THE ENGINEERING AND MINING JOURNAL.

VOL. XV.—No. 14.—FOURTH SERIES. NEW YORK, TUESDAY, APRIL 8, 1873. PRICE 10 CENTS PER COPY.

THE GUILD AND GARRISON STEAM PUMP.

The Guild and Garrison Steam Pump.

The unprofessional observer, looking at the almost numberless illustrations of steam pumps to be found in the advertising columns of technical journals, would probably be puzzled to guess in what respect they differ, and why one is better than another. He would be still more surprised to learn that new patents are taken out every week for improvements which do not appear to alter the form of the pump in any respect, for when the new machine is advertised, it does not seem to differ from the long array that has gone before. The truth is the critical points in pumps as well as in many other things are those which work entirely out of sight, and give no sign to the unpracticed observer. The effort toward improvement is mostly confined to the valve action ; simplicity, strength and ease of movement, so far as these are dependent on the other parts of the machine, being elements which are common to most modern pumps. But in the valve action there is the greatest diversity: Messrs. GUILD & GARRISON have aimed to produce a valve movement which shall give the piston a uniform speed throughout its course, without jarring or pounding, and which will act in any position of the piston. Their mechanism consists of a small auxiliary steam cylinder and piston which actuate the ordinary valve of the cylinder. The small cylinder has its own valve which is moved by a rocker shaft, the latter receiving its motion from the pump piston rod. The movement of the pump rod, therefore, admits steam into the small cylinder, which is in itself a small engine whose duty is to work the large valve. In addition to this the valve gear is so arranged that if the small piston moves too slowly the valve is reversed by the main piston itself, the action taking place before the piston can touch the cylinder head. The valves work accurately and the piston runs without concussion.

The inventors and manufacturers are Messrs. GUILD & GARRISON, 34 to 44 First street, Williamsburgh, N. Y.

The American Institute of Mining Engineers.

BOSTON MEETING.

THIRD SESSION—WEDNESDAY AFTERNOON, FEBRUARY 19, 1873.

(*Continued from page* 194.)

After the reading of Mr. RAYMOND'S paper, on

A MINING TRANSIT AND PLUMMET LAMP,

some discussion ensued. A member inquired the price of the transit.

The PRESIDENT—I am not certain; but my recollection is, that it is $190. Whether that is cheaper than foreign instruments, I do not know. The Coast Survey uses instruments made in London; but these are imported free of duty, for that department of the Government service.

Mr. FRANK FIRMSTONE—With regard to what is said in the manufacturers' description about clamping the needle, and reading all angles from the horizontal limb, I would remark that, so far as I know, no one who pretends to do correct work needs the compass, except for checking errors. In my own practice I select some one course of survey—generally the true meridian—and calculate the bearings of all the other courses from that by deflection; but I never omit to read the needle, even when I am in a place exposed to magnetic influence. For the needle gives always a running test, and sometimes a very necessary and decisive one, preventing the introduction of gross blunders. Every one knows, who has worked with an angle-instrument, how easy it is, especially in dark places, to put down the angle "left" when it ought to be written "right." Comparing the calculated bearing with the magnetic bearing will test that at once. Hence, I would not recommend to any one to work without taking the magnetic bearing of every line. For that purpose it is customary, in railroad work and all other surveys, to take the magnetic bearing. Where there is no local attraction the two ought to agree within fifteen minutes, if the compass needle is a good one. Of course, it is not necessary to begin with a true meridian. You can, if you choose, take any other line as a base.

A paper was then presented (in the absence of the author) from Mr. ECKLEY B. COXE, of Drifton, Pa., on

THE USE OF THE PLUMMET LAMP IN UNDER-GROUND SURVEYING.

This paper was published last week. It was remarked by the PRESIDENT, at its close, that the plummet lamp first designed by Mr. COXE was without the compensating ring. The addition of this arrangement completes the convenience and accuracy of the lamp.

A paper was then read by Prof. W. P. BLAKE, on

RECENT IMPROVEMENTS IN THE DIAMOND DRILL.

This paper is given elsewhere in full.

Dr. T. STERRY HUNT—May I ask Prof. BLAKE if he can give any information about the application of diamonds to saws for cutting stone? I heard in a vague way, from a person not well informed, that a saw was introduced with diamond points.

Prof. BLAKE—I saw it in use at the American Institute. It was cutting marble; and they exhibited samples of sienite and some of the hornblende rocks cut through in that way; but I did not have time to examine it fully, or become satisfied of its value. Some of the leading marble men told me they thought it would not be of any great practical advantage; but I was inclined to think otherwise, especially for hard stone. And it seemed to me that bort might be used in finishing up and polishing granite. I think this has been tried by Mr. PATTERSON, in Hartford, who made some experimental drills; but they are not in use there now. I don't think it has been fully tested. There is one point of great mineralogical interest to me—namely, that these diamonds show so little wear after so much work. The point is, that the hardness of the diamond is so very much greater than we can measure—so much greater than that of the stones classed next to it. Corundum, for instance, placed in these bits, and used in drilling rocks, is perceptibly worn away; but the diamond does not appear to be worn.

Some discussion followed concerning the alleged discovery, by means of boring, in Missouri and Indiana lead mines, of new deposits of lead, below what had been considered the bed-rock.

Dr. HUNT said if these discoveries had really been made below the magnesian limestone, the fact was of great importance. He thought there might be a mistake in the mention of Indiana, as that State was not included in the great western lead region, and contained, he believed, no lead except some beds in its southernmost part. Probably Illinois was meant. The lead region comprises the adjacent portions of Minnesota, Iowa, Illinois, and Wisconsin. It has been strenuously maintained that the lead was confined to the magnesian limestone, and not to be found at any lower level. All attempts to explore in lower depths, with hopes of finding lead, have been discouraged. It would be surprising if it should now be found that there is still a lower horizon occupied by lead.

Prof. BLAKE—It is reported that the St. Joseph Co., Lamotte County, Missouri, became discouraged, and took a drill and bored 70 feet below their lowest working, and struck an eight foot vein of lead, upon which they have been working, and paying dividends.

Dr. HUNT—That scarcely touches the point I raised, because the geological conditions are different in Missouri.

The PRESIDENT—I was about to suggest that it is probable these discoveries are of local significance only; and that what is considered the bed rock, is merely the rock beyond which work has not gone in the particular mine. The new ore-bodies found may not lie below the established geological horizon. The bodies, known to exist, have been becoming exhausted, until finally the West, instead of exporting lead, is importing it. I presume this has led to active prospecting, and the discovery of new deposits, in connection with those already known and in the same geological series.

A MEMBER said that in some of the Wisconsin mines, although they had gone down and found lead, two or three times over, they had not yet come upon the blue limestone, although that had been reached in other localities of that region.

The PRESIDENT.—Allusion has been made, by Prof. BLAKE, to the use of the diamond drill in prospecting. It was tried at the South Aurora mine, one of the mines lying upon Treasure Hill, in the White Pine mining district, so celebrated a couple of years ago, but now suffering a rather disastrous collapse. The characteristic deposits of Treasure Hill are, so far as explorations have ever shown, irregular masses and impregnations in limestone of Devonian age; and when exhausted were entirely without indications of the direction in which further ore was to be sought. The chambers have sometimes been of vast extent, and great richness; as for instance, the celebrated Blue Bell chamber, in the Eberhart mine, where I have seen at one time more than a million dollars worth of solid silver chloride existed, into which I could put a pick for half the length of the blade. Yet these richest chambers were exhausted; and the phenomenon was encountered, so universal in silver mining, that they had ten tons of poor for one ton of rich ore. After the available ore had been worked out, the question occured in some of the mines, how far explorations should be conducted; and it was with the idea of exploring the hill still further, to find, if possible, the direction of the deposit, that the diamond drill was pretty thoroughly tried in the South Aurora, and, to some extent, in other mines. The result has shown, what I ventured to expect beforehand; that, for deposits of this very irregular character, a drill is a poor prospecting apparatus; and the diamond drill, which is a convenient contrivance for boring a small hole to a very long distance, in any given straight line, shares this objection. Where deposits are very irregular, the hole that is made, with the sample taken from it, proves too little. The discovery of ore in that way might not be sufficient to justify the expenditure of a large amount of money to develop in that direction. And, what is still more disheartening, the failure to discover ore does not prove enough to justify the abandonment of the property. At the South Aurora mine, small holes were bored to a considerable distance in a dozen different directions. There were many drawbacks connected with the inexperience of the workmen and the hauling of the machinery, so that the work was not cheap, and yet the results were negative, but not conclusive. They cannot be quite sure, even to this day, but that a different method of exploration, permitting larger sections and cross-cuts, might have got indications which would have led them to a more favorable result. As an actual result, I hear, the mine has been abandoned, and they probably did well to abandon it. But, at the same time, the evidence obtained by the expenditure of money in diamond drilling, was not conclusive, not even conclusively discouraging. The same amount of money would have drifted a good way in that limestone, and the drift would have opened a so much larger sectional area, and given them a chance to study so much more carefully and conclusively the character of the side walls, that if there were no results to lead to new indications of ore, there would at least be a better ground for calm and final despair.

In its new form—the solid bit—the diamond drill has the same disadvantage, that the old-fashioned percussion forms had. It grinds everything fine, and it is all washed out together, being removed, in this case, by a continual stream of water rushing down through the drill rods, and, in the old-fashioned drill, by the sand-pump, used at intervals, the tools being removed. This gives little opportunity of studying with minuteness the character of the sides of the holes, and the mineralogical indications at any given time. A core must be taken for that and even a core gives a small and possibly misleading section. I do not think drills can quite supersede exploring drifts. On the other hand, it must be said for this drill, that it is the only one, permitting the boring of long holes in any desired straight line; and that for prospecting to determine the succession of strata, the order and character of regular veins or beds, and the nature of the rock for the excavation of which contracts are to be let, it is invaluable. Applied to ascertaining the position of coal seams, it may save great expenditure.

(TO BE CONTINUED.)

Contributions to the Records of Lead-Smelting in Blast-Furnaces.

BY A. EILERS, M. E.*

COMPOSITION OF CHARGES AND CONSUMPTION OF FUEL AT VARIOUS WORKS.

A marked peculiarity of most of the smelting works of the far West is the looseness with which accounts of the operations are kept. Indeed, probably over half of the works do not keep any detailed accounts at all, the yearly gross statement of profit or loss being considered sufficient for all purposes. The reasons for this must apparently be sought in the as yet unsettled state of *all* business-relations, and in the deplorable fact, that only in isolated cases educated metallurgists are in charge of the smelting works. Continual and regular assays of the ores, by-products and slags are almost unknown, so that it is impracticable to ascertain, even approximately, the losses in the smelting processes.

Of cases, where regular accounts are kept of the quantities of ore smelted, of

* A paper presented at the Boston Meeting of the American Institute of Mining Engineers, Feb. 19, 1873.]

the composition of charges and of the fuel consumed, I know only two or three. Under these circumstances it is extremely difficult to collect figures which cover the operations for a considerable length of time, and which are so valuable for the metallurgist, who wishes to get an insight into the economy of smelting operations, as shown by practice. Figures obtained by personal observation, which can of course cover only the brief space of the visit of the travelling metallurgist, must, therefore, be made to replace the more valuable data.

The writer has had occasion during the last and the preceding summer, to visit the larger number of the Western lead smelting works, and offers, in the following pages, such data relating to the economy of lead-smelting in the blast furnace at various works, as he has been able to obtain. The only object in doing so, is to place these figures on record, so that they may be from time to time supplemented with other data, which are now wanting.

I.—EUREKA CONSOLIDATED COMPANY'S SMELTING WORKS.

These works smelt the ores from the mines of the same company on Ruby Hill, Eureka, Nevada. The supply is almost unlimited, but the ores are comparatively poor. They are ferruginous carbonates, with occasional lumps and masses of galena, containing, in the summer of 1872, on an average about 12 per cent. of lead, and $25 to $30 per ton in gold and silver, the values of the two precious metals being about equal. Arseniate of iron enters largely into the composition of the ore, so that a "speiss," principally an arsenide of iron, is formed in smelting the raw ores. Since last noticed, several important changes have taken place in these works.

There are at present five large blast-furnaces for the ore-smelting, of which Nos. 1, 2, 3, and 4 were in blast during my visit in the summer of 1872; No. 5 being in the course of construction.

No. 1 is a rectangular furnace. The dimensions of the hearth, at the level of the slag-spout, are 6½x3 feet; at the tuyeres, which are 12 inches above the slag-spout, 5x3 feet. One foot above the tuyeres a short bosh commences, sloping back at an angle of 45 degrees, until the section of the furnace is 5 feet 9 inches by 4 feet 6 inches. From here to the top the walls are perpendicular. The total height from the tuyeres to the charge-door is 10 feet.

There are 8 water-tuyeres of 3½ inches nozzle, two of which lie horizontally in the back and parallel to each other; and 3 in each side, also parallel to each other. But the opposite tuyeres, instead of blowing directly towards each other, are all pointed forward, so that lines through the axes of the front pair, for instance, meet about 6 inches back of the middle of the breast. The blast is supplied by a No. 8 Sturtevant blower, which makes 2,100 revolutions per minute. Pressure of wind=1 inch mercury.

Nos. 3 and 4 are octagonal furnaces, with the same area of hearth as No. 1; but they have only 7 tuyeres each. Otherwise they have the same bosh, height, and vertical walls. They smelt the same charge as No. 1, and do equally good service.

CHARGE FOR NO. 1, 3, AND 4:

Charcoal:	6 measures	@1.2 bushels=7.2 bushels	@ 15 lbs.	=108 lb.	
Ore:	40 shovels	@15 lb.	= 600 lb.		(100)
Slag:	2 "	@15 lb.	= 30 "	630 lb.	(5)

Smelted in 24 hours:
Ore: 50 tons.
Slag: 2.5—5 tons. 52.5—55 tons.
Coal consumed.....1,200 (1,197) bushels =9 tons.
Coal consumed per ton of charge..22. 8 bushels=342 lb.=17.1 per cent.
" " " ore..24 " =330 " =18 per cent.

COST OF LABOR IN 24 HOURS PER FURNACE SMELTING 50 TONS.

3 smelters @ $4 50	= $13 50		
6 helpers @ $4 00	= $24 00		
6 chargers @ $4 00	= $24 00		$61 50
To this must be added:			
*¼ of wages of engineers.....	$4 50		
¼ " " " 2 foremen.....	3 00		
¼ " " " blacksmith.....	1 50		
*¼ " salary of metallurgist.....	3 33		
For roustabouts, etc.....	12 00		24 33
Total.....			$85 83
Cost of labor per ton of ore.....	$1 71		

The cost of repairing furnaces, wear and tear of machinery and tools, oil, and materials generally, as well as the waste of coal in handling, must be added to the costs given above. They are not in my possession at present, but to judge from the total cost of smelting given in the annual report of the Eureka Consolidated Company for 1871, these items must foot up heavily.

Furnace No. 2 is smaller than the others, and is charged differently. The size of the hearth at the level of the slag-spout is 5x3 feet; at the level of the tuyeres, 3½x3 feet. Above the bosh, which effects the transition to the larger section in the same manner as described in the larger furnaces, the size is 4 ft. 6 in.x4 ft. 3 in., and the whole height above the tuyeres is 10 feet. There are 4 tuyeres of 3½ inches nozzle. Pressure of wind, 1 inch mercury.

CHARGE FOR NO. 2.

Charcoal:	2 measures	@ 1.2 bushels=2.4 bushels	at 15 lb.=36 lb.		
Ore:	11 shovels	@ 15 lb.	=165 lb.		(100)
Slag:	1 "	@ 15 lb.	= 15 lb.	180 lbs.	(9.09)

Smelted in 24 hours: Ore, 30 tons.
Slag, 1.5 to 3 tons—31.5 to 33 tons.

* Assuming that 4 furnaces are running at a time.

Coal consumed, 870 bushels=6.525 tons.
" " per ton of charge, 26.6 bushels=399 lbs.=19.95 per cent.
" " " ore, 29.09 " =436 lbs.=21.81 per cent.

COST OF LABOR IN 24 HOURS PER FURNACE SMELTING 30 TONS OF ORE.

3 smelters @ $4.50	$13.50		
3 helpers @ 4.00	12.00		
3 chargers @ 4.00	12.00		$37.50
To which must be added:			
¼ of wages of engineers,	4 50		
¼ " " 2 foremen,	3.00		
¼ " " blacksmith,	1.50		
¼ of salary of metallurgist,	3.33		
For roustabouts, etc.,	8.00		$20.33
Total,			$57.83

Cost of labor per ton of ore, $1.93.

The remarks as to the other costs, made in speaking of the larger furnaces, are equally applicable here.

II. THE RICHMOND CONSOLIDATED COMPANY, EUREKA.

This company smelts the same class of ores as the foregoing, but they are richer in lead and silver. They come from the Richmond and Tip-Top mines, on the western end of Ruby Hill. The furnace running in the month of August 1872, was an exact copy of furnace No. 1 of the Eureka Consolidated Company, with the single exception of the depth of the furnace above the boshes, which was 6 feet 6 inches.

CHARGE.

Charcoal: 18 scoops=5 5 bushels at 15 lb.=82.5 lb.		
Ore: 25 shovels at 18 lb.=450 lb.		(100)
Slag: 2 shovels at 15 lb.= 30 lb.	480 lb.	(6.66)

Smelted in 24 hours 180 (?) charges=40.5 tons of ore, or 43.2 tons of charge.

Coal consumed, 990 bushels=7.425 tons.
" " per ton of charge, 22.9 bushels=243.5 lb.=17.17 per cent.
" " " ore, 24.4 bushels=366 lb.=18.3 per cent.

The cost of labor at these works is not in my possession. I can only say that the same number of workmen are employed immediately around the furnace, as at No. 1 furnace of the Eureka Consolidated Co., but the cost of supervision, blast and roustabouts is different; and, as only one furnace is run, probably considerably higher per ton of ore than at the works mentioned. At the Richmond Works the top of the furnace is intentionally kept blazing, eight billets of wood being thrown in on top after every charge. The effect claimed is the melting of the dust, and its adhesion in that state to the walls of the stack, from which the crusts are from time to time loosened and allowed to fall into the furnace. It is evident that only a very small portion of the dust can be arrested in this way, and more than probable that there is more dust created, when this device is employed, than there would be without it, to say nothing of the lead and silver which must be volatilized.

TO BE CONTINUED.

Polytechnic Branch of the American Institute.

PURIFYING METALS BY REMOVING THE GASES CONDENSED THEREIN.

BY J. F. BENNETT.

Some thirty years ago a Frenchman threw out the idea that all metals contain within them as much as they were capable of absorbing of the gases that surrounded them when they were last liquid. The suggestion lay unconsidered and unexperimented upon for upwards of twenty years, until the late Dr. GRAHAM, of London, the Master of the Mint, resolved to endeavor to find out what truth there was in it. Having first satisfied himself in his own laboratory, he called together a London audience, and melted a piece of iron before them, and put it in a vacuum, and drew from it, by pumping, four hundred times its own bulk of hydrogen gas. The gas boiled up from the metal with great noise, like the bubbles of carbonic acid gas rising out of champagne. He afterwards experimented on all the metals, and came to the conclusion that hydrogen was the gas that surrounded the aerolites when in the liquid state, and, possibly, the sun and the stars. There the matter rested.

Now let us consider in what condition such gases must exist in these solid metals, whether as gas, as liquid, or as solid. The power that a metal has to call into itself the gas surrounding it, is as strong as the power to compress that amount of gas into it. What is the condition of the gas in an aerolite containing 400 times its own bulk? 1,728 cubic feet of steam make one cubic foot of water. Suppose that a pressure of fifty atmospheres will reduce 2,000 cubic feet of gas to one foot; then hydrogen gas being one-twelfth the weight of the atmosphere, 400 cubic feet of hydrogen gas, if reduced to the liquid state, would be compressed within the compass of half a cubic inch. Then it would require a pressure of 15,000 atmospheres, or 225,000 lbs. to the square inch, to compress 400 cubic feet of hydrogen gas into one cubic foot of aerolite, equal to 100 miles head of water. That is, this hydrogen gas is not compressed merely into one foot, but into one foot already filled up with solid matter.

There are three gases which have never been reduced to liquids—oxygen, nitrogen, and hydrogen—although a pressure of 800 atmospheres has been applied. But it would require a pressure of 15,000 atmospheres to render hydrogen gas a liquid. Yet the metal itself exerts this power, twenty times greater than man has ever been able to apply. Then I conclude that these gases in the metals are not in the state of gases, but of liquids. I hold that they are not in a solid state, because although compression will reduce a gas into a liquid, no further

compression will reduce the liqnid into a solid state. Besides, it is the law of liquids that they expand the moment they become solid.

Next, let us consider the effect of liquids in metals. Some years ago, when the Great Eastern was lying on the banks of the Thames, it was fonnd that the hydranlic rams which were applied to move it, broke by degrees. The great force exerted on the small column cansed the atoms of water—being keener edged than the finest razor, and more incompressible than the finest steel—to act as wedges, penetrating under the blows into the interstices of the solid metal, making a small opening first, and a larger one afterwards, until the ram broke.

Pig metal, called cold-short, contains phosphorus, which becomes liquid at 250°. Is it not reasonable to suppose that when cold-short iron is heated to 500°, and hammered, it breaks, becanse the phosphorus is liqnid, and acts as minnte wedges penetrating the metal? Metal containing sulphur is red-short, and breaks when the temperature of the bar is at a fnll cherry-red, at a temperatnre of 1,000° or 1,100°. Is it not reasonable to suppose that the sulphur, which becomes liqnid at about 500°, is very liquid at 1,000°, and is converted into minnte wedges, scattered throughout the mass, of the finest points, and incompressible, the hammering on which breaks the bar? A railway car axle is of the best steel. It contains neither sulphur nor phosphorns. It is continually hammered by the concussion as it goes along the road, and by and by it breaks. Is it not reasonable to suppose that minnte wedges of liqnefied carbonic acid gas in the metal are hammered upon at every turn nntil the axle breaks? Cannons break with a certain number of discharges. Water pipes break from the continned action of what is called the water-hammer. Bell-metal breaks, after repeated blows in ringing. Is it not, in all these cases, because the metal is full of minute wedges of carbonic acid in the liquid form?

Convinced of the reasonableness of these operations, and desiring to test them in practice, I went to Pennsylvania, and took from the floor of a blacksmith's shop some scraps of steel, which I put into a crucible, and melted over a forge fire, and while in the liquid state, I pnt it under an air pnmp, and extracted from it about eighty times its bnlk of carbonic oxide gas. I do not think that all was removed. It was a very small quantity to operate on. It was put under the hammer, and the blacksmith said it worked like soft iron. It was made into a cold chisel, and employed in the severest work, with other cold chisels, and the workman considered it the best cold chisel he had ever worked with.

The experiment has not been carried any further. I have made these remarks in order that other gentlemen may have an opportunity of examining a subject of so much importance, not only with regard to the practical manipnlation of metals, but with regard to the prinuiples of chemistry, some of which will require modification if the theory I have explained is true.

Prof. Van der Weyde—The occlnsion of gases by solids, and especially by metals, is very interesting. I do not see the necessity for the inference that the gases are in the liquid state. Why should they not solidify? It is only a matter of pressure. Liquids solidify by cold. But the conditions of solidity and liqnidity cease as soon as we come to a chemical combination. This is not merely an absorption, bnt a chemical combination. The chemical eqnivalent of palladium is 198, and comparing that with the amonnt of hydrogen gas that may be occluded in it, it corresponds exactly. Gases have been submitted to the pressure of 2,000 atmospheres, and all have been liquified except five: nitrogen, oxygen, hydrogen, nitric oxide, and carbonic oxide. Nitrons oxide, or langhing gas, is solidified by about 600 atmospheres. The affinity of iron for snlphnr is exceedingly great, so that the Bessemer Process is the only process which takes it out effectually. It takes fire and burns ont. But phosphorus has snch an affinity for iron that the Bessemer Process will not take it out. Notwithstanding that phosphorus takes fire at 120°, the temperature of 3,000° is not sufficient to separate it from the iron. If such great heat will not drive the phosphorus ont, it is very doubtful if any vacuum process would be sufficient to draw it out. It may be that this process will improve the iron. I hope that experiments will be continued in that direction. No doubt the iron contains carbonic acid gas and hydrogen gas, which are in occlusion with it.

The President—It the hydrogen is combined with it chemically, can that be decomposed by mechanical action?

Prof. Van der Weyde—That is a good argument. If it is chemical action, it is doubtful if mechanical action can overcome it. When we make hydrochloric acid we make the gas, and the water absorbs the gas rapidly. It is an occlusion of the gas in a liquid. In ammonia the effect is still stronger. Fill a bottle with pure ammoniacal gas, and inuert it over water, aud the water will rush into the bottle as if it were a vacnum. That is occlusion, and not a chemical combination, because you can take it out by a vacuum. So it may be with palladium. The bulk of the metal is increased by the absorptiou of the hydrogen, as the bulk of water is increased by the absorption of ammonia. Liqnid mercury combines with solid sulphnr and forms cinnabar, a solid. Two solids may combine and form a liqnid, and *vice versa*. Ammonia is nitrogen and hydrogen, two gases which have not yet been liquified by 2,000 atmospheres pressure. Pass through it chlorine gas, and we shall have first hydrochloric acid, and then NHCl, which is an oily liqnid, in which the gases are close together, but yet there is no chemical combination. Take away the nitrogen, and it will make a most violent explosive. A single drop in a saucer will not only scatter the pieces of the sancer, but drive a piece of the saucer into the table, as if forced in by a punch. I tried that once, and have no wish to try it again. The occlusion of gases by iron has a practical bearing; for the metal of a cast iron stove, at a red heat, takes up the carbonic oxide from the fire, and it passes freely through the iron. The fact of the existence of hydrogen in meteorites is exceedingly interesting. The spectroscope has revealed to us the fact that some of the nebnlæ which the telescope will not resolve into stars are masses of incandescent hydrogen. These meteorites, traveling throngh space, bring to the earth hydrogen from celestial spaces. If two per cent. of carbon is put in iron, it becomes brittle. It may be that one-half of one per cent. of chromium may be an advantage, and yet a large percentage may make the iron brittle. The theory of the existence of little wedges in the iron seems to me as a mechanical hypothesis unphilosophical. Alloys differ materially from the metals of which they are composed. Copper and tin, both soft metals, melted together, make bell-metal, which is very hard. Brass is a great deal harder than either copper or zinc. Alnminum bronze, composed of copper nine parts and aluminnm one part, is exceedingly hard. It wonld be well to repeat the experiment which Mr. Bennett has made, in a variety of ways, to see if it was the scrap-steel, or what was the cause of the snperiority. A prescription given to one person proves nothing; but in a hospital, where it can be given to fifty persons, we may learn something about its effects.

Dr. Ott—Iron is made cold-short not only by a small percentage of snlphur but by other substances, as chrominm. If it is because the sulphnr becomes liqnid that the iron becomes cold-short, why should we not infer that the chroninm also becomes liqnid in the iron?

Mr. Bennett—I admit that one experiment proves nothing. There ought to be further experiments. Bnt I was told by the machinist where this was made, that he would not make that steel if he knew it wonld be better all the time; for people want cheap steel more than they do good steel.

The President—Can sulphur or phosphorus be removed from iron by a vacunm?

Mr. Bennett—I have not tried that. I have not learned where I could procure a good vacunm pump. I doubt whether a perfect vacnnm can be obtained with a liquid. I wonld suggest passing throngh an air-tight vessel the fnmes of zinc, and allowing the zinc to solidify, to see whether it would not make a vacnnm more perfect than we can get over mercnry.

Prof. Van der Weyde—By the spectroscope we can see that the Torricellian vacnum is really filled with the vapor of mercury. In the Geissler tubes, the vacuum is made as perfect as possible, with an air-pnmp; bnt they are always filled with some gas. We cannot make snch a vacnum so perfect that electricity will not pass. But I have snceeded better in this way: I made a vacuum as perfect as possible, with carbonic acid, and then allowed the remaining carbonic acid gas to come in contact with caustic potassa, which so condensed it that the electric spark from the strongest Rhnmkorff coil, which will pass through ten inches of air, wonld not pass through the space of $\frac{1}{4}$ of an inch. This not ouly shows the diffienlty of obtaining a perfect vacuum, but proves that electricity is not a fluid; for if it were it conld very easily pass across that short distance.

Effect of High Wages on English Workmen.

To quiet the outcries of the workmen who claim that they have not shared in the advance of prices, oue English iron master examined his books, and found that the lowest amount his puddlers had earned in one fortnight is £8 17s. 6d. each. This was the gross remnneration for ten "turns" work; in other words, for five days work per week. From this amonnt the puddler would have to pay his under-hand, and have £3 10s. per week left as his own share. The net wages of the puddlers at the average works wonld be £3 for every five "turns." It would be his own fault if, with full work at his disposal, he did not earn that sum every week. The same pay-sheet, to which we have just referred, showed the net earnings of the shingler to be £11 10s. and £12 for the same fortnight of ten 'turns"; thus the wages of the shingler wonld be quite 23s. English for every day he worked. The roller's wages are shown to be about 25s. per day. Upon these figures it was argued that the men cannot assert that they have been ill-paid, and that, considering the heavy expenses of the masters, the men are getting a better share of the present prosperity than their employers. The suffering caused by the strike in Wales has proved that, with all their opportunities for laying up money, the men were hardly a week beforehand when they went on strike. The loss of wages to the 60,000 strikers is estimated at £100,000 a week, and the suffering among them is said to be appalling.

Messrs. Neilson, of Summerlee, Scotland, have blown in a new patent furnace, the construction of which is designed to make the use of caking coals in the furnace possible. Their method used is totally different from the flue system adopted by Mr. Ferrie at Calderbank, Mr. Pultney, the manager at Summerlee, being of opiuion that the flues at the top of the furnace may be dispensed with. The whole secret of the present operation depends upon the elevation of the furnace, and the proper distribution of the gas generator. The chief deviation from the plan previously adopted is that the furnace has been elevated from fifty to fully seventy-five feet, with sides gradually sloping from sixteen and one-half feet at the boshes to twelve feet at the top, the raw material being filled upon equal layers, aud the blast modulated according to circumstances. The short paragraph from which we take these particulars is too meagre to permit a clear description of the new furnace. But it seems to bear out Mr. Bell's assertion that the good work of the Ferrie furnace is due to its height rather than to its patent.

THE COAL TRADE.

NEW YORK, April 2, 1873.

Business is fair, but the week as usual immediately after the auction sale, offers nothing particularly worth notice. The canals are filling up, and navigation will soon be completely open. The companies, as will be noticed from the circulars published in our last issue, have mostly reoccupied their summer shipping points. The breaking up of winter has, on the whole, been accomplished with little loss when the circumstances are considered. No change in Bituminous. Business is good.

Our quotation of the Franklin Company's bituminous coal last week, was an error. The price at Baltimore is $5, as given last week, but freights are only $2,25 instead of $2,50, and the price at New York is therefore $7,25 per ton.

Anthracite Coal Trade for 1872 and 1873.

The following table exhibits the quantity of Anthracite Coal passing over the following rontes of transportation for the week ending March 29, 1873, compared with the week ending March 30, 1872.

COMPANIES.	1872. WEEK.	1872. TOTAL.	1873. WEEK.	1873. TOTAL.
*Phila & Reading R.R†	79,994	970 490	107,573	1,138,675
*Schuylkill Canal	2,746	16,102	4.417	11,011
*Lehigh Valley R. R.	60,250	883,035	65,347	877,393
Lehigh & Sus. R. R.	37,681	337,411	47,044	462,474
" " "	106	106	....	....
Scranton North	9.420	152,168	13,035	154,103
" South	44.909	484,206	42,451	477.580
Penn. Coal Co., rail	22,104	225,758	15,146	186,854
" " " canal	....	....	....	....
Del. & Hnd. Canal Co	....	....	....	....
" " East	14,904	146,417	10,875	87,733
" " West	8,816	95.480	9.555	104,748
" " South	7,479	81,545	9,903	80,064
Shamokin	13,722	96,672	6,364	117,762
Trevorton	....	....	....	....
Lykens Valley Coal Co	....	....	....	....
Wyoming North	....	....	....	....
Wyoming South	....	....	....	....
P. N. Y. C. & R. R. Co.	12,193	164,047	10,321	177,951
Williamstown Col'y	....	.....	....	....
Big Lick Col	....	.....	....	....
Total	314,224	3,657,837	348,019	3,876,348
1871			314,224	3,657,837
Increase			33,795	218,511
Decrease				

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

† Less coal 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 March 29, 1873, compared with week ending March 30, 1872.

COMPANIES.	1872. Week.	1872. Year.	1873. Week.	1873. Year.
C. & O. Canal	16,656	25,501	3,556	4,349
B. & O. R. R.	23,052	245,871	28,777	295,408
Penn. S. Line	....	.....	2,476	24,012
H. & B. T. R. R.	....	59,711	....	90,692
*Harrisburg & D.	9,002	137,868	5,486	87,825
*L. V. R. R.	823	9,793	44	8,029
P. & N.Y.C. & R. Co.	7,313	95,653	6,254	75,779
Cumberl'd Branch Canal	5,.38	8,100	....	....
" Railroad	....	291	2,485	29,177
Total	62,184	683,088	49,088	615,271
	49,088			583,088
Decrease	13,096			
Increase				32,183

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, March 29, 1873.

	WEEK.	SEASON.
By Delaware and Hudson Canal	....	....
By Railroad, East	10.875	87,733
" West	9,555	104,748
" South	9,903	80,064
Total 1873	30,333	272,545
Corresponding time in 1872 :		
By Delaware and Hudson Canal	....	....
By Railroad, East	14.864	146,417
" West	8,816	95 480
" South	7,479	81,545
Total	31,099	323,438
Decrease	50,893	

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, March 29, 1873.

	WEEK.	SEASON.
North	37,981 09	550,3 4 17
South	9,903 07	80,963 15
Total 1873	47,884 16	63 ,448 12
Corresponding time in 1872 :		
North	53,090 00	560,.73 19
South	7,4.8 18	81,540 11
Total	60,568 18	672,514 10
Increase North		
Decrease No th		
Increase South		
Decrease South		
Increase		
Decrease	12,684 03	42,065 18

Philadelphia & Reading Railroad and Branches.

COAL TONNAGE

For the Week ending Saturday, March 29, 1873.
BY RAILROAD.—ANTHRACITE.
PASSING OVER MAIN LINE AND LEB. VAL. BRANCH.

	Tons.	Cwt.
From St. Clair	28,075	05
" Port Carbon	5,858	18
" Pottsville	2 486	16
" Schnylkill Haven	30,008	18
" Pine Grove	6,176	00
" Tamaqua	14,214	05
" Harrisburg		
" Dauphin	5,481	02
Total	92,300	04

FOR SHIPMENT BY CANAL.

Passing Frackville Scales	2,639	05
" Mill Creek "	709	18
" Schnylkill Valley Scales	71	04
" Mt. Carbon "	821	00
" Cressona "	3,779	04
" Pine Grove "	.....	
" Tamaqua "	347	00
Total	8,367	11

SHIPPED WESTWARD VIA CATAWISSA AND WILLIAMSPORT BRANCH AND NORTHERN CENTRAL RAILROAD.

Via Catawissa & Williamsport Br.	163	10
" N. C. R. R. passing Locust Gap.	507	18
" " " Shamokin.	2,835	18
" " " Herndon.	....	
Total	3,506	17

SHIPPED WEST OR SOUTH FROM PINE GROVE.

Via Schuylkill & Susquehanna R. R.	1,605	16
" Lebanon & Pine Grove Branch	749	08
Total	2,355	04

CONSUMED ON LATERALS.

From Frackville Scales	800	14
" Mill Creek "	860	06
" Schuylkill Valley Scales	812	17
" Mt. Carbon "	1,091	04
" Cressona "	233	11
" Pine Grove "	56	06
" Tamaqua "	406	09
Total	4,261	07

LEHIGH AND WYOMING COAL.

Received via Silverbrook Junction, Seat East	3,507	11
Cat. & Wpt. Br. Sent West	17	10
" " Rupert, Cat. & Wpt. Br.	60	19
" " Allentown, E. Penn'a Br.	4	08
" " Alburtis, " "	25	10
" " Oreland, G. & N. Br.	818	14
" " Willow Street R. R.	715	00
Total	5,149	02

BITUMINOUS.

From Harrisburg	5,486	04
" Connecting R. R., G. & N. Br.		
" Junction R. R.	.....	
Total	5,486	04

COAL FOR COMPANY'S USE.

Anthracite	6,870	17
Bituminous	143	16
Total	7,014	03

RECAPITULATION.

	Total for Week.	Corresp'g week last year.	Increase and Decrease.
Passing over Main Line and Leh. Val. Branch	92 300 04	65,944 07	i 26,355 17
For Shipment by Canal	8,367 11	5,518 08	i 2,849 03
Shipped Westward via Northern Central R. R.	3,506 17	7.507 16	d 4,000 19
Shipped West or South from Pine Grove	2,355 04	1,900 01	i 455 03
Consumed on Laterals	4,261 07	3,224 05	i 1.037 02
Lehigh and Wyoming Coal	5,149 02	1,417 14	i 3,731 02
Total Anthracite paying freig't	115,940 05	85,512 11	i 30,427 14
Bituminous	5,486 04	9,001 12	d 3,515 08
Total of all kinds paying freig't	121 426 09	94,514 03	i 26,912 06
Coal for Company's use	7,014 03	5,169 19	i 1,844 04
Total Tonnage for Week	128,540 12	99,684 02	i 28,756 10
Previously this year	1243754 19	975,695 15	i 85,301 14
Total to date	1372194 11	1259136 07	i 114,058 04

SHIPPED BY CANAL.

From Schnylkill Haven	4,247 00	2,211 00	i 2,036 00
" Port Clinton	170 00	535 00	d 365 00
Total Tonnage per Week	4,417 00	2.746 00	d 1,671 00
Previously this year	6,594 00	13,355 16	d 6.761 16
Total to date	11,011 00	16,101 16	d 5,090 16

Report of Coal Transported over Lehigh Valley Railroad

Report of coal tonnage for the week ending March 29, 1873, with totals to date, compared with same time last year.

WHERE SHIPPED FROM.	WEEK. Tons.	WEEK. Cwt.	TOTAL Tons.	TOTAL Cwt.
Total Wyoming	14,099	16	208 006	15
" Hazleton	40,473	15	547.317	17
" Upper Lehigh	142	09	1.614	08
" Beaver Meadow	12,371	09	193.785	00
" Mahanoy	7,126	07	106,477	19
" Mauch Chnnk	22	06	1,482	03
Total	74,135	13	1,039,184	02
Same time last year	70,902	13	1,027,928	15
Increase	3,233	00	11,194	07
Decrease				
Forwarded East from Mauch Chnnk by rail	65,347	05	877,392	13
Same time last year	60,249	17	888,034	12
Increase	5,097	08		
Decrease			10,641	19

DISTRIBUTED AS FOLLOWS.

Forwarded East from Mauch Chunk by rail	64,328	12	859,571	16
do East for use L. V. R. R.	1,018	13	17,820	17
Delivered at and above Mauch Chunk for use of L. V. R. R.	1,261	10	27.594	19
To P. & N. Y. R. R.	6,626	13	109 736	09
To N. C. R. R., at Mount Carmel			2,691	02
To D. H. & W. R. R.	559	17	13,470	16
To L. & S. R. R. at Packerton for rail	169	03	4,705	09
Delivered at M'h Chunk	43	07	1,366.	07
Delivered on line of road above Mauch Chunk	125	18	5,495	07
To L. &S. R. R., at Penn Hav., for railroad			1,541	10
Do. for canal				
To Lehigh Canal Mauch Chunk				
To Catawissa Railroad			35	00
To L. & B. R. R. at Lack. Junc.			154	10
Total	74,135	13	1,039,184	02

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

Week ending March 29—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	28527 10	15380 09		43907 19	383044 11
Upper Lehigh		3936 15		3936 15	48358 19
Beaver Meadow	2374 05	2082 18		4457 03	43766 07
Hazleton		245 07		245 07	3761 08
Mauch Chunk	122 12	6390 08		6513 00	95018 00
Total	31024 07	28035 17		59060 04	573949 05
Prev'ly reported	262340 08	252548 13		514889 01	
Total to date	293364 15	280584 10		573949 05	
Same time .1872	232174 09	173529 04	105 12	405802 05	
Increase	61190 06	107055 06		168140 00	
Decrease			105 12	"	

DISTRIBUTION.	WEEK 1873.	WEEK 1872.	YEAR 1873	YEAR 1872.
Forwarded East by Rail to Tidal points	31024 07	25412 01	293364 15	232174 09
Forwarded East by Rail to Local points	9,500 03	7005 08	124892 18	75853 17
Forwarded East by Rail use Central Division	1944 07	2967 09	21834 16	19991 04
Forwarded East by Rail use L. & S.	375 13	211 19	3415 15	2162 10
Delivered at and above Manch Chunk	1775 17	998 11	20905 09	13699 11
Delivered at Coalport & Hazard for Canal	4574 07	2401 10	22381 07	9497 00
Delivered to L. V. R. R. at Packerton	624 12	214 16	10891 03	4142 11
Delivered to L. V. R. Rd. at Sugar Notch	3191 14		23884 12	
Delivered to L. & B. R. R.at Plymouth Bridge	6049 04	4332 02	52378 10	48288 03
Total	59060 04	43593 16	583949 05	405809 05

Penn. and N. Y. R. R.—Coxton, Pa.

Coal tonnage for week ending March 29, 1872.

	Week. Tons.	Cwt.	Total. Tons.	Cwt.
Anthracite received :				
From Lehigh Valley R. R.	6,628	13	109,736	09
" Lack. & B. R. R.	712	00	9,623	00
" Pleasant Valley R. R.	2,980	18	47,323	07
" Sul. & Erie R. R.	.....		11,267	17
Total	10.321	11	177,950	13
Same time last year	12,193	05	164,047	08
Increase	1,871	14	13,903	05
Decrease				
Distributed :				
To Lehigh Valley R. R.	58	11	10,315	13
To Lack. & B. R. R.	11	04	315	06
To S. Central R. R.	1,836	08	37.686	13
To Ithaca & A. R. R.	3,99	10	31,221	05
To Erie R. W. Pockets for shipm't.	2,632	01	52,590	03
To Individuals on line of road	269	11	14,364	13
To points at & above Coxton for use of Co	495	00	8,978	17
To points between Waverley and Elmira	1,633	06	22,478	03
Total	10,321	11	177,950	13
Bituminous received from BARCLAY R. R.				
Shipped north from Towanda	6,230	01	75,234	16
Shipped south from Towanda	24	03	544	01
Northern Central R. R.	....		.....	
Total	6,254	04	75,778	17
Same time last year	7,213	05	95,653	07
Increase				
Decrease	1,059	01	19,874	10
Distributed :				
To Erie Railway	5,224	14	63,683	06
To So. Central R. R.	986	19	11,999	04
To Ithaca Valley R. R.	18	08	117	00
Lehigh Valley, R. R.	....		297	09
To Individuals on line of Railroad.	24	03	163	05
To points on line of road for use of Company	....		118	04
Total	6,254	04	75,778	17
Grand totals transported				
Anihracite	10,321	11	177,950	13
Bituminous	6,254	04	75,778	17
Total	16,575	15	253,729	19
Same time last year	19,506	10	259,700	15
Increase	.....		5,971	05
Decrease	2,930	15		

Delaware Lackawanna & Western Rail Road Company.

Coal transported on the Delaware, Lackawanna, & Western Railroad for the week ending Saturday, March 29, 1873.

	WEEK. Tons. Cwt.	YEAR. Tons. Cwt.
Shipped North	13,034 11	154,103 04
Shipped South	48.451 10	477,579 13
Total	62,486 01	631,682 17
For the Corresponding time last Year :		
Shipped North	9,420 04	152,163 04
Shipped South	44,488 15	484,205 13
Total	53 908 19	636,373 17
Increase	7,577 02	
Decrease	.....	4,691 00

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 March 28, 1873.

	Tons.	Cwt.		
East	1 180	12		
West	5,184	06		
			6,264	18
Same time last year			13,722	01
Increase			.....	
Decrease			7,457	03
Total amount shipped to date			117,76	09
Same time last year			96,572	10
Increase			21,189	19
Decrease				

Pennsylvania Coal Company.

Shipments of Pittston Coal for the week ending March 29, 1873.

	1873. WEEK.	1873. YEAR.	1872. WEEK.	1872. YEAR.
By Railway	15,146 06	186,853 18	24,104 04	225,257 13
" Canal	....	.....	.....	.....
Total	....	....	....	.....
Decrease 1873..	38,403 15			

Schuylkill Canal.

Report of coal transported over the Schuylkill Canal for the week ending Saturday, March 29, 1873.

	Tons. Cwt.
From Schuylkill Haven	4 247 00
" Port Clinton	170 00
Total for week	4,417 00
Previously this year	6,594 00
Total	11,011 00
To same time last year	13,963 04

Statement of Coal Transported over Cumberland and Pennsylvania Railroad

During the week ending Saturday March, 29, 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	3,596 01	24,776 19	2,475 14	34,818 14
1872	16,685 11	24,052 00	....	29,707 11
Increase	.....	5,724 19	2,475 11	4,888 17
Decrease	13,089 10	.....	....	

YEAR.

1873	4,340 03	295,408 08	24,012 02	321,760 10
1872	25,500 14	245,870 17	....	271,371 11
Increase	.....	49,537 11	24,012 02	52,397 19
Decrease	21,151 11	....	....	....

Cumberland Branch R. R.

WEEK.

	To C. & O. Canal. Tons. Cwt.	To B. & O. R. R. Co Tons. Cwt.	Total. Tons. Cwt.
1873	—	2,485 03	2,485 03
1872	5,337 16	.....	5,337 16
Increase	—	2,485 03	.....
Decrease	5,337 16	.....	2,852 13

YEAR.

1873		29,177 01	29,177 01
1872	8,400 01	290 10	8,690 11
Increase		28,886 11	20,486 10
Decrease	8,400 01		

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

	AT NEW YORK. April 3. R. A.	AT NEW YORK. April 3. W. A.	AT PHILADELPHIA. April 3. R. A.	AT PHILADELPHIA. April 3. W. A.
SCHUYLKILL.				
Lump	$- —	$5 25	- —	4 60
Steamer	- —	5 35	- —	4 60
Broken	5 61	5 35	4 25	4 00
Egg	5 75	5 50	4 40	4 15
Stove	5 95	5 65	4 60	4 30
Chestnut	5 10	5 85	3 75	3 50
Pea	- —	- —	- —	- —
LEHIGH. Freight to New York 50 cents.				
Lump, (on board)	- —	5 25	- —	- —
Broken	- —	5 20	- —	- —
Egg	- —	5 20	- —	- —
Stove	- —	5 60	- —	- —
Chestnut	- —	4 25	- —	—
Pea	- —	- —		
SPECIAL COALS.				
Honey Brook, Le'h W. A.	4 60@5 50		- —	- —
Spring Mountain " "	- —@- —		- —	- —
Sugar Loaf " "	- —@- —		- —	- —
Old Compy's " "	4 60@5 50		- —	- —
Room Run " "	4 60@5 50		- —	- —
Hill & Harris " "	4 60@5 50		- —	- —
Shamokin " "	4 60@5 50		- —	- —
Lykens Valley " "	4 75@6 00		- —	- —
Broad Top " "	6 50@- 00		5 25	- —

Company Coals.

April, 1873.

	L.	Str.	Gra.	Eg.	Sto.	Chest
*Scranton at E. Port	4 25	4 25	4 45	4 65	5 50	4 25
Pittston at Weehawken	4 70	4 70	4 70	4 90	5 40	4 60
*Lackawana at Weehawken	4 60	4 70	4 80	5 05	5 50	4 60
Wilk'b're at Hoboken	4 45	4 55	4 65	4 65	5 35	4 45
Old Co. Lehigh at Pt. John'n	5 25	—	4 85	4 90	5 15	4 15
Lehigh at Eliz. Port	5 00	—	4 75	4 75	5 10	4 15

For freights to different points see "Freights."
*To contractors only.

Prices at Baltimore—April, 1873.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$5 75@....
Pittston and Plymouth, do	5 50@....
Shamokin Red or White Ash, do	5 50@....
Lykens Valley Red Ash, do	....@5 85
By retail, all kinds per ton of 2,240 lbs	5 00@8 00
George's Creek and Cumberland f. o. b. at Locust Point for cargoes	....@5 00
Fairmont and Clarksburg gas f. o. b. at L. Point	6 50
Kanawha Cannel, coarse	@12 00
BITUMINOUS COALS.	
Kittaning Coal Co.'s Phœnix Vein, f. o. b. at Phila	$
Lemon " " "	
Cumberland Vein Coal	....
Newburgh Orrel f. o. b.	$7 00
Tyrconnel f. o. b.	$7 00

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

April, 1873.

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

Prices at Havre de Grace, Md.

April, 1873.

Wilkesbarre and other White Ash for Cargoes	$ @4 75
Lykens Valley	@5 75
Shamokin Red or White Ash	5 00

Bituminous Coals (Cumberland).

Georgetown, F. o. b.	$4 60
Baltimore "	5 00
New York "	7 55

Prices of Foreign Coals.

April, 1873.
Duty 75 c. per ton.

Corrected weekly by ALFRED PARMELE, No. 32 Pine street, N. Y.

Liverpool Gas Caking	Nominal.
" " Cannel	15 00@16 50
" House "	22 00@23 00
" Orrel	17 00@18 00

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

PRICES FROM YARD.

Liverpool House Orrel, screened	$21 00@22 00
"Cannel, "	24 00@25 00

Per ton 2,000 lbs. delivered.

Prices of Gas Coals.

April, 1873.

PROVINCIAL.

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

	Coarse.	Slack.
Block House	$2 00	$1 00
Gowrie	1 75	— 80

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

	Coarse.	Culm of Coal.
Picton...nett	$2 25	1 25
Sydney	2 25	- 80
Lingan	1 75	- 80
Caledonia	1 75	- 80

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	$7 10 @- —
Fairmount Gas Coal Co. of N. Y	7 00 @- —
Despard Coal Co	7 00 @- —
Penn	7 10 @- —
Newburg Orrel Gas	- — @- —
West Fairmount Gas Coal	7 00 @- —
Redbank Cannel, Penn	- — @- —
AT PHILADELPHIA.	
Westmoreland	7 00 @- —

Freights.—April, 1873

Cumberland. TO EASTERN PORTS.	From Georgetown.	From Baltimore
Amesbury		
Bangor		4 50
Bath		4 50
Boston	3 10	3 90
Bridgeport	2 75	3 00
Bristol		
Conasset Nar'ows	2 25	
Derby		
Dighton	2 85	
East Cambridge		
Fall River	2 75	3 00
Hackensack		
Hartford		
Hoboken	2 10	
Jersey City	2 10	
Middletown		
Mystic		
New Bedford	3 00	3 00
Newburyport	3 10	4 25
New Haven	2 75	3 00
New London	2 75	3 00
Newport	2 30	
New York	2 25	2 25
Norwalk	2 50	
Norwich		
Pawtucket		
Portland	3 25	3 90
Portsmouth, N. H		4 25
Providence	2 75	3 00
Rockport		
Saco		
Sag Harbor		
Salem	2 70	4 00
Stamford		
Stonington		
Taunton		
Warren		
TO RIVER PORTS		
Albany		
Catskill		
Cockaackie		
Coeymans		
Cold Spring	2 30	
Fishkill		
Haverstraw		
Hudson	3 25	
New York		
Nyack	2 25	
Poughkeepsie	2 50	
Rhinebeck		
Rondout		
Saugerties		
Sing Sing		
Stuyvesant		
Tarrytown		
Troy	3 00	
West Point		
Yonkers		

Anthracite. From Philadelphia.	From Ellis, Port, Port Johnston, and Hoboken.	From Newburgh.	From Rondout.
	2 60		
	2 40		
	1 00		
	1 40		
	1 40		
	50		
	50		
	1 50		
	1 40		
	2 80		
	1 00		
	1 20		
	1 40		
	50		
	1 00		
	1 45		
	1 60		
	2 40		
	2 55		
	1 40		
	1 30		
	2 40		
	1 00		
	1 50		
	2 00		
	1 4		

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

Foreign and Provincial Freight

April, 1873.

Foreign.
Newcastle and Ports on Tyne, per keel of 21 1-2 tons £
Liverpool, 5 per cent primage

TO NEW YORK.

Provincial.

Sydney	$3 00
Lingan	3 50
Cow Bay	3 75
Port Caledonia	3 10
Little Glace Bay	3 00

TO BOSTON.

Sydney	3 00
Lingan	3 00
Cow Bay	3 00
Port Caledonia	3 00
Little Glace Bay	2 90

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., 22c., 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	1 06
Shipping expenses at Elizabethport	25
Wharfage	10
Total	$2 13

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., Manch Chunk to Phillipsburgh	72
Morris & Essex R. R. Phillipsburgh to Hoboken	1 06
Shipping expenses	25
Wharfage	10
Total	$2 23

TO SOUTH AMBOY.

L. V. R. R.	72
B. & D. R. R. / Cam. & Am. R. R.	1 06
Shipping Expenses	25
Total	$2 23

PENN HAVEN TO ELIZABETHPORT.

L. V. R. R. Penn Haven to Phillipsburgh	0 84
C. Rit. of N. J. Phillipsburgh to Elizabethport	1 06
Shipping expenses	15
Wharfage	20
Total	$2 35

MARKET REVIEW.

NEW YORK, April 3, 1873.

MESSRS. BIGELOW & JOHNSTON, No. 48 Pine street, under date of April 3d, 1873, have kindly furnished us with the following report of the Iron Market:

PIG IRON—American is firmly held at $50 for No. 1, of leading brands of Lehigh. For No. 2 the demand is limited at $46@48. Scotch is very dull, but the stock being limited, prices are partly firm notwithstanding some decline in Glasgow. The high price of gold adds considerably to the cost, but unfortunately without adding proportionately to the price obtained by imports. We quote $53a60 for the various brands.

NEW RAILS—The continued dullness in the market for bonds, and the unusual stringency in money restrict operations. Importers are generally hopeful of higher prices, and therefore do not press their stocks, on view especially of the impossibility of replacing at any thing like present figures. We quote nominally $70a72 gold.

OLD RAILS—Demands very light, but arrivals equally so. There is considerable stock still in store, but it consists mostly of T. Section which is not so desirable. We quote D. Heads $57, T's. $55.

SCRAP IRON—The demand is not quite so active as it ought to be at this season, but prices as in other departments are well supported from the comparatively light stock which is being carried. We quote $55a56 for No. 1 ex yard.

IRON—The market for Scotch Pig is dull. The stocks here are light, and though the same may said of the country, yet there is no desire to change the hand-to-mouth-policy that has been the rule for months past. The non-opening of; navigation has also a quieting effect on the market. Advices from the other side quote the market a shade off, but though freights are low, there are few or no shipments here, on account of the high cost there and the inadequate returns the market here affords. We shade our quotations a little, but any active demand would have the tendency to advance them. We hear of nothing doing excepting a lot of Gartsherrie, to close an invoice, at $60. American Pig is firmly held at $50 for No. 1; No. 2 is steady at $46.50@$47.50; the deliveries of No. 1, it is said, are of a poorer quality than of previous years, and this has the tendency to keep Scotch Pig up to full quotations, and beyond an occasional lot there is little or none to be had of either Scotch or American, except at full rates; we have only to note 100 tons No. 2 Crane on private terms. New English and American Rails are quiet at our quotations. Old English are in some inquiry. We note sales of 300 tons, D. H., at Philadelphia, at $57; 100 do. here, $57; and 50 do. on terms not made public. Scrap is quiet; sales small lots ex ship, on terms not made public. Manufactured, from store, is quiet and steady.

LEAD—There is a moderate demand for Pig and the advanced prices are sustained; sales 75 tons Foreign at 6¼@6¾ cents; and 200 do. Domestic 6¾@6¾, all gold. Bar 9¼ cents, Sheet and Pipe 10½, and Tin-lined Pipe 16½, usual discount to the Trade.

COPPER—New Sheathing is steady at 43 cents and Bolts and Braziers 45, Bronze and Yellow Metal Sheathing 27, and Y. M. Bolts, 32, net cash. Ingot for immediate delivery is without movement. Lake is held at 34½ cents, cash, and 32@32½ for June to October deliveries; 200,000 lbs. sold for Summer delivery on private terms. Cables were received yesterday advising a further advance in England, Chili Bars now £92, and Best Selected £99, but these accounts, in the present disturbed state of financial matters, are wholly without effect. In English we note sales of 75@100 tons at 30¼ up to 30½ cents for small lots, 30 days.

LIVERPOOL, March 14th.—(From Messrs. SANDERS

Brothers' Monthly Metal Circular.)—The demand for English Copper for the United States has not been very heavy for the past month. We estimate the total quantity purchased at about 300 tons of Selected, prices varying from £95 to £91, the whole being required for immediate shipping. The total quantities contracted, and still unshipped, we estimate at about 800@1000 tons, which may probably be sufficient to meet the requirements of the trade until the Lake supply comes to market. Cable advices have been received here of a sale of 5000 tons of Lake Superior Copper, at prices ranging from 30 to 31 cents per lb., which is 4a5 cents per lb. below the spot value in New York. This news has had a depressing influence on our market, and until mail advices come to hand giving details of the transaction, speculative rumors are current, some asserting that this large transaction is a strong effort on the part of the Lake producers to exclude shipments of English Copper by reducing prices of their own supply to such a point as will entirely prevent profitable importation. Some are of opinion that the Lake supply will be larger this year than it was last, and that the sale only represents a portion of the total. Of course until we have some accurate data on which to base calculations, it is a matter of mere conjecture at the present time whether the shipments from this side—which have for the last twelve months been a very important item in our total exports—will be continued in the future. The demand from the United States has unquestionably been a very great lift for our market; prices undoubtedly would have receded much below their present level but for this. The consumptive demand in this country has been good, running more on Brass than Copper. The high cost of iron ships at present, causes an increased demand for wooden vessels, and a larger quantity than usual of Yellow Metal Sheathing is being manufactured.

Spelter—Has been very quiet; prices, however, are nominally as before, say 7¾a 7⅞ cents gold for Silesian., Domestic 11 c. currency.

Steel—There is nothing new to note, prices being steady and firm, and stocks so light, that only small orders can be filled without delay.

Tin—The market for both Pig and Plates has come to a stand, and we hear of no sales; we quote nominally, Straights Pig 33½ cents, English 32¼, and Banca 38 gold. The stock of Plates is moderate and not urged, the present impediments to business being looked upon as of a transient character. In the meantime, prices are steady at our quoted rates.

The following extract is from Messrs. Sanders Brothers' Metal Circular:—

Liverpool, March 14.—During the past month we have had an uninterruptedly good demand for all description of Tin Plates, both for spot and forward delivery; and makers have been much pressed by buyers to enter into contracts as far ahead as June, at prices slightly in advance of spot quotations, thus manifesting a thorough confidence in the future of the market. The strike in South Wales may be considered virtually over, though so far all the men have not resumed work. The Tin Plate makers have been able to secure supplies of Welsh Pig Iron out of stock at lower rates than the current quotations for West Cumberland Hematites, which are extensively used in the manufacture of Coke Plates. As soon as the iron works are in full swing, they will be thrown back on the more expensive iron again, which will tend to increase cost of manufacture. During the enforced idleness of the last few months, labor has been in very full supply, and Tin Plate makers have been able consequently to produce a greater quantity than the average. When operations are resumed at the large iron works, the men will return to their old employers, the scarcity experienced at the close of last year will again be felt, and a diminished production must necessarily result. The next meeting of Tin Plate makers will be held on the 24 of April, when an advance on the current list rates will undoubtedly be declared. We think it not improbable that quotations will be advanced to 39s. for ordinary Cokes, and 45s. for ordinary Charcoals, the figures agreed on in January last being 36s. and 42s. respectively. In previous years the difference between Coke and Charcoal Plates has been about 4s. per box; to-day 6s.a 7s. is usually asked. Prices still show an upward tendency, and although we must admit that figures are high, compared with the average of previous years, the exceptional circumstances experienced in all branches of the Iron trade fully warrant to-day's figures. Makers are very confident in higher figures ruling the next three months, and this view of the future is fully confirmed by the high prices paid by buyers. Most works are fully engaged to the end of May; some, however, have declined contracting beyond April, holding for the higher rates that they are satisfied will then rule. There is a marked absence of second-hand parcels in the market; all fresh orders must consequently be filled from the works direct.

Zinc—Mosselmann Sheet is steady at previous price from agents' hands without sales. Manganese, black oxide, 4 c.; Manganese, gray oxide, 5½.

Edward Samuel, under date of Philadelphia, April 1st, writes as follows:

American Pig Iron has been even more quiet the past month than that preceding, and sales of any magnitude have been only to dealers, not to consumers. The local trade is fully supplied. At Pittsburgh and other Western markets, the same dullness and comparative low figures exist as stated in last month's review. There has been some little scarceness of prime No. 1 Iron, but both No. 2 Foundry and No. 3 Gray Forge are in abundant supply. The better class of Irons are held at $47a $48 for No. 1, $44a$45 for No. 2, and $39a$40 for No. 3 Forge, all Furnace delivery.

Scotch Pig.—The market here has been fully stocked with Eglinton, owing to a large lot about which there has been some dispute being put on the market, sales of about 750 tons are reported at figures ranging from $54a$56.

In the English market, further advances are reported. Under date March 14th, the Liverpool quotations were F. O. B. in the Clyde as follows:—

Gartsherrie,	162s. 6d.	Carnbree,	149s.
Coltness,	162s. 6d.	Glengarnock,	149s.
Summerlee,	160s.	Dalmellington,	138s.
Langloan,	162s. 6d.	Eglinton,	138s.
Calder,	160s.		

Exports for February to United States,.....10,079 tons.
Exports to other countries.....67,064 "

Stock of Pig Iron, Glasgow, 25th Dec. 1872....106,919 "
" " " 7th March, 1873.. 84,478 "

Decrease,..... 22,441 tons.

Rails are held at $83a$85 per ton at mill, for good makes, and for present and near future delivery. The trade is dull, and from the number of mills comparatively idle, must be unremunerative. There are at present lying idle from different causes, three mills east of the Alleghanies, representing a production of not less than 90,000 tons; this, together with the high price of English Iron, should certainly advance the price before long. Rails are held at £11. 10 to £13 in England.

Merchant Bar has been better in price, an advance of a tenth cent per lb. being generally asked and realized; there is not however the usual pressure of orders which occurs at this season of the year, and many of the mills claim that at existing prices of raw material, the business is unprofitable. Refined bars are quoted at 4 1-10a 4 4-10c. per lb. at mill, Common $85 to $87.

Old Rails are dull at $53a$59 for D. H.s and $56a$57 for T's. Abroad they are active and firm at £9 2-6 to £9 5c. f & i, Philadelphia.

Wrought Scrap is in fair demand at from $52a$56 according to selection.

METALS.

New York, April 3, 1873.

IRON.—Duty: Bars, 1 to 1½ cents ℔ lb; Railroad, 10 cents ℔100 lbs.; Boiler and Plate, 1½ cents ℔ lb; Sheet, Band, Hoop, and Scroll, 1¼ to 1¾ cents ℔ lb; Pig, $7 ℔ ton; Polished Sheet, 3 cts. ℔ lb; Galvanized 2½; 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 Prices.
Pig, Scotch—Coltness ℔ ton	— —@65 00
Gartsherrie	— —@60 00
Glengarnock	56 00@— —
Eglinton	54 00@55 00
Pig, American, No. 1	50 00@— —
Pig, American, No. 2	46 50@47 50
Pig, American, Forge	41 00@43 00
Bar Refined, English and American	— —@110 00
Bar Swedes, assorted sizes gold	137 50@142 50

	Store Prices, Cash.
Bar, Swedes, 1¼ to 5 x ½ & ⅝ 2 sq. & 6 to 12 x ¾ & ⅝	150 00@160 00
Bar, Refined, ⅝ to 2 in. rd. & sq. 1 to 6 in. x ½ to 1 in.	107 50@— —
Bar, Refined, 1⅛ to 6 by ⅛	— —@112 50
Bar, Refined, 2½ to 2⅞ round 1 & 1¼ by ¼ & 5:16	115 00@— —
Large Rounds	115 00@127 50
Scroll	130 00@160 00
Ovals and half-round	132 50@152 50
Band	— —@125 00
Horse Shoe	— —@127 50
Rods, ⅜ to 3-16 inch	112 50@155 00
Hoop	155 00@180 00
Nailrod	@ 9¼
Sheet, Russia, as to assortment (gold)	16 @ 16½
Sheet, Singles, D. and T. Common	—6½@— 7½
Sheet, D. and T. Charcoal	—7¼@— 8½
Sheet, Galv'd, list 5 per cent, discount	—@— —
Rails, English (gold), ℔ ton	70 00@ 72 00
Rails, American, at Works in Pennsylvania, currency	80 00@ 85 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	— @— 43
Copper Bolts	— @— 45
Copper Braziers, 16oz. and over	— @— 45
Copper Nails	— @— 45
Copper, Old Sheathing, &c. mixed lots	28 @— 30
Copper, Old, for chemical purposes, 14@16 oz.	— @— —
Copper, American Ingot	31½@— —
Copper English Pig	30¾@— 30½
Yellow Metal, New Sheathing & Bronze	27 @— —
Yellow Metal Bolts	— @— 32
Yellow Metal Nails	27 @— 30

LEAD.—Duty: Pig, $2 ℔ 100 lbs.; old Lead, 1½ cents ℔ lb. Pipe and Sheet, 2¾ cents ℔ lb.

Galena, ℔ 100 lbs	$— — @— —
Spanish (gold)	6 62½@6 75
German, do.	— —@6 75
English do.	6 75 @7 12½
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	— 18 @— 22
English Spring (2d and 1st quality)	— 9½@— 10½
English Blister (2d and 1st quality)	— 11½@— 16
English Machinery	— 11½@— 14
English German (2d an 1st quality)	— 11½@— 12
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	38 @38
Straits	33½@33½
English	32½@—

PLATES.

Fair to Good Brands.	*Gold.*	*Currency*
I. C. Charcoal, ℔ box	$12 25 @12 50	$14 50 @14 75
I. C. Coke	10 50 @11 00	12 50 @13 00
Coke Terne	9 00 @10 00	10 75 @11 87½
Charcoal Terne	10 75 @11 25	12 75 @13 25

SPELTER—Duty: In Pigs, Bars & Plates, $1.50 p. 100lbs.

Plates, Foreign (gold) p. 100 lb.	7 75 @—7 87½
Plates, Domestic p. lb.	9 @—11

ZINC—Duty: Pig or Block, $1.50 per 100 lb.; Sheet 2½c. per lb.

Sheet	per lb.—11 @11½

San Francisco Stock Market.

BY TELEGRAPH.

New York, April 3d, 1873.

We have advices from the San Francisco Stock Market, dated April 1st and 3d respectively. The general tone of the market evinces a decided improvement over the recent unparalleled decline. Meadow Valley still follows the downward track, having declined $9½ since our last. Raymond & Ely, Chollar & Gould, are a little lower with which exceptions the market is firmer.

	April 1.	April 3.
Savage	— 46½	41
Crown Point	— 90⅛	90⅛
Yellow Jacket	— 60	59
Kentuck, "New Issue"	— 8½	8¾
Chollar Potosi	— 63⅞	42⅜
Gould & Curry "New Issue"	— 8⅞	8
Belcher "New Issue"	— 71	70
Imperial	— 6¼	6¾
Raymond & Ely	— 56⅜	54¾
Meadow Valley	— 10⅜	10

American Institute of Mining Engineers.

OFFICIAL BULLETIN.

Announcements to Members and Associates.

I. All members and Associates who pay their dues ($10,) for each current year, strictly in advance, will have sent to their address, regularly and weekly, the Engineering and Mining Journal, which is the organ of the Institute, and will contain the proceedings and transactions, and all important papers read before the Institute and all notices of meetings. Back numbers cannot, as a general rule, be sent.

Those members and associates who have not paid their dues for the current year, are requested to do so at once. Money may be sent in postal orders, checks or bank bills, to the Secretary, Thomas M. Drown, 1123 Girard street, Philadelphia, Pa.

II. It is expected that the more important papers, read before the Institute, and the debates thereon, will be published in annual or occasional volumes to which those Members and Associates will be entitled who have paid their dues.

III. All authors of papers are requested to notify the Secretary in advance of the meetings, giving the subject and length of their papers. Attention is also called, in this connection, to Rules 12 and 13.

IV. The ninth rule has been amended, so that there will be hereafter three meetings a year, in February, May and October.

Thomas M. Drown, Secretary.
1123 Girard street, Philadelphia, Pa.

The Bacon Hoisting Machines.

The tendency of blast furnace construction is now toward high furnaces with a cubic capacity from three to five times that which was in vogue only ten or fifteen years ago. Furnaces of 80 feet in height and 12,000 to 20,000 cubic feet capacity are now the rule in many of the British iron districts, and are multiplying in this country. One of the prime necessities introduced by the new order of things is an increase of hoisting power fully equal to the increase in capacity, or rather in excess of it. The accidents to which every furnace is subject compel an occasional cessation of charging for a time, which varies from a few hours up to several days, during which time the column of materials sinks in the furnace, and, when charging is resumed, the large space to be filled up taxes the powers of the hoist to the utmost. Some of the new furnaces have been built with hoists which, from insufficient power to overcome the occasional demand upon their resources, seriously delay the resumption of operations after one of these temporary stoppages, and it is only after hard work that the furnace can be filled up to the throat. These considerations have led to the abandonment, in many cases, of the old water balance, which, besides the constant inconvenience of a wet atmosphere about the furnace, and ice in winter, is not so susceptible of sudden increase of working power as some other forms of hoist. Pneumatic hoists were the first resort in the search for some machine to take the place of the old water balance. At present, however, the practice of engineers seems to be tending toward the employment of machines similar to, or identical with, those in use in other situations where bulky and weighty articles have to be lifted to a considerable height. At all events, the ordinary hoisting machine, with a drum worked by direct acting steam power, and winding a wire rope, has, within a year or two, been introduced in several blast furnace works, both abroad and in this country. The perfect neatness of this system, the absence of moisture, and the power of increasing the work of the machine at will, together with the small space it occupies, are advantages that must recommend its use.

We illustrate on our supplement this week, two of Mr. E. C. BACON'S hoists. One of them is especially designed for blast furnace use. It consists of two cylinders placed at the end of a shaft which carries a small pinion working into a cogwheel carried on an intermediate shaft. Another pinion on this shaft gears into a large wheel on the drum. The machine is designed to work with rapid strokes, and no boiler is supplied, steam being drawn from the common battery which supplies power for the other operations of the works; though, of course, a special boiler can be placed close to the hoist if desired. The drum carries two ropes, winding one and unwinding the other, whichever way it is turned. The piston rods have the shape of flat drums, in which the short connecting rods work, and the latter are attached to discs placed on the driving shaft. The drum is large enough to adapt it to wire ropes. A simple and strong framework, direct action and small space occupied, are points which will be appreciated by blast furnace men. The double action of the drum permits the use of two platforms with one machine. This hoist works well and economically at half speed, which permits an increase of work at will. It has a link motion, the valves being reversed by one lever, which can be worked from the top of the furnace. It is very suitable for mines, blast, furnaces and other situations where a stationary power is needed. The other machine which is illustrated in our supplement, is a portable hoist designed especially for quarries, contractor's work, pile driving and similar operations. It has two cylinders geared direct to winding drums, working a shaft which is geared directly to the drums, which are worked independently of each other, by the two levers at the side. These, however, are not the whole of Mr. BACON'S designs for hoisting machines; on the contrary, his catalogue contains a list of three styles of hoists with boilers attached, and six hoists without boilers, the differences consisting in provisions for using a greater or less power, winding from one or more drums, attachments designed to secure safety, and other details designed to fit the hoists for special uses in houses, stores, on shipboard and in various other situations. All of his machines are made by the Speedwell Iron Works, office, 36 Courtlandt street, New York.

A New Slag Machine.

Recipes for the utilization of blast furnace slag, have been the most frequent item to be found in the technical papers for the past year, but as we have seen little or nothing that was not included in Prof. EGLESTON'S paper, read before the Institute and published in this journal, we have omitted to gather them up. The attention called to the subject has, however, been fruitful in many ways. Companies have been formed for making slag into one material or another, by which the blast furnace manager is to be relieved of his slag without expense, if he gains no more than that. The important economy that can be effected in the transportation of this product by cars directly from the furnace, is, however, a more promising field of experiment, and in this something of real value has been done. *Engineering* of March 7, describes and illustrates a machine lately put in operation at the Tees Iron Works, in the Cleveland district, the object of which is to cool the slag rapidly and deliver it to a railway car.

The machine consists of a wheel 15 feet in diameter. This wheel is horizontal and is revolved by a pinion playing in a cog-ring placed on the under side. Along the edge, on the upper side, is a circular iron plate, about 30 inches wide, in segments, and cast upon coils of wrought iron pipe. The slag is delivered in a small stream upon the surface of this plate, and after it has revolved 6 or 8 feet, during which time it solidifies, water is thrown upon it from a distributing pipe which lies over the table for nearly half its circumference, and is furnished with half-a-dozen spouts. It is therefore cooled in a thin layer, and has the brittleness consequent upon rapid cooling. After making about a three-quarter revolution the slag encounters a set of scrapers which raise it from the table and throw it sideways into the trunk. In this form the slag is more useful and saleable than in large blocks, while accidents and the labor attending the removal are less with cold than with hot slag, especially when the latter is in large cakes with a still fluid center. The fact that 7 and 8 ton trucks can be used to remove it instead of the old 2 and 3 ton wagons, is also an item of economy.

This machine has been at work several months and has disposed of some thousands of tons of slag, all of which has been sold at a profit. It is patented by Mr. CHARLES WOOD. He has also invented another machine which turns out the slag in the form of sand.

The Tees Iron Works, where this machine is in use, is the only establishment in England which possesses a complete Danks plant. The last report from it claimed a large saving in cost and the production of a better iron. The dryness of this system of puddling is remarked upon by British iron experts as a special advantage, a fact which is somewhat remarkable when we remember that "boiling the iron in its own gravy" has been the process previously in use, and the melted cinder in which the iron is partly immersed has been given as one of the principal causes of the refinement which takes place in puddling. So sudden a change of base is a proceeding rather unusual with Englishmen, but it seems to be an accomplished fact.

Profitable Ore-Shipments from the Red Cloud Mine, Gold Hill, Colorado.

The Red Cloud mine has been repeatedly mentioned in this journal as being the only mine now worked in this country, which carries tellurides of gold and silver of extraordinarily great value.

The first class ore from this mine has for some time been shipped to Mr. H. ROBERTSON, of this city, Agent of the Royal Prussian and Saxon Smelting Works in Germany. Lately we have been favored with a glance at the returns of a shipment—the third of such high-grade ores—illustrating well at once the exceptional richness of the mine, and the favorable prices realized by ore-shippers, who take advantage of the liberal terms offered by the above works.

The shipment consisted of seventy-six sacks, weighing net 6,077 lbs., and containing total 1,176·5 ounces of silver and 202.5 ounces of gold. The gross proceeds at the smelting works were

For the silver.....	Rm.	5,938·8	= $1,425.31	coin.
For the gold.....	Rm.	16,326·45	= 3,918.35	"
	Rm.	22,265·25	$5,343.66	"
Net proceeds.....	Rm.	21,876	= 5,250	"
Total expenses from New York to the works.....	Rm.	389·25	$ 93.66	"

The owners received therefore, gross, $1.21 coin per ounce of silver and $19.35 coin per ounce of gold, and the total expense of handling and shipping over three tons of ore from New York to the smelting works was only $93.66.

Every pound of ore brought the owner, net, 86.4 cents or $1,728 coin per ton of 2,000 lbs. There are certainly very few mines in the world, that can produce ores as rich as these by the ton.

Explosion of a Six Hundred Pound Shell in a Melting Furnace.

This rare accident occurred at the Woolwich Arsenal, England, a place where of all establishments such an occurrence would hardly be expected. It appears that in consequence of the extraordinary system of rifling guns pursued in England, no shell can be fired without destruction, even though it is fired into soft earth. The rifling is of the "gaining twist" kind, and the shell is so injured in its efforts to get out of the gun, that it has to be remelted and recast. Before melting, the shells pass through the hands of special examiners, but it is evident that some one failed in his duty in this instance. The bursting charge was still in the shell, and when the iron became heated the powder exploded, throwing portions of the shell up through the roof of the workshop, which fell in the marshes several hundred yards off. The remarkable thing is that the largest sized shell thrown from a rifled cannon, and intended to be the most powerful destroying agent used in war, could explode in the midst of hot coke, iron and chalk, without killing all around and ruining the works. The result, however, was confined to damage to the skylights and neighboring roofs from the hot materials thrown on them. Probably the powder charge was not a full one.

While on this subject, we will add that each 12-inch shell costs £4 18s. to make, that to remelt it, a considerable charge for transportation and boring out the bronze-studs, besides the cost of re-casting, is incurred, and that the "Woolwich system of rifling" does not seem to pay. The guns burst, the shells crack when in store, and every time one leaves the gun it is in one way or another so much injured, that repairs or reconstruction is a necessity. This system of rifling was some years ago *proposed* in France and *adopted* in England with great eclat. It was re-christened with an English name, like so many other foreign inventions, and its dead failure can only be looked upon as a just punishment for such appropriation.

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.

We regret to learn the destruction by fire, last week, of DITTMAR'S Dualin manufactory at North Quincy, Mass. The loss, reported to be about $17,000, will not, we trust, seriously hinder or delay the continuance of the business. Meanwhile, the circumstance that 10,000 pounds of dualin in the works burned up without explosion, is a striking proof of the safety of this material, when unconfined. Such a demonstration as that may be worth $17,000 in the long run, as an advertisement.

Dr. W. A. ROYCE, of Newburgh, N. Y., proposes to use compressed air as a disinfectant. Intense cold is known to be a powerful agent for the destruction of the fomites of yellow fever, and the production of cold by the sudden expansion of compressed air appears to us to be a method which is peculiarly applicable to the disinfection of ships, and clothing, or other articles which a chemical agent may seriously injure. Dr. ROYCE is not happy in the letter which he has addressed to the Secretary of the Navy, which reads as the indefinite and unrestrained prospectuses of inventors are too apt to read. He proposes first, to use the compressed air for actuating an auxiliary engine, but does not say what work this engine is to do, and seems to be unaware of the fact, that in an engine furnished "with the best adjustable cut off," as he strictly prescribes, his production of cold will take place in the cylinder of his engine, and not in the chamber to be disinfected. He also proposes to attach a long cylindrical wire basket, covered with hair cloth, to the blast nozzle. This he thinks "will diffuse the cold air in every direction, and prevent a wasteful agitation and mixing of the cold air with the warm by the jet, which otherwise would follow the influx." In fact the whole of his letter is nonsense, except the bare suggestion of the propriety of using compressed air to produce cold. Many circumstances make that commendable, and the government can well afford to give it a trial.

The New York Fire Department last week tried a method for increasing its usefulness which commends itself both for its simplicity and for the success which it promises. In the block in which the offices of the JOURNAL are situated, on the corner of Broadway, is one of those high iron-fronted buildings which form landmarks to the visiting countryman and are the acknowledged dread of the fireman. A 4-inch wrought iron pipe has been fixed to the outside of this building and reaches from the sidewalk to the highest point of the roof, probably 110 feet in all. On Wednesday a steam fire engine was drawn up, its hose attached to the stationary pipe, and trials made of the distance to which the stream could be thrown from the top. The buildings around were soon dripping, but the effect of the great friction and pressure due to such a height, were evident in a decreased throw of the stream. This, however, is a drawback which is due to circumstances unconnected with the principle of stationary pipes, and it seems to us that this mode of lessening the time required for an engine to get to work is worth all it would cost. It is the time lost in carrying a hose up to the top of a high building that is the weak point of our fire system. Engines are promptly on the ground, but a great deal of time is often lost in dragging the heavy hose to the floor where the fire occurs. With the stationary pipe the connection with the engine is immediately made, a short hose is quickly carried to the needed level, attached to the main pipe by means of couplings placed at each floor, and the men are ready. With very high buildings its value is apparent, and in any thing like a large fire it could not fail to be be useful in preserving those towering roofs which have proved so disastrous in two of our cities.

Fire Extinguishers in Mines.

SIMONIN, in his *Vie Souterraine*, gives a picturesque representation of a phalanx of miners, attacking with portable extinguishers an underground fire. The text, however, does not indicate that this method has actually been employed in practice. Indeed, the imperfections of the earlier machines of this kind tended to discourage reliance upon them; since the first requisite for such an apparatus, in mines more than anywhere else, is certainty of effective action at any moment.

The simplicity, perfection and convenience of such machines as the Babcock extinguishers, and the undeniable verdict of experience above-ground, in their favor, suggest most forcibly the present feasibility of the proposition of M. SIMONIN. The conditions of subterranean fires, particularly when they originate among the old, dry timbers of mines, and not from wide-spreading fire-damp, are such as to indicate strongly this method of attack. Of these conflagrations it is specially true, that they are feeble at the outset and irresistible in the end. The ordinary ventilation of a mine in which mechanical ventilators are not employed, conveys too little air to support a fierce combustion. It is after the fire, smouldering and creeping, has gathered headway, that the rush of heated air created by it, works a vast increase of draught, and thus draws, in augmented volume, the needed supply of oxygen. A common phenomenon is the backward progress of the fire—instead of its advance in the direction taken by the flame and smoke. This is of course due to the extinguishing effect of the carbonic acid produced in combustion. The fire advances towards the supply of air. It is therefore possible to approach it in its early stages, from the windward side, and without penetrating, at risk of human life, the suffocating vapors it produces. In many cases, however, underground fires could be extinguished in a moment, if suitable appliances were at hand; and the simple expedient of a fire-extinguisher, placed at the working shaft on each level of a mine, would often, we think, save much money, time, pains, property and even life. The increasing depth of American mines, and the increasing amount and age of the timbers stowed away in them, make this matter important now, and certain to grow in importance henceforward.

The Product of Utah for 1872.

From the forthcoming Report of the U. S. Commissioner of Mining Statistics.

THE following statement of the product of gold, silver and lead of the Territory of Utah, during 1872, has been made up with care from authentic sources. I am particularly indebted for most of the data to Mr. GEORGE J. JOHNSON, of Salt Lake City, who, favored with the courteous coöperation of the various officials of mines, smelting works, and railway and express companies, has procured for me the most trustworthy returns which the circumstances would permit.

Base bullion (lead, silver and gold), 8,125 tons, produced as follows:

Flagstaff Works, 3,000 tons, at $250	$750,000
Miller Works, 1,536 tons, at $178.21*	273 730
Winnemuck Works, 1,232 tons, at $286.97	353,551
Utah Works, 650 tons, at $125	81,250
Saturn Works, 1,207 tons, at $233.07	282,287
Wahsatch Works (approximately), 150 tons, at $250	37,500
All other smelting works (estimated), 350 tons, at $250	87,500
Silver shipped by express, 170,191 oz., at $1.18	200,825
Gold bars and dust shipped by express, 5,556 oz., at $18	100,008
Ore shipped, according to U.C.R.R., 20,693,692 lb., worth in gold and silver $88 per ton	910,523
30 per cent., or 6,208,107 lb., of the above ore may be assumed as lead, worth 2½ cents per lb. in the ore	155,203
Total value of gold, silver and lead	$3,232,377

To obtain the product of the Territory in gold and silver alone, there should be deducted from the aggregate the value of the lead, viz.:

8,125 tons of unrefined lead, at $80	$650,000	
6,208,107 lbs. of lead in the ore, worth 2½ cents per lb	155,203	$ 805,203
Total gold and silver		$2,427,174

From the published statements of shipments by the U.C.R.R. and Messrs.

*The value of the Miller bullion is calculated from the report of the Superintendent, which gives $110 per ton as the value in currency of the gold and silver in this bullion. Converting this into coin at 112, we have $98.21, to which $80 is added, as the value of the unparted lead, at 4 cents per lb.

WELLS, FARGO & Co., and the report of the Germania Refining Works, communicated to me by H. ENGELMANN, M. E., of Salt Lake City, the following figures are arrived at :

Ore shipped, 20,693,692 lb., estimated worth in silver and gold $88 per ton	$910,523
Base bullion shipped, 11,066,853 lb., worth in gold and silver $149.64* per ton	828,033
Base bullion bought by the Germania Refining Works, 925 tons, worth in gold and silver $149.64 per ton	138,417
Silver shipped by express, according to WELLS, FARGO & Co., of Salt Lake City, 170,191 oz., at $1.18	200,825
Gold shipped by express, according to the same source, 5,556 oz., at $18	100,008
Total gold and silver	$2,177,896

To this may be added for lead :

11,066,853 lb., shipped as base bullion, unrefined, at 4 cents per lb	$442,674	
1,670,000 lb., on hand, unrefined, at Germania Refining Works, at 4 cents	66,800	
180,000 lb. refined, shipped by Germania Works, at 5 cents	10,800	
30 per cent. of amount of ore shipped=6,208,107 lb., at 2½ cents	155,203	$ 675,477
Total apparent product of metals		$2,853,283

In comparing the number of tons of base bullion shipped, and the amount bought by the Germania refining works, as per last statement, with the total number of tons reported by Mr. JOHNSON as produced in the various works, it is seen that 1666.5 tons more have been produced than shipped. At the end of the year this base bullion must, therefore, have been at the different furnaces and in transitu to the railroad. If we add the silver value of these 1666.5 tons at the above average valuation per ton, viz., $149 64, to the total amount of gold and silver in the second statement, we have :

Total gold and silver shipped, and bought by the Germania works	$2,177,806
Add 1666.5 tons, silver and gold, value $149 64 per ton	249,375
Total	$2,427,181

Mr. J. J. VALENTINE, Superintendent of WELLS, FARGO & Co., at San Francisco, in a statement, published shortly after January 1st, 1873, gave the product of Utah for 1872, as follows :

Gold by express	$415,166 77
Silver " "	365,285 32
Ores and base bullion	2,740,568 00
Total	$3,521,020 09

This statement gives Utah credit for over one million more than she has really produced in gold and silver. There are large errors in all three items, about half a million being caused in the first two alone, by including the express shipments of coin as part of the produce of the Territory. The large overvaluation of ores and base bullion must be referred to the difficulty of obtaining exact figures so early in the year.

Recent Improvements in Diamond Drills and in the Machinery for their Use.

BY PROFESSOR WILLIAM P. BLAKE.†

The use of diamonds upon a large scale in drilling rocks, and the substitution to a certain degree of rotary diamond drills for the ordinary steel percussion drills, marks a new era in the art of mining.

Since the invention by LESCHOT of the diamond drill, it has steadily advanced in its utility and range of application, and in the appreciation of miners and engineers. It must be claimed as one of the many gifts of science to the arts ; and it is, in particular, one of the fruits of the scientific education given at the *Ecole Centrale*, at Paris.

Members are all, doubtless, more or less familiar with the construction of the drill and of the machinery by which it is applied in boring. It is, therefore, my present purpose only to direct your attention to some recent marked improvements, made by the American Diamond Drill Company, by which the economy and efficiency of the machines have been increased.

Form of bit.—The annular or ring form of the drill-head or bit, was, I believe, the earliest ; and it is still in use, without essential modification, wherever it is desired to obtain a sample "core" or specimen of the rock traversed. But for mere drilling, regardless of the preservation of a test-core, a solid-head bit is preferred, except for very large holes.

Until recently, these solid-head bits were made with a pointed cutting face shaped like an obtuse cone. This form was assumed to be the best, being most in accordance with the experience obtained with percussion drills. It is found, however, that the exact reverse of this pointed conical form is the best. The bits are now made concave ; and the diamonds are studded over the concave surface.

The hollow chamber in the center of this bit is connected with the cutting face of the bit by three or more tubular channels drilled through to the face. These convey the water, forced down through the tubular rods. This water streams through the bit and rapidly removes the abraded rock from among the diamonds, keeping the surface of the rock clean.

This form of drill is a partial return to the annular form. It bores faster, and cuts a straighter hole than the pointed bits.

Setting the Diamonds.—In setting the diamonds in the solid steel heads, it has been the practice, until recently, to first drill sockets deep enough to receive the stones, and then to punch up the surrounding metal, so as to cover the projecting edges and hold them. Now, holes are drilled and the stones are, in some cases at least, forced through the steel from the inside of the bit by the hydraulic pressure. The holes are first drilled smaller than the stones ; and stones much larger than the diameter of such holes have been thus forced forward to the face of the bit. This method ensures the most perfect bedding and contact of the gem and gives a firmer setting. This is an interesting fact in physics, as well as practically important ; for it is a good illustration of the mobility of the particles of what appears to us to be solid and unyielding matter. It gives, also, a hint which may be of some value to jewellers, since cut stones could equally well be forced into solid gold or silver settings.

New Forms of Prospecting Machines.—Among the mechanical changes in the prospecting machines, probably the most important is the modification which facilitates hoisting and lowering the drill. Up to a recent date there was no provision made for raising the drill-rods from the hole without moving the machine. Now the machine may be bolted to its place and remain until the bore is completed. The drill stock is upon the end of a hinged arm, which, when not required, can be swung back out of the way, while the rods are being drawn or inserted.

A hoisting-drum has been added to facilitate handling the drill-rods. This being fixed to the machines, and the drill stock being out of the way, the rods can be hoisted and lowered quickly and easily. Powerful pumps have been added, of double the former capacity, with four-inch cylinders. They supply a body of water under pressure sufficient to wash the drill holes out clean.

Other Machines.—The tunneling and blasting machines are now made with hydraulic feeding apparatus, instead of the mechanical movement. The latter is, however, retained for the prospecting drills, where the holes are vertical or nearly so, and the weight of the rods enters as an element. With the hydraulic feed, the pressure is constant and uniform, while the speed of the drill varies with the hardness of the rock.

Improved Underground Drill.—The American Diamond Drill Company is now making an improved light machine for underground or tunnel work. It is built of steel and gun metal, weighs only about four hundred pounds, and can be handled by two men. For convenience, it may be mounted on wheels. There are two driving cylinders working upon one crank-shaft. Either steam or compressed air may be used.

Wear of Diamonds.—Experience teaches that there is a great difference in the effective hardness or cutting-power of different stones. In general, the African diamonds are avoided, they cleave too readily and split up. The Brazilian stones are the best. The compact black carbon or bort is preferred to the vitreous stones ; it lasts longer and is tougher. Mr. TOMPKINS, President of the American Diamond Drill Company, informs me that he has ascertained, by careful weighing, that after boring 200 feet, there was hardly any appreciable loss by weight in twelve pieces of carbon, set in one bit. When the stones were set, their aggregate weight was twenty-four carats ; when returned, twenty-three and three-quarter carats ; but this loss of a quarter of a carat in weight is attributed wholly to the breaking of one of the stones in cutting it out of the bit.

The Use of the Diamond Drills.—With regard to the present extended use of these drills, and their valuable services in mining and prospecting, it is not my purpose now to speak particularly. Some of the more important localities are enumerated in a recent valuable article in the ENGINEERING AND MINING JOURNAL of Feb. 4.

I must, however, refer to one or two notable examples which illustrate the value and economy of this method of boring. Foremost is the great work undertaken in Pennsylvania by General PLEASANTS, one of our members, and ably described at our meeting in New York in May last, by Mr. COXE. A recent summing up of the work in a tabular form shows that in the shaft, 14 by 21 feet, twenty-five holes were drilled, averaging 254 feet in depth. In 58 working days, the average number of feet drilled daily was 109½. Average number of machines at work, two and eight-tenths. Average cost of wear and tear of bits, etc., 13¼ cents per foot. The rock is the "blue-stone conglomerate." A concave bit is used and the holes are one and three-quarters of an inch in diameter.

On the 1st of February, the east shaft was 530 feet deep, and the west shaft 261 feet, work having been delayed in the latter by an explosion in the engine house. The best blasting thus far has been 80 feet per month of shaft sunk and the best drilling 79 feet of hole drilled in a twelve hours shift. The cost of wear and tear of diamonds and damage to bits was about fifteen cents per foot.

These are some of the many improvements which are now making in this valuable invention. I am sure that gentlemen who are engaged in prospecting, or examining mineral regions for unknown deposits of ore would find this machine of very great service. Even in mines that are already in active work, it is

* Average obtained from the foregoing statement.

† A paper, read before the American Institute of Mining Engineers, at Boston, February 19. 1873.

very desirable to know, in advance of the working, what the ground is, and what amount of ore may be counted upon, in order that the work for its extraction may be properly projected and carried forward.

Refining Gold by Chlorine.

By ADOLPH LEIBIUS, Esq., Ph.D., Senior Assayer of the Sydney Branch of the Royal Mint.*

In refining argentiferous gold by means of chlorine gas (Miller's patent), the silver is eliminated in the form of chloride of silver, or, as now termed, argentic chloride.

In the paper read by Mr. Miller before this Society, on December 1st, 1869,† he described this process so fully that I need not refer to more of it than that part which speaks of the argentic chloride produced. This argentic chloride is never pure, but contains, besides chloride of copper, a considerable quantity of gold, stated by Miller, in the paper quoted above, as 2 per cent of the gold previously refined. If this auriferious argentic chloride is reduced to metallic state without freeing it of its gold, silver bullion results, containing from 12 to 20 per cent of gold, the average being about 18 per cent. This gold exists chiefly in combination with chlorine, and also as a double compound of chloride of gold and silver. By melting the chlorides in a boraxed clay pot, with from 8 to 10 per cent of metallic silver, the greatest part of this gold was removed, but never the whole. Miller states that, with proper care, the amount of gold remaining in the silver need not exceed 3 parts in 10,000. While such was the case in many instances during the time the experiments were going on, the amount of gold left in the silver produced varied from 3 to 27 parts in 10,000, the average being 13 parts in 10,000. Lengthy experience obtained since has shown that, when working on a large scale, and therefore with less time at disposal than when engaged in experimental trials only, the results became still more variable, the gold in the silver bullion having been not seldom as much as 100 to 150 parts in 10,000, and often 10 to 40 parts in 10,000. This irregularity in the results obtained made it desirable to institute further experiments with a view of arriving at a method which would, if possible, take out all the gold, or at all events would only leave a minute and regular proportion of this metal in the silver bullion produced. To free the silver bullion from gold by dissolving it in acid would, in the Colony, where acids are very expensive, not be found remunerative, especially as silver bullion containing 5 grs. of gold per lb. troy can be more advantageously sold in London. When the auriferous argentic chloride is merely fused in a boraxed clay pot without any addition of silver or anything else, about 60 per cent of the gold therein is separated, while about 40 per cent remains in combination with the argentic chloride.

In the use of metallic silver, which was employed in strips about $\frac{1}{8}$" thick, the silver thus added acts decomposing upon the gold compounds, forming chloride of silver, at the expense of the chlorine formerly in combination with the gold. The silver had to be in contact with every part of the molten chloride, which was, as much as possible, achieved by stirring the same with the silver strips employed. Was the heat of the furnace a little too great, and thus allowed the silver strips to melt too rapidly, the silver sank to the bottom of the pot with only a portion of the gold, producing a silvery gold button, while more or less gold was left in the liquid chloride. This, no doubt, was the chief cause of irregularity in the results obtained by employing silver strips. But, even had this not been so frequently the case, a considerable objection to its use would always have been the fact that a large amount of metallic silver would annually have been converted into argentic chloride, and back again into metallic silver.

To avoid this addition of metallic silver, and to substitute other reducing agents, a series of experiments was instituted; fusion, with addition of argol and of resin, as well as reduction by means of hydrogen gas, and also coal-gas, were successively tried; the results have, however, not been found sufficiently practicable.

The addition of carbonate of soda promised more success. Indeed, during the experiments carried on in the Syndney Mint in 1858-9, conjointly with Mr. Miller, by Mr. Hunt and myself, to test the applicability of the refining process on a large scale, the employment of soda for freeing the argentic chloride from gold was suggested by me; but only one trial was made, and, not having been carried out with the precaution which I now find to be required, a considerable loss in the operation caused its rejection in favor of the before-mentioned metallic silver strips. When soda is added in powder to fused chloride of silver, the action ensuing is very violent, and this causes a spitting and throwing up of metallic silver, thereby causing great loss; but when the fused chloride is covered with a layer of borax one-eighth to one-quarter inch in thickness, and the soda is gradually introduced on the top of this layer of borax, the action is found to be very gentle, and can easily be regulated. The quantity of soda required may vary from 16 to 20 ounces per 230 ounces of chloride, fused in a No. 18 boraxed French clay pot. Twenty ounces of soda produce a gold button weighing about 35 ounces, assaying from 870 to 880, while the silver bullion produced will contain from 2 to 5 parts of gold in 10,000 parts.

The operation is very regular in its results, but, as seen, not all the gold is removed thereby; in fact, in no case, even with an increased quantity of soda, was the whole of the gold removed in *one* operation. To produce silver bullion *free* from gold was, however, *always* successful when the argentic chloride was subjected to a second treatment, with about 3 ounces of soda per 200 ounces of argentic chloride. This second operation is done similar to the first, but in a new pot, also boraxed; it requires a short time—about one hour. The argentic chloride containing only traces of gold from the previous treatment with soda, fuses much more readily than when it contains much gold. The time occupied by the first operation varies somewhat, according to the heat of the melting furnace and the character of the chloride. To fuse 230 ounces argentic chloride, after having been introduced into a red-hot pot placed inside a guard, takes from 60 to 80 minutes; the addition of the soda, from 20 to 30 minutes; after which the pot is covered, and the heat of the furnace increased to get all in good fusion, which takes from 10 to 20 minutes. The pot is then removed from the fire, allowed to cool sufficiently for the gold to solidify, when the still liquid argentic chloride is poured off into iron pans, and placed in the galvanic battery, a description of which I gave in a paper read before the Royal Society of New South Wales in December, 1869.

While the soda is being added, the top layer is occasionally gently dipped with a stirrer slightly underneath the molten chloride, without stirring the same; in fact, it is preferable not to stir the fused chloride, but to let the gold collect at the bottom of the pot, and to pour the chloride carefully off.

The presence of a large proportion of copper in the chloride has been found to prolong the operation considerably; it is therefore advisable to refine gold bullion containing much copper by itself, and to free the resulting argentic chloride, which therefore contains much copper, by dissolving the same after being reduced to the metallic state.

It is remarkable how uniformly the gold is diffused in the argentic chloride. Any portion of a slab of this chloride, free from borax, may be assayed for gold, and will be found alike. This offers a convenient means for ascertaining the result of the treatment with soda before the argentic chloride is placed in the battery for reduction. A small piece is broken off from one corner of the slab of chloride, and reduced to fine powder in a Wedgwood mortar; the powder is kept in a corked glass tube, and from thence weighed out for assay in an assay balance. Ten grains are wrapped in a piece of lead-foil, 1½ inches square, and cupelled at low heat with about 60 grains of lead; the resulting silver button is boiled out, and the gold weighed.

This mode of assaying the chloride is so quick—six samples can be easily assayed, inclusive of powdering, in one hour—that it is well worth employing in all cases. Should the assay show more gold in the chloride than desirable, it must be subjected to another treatment with soda. Such a case need, however, only rarely, if ever, occur.

The question whether the *whole* of the gold should be removed from the chloride by a second treatment with soda, as described, or whether such additional expense for pot, fuel, etc., is better avoided, if silver bullion containing little gold were readily saleable, must naturally be left to the consideration of the circumstances attending each case.

* Read before the Royal Society of New South Wales, November 20th, 1872.

† Published in this journal and in the Report of the Commissioner of Mining Statistics for 1870.

A manufactory of ammonia and other products from the waste water of the St. Louis gas works has been started in that city, under the direction of Mr. C. C. PARSONS, who was formerly engaged with his brother, Mr. W. J. PARSONS, in a similar management in New York, now left entirely in the latter's hands. The increase of these product-saving works is a good sign in this country.

MINING SUMMARY.

Utah.

The Salt Lake *Tribune* of March 15 has the following summary for the month of February. (Continued from page 204.)

STAR DISTRICT.

This district is divided into five camps, known respectively as the North, South, East, West and Middle camps. The mines in East camp are better known as the "Foothill Mines."

At North Star the Hickory is a prominent mine, the ore from which assays $80 per ton in silver. Next may be classed the Shenandoah, the Midas, and the Rebel. The Lake Superior mine in the same district contains rich copper ore and is highly prized.

At South star the best developed mine is the St. Mary. The shaft is 75 feet deep and shows a continuous vein four feet in width. Average assay value of the ore is $100 silver and 40 per cent. lead. The vein is true fissure in a quartzite formation. In this district is also the Pitney mine, samples of ore from which have assayed from $210 to $1,800 in silver. Also the Bibbins lode which has a tunnel over three hundred feet in length; the ore is chloride and high grade. The Gentile lode is also in the same district; it is a contact vein lying between a granite and quartzite formation. The average assay value of the ore is $187 in silver and gold, and 40 per cent. in lead to the ton.

At East Star (the Foot-hills) prospecting is being carried on with great energy, large bodies of ore have been recently struck, and discoveries, so far, are very satisfactory.

At West Star, on the Temperance and Medusa group a large quantity of work has been done, including a tunnel 280 feet long, a shaft 68 feet deep, another 50 feet, and others varying from 10 to 30 feet. On the dump there is about 300 tons of ore. The character of the ore is milling and assays $80 in silver to the ton. The Flora is another good mine of smelting ore composed of carbonates and galena, and assays from $40 to $700 per ton. About 150 tons are on the dump. There are three shafts, respectively, 125, 50 and 40 feet deep, besides four or five others, ten or twelve feet

deep. The Look-out in the same camp is a twenty-inch vein, of rich ore assaying in some cases $400 in silver to the ton. There are also the Magyar and Lady of the Lake, both rich and valuable mines.

In Middle Camp the Jupiter mine has a shaft sunk on it sixty feet deep. A crevice of high grade ore has continued all the way down. The vein is in limestone. The locations on Clipper Hill, near by, are in a quartzite formation and are highly spoken of.

BEAVER LAKE DISTRICT,

About twelve miles from Star, is rather a recent discovery, but promises well. The San Francisco mine has, we are told, been sold to some capitalists who are at work developing it. The Fairview is a rich copper mine and has a shaft on it, fifty feet deep. The Tecumseh is a fine vein of horn silver. Considerable work has been done on it. The Big Mountain shows good prospects, samples of the ore have given by assay $800 in silver and sixty per cent. lead to the ton. Some of the ores in this district contain 40 per cent. in copper to the ton.

SAN FRANCISCO DISTRICT

Is about 250 miles south of Salt Lake City and 14 miles northwest of Star district. The Florence mine is down 110 feet on a four-foot ledge, which yields by assay $100 in silver, $45 in gold and 30 per cent. lead to the ton. Other noted mines in this district are the Captain Bill, Emma, Granite, State, Hugo, St. John's and St. Mary's. The Massachusetts shows a vein 83 feet wide on the surface; at a depth of 50 feet. fine specimens of oxide and native copper are developed, containing from 30 to 75 per cent. of copper. The ore also carries a large percentage of gold and silver. The Champion is a three-foot vein of galena and carbonates, assaying $60 in silver and 35 per cent. in lead. The Robert E. Lee and Red Warrior are also promising mines.

On the more elevated portions of the mountains are the Silveropolis group, having veins of mammoth proportions. The ore from these lodes contains gold, silver and copper. The chief silver mines are the Gallagher, Belfast, Aurora and Montana.

This district is one of the most promising yet discovered in the southern portion of the Territory, and the class of men who are investing their means toward development is a guarantee, if any other were wanting, that there is sterling wealth connected with the enterprise.

NEW MINING DISTRICTS.

THE NEWFOUNDLAND DISTRICT.

This district which has lately been discovered, is on the west side of Salt Lake, about seventy-five miles from Grantsville and twenty-five miles from the Central Pacific Railroad, in Box Elder County. Mr. JOHN FRANK has been elected recorder, and a code of district laws has been drawn up and agreed to. Several good copper ledges have been found which also carry galena and silver and in some instances gold. Assays have run as high as $37 in silver and 42 per cent. in copper. The following are the names of a few lodes located: Sandridge, Eagle Bird, Mammoth, Great Western, Look-out, Great Republic, Silver Chamber, Mountain Sheep, Plymouth, Jebo, Oregonian, Gem, Snowstorm, Mountain Chief, Franks, Crown Point, Don, Oriental, Sanford, Nellis, Storm King, Last Chance and Telegraph.

LEXINOTON DISTRICT.

This district is on the boundary line, between Utah and Nevada, some ninety miles from Pioche. Four or five new claims are being worked, and they are down from fifteen to twenty feet, with excellent prospects and yielding a paying quality of milling ore. The district is well supplied with wood and water, and possesses every facility to make it a prosperous mining camp.

SILVER ZONE DISTRICT.

This district is located eighteen miles south of Toano, and we understand is a very promising one. Its discovery and permanence will do much towards building up a large town on the present site of Toano.

DRUM DISTRICT.

This district was organized in December, 1872. It is situated forty miles southwest of West Tintic Mining Camp, and some interesting statistics have reached us from there. The principal mines which have been located are the Old Democracy and the Messenger. The veins are large and well defined and contain a larger percentage of copper than any other metal.

ST. CHARLES DISTRICT

Is situated in the northeastern portion of Utah on the western shore of Bear Lake. Valuable copper mines have been discovered, the ore from which is said to carry 70 per cent. in copper and $50 in silver and gold to the ton. The property is owned by gentlemen in Salt Lake City, who have erected substantial buildings, and contemplate putting up a furnace as soon as fine weather sets in.

California.

From the Sacramento *Record* of March 18:

CALAVERAS COUNTY.

RAILROAD FLAT DISTRICT.—The 100-foot south level of the Sanderson mine is being extended. The ore is three feet wide and is expected to mill $40 per ton. Sinking will be resumed next week.

MOSQUIRO DISTRICT.—The owners of the Dolly Varden are driving a level north at the depth of 100 feet. The ore is over four feet wide and shows free gold. Some fifty tons of ore from the Monte Cristo, crushed at the Good Hope mill, yielded in the neighborhood of $35 per ton. The vein is from two to four feet wide.

WEST POINT DISTRICT.—The Ohio Consolidated stopped work for a few days on account of smashing up the pump, which was of too weak a capacity for the body of water in the shaft. A large pump is on its way to the mine, and sinking will be resumed immediately on its arrival. It is stated that the Pancho has been sold to San Francisco parties. KINCAID & Co. crushed a lot of ore at HARRIS' mill, yielding $46 per ton. JOE GRIGGS & Co. are rolling out high grade ore pretty lively. Competent underground miners wanted.

GWIN MINE.—The average product is over $1,000 per day. The work of sinking the main shaft 100 feet deeper will be commenced to-day. Everything in connection with the mine looks as favorable as could be desired.

SIMPSON & Co., who for several months have been engaged in opening a hydraulic on Tunnel Ridge, will be ready to commence washing next week. They are fitting up their claim upon an extensive scale, and all the modern appliances for mining to advantage will be put in.

RAILROAD FLAT DISTRICT.—The Sanderson mine is yielding some extraordinary rich ore. It is the intention of the company to erect new and powerful hoisting works as soon as the weather becomes settled. They have just finished placing in position a large boiler of sufficient steam capacity to work the mine to a depth of 800 feet.

The present working shaft of the Petticoat is to be sunk an additional 250 feet, making a grand total of 700 feet in depth.

In the Wolverine, at a depth of 300 feet, levels will be started north and south, on an extensive body of handsome ore. The mine is opening handsomely, and has every promise of comparing favorably with our best mines. The company has been compelled to cease work in the mine during the past few weeks to make extensive alterations in the relocation of machinery.

CLARK & WOODBURY are having piping times, judging from the immense amount of dirt that is daily washed away from the Portland Flat. Their hydraulic is kept constantly in motion.

BUTTE COUNTY.

CHEROKEE.—The claims of both the Canal and Cherokee Companies are under full work, each set using two hydraulic chiefs. They are cleaning up from $5,000 to $8,000 per week. At least 100 hands are engaged in mining at present in the immediate vicinity of Cherokee, all receiving fair pay, and when the work on the Spring Valley ditch and Concow dam is finished, many more miners will be thrown into the same vicinity.

FORBESTOWN.—The prospects of this old pioneer '49 town are improving. They believe they have discovered the lost lead of Murphy's gulch, which formerly yielded fabulous sums of wealth. JOE PEYTON took out an eight ounce piece, with other fine gold of the character formerly found in that famous lead of '49-'50. Besides this riffle in Placer mining, parties in San Francisco are erecting an extensive quartz mill, the contract for its construction having been let. Extensive mining and water interests have been consolidated, and capital will soon be at work in that vicinity developing some of the best mines in the State. Hundreds of men are to be employed there during the coming summer.

BUSY WITH ROCKERS.—The Chinamen have been busy during the winter with rockers, digging up the country below Oroville. It is astonishing the amount of dirt they work with the ordinary hand rocker of '49. Men who quite recently proved to the satisfaction of the Land Department that this land was more valuable for agricultural than mineral purposes, and secured patents to it, are now disposing of it to Chinamen to be mined out, and Oroville will soon be surrounded on all sides by piles of barren rock, washed gravel, and Celestial slickings.

TUOLUMNE COUNTY.

ARASTRAVILLE.—The Wild Cat Company have their shaft down ninety feet, and a tunnel seventy-five foot long. The vein is eighteen inches to two feet wide and pays $40 per ton. The company have an arastra. The Easton claim rock is crushed by two stamps at present, and ground by an arastra. The Uncle Sam and Virginia claim have a shaft down about 100 feet. The rock pays $60 per ton.

PLACER COUNTY.

IOWA HILL CANAL.—The Iowa Hill Canal Company was organised July, 1872, and made the location of the waters of the middle-fork of the American river, and of the north fork of the American river. The capital stock of the company is $1,000,000. On the 19th of September the work of excavation for the canal was commenced at the Hog's Back, the point where the canal comes on to the main divide. The dimensions of the canal are eight feet wide at the bottom, twelve feet wide at the top, and four and a half feet deep, with a grade of ten feet to the mile. The capacity of the canal will be about 8,000 inches of water. The length of the main canal is about forty miles, length of branch canal from middle fork of American river to connect with main canal about eight miles. The water sources will furnish a supply sufficient to fill the canal until the 1st of August, and at least 1,500 inches of water at any time during the year, which may be increased by the use of reservoirs above the head of the canal. It is the intention of the company to construct the canal from Iowa Hill to Big Canyon (within ten miles of the head) this year and to complete the work next year. The total cost of the canal, including the construction of reservoirs, is estimated at $300,000.

NEVADA COUNTY.

CONDITIONAL SALE.—The American Mining Company, situate on Manzanita Hill, at Sebastopol, have bonded their claims for two hundred and fifty thousand dollars, the contract to be consummated in six months thereafter.

SAN JUAN HILL.—Messrs. BROWN and DAVIS, the only miners now at work on San Juan Hill proper, are conducting their mining operation on an extensive scale, and are doing well. A number of houses, which had been constructed north of San Francisco street, have been removed to their old sites to make room for the miners—the ground having been located for mining purposes before it was built upon. Perhaps twenty houses in all have thus been removed within the past four or five years.

NEW DITCH.—The Milton Mining and Water Company has, during the past winter, had constructed a large new ditch from Lake City to their claim on the Manzanita Hill, near Sweetland, with turnouts to Shady creek. This ditch is about four feet deep and five feet wide upon the bottom, and is intended to carry 3,000 inches of water. That part between Lake City and Cherokee, is entirely completed, and two thousand inches of water is now running through it, and a turnout to Shady Creek.

MINING AT SWEETLAND.—The most productive mine is called the Buckeye, taking its name from the nativity of its locators. It is now opened by English capitalists. Shortly after its purchase it was found necessary to run a lower tunnel, in order that the entire deposit could be systematically worked. It has taken almost two years to run this tunnel, which is now about finished. It gives ample drainage to the entire deposit, being about eighty feet lower than the one washing through; and time will tell of a clean up, or yield of gold, that will go ahead of any made on the ridge.

The Manzanita mine, situated on Manzanita hill, but a short distance west from town, is owned by a corporation called the Milton Mining and Water Company. This company is pushing with vigor a low tunnel from Sweetland creek, a distance of about 1,500 feet, through solid granite walls, giving an outlet to a large part of that mass of mining ground lying between the towns of Sweetland and Sebastapol, which beyond a doubt is one of the largest and richest deposits in the State.

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.*

Rates of Advertising.

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.

Back Page.....40 cents a line.
Inside Pages.....25 cents a line.

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

MISCELLANEOUS.

WM. A. SWEET, Pres't. GEO. W. HARWOOD, Treas. FRED. B. CHAPMAN, Sec'y.

SWEET'S MANUFACTURING CO.,
SYRACUSE, N. Y.,

MANIPULATORS OF

Bessemer Steel,
Siemens Martin Steel,
Cast Steel,
Blister Steel.

MANUFACTURERS OF

Sweet's Cast Steel Crow Bars,
Sweet's Cast Steel R. R. Bars,
Sweet's Oil-tempered Seat Springs,
Sweet's Excelsior Steel Tire,
Swede's Spring Steel,
Cast Spring Steel,
English Spring Steel,
Sleigh Shoe Steel,
Cutter Shoe Steel,
Frog Point Steel.

Nov. 19:1y

SUPERIOR RAIL MILL.—CAPACITY: 1,000 TONS PER WEEK.

Harbaugh, Mathias and Owens,

Manufacturers of

RAILROAD IRON,

Office, corner Fifth Avenue and Smithfield Street, Pittsburgh.

Our central location enables us to draw from both sides of the Allegheny Mountains Metals and Ores best adapted for making a No. 1 Rail, and together with our Improved Machinery, are a sufficient guarantee of our ability to produce Rails of a quality unsurpassed for durability and strength, by any foreign or domestic manufacture.

New Patterns, of any desirable weight, made to order on Short Notice.

We respectfully solicit orders for New Rails, or Re-rolling. June 25.1y

---

UNITED ROYAL SMELTING WORKS

OF THE

KINGDOMS OF PRUSSIA AND SAXONY.

GENERAL AGENCY—R. J. ROBERTSON, HAMBURG, GERMANY,

Whose representative for the United States,

H. ROBERTSON, 149 BROADWAY, NEW YORK,

Is ready to receive consignments of

ORE and all kinds of FURNACE STUFF

For the above-named Works.

Full particulars given on application. Oct. 8-tf

The Largest Organ Establishment in the World.

SEVEN EXTENSIVE FACTORIES.

J. ESTEY & COMPANY,

BRATTLEBORO, VT., U. S. A.

THE CELEBRATED

ESTEY COTTAGE ORGANS.

The Latest and Best Improvements.

Everything that is new and novel. The leading improvements in Organs were introduced first in this establishment.

ESTABLISHED 1846.

SEND FOR ILLUSTRATED CATALOGUE.

April 1:6m

E. B. BENJAMIN,
10 BARCLAY STREET,

NEW YORK CITY,

Importers and Manufacturers of all kinds of apparatus for mineral and chemical analysis. *Laboratory and Assaying Tools, Prospecting and Mining Implements, accurate* Balances and Weights, Furnaces, Tongs, Freiberg Scarifiers, French Cupels and Assay Cups, Flasks, Dippers, *Crucibles*, etc. Complete *Blowpipe* sets for gold and silver tests. Compasses, Beaker's Ingot Moulds, Lenses, Evaporators, etc., etc.

For better description of apparatus and prices, see the large *Illustrated Catalogue*, beautifully gotten up, in cloth,

Price - $1 50 per Copy.

1y-apr8-73

MISCELLANEOUS.

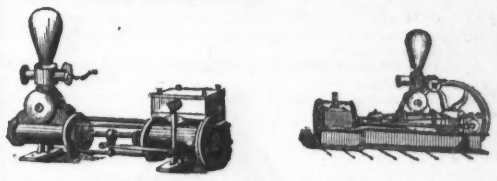
SCHOOL OF MINES, COLUMBIA COLLEGE.

FACULTY.—F. A. P. BARNARD, S.T.D., LL.D., PRESIDENT: T. EGLESTON, Jr., E. M., Mineralogy and Metallurgy; F. L. VINTON, E. M., Civil and Mining Engineer; C. F. CHANDLER PH. D., Analytical and Applied Chemistry; JOHN TORREY, M.D., LL.D., Botany; C. A. JOY, PH. D., General Chemistry: W. G. PECK, LL.D., Mechanics; J. H. VAN AMRINGE, A.M., Mathematics; O. N. ROOD, A.M., Physics; J. S. NEWBERRY, M.D. LL.D., Geology and Paleontology. Regular courses in Civil and Mining Engineering; Metallurgy; Geology and Natural History; Analytical and Applied Chemistry. Special students received for any of the branches taught. Particular attention paid to Assaying. For further information and catalogues, apply to

DR. C. F. CHANDLER,
Dean of the Faculty.

Nov. 21:1y

GUILD & GARRISON, manufacturers of Steam Pumps for all purposes, both Direct-acting and Balance-Wheel.



For sale at the Steam Pump Works, 34 to 44 First street, Williamsburg, N. Y. 1y

---

A. VIVARTTAS,
Architect and Engineer,
31 BROADWAY,
NEW YORK.

THE TANITE COMPANY,

Manufacturers of **Solid Emery Wheels**, from one inch to three feet diameter. **Emery Grinders** for Stove Manufacturers, Foundries, Machine and Railroad Shops, Planing Mills and Saw Mills. Emery Wheels and Saw Gumming Machines for sharpening and gumming **Gang, Mulay** and **Circular** Saws.

A judicious use of Tanite Emery Wheels and Grinding or Gumming Machines, will more than repay the cost in this year's work! Write for Circulars and Photographs to

THE TANITE CO., Stroudsburg, Monroe Co., Pa.

Feb. 25:6m

MISCELLANEOUS.

LEHIGH ZINC COMPANY.

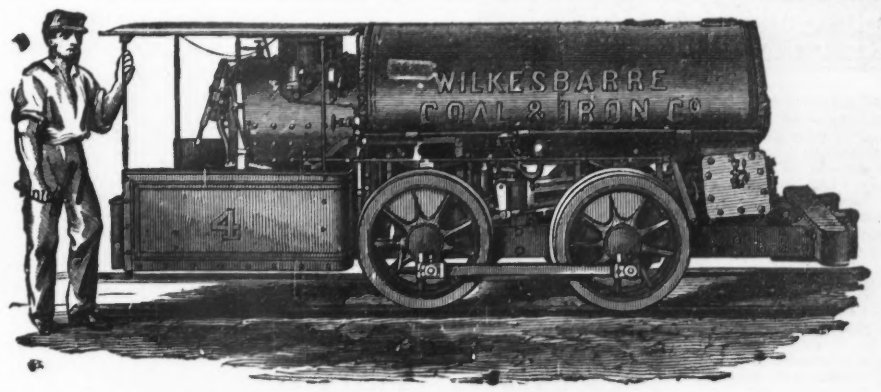
GORDON MONGES, Treasurer. B. C. WEBSTER, President.

WORKS, BETHLEHEM, PA. OFFICE, 333 Walnut Street, Philadelphia.

JOHN JEWETT & SONS, AGENTS, 182 FRONT STREET, NEW YORK.

OXIDE OF ZINC, SPELTER, SHEET ZINC.

Jun28:1y **SPIEGELEISEN CINDER FOR BLAST FURNACES.**



IMPROVED DIRECT-ACTING MINING LOCOMOTIVE

Gauge, two feet six inches or upwards; Hight above rail, five feet four inches; Width over all, five feet one inch. Adapte to burn Anthracite or Bituminous coal or coke.

Materials and Workmanship Equal to those in Full Gauge Railroad Locomotives,

Guaranteed to pass curves of twenty-five feet radius and haul on a level track in good condition.

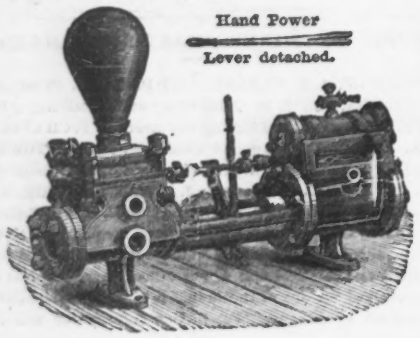
Three Hundred and Forty Gross Tons of Cars and Lead

For Photograph and full particulars, address

M. BAIRD & CO.,
Baldwin Locomotive Works, Philadelphia.

Feb:7-1y:ecw

MACHINISTS' SUPPLIES.

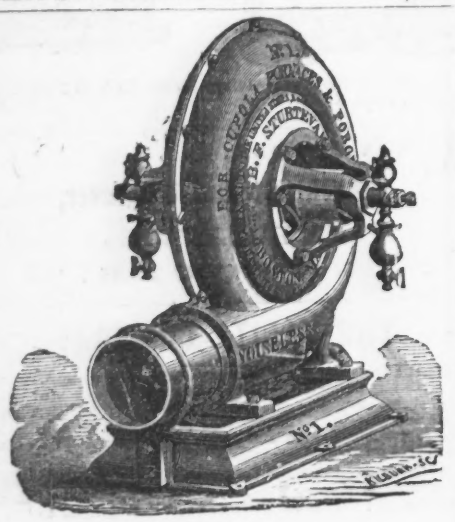


GEO. F. BLAKE & CO.,
MANUFACTURERS OF BLAKE'S PATEN
STEAM PUMPS.
No. 79 LIBERTY STREET, NEW YORK.
Factory 61 Chardon St., Boston, Mass.

A specialty made of the manufacture of DOUBLE-ACTING PLUNGER PUMPS for mining purposes—combining economy of space, capacity, and great durability. All wearing parts made of composition metal.

Also, Boiler Feed Pumps, Fire Pumps, Tank Pumps, Wrecking Pumps, etc., etc.

Send for Illustrated Price Circular. m-26 3m



B. F. STURTEVANT'S
PATENT IMPROVED
PRESSURE BLOWER,
FOR CUPOLA FURNACES AND FORGES.

Also manufacturer of the Sturtevant Patent Improved Fan Blower and Exhaust Fan. Send for illustrated catalogue.

B. F. STURTEVANT, 72 Sudbury street, Boston, Mass.
n29:1y

KROM'S PATENT DRY ORE CONCENTRATOR
AND COMPLETE MACHINERY FOR CRUSHING SCREENING AND CONCENTRATING ORES.

Minerals and Ores in which the difference of specific gravity is so slight and which are also sometimes in such fine particles as to defy separation by any other machinery or method, are rapidly separated by this Concentrator.

Mr. W. Bement, of Georgetown, Col., concentrating Silver ores, says: "I am satisfied your machines can not be beaten; they are simple, require no power(comparatively,) and do not get out of order."

A comparison is challenged between the results obtained by the approved methods of water concentration and the complete system of dry-ore concentration in the amount of ore saved, quantity concentrated, economy of working, and comfort of the operators and workmen

Parties interested in mining are invited to call at No. 210 Eldridge street. New York, where they may see a machine in operation and have samples of their own ores crushed and concentrated.

For information and circulars, apply to
S. R. KROM.
No. 210 Eldridge street, New York City.

WILLIAM F. McNAMARA,
SOLICITOR OF PATENTS
AND COUNSELLOR-AT-LAW.
No. 37 PARK ROW, NEW YORK, ROOM 22.
Advice in Patent Law given free. mar 8:tf

MISCELLANEOUS.

The Bessemer Steel Works,
of John A. Griswold & Co.
Troy, N. Y., May 3, 1872.

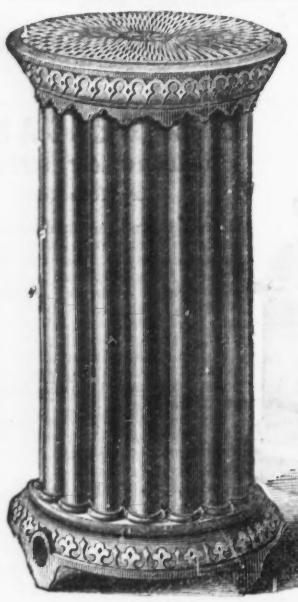
B. F. Sturtevant, Boston, Mass.,

Dear Sir, We have changed your No. 8 for your No. 9. Pressure Blower. The time in melting is about the same with either Blower. We are melting 225,000 lbs. (112½ tons,) Pig Iron daily, (20 hours running time.) It works well.

BARNEY MEE, Supt.

ENGINES, IRON WORK, ETC.

JOSEPH NASON'S VERTICAL TUBE RADIATORS IN VARIOUS SIZES AND PATTERNS.

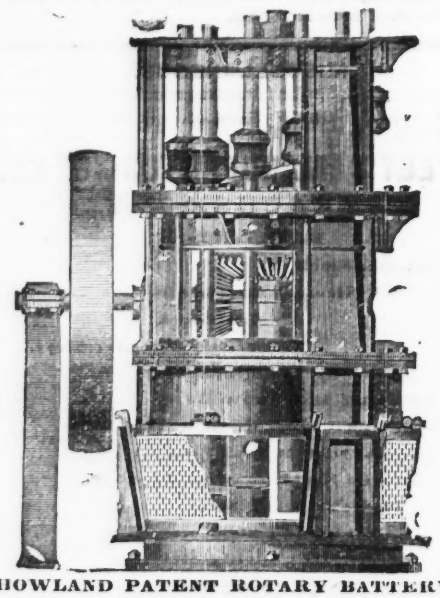


JOSEPH NASON & CO., 61 BEEKMAN ST., corner of Gold street.—WROUGHT and CAST-IRON PIPES; all kinds of STEAM and GAS FITTINGS; Apparatus for WARMING and VENTILATING BUILDINGS.
JOSEPH NASON. HENRY R. WORTHINGTON.
nov29-1y

JOHN J. ENDRES,
Mining and Civil Engineer,
MANUFACTURER OF MACHINERY FOR MINING AND SMELTING PURPOSES.
SPECIALITY:
Patent Ore and Coal Crushing and Washing Machines.
BUILDER OF IMPROVED COKE OVENS AND MACHINERY FOR DISCHARGING THE SAME.
Office and Works:
SOUTH PITTSBURGH PA.
Nov. 26:3m

W. B. COGSWELL,
Civil & Mechanical Engineer.
SPECIALITY:
Blast Furnace Construction.
P. O. Address
Franklin Iron Works,
Oneida County,
Nov. 19:1y N. Y.

MINING MACHINERY, ETC.



HOWLAND PATENT ROTARY BATTERY

of 12 stamps. It requires no frame to put it up. The best Battery ever used for amalgamating gold, or crushing silver ores, dry or wet. Can be put up on a mine in running order for one-half the price of the straight battery, and in three days after its arrival at the mine. 12-stamp battery, 20,000 pounds, with frame complete; 6-stamp battery, 7,000 pounds. Every mill run at shop before shipping.

CALIFORNIA STAMP MILLS,

All the various styles of Pans, Amalgamators, Rock Breakers, Separators, Settlers, Concentrators, Dry or Wet, for working Gold, Silver or Copper Ores, the same as built in California and at lower prices. SHOES AND DIES made of the best white iron. Send sizes and we will make patterns and forward Shoes and Dies at low prices. Engines, Boilers and fixtures, and other Machinery made to order.

☞ Send for a Circular.
Address MOREY & SPERRY,
Jan 6:6m 95 Liberty Street New-York.

COOPER'S GLUE AND REFINED GELATINE

COOPER HEWITT, & CO.,
NO. 17 BURLING SLIP, NEW YORK.
Bar Iron, Braziers' Rods, Wire Rods, Rivet and Machinery Iron, Iron and Steel
Wire of all Kinds, Copperas.
&c., &c.
RAILROAD IRON, COOPER WROUGHT IRON BEAMS AND GIRDERS,
Martin Cast-Steel. Gun-Barrel and Component Iron,
PUDDLED AND REFINED CHARCOAL BLOOMS,
Ringwood Anthracite and Charcoal Pig Iron.
Works at Trenton and Ringwood, N. J.
May 17:1y

WANTED.—A Mining Captain, to take charge of a "true fissure" vein Lead Mine. Must be competent and familiar with the working of true veins, and satisfactorily endorsed. Mine located in Southern Illinois. Address
A. H. BUGHER, 108 East Fourth Street,
April 8:2t Cincinnati, Ohio.

MISCELLANEOUS.

STEAM PUMPS.

COAL SHIPPERS.

Advertisements.

Advertisements admitted on this page at the rate of 40 cents per line. Engravings may head advertisements at the same rate per line, by measurement, as the letter press.