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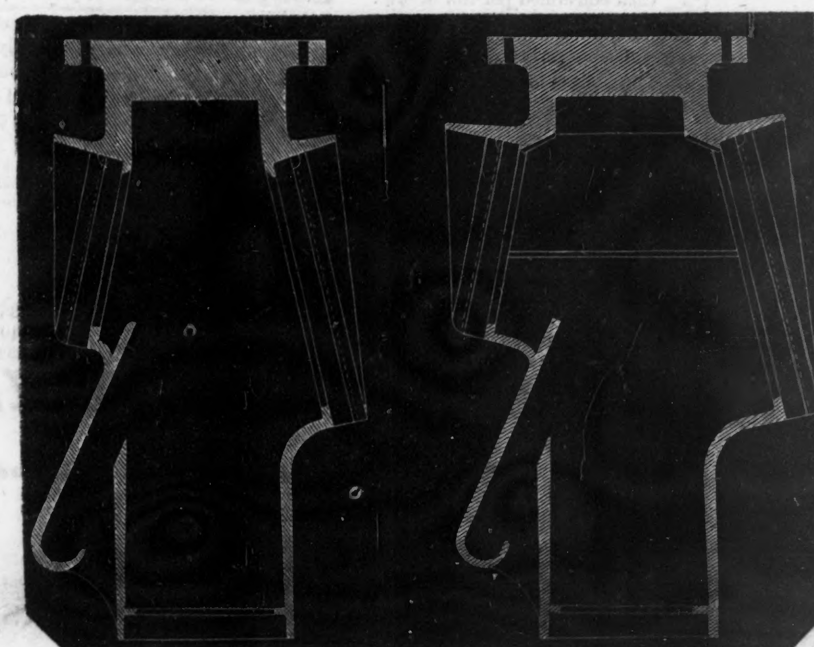

GOLD MORTAR. SILVER MORTAR.

Mortars for Wet Crushing.

Our illustration gives the outlines of mortars for stamping gold and silver ores, wet. In gold milling the interior of the mortar forms the most effective amalgamating surface, and the stamp box is therefore arranged in such a way that it can be lined with copper plates. A seat is formed on the inside of the die step, at the foot of the screens, the purpose of which is to afford means for placing a copper plate at the point where more gold settles than in any other given spot in the entire system of battery and amalgamating plates. This small plate takes up the gold, while it is still coarse, and places it beyond the possibility of loss by further powdering. A convenient arrangement for the ready placing of these interior copper plates is an essential requirement of mortars for gold mills, for this is the most frequent work connected with the treatment of auriferous ores. It is also a task that necessitates the stopping of the stamps and the loss of a certain amount of time.

The mortar for silver ores is narrower than the above, and also has a deeper die seat. As its use is confined to reducing the size of the ore and no other work goes on within it, the arrangements for the insertion of amalgamating surfaces are omitted. Here the main requirement is the speedy discharge of the slime after it has been formed. The screens are therefore set near the line of the stamps. Both these mortars, as well as those described two weeks ago, have a charging slit, one side of which is curved at the top, or narrowed by some similar device, in order to restrict the size of the ore charged, while the expansion of the opening below the top gives a ready fall to any ore that passes the mouth.

All these mortars are made by H. J. BOOTH & Co., of San Francisco, and form part of their series of milling machinery.

The American Institute of Mining Engineers.

BOSTON MEETING.

THIRD SESSION, WEDNESDAY AFTERNOON, FEB. 19, 1873.

Continued from page 210.

The discussion was continued concerning Prof. BLAKE's paper on the Diamond Drill.

A member inquired—Is the expense of drilling, and leaving the core, much greater than with the bits that take out all of the middle? If I remember, all the holes at Hell Gate were made with the hollow bit.

Prof. BLAKE—The expense is not greater, but the labor and time is somewhat greater. The removal of the core itself is a matter of great trouble. But with the full bits you drill straight ahead and never take out the rods. It is sometimes important to get a core, to determine the nature of the rock, as, for instance, in the sandstone of the Connecticut valley and the marble deposits of Vermont. They are drilling at right angles to the plane of stratification, and the core tells whether it is fine or coarse, whether coherent or the reverse, or whether free from stain or color. The same may be said of the Portland quarries, near Middletown, where they have used the drill, and satisfied themselves that for a great depth they may expect a certain class of stone.

Prof. ROCKWELL—One objection I can see to this borer, which applies to all borers where the water passes down the center of the hollow rods, and up outside—namely, trouble in drilling through porous rocks. Suppose in going twenty feet from the surface, you pass through a bed of very porous sandstone. The water rising to that point would flow off; it would then act as a sieve—as a filter. Your debris would be left at that point. That is the objection which has been urged, which was found in practice, against the system which FONVEILLE inaugurated, which was that of the hollow rod, using percussion with the ordinary drill, and removing debris by a stream of water pouring down the center and up the sides. It was found that better results were obtained by forcing the upward current through the rods. But that, of course, would not answer in cases where you pass through beds which are very porous.

The PRESIDENT—We never have met that difficulty with the diamond drill, so far as my observations go, in this country. Of course we could not, in this case, force the upward current through the rods. It would clog the holes in the borer. The concave form of the boring face has seemed to me liable to an objection, analogous to that which I think I have heard was made to the same form in percussion drilling—that the outside edges do the brunt of the work, and that there is more chance of the drill entering obliquely, from some change in the rock. For instance, in the St. Clair mine the drill came down on a soft seam of clay. This side drilled faster than that, and the bore received a torsion towards the side of the soft clay, not sufficient to prevent the revolution of the drill-rods, but still a deviation from the true vertical. Of course, it was discovered during the drilling, but, as long as they found the rod would enter the hole, they went on with the drilling. I am not aware that that hole had to be left off any sooner than any of the rest. It might happen, in certain kinds of rock, that this evil would increase, and the question arises, whether the concave head is a form specially liable to it.

Prof. ROCKWELL—I don't think that has been the experience in percussion drills.

Mr. FIRMSTONE—Whatever may be the experience in percussion drilling, I have no doubt that in cutting or revolving drills, the concave form is most likely to make a straight hole. In metals, for instance, when it is necessary to drill a true hole through plates of cast and wrought iron, the bit is always made a little hollow, in that shape, but generally it is made with a small pin in the center. This point in the center is not essential, although generally put in. Then by making the bit hollow these edges cut first. So, if a bit is rightly made, the last chip will come out in the shape of a ring. For the same reason it has been the practice in using an annular drill to leave a central core to steady the drill. But if you attempt to do it with an ordinary drill, you will drill in the cast and not in the wrought. The men say the cast is softer than the wrought. That is not true; but the wrought is stronger than the cast and will not pare off and break away. The simplest remedy is to replace one cutting edge with a blunt one, then one always supports the other. With a pin drill you can drill almost anything, and drill straight.

THE PRESIDENT—I was doubtless mistaken in my recollection as to the cause of the discarding of the concave bit in percussion-drilling. Certainly there are other sufficient reasons for its disuse there—the difficulty of sharpening a wedge with a concave curved edge, the chance of breakage at their outer points, and so on. As to the full concave drill for cutting, I must admit that the principle of the augur, rather the chisel, applies in that case—so my analogy appears to be doubly a mistake—historically doubtful, and inapplicable besides! One advantage of using the water pressure inside of the rod, forcing it down through the rod instead of outside, is that having no outside tubing, (at least not when boring for exploration or subsequent blasting) we don't get as complete a pressure, if you pass through any porous or fissure rock, as by having the pressure inside of the boring rods. It seems to me that the water-tight enclosure of the column inside of the rods would make it more advantageous to force it down that way and have it come out the other, to say nothing that some obstruction outside of the rod would not have the effect of stopping the whole annular space.

Prof. ROCKWELL—It was deemed important to have the water passed up inside of the rods, in FONVEILLE's apparatus, because of the smaller diameter, by which a greater velocity could be obtained, which would carry up large particles of the debris. In rock sufficiently porous to let the water out I think it would be impossible to use that drill successfully.

Mr. FRANK FIRMSTONE exhibited some very interesting specimens of

BLAST-FURNACE PRODUCTS, FROM ALLEGHANY CO., VA.,

consisting of 1. Clusters of long, slender crystals, found inside of blisters in the crust which formed in the lining of the furnace while blowing out; and 2. Lumps of so-called "Cadmia," which collected in thick hard crusts round the throat of the furnace while in blast. This shows an abundance of zinc, when tested with the blow pipe.

Mr. FIRMSTONE.—This furnace had been in use for 16 months, and was blown out for repairs—in fact, to be rebuilt; and on tearing it down they found on the inside of the lining, about five feet below the top and extending down to 15 feet in many places, a thin pellicle of less than a quarter of an inch thick, adhering to the bricks. In some places this was forced away from the bricks and formed a blister, and on the inside of that blister was the reddish crystalline substance here shown. It was like needles, some more than an inch long.

The temperature in the furnace at that point when it is going, is not sufficient to produce such a coating. The pressure in the stack would have destroyed these blisters. I also found in the joints of the bricks a similar substance, except that it was quite colorless. The ores used at this furnace contain zinc in considerable quantities.

The crystals I have never seen before and never have heard of, and the manner of their occurrence in the blisters is rather remarkable. The coating looks a good deal like "cadmia;" but it has been vitrified, so I do not suppose it is the same thing. I hope to collect enough to have an analysis made. I have never seen anything of the kind in anthracite furnaces.

Mr. H. M. HOWE.—Travelling in the Salisbury (Conn.) region, I was shown some metallic zinc, said to be contained in the deposits of a furnace after blowing out.

MR. FIRMSTONE.—Almost all iron ores contain traces of zinc. A person who is accustomed to the appearance of oxide of zinc sees it about all furnaces, but not in great quantities.

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

BY A. EILERS, M. E.*

CONTINUED FROM PAGE 211.

3. THE MILLER MINING AND SMELTING COMPANY'S SULTANA WORKS.—The works are located near the head of American Fork Cañon, Utah. The ores smelted come from the Miller mine, near by, and consist of very ferruginous oxidized ores of lead, containing much galena and very little quartz, too little, in fact, to permit the formation of a fluid slag in smelting the ore alone. This fact, however, was not understood by those running the works in the summer of 1872. The ore contained, according to many assays, 40 to 42 ounzes of silver and 0.4 to 0.6 ounzes of gold per ton, and 56 per cent. of lead.

There are three circular furnaces of the Piltz pattern, nine feet high above the tuyeres. The section of the hearth of No. 1 is 28×36 inches. It has six water-tuyeres with two and a half inch nozzles. The size of Nos. 2 and 3 in the hearth is 24×32 inches. They have four tuyeres each, of the same size as No. 1. They lie about six inches above the slag spout, and are inclined inward, so that they must blow directly on the metal-bath, thus occasioning volatilization of lead. All the furnaces are provided with the automatic tap.

CHARGE:

Charcoal: 6 scoops = 1.8 bushels @ 16 lb. = 28.8 lb.
Ore: 5 shovels @ 20 lbs. = 100 lb.
Slag: About ¾ shovels @ 16 lb. = 12 "
112 lb.

Smelted in 24 hours: 240 charges=12 tons of ore, or 13.44 tons of charge.
Coal consumed: 432 bushels = 3.45 tons.
Coal consumed per ton of charge: 32.1 bushels=513.6 lb.=25.68 per cent.
Coal consumed per ton of ore: 36 " =576 " =28.8 per cent.

The product, per furnace, at these works in 24 hours was 4 to 4.5 tons of lead, containing 85 to 121 (rarely) ounces of silver and 1.2 to 1.45 ounces of gold. This shows an enormous loss of lead, and of the precious metals. There are two causes for this, both evident at once to the observer. The first is the flaming top of the furnaces, out of which a roaring bundle of fire issues continually, tearing along great quantities of fine ore and coal, which are deposited in a thick layer on the roof of the smelter-building and in the vicinity. The second is the fact, that the slag produced is far too basic, thus enveloping metallic lead and matte and preventing separation. There is no matte saved, so far as I know.

4. SATURN WORKS, Sandy Station, 11 miles south of Salt Lake City. The ores smelted are principally ferruginous carbonates with some galena from the Cottonwood cañons, quartzose carbonates from Bingham cañon and occasionally ores from Tintic (?). There are three small circular furnaces of the Piltz pattern, with 4 tuyeres, two in the back and one in each side. One Sturtevant blower, driven by steam, supplies the blast, which is kept at a pressure of about 1 inch quicksilver. Two furnaces were running at the time of my visit (August 23, 1872). Slag free and apparently a singulo-silicate.

CHARGE:

Charcoal: 4 scoops =1.2 bushels @ 16 lb. =19.2 lb.
Ore: 3 large shovels @ 20 lb. = 60 lb. (100)
Rawlins iron ore: 1 shovel 15 " (25)
Limestone: ½ " 6 " (10)
Slag: 1 " 15 " (25)
96 lb.

Smelted in 24 hours: 345 charges=10.35 tons of ore, or 16.56 tons of charge.
Coal consumed: 414 bushels = 3.32 tons.
Coal consumed per ton of charge: 25 bushels = 400 lb. = 20 per cent.
Coal consumed per ton of ore: 40 bushels = 640 lb. = 32 per cent.

5. BRISTOL & DAGGET'S WORKS, Bingham cañon, Utah. The ores smelted are very siliceous carbonates containing little iron, and some galena, principally from the Winnemuck mine, on the hillside behind the works. There are two circular Piltz furnaces, 14 feet high above the tuyeres. Their diameter at the level of the tuyeres is 3.5 feet. There are 6 of the latter with 2.5 inch nozzles, lying 10 inches above the slag-spout. The blast is supplied by two large Root blowers, and a pressure of 1.5 inches mercury is maintained.

A report for the three months from April 1st to June 30th, 1872, furnishes the following items:

Average assay of ore smelted: Lead 37.7 per cent.
Silver 56.18 ounces per ton.

Smelted:	Ore	1,268. tons.
	Iron oxide	407.888 "
	Limestone	518.140 "
	Own Slags	208.352 "

Coal consumed: 74,830 bushels = 598.64 tons.

This gives an average charge as follows:

Ore	100	
Iron oxide	32.16	
Limestone	40.86	
Own slags	16.43	
		189.45
Charcoal:		47.2

Coal consumed per ton of charge: 31.14 bushels=498.24 lb.= 24.9 per cent.
Coal consumed per ton of ore: 59. bushels=944. lb.= 47.2 per cent.

The product from the above materials was:

Lead .... 439.951 tons.
Silver .... 67,478.2 ounces, which would show an apparent loss of

Lead .... 7.9 per cent.
Silver .... 5.3 per cent.

This loss, it will be observed, is not a very large one for western circumstances. From the writer's own observations he is indeed led to believe, that Bristol and Dagget's works are more intelligently managed, and lose less in lead and silver, than any other works in the west, with the single exception of, perhaps, one or two smelting works at Eureka, Nevada. The average length of campaigns at these works is from 20 to 22 days and 14 tons of ore are smelted in 24 hours. Iron ore from Rawlins costs $25 00 per ton; limestone, $7 00; coal, 33 cent. per bushel, and the ore (mining, including all prospecting and construction,) $6 00 per ton. The cost of labor is not in my possession.

6. BELSHAW AND JUDSON'S SMELTING WORKS, CERRO GORDO, INYO CO., CAL. The works smelt the ore from the Union mine, consisting of gray carbonate, ferruginous earthy carbonates and galena. Small quantities of very siliceous true silver ores are added to the charge for the purpose of concentrating their silver in the lead. The furnace is a low round shaft-furnace with three cast-iron tuyeres of two and a half inches diameter, lying about 12 inches above the slag-spout. The diameter of the furnace is uniformly 30 inches from the tuyeres to the charge-hole, the latter being seven and a half feet above the former. The lower part of the furnace up to within five feet above the tuyeres is constructed of masonry. On top of this rests an iron cylinder two and one half feet high, its upper rim reaching to the bottom of the charge-hole. Above are again three feet of masonry, from which the flue leads into a so-called "down-throw" and a low chimney. The furnace is not charged up to the charge-door, but only to the lower edge of the iron cylinder, it being claimed, that, if the furnace is filled to the top, the smelting is much slower, and considerably more coal is used per ton of ore. This can only be explained by great weakness of the blast, the increased weight of a higher column of charge preventing the penetration of the blast to the middle of the furnace. With a proper blast the heightening of the smelting column should cause a saving of fuel and an increased production. The blast is supplied by a small Root blower (No. 2), which is driven by a ten-horse-power engine. The blower makes 325 revolutions per minute, which is many times more than it is intended to make by the builders. The consequence is that frequent repairs become necessary. Formerly the ores were first roasted and slagged in a Mexican "galemador," and then smelted in the shaft-furnace, but the slag falling at that time contained still from 15 to 20 per cent. of lead with 1 to 4 ozs. of silver per ton. It was found that in smelting the ores immediately in the blast-furnace, the slags contained only from 8 to 10 per cent. of

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

lead, and less silver than formerly. So the latter less expensive process was altogether introduced, as the choice of the least evil of the two. It is the pride of these works, that they smelt comparatively more ore with less fuel in twenty-four hours, than any other works in the country. But from the great loss of lead it is evident, why this is the case, to wit, because so large a portion of the lead in the ore is not reduced at all, and, consequently, consnmes no carbon for that purpose, but is converted into a silicate of lead which requires little heat for fusion. The charcoal is a very excellent article, and made altogether of piñon and mahogany.

Charcoal :	175 bushels @ 18 lb.	31.5 lb.		
Ore, fine carbonate :	12 shovels @ 16 lb.	= 192 lb.		(100)
Ore, galena :	1 "	= 20 lb.		(10 4)
Ore, quartzose silver ore :	1 "	= 15 lb.		
			227 lb.	(7.8)
Slag : 2 shovels @ 15 lb.			30 "	(15.6)
			257 lbs.	

Smelted in 24 hours, 200 charges = 22.7 tons of ore, or 25.7 tons of charge.
Coal consumed : 350 bushels = 3.15 tons.
Coal consumed : per ton of charge, 13.6 bushels = 244.8 lb. = 12.2 per cent.
Coal consumed : per ton of ore, 15.4 bushels = 277.2 lb. = 13.8 per cent.

The consumption of fuel is remarkably small, and it is only possible for the reasons above stated. It is to be regretted, that exact data could not be obtained at the works, to elucidate the economical bearing of the Cerro Gordo process fully and incontrovertibly. As it is, there is barely a sufficiency of data on hand, to show that fuel is economized by means of an almost unprecedented loss of lead. It is also claimed by the manager of the works, that it is cheaper to lose the lead, than to procure iron oxides for the purpose of mixing with the charge. But whoever has seen the enormous masses of hydrated oxide of iron in the Cerro Gordo mines, will hardly be able to realize this.

The whole management of the works is rather calculated to create the suspicion, that the proper composition of the charge is not understood. It is certain, that either by an addition of iron oxide to the present charge, or by omitting the addition of the quartzose silver ores altogether, far better results might be obtained than at present. The exact proportion of the smelting mixture ought, of course, to be regulated upon determination by analysis.

The following are a few additional data, which help to give some idea about the work done at this smelter. Two hundred charges are generally made in 24 hours ; when the furnace is in the best smelting order ; the number of charges in 24 hours rises sometimes as high as 240. From 100 to 148 bars of bullion are made in 24 hours, a bar weighing 85 lb. Different lots of bullion contained respectively 130, 125, 147, 145, 134 oz. of silver per ton. The lead bars, after deducting the silver, contain 98 per cent. of lead, the principal impurity being copper, which comes originally from the quartzose silver ores. It enters into the lead, because the lead-copper-matte, which forms in the proportion of 100 lb. to one ton of bullion, is always given back raw into the smelting process. The fine ore contains about 25 oz. of silver per ton, the galena from 50 to 80, the silver ore, third class, 50 oz., second class, 65 to 100 oz , first class, 250 to 300 oz., the abundance of these three classes being in the order given. The silver ores proper are bought from other parties, $20 per ton being paid for third class. The Union mine, furnishing the lead ore, belongs to the works. The average contents of lead in the charge is not precisely ascertained at the works, but from calculation it must be about 34 per cent., if 22.7 tons of ore furnish 5.25 tons of bullion , and the slag contains 15 per cent of lead.

All that has been said of the last works applies also to BEAUDRY's furnace in the same district.

7. THE OWEN'S LAKE SILVER MINING AND SMELTING CO.'S WORKS, located at Swansea, ten miles west of Cerro Gordo, on the eastern shore of Owen's Lake. This company has two furnaces, which are in their general features like those just described. They are eight feet high above the tuyeres, of which there are three, with three-inch nozzles in each. They lie only a few inches above the slag-spout, and are inclined downward. This accounts for the formation of the extremely small quantity of matte produced, though there is more sulphur in the charge smelted here than in that of BELSHAW's works. Hereafter these works will smelt the lead ores of Santa Maria and Cerro Gordo, together with such small quantities of quartzose silver ores as can be bought to advantage, and the charges for the furnaces can, therefore, be kept more uniform than formerly, when small lots of different custom ores were smelted, as they could be picked up. Daily records have heretofore not been kept at the works, but the following is given as about an average charge : *

Charcoal: 60 to 80, average 70 bushels@18 lb.=1,260 lb.		
Ore : 3 tons of carbonates	= 6,000 lb.	(100)
1 ton of galena	= 2,000 lb.	(33.3)
0.5 ton of quartzose silver ore	= 1,000 lb.	(16.6)
	9,000 lb.	
Slag : 0.675 tons	1,350 lb.	(22.5)
Total,	10,350 lb.	

Coal consumed per ton of charge, 13.52 bushels=243.36 lb.=12.16 per cent.
Coal consumed per ton of ore, 15.55 bushels=280 lb.=14.11 per cent.

Fuller returns from these works are promised hereafter.

For the purpose of comparison, I give here the blast-furnace charges and a short description of the furnaces of European works, which beneficiate lead ores by the same or similar processes, as practised at the American works above enumerated.

8. WORKS AT LA PISE, DEPARTEMENT DU GARD, FRANCE.—Circular furnace of about 30 inches diameter at the tuyeres and above. The tuyeres, of which there are three of not quite two-inch diameter, lie in pillars of masonry between water-cooled cast iron plates, 0.82 feet above the slag-spout. Only two of the tuyeres are generally used in smelting. The total height of the furnace above the tuyeres is 9 feet 6 inches. Campaigns last from 2 to 3 months. Pressure of blast 1.18 inches mercury.

The ores treated come from Pallières, near Anduze, and from Sardinia. The former are reported to contain, after roasting, 40 per cent. of lead, 0.11 per cent. silver, and 20 per cent. silica. In 24 hours 8.8 to 11 tons of ore are smelted with 25 per cent. of coke=2.2 to 2.75 tons.

CHARGE :

Roasted ore	10 tons
Limestone	2.5 tons
Iron ore	0.3 to 0.4 tons
Iron	0.2 to 0.3 tons
	13.2 tons

Metallurgists generally rate the effect which can be produced with one ton of coke equal to that of 200 bushels of inferior charcoal, weighing 12 lb. per bushel, or 2,000 lb. of coke=2,400 lb. charcoal. According to the above, 25 per cent. of coke is used in smelting the ore in the La Pise shaft furnace. The charge, in which there are ten tons of ore, requires, therefore, 2.5 tons of coke. Expressing this in charcoal, weighing 15 lb. to the bushel, which is the fair average weight of western charcoal, we have 400 bushels of charcoal consumed to smelt ten tons of ore. Therefore :

Coal consumed per ton of charge: 30.3 bushels@15 lb.=454.5 lb.=22.7 per cent.
Coal consumed per ton of ore: 40 bushels@15 lb.=600 lb.=30 per cent.

SMELTING WORKS AT CLAUSTHAL (I), LAUTENTHAL (II), AND ALTENAU (III).—The smelting is done in Raschette furnaces, 3 meters (9.8 feet) long, and 0.94 meters (3.08 feet) wide at the tuyeres, and 6.277 meters (20.59 feet) high, with ten tuyeres of 0.049 meters (0.16 feet=1.92 inches) diameter. In twenty-four hours 7,500 kilo.=16,500 lb. of ore, or 20,000 kilo.=44,000 lb. of charge, are smelted with 2,500 kilo.=5,500 lb. coke, the latter according to the data above given, equal in effect to 440 bushels of charcoal.*

From the above it appears that, expressing the values for fuel as charcoal, there are consumed :

Per ton of charge : 20 bushels@15 lb.=300 lb.=15 per cent.
Per ton of ore : 53.33 bushels@15 lb.=799.95 lb.=39.99 per cent.

The charges at the three works named are as follows :

	I.	II.	III.
Ore	100	100	100
Roasted Matte	51	56	50
Copper Slags from the Lower Hartz	60	115	87.3
Slags from the same smelting	93	75	55.3
Dressed Furnace Scrapings	3	—	—
Slag from the Smelting of Scrapings in the Copper Process			26.6
Scraps rich in Lead			4
	307	346	321.2

Early in 1872, when the "Kast" furnace had been introduced and in operation for some time, Mr. A. WOLTERS, M.E., Assayer at the U. S. Assay Office, Boise City, returning from Clausthal, brought the following notes : The charges for both the "Kast" and Raschette furnaces were, with due regard for the differing gangue of the ores and the varying contents of lead and silver, mixed so in quantities of 1,000 cwt. (dry), that the average contents were :

Lead	58 to 60 per cent.
Silver	0.1 per cent.

and the proportion of the different gangues was made so as to furnish an easily fusible slag.

Such a quantity of 1,000 cwt. was divided into 20 "charges" of 50 cwt. each. To this "charge" are then added the following substances in the proportions given :

Ore	100
Roasted Matte from former Smelting	50
Copper Slag from Lower Hartz	80
Slag from Matte-Smelting	40
Impure Slag from same process	32
	302

The last two items vary somewhat, according to the acidity of the gangue. To the charge for the Raschette furnace there are often added twenty additional parts of slag from the same smelting.

The quantity smelted in a Kast furnace in twenty-four hours, according to an average of a month's working, is 63 cwt. of ore, or 190.26 cwt. of charge, equal to about 9.5 tons. 100 cwt. of ore requires 51 cwt. of coke in smelting. One pound of coke carries, therefore, according to the foregoing, approximately six pounds of charge, or, 16.66 per cent. of coke are used. Assuming again the effect

* These items were obtained in September, 1872. Since then the charges have been changed

* Further and late information in regard to the furnaces and smelting operations at the Upper Hartz can be found in *Metallurgie des Bleies*, by Dr. C. RAMMELSBERG. Pages 248-270.

of one ton of coke, equal to that of 160 bushels of charcoal of 15 lb. each, we have:

Charcoal consumed per ton of charge: 27.7 bushels@15 lb.=415.5 lb.=20.77 p. c.
Charcoal consumed per ton of ore: 81.6 bushels@15 lb.=1224 lb.=61.2 p. c.

10. SMELTING WORKS OF FREIBERG, SAXONY. All the ores occurring in the Freiberg mines are now subjected to the same metallurgical treatment, with the exception only of the ores containing more than 30 per cent. of zinc, and those containing a large amount of arsenic. These two classes are specially treated.

The ores smelted at "Muldener Hütte" during 1869 (16,589,500 kilo. = 36,573,211 lb.=18,286.60 tons) contained on an average 17.6 per cent. of lead and 0.6 per cent. Cu. The smelting, both at the "Muldener" and at the "Halsbrückner" works, is done in round shaft-furnaces (with 8 tuyeres each) of 1.726 M. =5.66 feet diameter, and a height of 3.84 M.=12.59 feet above the tuyeres.

CHARGES:	MULDENER HÜTTE.	HALSBRÜCKNER HÜTTE.
Roasted Ore	100	100
Raw Matte	10	3.03
Kiln-roasted Pyrites	15	—
Slag	80–100, Avg. 90	50
Entzinkungsrückstände		3.338
Fluorspar		0.35
Calcspar		1.583
Heavy spar		0.145

In twenty-four hours at the former works (25,000 to) 30,000 kilo. ore=(55,000 to) 70,000 kilo. charge are smelted; at the latter 35,000 kilo. ore = 50,000 kilo. charge. (11 to) 12 per cent. of coke (referring to the charge) are used.

This shows for

MULDENER HÜTTE.

Charge 70,000 kilo. = 154,322 pounds English.

Coke consumed 12 per cent. = 18,518 pounds, which is equal in effect to 1,481.44 bushels of charcoal of 15 pounds each.

Charcoal consumed, per ton of charge: 19.2 bushels=288 lb.=14.4 per cent.

In the 70,000 kilo. charge are 30,000 kilo. ore = 66,138 pounds English. Therefore:

Charcoal consumed per ton of ore: 44.8 bushels = 672 lb.=33.6 per cent.

HALSBRÜCKNER HÜTTE.

Charge 50,000 kilo.=110,230 pounds English.

Coke consumed, 12 per cent. = 13,227.6 pounds, equal in effect to 1,058.2 bushels charcoal of 15 pounds each.

Charcoal consumed per ton of charge: 19.2 bushels=288 lbs.=14.4 per cent. 50,000 kilo. charge contain 35,000 kilo.=77,161 lbs. English, ore. Therefore:

Charcoal consumed per ton of ore: 27.4 bushels = 411 lb. = 20.5 per cent.

The following table will give the amounts per ton, and percentage of fuel used at the American and European works brought forward in the foregoing article:

CONSUMPTION OF CHARCOAL IN LEAD BLAST-FURNACES.

Names of Smelting Works.	Bushels of Charcoal per ton of		Pounds of Charcoal per ton of		Percentage of Charcoal per ton, of	
	Charge.	Ore.	Charge.	Ore.	Charge.	Ore.
AMERICAN WORKS:						
1. Eureka Consolidated Company,						
a. Furnaces No. 1, 3 and 4	22.8	24	342	360	17.1	18
b. Furnace No. 2	26.6	29	399	436	19.9	21.8
2. Richmond Consolidated Co.	22.9	24.4	343.5	366	17.17	18.3
3. Miller Mining and Smelting Co.	32.1	36	513.6	576	25.68	28.8
4. Saturn Works	25	40	409	640	20	32
5. Bristol & Dagget's Works	31.14	59	498	944	24.9	47.2
6. Belshaw & Judson's Works	13.6	15.4	244.8	277	12.2	13.8
7. Owen's Lake S. M. and S. Co.	13.5	15.5	243	280	12.16	14
EUROPEAN WORKS:						
8. La Pise	30.3	40	454.5	600	22.7	30
9. Clausthal, Lautenthal and Altenau,						
a. Raschette Furnace	20	53.3	300	799.9	15	39.99
b. Kast Furnace	27.7	81.6	415	1224	20.7	61.2
10. Freiberg,						
a. Muldener Hütte	19.2	44.8	288	672	14.4	33.6
b. Halsbrückner Hütte	19.2	27.4	288	411	14.4	20.5

According to a supplement in "Rammelsberg's Metallurgy of Lead," the Raschette furnace at Clausthal consumes for 100 lbs. of ore 48 lbs. of coke, and the Kast furnace 41.6 to 42.4 lbs. Accepting for the Kast the first of the two figures given, we would have, calculated for charcoal:

	Bushels of Charcoal per ton of		Pounds of Charcoal per ton of		Percentage of Charcoal, per ton of	
	Charge.	Ore.	Charge.	Ore.	Charge.	Ore.
Raschette furnace,	25	76.8	375	1152	18.7	57.6
Kast furnace	22	66.5	330	997.5	16.5	49.8

It is evident that these figures cannot be reconciled with those given before. Yet both are on equally good authority, and all those in regard to the Raschette furnace are even taken from the same author. I am inclined to think that the main error is in Dr. RAMMELSBERG's statement, page 258 of his *Metallurgie des Bleies*: "In 24 hours there are smelted 7,500 kilo. ore with 2,500 kilo. coke." This would be a consumption of coke of only 33.3 per cent., while all other authors, who have written on the Clausthal works, have always given for the Raschette furnace a consumption of 43 to 50 lb. of coke to 100 lb. of ore.

From the foregoing tables it appears that, setting the two Cerro Gordo cases aside, (sufficient reason for which is given in the text,) American works use more fuel in smelting their blast-furnace *charges* than European works, although their ores are "kindlier;" but that, in referring the quantities of coal used to the ore in the charge, American works appear to be conducted more economically in this respect. Whether *true* economy is practiced, must, for the present, remain an open question, which can only be answered, after American works have begun, to control their whole process by means of chemical analysis. European works generally add large quantities of slag, and other indifferent materials, from previous smeltings, to their charges, in order to protect the metal, and the slags finally thrown over the dump contain usually only from 0.5 to 1 per cent. of lead, and silver in hardly appreciable amounts. American lead-slags hardly ever contain less than 5 per cent., and in some exceptional cases up to 20 per cent. of lead, while the contents in silver correspond with those of lead. There are cases in which this loss cannot, with economy, be avoided at the present time, but there are more of those in which metallurgical skill could, without increase of cost, compose charges, the result of which would be slags as clean as the European ones. There is, however, one consolation for this present unnecessary loss: while the robbing of mines leaves them generally in such a shape, that a subsequent generation cannot repair the losses occasioned by the first method of working, the robbing of ores leaves residues from which, in the future, science can profitably extract the useful constituents.

Engineering and Mechanical Notes.

The sleeping car which the North British railway is proud of as the first of its class in England, lately made a trial trip, but the hindmost axle was found so greatly heated, and the smell of burning so strong, that it was considered unsafe to allow it to go farther, and it remained at Berwick to undergo examination. Fortunately it was on a *day* train so that there were no passengers to wake up.

The *American Standard*, of Uniontown, says Mr. E. C. PECHIN is preparing a cabinet of specimens of ores, limestone, coal and other minerals used at the Dunbar furnace, with samples of the iron manufactured, to be forwarded for exhibition at the Vienna Exposition next summer.

The Krupp Cast Steel works have been insured against fire risk. The amount covered testifies to the extent of the works, amounting as it does to 6,561,330 thalers. And this amount only represents portions of them specially liable to suffer from a conflagration. The steam smelting works are not insured, nor is the canal system covered, nor are the workshops through the length and breadth of the works, nor the railway and telegraph lines, nor the stocks of metals. Twelve German insurance companies have combined to assume the risk of insurance.

Mr. SELLERS, of Philadelphia, proposes to tap lead furnaces by introducing a siphon pipe into the bath of melted metal, exhausting the air and thus drawing the metal over. The long arm of the siphon is attached to the mould, and the exhaustion of air takes place from the latter.

The *Railroad Gazette* gives a list of thirty-six patentees of power brakes, the number of patents issued to them being 58, and the history of the invention going back to 1847. In England, patents have been recorded for 21 electro-magnetic, 20 hydrostatic, 30 pneumatic, and 54 steam brakes.

The ideal metallurgist of the future, according to the most advanced view, will be a BERZELIUS for analysis, a NEWTON for profundity, and a ROTHSCHILD in finance. The beginning of the millenium is seen in Mr. KRUPP, who, unable to be all himself, supports his personal labors with those of learned men in every branch of his business. A late account of him says that "his overseers are practical mechanics and graduates from the Polytechnic schools of Germany. At his laboratory are several chemists, one of whom is one of the most celebrated analytical chemists on the Continent. Mr. KRUPP also retains a doctor of laws, who is constantly engaged with the settlement of contracts and disputed questions of law. There are several interpreters in different languages to converse with the many foreigners who call at the office."

About the most successful of the coal-cutting machines now in the market is the one patented by the Messrs. BAIRD, of Gartsherrie Ironworks, Scotland. It is worked by compressed air, brought in cast-iron pipes from the mouth of the pit, at a pressure of 45 lb. to the square inch, the exhaust of which at the same time tends to freshen the unwholesome air the miner has to breathe. The machine can cut 350 feet of coal per shift of eight hours, yielding 70 to 75 tons of coal, equal to the power of about 40 men, whilst only three or four men are required to look after it. The day of coal-cutting machines is certain to come, and though their introduction is a slow process, quite a number are in use, and a few years will see them producing a good part of the yearly output of coal. The Gartsherrie machine is the result of years of experiment and the expense of some hundreds of thousands of dollars. Its development has been persisted in through many discouragements, less for the sake of present profit, than in the belief that machines—as coal-getters which neither strike nor limit their production—are, or soon will be, absolutely necessary to mine owners.

The 77 blast furnaces in the Cleveland district made 95,248 tons of pig in January last, or close on 40 tons a day to each furnace. This average was a little less than that for December, but far above the average for January of last year.

THE COAL TRADE.

NEW YORK, April 10, 1873.

Business in the Anthracite trade is quiet, for transportation still hangs, and like so many other things in Spring time, the old order of things is half abandoned while waiting for the new to open. There is considerable activity, however, at some points, as Newburgh, and there seems to be no doubt that briskness will follow the opening of the canals. As to these, the ice is mostly out of them, and the lack has been water, which the rivers are now supplying in quantities that ought to satisfy all parties. The freshets and interrnption to travel will perhaps tell upon the quantity brought forward for a short time, and some collieries in the Lehigh region are reported to be drowned out.

The *Miners' Journal* of Pottsville says: "The shipments by canal have been checked considerably by the high water, but as far as we can learn the canal has suffered but little, if any, damage so far. On the Lehigh the freshet was much greater than on the Schuylkill, and no doubt the Lehigh canal has suffered some damage, but to what extent cannot be ascertained until the water subsides. So far we have heard of but little. In this region upwards of twenty collieries have been drowned out by the heavy rains and the melting of the snow in the mountains. The soil below the snow is but little frozen and very porous, leaving the water through almost like a riddle.

Matters are better in the soft coal trade, and the companies have orders for all they can produce. Western Pennsylvania coal is quoted at $6.75 in New York, and Maryland coal $7.25.

The Philadelphia and Reading Company gives notice that, hereafter, all orders forstopping or restoring coal will be issued by Mr. T. H. WILSON, General Coal Agent.

The Pennsylvania Coal Company has issued the following rates of freight on the Hudson River:

RATES OF FREIGHT FROM NEWBURGH ON "PITTSTON COAL," BY BOATS AND BARGES OF THE PENNSYLVANIA COAL COMPANY, PER TON OF 2,240 LB.

Troy and West Troy; if discharged above the bridge or locks, or at R. R. docks	65 cts.
Troy and West Troy, except as above	60 "
Albany and Greenbush	55 "
Coeyman's	65 "
Stuyvesant	55 "
Coxsackie (lower dock)	50 "
Hudson and Boston R R. dock, Hudson, discharged to cars	50 "
Hndson (except as above)	40 "
Catskill, at mouth of creek	50 "
Germantown	50 "
Saugerties, at mouth of creek	40 "
Barrytown	40 "
Rhinebeck and Rondont	30 "
Poughkeepsie and New Paltz Landing	30 "
Fishkill Landing	20 "
Cold Spring and West Point	20 "
Peekskill (River docks)	40 "
Haverstraw (Peck's dock)	40 "
(If boats are moved from Peck's dock to adjacent points, and returned there within two days, without expense to the company, no extra charge will be made.)	
Nyack	45 "
Sing Sing and Croton Landing	50 "
Tarrytown	50 "
Piermont	50 "
Yonkers	50 "

The coal must be discharged at the expense of the consignee, who shall also pay wharfage on the boat (except to Boston and Hudson R. R., when rate is fifty cents.)

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 April 5, 1873, compared with week ending April 6, 1872.

COMPANIES.	1872. Week.	1872. Year.	1873. Week.	1873. Year.
C. & O. Canal	19,322	44,823	16,390	20,739
B. & O. R. R.	23,972	270,843	29,233	324,641
Penn. S. Line	....	......	2,440	26,452
H. & B. T. R. R.	8,134	83,490	10,702	120,365
*Harrisburg & D	10,340	148,208	6,419	94,244
*L. V. R. R.	496	10,289	516	8,545
P. & N.Y.C. & R. Co.	7,321	102,975	7,850	83,629
Cumberl'd Branch Canal	5 478	13,878	2,845	2,845
" Railroad	485	776	2,036	31,203
Total	76,548	675,282	78.421	712,663
			76,548	675,282
Increase			1,873	37,381

Anthracite Coal Trade for 1872 and 1873.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending April 5, 1873, compared with the week ending Adril 6, 1872.

COMPANIES.	1872. WEEK.	1872. TOTAL.	1873. WEEK.	1873. TOTAL.
*Phila & Reading R.R†	103,134	1,073,624	99,322	1,232,997
*Schuylkill Canal	17,597	33,635	9.662	20,673
*Lehigh Valley R. R.	69,956	957,990	65.041	942,434
Lehigh & Sus. R. R.	38,413	375,824	42,459	534,934
" " "	....	106	1,894	1,894
Scranton North	10.042	162,210	16,181	170.284
" South	46,536	530,742	49,729	527,309
Penn. Coal Co., rail	25,501	250,758	18,745	205,599
" " " canal	....	....	....	....
Del. & Hud. Canal Co	15 199	161,616	7,663	95,396
" " East	7,639	103,119	8,677	113.425
" " West	7,539	88,900	8,802	88,865
" " South	12,227	108,800	7,254	125,016
Shamokin	....	....	....	....
Trevorton	....	....	....	....
Lykens Valley Coal Co	....	....	....	....
Wyoming North	....	....	....	....
Wyoming South	....	176,770	11,110	189,060
P. N. Y. C. & R. R. Co	12,723	......	....	....
Williamstown Col'y	....	......	....	....
Big Lick Col	....	......	....	....
Total	366,506	4,074,151		4.222,886
1872	346,539			4,024,154
Increase			316,539	198,732
Decrease	19,967			

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

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

Report of Coal Transported over Lehigh Valley Railroad

Report of coal tonnage for the week ending April 5, 1873, with totals to date, compared with same time last year.

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	TOTAL Tons. Cwt.
Total Wyoming	12,743 06	220,750 01
" Hazleton	40,734 01	568,051 18
" Upper Lehigh	32 10	1,646 18
" Beaver Meadow	10,344 00	204.129 00
" Mahanoy	11,671 01	118,744 00
" Mauch Chunk	55 04	1,537 07
Total	75,780 02	1,114,964 04
Same time last year	80,031 05	1,108,021 00
Increase		6,943 04
Decrease	4,251 03	
Forwarded East from Mauch Chunk by rail	65,040 19	942.433 12
Same time last year	69,955 11	957,990 03
Increase		
Decrease	4,914 12	15,556 11

DISTRIBUTED AS FOLLOWS.

Forwarded East from Mauch Chunk by rail	63,921 09	923,193 05
do East for use L. V. R. R	1,419 10	19,240 07
Delivered at and above Mauch Chunk for use of L. V. R.R	1,490 08	24,085 07
To P. & N. Y. R. R	7,036 06	115,772 15
To N. C. R. R., at Mount Carmel	907 10	3,598 12
To D. H. & W. R. R	531 12	14,002 08
To L. & S. R. R. at Packerton for rail	130 07	4,835 16
Delivered at M'h Chunk		1,388 10
Delivered on line of road above Mauch	22 03	
Chunk	620 17	6,116 04
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	75,780 02	1,114,964 04

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, April 5th, 1873.

	WEEK.	SEASON.
North	49,204 08	599 589 05
South	8,801 14	88,865 09
Total 1873	58,006 02	688,454 14
Corresponding time in 1872:		
North	47,264 04	633,238 03
South	7 359 18	88,900 09
Total	54,624 02	72[illegible],138 12
Increase North		
Decrease North		
Increase South		
Decrease South		
Increase	3,382 00	
Decrease		38,683 18

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 April 4, 1873.

		Tons. Cwt.
East	1 903 14	
West	5,350 06	
		7,254 00
Same time last year		12,227 03
Increase		......
Decrease		4,973 08
Total amount shipped to date		1?5,016 09
Same time last year		108.799 18
Increase		16,216 11
Decrease		

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, April 5th, 1873.

	WEEK.	SEASON.
By Delaware and Hudson Canal	....	....
By Railroad, East	7,663	95,396
" West	8,677	113,425
" South	8,802	88,865
Total 1873	25,142	297,686
Corresponding time in 1872:		
By Delaware and Hudson Canal	....	....
By Railroad, East	15,199	161,616
" West	7,639	103.119
" South	7,539	188,900
Total	30,377	353,935
Decrease	55,949	

Philadelphia & Reading Railroad and Branches.

COAL TONNAGE

For the Week ending Saturday, April 5th, 1873.

BY RAILROAD.—ANTHRACITE.

PASSING OVER MAIN LINE AND LEB. VAL. BRANCH.

	Tons. Cwt.
From St. Clair.	31,328 08
" Port Carbon.	3,471 17
" Pottsville.	684 19
" Schuylkill Haven.	25,447 08
" Pine Grove.	6,845 15
" Tamaqua.	13,342 14
" Harrisburg.	
" Dauphin.	3,259 16
Total	84,380 17

FOR SHIPMENT BY CANAL.

Passing Frackville Scales	4,613 06
" Mill Creek "	702 12
" Schuylkill Valley Scales	436 19
" Mt. Carbon "	174 17
" Cressona "	3,426 02
" Pine Grove "	......
" Tamaqua "	186 10
Total	9,520 06

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

Via Catawissa & Williamsport Br.	127 11
" N. C. R. R. passing Locust Gap.	373 18
" " " Shamokin.	3,074 04
" " " Herndon.	....
Total	3,575 13

SHIPPED WEST OR SOUTH FROM PINE GROVE.

Via Schuylkill & Susquehanna R. R.	1,523 03
" Lebanon & Pine Grove Branch	766 08
Total	2,289 11

CONSUMED ON LATERALS.

From Frackville Scales.	848 06
" Mill Creek "	638 06
" Schuylkill Valley Scales.	862 11
" Mt. Carbon "	396 02
" Cressona "	140 02
" Pine Grove "	144 07
" Tamaqua "	727 10
Total	3,757 04

LEHIGH AND WYOMING COAL.

Received via Silverbrook Junction, Sent East	3,631 18
Cat. & Wpt. Br. Sent West	23 16
" " Rupert, Cat. & Wpt. Br.	....
" " Allentown, E. Penn'a Br.	98 18
" " Alburtis, " "	......
" " Oreland, G. & N. Br.	1,129 10
" " Willow Street R. R.	434 02
Total	5,318 04

BITUMINOUS.

From Harrisburg.	6,299 00
" Connecting R. R., G. & N. Br.	
" Junction R. R.	120 00
Total	6,419 00

COAL FOR COMPANY'S USE.

Anthracite	6,648 06
Bituminous	252 15
Total.	6,901 01

RECAPITULATION.

	Total for Week.	Corres-p'g week last year.	Increase and Decrease.
Passing over Main Line and Leh. Val. Branch	84,380 17	89,675 11	d 5,394 14
For Shipment by Canal	9,520 06	19,694 08	d 10,174 02
Shipped Westward via Northern Central R. R.	3,575 13	5,490 17	d 1,915 04
Shipped West or South from Pine Grove	2,289 11	2,421 08	d 131 17
Consumed on Laterals	3 757 04	4.234 16	d 477 14
Lehigh and Wyoming Coal	5,318 04	1,311 03	i 4,007 01
Total Anthracite paying freig't	108,841 15	122,828 05	d 13.9-6 10
Bituminous	6,419 00	10 340 01	d 3,921 01
Total of all kinds paying freig't	115,260 15	133.168 06	d 17,907 11
Coal for Company's use	6,901 01	5 672 17	i 1,228 04
Total Tonnage for Week	122,161 16	138.841 03	d 16,679 07
Previously this year	1372194 11	1258136 07	i 114,058 04
Total to date	1494356 07	1396977 10	i 97,378 17

SHIPPED BY CANAL.

From Schuylkill Haven	9,310 15	20.818 13	d 11,507 18
" Port Clinton	351 00	1,089 00	d 738 00
Total Tonnage per Week	9,661 15	21,907 13	d 12,245 18
Previously this year	11,011 00	16,101 16	d 5,090 16
Total to date	20,672 15	38,009 09	d 17,336.14

Delaware Lackawanna & Western Rail Road Company.

Coal transported on the Delaware, Lackawanna, & Western Railroad for the week ending Saturday, April 5, 1873.

	WEEK. Tons. Cwt.	YEAR. Tons. Cwt.
Shipped North	16,181 03	170.284 07
Shipped South	49,729 04	527,306 17
Total	65,910 07	697,593 04
For the Corresponding time last Year:		
Shipped North	10,042 05	162,210 09
Shipped South	46,536 05	530,741 18
Total	56 536 10	692,952 67
Increase	9,331 17	
Decrease	......	4,640 07

Pennsylvania Coal Company.

Shipments of Pittston Coal for the week ending April 5, 1873.

	1873. WEEK.	1873. YEAR.	1872. WEEK.	1872. YEAR.
By Railway	18,745 09	205,599 07	25,500 15	250,758 08
" Canal	....		......	
Total	....	....	....	......
Decrease 1873	45,159 01			

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

Week ending April 5—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......	24215 18	12461 13	1783 17	38461 08	421505 19
Upper Lehigh.		3930 02	110 06	4040 08	52392 07
Beaver Meadow	2089 12	1814 12		3904 04	47670 11
Hazleton.......		158 01		158 00	3919 08
Mauch Chunk.	3357 01	3998 03		7355 04	102373 04
Total.........	29662 11	22382 10	1894 03	53919 04	627868 09
Prev'ly reported	293364 15	280584 10		573949 05	
Total to date	323027 06	302947 00	1894 03	627868 09	
Same time .1872	255564 03	194915 10	105 12	450585 05	
Increase.....	67463 03	108031 10	1788 11	177283 04	
Decrease.....					

DISTRIBUTION.	WEEK 1873.	WEEK 1872.	YEAR 1873	YEAR 1872.
Forwarded East by Rail to Tidal points	29662 11	28380 14	323027 06	255564 03
Forwarded East by Rail to Local points	9021 07	11790 01	133914 05	87943 18
Forwarded East by Rail use Central Division	1769 14	963 14	23604 10	20954 18
Forwarded East by Rail use L. & S.	604 09	311 02	4020 04	2473 12
Delivered at and above Mauch Chunk	2191 16	1091 00	23097 05	14790 11
Deliver'd at Coalport & Hazard for Canal	2006 08	2263 06	24387 15	11766 06
Delivered to L. V. R. R. at Packerton	384 06	196 06	11275 09	4338 17
Delivered to L. V. R. Rd. at Sugar Notch	1668 14		25653 06	
Delivered to L. & B. R. R. at Plymouth Bridge	6600 19	4734 17	58988 09	53053 00
Total	53919 04	44776 00	627868 09	450585 05

Penn. and N. Y. R. R.—Coxton, Pa.

Coal tonnage for week ending April 5, 1873.

	Week. Tons. Cwt.	Total. Tons. Cwt.
Anthracite received:		
From Lehigh Valley R. R.........	7,036 06	116,772 15
" Lack. & B. R. R..............	772 03	10,395 03
" Pleasant Valley R. R........	2,404 19	50,227 17
" Sul. & Erie R. R..............	1396 16	11,664 13
Total........................	11,109 15	189,060 08
Same time last year	12,722 17	176,770 05
Increase	1,613 02	12,290 03
Decrease		
Distributed:		
To Lehigh Valley R. R............	698 08	11,014 01
To Lack. & B. R. R...............	34 18	350 04
To S. Central R. R...............	3,000 14	40,687 07
To Ithaca & A. R. R..............	474 08	31,695 13
To Erie R. W. Pockets for shipm't.	4,429 19	57,120 02
To individuals on line of road....	456 09	14,821 02
To points at & above Coxton for use of Co......................	900 06	9,879 03
To points between Waverley and Elmira......................	1,014 13	23,4?2 16
Total..........................	11,109 15	189,060 08
Bituminous received from BARCLAY R. R.		
Shipped north from Towanda......	7,832 05	83,067 01
Shipped south from Towanda......	18 00	562 01
Northern Central R. R............	....	......
Total..........................	7,850 05	83,629 02
Same time last year..........	7,221 14	102,975 01
Increase	528 11	
Decrease......................	......	19,345 19
Distributed:		
To Erie Railway..................	6,160 18	69,244 04
To So. Central R. R..............	1,671 07	13,670 11
To Ithaca Valley R. R............	....	117 09
Lehigh Valley, R. R..............	12 00	309 09
To individuals on line of Railroad.	6 00	169 05
To points on line of road for use of Company..................	....	118 04
Total..........................	7,850 05	83,629 02
Grand totals transported		
Anthracite.....................	11,109 15	189,060 08
Bituminous.....................	7,850 05	83,629 02
Total..........................	18,960 00	272,689 10
Same time last year	20,044 11	279,745 06
Increase	......	
Decrease	1,084 11	7,055 16

Statement of Coal Transported over Cumberland and Pennsylvania Railroad

During the week ending Saturday April 5, 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...............	16,390 07	29,233 02	2,440 01	48,063 10
1872...............	19,322 10	24 972 01	....	44,294 11
Increase...........		4,261 01	2,440 01	3,768 19
Decrease	2,932 03	......	....	

YEAR.

	C. & O. C'l Tons. Cwt	B. & O. R R. Tons. Cwt.	Pa. S. Line Tons. Cwt	Total. Tons. Cwt.
1873...............	20,739 07	324,411 10	26,452 03	371,833 00
1872...............	44 823 04	270,842 18	....	315,666 02
Increase...........	....	53,798 12	26,452 03	56,166 18
Decrease...........	24,083 17	....	....	....

Cumberland Branch R. R.

WEEK.

	To C. & O. Canal. Tons. Cwt.	To P. & O. R. R. Co Tons. Cwt.	Total. Tons. Cwt.
1873.............	2,845 00	2,026 00	4,871 16
1872.............	5,478 05	485 07	5,963 12
Increase.........	—	1,540 13	......
Decrease.........	2,632 19	......	1,092 03

YEAR.

	To C. & O. Canal. Tons. Cwt.	To P. & O. R. R. Co Tons. Cwt.	Total. Tons. Cwt.
1873.............	2,845 06	31,203 01	34 048 07
1872.............	13,878 06	775 17	14,654 03
Increase.........		30,427 04	19,394 04
Decrease.........	11,033 00		

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

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

	AT NEW YORK. April 10. R. A.	W. A	AT PHILADELPHIA. April 10. R. A.	W. A.
SCHUYLKILL.				
Lump..................	$- —	$5 35	- —	4 00
Steamer	- —	5 35	- —	4 00
Broken,................	5 60	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 65	5 50	4 60
Wilk'b're at Hoboken..........	4 45	4 65	4 80	5 00	5 35	4 45
Old Co. Lehigh at Pt. John'n	5 50	—	5 30	5 30	5 45	4 60
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@6 00
Pittston and Plymouth, do.......................... 5 50@5 75
Shamokin Red or White Ash, do...................... 5 50@5 75
Lykens Valley Red Ash, do..........................@5 80
By retail, all kinds per ton of 2,240 lbs.......... 7 50@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 60@4 75

Prices at Havre de Grace, Md.

April, 1873.

Wilkesbarre and other White Ash for Cargoes......$ @....
Lykens Valley .... @....
Shamokin Red or White Ash............................ ....

Bituminous Coals (Cumberland).

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

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 .. .. — —@— —
" " Cannel.. .. .. 17 00@— —
" House " . .. . 22 00@23 00
" Orrel. .. .. 19 00@— —

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

PRICES FROM YARD.

Liverpool House Orrel, screened............... $20 00@22 00
"Cannel, " .... 23 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 50	$1 00
Gowrie...................................	2 50	1 00

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

	Coarse.	Culm of Coal.
Picton.................................nett	$2 50	1 50
Sydney..................................	2 50	1 00
Lingan..................................	2 00	1 00
Caledonia...............................	2 00	1 00

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

AMERICAN.

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

Freights.—April, 1873.

TO EASTERN PORTS.	Cumberland. From Georgetown.	From Baltimore	Anthracite. From Philadel'a.	From Eliz. Port, Port Johnston, and Hoboken.	From Newburgh.	From Rondout...
Amesbury	—	—		2 20	—	—
Bangor	—	4 00		2 30	—	—
Bath..............	4 00	—		2 25	—	—
Boston 3c. pr bdg	3 75	3 75		1 00	2 40	2 50
Bridgeport.	2 90	2 75		1 40	1 10	1 25
Bristol	—	—		—	1 50	1 55
Cohasset Nar'ows	3 75	—		—	—	—
Derby............	—	—		1 25	—	—
Dighton	3 00	—		1 50	—	—
East Cambridge.	—	—		2 05	—	—
Fall River.........	3 00	3 00		1 40	1 60	1 60
Hackensack	—	—		—	—	—
Hartford..........	—	3 00		1 50	1 70	1 75
Hoboken	2 25	—		45	60	65
Jersey City......	—	—		45	60	65
Lynn....	—	—		—	—	—
Middletown	—	—		1 30	1 50	1 60
Mystic...........	—	—		1 20	—	—
New Bedford.....	—	3 25		1 40	1 60	1 60
Newburyport ...	—	4 25		2 50	2 55	2 65
New Haven	2 90	2 75		1 00	1 20	1 25
New London.....	—	3 00		1 20	1 40	1 40
Newport.	—	—		1 40	1 60	1 55
New York	2 35	2 15		45	60	65
Norwalk				1 00	1 20	1 25
Norwich	3 10	3 00		1 30	1 50	1 50
Pawtucket.......	—	3 50		1 50	1 70	1 70*
Portland	3 75	3 90		1 90	2 20	2 30
Portsmouth, N.H	4 00	4 25		2 40	2 50	2 60
Providence	3 00	3 00		1 40	1 60	1 60
Rockport	—	—		—	—	—
Saco	—	—		2 60	—	—
Sag Harbor......	—	—		1 20	—	—
Salem	—	4 00		2 25	2 40	2 50
Stamford	—	—		1 00	1 20	1 25
Stonington	—	—		1 25	1 55	1 45
Taunton..........	—	—		1 90	—	—
Warren..........	—	—		1 4	—	—
TO RIVER PORTS						
Albany	—					
Catskill..........	—					
Cocksackie......	—					
Coeyman's.......	—					
Cold Spring.....	—					
Fishkill	—					
Haverstraw......	—					
Hudson	3 00					
New York	2 35					
Nyack............	—					
Poughkeepsie...	—					
Rhinebeck	—					
Rondout..........	—					
Saugerties	—					
Sing Sing	—					
Stuyvesant	—					
Tarrytown.......	—					
Troy	—					
West Point......	—					
Yonkers	—					

* And Towing.

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

Foreign and Provincial Freight

April, 1873.

Foreign.

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

TO NEW YORK.

Provincial.

Sydney.................................	$3 05
Lingan.................................	3 50
Cow Bay................................	3 75
Port Caledonia.........................	3 10
Little Glace Bay.......................	3 00
TO BOSTON.	
Sydney	3
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., 20c., 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 3

MAUCH CHUNK TO PORT JOHNSTON.

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

TO HOBOKEN

L. V. R. R., Mauch Chunk to Phillipsburgh	
Morris & Essex R. R. Phillipsburgh to Hoboken,.....	
Shipping expenses................................	
Wharfage...	
Total..	$2 21

TO SOUTH AMBOY.

L. V. R. R...	
B. & D. R. R... .. }	} 1 06
Cam. & Am. R. R. }	
Shipping Expenses.	
Total	$2 21

PENN HAVEN TO ELIZABETHPORT.

L. V. R R. Penn Haven to Phillipsburgh	
C. RR. of N. J. Phillipsburgh to Elizabethport...	01
Shipping expenses	15
Wharfage	
Total..............................	

MARKET REVIEW.

NEW YORK, April 9, 1873.

IRON—The market for Scotch Pig is dull, and prices in some cases have been shaded. The business from importers' hands is confined to parcels to supply the immediate wants of buyers at about our quotations. We note sales of a few hundred tons Glengarnock, part at $54, and 100 do., May delivery, $53. American Pig is steady and firm at $50 for No. 1 Lehigh brands, the furnaces are offering sparingly and no large quantities can be had for prompt delivery; No. 2 X is plenty, and may be quoted $46@$48; the sales are 300 tons No. 1 Allentown at $50 cash. New English Rails are quiet and nominal at $70@$71 gold. New American are in fair inquiry —3@4000 tons. prompt deliveries, sold at $85 currency at the works in Pennsylvania. Old English Rails continue in demand at about $57@$58 for D. H., and $55 for T., both currency—250 tons D. H. sold at $58, and 600 tons at Philadelphia, on private terms. Scrap is dull and easier—200 tons is reported from yard at $52.50 per ton, deliverable at Hoboken. Manufactured from store is nominally steady at old figures, though large buyers could obtain some concession. Galvanized sheet is now quoted 10 per cent. discount, which is an advance.

LEAD—Pig is in moderate demand, and prices remain firm; we note sales of 200 tons in lots, at 6⅞ cents for Common Foreign and 6⅝@6¾ for American, all gold. Bar 9¼, Sheet and Pipe 10½, and Tin-lined Pipe 16½, less 10 per cent. to the trade.

COPPER—New Sheathing is steady at 43 cents, and Bolts and Braziers 45; Yellow Metal Sheathing 27, and Yellow Metal Bolts 32, net cash. The market for Ingot is at a stand, and we hear of no business; Lake is held at 34 cents, cash, and English 31, 30 days. 5000 lb. Old Copper sold at 27½ cents.

COPPER CIRCULAR.

NEW YORK, April 4, 1873.

The mines on Lake Superior are furnishing the principal part of the supply of Copper for consumption in the United States; therefore, the period of the arrival of fresh shipments from the Lakes may be called appropriately the "beginning of the new season" in our Copper trade. As the old season is soon drawing to a close, we herewith beg to offer a recapitulation of the events in the trade of this metal during the course of the year.

The first sale of Lake Superior Copper for delivery in June to October, 1872, was made in March of that year, comprising 8,000,000 lb. at 27 cents. A short time after the transaction of this sale a lively speculation in Copper took place in England, which had the effect of advancing the price of Chili Pig to £105@£108, and of Best Selected English to £115@£118 per ton. These prices attracted to England all the available stock from Chile, Australia and Japan, and even reshipments were made from the East Indies; while, at the same time, these high prices caused a diminished consumption in England, and restricted the export of Manufactured Copper to other countries. A gradual accumulation of stock to the extent of 18,000 tons above that of the year previous was the consequence. It may be stated here, that the large increase of stock was effected only by concentration in England; that the aggregate stock of all the several countries (England included) was, after all, smaller by 5000 tons than the year previous.

When, last Fall, the Bank of England raised the rate of discount to 6 and 7 per cent., most of the speculators in Copper could not carry their stock, and were obliged to sell, which caused a break down of the price to £80 for Chile Pig and to £90 for Best Selected. Since that time it has recovered somewhat, and is now quoted at £91@£92 for Chile Pig and £99@£100 for Best Selected.

These great fluctuations could not remain without influence in our market. The stock of copper here towards the end of March, 1872, was very small, and a fear was entertained that it would not be sufficient to supply our demand until the arrival of new shipments; in consequence, the price advanced in a short time from 30 to 42, and even to 45 cents for some small lots. The new arrivals found the market pretty bare of stock, but, nevertheless, the price settled down to 33 cents, from which figure several fluctuations occurred, during Summer and Fall, until it reached 35 cents, at which 2,000,000 lb. were contracted for delivery from October to March. However, in November, on the arrival of large shipments of Best Selected English, offered for sale at 28@28½ cents, the price of Lake receded to 32, and in December to 31. In the middle of December, a sale of 2,000,000 lb. Lake was effected at 32½ cents, for delivery during the following three months, from which time a gradual advance took place to 35. Although in the month of January, from 1,000,000 to 1,500,000 lb. were contracted for at 35 cents for delivery until April, this price could not be fully sustained, English Best Selected selling at 29@30, interfering with the consumption of Lake copper. We quote the price of Lake Ingot at present 34@34½ cents, Cake 35, cash, and Best Selected 30¾@31, on 30 days. The stock of Lake Superior copper is estimated at 2,000,000 lb., and of different kinds of Foreign at 1,000,000 lb.

The four principal mining companies of Lake Superior sold early in March last from 8 to 9,000,000 lb. at 30 cents, for delivery in the Summer months; the Union Consolidated Mining Co. of Tennessee, 750,000 lb. at 31 cents; and the Vermont Copper Co. 800,000 lb., on private terms, for delivery until the close of the year.

The production of the Lake Superior mines has been almost stationary during the last four years, at about 25,000,000 lb.; last year we received from that source only 24,500,000 lb.; from the Tennessee mines, 1,500,000 lb.; from the Vermont mine, 750,000 lb.; from different small mines, 750,000 lb.; importation of English, Chili, etc., and other Foreign copper, 8,000,000 lb.—total, 35,-500,000 lb.

Chili produced in 1869..........................tons 55,000
" " 1870..........................48,600
" " 1871..........................44,900
" " 1872..........................40,500

This falling off—4400 tons as compared with 1871, 8100 tons as compared with 1870, and 14,500 tons as compared with 1869—is attributed chiefly to the scarcity of labor, and to the difficulty of procuring coal, even at an enormously increased cost. Both obstacles are continuing in full force.

Australia shipped to England about 3,000 tons Copper more in 1872 than the year previous.

The consumption in the United States is estimated to have been 36,000,000 lbs., which would leave us with even a smaller stock on hand than last year, presuming no further importation of any amount will be made from England in consequence of higher prices there, and the great advance in the premium of gold.

As to the prospect of the range of prices during the ensuing season, our market will be governed greatly by the ruling prices in England, especially towards the end of the year. Our production of Copper, although probably increased by 3,000,000 lbs. from Lake Superior, cannot be sufficient for our home consumption, which, by the revival of shipbuilding and other causes, will exceed that of the proceeding season. We have, therefore, to look to England to provide for the deficiency. The stock in England is still very large, but the shipments from Chili are falling off considerably; in the first half of February only about 500 tons were shipped, against 1700 tons during the same period last year; in the first half of March last year over 4 000 tons (81,250 quintals), during the corresponding period this year the shipments will probably be less than 1,000 tons; in consequence, we may expect with confidence *a decrease in the monthly imports*, and, as Germany, France, the East Indies, &c., are bare of stock, and have to supply their wants from England, *a coincident increase in the monthly exports* of Copper, which must diminish the surplus in England very quickly. The scarcity and high price of coal in England will not remain without influence on the production of Copper, because it would not pay to smelt the low grades of copper ore with dear coal.

From all this we anticipate a steadily rising market in England, and a corresponding one here.

F. W. HEYNE & BROTHER.

SPELTER—Foreign is quite, but firm at 7⅝@7¾ cents gold for Silesian.

From a recent number of the *Iron Age* we take the following:

THE UPWARD TENDENCY OF SPELTER IN EUROPE AND ITS CAUSES.

For the information of the metal trade we publish the following interesting correspondence, forwarded to us from Hamburg in response to inquiries from this office respecting the causes of the upward tendency of spelter on the Continent:

HAMBURG, March 7, 1873.

Messrs. Soltau, Trautmann & Co.—DEAR SIRS:—In answer to your inquiries about spelter we beg to state the following: The importation into, and, of course, the export from, Hamburg of Silesian spelter has of late years been on the decline, principally on account of the extraordinary demand for rolled zinc plates in the interior of Germany, in Austria, and, since the close of the Franco-Prussian war, partially in the newly-acquired Imperial provinces, Alsace-Lorraine, entering duty free, as the latter do.

Last year the tendency was a rising one, and toward its termination, and early the present year, a further upward tendency was developed, due, in part, to the enhanced cost of production of the raw material, in consequence of the enormous rise in the value of coal—a rise which equally influenced all other metals—and, in part, to the diminished export of spelter from Silesia. This export has, from an average of 200,000 to 300,000 cwts., gradually decreased to 100,000 cwts. last year, but will, in all likelihood, be on the increase again this year—the improvement in value all over the world naturally drawing it away from the country of production toward its most convenient port of exit, Hamburg.

The fluctuations in the quantity annually produced have been comparatively slight, varying, as the aggregate does, between 650,000 and 700,000 cwts.

Abroad its production is not inconsiderable. Belgium produces it, and in Germany we have Rhenish and Westphalian spelter. But consumption, on the other hand, is on a vast scale also, and this is proved by the small stocks in England, in France, and in the United States. It would be wrong to insist that spelter has, in its trade movements, sought other channels of exit. Silesia has, it is true, forwarded a trifle through Stettin to the consuming countries, which does not weigh the balance. The value on the spot here, to-day, is 28 80 Imperial marks, and for future, 26 50 to 26 80.

In the event of your transmitting any orders, you ought to leave a fair margin within your limits, so as not to be disappointed. For some time to come the tendency is likely to remain a rising one; at all events, this is more probable than the contrary.

We append, for further illustration, a table of spelter movements since 1854, and the course of values in marks Banco, and remain, dear sirs, respectfully yours,

H. F. SCHLESINGER & C. DE VOSS.

STOCK IMPORT AND PRICES OF SPELTER AT HAMBURG.

Year.	Imports. Cwts.	Stock Dec. 31. Cwts.	Lowest. Marks.	Lowest. Shillings.	High'st. Marks.	High'st. Shillings.	Price. Dec. 31. Marks.	Price. Dec. 31. Shillings.
1854	313,000	90,000	13	..	15	12	15	..
1855	275,000	70,000	13	13	15	4	14	12
1856	360,000	40,000	14	9	18	..	17	4
1857	378,000	35,000	14	..	19	8	14	..
1858	265,000	35,000	14	..	17	11	15	4
1859	370,000	65,000	11	9	15	4	14	2
1860	245,000	80,000	12	9	14	2	12	8
1861	278,000	54,000	10	11	12	9	11	4
1862	295,000	100,000	11	4	12	7	11	10
1863	292,000	28,000	11	7	12	5	12	2
1864	520,000	55,000	11	14	16	8	12	12
1865	315,000	20,000	12	4	15	..	14	12
1866	345,000	30,000	12	8	16	5	14	10
1867	399 000	50,000	13	7½	14	9	13	12
1868	265 000	40,000	13	2	13	14	13	6
1869	236,000	40,000	12	12	14	8	13	..
1870	200,000	30,000	11	6	13	1	11	12
1871	169 000	45,000	11	9	14	10	14	14
1872	100,000	10,000	14	10	12	8	15	10

HAMBURG, March 11, 1873.

To the Editor of the Iron Age—DEAR SIR: In handing you the foregoing answer to your inquiry concerning the advances in spelter, we beg to add that considerable sales have been effected last week, viz.: 1,000 cwts. at 26 marks on the spot, and 11,000 cwts. spring "futures" at 26·35 to 26·80; the market closing with considerable firmness. Of a special brand, 1,000 cwts. have sold since at 27 marks, and it seems to us that the market will still further advance.

Very respectfully yours,

SOLTAU, TRAUTMANN & CO.

REGULUS ANTIMONY.—There is considerable inquiry, and the market is rather firmer; 10 casks sold at 14½ cents gold, cash, and there are rumors of sales besides of 50 casks, but we have no particulars.

STEEL.—The market presents the same features so frequently noticed—a small supply, good demand, and firm prices.

TIN.—Pig remains inactive, and prices are wholly nominal at 33¼@33½ cents for Straits, 32½@32¾ for English, and 38 for Banca, all gold. Plates meet with but a moderate demand, the money pressure and fluctuations in gold having an unfavorable effect upon trade. Sales have been made of 500 bxs. Charcoal Tin at $12 gold for I.C.; and 1,000 do. Coke Tin, 14 by 20, and do. Charcoal Terne, on private terms.

ZINC.—Mosselmann Sheet is steady at old quotations, without sales. Lehigh may be quoted 10½@11 cents currency.

Manganese block oxide..........................3½
" gray "..........................5½

The Emma and Its Management.

When a mine like the Emma fails, or even falls into difficulties for a year, it is worth while to study the case, and ascertain, if possible, the cause of its disaster. The ignorant and excited shareholders made but little progress in their meeting toward ascertaining the truth; but two extracts from our foreign files, while they do not tell the whole story, will probably be found sufficiently significant to give our readers a fair idea of how the Company was floated and how it has been managed.

The first is taken from an item in no less a paper than *Engineering*, of date November 10, 1871. The item formed one of those means of establishing a reputation which are a favorite design with English "promoters." This valuable contribution to the history of mining enterprises informs us that—

"It is only a little more than twelve months since the mineral wealth of Utah was developed and already the proceeds of some of the workings have exceeded the most sanguine expectations of the owners. The mine now brought before the public is valued at 1,000,000*l.* so that the whole of the capital will be handed to the vendors, half in cash, for which applications are now made to the public, and half in fully paid-up shares. On the other hand the purchasers of the property will receive ore now *en route* for England to the value of 181,300*l*, equivalent to a dividend of 18 per cent, for one year, besides the mine and claims connected with it, and the machinery and plant upon the works. The sale of the ore already raised and forwarded, and the smelting of that now piled up at the mine, will also provide working capital. The directors propose to limit the dividends to 18 per cent. per annum, accumulating a reserve fund, until it amounts to a year's dividend at that rate, after which the whole of the proceeds will be divided amongst the shareholders, with such reservations as the directors think advisable. A special feature mentioned in the prospectus is that of paying dividends monthly, and the directors anticipate extremely favorable results from the fact that the reports show that returns will be immediate, and very large, even upon the great amount of capital."

This, observe, is the promise: a year's payment at the rate of 18 per cent. already in hand. The result of that year, as our readers know, was really 7½ per cent., including the whole of the above "ore *en route.*"

Our other extract refers to the management of the Company. A meeting of the Scotch share-holders has been held in Glasgow, and Mr. HENDERSON, one of the new directors, gave an account of what he found out at his first meeting with the old board. He says:

"Well, unfortunately I found that was very little. When I came to the point, the first thing I inquired into was what check they had upon the sampling and the sales made at the mine; and I was astonished to find that during the whole of this period they never have received a check sample from America, nor had they the analysis of either the first or second class ore in the office, nor indeed had any analysis ever been made. I also wanted to inquire into the reasons for their statement that the ore was difficult to smelt. I showed them from the analysis I had previously made of two specimens, or samples rather—for they did not appear to know the difference between a sample and a specimen—they sent down to me, and which I analysed, to see the nature of the ore, not believing that a single stone could represent in any way the whole mass of ore to be dealt with. The directors insisted that the stone sent me was a representative stone. To my mind the difference between a specimen and a sample is immense. If we want to get a fair sample of so large a mine as the Emma, it is clearly necessary to cut down in a hundred different places along the face of the mine, and having procured samples, to thoroughly mix them together and reduce them to a coarse powder. When this is done, then you have a chance of getting a fair sample of the quality of the ore. Mr. ANDERSON said he had taken a sample from the rock, which made out 2,000 odd ounces of silver a ton, but that was only a single stone. On this very important point I found that the directors were very deficient of information, and it is quite clear to my mind that they have no check whatever upon the faithfulness of the samples that had been sent to be assayed nor of the actual assays themselves. I was very glad to learn from them that they had appointed a gentleman to go out, and that Mr. HUSSEY was leaving or had left the mine to Mr. ATWOOD, the gentleman who had been appointed, and was to take entire charge. As this was a very important matter, I asked to see his agreement with the company. I looked it over very carefully, and I saw that Mr. ATWOOD by it had full power to do what he pleased, and the orders of the directors were to turn off Mr. HUSSEY and every American in the mine. (Applause.) This, I think, was a good feature. (Applause.)

We doubt, if with the keenest inspection, the new directors will find anything out of the way with the average returns of the mine. They will hardly come up to the glowing views of the vendors in 1871, and the sooner the Englishmen turn their vast intellects from the consideration of knavery, that is at the best very doubtful, to thinking of the best means of treating $80 ore, the sooner they will get in the path that leads to a moderate success.

Distribution of Carbon in Bessemer Steel.

This subject has recently been experimentally examined by MADERSPACH. He finds that if clean bright sections of Bessemer steel are exposed to the action of dilute mineral acids, a peculiar phenomenon occurs. The action of the acid is more energetic in some parts than in others. The center is more strongly attacked than the exterior, and is covered with a black powder easily removed by washing. The figure thus formed is remarkably regular in sections of one and the same kind of iron. This result proves that the metal is not quite homogeneous.

A series of samples of steel was treated with acid, and portions were bored out, in each case; one from the part most strongly attacked, and another from the part least corroded. During the treatment with dilute acid, action commenced first in the parts which became ultimately most attacked. Hydrogen and carburetted hydrogen gases were given off, and carbon deposited, not all in the state of graphite, but some of it as easily-combustible carbon liberated from chemical combination. There was found a striking difference between rolled and forged articles. The former showed in section a large, strongly corroded center, surrounded by a narrow border where the action had been much less. Forged articles showed the parts strongly and slightly acted upon, blended irregularly together. The carbon in these respective parts was determined by the action of chromic acid, ULGREN'S method. Six samples of steel were thus examined. Each number is the mean of the analyses:

CARBON, LEAST ACTION.	CARBON, MOST ACTION.	DIFFERENCE.
0·2863	0·1432	0·1431
0·2285	0·1841	0·0444
0·1704	0·1261	0·0443
0·1979	0·1227	0·0750
0·1738	0·1193	0·0545
0·3102	0·2147	0.0755

Hence we see that in every sample of steel tried, the parts most freely attacked by acids contain a smaller amount of carbon, though the difference shows no constant proportion.

Scientific and Technical Notes.

Mr. WILLIAM YATES, of London, has been granted a patent for a new Miner's Safety Lamp, which is said to be a great improvement upon that invented by DAVY. Mr. YATES has removed the wire gauze from that part of it which surrounds the flame, and replaced it by a strong lens or bull's-eye glass on one side, and a silver reflector on the other. The result of this arrangement is that his lamp gives "a cheerful light, estimated at 20 times that of the old Davy, and sufficient for all necessary purposes." By this means temptation to expose the flame to obtain more light is removed. He further provides a complete check against the practice of heating the lamp by means of the flame, for it is placed so low that it cannot be made to approach the gauze, either by the breath or by tilting the apparatus. He has remedied a third defect. The lower portion of the apparatus, containing the oil reservoir and the wick, which is screwed to the part which consists of the gauze funnel, the bull's-eye, and the reflector, has a spring bolt attached to it, which catches each time the screw is turned, and finally locks together the two parts of the lamp. The bolt is easily removed by another screw, but this cannot be done without at the same time withdrawing the wick and extinguishing the flame, and it thus becomes impossible to obtain a light by opening the lamp. The new invention thus remedies the chief defects of the old lamp, and those to which the accidents still occurring in mines are chiefly attributed. The apparatus seems strong, little likely to get out of order, and altogether well adapted for the rough usage to which a miner's lamp is likely to be exposed. It is much more expensive than the forms of the lamp now in general use, but it is said that the saving of oil effected by its use will in one year pay the additional cost. When the principle of the Davy lamp was made known by its inventor, it was supposed that a means had been discovered of putting an end to all accidents from fire damp—and, so far as these arose from the immediate contact of a naked flame with the explosive gas, this has been proved to be the case. But there were many objections to the old lamp which interfered with its usefulness. It gave too little light, and it was too easily opened. In consequence, the miners, a proverbially reckless class, in order the better to see their work, or even simply to obtain a light for their pipes, were constantly tempted to remove the protecting gauze, and exposed the naked flame. This practice has been checked no doubt, by putting a lock upon the lamps. It has been found, however, that even when this is done the lamps can be tampered with. The flame can be made to strike against the wire gauze in such a way as to enable the workmen to obtain a light at the heated part; and this, in fact, is constantly done, fearful as the risk is. It has been said that no explosions from fire-damp could occur in mines if the safety lamp were properly used; and yet the number of deaths arising from such accidents still amounts to about 300 a year.

The great lack of rolling stock on our railroads is indicated by the fact that the United States Rolling Stock Company are running no less than 28 locomotives, 35 first-class cars, 15 second-class cars, 4 combination cars, 23 baggage cars, and 2,735 freight cars. The value of this is $2,809,914, and the profits in 1872 were $263,425, from which eight and one-half per cent. dividends were paid for less than a year's work. If this success encourages the increase of these rolling stock companies, the coal and ore miners of the country will be the gainers. The average valuation of locomotives is put at $11,400 each; of first-class cars, $5,044 77; of second-class cars, $4,862 48; of combination cars, $4,303 78; of baggage cars, $2,227 81; of freight cars (including box, dump, flat, gondola, and oil-tank cars,) $794 42.

The great difficulty in the manufacture of gun cotton has been the impossibility of exploding it wet, and the extreme danger of drying it, on account of its great sensitiveness. These drawbacks have been removed by the discovery of a means of exploding it wet, by electricity. Discs taken wet from the hydraulic press, and containing from 15 to 20 per cent. of water, were placed upon a slab of iron, one inch thick, without any tamping or covering. On placing the electric detonator within them and firing the mass, the plate of iron was deeply indented in the center. A slight tamping of sand, however, placed over the discs, so far increased the explosive agency that a slab of iron was shivered to fragments on detonating the cotton.

England exported in 1871, 1,057,458 tons of pig and 1,979,117 tons of other iron and steel. In 1872, the amount was 1,339,726 tons of pig, and 1,926,532 tons of other iron and steel.

The Engineering and Mining Journal.

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

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Tyndall's Gift.

The *Popular Science Monthly* publishes the following list of the receipts from Prof. Tyndall's lectures in this country :

Boston, six lectures	$1,500
Philadelphia, six lectures	3,000
Baltimore, three lectures	1,000
Washington, six lectures	2,000
New York, six lectures	8,500
Brooklin, six lectures	6,100
New Haven, two lectures	1,000
Total	$23,100

The above shows the folly of putting a large man in a small hall, as was done in Boston, where the self-sacrificing lecturer was compelled to work as hard for a few hundred listeners as if his audience had numbered thousands, while multitudes who would have derived benefit from the lectures were unable to be present. As the result of the whole visit to this country, Prof. Tyndall had $13,000 left after paying expenses, and this sum has been made over to Prof. Henry, of Washington, as trustee, to aid young students of science in studying abroad.

The Phenomena of Iron.

Mr. Bennett's paper, read before the Polytechnic Association, on the condition of the gases absorbed by metals while in a state of fusion, and their effect upon the character of the product, touched one of the most important and interesting of the unsolved problems of theoretical metallurgy. His idea seems to be that the occluding power of metals is superior to the dissociating power of heat, so that although sulphur melts at about 226° F., and volatilizes, under natural circumstances, at heats above that, it does not volatilize, but still retains the liquid form in cast or wrought iron, even when these are melted, and the temperature is from 3,000° to 4,000° F. Other elements which, so far as our present means of solidification are concerned, are constant gases, like hydrogen, are similarly retained by iron and other metals when in fusion, and therefore present the same opposition to the dissociating powers of heat. But these elements can be withdrawn from the metals by means of the air pump, and we have here one of the rare instances in which mechanical force is more powerful than chemical force. Mr. Bennett therefore suggested that the solids, sulphur and phosphorus, may be drawn from melted iron by the use of a vacuum, just as hydrogen and carbonic oxide are withdrawn from the solid metal. This did not meet the view of Prof. Van der Weyde, who did not dispute the possibility that sulphur and phosphorus may be separated from melted iron by the use of the vacuum, looking upon that as subject for experiment and not theoretical treatment; but who could not believe that mere mechanical action is a force superior to the chemical power of heat. His opinion is sustained by the recent investigations of Roberts and Wright in England, who have proved that the hydrogen occluded by palladium does not form an alloy with that metal; but this leaves the question of the alloyed, or rather combined, state of sulphur and phosphorus untouched.

But little is known on this subject, and the discussion in the Polytechnic Association was as definite as the present state of our knowledge would permit. The natural inference from the facts brought forward there is, that the solids and gases contained in melted metals are not in a similar state, and that the means which are effective with gases are by no means certain of accomplishing the dissociation of the solids. In fact, with all the labor so eagerly expended in the effort to ascertain the constitution of cast iron, there has been nothing more plausible offered than the old supposition that sulphur forms a definite compound with the iron (or that a definite compound of sulphur and iron is homogeneously dispersed throughout the mass of metal), which is broken up at a certain temperature, when the sulphur resumes the uncombined state. Below the temperature at which this dissociation takes place the iron can be welded, but above that temperature the now free sulphur becomes a thin layer, spread over the surfaces of the iron molecules, and prevents their union. In this connection compression, instead of causing the iron to weld, only results in a change of form. The molecules slide over each other, lose their cohesion, and the mass breaks up.

This explanation, long ago suggested, is only—what we have called it—a supposition. It does not rise to the dignity of a theory, for there is but one observed fact to sustain it: that is the fact that many irons are weldable at a low temperature which break up at a high one. But there are several powerful reasons for doubting its correctness. One is, that the welding temperature of red-short irons is often an immediate one. It breaks if worked below that, as well as above. Another is, that solids whose fusing point is high, like chromium, make iron red-short ; and, as Dr. Ott said, if the liquid theory is maintained for sulphur, it will have to explain the red-shortness due to chromium also. The whole subject is interesting, significant, and of the greatest practical importance to iron workers.

New Publications.

Report on the Hydraulic Lime of Teil. By Leonard F. Beckwith, Civil Engineer. New York: Van Nostrand, 1873.

At the time of the Paris Exposition, Mr. Beckwith distinguished himself by his report on the manufacture and applications of Béton-Coignet. In that report, after giving a tabular statement of the experiments made at the *Conservatoire des Arts et Métiers*, to test the crushing strength of béton made from various mixtures, he remarks: "An examination of the preceding table will show that the strength or bearing power of each variety of béton is sufficient for ordinary uses, but that the differences are great." The table itself shows that the béton made with one particular kind of hydraulic lime far exceeds all others in its strength, becoming fissured only under a pressure of 7,000 pounds to the square inch. This was the celebrated lime of Teil.

In the present report, addressed to Messrs. H. Champin & Gillet, sole representatives and agents for North America of the French manufacturers, Mr. Beckwith describes in detail the fabrication of the Teil hydraulic lime, and its use in the construction of marine works, canals, aqueducts, sewers, tunnels, bridges, railroads, buildings, foundations, floors, artificial stone, etc., etc. The quarries are on the banks of the Rhone, in the Department of Ardèche, France, and have been worked for several centuries. This siliceous hydraulic lime is remarkable, not only for the great strength which it imparts to concrete, but particularly for its capacity to resist the destructive action of the sea. This action consists, in ordinary mortars, in the solution of the hydrate of lime, not yet carbonated, and the subsequent decomposition, in the porous remaining mass, of the aluminate and silicate of lime, by the chloride of sodium, salts of magnesia and carbonic acid in the sea-water. "When, on the contrary, the mortar has had time to become carbonated by the free hydrate of lime absorbing carbonic acid from the air and water, and forming an impervious protecting shield to the mass, and when hydraulic limes derived from siliceous limestones are employed, instead of limes from argillaceous (aluminous) limestones, then the mortar will not be destroyed." Vicat, Chatoney and Rivot concluded that the chief element of hydraulic virtue is the silicate of lime. Alumina in limes and cements hastens the setting, but is no guaranty of durability. Teil lime contains 66 per cent. of silicate of lime, a very small proportion of alumina, and a sufficient quantity of uncombined lime to form the protecting envelope of carbonate of lime, so important for the preservation of mortar.

This lime is claimed to be more economical in use than Portland and other cements, because it weighs but 1200 pounds per cubic yard, against 2,100 pounds, the weight of the latter, and because, for equal weights, the Teil lime contains more silicate of lime. It has been largely used at Marseilles, Toulon, Cette, Bordeaux, St. Malo, Cherbourg, Barcelona, Corsica, Algiers, Bona, Oran, Tunis, Genoa, La Spezzia, Trieste, Constantinople, Odessa, Suez, Port Said, Alexandria, etc., and is exported to the harbors of South America. Mr. Beckwith gives many instances of its use (as concrete) in land constructions ; and an appendix to his essay contains numerous testimonials from civil engineers in charge of great works, of different nations. There are also a number of plates, illustrating the machinery of its manufacture and the manner of its use.

Year-book of Nature and Popular Science for 1872. Edited by John C. Draper, M. D. New York: Scribner, Armstrong & Co., 1873.

The introduction of carefully prepared scientific miscellanies into our popular magazines is a comparatively recent feature; and one of its fruits is the appearance of several annuals, containing these miscellanies in book-form. Such we presume is the origin of the volume before us, though doubtless the eminent and accomplished editor has added to its scope. Dr. Draper's name is guaranty for the general accuracy of the language, and the interesting nature of the items; but the book remains a scrap-book merely, containing not so much a complete record of the actual progress of discovery during the year 1872, as a collection of such paragraphs as happened, during that year, to be going the rounds of the journals. The advantages of the metrical system; Rev. Charles Kingsley's views on the study of science, and other good reading of this kind, cannot be called the product of the year; still less the numerous recipes, old and new, in domestic and manufacturing chemistry, agriculture, etc., which stud these pages. The departments of engineering and metallurgy are lamentably scanty. The contents are arranged under the classifications adopted by the British Association, and there is an analytical, alphabetical index to facilitate reference. These features give the book a positive value, since they enable the reader to consult it without waste of time. But its most serious deficiency is the absence of full references to original authorities. Credit is indeed given, but not in such a way as to enable the student easily to trace an item to its source. The least that a scientific editor should do, when he epitomizes in a suggestive but unsatisfactory paragraph some elaborate essay, is to label his specimen so that whoever is interested may know exactly where to look for the original deposit. But Dr. Draper either gives no authority, or names the author without specifying the journal or volume, or names the journal without specifying the date, or the book without giving its proper title and place and date of publication. Consequently, the Year-book, which might have been a valuable *Index Rerum*, is merely an agreeable and tantalizing anthology, free from gross errors and absurdities, and well worth its moderate price, as a book for the family; but not what it could have been, and should have been—and we venture to say would have been—if Dr. Draper had edited it in a sense beyond mere revision.

Annual Report of the State Geologist of New Jersey. Trenton: Murphy & Bechtel, Publishers.

Prof. Cook announces that the field work of his survey is completed, and it can be closed and reported upon, but the drainage law having thrown unexpected work upon the geological survey and delayed the prosecution of its proper task, he asks, very justly, for a continuation of its powers. The survey, in fact, ought to be made permanent. A yearly pamphlet upon the possibilities and requirements of New Jersey as a producer of minerals, and upon the relation of its soil to agriculture, could not fail to be valuable. These two subjects take up most of the present report. In mining, the activity of the last year in the magnetic ore region gives more than usual value to the report upon these deposits. We propose to quote at an early day from this part of Prof. Cook's work. The advantages of boring as a means of prospecting are strongly urged, and moderate as the pamphlet is in size, it is one which is worthy the attention of New Jersey people.

Eighth Annual Report of Rutger's Scientific School, situated at New-Brunswick, N. J.

This school affords two principal courses of study, one in engineering and mathematics, and the other in chemistry and agriculture. Of the students, 53 are from New Jersey, 14 from New York, 1 from Connecticut, and 2 from Japan. In the appendix are valuable papers on the culture of Indian corn and a report of operations on the agricultural college farm, and the experiments made there close what is both an interesting and valuable report.

Saward's *Coal Trade Circular for 1872, Volume 4. Published at* 111 *Broadway*—$2 50 *a year—by* F. E. Saward.

The *Coal Trade Circular* forms, in its bound form, a handy book of reference, giving not only the statistical results of the year's work in the coal mines, but adding to that a running account of the condition of business from week to week. Mr. Saward is an energetic and careful editor, and deserves the success he has labored for so hard and the appreciation his paper meets with on all hands.

The Estimation of Phosphorus.

Last year we assembled several of the processes in use for the determination of phosphorus, a task that acquires increasing importance every day. It is also undergoing constant study, and we therefore present the following from two well known English Chemists. Mr. John Parry, Chemist to the Ebbw Vale Iron Works, is the author of the first.

PARRY'S NOTE.

The precipitation and estimation of phosphoric acid as pyro-phosphate of magnesia being (although very accurate when conducted with care), as is well known, a troublesome and slow process and, when almost daily determinations are called for, involving much labor, the author was induced to use molybdate of ammonia dissolved in measured quantities of ammonia and nitric acid and water, as recommended by Eggertz. Failing to get satisfactory results, and being informed by Mr. Snelus that a simple solution of molybdate of ammonia added to the hydrochloric solution containing phosphorus would do, the author tried the latter, but still with uncertain results.

In some instances the phosphorus could not be precipitated at all, even on adding a large excess of the molybdate solution. It was found, however, that the non-precipitation of phosphorus was due to the fact that the solution was not sufficiently acid; also, that an excess of acid considerably retarded the precipitation of the phosphorus, and it consequently occurred to the author that it would be well to add a slight excess of ammonia to the hydrochloric solution, and carefully acidify with nitric, or hydrochloric acid indifferently. The latter, however, proved to be the best, and ultimately the hydrochloric solution, containing phosphorous, and about one-fourth litre in bulk, was treated as follows:

1st Ammonia added until complete precipitation of the oxide of iron, etc. 2d. Nitric acid added in just sufficient quantity to redissolve the precipitated oxide of iron, etc. 3d. Heated to boiling, molybdate solution added (50 grammes molybdate of ammonia in one litre of water).

Solution well shaken (glass flasks are most convenient for this). If the usual yellow crystalline precipitate does not appear, a little nitric acid is added, the flask well agitated, more acid added, drop by drop, until a distinct precipitate appears, when a small additional quantity of acid may be added. The resulting yellow crystalline precipitate filters freely, is washed with water slightly acidulated with nitric acid, and has no tendency to pass through the filter. It is dried and weighed in the usual manner. One hundred parts contain 1·63 phosphorus. Provided the above details are strictly observed, the greater part of the phosphorus is thrown down almost instantaneously.

It has been found, from frequent experience, that the whole process depends on adding exactly the proper quantity of nitric acid, with solutions containing about ·001 grammes of phosphorus; also, that if the solution be too acid, no precipitate is shown; and, on afterward cautiously adding ammonia, an immediate precipitation is observed. On the other hand, the same result is shown when insufficient acid has been added, and a careful addition of nitric acid instantly throws down the phosphorus. With larger quantities of phosphorus this is not so marked; a notable quantity of phosphorus may, however, be easily overlooked; and the proper quantity of nitric acid to be added can only be learnt by experience.

In order to test the accuracy of the process, and also to ascertain the time required for the complete precipitation of a known quantity of phosphorus, the following experiments were made by my assistant, Mr. J. Needham, on whose practical skill I could thoroughly rely, the experiments being conducted under my personal supervision: A solution of phosphate of iron was made and mixed with excess of perchloride of iron. 100 cc. of this solution contained 0·1152 grammes phosphorus. For the experiments 100 cc. of the solution was poured into a tube, 100 cc. Burette, divided into 200 parts, provided with an Erdmann's float, so that the number of cc. to be used could be accurately run out.

Experiment 1.—To 25 cc. solution, excess of ammonia was added, then acidified with nitric acid, boiled 8 cc. molybdate solution added, and sufficient nitric acid until precipitation. Set aside on sand-bath 26 minutes.

Mean of five trials—Phosphorus found .... ·002868 grms.
Mean of five trials—Phosphorus in solution .... ·002880 "

Experiment 2.—25 cc. solution as above, was mixed with 12 cc. molybdate solution, to ascertain whether excess of molybdate would interfere with the accuracy of the process. Phosphorous found, ·003085 grms.

Experiment 3.—10 cc. molybdate solution added to 25 cc. phosphorus solution, afforded ·002880 grms. phosphorus.

Experiment 4.—16 cc. molybdate solution added to 25 cc. phosphorus solution, on four trials afforded ·003378 grms. phosphorus.

Experiment 5.—12 cc. molybdate solution, added to 25 cc. phosphorus solution, along with an excess of nitric acid, yielded ·001369 grms. phosphorus.

Experiment 6.—12 cc. molybdate solution added to 25 cc. phosphorus solution, 7 cc. excess nitric acid. Phosphorus found, ·00271 grms.

Experiment 7.—As above, but 14 cc. excess of nitric acid used. Phosphorus found, ·001450 grms.

The experiments 6 and 7, when set aside for many hours, gave no further precipitate.

Experiment 8.—It was thought that in experiments 2 and 4, with 12 cc. and 16 cc. molybdate solution, a shorter time might suffice for the precipitation of the phosphorus. Accordingly experiments 2 and 4 were repeated, but only allowed to stand 12 minutes. Phosphorus found, ·002958 grms.; experiment 2 (two trials). Experiment 4 repeated with 16 cc. molybdate solution, and a slight excess of nitric acid, for 12 minutes. Phosphorus found, ·00295 grms.

Experiment 9.—16 cc. molybdate solution to 25 cc. phosphorus solution; solution boiled, after precipitation of phosphorus set aside for 15 minutes. Phosphorus found, ·004254 grms.

The foregoing experiments show that great caution must be exercised throughout the whole progress.

As far as the author's experience goes, it is best to add about 30 per cent. more molybdate solution than may be thought necessary; and if a considerable precipitate is at once shown, it may be considered probable that an excess of molybdate solution has been added. A slight excess of nitric acid is added, and the solution filtered as soon as the precipitate has settled, about twelve minutes being usually sufficient. In all cases the filtered solution should be retested for phosphorus; and if a further precipitate is shown, it is best to take a smaller quantity of the iron or steel, so that the whole of the phosphorus may be thrown down on the first addition of the molybdate solution. Experiment 9 shows that boiling must be avoided. The presence of lime, magnesia, aluminia, and silica were found, by a careful series of experiments, not to interfere with the accuracy of the process. It is usually stated that the presence of soluble silica must be avoided. The author, however, is unable to confirm this.

For the estimations of phosphorus in Bessemer, pig, steel, and wrought iron, it is best to weigh 5 grammes of metal. Half a gramme is sufficient of common white cinder pig; one gramme for unknown irons, with second trial, guided by results of the first.

W. MATTHEW WILLIAMS' NOTE.

I first used the molybdate according to the method described by Fresenius, as Sonnenschein's, the re-agent being prepared by dissolving 1 part of molybdic acid in 8 parts of ammonia, to which 20 parts of nitric acid were afterwards added. I used this as directed by Fresenius, with considerable perseverance and much vexation, the results being so contradictory and unsatisfactory that I never ventured to make any use of them, and was about to condemn the molybdate process altogether, when I met the formula of Eggertz. My great respect for the accuracy and reliability of Prof. EGGERTZ induced me at once to throw my own halting conclusions overboard, and begin afresh upon the molybdate process, following most faithfully every detail of his instructions. The results were quite satisfactory, and by following up the subject I afterwards learned the cause of the previous unsatisfactory and contradictory results. The following is the method of preparing the re-agent:

The molybdic acid should be first heated with nitric acid over a water-bath for a few days, in order to convert the B-phosphoric (pyrophosphoric acid), which it commonly contains, into C-phosphoric acid. It must be evaporated to dryness to drive off the free nitric acid. To one part of this molybdic acid add four parts by weight of ammonia, of 0·95 specific gravity, and digest in a closed bottle at 16° C. When the solution is thus completed, suddenly add fifteen parts of nitric acid of specific gravity 1·20, still at the temperature of 16° C. This solution must now be set aside, when the presence of any C-phosphoric acid in the original molybdic acid will be shown by the formation of a yellowish precipitate. In order to secure the complete removal of this, I find it desirable to heat the re-agent for two or three hours at 40° C. After this the clear solution may be either decanted or filtered, and it is then ready for use. The strictest attention to the above stated quantities, specific gravities, and the temperatures is necessary, for reasons which I will presently show.

Having thus prepared the re-agent, its application is simple enough, but care is still required:—1. One gramme of the iron or steel is dissolved in 12 cubic centimetres (0·43 fluid ounces) of nitric acid of 1·20 specific gravity. This solution is best effected over a water-bath. 2. The solution is evaporated to dryness over a water-bath, and then two cubic centimetres of nitric acid of 1·20 specific gravity, and an equal quantity of hydrochloric acid are added, and left for about an hour until the red gummy mass is redissolved. 3. Four cubic centimetres of water are now added, and the solution is filtered, care being taken that the filtrate and wash-water do not exceed 20 cubic centimetres. Half that quantity is sufficient. Two cubic cetimetres of the re-agent are now added for every 0·001 gramme of phosphorus supposed to be present. It must now be digested for at least three hours (I have sometimes found six or eight hours desirable) at about 40° C, and occasionally stirred. If no precipitate occurs in the course of one hour, add more of the re-agent. 5. The yellow precipitate is now collected on a weighed filter, washed with water containing 1 per cent. of nitric acid, dried in a water-bath, and weighed. It contains 1·63 per cent. of phosphorus. 6. In order to be sure that all the phosphorus is precipitated, the filtrate should be again digested with more of the re-agent.

In applying the re-agent, especial attention must be given to temperature.

As already stated, I discovered the cause of my first contradictory results when following FRESENIUS. I found that a primary condition of success was *an accurate adjustment of the temperature of precipitation to the quantity of free acid present*, and that this depended upon the tendency of molybdate of ammonia to decompose when heated, which tendency is controlled by the presence of free nitric acid (and probably, also, by hydrochloric acid). A solution of molybdate of ammonia, which decomposes at a certain temperature, will resist that degree of heat and require a higher temperature for its decomposition, when more nitric acid is added. At the same time it is desirable, in order to secure the easy and complete precipitation of the phosphorus, to work at a temperature not far below that at which the molybdate is decomposable.

The re-agent, prepared as above, will bear a temperature of 40° C without decomposition, but must not be raised much higher. If, however, more nitric acid be added, the temperature may by proportionately raised without decomposition; but then the precipitation is more tedious.

This decomposition is a serious matter, inasmuch as the molybdic acid is thrown down with the yellow phosphorus compound, and is not distinguishable from it, and thus produces utterly false results.

The directions in FRESENIUS are vague and indefinite as regards strength of acid and alkali, and also in reference to temperature of precipitation; and until I had learned the above by my own experiments (suggested by a hint from Eggertz), I had failed to balance the acidity and the temperature with sufficient accuracy and constancy, and hence obtained, on one side, an obstinate sluggishness of precipitation, or on the other, an over facility and rapidity, accompanied with an excess due to precipitated molybdic acid.

I suspect that this has been the case with other chemists who have condemned molybdate of ammonia as a re-agent for the determination of phosphorus in iron and steel.

Finding the temperature so important, I devised a very simple modification of the water-bath, for the special purpose of keeping several small beakers at 40° C for a long time, and with the smallest possible amount of attention. It was a circular tin-plate vessel, a saucepan with double sides and false bottom. The space between the two bottoms and the two sides being filled with water, and the whole heated by a gas-flame, the dry open cavity within forms a sort of hot air bath, the temperature of which is easily regulated, so that the contents of the beakers therein may be maintained at 40° C. Having once determined the heat of the water required for this, a thermometer is only needed in the water jacket, a hole being of course left for this and for filling. As every degree of variation in the water produces only about half as much variation in the beakers, it is easily regulated, and the beakers are kept dry outside, and thus easily handled. I have frequently left this little water-oven all night, after adjusting the gas flame, without finding more than two degrees of variation in the beakers on the next morning. It may be used with or without a cover, and is very useful for drying precipitations, &c., especially for these phosphorus precipitates, which should always be kept well below the boiling point of the water.

I should add, that one of the great advantages of the molybdate method is the small percentage of phosphorus contained in the precipitate. Being less than one-sixtieth part of the total weight, very small quantities of phosphorus become weighable.

MINING SUMMARY.

Colorado.

We copy the following interesting budget of mining news from the March number of the Georgetown *Mining Review*.

GRAND ISLAND—BOULDER COUNTY.—It has been reported and denied that the Caribou Lode has been sold for $1,500,000. The last week in January, silver from this mine was produced to the amount of $6,050 19, during one half cash of the first and second weeks in February the yield was $13,646 49 or for the two weeks $22,491 22 currency. On the 18th $10,588 60 in bullion was received in Central, and on the 4th, $7,400, making the yield of the month of February in the neighborhood of $32,000. The mine is producing on an average twenty-five tons a day, worth from $100 to $200 and is capable of doubling this. The mill is to be enlarged to double its capacity, the necessary machinery having already been ordered. During the first week of March a body of sulphurets was struck worth from $1,000 to $3,000 per ton. Work on the Tunnel to cut the lode is progressing at the rate of fifty feet per month. This lode (East and West end) is employing about seventy-five men. The Isabel lode is bein worked by Charles E. Sherman who is finding good ore. The Idaho, No Name and Sherman are also in good pay. Lots from the No Name, sampled at Central, yielded $520 for first-class, and $256 for second-class. In a drift at the depth of 100 feet on the Idaho, a vein of mineral is being worked twenty inches wide and said to be valued at 600 ounces per ton. A rich pocket is reported as struck on the Blue Bird, assaying $1,180. This mine is owned in Golden. The McCarthy Co., capital $50,000 in 500 shares, is a new organization to prospect mines, buy and sell mineral property, bullion, coin, and negotiable paper at Caribou.

TELLURIUM.—The mineral "petzite" which has within the last year brought fame to Gold Hill is reported now to have been found in several lodes outside of the Red Cloud. This mine is producing heavily, and at a depth of 100 feet has a 6-foot vein. The Cold Stream, forty feet north of the Red Cloud, is being worked by TRUEMAN WHITCOMB, and is turning out ore reported to be worth from $300 to $400. The Corning Tunnel is in rapid progress, and the old Phœnix lode showing much promise of wealth when opened at depth. On Sugar Loaf, the U. S. mines are being worked by Ed. BUTLER & Co., the best of their ore yielding $1.100 per ton in silver. The Old Hoosier is silent. The Tammany mine owned by J. R. LONG & Co. is, we understand, in good pay. Among the most promising of later discoveries at Gold Hill are the Freiberg and Alpine.

WARD.—The Celestial mine is negotiating for a sale, with a fair prospect of completing it. Mills at Ward have been forced to stop for the want of water. There is a great scarcity of this commodity in Left Hand Creek.

CACHE-A LA-POUDRE.—The Boulder *News* gives an interesting account of the mines along this creek in northern Colorado, to which we are indebted for the following:

"The mines at Livermore are 15 mines west of the canyon, and consequently in the foot hills. They are situated in feldspathic granite, and have a trend nearly north-east and south-west. Those that we have examined have a width of three or four feet, and have firm and well defined walls. One or two lodes that were pointed out to us are nothing but hornblende and syenite, with a little iron. Others carry a strong amount of malachite or green carbonate of copper, with some silver. The ore is much decomposed, and has evidently once carried many cubes of iron pyrites. Occasionally masses of these will be found around which the ore is decomposed, giving them the appearance of what miners call "cinders." One specimen which we obtained there, which was much richer than the average, assayed 90 odd dollars per ton in silver. There are few, if any, mines that will pay for some years to come, though they will without doubt, be worked to a profit at some future time.

Going westerly from Livermore, it is some twenty miles to the south branch of the creek. In this distance there are many lodes, specimens of which assayed from $2.50 per ton in gold to $15 per ton in silver. On the creek, near where the road first reaches it, we found a stone lode, carrying good looking ore, which assayed $30 per ton in silver. Following up the stream for twenty miles above there, metal bearing veins are quite plenty, some of which carry considerable gold, though silver is the most plenty.

On the Range, we found a "nest of lodes," with a trend east and west. We obtained many specimens there of "top rock" only, and the lowest assay in silver was $15 per ton, while the highest was something over $10,600 per ton. The veins are large and strong, though they can be traced but a short distance. The character of the ore is much like that at Caribou.

A new coal deposit has been found by P. H. DUNNIGAN at the base of the mountain, on Cache-a-la-Poudre. The seams are only a few inches thick and have the appearance it is said of true cannel coal.

PARK COUNTY.—The Moose Mining Co. have working an average of 11 men all winter, preparing for spring. It is reported that a 13-foot vein of solid mineral has been struck and a two year supply of ore brought to light. The Baker has employed six men and averaged three tons of rich ore per day. The Hiawatha with two men has produced nearly 175 tons. Preparations are being made to work the Placers of the Platte. The Dudley works are reducing ten tons per day, and a 25-ton furnace is proposed at Horseshoe, six miles from Fairplay.

GILPIN COUNTY.—Mining affairs in Gilpin County have been very dull for a long time. But little work has been done on the Bobtail until recently, and before the Briggs Bro's resumed operations on the Gregory, that mine was lying idle. Since the Bobtail tunnel has been finished, work on that lode has taken, or is about to take, a new start. The Briggs mine is looking well, and has a quantity of ore in sight. Work is being actively carried on, a large amount of ore is raised, and the prospects are that the mine will soon be producing as much as it ever did. The smelting ore from the Briggs raised last month sold for $140 per ton. It is hoped that during the comming summer both the Bobtail and Gregory will be extensively worked. If so, it will enliven business greatly and furnish employment for a large number of men, as well as notably increase the bullion product of the county.

The Leavitt is holding out finely, and is probably producing more ore than any other one mine in the country. The Church Bro's are working the Gunnell Co's claims on the Gunnell lode under lease, and also the Cook Co's property on the vein. The Gunnel shaft is 540 feet deep. At about 500 feet the leesees are drifting and stoping, and raising about eight cords of ore per day. On the Cook claim they are working at a depth of about 250 feet, and raising about a cord of ore each day. The Messrs. CHURCH are working between 50 and 60 men. Their mill ore is worth about $10 per ton.

J. ALDEN SMITH has leased the Coleman claim on the Gunnell. He is opening ground at a depth of about 300 feet, and is working eight men. At the time of our visit he had at one point about two feet of ore in sight which assayed from $160 to $238 per ton.

The PIPPEN BRO's are working the University Co's. property on the same vein, stoping at the depth of 300 feet, and raise about three-fourths of a cord per day, which yields about seven ounces (gold) per cord. They are sending their ore to the Whale Mill.

San Francisco Stock Market.

BY TELEGRAPH.

NEW YORK, April 9, 1873.

Our report from the San Francisco Stock Board s dated April 8th. With the exception of a slight decline in Yellow Jacket, the market is firmer. Eureka Grass Valley is appended to the report as selling at $23 per share, which is a decided advance over its recent price. The receipts of the Eureka G. V. Co. for the month of March, were nearly $48,000. A dividend of $2 per share has been declared payable on the 7th prox.

		April 8.	
Savage	—	42	—
Crown Point	—	95	—
Yellow Jacket	—	57	—
Kentuck, "New Issue"	—	—	—
Chollar Potosi	—	42	—
Gould & Curry "New Issue'	—	8	—
Belcher "New Issue"	—	72	—
Imperial	—	6⅛	—
Raymond & Ely	—	58⅜	—
Meadow Valley	—	13½	—
Eureka G. V.	—	23	—

METALS.

NEW YORK, April 10, 1873.

IRON.—Duty: Bars, 1 to 1½ cents ℔ lb; Railroad, 70 cents ℔ 100 lbs.; Boiler and Plate, 1½ cents ℔ lb; Sheet, Band, Hoop, and Scroll, 1½ to 1⅝ 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	62 64@64 00
Gartsherrie	— —@— —
Glengarnock	54 00@55 00
Eglinton	54 00@53 00
Pig, American, No. 1	50 00@— —
Pig, American, No. 2	46 00@48 00
Pig, American, Forge	40 00@42 00
Bar Refined, English and American	— —@110 00
Bar Swedes, assorted sizes (gold	137 50@142 50
	Store Prices, Cash.
Bar, Swedes, 1½ to 5 x ⅜ & ⅞ 2 sq. & 6 to 12 x ⅜ & ⅛	150 00@160 00
Bar, Refined, ⅝ to 2 in. rd. & sq. 1 to 6 in. x ⅜ to 1 in.	107 50@ — —
Bar, Refined, 1¼ to 6 by ⅛	— —@112 50
Bar, Refined, 2⅛ to 2⅞ round 1 & 1⅛ by ¼ & 5:16	115 00@ — —
Large Rounds	115 00@127 50
Scroll	130 00@160 00
Ovals and half-round	132 00@152 50
Band	— —@125 00
Horse Shoe	— —@127 50
Rods, ⅝ to 3-16 inch	112 50@155 00
Hoop	155 00@180 00
Nailrod	@ 9½
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@ 71 00
Rails, American, at Works in Pennsylvania, currency	80 50@ 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	32½@— 34
Copper English Pig	31 @— 30¾
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, 2½ 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 and 1st quality)	— 11¼@— 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
Straits	33¼@33½
English	32½@32¾

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. 100 lbs.

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.—10¾@11½

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.

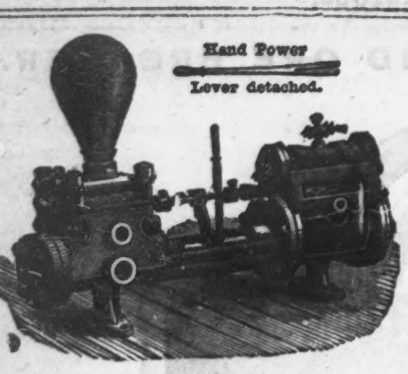
IV. The ninth rule has been amended, so that there will be hereafter three meetings a year, in February, May and October.

THOMAS M. DROWN, Secretary.

1123 Girard street, Philadelphia, Pa.

MISCELLANEOUS.

MACHINISTS' SUPPLIES.



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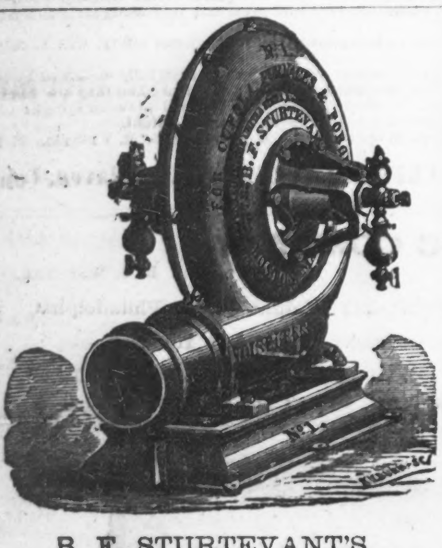

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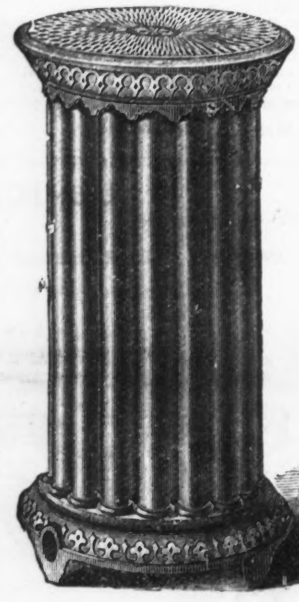

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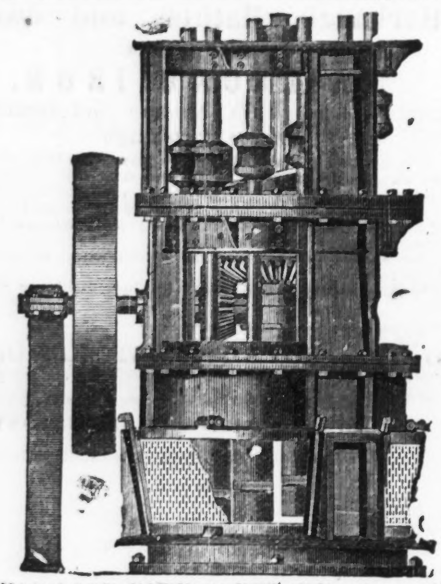

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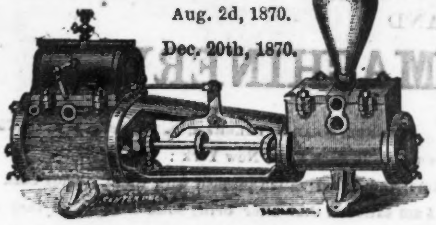

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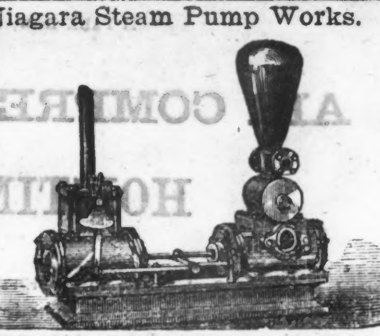

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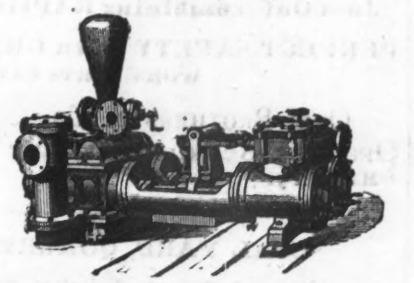

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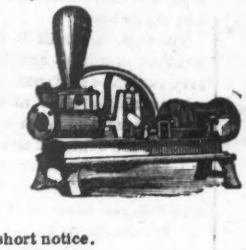

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