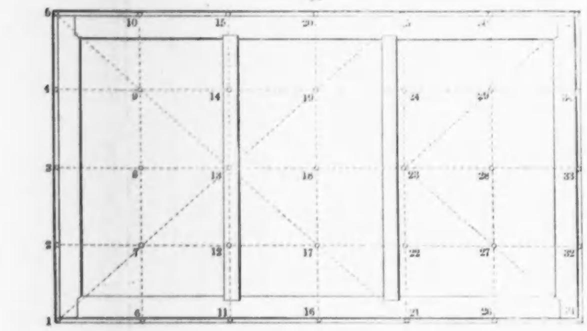


Fig. 4.

1/4800
Fig. 2.

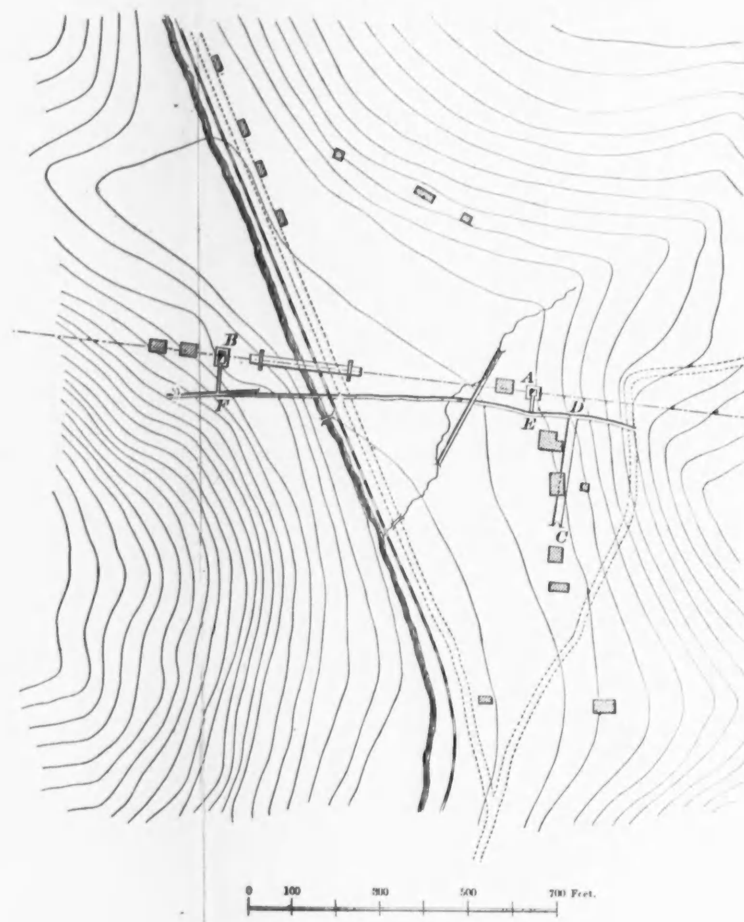
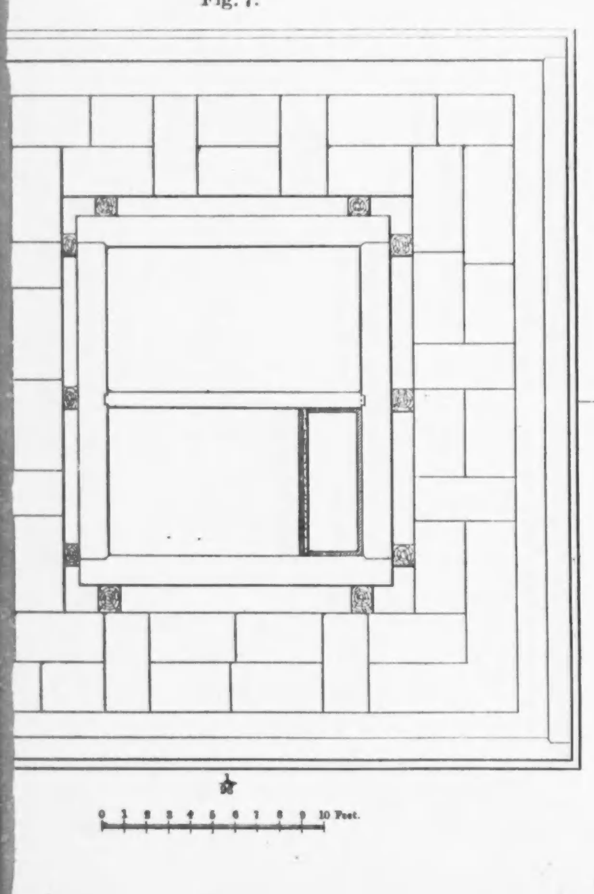


Fig. 7.



1/96

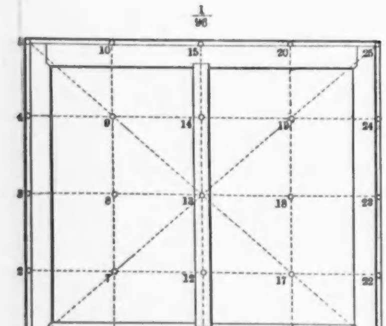


Fig. 5.

23, 1873.

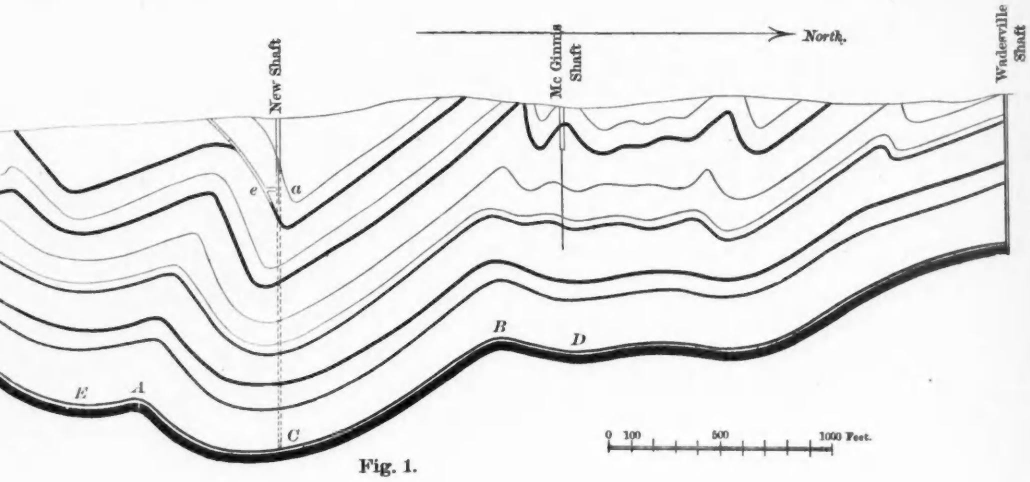
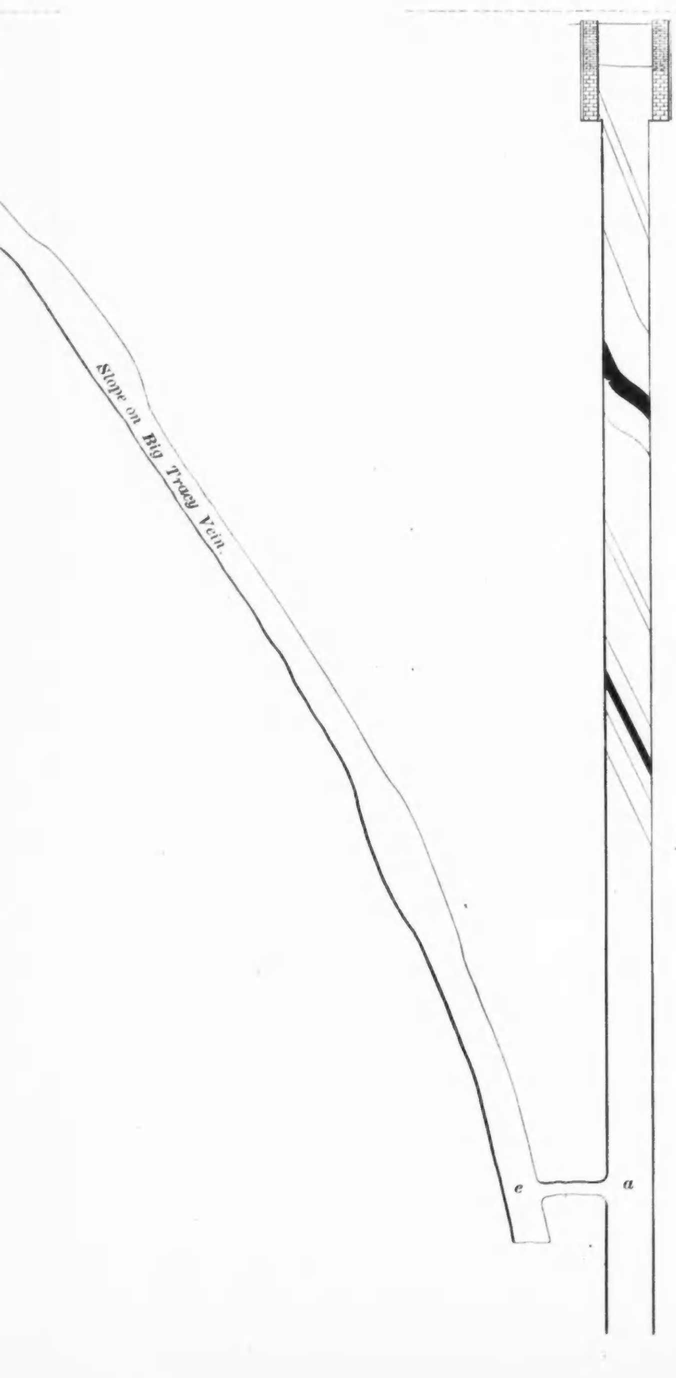


Fig. 1.

Fig. 3.



$\frac{1}{720}$

Fig. 3a.