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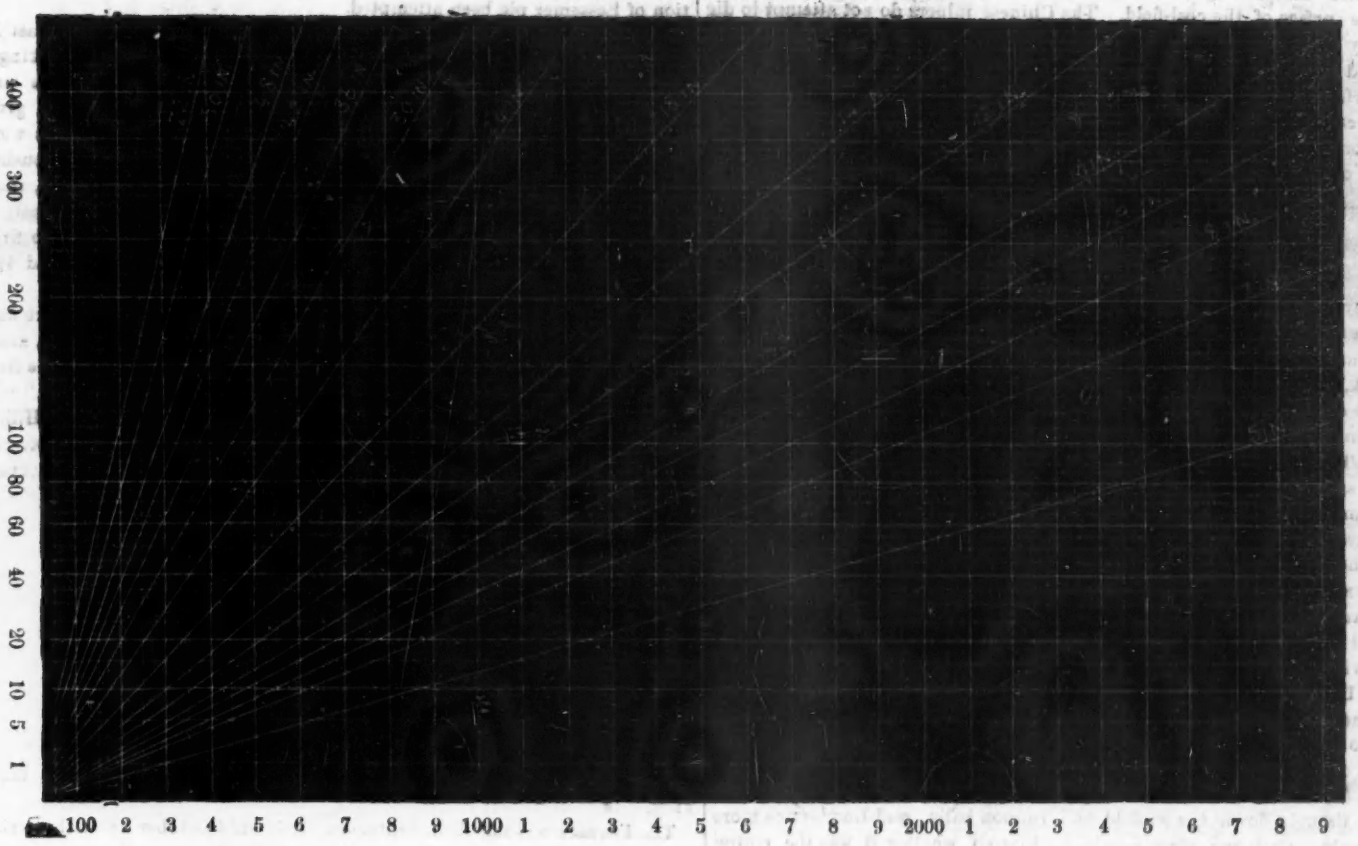
Water-Wheel Diagrams—Scale of Revolutions per Minute.

IN this scale the vertical parallel lines numbered up to 2900 show the number of revolutions per minute, while the horizontal parallels—placed at unequal distances apart, represent the heads of water. The formation of the scale depends upon the fact that the speed of wheels of different sizes, with the same head, varies inversely as their diameters. The graphic demonstration has been accomplished by representing the diameters of the wheels by diagonal lines which intersect the lines representing height of fall proportionately to the diameters.

To use the scale it is necessary to know the height of fall and diameter of the wheel. At the intersection of the two lines representing these factors will be found the vertical lines leading to the margin where the number of revolutions per minute is placed.

REVOLUTIONS PER MINUTE OF WATER WHEELS.



WATER-WHEEL DIAGRAMS.

Clay in Fresh and Sea Water.

Mr. DAVID ROBERTSON, F.G.S., read a note on the "Precipitation of Clay in Fresh and Sea Water." He stated that in making some observations on the gradual deposition of particles of clay held in solution by water, he found that in fresh water these were held suspended for a long time before wholly subsiding, while salt water, or a mixture of salt and fresh, became comparatively clear in the course of a few hours. The results showed that water only slightly brackish had a great power in precipitating the clay, and from this he concluded that the great bulk of the clay carried down in solution by rivers must be deposited before it could reach any great distance from the sea shore. This might throw some light on the formation of deltas, and on the silting up of river courses within the influence of the tides. It might also assist in determining how far the glacial mud, for example, could be carried into the seas by tides and currents. Mr. ROBERTSON exhibited some simple experiments bringing out the facts alluded to, and several members expressed their sense of the interest and importance of his observations.

Prize Medals at Vienna.

THERE will be awarded to the exhibitors at the Vienna Universal Exhibition five different classes of medals, divided as follows: 1. One class for fine arts. 2. One class for good taste. 3. One class for progress. 4. One class for labor. 5. One for merit

Each of these medals will be in bronze, 2¾ inches in diameter, and all will bear on the obverse a portrait of the Emperor of Austria, with an inscription in German to the following effect: "Francis Joseph I., Emperor of Austria, King of Bohemia, etc., and Apostolic King of Hungary." On the reverse of the medals a short inscription will be engraved, appropriate to each class.

The medal of the first class will only be awarded for meritorious art productions, included in Group XXV., of contemporaneous fine art, produced since the London Universal Exhibition of 1862. The figures on the medal represent the Goddess of Vienna, crowning with laurels the representatives of sculpture, architecture, and painting.

The medal for good taste will be reserved only for beauty in form and color applied to practical industry. The Muses and Graces represented on the reverse sufficiently indicate the class to which this medal belongs.

The medal for progress is one of the most general application, and will be distributed amongst the exhibitors in the first twenty-three groups, and also in Group XXVI., and it will be awarded only for those productions in which a marked improvement in manufacture or in invention is seen over all that has been shown in previous exhibitions. The reverse shows an allegorical group, indicating the reward bestowed by the country upon those whose efforts have promoted general and special progress.

The medal for labor is intended for the reward of managers of factories, foremen, designers, and also for those who have promoted the introduction of improved appliances, as well as their perfection. The figures of two mechanics on

the reverse of this medal, bending pensively over an impossible toothed wheel, just completed by one of them, who is being crowned with a laurel wreath, illustrate its object.

Lastly, the medal for merit is designed for exhibitors who can justly lay claim to having stimulated production, cheapened old, or created new markets, encouraged demand, and improved supply. On the reverse of this medal a female figure holding a distaff, receives a wreath from another, standing near, while a third holds in his hand a similar wreath which has just been presented to him.—*Engineering.*

Chinese Policy.

Mr. Strauss, the Belgian consul in Japan, has made a report on the coal and other mineral wealth of that country and China, which gives the latest summary of comparative coal areas, and also exposes some of the queer management so often found in China, which country is especially rich in coal. It appears certain, though native estimates must be relied upon in the matter, that a coal basin of more or less depth reaches from the north to the south of China, and comprises the eighteen provinces of the empire. This, with the coal-bed in the Island of Formosa, would give 127,000 square miles as the extent of the Chinese coal-field. The following comparative statement will give an idea of the wealth of coal represented by those figures:—

In England the coal area comprises	12,000	square miles.
In France	2,000	"
In Belgium	1,200	"
In Germany	9,000	"
In Spain	8,000	"
In the British Possessions in North America	18,000	"
In the United States	113,000	"
In Japan	6,000	"

Native industry in China, as in Japan—where, however, a few mines are worked by foreigners—has, through want of the proper appliances, done little more than scratch the surface of the coal-field. The Chinese miners do not attempt to dig when they come to rock; they are completely powerless before the influx of water; and the tools they use in mining are so clumsy that the coal is delivered on the surface in a broken and almost useless condition. The coal-owners have further to contend with the eccentric arrangement by which native coal entering Chinese ports pays a duty of 20 per cent., whereas English, Australian, and Japanese coal comes in almost free.

Experiments at the Lucy Furnace.

BY E. C. PECHIN, OF DUNBAR, PA.*

The Lucy furnace, owned by Messrs. Carnegie, Kloman & Co., and located on the Alleghany river, on the outskirts of Pittsburgh, is a splendid modern furnace, 75 ft. high and 20 ft. bosh. She had been working well on low grade ores of about 50 per cent., producing daily 68 to 75 tons. There was on stock 500 tons of Republic ore, one of the purest and best of the Lake Superior ores, averaging over 68 per cent. of iron, which had been procured for the purpose of making a trial for Bessemer iron. This was charged by itself, and Mr. Skelding, the founder, reports that he did not succeed in getting a single cast when it came down, before the furnace chilled from the hearth to the top of the boshes, some 25 feet. Every effort was made to save her, without avail, and the disagreeable duty of cleaning her out was begun. The hearth was dug out some five or six or perhaps eight feet up, when Mr. Skelding remarked in the hearing of one of the proprietors, that he wished he had a cannon. A mortar was forthwith procured from the arsenal, and they commenced firing shots up into the chilled mass. A large number of shots were fired, and with considerable success, bringing down from time to time portions of the chill. But by and by, the mass became pasty, and the cannon balls, of which they only had three, stuck fast. Mr. Skelding put in a large charge of powder, and then to the astonishment and amusement of the by-standers, rammed the mortar full of cotton waste, and on top of this placed a lump of hard ore, weighing about 50 lb. It is uncertain whether he said "Presto-change," but this novel shot brought down the scaffold and cannon balls, and Lucy once more breathed freely. Each one must decide for himself whether it was the cotton waste, lump of ore, or prestidigitation that accomplished this remarkable result, but accomplished it was, and the furnace is again running and doing exceedingly well. As far as the writer knows, no patent has been taken out for this process (for a wonder), so that it is available for any furnace man who is so unfortunate as to have a scaffold.

Another experiment is shortly to be tried at this furnace, which is novel at least in this country. It is proposed to use two tiers of tuyeres, one 18 inches above the other—seven below and five above. In the *Engineer* of March 15, 1867, appears an article entitled "on the production of high temperatures," and signed "T. F. B." The writer argues strongly and elaborately in favor of employing different ranges of tuyeres. The subscriber has had several conversations with Bennett, the author, in whith he contended that by elevating the zone of fusion, a larger product and superior material would result. He was very anxious to have some furnace try the experiment, but none were ever fixed for doing it. The Lucy furnace will test his theory on a large scale and under most favorable circumstances, and the result will not be without interest to all in the business.

* A paper read before the American Institute of Mining Engineers, at Philadelphia, May 21, 1873.

The Manufacture of Bessemer Pig Metal at the Fletcherville Charcoal Furnace, near Mineville, Essex County, New York.

By T. F. Witherbee.*

The Fletcherville Furnace was built in 1864 and '65, making its first blast from August until October of the latter year, when it was blown out to prevent its "bunging-up." Repairs were m de in time to enable it to be blown in again December 12, 1865, the blast ending October 7, 1866. Total product 1921, 15 tons iron—an average of 6.8.2.5 tons per day—from ores yielding 44.8 per cent. Consumption of charcoal 223·2 bushels per ton of iron. The furnace journal up to this time shows no record of furnace dimensions, or temperature of the blast, but as near as can be ascertained, they were as follows, viz:

Height of stack 42 feet.
Diameter of bosh 11 feet.
Angle of bosh 7½ inches to 12 inches rise, *about* 58°.
Diameter of *open* tunnel head 12 inches.
Number of tuyeres 3; each 3 inches in diameter.
Dam 15 inches high. Tuyeres 24 inches high. Tymp 22½ inches high.
Diameter of steam cylinder 20½ inches. } Stroke 5 feet.
Diameter of blast cylinder 64 inches. }
The engine is a direct-acting horizontal non-condensing.

December 26, 1866, the furnace was again put in blast, having been considerably altered in the crucible, the height of stack, bosh and tunnel head remaining as before.

Six tuyeres were put in, three in each of the side arches. The hearth or crucible, is rectangular in form, 3 feet wide × 3½ feet long × 6½ feet high. Inclination of bosh 58°. Height of tuyeres 26 inches; nozzles 2½ inches diameter. Temperature of blast estimated to be *about* 500°.

During this campaign 2,239½ tons of iron were made, 1,841½ tons of which was No. 1 Foundry; average per day 8.7.0.14 tons. The ores used were from the new bed, and local ore from lots Nos. 75 and 85 iron ore tract, and yielded 52·8 per cent. No analysis of iron had been made up to this blast, nor had the production of Bessemer pig been attempted.

The furnace was again blown in November 21st, 1867, the hot blast having been enlarged, in the mean time, by the addition of 12 new pipes, making in all 30 U pipes, each leg 8½ feet long × 7 inches outside diameter. The temperature of the blast averaged 750°, and the total production, 2,395½ tons, giving an average of 7.16 tons per day. Of the total make of iron 1,907½ tons were No. 1 Extra. Yield of ore 53·2 per cent. Consumption of charcoal 196·4 bushels.

Notwithstanding the increased temperature of blast and yield of ore, the make of iron per day shows a falling off, as compared with the previous blast, which fact was attributed to the very low yield of the ores used, during the first one hundred days—which, for each month, was respectively 36·6—49·7 and 49·7 per cent.

An effort was made at this time to find more suitable ores for furnace use, and to that effect not less than ten different kinds were experimented with, and with one exception, always as mixtures. The ores used, all magnetites, were from the following mines, viz: "Old Bed," "New Bed Pure," "Old Bed Shaft," "Miller Pit," "New Bed Lean," "No. 74," "No. 75," "No. 85," "Humbug Hill," and "Camel Hill." Iron from the latter, worked alone, contained over 5 per cent. of silicon. Iron made from a mixture of "New Bed Pure" and "No. 85" ore, contained by analysis:

Fe			92.82
Si			2.64
P			.066
S		trace	
Carbon combined	1.17		
Carbon graphitic	2.88		
			4.05
Slag, and trace of Ca. and Al			.42
			99.996

Iron made this blast constituted a part of the first Bessemer charge blown at Troy.

The Furnace was idle from September 1868 until October 1870, the writer in the meantime having obtained permission of the Company to enlarge it to its present dimensions, being led thereto by the results obtained by Mr. T. B. Bayley, at Shelby, Alabama.

The stack was raised by a wrought-iron shell to 60 feet in height, and tunnel head enlarged to 8 feet in diameter, and closed with a bell and hopper; diameter of bell 4 feet. All the other dimensions remaining the same.

A peculiar method of "blowing in" was employed, followed by *decidedly* peculiar results. Charcoal being charged to the top of the boshes, followed from that point by light, though increasing, charges of ore and flux to the top. When filled, the coal was ignited and in one hour blast put on. In one hour more a terrible explosion occurred, shattering the stack from top to bottom, bulging out one side over 12 inches—the gases escaping and burning out in all directions. At the time the fuel was lighted, everything was cold and damp, the fire used in drying the new lining having been out nearly two months.

An after examination showed the explosion to have been caused by gas leaking through the lining and collecting between the *inner* walls of the stack proper, amongst the boulder stones with which it is filled, being confined there by reason

* Read before the American Institute of Mining Engineers, Philadelphia, May 20, 1873.

of the stacks having been recently "pointed up." The proper temperature obtained, the explosion naturally occurred.

In three hours from the time blast was applied, *forge cinder* appeared, and continued, with scarcely an interruption until the end of blast, November 4th, 1870—just thirty days, 93 tons of poor white iron having been made.

Upon blowing out the lining was found to be perfect, receiving no damage from the explosion. From the boshes upwards, a distance of 20 feet, no combustion had taken place. The first charges having remained lodged as was evidenced by the absence of any glazing, and the fresh red color of the fire clay cement still remaining on the bricks. The charges in the upper part of the stack must have *slipped through* those lodged on the boshes.

The trouble was readily traced to the faulty construction of the "bell," and the *too flat* bosh. The bell, being too large, distributed the charge too close to the lining, the ore remaining mostly where it fell, and nothing but the coarse coal and wood rolling to the center, which being the most open part of the charge, presented the easiest outlet for escaping gases. The annular ring containing most of the ore and flux, being thus robbed of a great portion of its carbon, and also deprived of the necessary heat, and reducing gases, arrived at the tuyere in an unreduced condition—hence the forge cinder.

The trouble experienced during the last blast, suggested alterations which were made, and the furnace was again "blown in." The side tuyeres were raised to 30½ inches and two back tuyeres were set in the back arch, only to be used in case of an emergency. The tymp was also raised to 29½ inches. The bell and hopper was removed, the hopper being put back in an inverted position, which increased the height of stack to 61½ feet.

The bell was made into a cover which was operated by a lever attached to a vertical shaft, counterbalanced by a second lever and weight. The shaft slides in its boxes sufficiently to allow the cover to be swung around, off from the hopper. It gives complete satisfaction, being in use now, enabling the ore and flux to be put in, in any way thought best.

It, however, has always been charged by a travelling bell and hopper, the discharge of the materials being regulated by a suspended ring below the bell, lowering which turns the charge well towards the center, and raising which, allows the ore or flux to spread naturally from the bell. The bell and hopper are suspended from an over-head railroad track, extending over the tunnel head and through the top house; a portion of the track is attached to the elevator and goes up with it, matching the track over tunnel head at the top.

In commencing this blast, the stack was filled entirely with wood and coal, in equal proportions. The wood of ordinary length, 4 feet, sawed twice in two, and pieces more than 10 inches in diameter split once. A good start was effected, and the consumption of fuel per ton of iron was soon reduced to 150 bushels of coal, and continued about the same until March 25th, 1871, at which time anchor ice accumulated in the water supply pipe—causing tuyeres to burn out for want of water. Not being prepared for such wholesale destruction, only two new ones were available for setting. Those were set, one in each side arch, and in the succeeding twenty-four hours two more were put at work in the back arch.

This distribution of the tuyeres put the furnace so much out of balance, that the stock soon began to descend the fastest at the back side—eventually ending in a "scaffold" and a "slip," filling all the tuyeres with iron, as well as the crucible to the top of the tymp. Two tuyeres were immediately raised above the obstruction, and the blowing again resumed, just in time to take advantage of the lighter burthen that the furnace had been charged with two days previously. All efforts to clear out the crucible below the top of the dam-plate were unavailing. Tuyeres were added from time to time until the usual number, six, were in position. Number one iron was mostly made for seven weeks; from four tons per day the first two weeks, to six for the last five, at which time the writer determined to try a long contemplated experiment, the successful termination of which offered reasonable assurances of the production of Bessemer Pig.

As is well known to most Members of the Institute, nearly all of the Champlain ores are too much contaminated with phosphate of lime, to admit of being converted into Bessemer pig, by any blast furnace process known at present. The exceptions are the mines of Messrs. HAMMONDS, in Crown Point, New York, from which their charcoal furnace was supplied with ore, yielding about 50 per cent.

In Moriah, N. Y., the "New Bed," "Barton," and "Fisher" Mines each produce ore of suitable quality—the two latter rather by accident, as only the pure ores from either will answer the purpose. The three mines mentioned are all on the same vein. All of the Moriah Bessemer ores yield by analysis from 68 to 71 per cent., the difference being made by variation in the small amount of siliceous matter present. The quantity of Bessemer ore from Moriah mines does not at present exceed 10,000 tons per annum—nearly all from the New Bed—the production, however, can probably be extended considerably.

A combination of materials had long been sought for to work in connection with the New Bed Pure ore, but while the ore itself was suitable, the lean ores, clay and limestone used with it to form a cinder, invariably added more than the allowable amount of phosphorus to the iron.

Taking advantage of the fact that blast furnace cinder is, for all practical purposes, free from phosphoric acid, it being rarely found in excess of .008 per cent., it was decided to use it as a mechanical element of the charge, and to provide for the small percentage of siliceous matter in the ore, from 2 to 4 per cent., by the addition of sufficient limestone to form a bi-silicate cinder. The aluminum, magnesia and other elements found in the charge, being in such minute quantities, were not considered in the synthetical construction of the cinder. Nearly the entire amount of alumina found in the secondary cinder is from the "old cinder," made when the ore was grouted with clay-wash. Clay being in use about the time of the experiment.

Since nothing was to be lost and everything to be gained, everything but New Bed Pure Ore, cinder and limestone was discarded, the ore being tried upon its merits.

The furnace journal under date of June 1st, 1871, bears the following memorandum, viz.:

"Memorandum of chemical composition of charge, June 1st, 1871, calculated from analysis of ore and flux:

			SILICA.	LIME.	IRON.
New Bed Pure Ore,	lb.	740	32		503
" " Lean "	"	160	48		80
75 " " "	"	140	55		60
Humbug " "	"	160	62		69
Total ore	"	1200			
Limestone	"	250	35	112.50	
			232	112.50	712
Per centage			67.3-10	32.7-10	59½"

The above cinder being considered good enough, it was copied as per calculation below.

"Theoretical chemical composition of charge commencing with the 12th charge, June 1st, 1871.

			SILICA.	LIME.	IRON.
New Bed Pure Ore,	lb.	1050	45.		714
Limestone	"	60	8.40	27	
			53.40	27	714
Per centage			66⅔	33⅓	68

Cinder from this charge from ore and limestone ..... 80.4 lb.
" added to " ..... 260. "
Total ..... 340.4 lb."

By comparison it will be seen that the latter charge agrees *theoretically* with the former—near enough for practical purposes. Accordingly the furnace without any previous preparation, was charged with 40 bushels coal, 15 bushels wood, 1050 lb. ore, 60 lb. limestone, and 260 lb. old cinder. The result of the first 24 hours' working was anything but encouraging—forge cinder at once appearing, and a "bunging up" scrape evidently close at hand—leading to the substitution of the previous charge.

The next day 11 tons of No. 1 iron were produced, which naturally led to the *second* trial of the experimental charge—the proportions of which have not been changed from that time until the present—except a variation of 1 or 2 per cent. in the amount of limestone added, in every case followed by a return to the theoretical requirements of a bi-silicate cinder. The added cinder is merely used to make up a sufficient *quantity* to insure good working. Thirty-six hours after the experimental charge was in the crucible the second time, the hearth was free from obstructions for the first time in nine weeks. As would naturally be supposed, considerable "cut and try" was required before the proper weight of charge, pressure of blast, size of nozzles, and distribution of the charge by the hopper, was arrived at.

The only irregularity the furnace was subject to, was "shedding" the ore, or more properly a *slipping through* of the ore, which was put mostly into the center of the furnace. This derangement was almost entirely cured by increasing the *size* of the charge, the coal being increased from 20 to 80 bushels and the wood to 30 bushels, and ore and limestone in proportion, the cinder remaining nearly constant. The same trouble invariably appeared when the size of the nozzle was increased above 1¼ in. in diameter, or when the pressure of the blast was much reduced—the materials would then get hard in the center and remain free at the tuyeres, allowing the iron and cinder to hang around them, sometimes "ironing them up."

In view of the above, putting the charge so much in the center, might be urged as an objection, but after nearly two years' trial, it has proved to be the best practice, only requiring a strong blast—something like a "blow pipe jet" to keep the middle in proper condition. After running on the new plan three months, and establishing the success of the method beyond a doubt, the furnace was blown out and repairs made, going into blast again Oct. 17, 1871.

No alterations were made except raising the tuyeres to 44 inches from the bottom, and putting in a tuyere in the back arch, close to the bottom of the crucible, to heat the hearth when blowing in—the tuyere being withdrawn as soon as cinder appeared, and the whole closed up permanently, blast then being applied through the 6 side tuyeres.

The filling was the same as the last blast, coal alone being charged to the top, and the result, a good start. This method has been adhered to, to the present time, and the writer is of the opinion that the trifling amount of extra fuel used is more than compensated by the certainty of a hot furnace and a hot blast.

The last three months of the blast suffered by a broken bed-pipe in the oven, and by exposure of the hot blast conductor while building a new oven; the increased temperature of the blast attained by its use, over 400°, necessitated an addition of 600 lb. of ore per charge.

Owing to the failure of the charcoal supply, and to compare anthracite iron

with charcoal iron, anthracite coal was substituted for charcoal, the other elements of the charge remaining the same. Attention is called to the analysis of the charcoal and anthracite cinders.

The anthracite was charged directly on top of the descending charges of charcoal, and, notwithstanding the immense weight of material, as compared with the weight of charcoal charge, no evidence of crushing was apparent, and the furnace, to say the least, never worked any better, over 12 tons per day being produced the last three days, when the anthracite was descending. Owing to the absence of wood from the charge, the pressure of blast was increased from 1½ to 2¼—the quantity of air remaining the same—no doubt also partly due to the weight of the anthracite charges.

As regards the crushing of charcoal in a stack of that height, a little reflection and experiment would probably convince anyone that it is not at all likely to occur. The weight of material when using charcoal in the Fletcherville furnace, if calculated on the area of bosh clear down to the bottom of the stack, and supposed to be equalized like a column of water, only amounts to 8 lb. per square inch and can never exceed 10 lb. Anyone doubting the ability of charcoal from any wood used in a blast furnace, to sustain a greater pressure per square inch than the figures given, is requested to try the experiment on cubes, even only one inch on a side. They will be found to sustain very much more.

The production of anthracite iron for the week was 57 tons, all white iron but the last day, when 17 tons No. 1 were made. No trouble was found in using anthracite, except want of blast, owing to want of boiler capacity.

The low percentage of phosphorus, .008 per cent., in the iron (anthracite), was doubtless owing to the low temperature of the crucible at the time.

The recapitulation of the results shows that the yield exceeds the chemical analysis nearly three per cent. In view of the method of charging, no explanation is deemed necessary; the three per cent. gain will be found by a careful calculation, to still leave a margin of loss equal to two per cent nearly. Since October 17, 1871, the furnace has been worked with the old "blue oven" front, which is described and illustrated in nearly all works on the blast furnace, that is, a hole at the bottom to let the iron out, and another above the dam to let the cinder out. It gives complete satisfaction, probably making from ¼ to ½ of a ton of iron per day difference.

In order to ascertain the greatest proportion of wood that could be used for charge, it was added until the last addition of wood added nothing to the carrying capacity of the fuel, that point being reached when the charge was: coal, 20 bushels; wood, 40. The proportions now settled upon as giving best results, are 80 bushels of coal and 15 of wood, the latter being necessary to keep the stock free and open.

The practice is now to weigh everything excepting the wood. The wood used for coal being over one-half soft, such as spruce, hemlock, pine, etc., and the remainder maple, beach and birch, with some ash and poplar. In any case it would probably give the best results to weigh the charcoal—when wet, adding enough to compensate and *more, too*, for the water.

A sample of New Bed Pure ore is here open for inspection, in order to call the attention of members to its extreme fineness of subdivision. It is in just the condition in which charged into the furnace, and runs ahead of the charcoal and wood charged with it, about *six hours*, or five charges of eighty bushels of coal and fifteen of wood. By taking the precaution to charge a sufficient amount of fuel ahead of it to intercept it, the running ahead is of no importance and causes no derangement in the working.

Previous to the present blast the furnace was thoroughly overhauled, two new locomotive boilers being added, aggregating 75 horse power—making the engine perfectly independent of the furnace if required—enabling the ovens to always have plenty of gas. The new boilers are arranged to use either fine charcoal, wood, or gas from the furnace.

A second new oven has also been added, a duplicate of the one built last blast, each consisting of fifty pistol pipes, twelve feet long and ten inches diameter, and ten bow pipes, five at each end, twelve feet long and ten in. diameter. Gas is admitted into a combustion chamber at one end, and passes into a pipe chamber near the bottom, and is also taken out near the bottom at the opposite end—very much like the Ford system, the blast, however, passing through in the same direction as the gas. One thousand degrees is constantly sustained if required, and more heat could readily be obtained if accompanying risks were taken. The two ovens expose 3,400 square feet of internal heating surface, nearly two square feet to each cubic foot of air blown. So far but one stove has been in use, May being the fourth month of the blast, and the charge consisting of

Coal	1100 lb.
Wood, 15 bushels,	= 235 " coal,
Total	1335 lb.
New Bed ore	2640 "
Cinder	250 "
Limestone	120 "

The monthly recapitulation for April is appended, viz:

Number of charges	578.
" " bushels of charcoal	36,332
" " " " per ton iron	83.3
" " " wood	8,670.
" " " " per ton iron	19.4
" " " " and coal per ton iron	103.2

COAL ESTIMATED BY WEIGHT.

Coal, weighed	635,800 lb.
Wood, 578 charges=600 lb. per charge=38 per cent coal=131,784 "	
	767,584 lb.=1762 lb. net per gross ton iron.
Gross weight of fuel per gross ton iron	0.15 2 26
Tons New Bed pure ore	599. 3.1.16
" Cinder	77. 8.0.24
" Limestone	35.12.2. 0
Yield of ore	72.7 per cent.

IRON MADE.

Tons, No. 1	168.15.0.0
" " 2	114 15.0.0
" " 3	57. 5.0.0
" " 4	25. 0.0.0
" " 5	5. 0.0.0
" " 6	15.15.0.0
" white	48.10.0.0
" castings	0.15.0.0
	435.15.0.0
Iron made per minute, pounds	22.6
" " " hour, "	1355.66
" " " day, tons	14.10.2.0
" " " week, "	101.13.2.0

The unusually low consumption of fuel is mostly due to the temperature of the blast, it averaging 967° for the month.

It is designed, in order to carry the blast to the utmost limit allowable in iron pipes, to alter the engine to a condensing one—the condenser and air pump being now at hand. This will allow a great proportion of the gas now used for steam to be directed to the second oven, with the expectation that for every 100° the blast can be raised, 150 lb. ore can be added to the burthen.

In view of the small quantity of cinder in the charge, it becomes a question whether or not all the cinder added could not be dispensed with, depending entirely upon the six per cent. or less of limestone now used, and, also, the height of the tuyeres allowing a thick stratum of coal to be between them and the iron, the effect of which might be to change the CO_2 formed at the tuyeres to CO before it could possibly oxydize the iron in the crucible.

All the iron from No. 1 to No. 3 is used at Troy for Bessemer steel, and the remainder is used at various places for car wheels and malleable purposes.

Analysis of Hard Limestone, by J. B. BRITTON.

Insol. matter	14.10	
Oxide of iron and alumina	2.04	
Water	.58	
S	.164	
P	.049	
Ca O Co_2	81.10	
Mg O Co_2	1.40	
Undetermined and loss	.587	
	100.000	
Lime	45.42	
Co_2	35.68	
	81.10	

Analysis of New Bed Pure Ore, by J. B. BRITTON.

Fe	68.24
O with iron	26.01
HO	.38
Insoluble matter	4.32
S	practically none
P	.038
$Al_2 O_3$	.28
Ca O	.14
Undetermined and loss	.592
	100.00

Analysis of 1 lb. *Pig Iron made exclusively of New Bed Pure Ore*, by G. W. MAYNARD.

S	0.012
P	0.048
Si	1.019

Analysis of "Old Cinder" when using Clay, by J. B. BRITTON.

Silica	50.89
Lime	32.15
Alumina	12.51
Magnesia	1.44
Sulphur	.12
Protoxide Manganese	.76
Protoxide Iron (metal 1.39)	1.79
Loss, &c	.34
	100.00

Analysis of Secondary Cinder (Charcoal), by J. B. BRITTON.

Silica	43.52
Lime	36.72
Alumina	13.79
Magnesia	2.78
Sulphur	.27
Protoxide Manganese	.42
Protoxide Iron (Fe 1.74)	2.24
Alkalies and loss	.26
	100.00

Analysis of Fletcherville Anthracite Cinder, by J. B. BRITTON.

Silica	44.58
Lime	30.36
Magnesia	2.16
Alumina	15.87
Sulphur	.94
Calcium	1.17
Protoxide Manganese	.47
Protoxide Iron	3.62
Undetermined and loss	.83
	100.00

Analysis of Fletcherville Anthracite White Iron from New Bed Pure Ore by J. B. BRITTON.

Fe	93.564
Carbon almost all combined	2.086
Manganese	1.922
Silicon	1.689
Calcium	.035
Sulphur	.566
Phosphorus	.008
Undetermined and loss	.130
	100.00

THE exiled communists in New Caledonia have a blast furnace established by Assi, one of the prominent leaders in the scenes of violence that followed the subjugation of Paris. It cannot be a great afair, for we are told that the eight men whom he employed are said to be on strike, as they do not wish to submit any longer to the "infamous capitalist."

THE COAL TRADE.

NEW YORK, June 5, 1873.

Business in Anthracite coal is reported to be looking up somewhat, though not with decision. Dealers have not yet settled upon an explanation of the long continued dulness of the market, and there is a suspicion in a good many minds that the exceptional increase in the production of last year was really enough to cover two years, and that the trade this season will not bear a continuance of the increase. If that is true, prices must fall or else the companies must limit their production. The former we are convinced will not take place, but the latter has really been progress to a considerable extent.

In the bituminous trade the slack demand continues, and as the dull season is now approaching, there is little kelihood that the demand will improve until the fall trade ins.

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 May 24, 1873, compared with the week ending June 1, 1872.

COMPANIES.	1872. WEEK.	1872. TOTAL.	1873. WEEK.	1873. TOTAL.
*Phila & Reading R. Rd	107.121	1,814,739	105,193	2,012,775
*Schuylkill Canal	20,654	245,841	24 812	187 238
*Lehigh Valley R. R.	56,920	1,466,856	68,426	1,464,472
Lehigh & Sus. R. R.	41,383	655,611	44.617	797,735
" " Canal	21,802	167,573	25.6 8	165,431
Scranton North	17,694	265,013	23,683	288,461
" South	45,640	894,428	45,444	947,677
Penn. Coal Co., rail	26,741	471 604	35.368	440,360
" " " canal	119	1,189	121	2 113
Del. & Hud. C. Co. Canal	39,858	286 684	56.947	321,885
" " East	14,327	275,915	5,831	157,002
" " West	7,797	144,840	9,587	181,984
" " South	7 241	144,783	241	121,447
Shamokin	13,808	192,367	17,692	225,090
Trevorton	...	....	....	....
Lykens Valley Coal Co.	....	....	....	....
Wyoming North	....	....	....	....
Wyoming South	....	....	....	....
P. N. Y. C. & R. R. Co.	14,115	275,676	16,959	298,876
Williamstown Co'y	....	.....	....	....
Big Lick Col	....	.....	....	....
Total	434,823	7,330,590	479,572	7,637,640
1872			434.8.3	7.330,590
Increase			44.749	332,090
Decrease				

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

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

Bituminous Coal Trade, 1872 and 1873.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending May 24, 1873, compared with week ending June 1, 1872.

COMPANIES.	1872. Week.	1872. Year.	1873. Week.	1873. Year.
C. & O. Canal	19,570	193.815	21,693	174,547
B. & O. R. R.	26,687	496,299	30,289	562,145
Penn. S. Line	....	.....	639	37,679
H. & B. T. R. R.	7,026	124.321	7,863	196,948
*Harrisburg & D	9,797	216,876	6,480	162,897
*L. V. R. R.	300	13,851	261	13,503
P. & N.Y.C. & R. Co.	8,326	159,056	6,150	138,582
Cumberl'd Branch Canal	5,863	62,002	2 556	27,115
" Railroad	549	6,017	3,227	47,421
Total	78,120	1,274,237	79,2:9	1,360,837
Decrease			78,120	1,274,237
Increase			1,129	86,600

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, May 31, 1873.

	WEEK.	SEASON.
By Delaware and Hudson Canal	56,947	321.885
By Railroad, East	5,83:	157 002
" West	9,587	181,984
" South	244	121,447
Total 1873	72.609	782,118
Corresponding time in 1872:		
By Delaware and Hudson Canal	39,558	286,084
By Railroad, East	14,327	275 915
" West	7,797	142,880
" South	7,241	144,783
Total	68,923	849,662
Decrease	67,544	

Delaware Lackawanna & Western Rail Road Company.

Coal transported on the Delaware, Lackawanna, & Western Railroad for the week ending Saturday, May 31, 1873.

	WEEK. Tons. Cwt.	YEAR. Tons. Cwt.
Shipped North	23,682 14	288,494 19
Shipped South	48,443 12	947,676 16
Total	72,126 06	1,236,141 15
For the Corresponding time last Year:		
hipped North	17,653 18	265,013 03
hipped South	45,610 07	894,488 18
Total	63,325 05	1,159,502 06
Increase	8,801 01	76,639 09
Decrease	.....	

Philadelphia & Reading Railroad and Branches.

COAL TONNAGE

For the Week ending Saturday, May 31, 1873.

BY RAILROAD.—ANTHRACITE.

PASSING OVER MAIN LINE AND L&B. VAL. BRANCH.

	Tons. Cwt.
From St. Clair	21,317 15
" Port Carbon	5 230 14
" Pottsville	3.467 11
" Schuylkill Haven	28,129 05
" Pine Grove	4,984 08
" Tamaqua	11,662 11
" Harrisburg	
" Dauphin	5 339 05
Total	83,111 05

FOR SHIPMENT BY CANAL.

Passing Frackville Scales	8,338 11
" Mill Creek "	694 18
" Schuylkill Valley Scales	1,401 18
" Mt. Carbon "	910 10
" Cressona "	8,220 15
" Pine Grove "	1,445 07
" Tamaqua "	2,340 16
Total	23,342 15

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

Via Catawissa & Williamsport Br.	94 12
" N. C. R. R. passing Locust Gap	2,488 02
" " " Shamokin	4,951 18
" " " Herndon	....
Total	7,534 13

SHIPPED WEST OR SOUTH FROM PINE GROVE.

Via Schuylkill & Susquehanna R. R.	1,401 13
" Lebanon & Pine Grove Branch	895 17
Total	2 297 10

CONSUMED ON LATERALS.

From Frackville Scales	463 18
" Mill Creek	719 11
" Schuylkill Valley Scales	1,077 10
" Mt. Carbon "	400 04
" Cressona "	158 01
" Pine Grove "	26 19
" Tamaqua "	351 13
Total	3,204 10

LEHIGH AND WYOMING COAL.

Received via Silverbrook Junction, Sent East	7,020 05
Cat. & Wpt, Br. Sent West	13 14
" " Rupert, Cat. & Wpt Br.	....
" " Allentown, E. Penn'a br.	81 08
" " Alburtis, " " "	....
" " Oreland, G. & N. Br.	1,170 08
" " Willow Street R. R.	760 00
Total	9,045 13

BITUMINOUS.

From Harrisburg	6 469 13
" Connecting R. R., G. & N. Br.	
" Junction R. R.	10 00
Total	6,479 13

COAL FOR COMPANY'S USE.

Anthracite	6,139 13
Bituminous	271 01
Total	6,409 14

RECAPITULATION.

	Total for Week.	Corresp'g week last year.	Increase and Decrease.
Passing over Main Line and Leh. Val. Branch	83,111 05	95,573 11	d 12,462 06
For Shipment by Canal	23,342 15	21,919 03	i 1,421 12
Shipped West ward via Northern Central R. R.	7,634 13	5,300 13	i 2,234 00
Shipped West or South from Pine Grove	2 297 10	2,008 14	i 288 16
Consumed on Laterals	3,204 10	2,630 0	i 574 02
Lehigh and Wyoming Coal	9,045 13	1,608 00	i 7,437 13
Total Anthracite paying freig't	129,536 06	129,040 09	d 504 03
Bituminous	6,479 13	9,799 11	d 3 319 12
Total of all kinds paying freig't	135,015 19	138,840 00	d 3,824 01
Coal for Company's use	6,409 14	5 981 19	i 427 15
Total Tonnage for Week	141,425 13	144,821 19	d 3,396 06
Previously this year	2473939 04	2460969 04	i 112,970 00
Total to date	2615364 17	2605791 03	i 109,573 14

SHIPPED BY CANAL.

From Schuylkill Haven	20,828 10	21,758 00	d 930 10
" Port Clinton	4,004 00	1,575 00	i 2,429 00
Total Tonnage per Week	24,832 10	23,354 00	i 1,478 10
Previously this year	162,405 10	227,413 19	d 65,008 09
Total to date	187,238 00	250,767 19	d 63,529 19

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 May 31, 1873.

	Tons. Cwt.	
East	1,361 13	
West	16,329 19	
		17,691 12
Same time last year		13,807 16
Increase		3,883 16
Decrease		.....
Total amount shipped to date		205,019 11
Same time last year		192,366 14
Increase		32,652 17
Decrease		

Pennsylvania Coal Company.

Shipments of Pittston Coal for the week ending May 31, 1873.

	1873. WEEK.	1873. YEAR.	1872. WEEK.	1872. YEAR.
By Railway	33,368 07	440,340 01	26,749 00	471,804 07
" Canal	121 02	2,112 11	119 00	1,189 06
	33,489 09	442472 12	26,868 00	472,793 13
Decrease 1873	30,331 01			

Report of Coal Transported over the Lehigh Canal

For the week ending May 31, 1873

REGIONS SHIPPED FROM	TIDE tons. ct.	LOCAL tons. ct.	TL WEEK tons cwt.	TL. DATE tons, cwt.
Mauch Chunk Region	3,8.6 05	3,582 11	7,7.8 16	81,441 02
Mauch Chunk Region Hazardville				
Beaver Meadow Region	788 00	4,169 07	4,955 07	13,0 8 15
Mahanoy Region		193 17	193 17	2 250 16
Hazleton Region	1,754 05	5,052 15	6,807 01	44,269 14
Upper Lehigh Region	93 03	890 03	983 06	6,01 11
Wyoming Region	2,131 11	848 06	2,979 17	37,797 13
Wyoming Region, Hazardville				
Total	8,591 05	15,0 6 19	23,628 04	185,430 11
Previously reported	50,186 19	81.615 08	131,802 07	
Total to date	58,778 04	96,652 07	155,430 1.	
Corresponding week last year	63527 03	104,045 18	167.573 06	
Increase				
Decrease	4,749 04	7,393 11	12,142 15	

DISTRIBUTION.	WEEK 1873.	WEEK 1872.	YEAR. 1873.	YEAR. 1872.
Consumed on line of Lehigh Canal	2,563 09	2,368 17	15,094 13	16,020 13
Passed into Morris Canal to Tidal Points		200 18	445 03	993 04
Passed into Morris Canal to Local Points	1,056 16	266 09	6,847 18	4,296 03
Passed into Del. & Rar. Canal to Tidal Points	2,591 05	7,491 17	58,832 16	63,884 04
Passed into Del & Rar. Canal to Local Points	474 18	471 17	2 5'6 18	4 434 15
Consumed on line Delaware Div. Canal	290 06	1,682 07	7,187 12	10,602 02
Passed through to Bristol	9,951 10	9,200 07	64,865 07	66,192 05
	23 628 04	21 801 12	155 43) 11	167,374 06

Report of Coal Transported over Lehigh Valley Railroad

Report of coal tonnage for the week ending May 31, 1873, with totals to date, compared with same time last year.

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	TOTAL Tons. Cwt.
Total Wyoming	17.045 14	981.160 14
" Hazleton	49,709 05	931,273 16
" Upper Lehigh	27 03	1,862 13
" Beaver Meadow	13,610 11	304 631 10
" Mahanoy	10,616 00	192,036 19
" Mauch Chunk	107 03	2 205 05
Total	91,115 16	1,813,183 17
Same time last year	60,934 12	1,784,242 06
Increase	10,181 04	28,906 11
Decrease	.....	
Forwarded East from Mauch Chunk by rail	68.435 12	1,464,672 02
Same time last year	56,820 01	1,466,856 03
Increase	11,605 16	
Decrease		2,184 0

DISTRIBUTED AS FOLLOWS.

Local East of Mauch Chunk	936 03	40,993 04
Forwarded East for use L. V. R.	812 19	27,504 19
Delivered to Furnaces and Manufacturing Companies	13,171 07	351,259 11
Delivered to Cat & Fog R. R	212 00	2,914 16
" " East Penn R. R.	18 14	5,929 05
" " North Pennsylvania Railroad	4,750 07	138,896 04
" " Port Del	8,384 05	50,126 08
" " East Amboy Railroad		
" " Morris and Essex Railroad	5,921 01	142,864 16
" " Bel Del Railroad	23,980 04	417,670 05
" " Central Railroad	10,397 01	261,404 14
Delivered at and above Mauch Chunk for use of L. V. R.R.	1,449 02	34,878 08
To P. & N. Y. R.R.	10,550 01	185,073 06
To Northern Central R. R.	576 06	6,841 15
To D. H. & W. R. R.	661 18	17,364 07
To L. & S. R. R. at Packerton for rail	110 01	6,354 17
To Individuals at Mauch Chunk	42 07	1,075 08
To Individuals above Mauch Chunk	170 00	8,186 14
To L. & S. R. R., at Penn Hav., for railroad		1,541 10
Do. for canal	6,807 01	4,2.9 14
To Lehigh Canal Mauch Chunk	2,013 07	13,125 08
To Catawissa Railroad		20 00
To L. & S. R.R. at Lack. June	279 13	29,777 13
Total	91,115 16	1,813,180 17

Statement of Coal Transported over Cumberland and Pennsylvania Railroad

During the week ending Saturday May 31, 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	21,692 15	30,289 10	639 11	52,611 16
1872	19,569 19	26,687 06	....	46,257 05
Increase	2,121 16	3,602 04	639 11	6,354 11
Decrease	.....	.....	.....	

YEAR.

1873	174,646 13	562,144 13	37,679 03	774,370 07
1872	193,815 07	496,298 18	....	690,114 05
Increase		65,845 14	37,679 03	84,256 02
Decrease	19,268 15	....	....	....

Cumberland Branch R. R.

WEEK.

	To C. & O. Canal. Tons. Cwt.	To B. & O. R. R. Co Tons. Cwt.	Total. Tons. Cwt.
1873	2,555 12	3,726 16	5,742 08
1872	5,863 08	549 06	6,412 14
Increase	—	2,677 10	.....
Decrease	3,307 16	.....	630 06

YEAR.

1873	27,115 04	47,420 15	74,536 19
1872	62,001 11	6,017 01	68,018 12
Increase		41,403 14	6,517 07
Decrease	34,886 07		

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, May 31, 1873.

	WEEK.	SEASON
North	66,406 14	1,044 229 15
South	244 00	121,447 01
Total 1873	66,649 14	1,165,676 14
Corresponding time in 1872:		
North	62,439 09	1,053,373 02
South	7,240 03	144,783 09
Total, 1872	69,679 12	1,198,156 11
Increase North		
Decrease North		
Increase South		
Decrease South		
Increase	6,970 02	
Decrease		32,479 17

Penn. and F. Y. R. R.—Coxton, Pa.

Coal tonnage for week ending May 31, 1873.

	Week. Tons. Cwt.	Total. Tons. Cwt.
Anthracite received:		
From Lehigh Valley R. R.	10,550 01	187,073 06
" Lack. & B. R. R.	413 05	15,067 02
" Pleasant Valley R. R.	4,829 19	82 018 11
" Sul. & Erie R. R.	1,166 01	16,717 04
Total	16,959 06	298,876 03
Same time last year	14,115 06	275,646 00
Increase	2,843 18	23,290 03
Decrease		
Distributed:		
To Lehigh Valley R. R.	629 17	20,312 12
To Lack. & B. R. R.	84 10	641 18
To S. Central R. R.	6,013 11	59,690 08
To Ithaca & A. R. R.	2,251 15	43,663 03
To Erie R. W. Pockets for shipm't.	6,440 18	102,292 07
To individuals on line of road	225 01	18,955 06
To points at & above Coxton for use of Co.	498 04	13,384 08
To points between Waverley and Elmira	955 09	22,036 06
Total	16,959 06	298,876 03
Bituminous received from BARCLAY R. R.		
Shipped north from Towanda	6 105 01	137,695 17
Shipped south from Towanda	44 17	840 00
Northern Central R. R.	....	45 14
Total	6,149 18	138,581 11
Same time last year	8,325 18	150,056 01
Increase	.....	.....
Decrease	2,176 00	20,474 10
Distributed:		
To Erie Railway	5,722 14	119,510 06
To So. Central R. R.	382 09	18,033 05
To Ithaca Valley R. R.	6 00	117 09
Lehigh Valley, R. R.	....	428 14
To individuals on line of Railroad.	38 17	373 13
To points on line of road for use of Company	....	113 04
Total	6,149 18	138,581 11
Grand totals transported		
Anthracite	16,959 06	298,876 03
Bituminous	6,149 18	138,581 11
Total	23,109 04	437,457 14
Same time last year	22,441 06	434,732 01
Increase	667 18	2,725 13
Decrease	.....	

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

Week ending May 31—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	20501 18	12106 10	4702 13	47311 01	758625 18
Upper Lehigh		3442 00	1276 00	4718 00	83249 08
Beaver Meadow	3231 05	1504 04	3397 11	8 38 00	85134 11
Hazleton		26 12	6407 01	6833 13	49418 11
Mauch Chunk	1,354 03	4982 09	8.08 19	14745 11	190245 04
Total	25087 06	22061 15	24852 04	81746 05	170,764 10
Prev'ly reported	520388 11	425469 04	126180 10	1 [illegible] 08	
Total to date	563490 17	487530 19	149772 14	1170764 10	
Same time ,1872	478011 19	311044 11	103864 06	892920 16	
Increase	85478 18	146486 08	45908 08	280843 14	
Decrease					

DISTRIBUTION.	WEEK 1873.	WEEK 1872.	YEAR 1873	YEAR 1872.
Forwarded East by Rail to Tidal points	25092 06	23030 12	563490 17	478011 19
Forwarded East by Rail to Local points	7379 15	6573 12	190951 03	141884 00
Forwarded East by Rail use Central Division	1943 09	1659 09	37880 19	31985 17
Forwarded East by Rail use L. & S.	201 04	85 07	5441 12	3788 18
Delivered at and above Mauch Chunk	1499 00	1272 01	33469 16	23882 10
Delivered at Coalport & Hazard for Canal	2543 18	1639 11	176721 15	120660 11
Delivered to L. V. R. R. at Packerton	429 02	331 17	12746 00	8730 14
Delivered to L. V. R. Rd at Sugar Notch	1695 07		44406 19	
Delivered to L. & B. R. R. at Plymouth Bridge	6996 04	4788 16	104286 09	84136 07
Total	81746 05	64079 04	1170764 10	892920 16

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

Company Coals.

June, 1873.

	L.	Str.	Ore.	Eg.	Sto.	Chest
*Scranton at E. Port	4 35	4 35	4 35	4 75	5 00	4 50
Pittston at Weehawken	4 60	4 60	4 60	5 00	5 50	4 70
*Lackawana at Weehawken	4 70	4 70	4 70	5 10	5 60	4 70
Wilk'b're at Hoboken	4 35	4 75	4 90	5 10	5 45	4 55
Old Co. Lehigh at Pt. Jean's	5 45	—	5 30	5 45	5 85	4 75
New York Coal Exchange	5 35	—	5 20	5 20	5 35	4 65

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

	AT NEW YORK. June 6.		AT PHILADELPHIA. June 6.	
SCHUYLKILL.	R. A.	W. A.	R. A.	W. A.
Lump	$— —	$5 45	— —	4 10
Steamer	— —	5 45	— —	4 10
Broken	5 70	5 45	4 35	4 10
Egg	5 85	5 60	4 50	4 25
Stove	6 05	5 75	4 70	4 40
Chestnut	5 20	5 95	3 55	3 60
Pea	— —	— —	— —	— —
LEHIGH. Freight to New York 50 cents.				
Lump, (on board)	— —	5 45	— —	— —
Broken	— —	5 30	— —	— —
Egg	— —	5 30	— —	— —
Stove	— —	5 45	— —	— —
Chestnut	— —	4 45	— —	— —
Pea	— —	— —	— —	— —
SPECIAL COALS*				
Honey Brook, Le'h W.A.	4 70@5 60		— —	— —
Spring Mountain " "	— —@— —		— —	— —
Sugar Loaf " "	— —@— —		— —	— —
Room Run " "	4 70@5 60		— —	— —
Hill & Harris " "	4 70@5 60		— —	— —
Shamokin " "	4 70@5 60		— —	— —
Lykens Valley " "	4 85@6 10		— —	— —
Broad Top " "	5 60@— 10		5 33	— —

Prices at Baltimore—June, 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 50
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

* Freight to New York $2 15.

BITUMINOUS COALS.

Kittaning Coal Co.'s Phœnix Vein, f. o. b. at Phila	$
Lemon " " "	
Cumberland Vein Coal	
Tyrconnel f. o. b.	$7 00

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

June, 1873.

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

Prices at Havre de Grace, Md.

June, 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 25
South Amboy "	6 75

Prices of Foreign Coals.

June, 1873.

Duty 75 c. per ton.

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

Liverpool Gas Coking	—@— —
" " Cannel	19 00@20 00
" House "	22 00@23 00
" Orrel	20 00@— —

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

PRICES FROM YARD.

Liverpool House Orrel, screened	$21 00@22 00
" Cannel, "	17 00@ ...

Per ton 2,000 lbs. delivered.

Prices of Gas Coals.

June, 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 00	0 00

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

	Coarse.	Culm of Coal.
Pictou, nett	$2 50	1 50
Sydney	2 50	1 00
Lingan	2 50	0 00
Caledonia	2 00	2 50

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 50
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	7 50 @8 00

Foreign and Provincial Freight

June, 1873.

Foreign.
Newcastle and Ports on Tyne, per keel of 21 1-8 tons £
Liverpool, ½ per cent primage

TO NEW YORK.

Provincial

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

TO BOSTON.

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

Freights.—May, 1873

TO EASTERN PORTS.	Cumberland. From Georgetown.	Cumberland. From Baltimore	Anthracite. From Philada'a.	Anthracite. From Elis. Port, Port Johnson, and Hoboken.	Anthracite. From Newburgh.	Anthracite. From Rondout.
Amesbury	3 75	—		—	—	—
Bangor	3 25	—		—	—	—
Bath	2 87	—		—	—	—
Boston	3 00	3 00		2 15*	2 25	2 15
Bridgeport	2 50	2 50		1 00	—	1 25
Bristol	—	—		1 40	—	1 70
Cohasset Nar'ows	3 00	—		—	—	—
Derby	3 25	—		1 25†	—	—
Dighton	2 65	—		—	—	—
East Cambridge	2 75	—		2 25	2 25	2 40
Fall River	2 75	2 75		1 40	1 60	1 75
Hackensack	—	—		—	—	—
Hartford	—	—		3 25	—	1 75
Hoboken	2 10	—		50	—	65
Jersey City	2 10	—		50	—	65
Lynn	—	—		—	—	—
Middletown	—	—		1 30	—	1 50
Mystic	—	—		1 30	—	—
New Bedford	3 00	3 00		1 40	—	1 75
Newburyport	3 12	3 10		2 25	—	2 35
New Haven	2 35	2 35		1 00	1 20	1 25
New London	2 75	2 75		1 25	1 40	1 45
Newport	—	—		1 40	1 65	1 70
New York	1 15	1 15		50	—	65
Norwalk	2 75	2 75		1 00	—	1 25
Norwich	1 30	1 60		1 30	1 60	1 65
Pawtucket	1 60	3 00		1 50‡	—	—
Portland	2 10	3 00		2 10	—	—
Portsmouth, N.H	2 30	3 00		2 30	—	—
Providence	1 40	2 75		1 40	1 65	1 75
Rockport	—	—		—	—	—
Saco	—	—		—	—	—
Sag Harbor	1 25	—		1 25	—	—
Salem	2 15	—		2 15	—	—
Stamford	1 00	—		1 00	1 20	1 25
Stonington	1 25	—		1 25	—	—
Taunton	90	—		1 90	—	—
Warren	1 40	—		1 40	—	—
TO RIVER PORTS						
Albany	—	—		—	—	55
Catskill	—	—		—	—	50
Cocksackie	—	—		—	—	65
Coeyman's	—	—		—	—	20
Cold Spring	—	—		—	—	20
Fishkill	—	—		—	—	40
Haverstraw	—	—		—	—	40
Hudson	2 50	—		—	—	65
New York vessels	2 00	—		—	—	45
Nyack	—	—		—	—	30
Poughkeepsie	—	—		—	—	30
Rhinebeck	—	—		—	—	—
Rondout	—	—		—	—	40
Saugerties	—	—		—	—	50
Sing Sing	—	—		—	—	55
Stuyvesant	—	—		—	—	50
Tarrytown	—	—		—	—	60
Troy	—	—		—	—	20
West Point	—	—		—	—	50
Yonkers	—	—		—	—	—

† 3 c. per ton per bridge extra.
‡ New Haven rate and towing 25 c. extra per ton.
; T. wing from Providence and return, extra.
§ And towing.

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

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

MAUCH CHUNK TO PORT JOHNSTON.

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

TO HOBOKEN.

L. V. R. R., Mauch Chunk to Phillipsburgh	72
Morris & Essex R. R. Phillipsburgh to Hoboken	1 06
Shipping expenses	25
Wharfage	00
Total	$2 23

TO SOUTH AMBOY.

L. V. R. R.	72
B. & D. R. R.	} 1
Cam. & Am. R. R.	}
Shipping Expenses	50
Total	$2 23

PENN HAVEN TO ELIZABETHPORT.

L. V. R. R. Penn Haven to Phillipsburgh	84
C. RR. of N. J. Phillipsburgh to Elizabethport	1 06
Shipping expenses	25
Wharfage	10
Total	$2 25

MARKET REVIEW.

NEW YORK, June 5, 1873.

IRON—Business in Scotch Pig has come almost to a stand-still; the market is unsettled, and prices, though not quoted below our quotations, are weak and in buyers' favor; the arrivals by steamer have amounted to about 1000 tons of the various brands, but holders, we believe, are not pressing their supplies, choosing rather to store than sacrifice, the present ruling rates being several dollars below cost of importation; the sales are confined to jobbing parcels from yard. American Pig is not so firm as for some time past; the general dullness in trade, and a very light inquiry from consumers, have caused a weakness in prices, and our quotations are perhaps the extreme prices for the present; the No. 1 brands, though not in large supply, are in better stock than heretofore; No. 2 X is accumulating, and the stock of Gray Forge, as the season advances, is gradually increasing; the only sale we hear of is 100 tons No. 1 Allentown at $48. In old English rails we hear of no business; new are very quiet. Scrap is dull; 250 tons at Providence sold at $45; 200 do. No. 1 Wrought, here, $48, delivered; and a small lot ex-ship on private terms. Refined Bar continues dull at the decline of last week. Russia Sheet is held at 16½a18 cents gold, as to assortment.

LEAD—Pig remains very quiet, but prices are unchanged. Ordinary Foreign $6 75a6.87½, and Domestic $6.45a$6.55 gold. Bar, Pipe and Sheet are steady at old prices.

Withdrawals from bond for consumption 29th and 31st May, and 2d June—

Pig Lead, England..... pigs.1,289

COPPER—The manufactures of Copper and Yellow Metal are steady at our quoted rates. The market for Ingot is at a stand, and we hear of no business; Lake is quoted nominally 30@30½ cents for full parcels. English 29½@29½ cents.

REGULUS ANTIMONY—We note sales of 5 casks at 14@14½ cents, gold.

SPELTER—The demand for Foreign is very limited, and our quotations are rather nominal, say $7,75 gold, domestic 18c currency.

STEEL—Both English and American are steady at our quoted rates, for lots as wanted from store.

TIN—Holders of Pig continue to shade their views, but without effect upon the demand, and the market is as dull as ever; the only business is the sale of 100 slabs Straits at 31 cents. English may be quoted nominally 30, and Banca 36, all gold. Plates remain very dull; the English accounts are unfavorable to holders, besides which the presence of some 15,000 bxs. in outside hands has a depressing influence. Sales have been made of 500 bxs, Charcoal Tin at $11,25 for I. C.; 250 do. Coke Tin, 14 by 20, $9,12½; 300 do. S. T. P. Terne, $10; and 150 do. Coke Terne, $8,75, all gold; we quote at the close, Charcoal Tin $11@$11,37½, Coke Tin $8,62½a$9,25, Charcoal Terne $9,50 a$10, and Coke do. $7,75a$8.75 gold.

Withdrawals from bond for consumption 29th and 31st May, and 2d June.

Tin from England..... bxs.1,135

ZINC—We have no change to note, and little business to report. Sheet is held at 10½c, Manganese black oxide 3½, Manganese proxide 6c.

EDWARD SAMUEL, under date of Philadelphia, June 2, 1873, reviews the market for the past month as follows:

AMERICAN PIG IRON—No transactions worthy of note have transpired—consumers continue to withhold orders, and purchases are confined to small lots for immediate uses. There is some scarcity of good makes, No. 1 Foundry, but all other grades are in full supply. Furnace quotations for good makes are as follows: $45@$46 for No. 1; $41@$43 for No. 2; $36@$38 for No. 3

SCOTCH PIG—The local market has been without movement. Eglinton which is the only brand in stock here, is held at $50@$51. In the English market prices have receded about 5s per ton, in comparison with last month's figures. Under date May 14th, the quotations were F. O. B. in the Clyde, as follows:

Gartsherrie	137s 6	Carnbroe	122s 6
Coltness	137s 6	Glengarnock	125s
Summerlee	135s	Dalmellington	118s
Langloan	135s	Eglinton	118s
Calder	135s		

F. O. B. Liverpool about 7s per ton more, all round.

Exports to U. S. for month of April,.....12,225 tons.
" " for 4 months, ending April,..41,034 "

Stock of pig iron in store, Glasgow, Dec. 25, '72:106,919 "
" " " May 9, '73. 68,401 "

Decrease..... 38,518 tons.

RAILS, although still dull, are in somewhat better demand. Prices remain about the same, viz: $32 to $35 at mill. English rails are quoted at $70@$72 gold, N. Y., or £11 10s@£13 for heavy sections f. o. b. Wales.

MERCHANT BARS are greatly depressed, some of the Western mills are reported to have made sales as low as 3½ cts. per pound. The price here is 4 cts. to 4.2 cts. More inquiry is reported the last week than for some time preceding.

OLD RAILS are in better demand, and large transactions are reported from New York. There are but few rails in port or on the way, and the greater part of these have been purchased by speculators and re-sold to consumers. With the high price abroad and limited supply here, prices must advance. Would quote to-day D Hs at $54@$55 currency.

WROUGHT SCRAP is still weak and dull, but with very little offering, and sales ex ship, New York, are reported at as low as $40 currency. The price here is from $45@$50, according to selections.

METALS.

NEW YORK, June 5, 1873.

IRON.—Duty: Bars, 1 to 1¼ cents ₩ lb; Railroad, 70 cents ₩ 10 lbs.; Boiler and Plate, 1½ cents ₩ lb; Sheet, Band, Hoop, and Scroll, 1¼ to 1¾ cents ₩ lb; Pig, $7 ₩ ton; Polished Sheet, 3 cts. ₩ lb; Galvanized 2½; Scrap Cast, $6; Scrap Wrought, $8 per ton. All less 10 per cent. No Bar Iron to pay a less duty than 35 per cent. ad val.

	Store Prices.
Pig, Scotch—Coltness ₩ ton	59 00@— —
Gartsherrie	56 00@57 00
Glengarnock	48 00@— —
Eglinton	46 00@47 00
Pig, American, No. 1	48 00@50 00
Pig, American, No. 2	43 00@44 00
Pig, American, Forge	38 00@40 00
Bar Refined, English and American	70 00@— —
Bar Swedes, assorted sizes, gold	137 00@142 50
	Store Prices, Cash.
Bar, Swedes, 1¼ to 5 x ⅜ & ½ 2 sq. & ⅞ to 12 x ⅜ & ½	— —@— —
Bar, Refined, ¾ to 2 in. rd. & sq. 1 to 6 in. x ⅜ to 1 in.	97 00@ 50 00
Bar, Refined, 1½ to 6 by ¼	— —@102 50
Bar, Refined, 2½ to 2¾ round 1 & 1¼ by ¼ & 5-16	— —@105 00
Large Rounds	105 00@117 50
Scroll	115 00@145 00
Ovals and half-round	— —@145 00
Band	— —@115 00
Horse Shoe	— —@122 50
Rods, ⅜ to 3-16 inch	102 50@145 00
Hoop	142 50@170 00
Nailrod	9½@ 9¾
Sheet, Russia, as to assortment (gold)	16½@ 18
Sheet, Singles, D. and T. Common	—6½@— 7¼
Sheet, D. an I T. Charcoal	—7¼@— 8½
Sheet, Galv'd, 1ist 10 per cent. discount	—@— —
Rails, English (gold), ₩ ton	70 00@— —
Rails, American, at Works in Pennsylvania, currency	80 00@ 82 50

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	30 @— 30½
Copper English Pig	29 @— 29½
Yellow Metal, New Sheathing & Bronze	— @— 27
Yellow Metal Bolts	— @— 32
Yellow Metal Nails, Sheathing and Slat'g	27 @— 30

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

Galena, ₩ 100 lbs	$— —@— —
Spanish (gold)	6 75 @6 87½
German, do.	6 75 @6 87½
English do.	6 75 @7 00
Domestic do.	6 45 @6 55
Foreign, Refined	7 75 @7 80
Bar (net)	9 25 @— —
Pipe (net)	— —@10 50
Sheet	— —@10 50

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

English Cast (2d and 1st quality) ₩ lb	— 18½@— 21
English Spring (2d and 1st quality)	— 9½@— 10½
English Blister (2d and 1st quality)	— 14 @— 18½
English Machinery	— 14½@— —
English German (2d an 1st quality)	— 12½@— 14½
American Blister "Black Diamond"	— —@— 11½
American, Cast, Tool do.	— —@— 17
American, Spring, do.	— —@— 11
American Machinery do.	— 11½@— 12
American German, do.	— 9 @— —

TIN.—Duty: Pig, Bars, and Blocks, 15 ₩ cent. ad val.; Plate and Sheets and Terne Plates, 25 ₩ cent.; Roofing 35 ad val.

	Gold ₩ lb.
Banca	— @36
Straits	31 @—
English	30 @—

PLATES.

Fair to Good Brands.	Gold.	Currency
I. C. Charcoal, ₩ box	$11 00 @11 37½	$13 25 @14 75
I. C. Coke	8 62½@ 9 25	10 50 @11 50
Coke Terne	7 75 @ 8 75	9 50 @11 00
Charcoal Terne	9 50 @10 00	11 75 @12 25

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

Plates, Foreign (gold) p. 100 lb.	7 62½@ 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@11

San Francisco Stock Market.

BY TELEGRAPH.

NEW YORK, May 29, 1873.

Our report from the San Francisco Stock Market is dated the 3d inst. With the exception of a decline of $1.50 in Raymond & Ely and a $1 50 in Meadow Valley the market has materially advanced, Belcher leading the list, being $22 higher than per our last. The report is as follows:

			May 27
Savage	—	—	142
Crown Point	—	—	135
Yellow Jacket	—	—	82
Kentuck, "New Issue"	—	—	12
Chollar Potosi	—	—	66
Gould & Curry "New Issue"	—	—	16
Belcher "New Issue"	—	—	109
Imperial	—	—	7¾
Raymond & Ely	—	—	5½
Meadow Valley	—	—	23¼
Eureka C. V.	—	—	—
Gobin	—	—	—
Hale and Norcross	—	—	—

American Institute of Mining Engineers.

OFFICIAL BULLETIN.

Announcements to Members and Associates.

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

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

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

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

THOMAS M. DROWN, Secretary.
1123 Girard street, Philadelphia, Pa.

MISCELLANEOUS.

THE ENGINEERING AND MINING JOURNAL.

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

PUBLISHERS' ANNOUNCEMENT.

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

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

CONTENTS FOR THIS WEEK.

WE regret that the report of the Institute meeting in Philadelphia is not ready for publication this week. The publication of the papers is however begun and will be steadily continued. This week we give two papers of more than ordinary interest. One hardly knows whether to laugh at, or admire, the ingenuity with which a cathartic was administered to the "Lucy." Mr. SKELDING certainly deserves the credit of discovering a usefulness for the rifle shells which are sometimes charged in foundry cupolas. Hereafter iron men will probably keep them for choked-up blast furnaces. Mr. WITHERBEE's experience in blowing in his furnace was about as startling. These two occurrences show that with all their delicacy and liability to derangement blast furnaces can stand a good deal of battering.

THE well-known Freiberg Mining Academy, which has been the training-ground of so many American scientific men, has had its course of study somewhat altered under the management of Director ZEUNER, formerly Professor at Zurich. Now any young man with what we would call a common school education, can acquire there the sciences of mining and metallurgy and the studies connected with them. Circumstances have very much lessened the number of American students at the institution, there being at present thirteen from North America, while six years ago the number was forty-five or fifty. The reputation which this school has so long enjoyed, calls to it students from all the four quarters of the globe, and sixteen countries are now represented among its seventy-six students. Few institutions enjoy so wide-spread a support.

THE *Portage Lake Mining Gazette* criticises the figures of silver production from the Silver Islet mine, given in our issue of May 20, in the following style: "Will the ENGINEERING AND MINING JOURNAL be good enough to tell us how it came in possession of the exact ounces of silver taken from Silver Islet during the latter part of November, 1872, and up to January 27, 1873? No silver ore has been shipped from Silver Islet since about the 10th of last November until the other day, and it will be several weeks be ore a return in bullion can be had from it." Our information was not original, and we cannot therefore vouch for it, but we see nothing in our contemporary's remarks that vitiates the figures given by us. January 27 may be the date of the statement and not necessarily the date of the last shipment made. The *Gazette*, moreover, gives nothing to disprove the correctness of our account, and makes no effort to afford more accurate information.

A FRIEND some time ago criticised an expression in an article which appeared in this paper, February 11, on the Illinois Patent Coke Works, opposite St. Louis. We said that the German machines first used had to be replaced, and that "the defects in the first plant mainly consisted, *as might have been expected*, of time consuming, inconvenient and costly details. Our friend objects that German work is not necessarily badly done, and that in this case the trouble lay in the personal errors of the designer. The former part of his proposition is undoubtedly true, and we had no idea of charging German engineers with inefficiency. To do so would be folly and especially presumptious in treating of ore dressing machinery, for in ore dressing the Germans are far in advance of all other nations, and it is in their country that the preparation of ores has become a science beautiful in its thoroughness and economy. While we are on this subject we will mention that a long mislaid letter from Messrs. ADOLPHUS MEIER & Co., of St. Louis, proprietors of the coke works described in the article alluded to above, gives the following comparative analysis of their coke and Connellsville coke, the analyses being made by other parties. Date of the analyses August 16, 1872.

	Ill. Pat. Coke.	Connelsville.
Water	3·275	0·657
Volatile	2·600	1·404
Ash	11·600	13·659
Carbon	82·525	84·289
Sulphur	1·846	0·711

The coke analysed as above was made before the changes (described in our former article) in the dressing machinery and coke ovens were made. Those changes brought the percentage of ash down to 9·8 per cent., and it has never been above 12·5 per cent., while the sulphur has been reduced at times below 1 per cent. We publish these figures because we are convinced that the Mississippi Valley must depend upon its own mines for blast furnace fuel. If the coal is not naturally as good as that of some special mine some way of improving it must be found. We look upon the West as the fairest—because in some respects the most difficult—field for the exercise of intelligent metallurgical skill.

THE German Smelting Works have resumed the purchase of ore which was stopped some time ago on account of the immense quantities sent forward, chiefly from South America. One vessel is reported to have carried 800,000 thaler's worth (about $600,000 gold) of ore and copper regulus in one cargo to Hamburg. The success of the Germans has been wonderful. They have proved that the English works cannot begin to compete with them and much of the ore shipped from this country to England, on English account, has been transferred to Germany for treatment. We firmly believe, however, that the day will come when Americans, at least those of them who live in the United States, will do their own smelting. To do this, however, a change must come over the smelters. It is really marvellous to see how timid and incredulous they are of anything which is not an exact copy of what has been done somewhere else. Such a thing as the adaptation of known methods to the ore and other conditions under which they labor, is very rare, and smelters of many years' experience commit blunders which would be impossible if they had a fair knowledge of their business. They will learn in time that foreign works are not such scenes of magic transformation of ore to metal as they seem to suppose, and that even metallurgy is a thing that may be grasped and controlled by the exercise of forethought and common sense. That this has not hitherto been believed is shown by the fact that fifty or sixty "custom" smelting works in the country, built expressly for the treatment of Western silver and lead ores, are unable to prevent the exportation of a very large part of the most valuable produce of the mines. Even as the case stands many mines are unworked, simply because their owners have no confidence in the ability of the smelters to handle the ore if taken out. A meeting has been held in Chicago, to take into consideration the subject of making that city the seat of works which are to take the lead for magnitude of all the establishments for treating Western ores. Ex-Governor BROSS is reported to have said that $200,000 would be sufficient to set Chicago at the pinnacle of the smelting business. We can only say that Chicago will have to find something beside money before she can take the lead. If we are not mistaken there are already three works in that city of the kind proposed, and the meeting before raising too many subscriptions for new works had better ascertain why it is that the three establishments already in operation do not take more business.

English Mining Affairs.

A new difficulty presents itself in the English iron trade. The iron ore miners in the Cleveland district being refused an advance of wages which they demanded, attempted to enforce their wishes by restricting the output. The result was a lock-out by the furnace proprietors, though it is one of the peculiarities of the present difficulties that the men repudiate the charge of being on a strike, and the masters deny that there is a lock-out. We are not near enough to the field to be able to decide which is right, but, at all events, there is no more ore coming out of the mines; some works have been obliged to damp down the furnaces, others are preparing to do so, the stock of pig will not last a fortnight and if the difficulty continues, 8,000 men will presently be idle.

The present trouble has some of the most objectionable of those features which have compelled the world to deny its sympathy to the English workman in his more recent strikes, while there are others which give a more promising cast to the affair. The attempt to cut down the extraction of ore is certainly no more nor less than a breach of contract, for when a day's work is paid for it means the

whole energy of the workman for the stipulated number of hours. Intentional idling, if carried so far as to deprive the employer of the fair results of a day's labor, is a fraud. It is this consideration which has made the English of almost all classes indignant at the attempt of workmen to exercise a despotic sway over their employers, declaring that what they decide upon is in all cases right. On the other hand, the excessively high price of coal is likely to receive a check by the removal of a demand in so large a district as Cleveland. Prices are already weaker, and it is hoped that the cessation of work may result in a real benefit, by equalizing the demand for coal with the production of the mines.

A good deal of interest has been awakened abroad by the discovery of "spiegel ore," that is, a manganiferous spathic ore, in a lately opened district about twenty miles west of the Brendon Hills. Several large lodes of spathic and also of red hematite, both manganiferous, have been tested, and there seems to be no doubt that England will in future dispute with Germany the honor and profit of supplying the world's spiegel. Two analyses of the spathic ore are given in *Engineering*. They are:

No. 1.

Protoxide of iron	29.02
Protoxide of manganese	23,37
Carbonic acid	33.85

No. 2.

Carbonate of iron	55
Carbonate of manganese	24

It will be noticed that the large proportion of manganese in these ores makes them especially valuable. The value of this metal in the processes of iron manufacture has received a rapidly increasing recognition for many years, and if the deposits prove to be as large as they are intrinsically important, it is likely that we shall see a new district added to the famous iron regions of England. The fact that the price of spiegel has risen, mainly in consequence of the sharp demand for it, from £6 to £15 at Rotterdam, within ten years, is a proof that the new district may look forward to enjoying, for a time at least, those exceptional profits which are so useful in the establishment of any industry in a new field. There has already been talk of building blast furnaces, but we believe nothing has been decided upon.

Those who are so ready to talk of the impoverishment of nations may find in this occurrence food for instructive meditation. If there is any thing which one would not expect to find still untouched in England, it is mines of exceptionally valuable iron ore. And yet the history of Cleveland, Barrow, and now of Devon, prove that even England is not squeezed dry of iron. Hitherto the search for iron ores has been left to private hands, but if it became a matter of national necessity, the government could easily turn its attention to a systematic search for minerals, and it is hard to doubt that the united study of England's best geologists and engineers would be productive of very important results, even in that well-inspected island.

When we look at the productiveness of England in iron ores, and turn our eyes to our own country we can but acknowledge that the claim so often and so confidently made, that in the United States lies more ore than the world can use in ten centuries, is not even exaggerated. We are probably destined to see the *per capita* use of iron in this country far exceed the limit of any other nation, for when values in this and other countries have become more equalized (and foreign strikes are doing that rapidly) we can make iron cheaper than any one else.

American Society of Civil Engineers.

A regular meeting of this society was held at the rooms in New York, March 5th, 1873.

A paper on "Shaw's Gunpowder Pile Driver," by SAMUEL R. PROBASCO, C. E., of Brooklyn, N. Y., was read.

This Pile Driver was set at work in October, 1872, on a line of sheet piles for a reservoir dam in the valley of Parsonage Creek, Long Island. The material to be penetrated was sand and fine gravel, cemented together in places, so as to be hard and difficult to move with a pick, and like "hard-pan." Clay was found below the water level of the basin, some borings showing it at 15 feet below the surface; the lower stratum was tough and tenacious, and the whole material was under water.

The machine in form resembles an ordinary pile driver—a cast iron block, called a "gun," resting on the head of the pile, is bored out, and receives without windage a wrought iron piston attached to another cast iron block, called the "ram," which is lifted by explosion of powder in the bore. When the piston leaves the gun, a cartridge is thrown in, which, exploded by the heat freed by the piston in its descent, throws the ram upward again—and forces the pile downward. The area of the piston is adjusted to the weight of the ram, which also is adjusted to the work to be done. Soda Powder cartridges in cylinders of 1¼ to 1½ oz., coated with black lead and paraffine are used. The coating is expected to keep the powder dry, lubricate the gun, preserve the requisite tightness, prevent escape of gas, and cause the entire force to be exerted on the base of the piston.

The piston is made a little smaller than the bore of the gun, and has on its lower end a steel ring, which fits the bore closely. The performance was as follows: At first several explosions were necessary to lubricate the gun, which leaked gas, so that the ram would not go to the requisite height to move the pile. After a few shots the piston moved up regularly, and in its descent fired the charge, forcing the pile down and itself upward. When the resistance is slight, this machine may be economical, but when, as in this case, it required 300 blows from cartridges costing 2½ cents each to force a pile down 15 or 16 feet, it cannot be called so. The gas from the explosions cut passages in the ring at the end of the piston, and thereby much lessened the power of the machine. The gun became hot from the rapid discharges, and the bore enlarged, whereby more gas escaped; seven piles were driven with it—each costing more for powder than the contractor got for piles in place—when the machine refused to work; on examination, the steel ring was found furrowed by the powder, and the piston (diameter 5 inches) so bent by striking the bottom of the gun, as to be useless. The air cushion, relied upon to prevent this, was lost by the furrowing of the ring. The inventor, on being consulted, decided that the excessive consumption of powder was due to the piston being too small for the ram, weighing over 1700 lb. The bore of the gun was then enlarged to receive a piston 7 inches in diameter, and 10 piles more were driven, when the machine was again laid aside. The result of this trial was similar to the first, except that the piston was not bent. The gun got so hot as to fire the powder before the ram reached its place. Altogether 17 piles were driven to a depth of from 14 to 19 feet; requiring from 200 to 300 blows of 1½ oz. cartridges. An ordinary pile-driver was then employed, with a hammer weighing 1800 lbs. and falling 8 to 10 feet. In this way 11 piles were put down 15½ feet in 10 hours—costing per pile no more than 100 blows from the powder machine. These 100 blows, at best, would put the pile down but 10 feet.

The piling was spruce, from 10 in.×10 in. to 10 in.×14 in.—20 feet long—with 2 in. square tongue and groove.

The piles were beveled at the point on three sides, leaving the grooved side untouched. The groove was driven on the tongue of the preceding pile. The heads were protected with a light band; 7 piles were driven without shoeing, the eighth split and showed the necessity of protection at the point. A cast iron cup shoe, weighing about 40 lbs., with a groove in it, and made with three bevels and one plain side, was found to stand the work. The tendency of the tongue of the pile to work up was obviated by twisting a chain tightly about the pile and tongue; a lever with rope attached was used for this purpose, the force being applied as the blow was delivered. Seventy-five piles were driven in this way to a mean depth of 15½ feet. By experience 6 in. more depth has been attained, which is about the maximum penetration in this kind of material, and this can only be done with the best of sound, dry spruce.

A brief discussion followed, after which a paper on "Rail Economy," by C. P. SANDBERG, C. E., of London, England, in reply to the discussion had upon a former paper of his on the same subject, was read.

In that discussion it had been remarked, under the head of "Traffic Capacity," that the weight on locomotive driving wheels, stated therein, differed from American practice—that on the Philadelphia and Reading Railroad, 4 tons on drivers were not exceeded for a 64 lb. rail, and that on the Erie Railway 5½ tons had been found too much for a 70 lb. rail.

Mr. SANDBERG herein replied that it would be interesting to know what weight the rail and the rail joint would carry in the two instances mentioned. Six and a quarter tons on drivers on a 60 lb. rail, as stated in the table, and considered excessive, might not be so; the table showed that the 60 lb. rail of standard section with fishplate would carry 14 tons in the middle between 3 feet bearings, and 9¼ tons at the joint between 2 feet bearings. According to the table the maximum load on drivers on standard sections was one-third what the rail in the middle would carry, and two-thirds of what the rail joint would sustain. In order to obtain the full value of the material, the joint ought to be as stiff as the middle of the rail. For this it is best to use the fishplate as thick as will not interfere with the tyre flange; the angle should be as small as will permit an easy rolling of the rail. This angle is 11° and 15°, the latter for light rails, experiments having proved that the smaller the angle the stiffer the joint. With this fishing, the capacity of the rail at the joint is two-thirds that at the middle, while with ordinary fastenings it is but one-fourth. In regard to the Erie sections, experiments have shown that this rail will bear at the joint but 2 tons, while at the middle it will carry 10 tons, hence it is not strange that 5½ tons on the drivers proved disastrous. The necessity of sufficient thickness in the fish-plates is often overlooked. It is doubtless prudent to increase the number of drivers on American roads, but the statement that 6¼ tons on a 60 lb. standard rail section with standard fastenings is excessive, should be modified. This load is not the most economical for working a line, but that to which an increase of traffic might extend.

Many European railways, with a 70 lb. section, have a joint carrying only 6 tons, owing to too large an angle and too thin a fish-plate.

Japan Iron Imported into England.

PERHAPS the most noticeable item in the imports of Great Britain just now, is bar iron, made by direct processes and imported because its cost is less than that of English bars. At a late meeting of the Manchester Philosophical Society, Mr. BROCKBANK, F.G.S., exhibited specimens of iron manufactured by the old Bohemian process from hematite ores in the South of Europe. Similar iron has also recently been sent to England from Japan, the high prices now ruling having attracted supplies of iron from distant countries. The specimens exhibited cost only £6 per ton for the bloom and £8 per ton for the finished bar. The sizes of the bars are, however, very small; but it is a remarkable fact that on so small a scale iron of the very highest quality can be made and sold at half the price of English bars made on the largest scale with all the advantages of our modern machinery and appliances. It is believed that this iron is made by a similar process to that followed by the Romans in Britain, the remains of furnaces or "bloomeries" on Ennerdale Lake being of this class.

Estimation of Carbon in Pig-Iron, Wrought Iron, and Steel.

BY JOHN PARRY.

IN the course of experiments made with a view of estimating the amount and kind of gas occluded in pig iron, it was thought necessary to heat iron with oxide of copper *in vacuo*, and, ultimately, it was found that accurate carbon determinations could be made as follows:—

1. Digesting the metal in sulphate of copper solution, filtering and washing the residue of precipitated copper mixed with carbon, through asbestos.

2. The dried residue mixed with about fifty grammes pure oxide of copper, and placed in a combustion-tube sealed at one end, and drawn out at the other, the drawn out end being fitted into a water-joint connected with the pump, as shown in Frankland and Armstrong's memoir, *Chemical Journal*, vol. 6, p. 90. A vacuum being first formed, the tube was heated to a red heat until gas ceased to be evolved. The gas was collected in a carefully calibrated gas-tube, and measured with the usual corrections, for temperature, pressure and moisture, the amount of carbon being calculated from the number of c c., measured according to BUNSEN. Several trials were made with iron direct, mixed with oxide of copper, but all failed to give the full amount of carbon.

A sample, ascertained to contain 3·2 per cent of carbon, kept heated under the pump for more than twelve hours, gave only 2·97 per cent. of carbon, with carbonic acid gas still being evolved. Other trials, the heat being kept on for from two to four hours, gave 2 to 2.5 per cent of carbon.

It was found in all cases, that the gas given off *in vacuo*, consisted entirely of pure carbonic acid, but that care was necessary to ensure the perfect purity of the oxide of copper used, and also freedom from dust.

Experiment 1.—Gray pig-iron, half a gramme, was heated for one hour under the pump. It gave 29 9 c.c. of carbonic acid, which is eqnal to 3·206 per cent. of carbon; ditto, by ordinary combustion with oxide of copper in a current of oxygen, carbon (1) 3·280, (2) 3·264 per cent. To experimentally test the calibration of the gas-tube, a light glass flask, about 100 cubic centimetres capacity, was fitted with a capillary tube and glass stop-cock; this was connected with the pump, and the air having been exhausted, the stop-cock was closed, the apparatus detached from the pump and weighed. By passing the capillary tube up the tube containing the gas, and opening the stop-cock, the carbonic acid gas was drawn into the flask.

	Grammes.
First weight with exhausted flask	22·274
Second weight, with carbonic acid drawn in	23·333
Carbonic acid	0·059
Carbon	3·206 per cent.

Experiment 2.—Another sample of grey iron. (1.) Ordinary combustion, carbon 3·600 per cent. (2.) Under the pump, gas pumped direct into weighed potash bulbs, carbon 3·654 per cent.

Experiment 3.—It being thought probable that by ordinary combustion carbonic acid might be retained in the oxide of copper, one gramme of a grey pig iron was treated with solution of sulphate of copper, washed, &c., mixed with oxide of copper, and placed in a combustion tube, drawn out so as to admit of detaching the oxygen generating apparatus, and readily sealing the end in the blowpipe flame, gave carbon 3·228 per cent. The oxygen apparatus was detached, the tube sealed up, and allowed to cool; when cold, the tube was attached to the pump, exhausted, and again heated. A considerable quantity of gas was given off, which was found to be pure oxygen, without the slightest traces of carbonic acid, and carbonic oxide.

Experiment 4.—Puddle bar, described as being thoroughly puddled iron. Ordinary combustion, carbon (1.) 0·143 per cent; (2.) 0·131 per cent. Combustion *in vacuo*, carbon, 0·1465 per cent.

Experiment 5.—Wrought iron armor plate. Combustion *in vacuo*, carbon, 0·1426 per cent.

Experiment 6.—Steel. Combustion *in vacuo*, carbon, 0·2972 per cent. Eggertz's color test, carbon, 0·2800 per cent.

It appears, therefore, that the ordinary combustion method with oxide of copper in oxygen gas gives fairly accurate results. The author is, however, now able, by the use of the Sprengel pump, to estimate minute quantities of carbon in wrought iron with far greater certainty and accuracy than by ordinary combustion. Although the method appears more tedious, and requires some manipulative skill, yet, if the pump be properly fitted up, and the gas tubes carefully calibrated, combustion may be made with great facility.

Ordinary combustions require the undivided attention of the operator, and, from the number of parts, considerable care in guarding against leakage; moreover, the potash bulbs present a considerable surface for the deposit of dust and moisture.

With the pump, the vacuum once being secured and preserved to the end of the combustion, there is no fear of error from leakage; and the operator, having the carbonic acid gas in the tube, can leisurely verify his measurements, &c., and also test the gas for carbonic acid by passing up a potash ball, and, provided pure oxide of copper is used, and the combustion tubes are clean, can absolutely depend on first results. As far as the author's experience goes, such is not the case by the ordinary method.

When a careful determination of carbon in steel or wrought iron is required, two trials must always be made; the writer, as a rule, makes three determinations by the old method.

The Practical Mining Schools in Germany.

The Rev. H. SANDFORD lately read a paper before the Dudley (Eng.) Mining Institute on "Miners' Schools in Germany." His paper really confined itself to the lower grade of mining schools—those established for the sake of teaching the children of miners—and to two examples of these schools, those in the Saarbrück and Siegen districts. In the first locality, the mines are worked by the German Government, and the school was supported by the State. In the second, the mines are worked by private companies. The school at Siegen draws yearly about £120 from the Government, and £350 per annum are subscribed by the colliery owners, and these sums, augmented by a bequest of £90 per annum, represent the income of the Institution. The scholars pay nothing, but, on the contrary, receive a trifle for lodging whilst attending the course. The teachers, five or six in number, receive £190 per annum among them; but they have other sources of income. About £190 was expended on the pupils, £40 went for apparatus, and the whole expenditure reached about £500. The programme of the Royal School at Saarbrück set forth that the objects are "to prepare young miners, who have had sufficient practical training, for the office of mining surveyors and managers, and accountants, through instructions in such branches of study as bear on the above occupations." The instruction in the preparatory schools was rather to revive in the minds of the pupils their primary training, and in the preparatory schools the instruction did not interfere with the youths' labor. The only additional subjects they studied were the rudiments of geometry and the construction of machines. At Saarbrück, there were seventy-five scholars; at Siegen, about fifty. The subjects of instruction were, for the lower class, writing, drawing, arithmetic—especially the arithmetic connected with mining (mathematics)—mechanics and mechanism, surveying, chemistry, and geology. The subjects were the same for the upper classes, but, as might be expected, the scholars spent less time in writing and drawing, and more in studying mining and machinery. In regard to mathematics, a practical turn was given to the instruction, the lower class studying mensuration, levelling, etc., and the upper class trigonometry applied to the measuring of angles (for ascertaining the height of objects), the making of estimates, whilst the elements of algebra and the use of logarithms are taught to the upper and lower classes. To illustrate the laws in geology, there were excellent maps and models, showing the position of the strata and the situation of the beds of ore. The greatest number of hours was given to surveying and drawing plans, the study of the machinery, and the science of working mines. When he (the reader) visited Saarbrück, there were thirty young miners drawing plans of the workings. What was called mining science included instruction in the various gases found; how they were found; how to get rid of them; and how to recover those affected by them; the best kind of ventilation; the different kinds of roads, shafts, pumping apparatus, and the best way of preventing accidents; all the students were practical miners taken out of the pits. Before they could enter they must have worked two years in the pits, and the average was five years' service in the mines.

The reverend gentleman's description of the studies pursued in these schools for foremen is not very good, but otherwise he has given a good account of one of the most practical and excellent elements in the whole round of German technical education.

The Miner's Dial.

AT a late meeting of the South Wales Institute of Engineers, Mr. CHARLES HENRY JAMES, mining engineer of Merthyr, read an able paper on the miner's dial, in which he drew attention to the errors which were likely to arise in the construction of colliery working plans by trusting to the magnetic needle in conducting underground surveys, consequent on continual variation and depression of the needle, and the disturbances arising from local attraction, and strongly advocated the system of working with a "fast needle," and using the compass box as an angleometer for traverse surveying, by which means he obtained very accurate results with the "dial," preferring it to the the theodolite as an instrument for underground surveys. In connection with the use of the dial as a traversing instrument, he also advocated the adoption of "co-ordinate plotting," or the method of computing the position of the several "sights" or "stations" by trigonometrical computations, reducing all the angles to measured distances of latitude and longitude, preferring to accomplish this by the use of logarithms, rather than be dependent on tables constructed for this purpose. The members generally did not agree with Mr. JAMES and thought the theodolite the best instrument at the surveyor's command. One of them, however, cited numerous authorities to prove that the view advocated by Mr. JAMES had received favorable consideration from writers for many years. Among the causes of error in surveyor's work, the contraction of the paper on which the work is plotted was prominently discussed. One gentleman knew a case in which a survey was plotted on paper and several accurate tracings copied from it, and in ten years afterwards, when there was occasion to compare the copies with the original, a difference of 1 in. in 6 ft. was found to exist from the contraction of the paper.

Mr. AL. BASSETT remembered an extraordinary case in which a survey was plotted on new paper and laid by for some time in a warm room. Some time after, when the sections were plotted, from the same survey, so great a difference was found between the plan and the sections that considerable confusion arose when the dimensions came to be scaled off.

MR. JAS. MURPHY remembered many years ago the fate of a railway bill depended on the circumstance of the contraction of the paper upon which the plans were made. Mr. HAWKSHAW was the engineer, and he proved that the

contraction of the paper was such as to account for a difference of over 30 ft. in some of the measurements.

Mr. JAMES said that in using the dial in the way he recommended, he considered it was a theodolite; it was possibly rough, and could only be read to three minutes, yet to all intents it was a theodolite. The contraction of the paper was a source of much annoyance, and the method of plotting and computation advocated in his paper was to a great extent a safeguard against error, as the field book contained the latitude and longitude (or distances) of each set or station of the survey in figures, and any point could thus be ascertained without plotting or trusting to scale at all.

Engineering and Mechanical Notes.

MR. LUKE NATTRASS, librarian of the Nelson (N. Z.) Institute, has devised a method of enabling locomotives to safely ascend and descend steep railway gradients. His plan, and the working of a model, are well spoken of in the colony. Grooved driving-wheels are used instead of the usual flanged ones, the old pattern being retained for the leading and trailing wheels. The model ascends a slope rising one in eight, and it is stated that in the dangerous operation of descending the braking of the grooved wheels can be effectively performed.

AN old shell, one of the trophies of Gettysburg, was thrown into a cupola, at Shippensburg, lately, among a lot of scrap iron, when an explosion took place which created much consternation, but did no particular damage. A good way to make scrap of foundries and those at work therein.

GENERAL D. D. SMITH, Supervising Inspector General of Steam Vessels in the United States, lately informed the Master Mechanics Association, as a matter of importance to them, that Congress had appropriated $100,000 for the purpose of experimenting to discover the cause of boiler explosions. The experiments would be made during the months of September, October, and November next, at Pittsburgh or Cincinnati, and Sandy Hook, N. J. An effort would be made to find the cause of explosions, and in this master mechanics who navigate the land were as much interested as those who navigate the sea. Persons who have suggestions to make in reference to the experiments should address General SMITH, Treasury Department, room No. 28, Washington, D. C.

THE Woolwich workmen have lately been getting into place the great plate upon which is to rest the anvil block of the new 35-ton hammer. This plate weighs of itself one hundred and three tons, and had to be cast, of necessity, in an open mould. The surface which is to receive the anvil block lay, therefore, downwards, and when, after many weeks, the colossal casting grew cool, it was needful to turn the huge mass completely over. On April 17th an army of sturdy smiths undertook this task with hydraulic jacks, and a combination of the strongest tackle; before night they had lifted the monstrous lump of solid metal, twenty-two feet square, and since then they have laid it in its bed upon the rock-like structure of concrete and piles made to receive it. The anvil-block to be mounted on the huge plate will weigh only a trifle short of 200 tons, and the steam hammer which will strike upon it is made of 35 tons of metal. The whole weight of metal in the hammer is 500 tons.

Mr. W. CHAFFERS, author of "Hall Marks on Plate," says that it may be well to state for the information of the public, and to put people on their guard in purchasing gold, that, whether of the best or worst quality, it is still termed so and sold as warranted gold, although the value ranges from 85s. to 30s. per oz.; that 24-carat or pure gold is worth £4 4s. 11½d. per oz.; 22-carat, or standard, is worth £3 17s. 10½d. per oz.; 20-carat (Ireland only) is worth £3 10s. 9½d. per oz.; 18-carat is worth £3 3s. 8½d. per oz.; 15-carat is worth £2 13s. 1d. per oz.; 12-carat is worth £2 2s. 5½d. per oz.; 9-carat is worth £1 11s. 10½d. per oz. Hence any purchaser may tell by the stamp the intrinsic value of the article offered for sale, to which must necessarily be added the cost of manufacture.

The Lehigh Valley.

AT the late meeting of the National Association of Iron Manufacturers, Mr. OLIVER WILLIAMS gave the following statistics of the pig iron trade in the Lehigh Valley on the 1st day of May, from reports furnished to him by every furnace company in the valley for the information of the association:—

Actual present yearly product	tons,	425,000
Foundry Irons, 1 ex. and 2 ex., in stock	"	13,854
Foundry Irons, 1 ex. and 2 ex., sold to be delivered	"	74,540
Forge Iron on hand	"	17,890
Forge Iron sold to be delivered	"	53,715
White and Mottled on hand	"	1,650
White and Mottled sold to be delivered	"	230

Most of the companies reported white and mottled among forge irons, so the probability is that the actual stock of first-class forge iron is about 12,000 tons, as a large amount of white iron was made during the past winter. These figures are a key to the firmness of the Lehigh furnace companies, and show them to be, at least at present, masters of the situation.

Kitchen Boiler Explosions.

THE *Ironmonger* says that the yearly record of disasters caused by the bursting of kitchen boilers was smaller than usual in 1872. In that year, says our contemporary, "there were casualties and victims through boilers of various constructions and uses, but the returns show a gratifying falling off in the numbers. Explosions and accidents there always will be, just as there will be cab and other accidents; but sixty explosions, killing thirty-seven persons, and wounding nearly four times that number, does not seem a very large percentage of accidents from these causes, when it is considered how many boilers of all kinds there are in daily use. One peculiar feature of this list of calamities is that out of the thirty-seven persons fatally injured, nearly a fourth part were "strangers and passers by," and chiefly young people. In every instance rigid official inquiry took place, as it ever should do, and in only two cases were verdicts of "manslaughter" returned, and one of these was afterwards reversed. Taking, therefore, the whole of the facts, and remembering the vast number of boilers in use, 1872 has not been conspicuous for its boiler calamities.

MINING SUMMARY.

California.

CALIFORNIA MINES.

A recent British Blue-book gives the following important information on the subject of Californian mines. It states that the short supply of water during the past year has interfered materially with mining operations, both in California and Nevada. Many of the quartz mills in this State have been idle for many months, and hydraulic mining has had to be suspended altogether in many localities, both from want of water for hydraulic use and from the accumulation of the "tailings." Every year new capital is brought to bear on mining enterprise, and it is no longer difficult to find the requisite means to work a mine, if the prospects are at all encouraging.

During the past year, notwithstanding the limited supply of water, there have been more enterprises started or increased in magnitude than in any previous year. Hydraulic mining is the most attractive, and as the courses of the old river channels are more surely traced, this interest will be enormously extended. The State geologist has had, during the past two years, some of his staff employed in tracing the course of these rivers, and the result of these scientific researches will be to facilitate the action of the mines materially. In a semi-official report he says:—"In the prosecution of this work a large amount of valuable information has already been collected, both of a geographical and geological character. It is confidently expected that the working up of all materials collected, with the accompanying maps and sections, will exhibit the phenomenon of gravel deposits—in regard to which there has been so much discussion and such a multiplicity of opinions—in a new light, and that many difficulties which have hitherto perplexed the miners, will be solved. He desired the work to be continuously prosecuted until a full and detailed map and report on the whole region have been prepared, which he thought would be accomplished the next session if the pecuniary means are forthcoming." Hydraulic mining is becoming more general through the mining districts. It was for some years mainly confined to the counties of Yuba Nevada, Placer, El Dorado, and Butte, but it is spreading to Mariposa in the South, and Trinity, Klamath, and Siskiyou Counties in the North. Yuba and Nevada, always the leading counties in hydraulic mining, still maintain the ascendancy. From one small district in the former county nearly £100,000 was received, and the yield from the completion of tunnels will be much greater this year. Tuolumne has added to the counties known to possess old river channels. A large ditch is nearly completed to bring water from the Tuolumne River to a very extensive gravel deposit near La Grange, which is said to be unusually rich and free from cement. The great hindrance to the working of these mines has generally been the want of drainage capacity, which has compelled the construction of long and extensive tunnels, a work of great labor and time.

The large ditches now furnishing water for hydraulic purposes supply hydraulic power from nozzles of 7 inches in diameter, and the force is tremendous. Two or three years ago a 3-inch nozzle was the largest in use. A great many fine quartz mills have been built, with all the improvements that science and practical experience have taught, and though labor has not depreciated sensibly in value, quartz of a much lower grade can be profitably worked than heretofore.

The two leading quartz mines of California—the Amador, of Amador County, and the Eureka, in Nevada County—have paid in dividends respectively £172,000 (since it has been an incorporated company) and £354,800. The total yield of the Califoania gold mines is estimated at £3 000,000. Extraordinary developments have been made in the great "Comstock lode" of Nevada, and the yield has reached £2,200,000, fully one third more than the product of 1870. The more recent discoveries have been in the "Crown Point" and "Belcher" mines, which have proved so flattering as to send the value of their stock far above what it has ever before reached. The latter has heretofore paid in dividends but little over the assessments, but it recommenced paying dividends in January, 1871, by one payment of 10 dols. per share, equal to £28,000. The following are the dividends paid by four of the leading mines of this lode:—Chollar Potosi, £330,400; Crown Point, £168,000; Hale and Norcross, £32,000; Yellow Jacket, £88,000.

The estimated production of gold and silver for the past five years in the United States, based upon the coinage of the mints and the foreign exports, according to the commerce and navigation report is as follows:—

YEAR.	GOLD.	SILVER.	TOTAL PRODUCTION.
1867	£7,700,000	£3,800,000	£11,500,000
1868	7,000,000	3,000,000	10,000,000
1869	6,500,000	2,800,000	9,300,000
1870	6,000,000	3,200,000	9,200,000
1871	5,600,000	4,400,000	10,000,000

About one-third of the value of the silver production is also gold, which should be deducted from the second column and added to the first, to show the exact proportion of each metal produced. The above statement does not embrace the gold and silver exported in the form of ore.

A good many California and Nevada mines have been sold in the London market, and the price paid for them has generally been far in advance of their recognized value in the United States. The almost insatiable demands of the California and Nevada "opertors," and the London Stock Exchange, have in some instances caused the par value of the shares of a company to be five times or more what the mine has, or should have cost. Good mines are to be purchased at a reasonable valuation, if the same sagacit

and caution are displayed in securing them as would be in an ordinary mercantile transaction.

The production of quicksilver in 1871 amounted to 30,490 flasks, and was received from the following mines:—New Almaden, 18,760; New Idria, 8,180; Redington, 1,128; Guadaloupe, 327; San Juan Baptiste, 157; Vallejo, 125; Josephine, 47; Phœnix, 763. Only 1,322 tons of copper were shipped to England during the same year, and none to other countries.

QUICKSILVER IN SOLANO.

THE ST. JOHN'S MINE AND WORKS NEAR VALLEJO—PROSPECT OF A RIVAL TO THE FAMOUS ALMADEN.

[From the Vallejo Chronicle.]

That the hills of Sulphur Spring Valley, situated a short distance north and east of Vallejo, contain deposits of cinnabar or quicksilver ore, is commonly known. In the year of 1852, twenty-two years ago, Mr. JOHN NEATE first became convinced of the existence of minerals in this locality, and made the first exploration. In 1858, NEATE placed before W. E. BARRON specimens of cannibar and coal taken therefrom. BARRON discouraged the opening of any new quicksilver mine, stating as a reason that the supply was greater than the demand. In 1862, NEATE, having become discouraged in the hope of obtaining the help of capitalists, determined to start himself in the attempt to develop a mine, and engaged some miners to help him, when the Foscol grant was rejected; the uncertainty of titles now prevented him from making any developments. In 1868 the titles being quieted, NEATE obtained rights and privileges from the land owners and got fairly under way. The first actual mining done for quicksilver was upon the Brownlie ranch; here NEATE mined with the help of six or eight miners for eighteen months, and during that time extracted a quantity of rich ore, some of it going as high as 85 per cent. About $30,000 has been taken from the surface of this mine. It has not been explored to a greater depth than forty feet, and that only in one place. This mine is in the hands of the executors of the late W. B. BARRON. After leaving this mine in 1870 he commenced prospecting

THE ST. JOHN QUICKSILVER MINE,

Which is now attracting much attention. This mine and work are located on the Wilson Hill ranch, which is situated five miles directly north of Vallejo, in the range of high hills that form a portion of the Coast Range. The ledge runs southeast and northwest, near the summit of one of the highest hills in the range, and dips to the north at an angle of about forty degree. It was opened by a drift twenty feet below the outcrop, developing a drift of thirty feet for the ledge, with 15 per cent. ore all the way through. At the end of the tunnel or drift, or at the "wall," on the east side, the workmen have gone down with an incline for a distance of fifty feet; and it is in this latter excavation where the largest deposit of rich ore has been found. Our reporter descended the incline and saw a sight of wealth and riches pleasing to look upon. From the mouth of the incline, every foot down, the rock grew richer and richer, and the bottom of the incline was one solid mass of fifty or sixty per cent. ore; and out of the last twelve feet the Superintendent informed us that he had taken $5,000; and from the whole excavation between seven and eight thousand had been taken out. It has been estimated by experts that there is something like forty or fifty thousand dollars in sight there. It is considered by nearly all who have visited the mine that the entire ledge contains as large, if not the largest and richest deposit of cinnabar possessed by any mine at the present time. The Superintendent is running a tunnel to tap the ledge on a level 173 feet below the outcrop. This tunnel is already in 153 feet, and it is expected that the workmen will strike the ledge in two or three weeks.

At a distance of two or three hundred feet west of the location of the above described locations, near the summit, a little prospecting has been done, developing a vein six feet feet wide, containing a lead of very rich metal, six inches in width, with a foot and a half of paying ore on each side, which, when first discovered, was only the thickness of one's hand, growing wider as they went down upon it. Out of this excavation, which is not of sufficient dimensions to screen a yoke of oxen, over $800 has been taken out. The lode of this portion of the mine has been traced and explored for half a mile, and at intervals of twenty-five feet shows the outcrop of metal of exceedingly rich character.

When Mr. NEATE first commenced prospecting on his ranche, he run a 200-foot tunnel in a hill adjoining and north of the last mentioned eminence, in which he found quite a large body of low grade ore. At three or four other places he has opened on considerable bodies of low grade rock, which will pay to work, especially at this point, where a mine can be operated so economically. At the mouth of the tunnel mentioned in this paragraph is located the

SMELTING WORKS OF THE COMPANY.

At the time of writing, the Superintendent is rebuilding the furnace, making it of much greater capacity, and adding two more condensing chambers. The furnace torn down was too small for general use; it was built as an experiment in carrying out an idea of Mr. NEATE'S. It being a success, Mr. N. has applied for a patent, and is having the new one built on the same principle; it is now about completed. The company have also another furnace partially constructed, which can be completed very quickly whenever the occasion requires its use. The furnace proper is constructed of brick, in a circular form, between nine and ten feet in diameter, and about thirteen feet high. The largest diameter of this furnace inside is four feet and six inches; it has a depth of twelve feet; the chamber is "charged" by filling it with ore and coke—layer of each, one above another—and its capacity is eight tons every twenty-four hours. The fire is started in the chamber or furnace with an exceedingly heavy draught. The quicksilver rises in a vapor and passes with the smoke through a large flue about twenty feet long into the condensing chamber, which is of brick, about twelve feet square. By the time the smoke and vapor find egress to the second condensing chamber, the principal portion of the vapor has cooled off, precipitating the liquid silver, which is run off into proper receptacles through small iron spigots from the bottom of the chamber. There are five condensing chambers altogether, situated about ten feet apart, connected by a long brick flue, each chamber gathering some quicksilver; but in the fifth chamber little, if any, is found, about all the vapor having condensed before reaching that point; the smoke then passes off into a chimney, thence into the atmosphere.

There are thirty men employed by the company at the present time, but the Superintendent is making accommodations for 100.

There are seven buildings on the grounds, as follows; the smelting works shed; blacksmith shop; the furnace man's house; the Superintendent's dwelling; two lodging-houses; one eating-house, which is 70 feet long by 22 feet wide. A large lodging-house is in course of erection. In an air line, the mine is situated only two miles away from the railroad, to which a wagon road can be easily constructed, if necessary.

The following is written by an expert: "In the valley of the Sulphur Springs, equal distance from Napa and Suisun Bays, stands Sulphur Spring Mountain. The mountain is the southern limit of a range of hills which traverse the center of the peninsula, and in these hills and mountains are located the St. John's mines of quicksilver. This mountain has an altitude of 1,200 feet from the bay, and can be drained to a depth of 800 feet with an easy tunnel. The development is in ferruginous clay slate and sandstone. The clay slate lode is twelve feet wide, having well-defined walls of blue talcose slate. This lode, for fifty feet, has produced paying ore. The lode is in sandstone, thirty feet wide, with two well-defined walls. The metal crosses the lode, being about one foot upon the foot-wall, and runs to four and five feet upon the hanging-wall. This has been explored to a depth of forty feet, the ore and its matrix having that soft, rich, sugary appearance that cinnabar delights to live in. Other explorations upon the lode are showing a splendid outcrop, and considered by all quicksilver miners who have examined or worked in it as unparalleled in richness, and bids fair to outrival the famous Almaden mines. In the Brownlie mine, two miles southeast of the above mine, the ore occurs in clay slate (metamorphic), which changes to jasper, having a well-defined wall of talcose slate of cream color."

Montana.

TUCKER GULCH MINES.—Helena *Herald*, May 1: WM. F. WHEELER & Co. own 160 acres of mining ground lying east of "Tucker" which include the famous "Uncle Sam" lode. COLLINS & WALKER have a patent for 47 acres in Tucker, joining the above claim on the west. These mines have been prospected and worked from time to time, as much as the small supply of water would permit, since 1865; large quantities of gold have been taken out and there yet remains about three fourths of the ground untouched.

Since January, 1872, about the time Mr. ELAINE WALKER purchased his half interest therein, the claimants have put in a 16-inch flume 1,900 feet in length, 475 feet of which is set in a tunnel, cut through solid granite, at a cost of $9,000. They have constructed a reservoir of such capacity as to supply 150 inches of water for ten hours' working with a hydraulic; from this reservoir they have laid an iron pipe, 6 inches in diameter, giving them a "head" of about 90 ft. perpendicularly; to the end of this pipe is attached 130 ft. of hose with a two inch nozzle. Here was a successful opening of a valuable mine, and a supply of water at a reasonable rate cannot fail to yield the owners thereof a handsome income, if not a large fortune. The precious metal is there, for I saw it with my own eyes.

We yesterday saw at the Cosmopolitan a gold brick weighing 94.77 oz., 838 fine, and of coin value $1,641.70, being the result of a run in the Harvey mill, Grizzly Park, upon 64 tons of ore from the McCrea lode, at the head of Nelson. This is the third run made on ore from this lode, the first paying $14, the second $19, and this one $80 per ton, greenbacks. This lode was discovered last August by Mr. MCCREA, and it is thought by many to be the extension of the famous Park lode. It is developed to the depth of 130 feet, and has a crevice of from six inches to two feet.

The W. A. DAVIS lode, at Cherry Creek, named after its discoverer, is supposed by a majority to be the largest yet found in this district. The shaft is 60 feet deep, and at the bottom the crevice shows a width of six feet. I saw returns of three assays made from rock taken from this crevice. The lowest went 60 dollars to the ton, the next $125, while the highest reached the good figures of $575. There are now on the dump 30 tons of high-grade ore. There are many more lodes embraced in this district, several of which will compare favorably with those I have enumerated.

BULLION.—*Montanian*, May 1: Messrs. WIANT & LEHMAN of the Clipper mine, Silver Star District, on Sunday last sent up to Banker Elling, for shipment, another batch of eighty ounces of bullion from their lode. The regularity with which these shipments are made, justifies us in saying the Clipper is paying a handsome profit to its owners, and is the treasure-house of the district.

ANOTHER CLEAN-UP.—Helena *Gazette* May 7: Messrs. KEATING & BLACKER have just made another run and clean-up at their quartz mill at Keatingville, Jefferson County, and the result is, 520 ounces of gold retort, which was brought to this city yesterday by them in person and deposited in the First National Bank. The value of this bullion in currency is about $12,000. It will be remembered by our readers that it has only been a few days since Messrs. KEATING & BLACKER made their first run of the season, which was valued at over $14,000. These runs are from the average rock on the dump.

Colorado.

PARK COUNTY.

From the Mount Lincoln *Sentinel* of May 29:

We have taken considerable pains to get a correct statement of the silver production of Park County during the summer and fall of 1872, and think that the following will come nearer the truth than any estimate yet published.

THE MOOSE MINE

worked about eight men for 120 days, and produced 570 tons of ore, which was assorted into three classes. The first-class ore was shipped to Europe, and the assay of the same at Denver yielded $5,200 per ton, which, by the way, we claim to be the highest yield of any car load of ore yet shipped from Colorado. It was principally copper pyrites and galena, intimately mixed with silver glance and brittle silver. The second class ore, 300 tons, was valued at $550 per ton, while the third class mineral yielded $325 per ton, making a total result of $330,000 for this one mine. We know from personal examination that this enormous quantity of incredibly rich ore was taken simply from the drifts, shafts and cuts, which were run to develop the mine, and that to this day not one single pound of ore has been stoped out. The reserves in sight are immense, as the property shows a continuous vein of solid mineral 200 feet in length and two to seven feet in width. It is impossible to determine the worth of this gigantic mass of crude bullion, but competent mining engineers have estimated its value at two million dollars. This alone will place the "Moose" mine the first of the noted silver mines in the Territory. Each drift and tunnel, throughout the mine, shows large veins of exceedingly rich ore. In a future article we shall make a full and complete report of the working of this celebrated mine.

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

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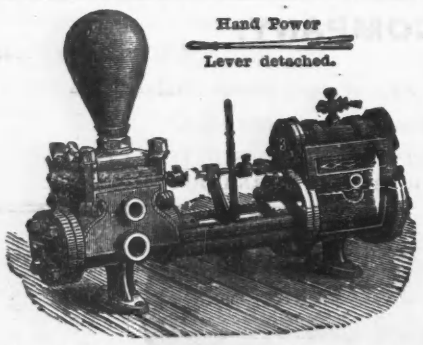

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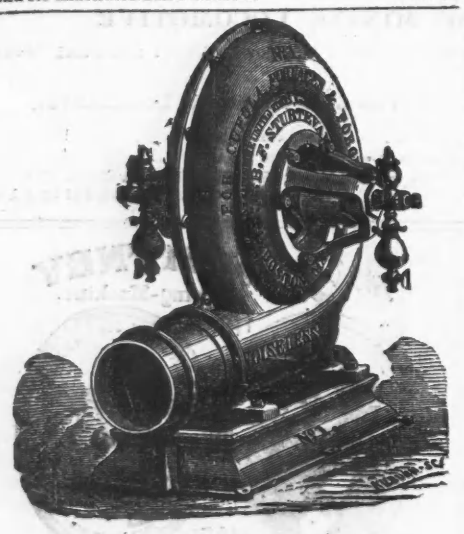

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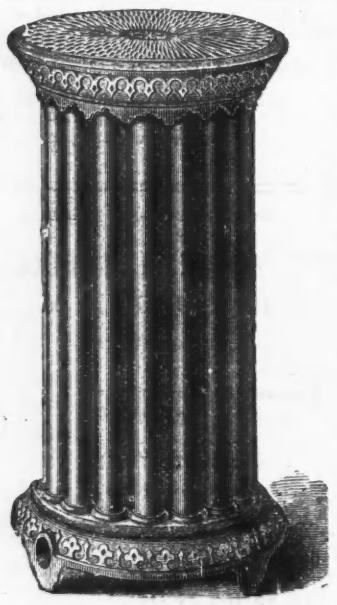

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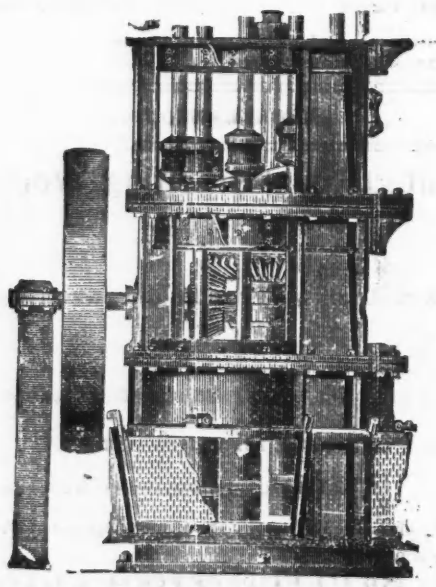

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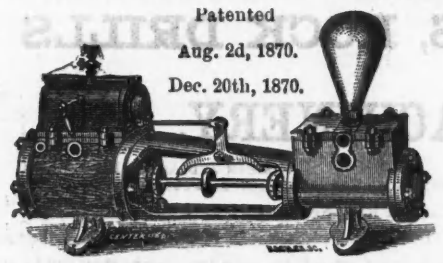

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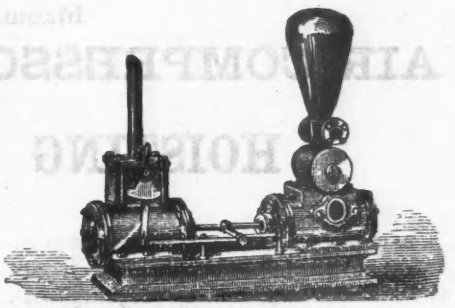

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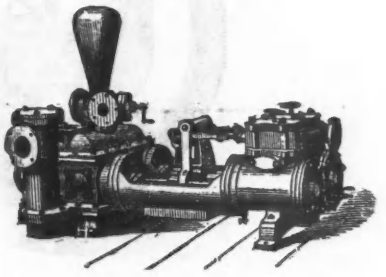

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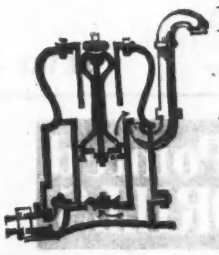

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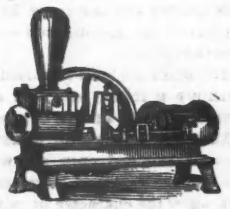

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