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"THE ENGINEERING AND MINING JOURNAL" ADVOCATES THE ADOPTION OF THE METRIC SYSTEM OF WEIGHTS AND MEASURES,

and urges all who are interested in the simplification of our present complicated and unsatisfactory systems to aid, by their active sympathy and encouragement, the early introduction of this much needed reform.

TABLE FOR THE CONVERSION OF ENGLISH AND METRIC UNITS.

This table will be published every week in the ENGINEERING AND MINING JOURNAL. It is based on the authority of RANKINE, and is correct to the fourth decimal place.

1 Meter = 3'2807 feet.	1 Atmosphere = 14.7 lb. per sq. in. = 10 ³ / ₃₃₃ kilog. per sq. meter = 29 ⁹ / ₉₂₂ in. or 760 mm. of mercury = 33 ⁹ / ₉ ft. or 10 ³ / ₅ meters water.
1 Foot = 0'3048 m.	1 Kilogramme = 2'2046 lb. av.
1 Liter (vol. of 1 kilog. water) = 0'2202 gal.	1 Pound av. = 0'4536 kilog.
1 Gallon (vol. of 10 lb. water) = 4'541 liters.	1 Deg. centigrade = 5-9 (deg. F. - 32°)
1 Kilog. per sq. meter = 0'2048 lb. per sq. ft.	1 Deg. Fahrenheit = 9-5 deg. C. + 32°
1 Kilog. per sq. mm. = 1422'28 lb. per sq. in.	1 Calorie (kilog. water raised 1° C.) = 424 kilogrammeters = 3'0683 heat-units.
1 lb. per sq. in. = 703'0052 kilog. per sq. m.	1 Heat-unit (lb. water raised 1° F.) = 772 ft.-lb. = 0'252 cal.
1 Gramme = 15'4323 gr.	
1 Grain = 0'0648 gram.	
1 Kilogrammeter = 7'2331 ft.-lb.	
1 Foot-pound = 0'1383 kglm.	

THE AMERICAN IRON TRADE IN 1876.

We publish elsewhere, from advance sheets of the annual report of the Secretary of the American Iron and Steel Association, complete and interesting tables giving the product and distribution of the iron and steel industry of the United States during 1876. The report from which these are extracted reflects great credit upon Mr. SWANK and his assistant, Mr. COPE; and, since we have not been backward in criticism when it seemed to us necessary, we are doubly glad of an opportunity to praise heartily where praise is due.

Probably Mr. SWANK would say that his views concerning the prospects and needs of the iron business have not changed. We do not care to discuss that question, or to claim that he has been led, by the inexorable logic of facts, to a position in substantial agreement with our own. It is far more important, as well as more agreeable, to note his present deductions from the figures he has so industriously and intelligently collected, and to suggest some further inferences which seem to be in harmony with his.

The leading fact presented by these tables is the decline in the pig iron product of the Lehigh, Schuylkill, and Susquehanna valleys since 1872 (though the difference between 1875 and 1876 in these regions is not very great), and the increase of product in the Hanging Rock district during the same period, together with the revival of industry in 1876 in the Shenango and Mahoning valleys. We do not anticipate that the Eastern districts will continue to decline in importance. Probably the bottom has been touched—in quantity, if not in cost and price. But it is becoming evident that the West will take care of its own growing market, and will prove a source of keener competition than need be feared from abroad.

Another point noted by Mr. SWANK is the falling off in the product of charcoal pig of nearly 50 per cent. since 1874. This decline is very generally distributed, only one State, Maine, showing an increase. But the total product of Maine is but 3,002 tons. Michigan, the heaviest manufacturer of charcoal pig, has lost, since 1874, 36 per cent.; Ohio, the next in order, has lost 47 per cent.; Massachusetts and Virginia, 70 per cent.; Tennessee, 73 per cent., and other States an average of about 40 per cent. This wide-spread phenomenon is undoubtedly the result of "hard times," which have so cheapened the prices of anthracite and coke irons as to exclude the use of the more costly charcoal irons, except for

purposes for which they are considered absolutely necessary, and also, we may add, to reduce somewhat the category of such purposes.

The continued increase in the proportion of iron smelted with bituminous coal and coke is but another form of the change produced by the rapid development of the West. It has a geographical and industrial rather than a metallurgical significance.

Mr. SWANK shows that the total consumption of pig iron in 1876 was 2,172,503 net tons, or a quantity equal to the consumption in 1871. He adds, "The changed condition since that year of the pig iron branch of the American iron trade is seen more in the fall in prices than in the decrease in production." This is quite true, but it must be taken in connection with some other figures furnished by Mr. SWANK, in order to present the whole truth. In 1872, the product jumped to more than 3,000,000 net tons, and was nearly as great in 1873. In 1871, according to the annual report of the Association, the utmost capacity of the blast furnaces of the country was about 2,500,000 tons. At the close of 1873, the number of furnaces was 657, and this number was increased in the following years to 693, 713, and 714. Mr. SWANK is fully justified in saying that the productive capacity of the furnaces of the country is at least twice the actual yield of either of the last two years. Taking all these facts together, we see that we have, since 1871, doubled our capacity for production, while the product does not exceed that of 1871. In other words, the immense expansion of the industry in 1872 and 1873 is the cause of its present collapse; and this collapse is measured not by a direct over-production, but by an over-capacity for production, which tends to produce the same effect in respect of low prices. No considerable advance in prices, without an increase in consumption, is, therefore, likely to be realized, since the first result of a movement in that direction would be the starting of idle furnaces which cannot be profitably run at present prices, and which would render actual the over-production which is now potential. Mr. SWANK concludes, from a careful review of the field, that the product of 1877 will be at least as great as that of 1876, and remarks that "it is for the producers to decide whether it is wise to increase production at present prices." It is, however, hopeless to attempt to effect any "combination" among producers; and the only way in which they will decide this question is according to their own individual necessities or advantages. The continuance of low prices is sure in the end to increase consumption and restrain the tendency to over-production. Hence the low prices must be regarded as a "blessing in disguise" even to the iron manufacturer. That they have been and are a blessing undisguised to the great railway and other industries employing iron, Mr. SWANK very clearly points out.

A striking proof of this is the steady maintenance of the item of rolled iron. The product of our rolling mills in 1876 was nearly as great as in 1872 or 1873. This being the form in which the larger part of our pig iron is used, the fact seems at first glance extraordinary that there should be a falling off in pig iron of nearly 800,000 tons from 1872 to 1876, and no corresponding decline in the amount rolled. We think the chief cause is to be found in the great consumption of old rails in the manufacture of beams, shapes, and bars, as well as rails. The low price of old rails (not much above that of foundry iron) has made them available for many purposes. We do not think, however, that they have yet been used in this country for the manufacture of steel, as they are at Terre-Noire.

The Bessemer and other steel industries, profiting by the cheapness of their raw materials, and by the progress in mechanical perfection achieved by American genius and energy, have made rapid advances during the last three years. Mr. SWANK gives the product of Bessemer ingots at 525,996 net tons in 1876, against 375,517 tons in 1875, about four-fifths in each case having being manufactured into rails. The product of 1877 will be still larger; but the capacity of the existing plant is larger yet. The product of Siemens-Martin steel increased from 9,050 net tons in 1875 to 21,490 in 1876. This manufacture may be expected to increase hereafter with still greater rapidity. We hear of several projected works. But it is, in the opinion of the best authorities, not likely that new Bessemer works will be erected for a considerable time to come.

Mr. SWANK advocates the "generous aid of the United States in establishing direct communication between the leading seaports of this country and the seaports of other countries"; opposes the admission to register of foreign-built ships; and considers it "a source of mortification that we should last year have bought about ten million dollars' worth of pig iron, bar iron, steel, etc., which our own iron and steel makers could have manufactured with the help of idle workmen." We cannot fully agree with him in these particulars. We are opposed to government subsidies, for one reason if no other: that they have proved, under our form of government, a source of corruption in legislation far outweighing any real or fancied benefit conferred by them on special interests. We do not feel greatly "mortified" about the imports of iron and steel, etc., when we note that our exports of the same class of commodities were considerably greater—\$15,997,643 currency against \$10,584,126 gold—and, moreover, that the largest items of imports were the comparatively crude materials of manufacture, while the largest items of exports were higher forms of manufacture, involving less material and more labor and skill in proportion to value. Of course we cannot have foreign commerce without importing something, and it seems clear that this had better be, so far as American industry is concerned, material susceptible of further manufacture by our own artisans. Mr. SWANK will doubtless agree with us that, if we managed to exclude all foreign iron and steel, and foreign countries reciprocated the measure by excluding American reapers, mowers, and sewing-machines, the result would not be in our favor,

We do not understand that Mr. SWANK proposes the removal of the source of mortification above alluded to by an increase in the tariff. What he seems to urge is that the present tariff shall be let alone. He may be advised of some peril in that direction of which we are ignorant, or he may be merely repeating, for reasons of consistency or by force of habit, arguments which possessed more interest in times when the tariff was really of importance to the iron business. At present, with the exception of the steel manufacture, we doubt whether any branch of this industry cares much about it. Home competition is now the overwhelming pressure; and this fact Mr. SWANK abundantly recognizes. When the trumpet sounds again for the assault on the despotisms of Europe, we may or may not follow his oriflamme. That will depend upon the nature of the crisis and the rate of his headlong charge. But for the present we find ourselves in harmony with him on the points which he would doubtless admit to be of most pressing and immediate importance—above all, on the supreme necessity of increased economy, skill, and prudence in management, as the only means of insuring a survival in the present fierce struggle for life among iron manufacturers.

A NEW TELLURIUM PROCESS.

Staff Correspondence of the Engineering and Mining Journal.

A correspondent of the *Denver Mirror*, who states that he has given two years' study to the Boulder County tellurium mines, broaches an entirely new and highly original set of theories regarding the occurrence of these minerals, and, as usual, gives the outlines of a new "process" for their beneficiation. His "thoughts" on the subject are so highly suggestive that we feel it a duty to copy them verbatim, feeling assured that the many readers of the JOURNAL in the tellurium belt will be desirous of profiting by them. They are as follows:

"These ores are already in a state of sublimation, that is, the ore has been forced up through fissures in the rock in immense waves. They are called pockets or chimneys, and range at an angle of 45 degrees. These were (as I can conclusively prove) in a more than molten heat, and the gold, tellurium, arsenic, etc., were forced through the rock by incalculable pressure while heated to a state of vapor, when the rock or ore was in a molten mass. It is a well known fact that gold will sublimate and pass off at a heat of about 4,000 degrees. Hence you perceive at once the folly of trying to concentrate with water, because water has an affinity for gold nearly equal to quicksilver, and never drops it, as can be abundantly proven, but the gold in these ores is infinitely finer than flour, if possible. You also see the folly of trying to smelt it. These are the reasons that our immense mines in this county do not pay, but you say, How can they be treated differently? Oh! very easily. The ore must be roasted in an air-tight cylinder or compartment, as gas or quicksilver is retorted from the cinnabar, its ore. Then it must be repulverized and amalgamated dry. For details see 'Paul's Plan for Dry Amalgamation.' It is the California plan, by which they so successfully treat their ores, and will soon be in operation in the Atchison Co.'s mill, at the mouth of Gold Run, near Salina, when it will speak for itself."

After reading this our subscribers in Colorado will doubtless draw a long breath of relief and thank Providence that light has come at last. The subject is exhausted, the true process found out, and the revolution in metallurgy already begun. Our smelters and mill-men may as well close down their furnaces immediately, and even Brett will find it necessary to emigrate. The JOURNAL experiences a feeling of mortification that it has been forestalled by a political paper in publishing first the details of the metallurgy of the future.

We confess, however, to some curiosity as regards the means the gentleman in question will take to prove his first position, viz. that the "gold, tellurium, arsenic, etc., were forced through the rock by incalculable pressure while heated to a state of vapor." Not that we doubt the assertion for a moment, but if the pressure was incalculable, the elements of the proof must be infinite quantities, and the solution of a problem of this nature must present some rather unusual features. We also know that gold will volatilize at 4,000°, more or less, according to the fancy of the metal, but the connection between this very apparent fact and the succeeding statement of the *Miner's* correspondent, that it is "folly to try to concentrate with water," is, we confess, somewhat dim. Again, it has been the prevailing opinion among students in all ages that water and gold had no special affinity for each other, except that an infinitely large quantity of the former is thought to have the power of dissolving an infinitely small quantity of the latter. These old foggy notions will, however, have to be given up in the future. The new theory affords an excellent explanation of the fact that gold occurs in the bed of creeks. The affinity of the metal for water is so great that it is drawn out of the veins into the gulches, and there held.

The writer's process is simple in the extreme. Roasting in air-tight cylinders, pulverization, and amalgamation. It is not stated how high a percentage of the metal is to be saved, but we presume that anything under 150 per cent. would be regarded as poor work. The inventor is also silent as to the cost of the process, but private information from the Atchison Company's Mill, at Salina, kindly vouchsafed to us by his assayer, intimates that, instead of making any charge, a bonus of \$50 per ton will be paid for each ton of ore brought in, besides its full contents as determined by fire assay, and that the company is preparing a fine chromo in forty-three colors, which will be distributed among sellers as an added inducement.

THE JACARILLA MINES, N. M.

A genuine excitement has begun over the Jacarilla placer mines in New Mexico. There is no water whatever on the ground, and all operations must be carried on by dry washing, as it is called.

The top ground of these diggings yields from 10 to 25 cents to the pan. The deposits are very deep, and have been known for many years, but the complete absence of water has prevented their exploration. Several parties of miners

from Southern Colorado have recently started for the new camp. A new process for working the gravel, by means of a machine known as Ginn's patent dry washer, has lately been tested on the ground, and is reported to have given great satisfaction. If this report is corroborated, there will be a tremendous rush to the new camp in a few weeks.

STATISTICS OF THE AMERICAN IRON TRADE.*

We are indebted to Mr. JAMES M. SWANK, the Secretary of the American Iron and Steel Association, for advance copies of his annual report upon the iron trade, and for courtesies by which we are enabled to give our readers at this early day a full statement of the condition of the American iron trade, embodied in the following tables:

GENERAL ANALYSIS, IN NET TONS OF 2,000 POUNDS.

We give in the following table an analysis of the total iron and steel production of the United States during the past five years.

PRODUCTS.	1872.	1873.	1874.	1875.	1876.
Pig iron.....	2,854,558	2,868,278	2,689,413	2,266,581	2,093,236
All rolled iron, including nails and rails,	1,941,992	1,966,445	1,839,560	1,830,379	1,921,730
including rails, including nails and ex-					
cluding rails.....	941,992	1,076,368	1,110,147	1,097,867	1,042,101
Bessemer steel rails.....	94,070	129,015	144,944	290,863	412,461
Iron and all other rails.....	905,930	761,062	584,469	501,649	467,168
Street rails, included in iron rails.....	15,000	9,430	6,739	16,340	13,086
Rails of all kinds.....	1,000,000	890,077	729,413	792,512	879,629
Kegs of cut nails and spikes, included in					
all rolled iron.....	4,065,322	4,024,704	4,912,180	4,726,881	4,157,814
Crucible cast steel.....	29,260	34,786	36,328	39,401	39,382
Open-hearth steel.....	3,000	3,500	7,000	9,050	21,490
All other steel, except Bessemer.....	7,740	13,714	6,353	12,697	10,306
Bessemer steel ingots.....	120,108	170,632	191,333	373,517	525,996
Blooms from ore and pig iron.....	58,000	62,564	61,670	49,243	44,628

TOTAL PRODUCTION OF PIG IRON IN 1872, 1873, 1874, 1875, AND 1876, BY STATES.

Statistics collected from the manufacturers by The American Iron and Steel Association.

STATES.	Whole Number Completed Furnaces, December 31.					Condition of Furnaces on December 31, 1876.	Make of Pig Iron in net tons. (Tons of 2,000 pounds.)					
	1873	1874	1875	1876	In.		Out.	1872.	1873.	1874.	1875.	1876.
Maine.....	1	1	1	1	1	.....	.....	780	1,661	2,046	3,002
Vermont.....	2	2	2	2	2	.....	2,000	3,100	3,450	2,400	550
Massachusetts.....	6	6	6	6	5	.....	17,070	21,136	27,991	21,255	5,040
Connecticut.....	10	10	10	10	4	.....	22,700	26,977	14,518	10,880	10,160
New York.....	53	58	57	57	23	34	291,155	296,818	326,721	266,431	181,620	
New Jersey.....	16	17	18	18	4	14	163,858	102,311	90,150	64,069	25,349	
Pennsylvania.....	262	266	278	279	113	166	1,401,497	1,389,573	1,213,133	960,884	1,009,613	
Maryland.....	22	23	24	24	5	19	63,031	55,986	54,556	38,741	19,876	
Virginia.....	35	38	34	33	6	27	21,445	26,475	29,451	29,985	13,046	
North Carolina.....	8	8	8	8	.....	8	1,073	1,432	1,340	800	400
Georgia.....	8	10	12	11	2	9	2,945	7,501	9,786	16,508	10,518	
Alabama.....	11	14	14	13	5	8	12,512	22,283	32,863	25,108	24,732	
Texas.....	1	1	1	1	.....	1	619	280	1,012	.....	426
West Virginia.....	6	9	12	12	1	11	20,796	23,056	30,134	25,277	41,165	
Kentucky.....	25	27	23	23	4	19	67,393	63,839	61,227	48,339	34,583	
Tennessee.....	20	22	22	24	5	19	42,454	43,134	48,770	28,311	24,585	
Ohio.....	88	93	100	100	38	62	393,743	406,029	425,001	415,893	403,277	
Indiana.....	8	8	9	9	3	6	39,221	32,486	13,732	22,081	14,547	
Illinois.....	10	10	12	12	3	6	78,627	55,796	37,946	49,762	54,168	
Michigan.....	33	34	34	34	7	27	100,222	123,506	136,662	114,805	95,177	
Wisconsin.....	13	14	14	14	5	9	65,036	74,148	50,792	62,139	51,261	
Missouri.....	18	19	19	19	6	13	101,158	85,552	75,817	59,717	68,223	
Oregon.....	1	1	1	1	.....	1	.....	.....	2,500	1,000	1,750
Utah.....	1	1	1	2	.....	2	.....	.....	200	150	65
Minnesota.....	1	1	1	1	.....	1	.....	.....	.....	.....	.....
Total.....	657	693	713	714	236	478	2,854,558	2,868,278	2,689,413	2,266,581	2,093,236	

ANTHRACITE.

STATES.	1872.	1873.	1874.	1875.	1876.
Massachusetts.....	1	1	1	1	.....
New York.....	36	41	41	18	23
New Jersey.....	16	17	18	18	4
Pennsylvania.....	149	152	161	164	62
Maryland.....	4	5	3	3	1
Virginia.....	1	1	1	1	.....
Total.....	207	217	225	228	85

BITUMINOUS COAL AND COKE.

STATES.	1872.	1873.	1874.	1875.	1876.
Pennsylvania.....	74	75	78	76	35
Maryland.....	4	4	6	6	6
Virginia.....	.....	5	5	1	4
North Carolina.....	.....	1	1	1	.....
Georgia.....	1	1	3	3	1
Alabama.....	.....	2	2	1	1
West Virginia.....	2	5	6	6	1
Kentucky.....	3	4	4	4	2
Tennessee.....	3	4	4	4	2
Ohio.....	51	56	63	63	27
Indiana.....	7	7	8	8	2
Illinois.....	10	10	12	12	3
Michigan.....	4	4	4	4	1
Wisconsin.....	3	3	3	3	0
Missouri.....	9	8	8	8	2
Utah.....	.....	.....	1	0	1
Total.....	171	181	207	206	78

* Copies of this Report may be obtained by addressing JAMES M. SWANK, Secretary, No. 265 South Fourth Street, Philadelphia, and inclosing \$2 for each copy ordered.

IDAHO.

Staff Correspondence of the Engineering and Mining Journal.

The revival of quartz mining at Silver City, Idaho, promises this year to be rapid and permanent. For several years this district has been under a cloud, owing to the cessation of work on its more prominent mines, which, by reason of bad management on the part of the companies, or the nearly simultaneous striking of barren reaches in the veins, had failed for some time to be productive. This spring our Idaho exchanges, and principally the *Avalanche* of Silver City, bring reports of the reopening of a number of the finest veins, and the discovery already of rich chimneys of ore.

Mining first commenced in Idaho in 1860. The discovery of gold at Oro Fino began the excitement which culminated in the exploration of the Snake River Valley and the opening of the Montana mines. With great rapidity the Salmon River, Boise Basin, Owyhee, and Atlanta districts were opened, and a large mining population congregated on the various camps. From 1861 to 1867 about forty millions in gold and silver had been shipped out of the Territory. From that time the production rapidly fell off, and has not exceeded two and a half to three millions during the last five years. This decline was due almost wholly to the exhaustion of the rich surface diggings before quartz mining, except at Owyhee, had made any great advance.

The silver mines of this Territory are, however, second to none in the West in point of richness and extent. Those of Silver City are the most noted, and in fact during the first three years of their history the Owyhee mines were considered as extensive and promising as were those of Washoe and White Pine in their early days. The finest properties fell rapidly into the hands of companies, however, some Eastern and some Western, and through mismanagement, stock speculation, and rascality, one by one fell into trouble and ceased operation, till hardly a mine of any note in the district was at work. At this time a depth of 800 to 1,000 feet and over had been gained on several veins, so that the injury inflicted on the district by the stoppage was very great, and at the same time the inundated mines suffered much by caves and damaged timbering.

The latest evidence of a change of affairs at Owyhee is the reopening of the Empire, a mine whose past history will compare favorably with almost any in the West. The *Avalanche* gives the following details of the mine:

"The hoisting works and machinery are being put in thorough repair, and business is now going on there with the precision of clockwork. Mr. T. and those in his employ are confident of the existence of a magnificent ore body here, and no effort looking to a systematic development will be spared. The ledge on the 6th level is about three feet wide, with eight inches on the hanging wall, which is very rich in free gold, much of which will mill up into the hundreds. The balance of the ledge is strong and well defined, being liberally streaked with silver and gold, with every indication that none of the quartz in it will yield less than \$40 to the ton. About one hundred tons of the rock will be crushed during the month of May, and it is the intention to have two more levels opened up early next month, when the supply of high grade ore will be sufficient to keep a mill constantly running."

The Poorman is still idle. Of the other two noted mines, the Golden Chariot and Belle Peck, the same paper reports as follows:

"The Golden Chariot is wearing a more promising look than ever. The 13th level is now in 325 feet. The vein matter has changed somewhat in appearance recently. It exhibits more mineral and has a more healthy indication as the work progresses. The cross drift from the 9th Chariot towards the east side is in 190 feet. The developments on the first south extension are very promising, sufficiently so to warrant the belief that the cross drift will intersect the lode at a point where a large ore body may confidently be looked for. As a result of the systematic and well directed operations that have been in progress in this mine for the past few months, the existence of three promising veins, east of the Chariot, viz., the middle vein, Crane & Driggs, and the East Side, is now very clearly defined, and each is contributing its quota to the general yield of the mine. The two first named veins are dipping rapidly into the East Side, and the point of intersection of the cross drift from the 9th Chariot will, it is expected, find the three united in one vein. The large quantity of ore now ready for crushing is mainly from the middle vein running from the 4th to the 7th level, and as it will unquestionably yield a handsome return, judging from assays, it turns out to be a fortunate circumstance that the operations in this section of the mine have been conducted with such untiring energy and thoroughness by Superintendent Baldwin. Coupled with the hopeful and promising character of the work so faithfully prosecuted at the 13th level, we have every indication and assurance that the Golden Chariot will become a property that will handsomely repay the toils, investments, and patience of its owners. The road leading to the mill is now in thorough repair. Quartz hauling has commenced, and the mill is crushing away at a lively rate.

"The Belle Peck is looking splendidly again, and the work is being carried on both night and day. Rich rock is being taken from the ledge in the lower levels, and now that the water is being kept at bay, everything in and about the mine has a promising appearance. The pay streak is from two to two and a half feet wide, and looks remarkably promising throughout; so much so that Mr. Peck is satisfied there are fully fifty thousand dollars in sight."

AFFAIRS IN ARIZONA.

Staff Correspondence of the Engineering and Mining Journal.

Our mining summary in this issue from the far Southwest will be found to contain many interesting items. Arizona mines are attracting much attention at present in California, where capitalists are always on the lookout for new and rich investments, and during the last twelve months the developments in that territory have been of a character to excite the liveliest interest in its future. On the coast there is almost an Arizona excitement. This, however, is partly due to the near approach of the Southern Pacific to the Colorado River, and to the belief which exists that not only will that road be pushed on across the river and up the valley of the Gila, but that the coming summer will result in something definite in the affairs of the Texas Pacific. From New Mexico we have correspondingly encouraging reports. The Jacarilla gold excitement is on the increase, and is drawing quite an immigration, while affairs on the Moreno, at

Silver City, and in the mineral districts around Santa Fe are brighter than at any time previously.

The prospects for the great Southwest are therefore very promising. By reason of its remoteness and inaccessibility, its greasers and Indians, this part of our country has developed heretofore very slowly. General Crook's successful campaign in Arizona against the Apaches has had much to do with the change of affairs in that Territory. No part of the West is better supplied with rich mines than Arizona, and whether the Indians are subdued by the military or gradually exterminated by the miner, it has been only a question of time with that Territory.

Among the great mines of Arizona, the Vulture, the Silver King, the Peck, the Zalido, the Huckleberry, Naiad Queen, McCracken, and Picacho are at present attracting the most attention. Near the New Mexican border, the Santa Rita copper deposits are turning out magnificently. The Castle Dome mines, though but little heard of, are yielding well and with regularity, and in the northern part of the Territory, near the Nevada and Utah line, the country is covered with prospectors from Pioche and Leeds, who may be expected before long to bring to light something new and rich. Arizona is emphatically a land of wonders in many ways. The greater part of the country is barren, hot, deserted, and forbidding, but it is rich in ruins of races long since extinct, who in centuries past wandered through its gray canons and over its treeless plains, and here and there assembled themselves in villages. There are abundant evidences of abandoned quartz and placer mines from which the aborigines took gold, silver, and copper, and which, in a few years more, will doubtless be largely rediscovered and reopened by the American miner.

Since its incorporation into the territory of the United States, Arizona mines have yielded about \$15,000,000 in gold, silver, and copper. Notwithstanding the forbidding aspect of the country, it is crossed by several beautiful and productive valleys, and will never lack for the necessaries of life. And as it is opened by the railroad, and the labor of the prospector and miner is eased by approaching civilization, no part of the West is likely to grow more rapidly.

A NEW TELLURIDE DISCOVERY.

Staff Correspondence of the Engineering and Mining Journal.

Telluride of lead has lately been discovered at the head of the Blue River in Summit County, close by the Hoosier Pass. A well-defined vein is the carrier of this mineral, and, though the sample brought to our Western Office showed no traces of precious metals, it is likely that sylvanite, hersite, and petzite will be found as soon as the vein is explored further, as it most probably will be this summer.

The discovery of this rare element so far away from the recognized limits of the Colorado tellurium belt is, at least, an interesting fact. The Blue Valley has long been known to be rich in ores of lead, copper, zinc, and bismuth, and, if its somewhat remote location had not operated strongly against a thorough prospecting of the mountain in which it lies, probably tellurides of gold and silver would have been found and mined long before this.

In the summer of 1873 the writer met a gentleman at Breckinridge who had just returned from a prospecting tour in the mountains around Hoosier Pass. He had with him a sample of very rich silver ore, of a dark color and metallic lustre. Neither party who examined it was positive of the character and name of the ore, nor has the writer ever heard anything of the examination which was probably made. It is possible that the specimen in question was a telluride. If so, the gentleman who found it, and is now one of Georgetown's mill men, may possibly have been the first discoverer of this rare mineral in Summit County.

LATEST FROM THE BLACK-HILLS.

Staff Correspondence of the Engineering and Mining Journal.

Information from the Black-Hills is generally discouraging. The New Eldorado is thronged with thousands of penniless men, who are wholly unable to secure ground to work, and equally unable to pay their living expenses. So far, the spring has been very backward, deep snows have fallen along the routes from Bismarck, Yankton, and Cheyenne, and cold, raw weather has prevailed. There is much suffering among the new arrivals.

Deadwood, Whitewood, and Spring gulches are being worked with some success, about 23 miles of the bed of these creeks having been taken up. The first named has so far been the most productive, but all are sported. Bed rock has been reached only in a few places. The depth of the gravel is from 12 to 25 feet, and in rare instances deeper. No new strikes are yet reported, though hundreds of men, who find there is no ground left to take up and have no money to purchase, are scattering over the adjoining districts and giving them very thorough examination. There will doubtless be some new discoveries this year.

Six stamp-mills and one arastra are in operation on quartz taken from the lodes around Lead City, Gayville, and Golden City. Three or four other mills are on the way or being set up. There is also a Hendric pulverizer in operation.

It is said that three hundred and fifty-nine ounces of gold was the result of a nine days' run of a ten-stamp mill at Central City, Dakota, recently.

Discoveries of silver ore are being made at Bear Buttes. It is thought by many that the resources of the Hills in this metal are already showing better than for gold. Several large sales are reported.

The Union Pacific Railroad Company has ordered 7,000 tons steel rails for the Black Hills branch of its road.

THE PROPERTIES OF IRON ALLOYED WITH OTHER METALS.*

By G. H. Billings, Norway Iron Works, Boston, Mass.
(Concluded from page 395.)

IRON AND PLATINUM.

These metals readily combine at a lower temperature than is required to melt iron and in every proportion. Crookes and Roehrig, in their *Treatise on Metallurgy*, remark: "It is still problematical whether the small additions of platinum, silver, nickel, etc., exert that good influence attributed to them upon the sorts of steel known as platinum steel, silver steel, etc., or whether the good quality of the steel is due only to suitable treatment." The numerous experiments I have made go to show that the good quality of steel and iron, especially low iron, is due to the treatment they receive, and to their freedom from all foreign elements, with the single exception of carbon. My experiments have not shown another element that has the property of giving hardness to iron to the same degree without impairing its workable quality to a greater. Platinum alloyed with iron renders it hard, but less so than the same amount of carbon; while at the same time it prevents its being worked at as high a heat as the unalloyed iron, or the iron containing the same amount of carbon. The fracture of an alloy containing as high as 1 per cent. of platinum does not materially differ in appearance from that of the unalloyed iron. The grain, however, is somewhat finer, resembling the fracture of steel of about 3 per cent. carbon. In rolling an ingot of iron alloyed with .82 per cent. of platinum and .08 per cent. carbon at a red heat, in a strand groove (it would work solidly in this if it would work at all), it broke into pieces two or three inches long throughout the entire delivery of the bar. At a white heat it would not bear the blow of a hammer without falling to pieces. Specific gravity, 7.861. The same iron, when containing 4 per cent. of platinum and nearly 2 per cent. of carbon, at a low red heat was drawn under the hammer and rolled with but slight evidences of red-shortness, yet in quality it was not equal to the same iron having nearly the same amount of carbon without the platinum.

IRON AND ALUMINIUM.

Opinions as to the effect of aluminium alloyed with iron are greatly at variance. Most of the attempts to produce this alloy having been made with steel or cast-iron, it is probable that the effect of the aluminium was neutralized to a certain extent by the amount of carbon present, and that the beneficial effect ascribed to the aluminium was really due to the carbon. An account in *Useful Metals and their Alloys* relates "that Faraday and Stoddard obtained an alloy of iron containing .064 of aluminium and some carbon by keeping under fusion during a considerable time a mixture of highly carburated steel with alumina. The alloy was white, very brittle, and of granular texture." While M. Karsten attributed a mischievous influence to aluminium, Messrs. Faraday and Stoddard concluded that "aluminium in small quantities does not impair the quality of iron; and that it appears to considerably improve the quality of steel." "Grüner and Lan think aluminium to be more injurious than is generally believed, and for this reason presume the ores from Dannemora, which are poor in alumina, form an excellent material for the Bessemer process." In alloying aluminium with iron by using its oxides, I employed, by weight, twelve parts of emery, eighteen parts of alumina, one part of pulverized charcoal, and thirty-six parts of fine turnings of the same iron as used in all these experiments. After mixing the mass thoroughly, it is subjected to a white heat for 48 hours, and then placed in a port flame of a Siemens regenerative furnace, and allowed to remain, uncovered as long as the crucible would stand the excessive heat. It was then taken out and the contents poured into a cylindrical iron mold. When cold, the ingot was broken, but with considerable difficulty. The fracture showed a solid homogeneous body of fine crystalline structure, resembling steel of about 1 per cent. of carbon. Heated to cherry-redness and placed under the hammer, it forged remarkably well. But upon endeavoring to forge it at a yellow heat, it crumbled into fragments. A piece was rolled at a red heat and worked without cracking, and when cold this was broken, showing a very fine fracture, crystalline in appearance, inclining to silky gray in color. Heating afterwards to a yellow heat a piece that had been rolled at a red heat, it failed under the hammer. It would not harden, nor was its resilience increased more than soft iron would have been by plunging it at a red heat into cold water. With an increase of carbon, I found that at the same temperature there was an increase of cohesion, while, with 1 per cent. of carbon, the alloy, with proper attention, could be worked without fracture, yet it could not be welded. It will be noticed by the analysis that the addition of carbon as a flux increased the percentage of that element in the alloy. Analysis:

Carbon.....	20	Specific gravity.....	7.727
Aluminium.....	52		

When the metal aluminium was added to a pot of melted iron, the product exhibited the same characteristics.

IRON AND ANTIMONY.

One per cent. of antimony was added to the melted iron without producing any unusual feature, and the whole allowed to remain twenty minutes in the furnace after the addition of that metal, when the alloy was poured into a mold, showing a slight rising in the center of the ingot. The union of the two metals seemed to take place with freedom and much greater ease than lead, zinc, or copper with iron, these metals mostly vaporizing in a short space of time. After the ingot was cold it was struck with a small hammer to disengage some adhering scoria, when it fractured at the point of contact, exhibiting a honey-combed fracture of uneven, coarse crystallization, having the appearance of the fracture of blister steel of about 1½ per cent. of carbon, such as the most highly heated bars of cementation exhibit. When heated and hammered, or rolled in a strand groove, it crumbled into pieces. By all tests applied it displayed decided cold-shortness as well as red-shortness.

IRON AND BISMUTH.

Having added 5-10 per cent. of bismuth to a pot of melted iron as heretofore, the contents poured freely without boiling or rising in the mold. When cold the ingot was broken with great difficulty, showing a beautiful fracture resembling that of low Bessemer steel. The strength of the iron did not appear to be greatly diminished, although it was somewhat harder. M. Karsten endeavored to ascertain the influence of this metal upon iron; with this object he tried several refining experiments (probably using cast iron), in which he added 1 per cent. bismuth. He found that the bismuth did not produce any unfavorable effect, except that of retarding refining, the bars appearing to have their usual strength. The iron of his experiments contained .08 per cent. of bismuth, and there is no record of how he conducted the process, nor what tests he applied to

* A paper read before the American Institute of Mining Engineers, at the New York meeting, February 1877.

the alloy. As it is probable that the iron used contained a high per cent. of carbon I am inclined to think that the influence of the bismuth was obscured by the excess of carbon, because, in all my experiments with this metal alloyed with iron low in carbon, decided red-shortness was observed when worked and rolled at a red heat. Analysis gave bismuth only a trace, carbon .08 of 1 per cent.

IRON AND MOLYBDENUM.

Molybdenum readily unites with iron, rendering the melted metal very fluid, settling well in the mold, and producing an alloy which cannot be worked on account of its extreme red-shortness. One per cent. of molybdenum renders good iron utterly worthless.

IRON AND ZINC.

When zinc was added to the melted iron, excessive boiling resulted, accompanied by copious vapors of zinc. When all vapors had ceased, the contents in the crucible were poured, and the ingot rolled while yet hot. It rolled well until reduced to a thin flat, when evidences of red-shortness appeared. The product of this experiment rolled better than that of any of the others, but still was seriously impaired with the zinc, although only traces of that metal were found by analysis.

IRON AND LEAD.

Results the same as with zinc.

IRON AND SILVER.

In this experiment the silver showed but little affinity for the iron. Five-tenths of 1 per cent. of pure silver was added to a pot of iron after complete fusion, and the contents poured twenty minutes later, flowing freely, and settling well in the mold. When cold the ingot was examined, and globules of silver found in the adhering slag and in the top of the ingot, and also in the bottom of the crucible. The alloy fractured with difficulty, showing a firm, solid fracture of fine crystalline appearance. The alloy was harder than the iron unalloyed. When rolled and hammered at a red heat it showed red-shortness. Analysis gave only traces of silver.

IRON AND COBALT.

According to Berzelius, "the alloy of these two metals is hard and magnetic, but the precise influence which different proportions of cobalt exercise upon the ductility of iron is not known." M. Berthier says "that the alloys of these two metals have the same properties as pure iron, and are whiter." Observing traces of cobalt in most of the manganiferous pig irons and spiegeleisens and the iron made from these, which was often red-short, a more thorough investigation was given to the influence of this metal upon iron than to some of the other, as many of the other are seldom met with in practice. Five-tenths per cent. of cobalt, in the form of pure protoxide, was intimately mixed with a sufficiency of pulverized charcoal for its reduction, and placed in the bottom of a crucible, with turnings of the iron placed above, and upon this fifteen pounds of iron cut in small pieces. The whole was allowed to remain in the furnace, until complete fusion was effected, when it was poured as heretofore, forming a solid ingot, tough when broken, and of clear crystalline fracture. When rolled into a bar 2 inches by 5/8, it evinced but slight evidence of red-shortness. Desiring to test it for its suitability for horseshoe nails—for which purpose the original iron was used—it was reheated and further rolled into a plate, having the heads of the nails formed by the rolls. By this rolling it cracked very badly upon the edges, some of the openings running half way across the plate; however, the nails were punched from the plate and finished, and when the customary test was applied to them they showed decided weakness, averaging but 20 per cent. of the strength of the original iron. Analysis showed cobalt .33.

THE KIND-CHAUDRON PROCESS FOR SINKING AND TUBING MINING SHAFTS.*

By Julien Deby, C. E., of Brussels, Belgium.

The sinking of a deep shaft is always a serious undertaking, especially when the strata to be traversed are of great hardness, or when they are feebly coherent or highly saturated with water.

In the first case, that of solid rock, modern appliances, such as the rock-drill put into motion by air compressors, along with suitable explosives, will generally answer the purposes of the mining engineer until he has reached the main water levels. When these have been attained, powerful and expensive pumping or hydraulic machinery comes into immediate requisition, and engines are often, at this period of the undertaking, expected to perform a higher amount of duty than any previous computation could foresee, and for which they may consequently prove inadequate. Thus frequently arise disappointment and serious trouble, both technical and financial.

If, on the contrary, the valuable minerals are overlaid by ground of a crumbling consistence, liable to "cave" or to "run," or which is drowned in a body of water, the success of sinking a shaft by the ordinary methods of mining is in most cases problematical, or at the best constitutes an undertaking of great difficulty; and when bored through such material, the shaft is always sure to prove leaky, and the mine below to contain much water, both of which constitute sources of permanent expense in the future, as well as of continual danger and discomfort to the miner.

Most sandstones, gravel and flint beds and deposits, many clays and friable limestones and marls, the chalk formation from the greensands to the white chalk, the Jurassic and Triassic formations, the tertiaries, quaternaries, and recent deposits, including most river beds, ancient and modern, belong to this class of what miners have long known by the denomination of "bad ground."

Such unsatisfactory regions occur in all parts of the world. We find them abundant in the province of Hainault, in Belgium, overlying the coal measures; in the department of the Nord and of the Pas-de-Calais, in France; in the late department of the Moselle; in the Valley of the Rhur, in Westphalia; in Staffordshire and elsewhere in England. In the United States much valuable mining property remains unexplored and unproductive from the difficulties attending the sinking of shafts through water-bearing strata. We find localities of this description in the valleys of the Lehigh, of the Susquehanna, of the Monongahela, and of the lower Mississippi, the first in the coal and anthracite regions, and the latter overlying, apparently, beds of sulphur of vast thickness and of immense value.

In the year 1849, M. Kind, an engineer, well known by his success as a well-borer, imagined that he could go through any kind of strata mechanically on the largest scale. The only thing needed to effect this being, as he supposed, the employment of sufficiently powerful and weighty tools. This idea had, however, previously been enunciated by Prof. Combes, as early as 1844, but had never been put into practice.

* A paper read before the American Institute of Mining Engineers, at the Philadelphia meeting, June, 1876.

M. Kind soon took out letters patent for his apparatus, and between the years 1849 and 1854 he undertook to execute the sinking of three shafts through water-bearing strata by his new method. Two of these were situated at Stiring-Wendel, in the department of the Moselle, and the third in the Valley of the Ruhr, in Westphalia.

It would be useless for us to give here full details of the eventual failure of all these attempts, attributable in part to the inefficiency of the tools employed, but more especially to the impossibility of making any kind of wooden tubing or casing tight at the horizontal joints, or sufficiently strong to resist the tremendous outside pressure. Although staves twelve inches thick were made use of, carefully banded together by means of iron hoops, they in every instance eventually gave way, causing the loss of the shaft. The addition of an external coating of twelve inches of concrete had no useful effect in preventing disasters. The subsequent trial of the boiler plate tubing also proved inadequate to meet the emergencies of the case.

In the year 1849 M. Mulot, the well known engineer of the Grenelle artesian boring in Paris, attempted to sink a colliery shaft by mechanical means in the Pas-de-Calais. He failed also signally through the imperfection of his tubing.

All mining engineers on the continent of Europe now hastened to condemn M. Kind's and every other process for sinking shafts by mechanical means through water-bearing strata, and they would, according to all probability, have passed forever into oblivion, had not M. J. Chaudron, an eminent Belgian engineer, taken up the study of the whole question where it had been nearly abandoned by its first promoters.

He soon modified most of the details in the construction of the boring tools, and replaced the inefficient wooden and sheet-iron casings by one formed of a series of superimposed heavy cast-iron rings. These he found it was a practical necessity to employ in a single piece and not in sections, and with flanges carefully planed on the surfaces of contact. Every separate ring was next tested as to its resistance by means of external hydraulic pressure, which proved to be a most necessary precaution, as many rings were found to be defective from imperfections in the castings. The formula employed by M. Chaudron for determining the thickness of his tubing at various depths below the surface is the following:

$$E = \frac{R \cdot P}{K}$$

in which E is the thickness required, R is the external radius in decimal metric measure, P is the pressure to be supported in kilograms per square centimeter, and K the coefficient of resistance to crushing force of cast-iron, and which M. Chaudron fixes at 500.

In order to make assurance doubly sure, he adds 0.02 m. to the value of E , and obtains thus his practical or working formula:

$$E = 0.02 \text{ m.} + \frac{R \cdot P}{500}$$

which may be fully relied on in all cases.

M. J. Chaudron did not limit his labors to devising the boring of a shaft and the subsequent introducing into it of a solid cast-iron column, but he added to his ingenious apparatus the only rational appliance for sinking, vertically and simultaneously, such an apparently unwieldy assemblage of cast-iron rings, the total weight of which often surpassed several hundred tons. This he did in a very clever manner by suspending or floating the whole system upon the surface of the water in the shaft by means of a false bottom, adapted to the lower part of the huge cast-iron tube. He still further perfected the process by introducing beneath this false bottom a stuffing-box, or as he calls it a "moss-box" (*boite a mousse*), filled with moss, and of the same diameter as the outer tubing, which constitutes, when the casing has finally reached the bottom of the shaft, a perfectly water-tight joint, shutting out permanently from the workings in the mine below, all water, either stagnant or flowing around the outer walls of the shaft. We refer the reader to *Appendix No. I.* to this paper for a short notice of the principal tools employed in the boring, and of the tubing used by M. J. Chaudron in his more recent and successful undertakings.

Soon after this gentleman had fully ripened his plans he undertook the contract for the sinking of two shafts for the *Societe de Peroumes* in Belgium, a company which had since 1827 spent immense sums of money in vainly attempting to reach the coal seams. These two shafts were known as No. 3, *Saint Vaast*, and No. 2, *Sainte Marie*. The first was to reach a depth of about 405 feet, the second of about 350 feet. The operations once commenced were carried on day and night. The body of men employed comprised, as is usual when the Chaudron process is followed, one chief foreman, one blacksmith and his striker, besides two shifts of six men each, consisting of an engine-driver, a fireman, a boss workman, and three ordinary laborers under the orders of the last.

The ground to be traversed consisted of beds of marl, with heavy layers of flint and chert, of greensands, of argillaceous glauconites, of sand, and, in fact, all the lower measures of the cretaceous formation.

These shafts were bored in two successive operations, the first bore of small diameter being subsequently enlarged to its permanent dimensions.

The shaft No. 3, *Saint Vaast*, was bored to a diameter of about 4½ feet, and to a depth of about 405 feet. This was done in the course of 121 working days. The widening of this shaft to 14 feet, and to a depth of 315 feet, where a good supporting bed for tubing was met with, required seven months.

An examination of a careful record of operations gives us the following figures for the relative periods occupied by the different parts of the process. During the boring of the small preliminary shaft, 56 per cent. of time was taken up by the operation of boring proper; 14½ per cent. in lowering and elevating the boring tools; 19 per cent. in dredging out the refuse; 10½ per cent. in stoppages for change of tools, accidents, and for necessary repairs.

The average advance for 24 hours was equal to 81 centimeters, and would have been greater had not the tools or trepans been rather too light for the work to be done. During the widening of the shaft from 4½ to 14 feet, 42 per cent. of time was occupied in the boring proper; 11 per cent. in lowering and raising the boring tools; 21 per cent. in dredging; 8 per cent. in occasional work with the smaller boring tools; 18 per cent. in changing tools, repairs, and accidents. The average daily advance was here only 32 centimeters, much time being lost by the use of too small a sand-bucket, and of boring tools deficient in weight.

The general summary shows that this shaft was finished to a depth of 405 feet, with a diameter of 4½ feet, and widened to a depth of 314 feet and a diameter of 14 feet, in the short space of 12½ months from the day the work was begun. During this period fully two months of stoppages occurred from accidental causes.

The cast iron tubing lowered into this shaft had a total height of 204 feet, and weighed 245 tons. The whole of the tools and machinery employed did not cost more than \$14,000, and the total expense of the shaft, when completed, about \$44,000.

The cost of buildings and foundations, most of which remained *in situ* for the permanent working of the mine, amounted to 24,454 francs; the expense of boring the shaft, to 51,235 francs; the cast iron tubing in place, to 127,646 francs; the sinking fund, to 17,000 francs; in all, 220,336 francs. Subsequent shafts, proportionately to their depth and to the amount of iron tubing placed in them, cost a less sum of money for their execution.

The shaft No. 2, *Sainte Marie*, intended as a ventilating shaft, was first sunk to a depth of 325 feet, with a bore of 4½ feet, and widened afterwards to 7 feet and to a depth of 315 feet. The work, begun on the 27th of June, was entirely completed by the 29th of January following, or in less than 7 months, although nearly 4 weeks were lost by the necessity of repairing a serious accident, namely the deviation of the shaft from the vertical. The iron column in this shaft had a height of 186 feet. In this case the total cost of the shaft was established as follows:

Buildings and foundations.....	10,091 francs
Boring proper.....	18,581 "
Cast iron tubing, etc.....	29,785 "
Sinking fund.....	6,000 "
Total.....	64,457 "

Or in round figures about \$13,000.

The next two shafts undertaken by M. Chaudron were those of L'Hopital, in the department of the Moselle. These had to be bored through the tough but highly water-bearing sandstones of the Vosges, as well as through the various strata of the new red sandstone, including its basal conglomerates of exceeding hardness. More than 21 millions of francs had been spent in this very locality within a short period of years in unsuccessful attempts to reach the coal underlying these rebellious strata.

One of the shafts of L'Hopital was to be 480 feet deep, and 12 feet in diameter, the other 5½ feet wide, and the same depth as the preceding. The larger shaft was started on the 9th of June, 1864, and completed on the 21st of November, 1866. The smaller shaft was begun at the end of 1862, and finished in December, 1865. The difficulties to be contended with during the boring of these shafts, through much harder ground than had ever before been attempted by the Chaudron process, were very considerable, but the intelligence and perseverance of the engineer in charge finally overcame all obstacles, and the work was brought to a very satisfactory conclusion, at a cost of \$30,000 less than had been established by the preliminary estimates.

The large shaft contained 635 tons of iron tubing, and the smaller 258 tons. The cost of these shafts, complete, was \$88,000 for the larger and \$51,200 for the smaller one.

On the 9th of July of the same year, a shaft 273 feet deep was begun by the Chaudron process at *Sainte Barbe*, and was entirely finished on the 7th of January following. This shaft contained a column of cast iron 168 feet in height and weighing about 200 tons. The total cost of this shaft, including a certain amount of temple tubing rendered necessary by the presence of a remarkably liquid bed of quicksand, amounted to about \$30,000.*

The Chaudron process was next introduced into Germany at Dalbusch, in Westphalia, in the Valley of the Ruhr. Two shafts were sunk there, the one a working shaft 12 feet in diameter and 302 feet deep, and containing 302 feet of tubing, the other a ventilating shaft. Both were carried to a rapid and successful termination at a total cost of about \$111,000 for the two. We may add that since this period the same company has added three new shafts to its previous two, all of which have been bored and tubed by the same Chaudron process.

The Kind-Chaudron method was now generally recognized as a great success, even by the most incredulous of its former adversaries, and its employment soon spread rapidly.

In 1868, Escarpelle followed with two shafts 338 feet deep; in 1870, Mauraige, with two 626 feet deep; in 1872, Lieven, with three 290 feet deep; Meurchin, with two 298 feet deep, and Douchy with one 115 feet deep; in 1873, Vendin, with one 365 feet deep and two 285 feet deep; Anniche, with one 298 feet deep; Marles, with two 400 feet deep; Cibly, with two 285 feet deep; and Dalbusch, with three 302 feet deep; in 1874, Bruay, with two 400 feet deep; in 1875, Crespin, with one 368 feet deep. During the present year, we have Escarpelle with two new shafts, sinking to a depth of 338 feet; Dax, in the department of the Landes, one to an unknown depth; Ghlin, near Mons, in Belgium, two 760 feet deep; Braquenes, in Belgium, two 721 feet deep; Cannock-Chuse, in Staffordshire, two 394 feet deep; Sarre, in Alsace-Lorraine, three 520 feet deep; Marly, one, depth unknown.

The total number of shafts completed or in course of sinking by the Chaudron process is 43, the total sum of the borings amounting to nearly 10,000 feet.†

Every shaft sunk to this day by the Chaudron process in Europe, without a single exception, has resulted in a success. All have kept water-tight and have resisted external pressure, and are this day giving the greatest satisfaction to their owners.

The boring of a mining shaft through even the most highly water-bearing strata need no longer be dreaded by any mining engineer who thoroughly understands the working of the Chaudron process. The whole profession owe to this eminent and enterprising engineer a debt of gratitude for his really very important contribution to the science of mining technology.

In conclusion, we may summarize the advantages of the Chaudron process over the older methods of mining, under the following heads:

1. The water from all the water-levels situated above the bottom of the tubing is isolated and kept permanently excluded from the shaft as well as from the workings below it.
2. The solidity and durability of the shaft is very great, and much superior to that obtained by any other means.
3. The cost of sinking a shaft through water-bearing or caving strata is reduced to a minimum.
4. A great saving in time is realized.
5. The possibility, not to say certainty, is obtained of traversing, without much difficulty, any number of successive water-levels and any kind of water-bearing strata without having recourse to any pumping machinery whatever.
6. The absence of all danger and inconvenience to the miner during the operation is complete, and contrasts with the perils and discomfiture attendant on the ordinary mode of sinking shafts below the water level.
7. Safe and reliable preliminary estimates as to the cost of sinking a mining shaft through unpropitious ground are attainable only by the adoption of the Chaudron process.

TO BE CONTINUED.

* For further details regarding the cost of sinking mining shafts by the Chaudron process, see *Appendix No. II.* to the present paper.

† See *Appendix No. III.* for a tabular statement of all the shafts sunk by the Chaudron process to this date, with indication of their depth, of the amount of temple-tubing and of case-tubing employed in them, and of the duration of the operations of boring and tubing them.

PRIMARY LESSONS IN METALLURGY.—VI.

Written for the Engineering and Mining Journal.

When the puddling hearth is brought into the condition indicated in the last chapter, and after the bottom has been allowed to chill, the fire having been cleaned, it is ready to receive a charge of pig iron. All the cracks and leaks about the bottom will have been stopped with chilled cinder, even the tapping holes in the breasts.

Previous to charging the pig iron a small barrowful of squeezer cinder is thrown upon the hearth, with usually a shovelful or two of pounded ore, and the "fix" or ore walls about the boshes repaired where they had become imperfect. Then the pig iron is thrown upon the hearth, the furnace doors closed, and the blast turned on. When the iron is melted, the damper is adjusted to make a slight plus pressure in the furnace, so that all leaks shall be outward rather than inward, to prevent the entrance of chilling streams of air into the furnace, and the blast gate opened so far as to pass through the fire more oxygen than is burned in the fire, thus giving the flame an oxidizing character, although, if the flame were simply balanced, and the gas were simply CO_2 , it would take C from iron and become CO. The charge is now continually stirred about upon the bottom by hooked bars—rabblers—put through the stopper holes, and soon may be observed a great and sudden increase of temperature, from that of a murky red to a full white heat, the charge appearing for a time to be hotter than the jambs and roof of the furnace itself. This increase of temperature is caused first by the burning of the silicon contained in the iron with the O of the hammer cinder, as well as with that of the ore used for fix, and also with the free O passing over the charge in the flame, the action being always aided by the liquid cinder now mixed with the iron, because of its property of absorbing O from the flame and the fix, and carrying it to the combustible silicon and carbon yet in the bath.

In a short time the charge begins to boil, and as each bubble of gas escapes from the surface a small blue flame shoots up, which is characteristic of the burning of CO to CO_2 , and indicates the gasification of the C absorbed by the iron in the blast furnace, which now escapes as CO, and of course burns to CO_2 upon contact with the free O in the flame.

The attention is next challenged by the appearance of exceedingly bright points upon the surface of the charge, which rapidly increase in numbers and size. These points are particles of decarburized iron, which are rapidly oxidized or burned when in contact with the flame, but which give up their O again to the C still remaining when they are carried under by the rabbling, which is now continuous and active.

The boiling becomes more and more active until the charge appears like a seething mass of froth, carrying lumps of shining matter, which are simply accretions of iron particles, in much the same condition that they were at one stage of reduction in the blast furnace, when the mass was called iron sponge.

When the combustibles of the charge have been burned away, the charge shrinks to nearly its original proportions, there being no escaping gas to swell it, and the iron "falls." The skillful puddler keeps the iron sponge afloat in the slag as long as possible, and when it begins to fall gathers the sponge into balls of convenient size, and draws off the greater part of the cinder through the tapping holes. He then closes the stopper holes and makes sure that the fire has been made thick, and tempers the blast and adjusts the damper so as to produce as hot a flame as possible, seeking to make it also non-oxidizing, to give the final welding heat to the balls, to fit them for hammering or squeezing. But in all the furnaces examined the oxidation of the balls went on during the final heat, as shown by the spotty brightness of the surfaces. Indeed it is doubtful if the proper heat can be attained without burning some of the iron to re-oxidize and intensify the natural heat of the furnace as it is now built and arranged. This doubt is strengthened by the fact that, if at the beginning of a final heat we place a few small lumps of bituminous coal upon the fix next the bridge, so that the hydrocarbons of the coal will be distilled off and float throughout the furnace, the burning of the iron will cease because the floating C takes up the free O, which would otherwise attack the iron. Whenever such an experiment has been tried by the writer, the result has been the breaking up of the balls in the squeezer for want of adequate heat, although the furnace appeared to the eye hotter after the introduction of the soft coal than before.

When the iron is deprived of its C and the particles agglomerate in the bath of cinder, it is said to "come to nature."

The process just described was formerly called "pig boiling," and the term puddling was applied to a process of working iron to nature—without help of a cinder bath—which had been "refined," that is, deprived of a great part of its silicon and carbon by melting it in a finery fire, which was similar to a bloomery fire, under a layer of burning coal, with the tuyeres inclined downwards to direct the blast upon the melted iron. The O coming in with the blast seized upon the silicon and carbon. This fining was continued until the iron became somewhat viscid, and it was then tapped off and run into molds. Chemically this was just the same as if the iron were tapped off from one furnace just before it began to come to nature, and carried to another furnace for the finishing of the process. The process of first fining and then puddling iron having fallen into disuse, the original expressive name of "puddling" has almost supplanted the less expressive term "pig boiling."

In the foregoing chapters we have given a bare and meager outline of iron metallurgy, in the hope that such of our readers as are beginners in the study will derive benefit therefrom; and if we have awakened a desire for fuller knowledge in the minds of any, and in any degree inculcated the belief that a knowledge of science is a great aid to practical skill, we have accomplished our object.

N. W. W.

CAN ZINC BE SMELTED IN A BLAST FURNACE?

By F. L. Clero, Chemist, Bethlehem, Pa.

In a former number of this JOURNAL, October 14, 1876, I called attention to the anomalous condition of the metallurgy of zinc as compared with the metallurgy of other metals, and showed that the gravest defects of the present system of treatment were so far inherent in its present nature that they could only be remedied by getting rid of it altogether and substituting a mode of treatment radically different.

On the other hand, I admitted that the present system is founded on certain peculiar properties of the metal zinc, which necessarily separate it widely in its mode of treatment from all other metals, and that all attempts to supersede it by a better one have ended in failure, and said that, as the result of this painful experience, practical metallurgists, and even theoretical authorities on metallurgy, have come to regard the present system as the only available one, and are rather disposed to apologize for it and defend it with all its admitted imperfections, than to expend time and money in seeking for a better one.

I then examined the various attempts which have been made to achieve a direct process, with a view to discover whether they had failed because of insurmountable difficulties in their way, or from a misunderstanding of the nature of the problem and a failure to employ the right means to solve it.

I discovered a great uniformity in the modes of procedure and a striking similarity in the manner of failing, and announced, as the result of my own studies and experiments, that the problem is not nearly so difficult as is commonly supposed, and that the failure to solve it has been entirely due to defects in the apparatus and means employed. I also proposed a form of furnace which I believe to be free from these defects, and which, I think, will be found practically successful.

At the time I thought I saw my way clear to erect the furnace, and put to it at once the crucial question. The answer which it would have given would have been intelligent to all, and from it, so far as I am concerned, there would have been no appeal. Unfortunately in the present abnormal condition of affairs, by no means confined to this country or the zinc trade, when the stronger companies, feeling themselves possessed of an element of success in their strength, which they were unwilling to jeopardize by dissipating in what might prove a hazardous enterprise, and the weaker, had all they could manage in carrying on their daily routine, and when outside capital, disappointed on all sides in what had appeared secure investments, was seeking absolute safety rather than the promise of large returns, I find myself disappointed in my immediate expectations, and reduced to the somewhat unusual position of seeking to prove possible the problem of which I believe I have offered a solution.

It is to this task that I now address myself. Any process to successfully extract zinc from its ores must accomplish the following results: It must reduce the metal in the form of a gas, it must protect it from reoxidation, and condense it to a liquid state; moreover, it must be capable of being carried on continuously or in a succession of similar charges. Concisely, any process which will effect these results is clearly practicable, provided, of course, it is able to maintain itself in point of economy in competition with the present system. To prove, therefore, that zinc can profitably be extracted in a blast furnace, it is necessary and suffices to prove—1st. That it can be liberated in the metallic state in such a furnace. 2d. That it can be protected from subsequent oxidation. 3d. That it can be condensed and collected in a liquid state. 4th. That the operation can be carried on continuously, and that it does not involve anything which will necessarily interrupt its course. To prove that it would pay, it will suffice to compare the expenses connected with such an operation and the loss of metal with those of the present system.

First.—Can zinc be liberated as a metal by injecting a blast of air into a mixture of coal and ore?

If any further answer were needed to this question than the *a priori* one given by the consideration that the addition of a blast does not change in any way the conditions of high temperature and the presence of reducing agents, carbonic oxide and incandescent carbon, which suffice to effect it in the retorts of the present system, it would be given emphatically in the affirmative by the practice of the Wetherill oxide furnace, in which the ore is mixed with coal on a grate and air blown through it, and the zinc is driven off unquestionably as a metallic gas, for the oxide of zinc is practically non-volatile, and also by the experience of those iron masters whose ores contain small quantities of zinc, who find that it goes off in the furnace gases and scarcely a trace of it is found at the bottom of the furnace. The fact that the zinc is again oxidized in both of the above operations has no bearing on the present division of the question. It must have been reduced to a metal, for it has been volatilized, and the oxide is not volatile.

Second.—Is it possible to protect the metal from oxidation after reduction? Before answering this question it is necessary to determine under what conditions zinc will combine with oxygen, and from what sources it can obtain it in a blast furnace. Zinc has a strong affinity for oxygen, particularly at high temperatures, and will extract it from air, carbonic acid, and vapor of water; clearly, then, when any of them is present, and they may all be present in the gases of a blast furnace, it cannot escape at least partial oxidation. Conversely, if none of them is present, since they are the only sources of oxygen in the furnace gases, it cannot possibly be reoxidized.

The second question may, therefore, be better put: 2. Is it possible to avoid the presence of these sources of oxygen in the gases of a blast furnace designed for the reduction of zinc?

The dry ores of zinc, such as roasted blende and calcined carbonates and silicates, if they are freed from the air inclosed in their interstices, cannot of themselves supply any one of them, and a reducing agent and fuel, such as anthracite coke or charcoal, can manifestly be obtained also practically free from them. There remain three possible sources from which they may be derived: the blast, the carbonic acid formed in the reduction of the zinc oxide, and that formed by the reduction of such other metallic oxides as of iron, manganese, or lead, as may happen to be mixed with the charge. We may simplify the question somewhat by omitting to consider the last possible source, since very many zinc ores are practically free from other metallic oxides. Of the two that remain no trouble need be apprehended from the first—the blast—inasmuch as all experience teaches us that, if a current of air is blown through a thickness of several feet of incandescent carbon, the gases at the top will consist of nearly pure carbonic oxide and hydrogen mixed with the nitrogen of the air, and will be practically free from any of these sources of oxygen. The second remains to be considered.

The reaction $\text{CO} + \text{ZnO} = \text{Zn} + \text{CO}_2$, takes place only at a temperature in the neighborhood of 1,000° Cent., that is, very nearly the point at which cast iron begins to melt; it must therefore occur in the lower part of the furnace near the source of heat, that is, the combustion of the fuel where the blast first strikes it. The carbonic acid formed is, therefore, in practically the same position as that produced by the combustion of the fuel. Let us follow it in its upward course through the furnace, and see what are its chances of escaping unaltered at the top of the furnace. It is formed at the high temperature of 1,000° Cent. in the presence of incandescent carbon, and will have to force its way up through a considerable thickness of it before leaving the furnace, but carbon acts vigorously to reduce carbonic acid to carbonic oxide at temperatures even as low as 500° Cent., that is, at temperatures considerably lower than zinc oxide can be reduced; there is no likelihood, therefore, that any considerable proportion of it will escape reduction.

We are forced, then, to the conclusion that, with a proper attention to the calcining and drying of the ore and fuel, and the exclusion of other metallic oxides from the charge, there need be no fear of reoxidation of the metal at the top of the furnace, if the blast is sufficiently hot and the layer of fuel in the furnace sufficiently thick to approximate to the conditions existing in an iron blast furnace. In addition to the above considerations, I may state that careful experiments of my own, made under much less favorable circumstances than those given above, have proved to my entire satisfaction that no serious trouble need be feared from this source.

TO BE CONTINUED.

MINING IN CANADA.—ANNUAL REVIEW FOR 1876.

By Prof. Robert Bell, of the Geological Survey of Canada.

(Concluded from page 395.)

ASBESTOS.

The refractory properties of this mineral, which were well known to the ancients, render it available for a variety of modern purposes. As long as it was believed to be too scarce to be of much economic importance it was but little used outside of the chemist's laboratory, and a very small quantity supplied the market. Now, however, that it has been found so useful for steam packing, fire-proof roofing, etc., a considerable demand has been created. It is found in greater or less abundance in various parts of Europe, the finest coming from Italy. The United States are principally supplied from Staten Island and Maryland, but it is found also in Virginia, New York, and other States. Its value ranges, according to quality, from \$10 to \$60, delivered. In Canada asbestos is either known or reported to occur in the following localities: (1) east side of Lake Nipigon; (2) north side of Batchawana Bay, a short distance west of the Batchawana Iron Company's location; (3) northward of Echo Lake; (4) near Desert Lake, north of the Bruce mines; (5) township of Thorne, county of Pontiac; (6) Gatineau River, lower part; (7) Riviere Blanche, Templeton; (8) Petite Nation seigniory; (9) near Perth; (10) Second Chute, Indian River, near Peterboro'; (11) township of Stukeley, Q.; (12) Lot 8, in the 8th concession of Bolton; (13) Melbourne slate quarry; and (14) St. Francois, Beauce. In some of these localities the mineral is true asbestos, while in others it is either chrysolite or picrolite, fibrous varieties of serpentine, which answer the same purpose.

BARYTES.

Owing to the fact that barytes is being every year more largely substituted for white lead, it is assuming a value which it did not formerly possess in this country. The manufactory of Messrs. Thomas Ramsay & Co., of Montreal, consumed all that was produced in Ontario and Quebec in 1876. They obtained 108 tons from Messrs. Mansfield & French, who mined it from a vein about three feet wide on the west half of lot 7, in the 10th concession of Hull, employing seven men during the latter part of the summer. Mr. William J. Morris, of Perth, furnished them with 123 tons, obtained from lot 4, in the 8th concession of North Burgess. The above sources having proved insufficient to supply the demand, the Messrs. Ramsay now propose to bring the mineral from either Jarvis or McKellar's Island in Lake Superior, having learned of its existence on these islands through the "Descriptive Catalogue" of minerals sent by the Geological Survey to the Centennial Exhibition.

A portion of the barytes required in 1876 by the Dolphin Manufacturing Company of Nova Scotia for making paints had to be imported, although in former years they obtained a sufficient supply at Five Islands.

BRICKS.

Mr. T. M. Clark, of Ottawa, has discovered the fact that common red brick clay, when mixed with a certain proportion of fresh water shell-marl, produces a beautiful "white" or cream-colored brick. Bricks made in this way have been used to a considerable extent in Ottawa City. This discovery is of importance, as shell-marl exists in a great many places in Ontario and Quebec, and white bricks may now be made at these localities instead of the less valuable red ones.

PETROLEUM.

The last report of the Minister of Inland Revenue shows that for the year ending 30th June, 1876, the amount of crude oil and distillate "used" in the Dominion was 9,417,901 gallons, which (at forty gallons to the barrel) would be equal to 235,447 barrels. The same report gives the "total quantity manufactured" for the same year as only 4,838,215½ gallons. The quantity of crude oil sent from Petrolia in 1875 I put down at about 220,000 barrels. It is difficult to obtain correct figures with regard to the petroleum business of Ontario, but it is believed that there are still between 300 and 400 wells in the Enniskillen region capable of producing oil, about half of which were in operation during the last year. The industry gives employment to about 500 men in the production, and to about 300 in the refining of the oil. The greater part of the crude oil is refined at London, Ontario, where some fifteen establishments are in operation. The principal refinery is the Atlantic Petroleum Works, belonging to Messrs. Waterman Bros., whose fine collection of Canadian mineral oils and their products attracted so much attention at the Centennial Exhibition last summer. For some years back but little petroleum was exported from Canada; however, towards the close of 1876 a revival in the trade commenced, and considerable shipments of refined oil were made. By the improved processes of refining a perfectly colorless and thoroughly deodorized illuminating oil, standing a high fire-test, is now produced from our Canadian petroleum, at a price which enables it to compete in foreign markets with the best refined oils from the United States.

SALT.

Perhaps the most important fact of the year in connection with the salt interest of Ontario has been the completion of Mr. H. Y. Attrill's boring at Goderich, which proves the great thickness of the rock salt underlying that region. A full account, by Dr. T. Sterry Hunt, of this boring was published in January last, from which it appears that six beds of solid rock salt were passed through, having an aggregate thickness of 126 feet. A considerable portion of this thickness Dr. Hunt found to be almost chemically pure, containing over 99¾ per cent. salt. Mr. Attrill is about sinking a shaft to work these beds. The quantity of salt made in the whole of the Ontario region in 1876 was probably quite equal to that of the previous year, which amounted to between two and three millions of bushels.

MISCELLANEOUS.

Complete returns have not come to hand in regard to the production of gypsum. In Nova Scotia and New Brunswick the average annual quantity was quarried and shipped. The demand for land plaster in Ontario is supplied from northern New York, and from the comparatively thin beds of gypsum occurring along the lower part of the Grand River.

The hydraulic cement consumed in the Dominion is supplied principally from Thorold and Limehouse. Should any considerable quantity of this material be required for the construction of the Pacific Railway, it might be manufactured from certain beds of the Nipigon series of rocks at Thunder Bay; but the only way of determining the value of supposed cement-stones is by actual experiment, as their chemical composition varies greatly, and every different kind requires some peculiarity in treatment suited only to itself.

The granites of Canada may properly be noticed in connection with her other mineral resources. Mr. Robert Forsyth, of Montreal, continues to manufacture monuments, pillars, etc., from the beautiful granite of his island near Ganouque. A hill of similar granite on the east side of the harbor of Kingston has been

leased by the Hon. John Young of Montreal. The Bay of Fundy Red Granite Company are doing a large business in manufacturing granite at St. George, New Brunswick.

MINING NEWS.

Staff Correspondence of the Engineering and Mining Journal.

COLORADO.

The Specie Payment Mine, Virginia Cañon, yielded, we are informed, 9 oz. 1 er cord—not \$9—as erroneously printed on page 378 of our issue of June 2.

LETTER FROM ROSITA.

It requires but a very short stay in Rosita to convince one that that camp is a growing one and is far from being dull. After a long day's weary ride across the barren and desolate mesas lying between Pueblo and the base of the Greenhorn Range, and a tiresome pull up the cañon of Hardscrabble Creek, the view of Rosita, nestled just over the crest of the hills on the western slope, is certainly a pleasant one, for the town is prettily located for a mining camp, has a glorious view of the sharp white peaks of the Sangre de Christo, across Wet Mountain Valley, and is rather notably free from the many disfiguring details that generally mark the home of the rough miner.

As one passes over the ridge the puffing stream from the Virginia Mine first attracts attention, and next one sees the huge white dump of the Humboldt, beyond which a glimpse is caught of the handsome new shaft-house of the Pocahontas. So that the first sight of the camp is an encouraging one, though subsequent examination shows that aside from these mines only two others, the Chieftain and Polonia, are working. And yet several hundred locations have been made in Rosita.

About a quarter of a mile below town on the road to Wet Mountain Valley is the new mill of the Pennsylvania Company, which has just gone into operation under charge of Mr. P. H. Van Diert. It is a 5-ton amalgamation works, very substantially and conveniently built, and was erected to treat the ores of the Virginia and Humboldt mines. A commencement has been made on 35-ounce ore, and the results obtained have been so good that the two mines will probably little by little turn into their other grades until the entire product of the two is reduced there. The mill is built so that it can be enlarged to a capacity of 15 tons if desirable. The wastes are done in a Bruckner cylinder. A leaching vat is now being added to save the copper which occurs to some extent in Rosita ores. Mr. Van Diert's first trial runs have showed a saving of 30 ounces out of 35, corresponding to a loss of about 15 per cent, which is good for the beginning.

The Virginia Mine is now 230 feet deep. Its upper levels were very rich and productive, but in the bottom the ore was not so abundant at the time of my visit. The mine is well supplied with good hoisting and pumping gear, and shows the same wall which has made the great Rosita vein so well known. The company are thinking of sinking a new shaft about 700 feet westward in the center of the claim, and have already made some explorations at that part of the lode, which make a promising showing.

The Humboldt has been sunk 420 feet, but in the last 20 feet a very heavy body of water was struck, and, because the pumping facilities were unequal to the work of keeping the mine clear, all work below the 300-foot level is for the present suspended. Above the second level and between the second and third the vein shows finely, and is being stoped out. A new ore-house has lately been built, or rather the old one has been extended, so that there is now sufficient accommodations for a large production. This mine has been a very productive one, and is maintaining its standing well. With a capital of \$75,000, it has averaged one per cent. a month dividend during the last eighteen months, some months paying four and five per cent. As soon as more powerful pumping machinery is put in, work on the shaft will be resumed, and the ground already opened, and which has shown well, will be further explored by levels.

The Pocahontas is now producing about eight tons daily. Above the second level this mine shows about 2,000 fathoms of ground yet unbroken, and displaying a good vein of ore everywhere. Stoping has just begun on both sides of the winze connecting the second and third levels, and both faces of the level are being pushed ahead rapidly. The new ground opened within the last three months is looking better than has any other part of the mine. The vein of ore has increased in width, and will mill in bulk probably about \$75 per ton. The perpendicular shaft is down 160 feet, and is steadily sinking. When a depth of 200 feet is gained, a drift will be run across the porphyry to the vein, which will open it about 400 feet below its outcrop. The surface buildings and the mechanical arrangements for hoisting, pumping, and ore sorting reflect great credit on the superintendent.

Mr. Mallet's Works, located about two miles southwest of the camp, are mining quite steadily, and handle about five tons daily. Mr. Mallet has completed some experiments lately which, he says, will permit him to offer a small price for ten and fifteen ounce ore, and, in the expectation of having plenty of this class of mineral, is engaged in putting up the necessary machinery for the new class of work.

Northern Mines.—There is a report afloat concerning the consolidation of the Caribou and Native Silver Mines, at Caribou. If true, this will be one of the most important transactions that has ever taken place in Colorado. The two mines are undoubtedly adjoining claims on the same vein, and are both very fine property. The size of the combined claims is 3,000 feet. Already the Caribou, under the new management, is displaying new and extensive bodies of ore, while the Native Silver is in excellent condition. A combination of the two companies in interest would form a magnificent property, fully equal to any existing in the State. It is to be hoped that the rumor has a solid foundation.

Central Colorado.—Referring to the revival of interests in the Montgomery mines, the *Alma News* speaks as follows of the Nova Zembla:—"Work at the Nova Zembla is now going on in earnest. At present twelve men are employed, and the product of the mine is larger and of better quality than ever. In addition to the main workings a tunnel is being started on the vein lower down the hill, which, it is believed, will pay as soon as fairly underground. Within a short time work will begin on other lodes in the immediate neighborhood, and there is little doubt that the present season will see Montgomery resuming its old time portion as an active, prosperous mining camp."

The Mt. Bross Tunnel Company is an organization for the purpose of driving a tunnel under the limestone of the mountain, with the expectation of intersecting the ore channel from which the silver deposits above are supposed to have originated. The capital is \$2,000,000. Its course leads under the Hiawatha and Dolly Varden claims. If pushed till the center of the range is reached, it will gain a depth of 3,000 feet.

The Dolly Varden mine has lately been yielding unusually well. This mine has in the past been a very steady producer, and bids fair to continue. It has recently been thrown into a stock organization, and as additional capital has been gained, its development will, in the future, be rapid.

On Mt. Lincoln the Russia, Moss Vale, Ford, Lincoln, Hill, Wilson, Eagle, Hoyle, and Ketsby mines are looking well. The Russia is in an especially good condition, and shows large bodies of ore in sight. An improvement has taken place in the grade of ore from this mine of late. There are now in the slopes some large bodies of rich mineral.

The recent strike in the Corning Tunnel, under Gold Hill, is attracting a great deal of attention. The vein was intersected at a depth of 475 feet from the surface and 1,000 feet from the mouth. Up to date (June 9), it had been penetrated 22 feet without finding the south wall. The vein carries a number of narrow streaks of free gold and telluride ore, ranging from one to five inches in thickness. In cross-cutting, about 1,200 lbs. of very rich mineral was taken out, and the probability is that as soon as drifting is begun (which will not be until the other wall is found) some valuable developments will be made.

We visited the Plutarch a week ago, and found Haines, Riley, Kelly, and Chambers working in No. 2 tunnel. This famous property is, without doubt, one of the richest in the district, and from its nearness to mills and its easy accessibility is bound to rank among the leading mines of the country. The walls are clearly defined, the pay-streak wide, and the mineral very high grade, being largely composed of gray copper and black sulphurets. The mine is better developed than we had supposed. No. 1 tunnel is in 65 feet; it is running for the vein, and has yet 60 feet to go to strike it. No. 2 tunnel strikes the vein at a distance of 55 feet; two drifts are run from it, one west 45 feet and the other east 55 feet, giving 100 feet of stoping ground, in which considerable mineral has been removed by underhand stoping, and the vein uncovered and much of the mineral left standing. In these drifts the pay-streak stands fully 21 inches, solid mineral. From the east drift in this tunnel, a shaft is sunk 60 feet. No. 3 tunnel is in 90 feet, with one shaft sunk from it, down 45 feet, and another 55 feet. No. 4 tunnel is in 75 feet; this is a bed rock drain. The Sioux Chief and Silver Star, extensions of the Plutarch, show the same grade of mineral. Assessments are being worked on both. On the former is a shaft down 20 feet, and on the latter a shaft of 30 feet.

Reports from Summit District are encouraging. A large production of gold quartz may be expected this year, and many thousand tons will be milled. As yet, the numerous reported discoveries in the neighborhood of South Mountain have not caused much excitement, but this is probably owing to the fact that snow is still interfering somewhat with developing work.

San Juan.—The *Miner* reports the striking of a rich body of gray copper ore assaying \$1,000 a ton, in the Look-out lode at the head of Cunningham Gulch. This mine is opened by a cross-cut tunnel 150 feet long, from which a shaft is being sunk which is now 15 feet below the level of the tunnel, and 160 feet below the surface. The strike made was in this shaft.

It is stated that two ten-stamp mills are on the road from La Veta, the terminus of the Rio Grande railroad, for Parrott City.

From the *Silver World* we glean the following notes:

"The Belle of the West is being worked on two leases, the first to Beveredge and Marshall, on 380 feet, from the west end, lease running six months. Daniel Denny and Geo. W. Wade have a lease beginning 100 feet above the former, on 100 feet, also for six months. This famous property holds its own and is turning out very rich mineral as usual.

"Smeeton Bros. and Tom Neal have struck it rich on Cataract Creek, a branch of Cottonwood. They made a location last fall which they named the George Washington—probably because they didn't find any cherry trees to cut and had lost their hatchet. They have just completed their first assessment. At the depth of 10 feet the pay-streak shows 26 inches of mineral, in which silver glance and ruby silver appear in liberal quantities.

"B. G. Balch has returned from Rock Ridge, and will at once proceed to work his mine near Henson Creek forks. The Sybarite, on the south fork, owned by Balch, Dissmore, and Jones, is down in one shaft 14 feet; it shows a 22-inch pay-streak, galena, showing gray copper in small quantities. The Mono, on the same vein, shows a 2-foot pay-streak, same grade of mineral as the Sybarite; only one assessment has as yet been worked. The Little Pattie, on Capitol mountain, is open in one tunnel, in 14 feet; the vein shows one foot of solid galena."

BUTTE PLACER MINES.—When the quartz excitement broke out eighteen months ago, it was supposed placer mining would be very limited and little work done about Butte in that branch of industry. On the contrary, last season was the best ever known, and the yield of gold was larger than for any previous year, considering the number of claims operated. Last season was an exceptionally good one for water, a great amount of rain falling during the summer and fall, keeping the ditches well filled until along in September. The water was turned into the ditches some six weeks ago, but, owing to the state of the weather and the light fall of snow, a sufficient head was not obtained to supply all the companies until within the past two weeks. Now there is plenty and some to spare, and the recent storms have piled up heavy banks of snow at the head of the ditches, sufficient to furnish water for a long time. In fact the indications point to as good a season's water supply as last, if we are favored with a reasonable amount of summer rains. No reliable estimate can be obtained of the yield of the Butte placers, but it is known that the owners were perfectly satisfied with results last year, and the probabilities are they will be equally well pleased with operations this season. Below we give a list of claims operated, with the number of men employed:

Commencing at Caribon gulch, east of town, David Meiklejohn is working two men and using 50 inches of water, ground-sluicing. Jones and Emery come next; hydraulic claim; use 140 inches of water and employ four men. Chas. Colebert; hydraulic claim; working three men and uses 100 inches of water. Hickey Bros.; hydraulic claim; working two men and using 100 inches of water. William Hill & Co.; hydraulic claim; working four men and using 150 inches of water. A small claim owned by Peter Humes, ground-sluicing with 50 inches water; works one man besides himself. Levi Prentice; ground-sluice claim, working two men and uses 80 inches of water. Noyes & Upton; hydraulic claim; this company work six men and use 200 inches of water. William Hill is working ground individually and apart from that mentioned above; he has a separate ditch and uses 150 inches of water.

The above takes in all the mines below town and east of the mills. The claims vary in size from 600 to 1,000 feet surface ground each. Crossing over into Missoula gulch, the first claim is owned by Bernard & McCausland; these parties have some 60 acres of mining ground, 30 acres being under patent. They employ six men, working from daylight till dark, and using 150 inches of water; hydraulic. This is the only claim worked on Missoula gulch till Butcher & Archbold's ground is reached, near the head. We do not know how many men are employed on this claim. West of Bernard & McCausland, on what is known as Sailor Fork, Valentine Kroff is opening some bar diggings which prospect well. He is working two men and using 60 inches of water. All the mines east of the mills, except one claim run by William Hill, are supplied with water by the Barnard & Noyes ditches, the largest one carrying 600 and the smaller 200 inches

of water. Messrs. Preston Scott, Pat Talent, and others have opened ground still west of Kroff on one of the small gulches emptying into Silver Bow Creek. Water is obtained, we think, from Brown's gulch, and the ground is said to prospect well. No clean-ups have yet been made. These parties have acres of ground, and if it pays anything like what is expected the owners have a good thing, and will have mines left in 1900.—*Butte Miner*.

NEW MEXICO AND ARIZONA.

At the bottom of the 125-foot shaft on the Naiad Queen (Silver City) silver ore vein, rich in chlorides, is being mined.

"Copper bullion in considerable quantities is being shipped from the Wheatfield mines in Pinal County. Twenty-four tons of it are now en route for San Francisco. Instead of being run into bars it is made into hemispherical chunks, weighing about 200 pounds. It is said to assay very high in gold and silver. Many of the ores of that vicinity are quite rich, but not suited to mill process. Lead ores are scarce in that country, while copper ores are very abundant. The latter having now proved a good flux for smelting, we can look for regular shipments of base bullion from Pinal County."—*Arizona Sentinel*.

The *Sentinel* has the following regarding the McCrackin silver mine (Arizona): "The croppings of the mine are bold and distinguishable from a distance of many miles. The ledge cuts through a hill, rising at least 1,500 feet above the surrounding country. This feature enables the ores to be extracted, to at least that depth, through tunnels, and without the use of hoisting machinery and without the necessity of pumps, even if water should be encountered, which is doubtful. In some respects accounts of this property have been exaggerated, in others it has been underrated. The rock is chiefly a discolored, honeycombed quartz, whose interstices are filled with decomposed silver ores; these shatter out in the processes of mining. When the ore is run out of the mine, it is dumped upon a grating over a chute, which conveys all the finer particles to an ore-bin lower down the mountain, while the coarser fragments slide off the grating on to the ore dumps. The coarse ore presumably contains a larger proportion of quartz and a smaller one of silver than the fine stuff, which is hauled to the mill at Greenwood. The former is declared to assay an average of \$50 per ton and is being held for future reduction. The latter looks like a purple-brown earth, containing few lumps larger than a hazel-nut, and assays, very evenly, about \$75 per ton. Its actual yield in bullion has for months averaged \$55. The most noteworthy facts in connection with this mine are that, while the ore dumps are large and evidently formed without any attempt at deceit, the waste dump is insignificantly small; that the ledge is worked for a width of some 30 feet, everything between the walls being taken out clean; and that the walls stand firmly in such a large stope without timbers. It needs no expert to judge from these facts that the ore body is a large one, and that the ledge is a permanent and unbroken one. The value of the ore can be easily appreciated by following it to the mill and touching the silver constantly being extracted from it. The ore is easily mined, and few miners are needed to keep the mill supplied. The quantity already broken down and piled up in the caverns of the mine is simply enormous. Adjoining the McCrackin, and on the same ledge, extensive operations are being prosecuted by the Signal M. Company, under the direction of Mr. Wm. Leete, one of the principal owners. The Signal Company are putting up a ten-stamp mill on the Sandy, near Greenwood. The McCrackin Company bought the old mill sent out here to work the 'Moss' mine, and which laid so long on the Colorado, near Hardyville. Bob Steen bought it for a gold mine near Greenwood, hauled it over, and set it going on gold quartz. That mine did not pay, and the mill was bought by the McCrackin Company, who refitted it for working silver ores. It is an old rattle trap at best, but it is doing good work—so good as to reflect much credit on the manager, Mr. D. P. Pierce."

Placer gold is coming in in fair quantities from the country around Santa Rita.

The Picacho Mill is shipping gold bullion with regularity, and is running smoothly.

The Keystone Mill at Mineral Park has stopped operations for the present.

The negotiations for the Peck Mine in California have again fallen through, and the property is again out of bond. The *Arizona Miner* gives the following interesting account of the negotiation: "Mr. Bean arrived in San Francisco on the 8th, and on the morning of the 9th deposited with the First National Gold Bank of that city all the stock of the Peck Mining Company, as stipulated, and notified Mr. Lent that the Peck Company had fulfilled their part of the contract according to agreement, and were ready to hear from him and receive the sum of \$400,000 in gold coin for said stock. Mr. Lent stated that, since the negotiations were opened 60 days previous, universal disaster had overtaken the stock market; that there had been a shrinkage in values of over two hundred millions of dollars, and that his associates in this negotiation were amongst the heaviest losers, and that in consequence he was unable to make the payment on the mine. Mr. Lent acknowledged that he had been treated by the Peck Mining Company with the utmost courtesy and liberality, and that he believed the mine to be one of great value. Mr. Lent presented Colonel Bean, as president of the Peck Mining Company, a very beautiful map, showing the exact condition of the mine, and a very full and admirable report of Mr. Haigue, mining expert. He also expressed his obligations to the company in not taking his proffered forfeit of \$20,000. That he would, in any way possible, assist them in whatever negotiation the company desired now or hereafter. This ended the negotiations, and at a subsequent interview with Mr. Haigue, the expert, Mr. B. was gratified to learn from his own lips that his estimate of the mine and belief in its future was equal to that of the owners of the Peck Mine; but that as an expert he was compelled to report upon what he saw, and had therefore recommended the purchase of the mine at \$300,000 in coin.

"It will therefore be seen that the mine has stood the test of a tremendous overhauling and of multitudinous assays, and has escaped not only condemnation, but was recommended for purchase at a tolerable figure, as stated above, by the most competent mining authority who has ever visited this section of our Territory. It only remains for the Peck Company to adhere to that good old injunction sometimes given of 'mind your own business,' and they may hope for as good success in the future as the past, whether the stock market in San Francisco has gone to the level or not.

"The company have made arrangements to ship monthly, in refined silver bars, to the First National Bank of San Francisco, \$50,000, and with their new machinery on the ground and the splendid outlook of the mine, we think they will find it an easy thing to accomplish."

A correspondent of the same paper has the following concerning the Silver King, and the camp of which it is the center:

"This camp is a lively little cluster of frame buildings, tents, and stone huts, with about 200 inhabitants. The camp is situated at the head of a canyon surrounded by lofty peaks on every side. The Silver King Mine employs about 40 men, and the Northern King and Silver King South employ 20 men. This Silver King Mine was discovered in rather a peculiar manner,

affording us another proof that it is better to be born lucky than rich. Four men, by name Long, Mason, Copeland, and Reagon, were packing ore from Globe City to Florence, and while endeavoring to capture a refractory mule stumbled upon this silver deposit, and are now all wealthy men. The richness of this ore is something wonderful. The ore is principally of an antimonious combination; although metallic silver, chloride of silver, galenite, iodide of silver, and sulphurets are found in their shafts. They are down about 200 feet in their incline shaft, and already have an immense amount of ore in sight. At Pickett Post, about six miles below the mine, they have commenced the erection of Concentration Works, and rumor says they have a mill *en route* for the Northern King, which is down about 60 feet, and the Silver King South, about 90 feet; both are now working in pyrites of iron and quartzite. Neither of these mines has, as yet, struck any rich mineral."

The Zalida Mine promises to become shortly a bonanza. It is only opened to a slight depth, but is showing some very fine and rich ore. The shaft of the Hackberry is down 450 feet, and shows a fine vein at that point. A recent nine days' run on tailings at the old mill yielded \$7,200, showing that much has been lost in previous runs. The company are putting up a new 10 stamp mill.

In Humbug District the Silver Jack and Urba Masa veins are looking unusually well. This is doubtless one of the best camps in Arizona, as further development will show.

The following, concerning Globe District, we clip from the *Miner*: "Globe City, the principal place in Globe Mining District, has a shifting population of about 200. Everything is terribly dull here, owing to the lack of capital to develop the mines.

"There are two stamp mills here, one two stamp, and the other five stamp; but their returns have been so unsatisfactory that the miners have no confidence in them, and will not furnish them with rock.

"Mr. Kennedy has a smelter here, but as lead is too high it makes that way of working expensive. The ore of this district contains, in large quantities, iron, copper glance, antimony, and sulphur, and most assuredly requires roasting.

"There is very little free milling ore found here. Messrs. Townsend, Jerrold, and others of Carriboo, B. C., have settled here, and sent on to San Francisco for a complete ten stamp mill, with a 'mechanical roaster.' Messrs. J. D. Wilson & Co. are also having a mill built, with a capacity of twenty tons per diem.

"As soon as these mills are erected and in working order, the miners will commence working their claims, and as they can take their own ore and have it successfully worked they can thus make expenses while developing their mines."

UTAH.

The suit of Samuel Kahn vs. The Old Telegraph Mining Company has been decided in favor of the latter. Two new important other mining suits are now on hand, viz., the South Star & Titus vs. Flagstaff, and Queen of the Hills vs. The Herschel Company.

A correspondent of the *Tribune*, writing from San Francisco District, gives the following description of the Big Bonanza Lode near that town:

"Situated about fifty miles west from Beaver and twelve miles from Star District lies this unpretending little town, with the biggest mine in Utah, without any exception. The Big Bonanza lies about one mile from the village, and, as I said before, is a wonder. The shaft is sunk one hundred and fifty feet—all of the way in solid ore, and growing richer as they go down. Not a pound of waste rock or dirt has been taken out of the shaft. The ledge is known to be two hundred feet wide, and how much wider remains to be seen. Nearly 7,000 tons of ore have been taken out, and one can hardly see where it came from. Nine lineal feet of this ore will weigh a ton. About 1,500 tons were taken out to make a level for the whim, which rests on a solid foundation of good ore. A mine with 150,000 tons of good ore in sight and not a sign of waste on the dump is a curiosity. It will average over \$40 per ton, and is steadily increasing in value. There is as yet but one smelter running, but another is to be built immediately by Mr. Godbe, of Salt Lake, who has contracted with the owners of the mine for 5,000 tons of ore as a starter."

NOTES.

TEXAS SULPHUR MINES.—The *South* says: "Sulphur mines have been opened in Montague County, Texas, which promise great profits to their operators."

EXPORTS OF COAL FROM NEW YORK.—The total exports of coal to foreign countries from the port of New York from January 1 to May 31, 1877, was 18,633 tons, as against 13,888 tons for the same period in 1876.

CONSOLIDATION OF UTAH LAND OFFICES.—The Land Office at Beaver, Utah, is to be discontinued and the district consolidated with Salt Lake City. Similar consolidations of a number of other districts will be ordered.

THE UNION COAL WORKS at Moundsville, W. Va., have had the quality of their coal tested for gas purposes, with very encouraging results. The Cincinnati Coal Company have sent them an order for 40,000 bushels at seven cents a bushel.

A NEW TENNESSEE COAL MINE has been opened on the line of the Tennessee Coal and Railroad Company's line by Col. S. G. Jones, which is said to be very good, and pronounced by Col. J. B. Killebrew to be the best coal in the State.

KENTUCKY GEOLOGICAL SURVEY.—We note the statement that Professor Shaler, State Geologist of Kentucky, intends to continue the survey of the State during this year, although the appropriation was not sufficient, and he will have to pay a considerable sum out of his own pocket.

ADVANTAGE OF MECHANICAL PUDDLING COMPARED WITH HAND LABOR.—Mr. I. Lothian Bell expresses himself confidently on the distinct superiority in freedom from phosphorus which marks iron made by mechanical puddling over that obtained by hand labor.

EXPORTING COAL FROM GERMANY.—Germany entertains the idea of establishing an export and coasting trade in coal. Some thirty new pits have lately been sunk or are undergoing the process of sinking, and it is estimated she could readily increase her present output 50 per cent.

DRY ROT.—The best preservative against dry rot is the following of Mr. Schwartze, who made millions by it, and by whose recent death the secret was revealed: 1 part oil of cassia, 1 part wood tar, and 1 part train oil; apply three coats on the reverse sides and on the ends of planks, floors, etc. In all probability oil of cassia played the chief role as preservative.—*Am. Jour. Pharm.*

SALE OF THE GREENVILLE, PA., ROLLING MILL.—The Greenville Rolling Mill, it is reported, will be offered for sale on the first of August. It has been appraised at \$49,757. It contains 12 boiling and 2 heating furnaces, bar and guide mills, with full complement of rolls, all in good running order, and, it is said, could not be built, even at the present low price of material, for less than \$60,000.—*Sharpsville Advertiser.*

ANCIENT PERSIAN AND ROMAN GOLD MINES.—Captain Burton, who has returned to Cairo from his Red Sea exploration, announces in his report to the Khedive the discovery of great treasures, and of remains of the seven ancient cities which were built on the sites of the gold mines once worked by the Copts, the Persians, and the Romans. Captain Burton intends to begin the work of mining at these places in November.

A LOST GOLD MINE FOUND.—The great gold mine of Los Cristales, at Cauquenes, in Chili, which has been lost for forty years, has been found by three Englishmen. It was abandoned at a time when the Chilians were shooting each other and trying to overturn the government. It then filled up with water and an avalanche slid into and over it, and confounded all the geographers for forty years in regard to its whereabouts. Now that it has been found it will be worked again by English capital.

BLACK DIAMOND STEEL WORKS.—Messrs. Park, Bro. & Co., Pittsburg, are engaged in making a series of experiments on Siemens's new direct process for making steel. The apparatus used is a Siemens rotary puddling furnace, in connection with a Siemens regenerative furnace. The ores used are Lake Champlain and Iron Mountain. They are submitted in the puddler to the direct action of the reducing gases from the gas furnace. The success of the process has not yet been fully learned, but we have favorable reports of its working in England. It is said the most phosphureted ores made good steel. The experiments are being conducted by Mr. Siemens, a nephew of the celebrated metallurgist.

MINES ON FIRE.—The proprietors of the Middle Creek Mines, at Tremont, Pa., are much alarmed at the discovery that the mines are on fire and burning to a considerable depth. The fire originated last Saturday by a blast which ignited the gas. An explosion followed, and considerable damage to the walls, doors, and props ensued. A later dispatch from that section states that it is believed seven breasts or gangways are burning, and the fire is making rapid progress. A large stream has been turned into the mine. There were no miners hurt by the explosion. It was deemed necessary to flood the Middle Creek mines, at Tremont, Pa., to stop the further progress of the fire in them. After the flames are extinguished it will probably require at least three weeks to pump out the mines.

ORIGIN OF PETROLEUM.—M. H. Byasson has been led by the following experiment to give a scientific explanation of the formation of petroleum: If a mixture of vapor of water, carbonic acid, and sulphureted hydrogen be made to act upon iron heated to a white heat in an iron tube, a certain quantity of liquid carburets will be formed. This mixture of carburets is comparable to petroleum. The formation of petroleum can thus be naturally explained by the action of chemical forces. The water of the sea, penetrating into the cavities of the terrestrial crust, carries with it numerous materials, and especially marine limestones. If the subterranean cavity permits these new products to penetrate to a depth where the temperature is sufficiently high, in contact with metallic substances, such as iron or its sulphurets, we have a formation of carburets. These bodies will form part of the gases whose expansive force causes earthquakes, volcanic eruptions, etc. Petroleum is always found in the neighborhood of volcanic regions, or along mountain chains. In general it will be modified in its properties by causes acting after its formation, such as partial distillation, etc. Petroleum deposits will always be accompanied by salt water or rock salt. Often, and especially where the deposit is among hard and compact rocks, it will be accompanied by gas, such as hydrogen, sulphureted hydrogen, carbonic acid, etc.—*Revue Industrielle.*

PRESENCE OF SELENIUM IN REFINED SILVER.—It has often been found that ingots of silver of so high a standard of purity as 998 to 999-1,000ths are very ill suited for the preparation of industrial alloys. The bad quality of this silver appears most striking in the alloy 950-1,000ths (first standard). The bars or plates are blistered, and when worked they display surfaces covered with grayish points which do not readily disappear on polishing, and which always reappear under the gilding. During the fusion of the metals silver and copper, which form the alloy, a brisk ebullition is produced with projection of particles, even when working, as is customary, under a stratum of carbon. These peculiarities are due not to sulphur, of which not a trace is present, but to selenium. To detect this body in the silver we dissolve 100 grams in hot nitric acid, at 34° Baume. The trace of gold present remains in the form of very dense blackish flocks, which are separated from the solution. This latter is then precipitated with hydrochloric acid and evaporated to dryness, and, without too much heating the acid liquid, it is clarified or filtered. The selenium is then found in the residue as selenic acid. It is boiled with a few drops of hydrochloric acid to convert it into selenious acid, and we add to the liquid thus obtained a solution of sulphurous acid, which—especially in heat—reduces the selenious acid, and gives a black deposit of selenium, easily recognized. The source of the selenium is in the sulphuric acid used by the refiners in separating gold from the triple alloy of gold, silver, and copper. It is therefore very important to reject samples of acid containing this impurity. To detect the presence of selenium in sulphuric acid it is diluted with four times its volume of water, and a concentrated solution of sulphurous acid is added to the clear decanted liquid. The mixture is then heated to 80°, when a precipitate of finely divided selenium appears, generally red.—*Chemical News.*

ASSAY DEPARTMENT OF THE ENGINEERING AND MINING JOURNAL.

This department is opened for the purpose of affording to miners and prospectors the means of ascertaining the general character and approximate value of minerals found, and, when so desired, the actual value of the ore will be determined by careful assay or analysis.

Replies will be made in the columns of the *ENGINEERING AND MINING JOURNAL* to questions asked regarding the nature and the commercial value of minerals and of samples sent. The results of assays will also be published in these columns, except when otherwise requested.

No charge will be made for these examinations or replies. Where assays are desired, the following rates will be charged. The amount should invariably accompany the order.

Assay for Gold.....	\$2 00	Assay for Lead.....	\$1 50
" Silver.....	1 00	" Zinc.....	2 00
" Gold and silver.....	2 50	Control Assays.....	3 00
" Copper.....	1 00	Zinc Analyses.....	5 00

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ANSWERS.

ASSAY.

New York Office:

No. of Assay.		Oz. per ton of 2,000 lb.
		Gold. Silver. Lead.
IV.	J. H. M., Va.,	3.26
VII.	San Luis, Mexico,	Trace 39.39 65.16
VIII.	" "	0.09 166.23
IX.	" "	0.013 265.96
X.	" "	Trace 17.31

STATISTICS OF COAL PRODUCTION.

This is the only Report published that gives full and accurate returns of the production of our Anthracite mines. Comparative Statement for the week ending June 9, and years from Jan 1st.

Tons of 2,240 lb.	1877.		1876.	
	Week.	Year.	Week.	Year.
Wyoming Region.				
D. & H. Canal Co.	59,911	946,257	40,297	816,772
D. L. & W. RR. Co.	56,116	946,222	14,017	534,494
Penn. Canal Co.	33,614	454,596	2,523	379,169
L. V. RR. Co.	18,935	425,766	6,450	383,827
P. & N. Y. RR. Co.	1,218	22,088	...	10,847
C. R. of N. J.	33,902	650,372	10,517	499,978
Penn. Canal Co.	14,947	118,166	9,070	102,566
Lehigh Region.	209,643	3,563,467	82,874	2,727,653
L. V. RR. Co.	56,800	1,253,881	32,253	881,410
C. R. of N. J.	33,286	630,859	10,627	460,910
D. H. & W. B. RR.	...	6,297	691	14,754
Schuylkill Region.	90,086	1,897,037	43,571	1,357,074
P. & R. R. RR. Co.	154,953	2,454,040	1,620	1,608,923
Shamokin & Lykens Val.	8,623	240,120	27,880	325,883
Sullivan Region.	163,576	2,694,160	29,518	1,934,806
Sul. & Erie RR. Co.	...	4,858	954	26,059
Total	463,305	8,159,522	156,917	6,045,892
Increase	306,388	2,113,930	...	...
Decrease	...	...	...	...

The above table does not include the amount of coal consumed and sold at the mines, which is about five per cent. of the whole production.

Receipts and shipments of coal at Chicago, Ill., for the week ending June 9, and year from January 1:

	Week.	Year.
	Tons.	Tons.
Receipts	48,799	572,738
Shipments	3,286	80,939

The receipts and shipments of coal at Cleveland, Ohio, for the week ending June 9 were as follows: Receipts by canal, 5,493 tons; shipped coastwise, 9,074 tons; total for year, 62,312 tons; foreign shipments, 4,391 tons; total for year, 19,290. Total of coastwise and foreign shipments for week, 13,465; for year, 81,602.

Receipts of Coal at Boston, for the week ending June 8, and years from Jan. 1.

Tons of 2,240 lb.	1877.		1876.	
	Week.	Year.	Week.	Year.
From				
Alexandria and Georgetown	2,618	14,378	...	17,158
Philadelphia	22,527	222,280	4,452	185,715
Baltimore	1,410	48,698	400	44,516
Other places	6,471	104,887	1,322	103,755
Great Britain	...	1,197	297	3,806
Nova Scotia	...	4,478	1,099	2,038
Total	33,026	395,912	7,570	356,988

Shipments of coal at Pictou, N.S., for the week ending June 9, and year from January 1:

	Week.	Year.
	Tons.	Tons.
To Canada	1,333	4,350
" United States	118	5,740
" Other Provinces	1,422	7,418
Total tons	2,873	17,508

The Exports of Coal from Baltimore for the week ending June 8 were — tons, and since January 1st, 18,248 tons as against 16,315 tons for the corresponding period of 1876.

Perth Amboy business: Tons. Received for the week 18,196. Shipped for the week 29,318. On hand June 9 122,894.

The Receipts of Coal at Rondout, N. Y., by the Delaware & Hudson Canal for the week ending June 13 were 341 boats, carrying 43,729 tons.

The decrease of shipments of Cumberland Coal over the Cumberland Branch, and Cumberland and Piedmont Railroads amounts to 31,704 tons, as compared with the corresponding period in 1876.

Belvidere Delaware RR. report for week ending June 9.	Week.	Year.	Year.
	1877.	1876.	1876.
Coal for shipment at Coal Port (Trenton)	98	9,251	80,668
" " " South Amboy	9,027	285,435	188,003
Coal for distribution	3,072	77,243	60,249
Coal for Company's use	1,084	34,537	22,504

The shipments of coal over the Erie Canal for the week ending June 14, 1877, was 12,447 tons, and since the opening of navigation 88,742 tons. For the corresponding time last year, — tons.

The production of Bituminous Coal for the week ending June 9, was as follows:

Tons of 2,000 lb., except where otherwise designated.	Week.	Year.	Year.
Tons of 2,240 lb.	1877.	1876.	1876.
Cumberland Region, Md.			
Barclay Region, Pa.	6,064	147,012	
Broad Top Region, Pa.			
Huntingdon and Broad Top RR.	2,563	62,754	
*East Broad Top	529	20,863	
Clearfield Region, Pa.			
*Snow Shoe	326	18,917	
*Tyronne and Clearfield	10,983	533,193	
Allegheny Region, Pa.			
*Pennsylvania RR.	2,261	83,277	
Pittsburg Region, Pa.			
*West Penn. RR.	2,763	80,809	
*Southwest Penn. RR.	283	18,118	
*Penn & Westmoreland gas coal, Pa. RR.	7,211	313,584	
*Pennsylvania RR.	4,031	156,739	
*For three days ending May 31.			

The Production of Coke for three days ending May 31.

	Tons of 2,000 lb.	Week.	Year.
West Penn. RR.	829	28,193	
Southwest Penn. RR.	6,410	252,166	
Penn & Westmoreland Region, Penn. RR.	665	34,049	
Pittsburg, Penn. RR.	794	59,336	
Total	8,698	373,744	

COAL TRADE REVIEW.

NEW YORK, Friday Evening, June 15, 1877.

Anthracite.

The auction sale of the Pennsylvania Coal Company took place on Wednesday. The attendance was quite large, the bidding, at times, fairly active, and the prices received, when the depressed condition of the market is considered, were extraordinarily high, although still netting the company a loss. The following quantities were disposed of at the prices given; comparison is made with the sale by the same company on the 29th ult.: deliveries at Newburg:

Tons.	June 13.	May 29.
	Prices.	Prices.
27,950 Lump	\$2 514	\$2 75
7,200 Steamer	2 473	2 75
44,950 Grate	2 50	2 682
30,550 Egg	2 485	2 80
65,250 Stove	2 517	2 75
18,075 Chestnut	2 457	2 70
5,000 Pea	2 05	2 30
198,975	Average \$2 489	\$2 728

The average decline was therefore nearly 24 cents per ton. Previous to the sale it was announced that the usual deposit of 50 cents per ton, to be made by purchasers on the day of the sale, would be reduced to 20 cents per ton. Mr. Hoyt stated that the company would not feel itself obliged to fill orders in case of an advance in price, unless the purchasers gave instructions to have their coal shipped promptly, or at least equally distributed through the three fortnights in which the whole quantity is to be delivered. The company claim that the object in selling so large a quantity of coal is that its business may proceed without interruption from an accumulation of stocks, and that it is not its intention to give buyers a 45 day "call" on the coal at 20 cents per ton.

A very important feature of this sale was an acknowledgment that no difference exists in the value of the several sizes of coal, excepting "pea" size, which was rated lower than the others. The company offered the choice of any particular size, and the record of the sale shows that the sizes most in demand were grate, egg, and lump. This condition of affairs has been steadily pointed to for several years, and it is not unlikely that pea size will soon take a position with the others. The impression is almost universal that the sale was "bolstered," and that the prices obtained, low as they were, were not down to the natural level of the market, and there are not wanting grounds for this impression, for though some of those who purchased large quantities are able to handle the coal, yet not at a profit upon the prices they paid; other large buyers appear to have purchased at the several auction sales during the year more coal than they could handle in several years. It is generally believed that an arrangement existed to prevent the average of the sale going below \$2.50 per ton. The following quantities of coal were announced to be sold:

	Tons.	Tons.
Lump	25,000	70,000
Steamer	20,000	20,000
Grate	35,000	5,000
Egg	25,000	

When comparison is made with the amounts actually disposed of, it will be observed that the company nicely manipulated the sale in accordance with the popularity of the various sizes, and that, contrary to its usual custom, the full amount of the coal advertised was not disposed of.

Considerable business was done by other companies immediately after the auction sale on the basis of the average prices obtained at it, and the same prices generally continue to be asked.

The production of anthracite coal last week was 463,305 tons, as against 451,173 tons for the previous one, and 156,917 tons for the corresponding week of 1876. The total production to June 9th was 8,159,522 tons, as compared with 6,045,592 tons for the like period of last year, showing an increase this year of 2,113,930 tons.

THE PROSPECTS OF COMBINATION.

The war between the coal companies is apparently approaching a critical point where the trade and con-

sumers may be suddenly surprised by a flank movement of great importance.

Let us briefly sketch the situation.

On the first of January, 1877, the stocks of coal held by the several companies were about as follows—these figures, which are now for the first time published, are from official sources:

Stocks of coal at tide-water, Jan. 1, 1877.	
P. & R.	13,564'18
L. V. R. R.	100,498'13
D. & H.	43,980'03
D. L. & W.	101,766'18
C. R. of N. J.	58,668'04
Penna. Coal Co.	14,884'00
Total	333,375'18

In addition to this the Delaware & Hudson had 196,340 tons at Honesdale, and the Pennsylvania Railroad Company had a considerable quantity at South Amboy.

During the first four months of this year up to May 1, the following were the shipments made by the several companies:

SHIPMENTS OF ANTHRACITE FROM JANUARY 1 TO APRIL 30, 1877.

	Tide.		Local.		Total
	Tons.	Cwt.	Tons.	Cwt.	
P. & R.	488,778	04	1,056,786	14	1,545,564
L. V.	364,436	19	822,482	13	1,186,919
D. & H.	202,248	10	247,535	07	449,783
D. L. & W.	343,491	06	287,538	00	631,029
C. R. of N. J.	541,832	16	338,958	19	880,791
Penn. C. Co.	243,099	07	56,829	98	299,928
Totals	2,183,837	02	2,810,131	01	4,993,968

From a comparison with our reports of production at the end of April, we note that the Delaware & Hudson Canal Company had apparently added to its Honesdale stock about 200,000 tons in the four months. It is very evident that the Reading and Lehigh companies have been absorbing the lion's share of the tide water business, and the competition has resulted in prices ruinously low for the Lackawanna companies, and in a heavy loss of their trade. We have kept our readers thoroughly and accurately informed—as they never were before by any other journal than this—of the actual and prospective condition of the market. We noted the disastrous effect of the low prices on the Lackawanna companies, and showed clearly that they are unable to compete with the Reading. With the announcement that Mr. Gowen has succeeded in getting from his English stockholders the financial assistance he required, the Lackawanna companies seem to have come to a full realization of the fact that the fight has gone against them, and they now appear disposed to surrender at discretion, and accept Mr. Gowen's conditions with the best grace they may.

Unquestionably Mr. Gowen has gained a great victory, and his rivals are suing for peace upon his own terms.

MR. GOWEN'S PLAN.

It is well known that the fundamental principle in Mr. Gowen's plan for an ideal coal trade is that substantially the same company should mine and transport the coal and sell it direct to consumers, without the intermediary of any middlemen whatever.

In entering the combination which fell to pieces about a year ago, he aimed at abolishing the middle interest, and he partially succeeded; and, could honesty in the execution of the programme have been secured, he would doubtless have succeeded completely.

Events proved, however, that good faith in the execution of any plan of combination can be secured only by pooling all the coal and selling the entire competitive tonnage through one office, a plan which would undoubtedly effect a very important economy in the expense of marketing. This plan was at once and unanimously rejected by the other companies in April last as "not feasible," and outside of the committee room it was referred to in even less respectful terms. Now it seems as if these other companies feel disposed to accept it, and since combination is always possible when it resolves itself into one man making the terms and the others simply accepting them, there seems to-day a better prospect of a new combination being effected than there has been at any time within the past ten months.

We would not be understood as stating that any definite steps have yet been taken, but there is no doubt of the fact that the Lackawanna and also the Lehigh Companies are "very sick" of the fight, and have indicated a willingness to accept peace on Mr. Gowen's plan, which contemplates the formation of a company

with a capital of \$2,500,000, to sell the "competitive" coal and guarantee sales.

It has even been suggested that Mr. Geo. A. Hoyt, Vice-President of the Pennsylvania Coal Co. (who is in full accord with Mr. Gowen), would be a suitable president for the new company.

There are, of course, many difficulties and dangers besetting such a combination, should it be entered into; not the least of which lies in the fact that the plan of pooling the coal excludes personal ambition, and is an effectual extinguisher on individual business enterprise. Consumers, uninfluenced by the special pleading of individual interests, will soon come to look upon all anthracite coal as of equal value; and those companies which have created a good demand for their coal, because of its superior quality or more careful preparation, will have to relinquish their vantage position and enter the ranks, in which all must soon come to be on the same level.

There is no doubt the pooling scheme would at once result in an advance of probably fifty or seventy-five cents per ton (i. e., an advance to \$3 to \$3.25), and no doubt, also, the assurance of the ability to exact any price demanded—limited only by the price of bituminous coal—would lead in the future, as it has always done in the past, to exorbitant demands, high wages, extravagance in management, and the devising of means for avoiding the spirit of the agreement, and finally a rupture and return to open competition and low prices, all the harder to bear because of the extravagance which the ability to exact high prices had fostered. How long it would require to make the cycle and get back to the starting point is not of immediate concern; that it always does get there has been proved over and over again. What can the companies gain by entering into such a combination?

The Reading will gain a higher price for its coal, but submit to a restriction of its possible business that will, with the inevitable increase in cost, probably ultimately more than compensate for the advantage, though a temporary gain may be shown.

The Pennsylvania Coal Company will keep its regular business and get prices that will be very remunerative. It has little to lose and much to gain by the combination.

The Lackawanna Companies will save a larger proportion of their business from the grasp of the Reading, and will tie its hands in a measure; they may be able with higher prices to keep out of the hands of a receiver and retain those expensive habits and support the numerous parasites that have done much to get them into their present lamentable condition.

The Lehigh Companies.—It is not clear how these can control their individual mine owners, or what they have eventually to gain.

The Pennsylvania Railroad would not join the combination, but would profit by it more than any of the others.

We shall keep our readers fully informed of the developments in the case. At present the scheme is in embryo—but it seems to have a rather better foundation than the propositions to which we have been treated so often during the past ten months.

The rumors of a combination of independent operators (heaven save the mark!) and the Erie and Pennsylvania railroad interests which have been circulated in some of the daily papers during the past week, have no possible foundation in fact. Such an arrangement would be impracticable and ineffective.

Should the Gowen plan be adopted, the individual operators would all be benefited, and it would therefore receive their approbation, with, perhaps, a few Lehigh exceptions.

Bituminous.

This trade continues to be very much depressed, owing to the low prices prevailing for anthracite coal. There are indications that there will be a strike among the boatmen on the Chesapeake & Ohio Canal for \$1 per ton freight on coal destined to Georgetown, and \$1.05 to Alexandria. This is certainly a very inauspicious time to inaugurate such a movement. Rates have ranged during the past few weeks from 55c. to 90c., although most of the shipments have been made at 70c. to 80c.

The Baltimore and Ohio Railroad has abandoned the policy of secret drawbacks in the coal trade, and has openly made a reduction of 25 cents per ton in freights.

The Pictou Standard speaks thus of the Nova Scotia business:

"The coal shipments are now fairly begun, and we regret to remark that appearances lead us to estimate an otherwise than remunerative season's work. The shipments by sea are not as large as last year's, and we understand that the quantities sent by railway are also considerably less than for some time past. Some of the mining companies are doing much better than last year, the Vale, in particular, presenting very fair shipments. The Halifax Company is much behind in shipments, at least to this date, but we presume this is principally on account of temporary stoppages in some of their works. The Intercolonial Company are only beginning to load their freight boats, the *Hadji* being to take the first cargo. The Acadia Company seem to be doing a large local business, and are shipping as largely as they did last year. The Nova Scotia Company are only beginning to ship their large contracts."

New York and Philadelphia.

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

	Lump.	Steamer.	Grate.	Egg.	Stove.	Chestnut.
Wyoming Coals.						
Lackawanna at Rondout	2 65	2 65	2 75	2 75	2 85	2 75
Scranton at Hoboken	2 46	2 38	2 51	2 70	2 37	
Wilkes-Barre at Port Johnston	2 65	2 65	2 75	2 75	2 85	2 60
Plymouth, R. A.			2 75	2 75	2 95	2 70
Susque. Coal Co. (S. H. Brown & Co.) At Amboy	2 65	2 65	2 75	2 75	2 85	2 75
Kingston at Hoboken	2 65	2 65	2 75	2 75	2 85	2 65
Pittston at Newburgh:						
A. S. Swords	2 75	2 75	2 75	2 80	2 80	2 70
*Penn. Coal Co.	2 51	2 47	2 50	2 40	2 51	2 45
Lehigh Coals.						
Old Company at port Johnston	3 25		2 85	2 85	2 85	2 60
Old Company's Room Run	3 25		2 85	2 85	2 85	2 60
Sugar Loaf, Hobok. & Amb.	3 25		2 85	2 85	2 85	2 60
Lehigh at Perth Amboy						
Honey Brook Lehigh	3 25		2 85	2 85	2 85	2 60
Mount Pleasant at Hoboken	3 25		2 85	2 85	2 85	2 75
Cross Creek at Port Johnston	3 25	2 75	2 85	2 85	2 85	2 75
Schuylkill Coals at Port Richmond, Philadelphia.						
Schuylkill white ash						
Schuylkill red ash						
Lorberry						
Lykens Valley						

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

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

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

Pittston coal at New York delivered by Penn. Coal Co.'s boats 60c. per ton additional.

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

Wholesale Prices of Bituminous Coal.

Domestic Gas Coals.

Per ton of 2240 lb.	At the Shipping Ports.	Alongside in New York.
Westmoreland and Penn. at Greenwich	\$4 50	\$5 50
Philadelphia	5 00	5 50
at S. Amboy	8 00	8 50
Red Bank Cannel Pa. at Philadelphia	4 50	5 05
Youghiogheny, Waverly Co., at Balt.	4 50	6 00
Despard, West Va.	4 50	5 86
Murphy Run, West Va., at Baltimore	4 50	5 70
Fairmount, West Va.	4 50	6 00
Newburg Orrel, Md.	4 50	6 00
Cannelton Cannel, West Va.	4 50	7 00
" Splint " at Richmond	4 14	5 65
" Gas Coal at Richmond	4 14	5 65
Peytona Cannel W. Va. at Richmond	4 14	5 65
Manufacturing and Steam Coals.		
Cumberland at Georgetown and Alexandria, Va.	3 00@3 15	4 40
Cumberland, at Baltimore	3 15@3 25	4 70
Clearfield f. o. b. Canton, Baltimore	3 25@3 40	4 50
Clearfield "Eureka" at mines per ton 2,000 lb., 75c.; f. o. b.		
Baltimore and Philadelphia per ton of 2,240 lb., \$3.25; f. o. b.		
South Amboy, \$4.25; alongside at New York, \$4.50.		
Foreign Gas Coals.		
Newcastle, at Newcastle-on-Tyne	8/6@10/6	5 50@6 00
Liverpool House Orrel, at Liverpool	25/	13 00
Ince Hall Cannel	35/6	18 06
" Gas Cannel	25/6	10@10 50
Scotch Gas Cannel, at Glasgow, nominal	25/	7 50
Gold.		
Block House, at Cow Bay, N. S.	1 75	4 75
Caledonia, at Port Caledonia	1 50	4 25
Glance Bay, at Glance Bay	1 50	4 25
Lingan, at Lingan Bay	1 75	4 50
International mines at Sydney	1 75	4 50
Pictou, Vale mines, at Pictou	2 25	5 00

Retail Prices in New York.

Per 2000 lbs.	Grate and Egg.	Stove.	Chestnut.
Pittston coal, in yard	\$3 90	\$4 20	\$3 90
Lackawanna coal, in yard	3 25	4 00	3 90
Wilkes-Barre, delivered	5 00	5 30	4 60
Lehigh and Locust Mountain, del'd.	5 50	5 50	5 00
Schuylkill Red Ash, del'd.	5 25	5 50	4 75

The Cost of delivery for Pittston and Lackawanna coal ranges from 40 cts. to \$1 10 per ton, according to distance from the yard.

Bituminous.

Liverpool House Orrel, delivered, per ton of 2000 lb.	\$18 00
Liverpool House Cannel	18 00
American	11 00
Cannelton Block, or splint	10 14
American Orrel	11@00
Red Bank Cannel	9 00
Cumberland	7 00

Baltimore. June 13, 1877.
Specially reported by Messrs. E. STABLER JR., & Co.

Wholesale Prices.

AFLOAT BY CARGO PER TON OF 2,240 LB.

Lump and Steamboat	\$3 40	Stove	\$3 65
Broken	3 25	Chestnut	3 40
Egg	3 30		

In cars in dealers' yards or on switch, 15c. per ton additional.

Lykens Valley Red Ash.

AFLOAT BY CARGO. **BY RAIL IN CARS.**

Broken	\$3 98	Broken	\$4 15
Egg	4 13	Egg	4 20
Stove	4 13	Stove	4 30
Chestnut	3 30	Chestnut	3 80

From wharf or yard to the trade, 50c. per ton additional.

Bituminous.
George's Creek, f. o. b. at Locust Point \$3 50 to \$3 60
Clearfield, " " Canton 3 30 to 3 40
Boston. June 9, 1877.

The market has continued to rule very dull, and prices decidedly favor the buyer. Freights are quoted at \$1.50@1.60 from Philadelphia, at \$1.20@1.25 from New York, \$1.65@1.75 from Baltimore, and \$1.75@1.80 from Alexandria and Georgetown. In Nova Scotia coal there have been further contracts for gas purposes at \$1 75 per ton, free on board at the mines. Cumberland coal continues dull, and is selling at \$2 75@3 25 per ton at Georgetown, Alexandria, and Baltimore. In Pennsylvania and Westmoreland gas coals there have been sales at \$4 50 per ton, delivered at Baltimore. Anthracite is, of course, very easy. The contract for supplying the State House for the ensuing year has been awarded at \$3 85 per ton, the amount being 300 tons. Anthracite, broken \$4 00@4 35 Cannel, English \$10 00 do. egg 4 00@4 35 do. Buckeye 10 00 do. stove 4 25 Lingan 4 50 Cumberland 4 50 Pictou 5 00 Clearfield 4 00 Penn 5 50 Westmoreland 4 50 Youghiogheny 4 50@5 50 Caledonia 4 00

Commercial Bulletin.
Buffalo. June 8, 1877.
Specially reported by LEE & LOOMIS.

The Scranton, Wilkes-Barre, Plymouth, Shamokin, and Delaware and Hudson (Lackawanna) are offered for the present at the following prices per ton of 2,000 lb.:

Delivered at	Rochester			
	Elmira.	Ithaca.	Syracuse.	Ret. Del.
Lump	\$4 75	\$2 05	\$2 85	\$3 10
Grate	\$3 50	2 95	2 95	3 20
Egg	3 50	3 20	3 20	3 45
Stove	3 75	3 10	3 00	4 70
Nut	3 75	3 10	3 00	4 50

Delivered at	Buffalo.			
	F. O. B.	F. O. B.	Afloat.	Ret. Del.
Lump	\$3 25	\$3 75	\$3 35	\$4 60
Grate	3 30	3 85	3 45	3 85
Egg	3 65	4 10	3 70	4 10
Stove	3 30	3 90	3 50	4 75
Nut	3 40	3 90	3 50	4 75

Cost of coal from Erie, Oswego, Sodus Point, or Charlotte for Western market, same as if shipped from Buffalo. Terms cash. All payments to be made in New York city funds:

	Lump.	Run of Mine.	Nut.	Slack.
Connellsville Coke	\$5 00			
Brookfield Coal	4 15			
Brier Hill	4 00		2 85	
Youghiogheny	4 00			
Monterey	3 25	3 00		2 25
Catfish				2 25
Stoneboro			2 75	2 25
Sterling Cannel	5 00	4 75	nut & slack	
Reynoldsville	3 25	3 00	2 65	2 25
Buffalo Coal Company	3 00			2 25

Chicago, Ill. June 12, 1877.
Specially reported by Messrs. RENO & LITTLE.

The following are the prices to-day for coal:

Lackawanna Stove	\$6 00	Erie and Brier Hill	\$5 50
" Chestnut	6 00	Wilmington and Ill.	5 00@4 00
" Grate and Egg	5 75	Blossburgh	6 50

Cincinnati, O. June 12, 1877.
Specially reported by the Consolidated Coal and Mining Co.

Since our last report we have had a coal rise in the Ohio, and an addition of about two million bushels to our stock of Youghiogheny coal. This, with the usual run from the Ohio and Kanawha rivers, has relieved the market of much of the firmness which it exhibited last week. Prices are steady for second pool Youghiogheny at 7 cents afloat and 9 1/2 to 10 cents delivered to consumers. Sales of anthracite have been made at \$6 to \$6 25 on cars, but special prices have undoubtedly been made considerably below these figures.

Wilkes-Barre, delivered to consumers, \$7 25 per net ton.

Table with columns: AFLOAT. Per bush. 2,000 lb. DELIVERED. Per bush. 2,000 lb. Items include Younghogheny lump, nut, slack, Camden, W. Va., Peytona Cannel, Connellsville coke, Younghogheny coke, Crushed coke, Anthracite, Wilkes-Barre or Lehigh by car load.

Cleveland, O. June 12, 1877.

Specially reported by Messrs. LAMBE & BATES. Per ton of 2,000 lbs. f. o. b. vessels.

Table listing coal prices for Cleveland, O. Items include Brier Hill (Church Hill), Straitsville Lower Vein, Hocking Valley, Massillon, Mineral Ridge (Cambria Mine), Tuscarawas Valley, Columbiana, Nut coal, various grades, Screenings, Younghogheny gas coals.

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

Table with columns: RETAIL TRADE. 1 to 10 tons. Items include Brier Hill lump, nut, Massillon and Mineral Ridge lump, Straitsville Lower Vein, Hocking & Shawnee, Del Carbo lump, Rich Hill lump, Columbiana lump, Lackawanna, Wilkes-Barre and Pittston egg and grate, Lehigh \$1 25 per ton higher.

Hamilton, Ont. June 12, 1877.

Specially reported by H. BARNARD.

The present state of our market is as follows:

Table listing coal prices for Hamilton, Ont. Items include Grate, Egg, Stove, Nut, Lehigh Lump, Briar Hill, Massillon, Smithing.

Indianapolis, Ind. June 12, 1877.

Specially reported by Messrs. COBB & BRANHAM. Wholesale on board cars, and retail delivered to consumers.

Table listing coal prices for Indianapolis, Ind. Items include White River, Brazil Block, Highland grate, Block coal, nut, per car, Highland, Block Slack, Peytona Cannel, Indiana Cannel, Hocking Valley, Younghogheny, Blossburg (smithing), Piedmont, Gas Coke, per bushel.

Table listing Anthracite (Lackawanna and Wilkes-Barre) prices for Broken, Egg, Lehigh Anthracite.

Table listing Broken, Egg, Lehigh Anthracite prices for Broken, Egg, Lehigh Anthracite.

Table listing Retail, per bushel, delivered. Items include Sand Creek, White River, Brazil Block, Highland Grate, Block Nut, domestic use, Highland Nut, steam.

Table listing GAS COKE (measured) prices for Crushed, Anthracite.

Table listing Anthracite prices for Wilkes-Barre and Lackawanna (all sizes), Lehigh, retail.

Louisville, Ky. June 12, 1877.

Specially reported by Messrs. BYRNES & SPEED.

Below find latest quotations:

Table listing Wholesale prices for Pittsburg, Raymond City, Pine Hill, Kentucky.

Table listing Retail prices for Pittsburg, Raymond City, Indiana Cannel, City Make Coke.

Milwaukee, Wis. June 5, 1877.

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

Retail price per ton of 2,000 lb.

Table listing coal prices for Milwaukee, Wis. Items include Lehigh Lump, Lehigh Prepared, Lackawanna (all sizes), Scranton, Briar Hill, select, Blossburg, Cannel, Pittsburg, Oak Hill, Steam coal.

Montreal. June 12, 1877.

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

Table listing coal prices for Montreal. Items include Scotch Steam, Pictou, Anthracite at retail, per 2,000 lb. delivered, Egg, Stove.

New Orleans, La. June 8, 1877.

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

Table listing coal prices for New Orleans, La. Items include At wholesale (by boat load), To steamboats, manufacturers, families, In hds. (for shipment), Anthracite Coal, At wholesale (per ton), retail.

VIRGINIA CANNEL COAL. ST. BERNARD (KY.) COAL.

At retail. To steamboats. Families. Philadelphia, Pa. June 14, 1877. Specially reported.

It is reported that the collieries of the Reading Coal and Iron Company are making extra time in order to make up for tonnage lost by many individuals either stopping or reducing their production. This accounts for the tonnage remaining as large as it is. Prices on board keep going down steadily, and there seems to be no bottom. The sale of the Pennsylvania Coal Company has no very good effect, for, low as it is, the impression of parties who were present seems to be that it would have gone much lower if the friends of the company had not come to the rescue by buying large quantities whenever prices reached below \$2.50. It is to be hoped that out of this chaos some good will be reached.

Freights remain as last quoted, but vessels are not so plenty.

Pittston, Pa. June 12, 1877.

Pennsylvania Coal Company's Coal in yard, ton of 2,000 lb. Retail.

Table listing coal prices for Pittston, Pa. Items include Lump, Egg and Stove, Chestnut, Pea, Delivered, fifty cents per ton additional.

Richmond, Va. June 12, 1877.

Specially reported by S. H. HAWES, Dealer in Coal. Per ton of 2,240 lb., f. o. b.

Table listing coal prices for Richmond, Va. Items include Kanawha Cannel, New River Bituminous, Coalburg Splint, Clover Hill Coal, Leawiston, James River Bitum., Kanawha Gas Coal, Carbonite.

San Francisco, Cal.

From the Commercial Herald of June 7, 1877. COAL—Imports from January 1st to May 16th:

Table listing coal imports for San Francisco, Cal. Items include Anthracite, Australian, Coos Bay, Cumberland, English, Chili, Mt. Diablo, Vancouver Island, Rocky Mountain, Seattle, Bellingham Bay, Ione, Cal.

We remark an increased inquiry for Australian cargoes to arrive, and for Wallsend \$9.25@9.50 have been paid. There appears to be a very marked falling off in the demand and consumption of Lehigh and other kinds of Anthracite. Foundrymen seem to give a decided preference to Coke over even Lehigh, which will account for this falling off. As before stated, strong efforts are making to introduce Seattle and other coast coals into more general use for steam and household purposes. To this end egg size Seattle is selling by the cargo at \$5@5.50 per ton, while coarse kinds of Seattle, Nanaimo, Wellington, Coos Bay and Bellingham Bay screened may be quoted at \$7.50@8.00 per ton, according to quantity. Black Diamond and other California Mt. Diablo Coals sell at \$5.75@7.75 for fine and coarse respectively. Prices of Scotch and English Steam to arrive may now be quoted at \$8.25@9; West Hartley, \$9@9.50. A new discovery of Coal deposits on the Pacific Coast is announced by the arrival of schooner California on May 9th from Ounalaska, Alaska Territory, she bringing 40 tons which was sold to dealers at \$6, and consumers at \$10 per ton. A company has been incorporated under the name of Kimberly Coal Company, and in due course of time expects to receive some 500 tons for further tests. In 1871 we received 565 tons from Queen Charlotte Island, and 18 tons from Sitka.

Sandusky, O. June 12, 1877.

Specially reported by C. E. BLACK, Agt. Con. Coal & Mg. Co.

We quote coal on cars at Sandusky, as follows:

Per ton of 2,000 lbs.

Anthracite.

Table listing Anthracite prices for Wilkes-Barre, Lackawanna, Lehigh, Grate, Egg, Stove, Chestnut.

Bituminous.

Table listing Bituminous prices for Massillon, Del Carbo, Hocking Valley, Straitsville, Shawnee, Blossburg.

Toledo, Ohio. June 12, 1877.

Specially reported by Messrs. GOSLINE & BARBOUR.

There is no change in prices of coal at Toledo to note.

Ton of 2,000 lb.

Table listing coal prices for Toledo, Ohio. Items include Straitsville lump, Shawnee lump, Hocking Valley lump, Massillon nut, Cumberland, Blossburg.

Grate, Egg, Stove, Chestnut.

Table listing coal prices for Toledo, Ohio. Items include Pittston, Wilkes-Barre, Lackawanna, Lehigh, Grate, Egg, Stove, Chestnut.

For retail delivery, from 50¢ to \$1 per ton in addition to above prices is charged.

Prices soft coal f. o. b. vessel for Lake shipments will be from 15 to 20¢ per ton more than prices on cars.

St. Louis, Mo. June 12, 1877.

Reported by JAS. J. SYLVESTER, Secretary of the Anthracite Coal Association.

Retail prices, delivered. Ton of 2,000 lb.

Anthracite.

Table listing Anthracite prices for Lackawanna, Wilkes-Barre, Schuylkill, Lehigh, per ton.

Bituminous.

Table listing Bituminous prices for Blossburg, Pittsburg, Indiana Block, Big Muddy, Illinois Coals, Connelville Coke.

Freights. Representing the latest actual charters up to June 14: Per ton of 2240 lb.

Table listing freight rates for various ports including Philadelphia, Baltimore, Georgetown, Elizabethport, Port Johnson, South Amboy, Hoboken and Weehawken. Ports include Augusta, Me., Albany, Alexandria, Va., Annapolis, Md., Bangor, Me., Bath, Me., Baltimore, Boston, Mass., Bridgeport, Ct., Bristol, R. I., Beverly, Mass., Cambridgeport, Mass., Charleston, S. C., Danversport, Mass., East Greenwich, R. I., Fredericksburg, Va., Fall River, Gloucester, Greenport, N. Y., Hartford, Conn., Hoboken, Hudson, Jersey City, Lynn, Mass., Medford, Mass., Middletown, Marblehead, Mass., Nantucket, Mass., New Bedford, Newburyport, New Haven, New London, Newport, New York, Norfolk, Norwich, Portland, Portsmouth, N. H., Providence, Poughkeepsie, N. Y., Quincy Point, Mass., Richmond, Va., Salem, Mass., Saugus, Mass., Saco, Me., Savannah, Ga., Thomastown, Mass., Troy, Trenton, N. J., Washington, Weymouth, Wareham.

* And discharging and towing. † And discharging. ‡ And towing. § 3c per bridge extra.

Towing.

For rates of Towing we refer to issue of June 2.

Rates of Transportation on Anthracite Coal to Tide Ports.

For rates of Towing we refer to issue of June 2.

Schuylkill Coals.

per ton of 2240 lb.

Table listing Schuylkill Coals prices for To Port Richmond, via P. & R. R. R., Main Line, for shipment, Harrisburg, via Lebanon Valley Branch, via East Pennsylvania Branch, via R. & C. R. R., Dauphin, via Schuylkill and Susquehanna ranch, Slatedale Junction, via Berks and Lehigh ranch, Lebanon, via Lebanon and Tremont ranch.

From Tamaqua, to Catawissa, McAuley, Matville, Rupert, and Danville, via Catawissa and Williamsport Branch Railroad.

From Tamaqua to Williamsport, Hall's, and Montourville, via Catawissa and Williamsport Branch Railroad.

Coal sent to points on the Catawissa and Williamsport branch will be charged one and one-half cent per ton per mile, and two cents per ton additional to Tamaqua.

From Port Clinton to Philadelphia via Schuylkill Canal, including freight and charges for the use of cars and barges, and for tolls (exclusive of cost of unloading).

An additional charge of 25 cents per ton will be made on Chestnut and Pea Coal to whatever point consigned. If the shipper signs a release of all demands arising from a deficiency of weight at the place of destination, and agrees to indemnify the company from all claims by reason thereof, such additional charge will not be made. Releases, properly prepared, will be furnished, and can be signed at the coal offices of the company, at St. Clair, Palo Alto, Schuylkill Haven, Mount Carbon, Pine Grove, and Tamaqua.

For shipment via Main Road or Schuylkill Canal, one and one-half cent per ton per mile, and two cents per ton additional to Schuylkill Haven, Pine Grove, Tamaqua, or Port Clinton, for Canal, as the case may be.

For consumption at local points in coal region, including Shamokin, Herndon, Schuylkill Haven, Pine Grove, and Tamaqua, three cents per ton per mile, and two cents per ton additional; and a charge for car service, of fifteen cents per ton to individuals, and five cents per ton to manufacturers,

when in Philadelphia and Reading Railroad cars, provided no charge, including freights, tolls, and car service, shall be less than twenty-five cents per ton.

Sent westward via Northern Central Railway (in N. C. R. W. Co.'s cars), four and two-tenths cents per ton per mile, to Locust Gap, Shamokin, or Herndon provided no charge will be made less than fifteen cents per ton.

One mile extra will be added for coal passing through the East Mahanoy Tunnel.

Fractions of distances and rates will always be stated in tenths.

No charge will be made for weighing or making returns of coal shipped, and the latter will be furnished free of charge, upon application to the Weighmaster; if these returns are to be sent by mail, envelopes, properly stamped and addressed, must be furnished to the Weighmasters.

All coal will be charged the rates (both lateral and Main Line) current on the day it is weighed; it will also be way-billed on the same day.

Circulars relating to freights on Schuylkill coals will be found in the issue of this Journal of March 24 and March 31 in the "Coal Trade Review."

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

To East Waverly, N. Y.	\$1 75
" Ithaca for C. Lake R.R. (local)	1 64
" " for C. L. R.R. and for shipment via Erie Canal	1 13
" Van Etten, for U. I. and E. R.R.	1 61
" Genesee (local)	1 62
" Genesee for S. P. and S. and L. O. S. Railroads, and for N. Y. C. and H. R. R.R., except Auburn and Cayuga	1 46
To Genesee for Buffalo and Tonawanda	1 34
" " " Genesee Docks	1 30
" " " Rochester and Charlotte	1 43
" " " Auburn and Cayuga	2 50
Total rate to Buffalo	2 23
" " " Rochester	2 02

REGULATIONS.

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

No allowance will be made for coal lost from cars on account of broken doors or other defects existing when the cars are loaded.

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

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

For freights on *Lehigh & Wyoming Coals* we refer to our issue of June 9.

For freights on *Pennsylvania & New York Railroad* we refer to our issue of June 2.

For rates of transportation on coal via the *Erie Canal* we refer to our issue of June 9.

For freights from *Newburg and Rondout* we refer to our issue of June 2.

Rates of Toll

For the above rates we refer to our issue of June 9.

IRON MARKET REVIEW.

New York.

FRIDAY EVENING, June 15, 1877.

American Pig.—The market is generally very quiet, and prices barely steady. Buyers only purchase to supply their most pressing necessities, and there is not a shade of speculative feeling in the Trade. The Thomas Iron Company reports sales of 1,500 tons of iron at our higher quotations.

We quote No. 1, foundry, \$18.50@19; No. 2, foundry, \$17.50@18; and forge \$16.50@17.

Elsewhere in this number we publish the statistics of the iron trade, as prepared by the Iron and Steel Association, to which we refer for much valuable information.

Scotch Pig.—The business in this article has only been in a small way with prices, both here and in Glasgow, weaker. We quote: Eglinton at \$24.25@24.50; Glengarnock, \$26; and Coltness \$27@27.25.

Rails.—We learn of no business in these, and continue our previous quotations: iron rails at mills, \$33 @.36; and steel, \$44@46.

Old Rails.—We quote a sale of 600 tons at \$19— which may be considered the market price.

Scrap.—We are reported sales of No. 1, wrought aggregating about 800 tons at prices equal to \$23 and \$23.50 here.

Baltimore, Md. June 13, 1877.

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

The iron market remains unchanged. Sales are generally for moderate amounts and immediate use, and the business in general dull. We quote prices as follows:

Baltimore Charcoal	\$29@31	Mottled and White	\$15@16 00
Virginia Charcoal	28@32	Charcoal C. B. Blooms	53@60 00
Anthracite No. 1	20@21	" " Billets	60@65 00
" " " 2	19@20	Refined Blooms	45@50 00
Anthracite No. 3	18@19	Scrap Blooms	43@45 00

Boston.

June 9, 1877.

Pig continues depressed, and prices tend downward. The talk of shutting down the production of certain kinds of manufactured iron is not encouraging to holders of pig. We quote \$22 50@23 50 for No. 1, \$21 50@

\$22 for No. 2, and \$21@22 for gray forge. Scotch pig is neglected. We quote \$24@30 for store lots, these being the best figures that could be actually obtained. The foreign markets continue easy. Bar is dull, quoting \$46@47 for refined, and \$37@38 for common. Nails are in light demand at unchanged prices. Sheet is selling at 3@3 3/4 c. per pound. Russia is quiet at 12c. currency. It is believed that the pipe manufacturers will shut down for three months.—*Commercial Bulletin.*

Louisville, Ky. June 12, 1877.

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

The market is dull and lower. Consumers are disinclined to believe that there will be an advance in prices in the near future, and buy for immediate wants only. The usual time—four months—is allowed on the quotations below.

FOUNDRY IRONS.	
No. 1 Hanging Rock, Charcoal	\$24 00@24 50
No. 2 " " "	21 00@22 00
No. 1 Southern Charcoal	21 00@22 00
No. 2 " " "	20 00@20 50
No. 1 Hanging Rock, Stonecoal and Coke	22 00@23 00
No. 2 " " "	20 00@21 00
No. 1 Southern Stonecoal and Coke	20 50@21 00
No. 2 " " "	20 00@20 50
" American Scotch"	22 50@23 00
Silver Gray	19 00@21 00

MILL IRONS.	
No. 1 Charcoal, Cold-short and Neutral	20 00@20 50
No. 1 Stonecoal and Coke, Cold-short and Neutral	19 00@20 00
No. 2 " " "	18 50@19 00
No. 1 Missouri and Indiana Red-short	22 00@23 00
White and Mottled, Cold-short and Neutral	16 00@17 00

CAR-WHEEL AND MALLEABLE IRON.	
Hanging Rock, and Cold Blast	35 00@38 00
Alabama and Georgia	26 00@33 00
Kentucky Cold-blast	25 00@36 00

Montreal. June 5, 1877.

We quote: Pig Iron, Gartsherrie, \$20 to \$20.50 Summerlee, \$19 to \$19.50; Eglinton and Clyde, \$18.50 to \$19; Langlois \$19.25 to \$19.75; Coltness, \$20.25 to \$21; Hematite, \$23 to \$24; American, \$20 to \$21. Bars—Scotch and Staffordshire, \$1.90 to \$1.95; best do., \$2.20 to \$2.25; Swedes and Norway, \$4.50 to \$5; Lowmoor and Bowling, \$6.25 to \$6.50.—*Monetary Times.*

Philadelphia, Pa.

[Weekly Report of the Philadelphia Iron Market, furnished for THE ENGINEERING AND MINING JOURNAL, by JUSTICE COX, JR., & Co., Iron Merchants, 333 Walnut Street, Philadelphia, Week ending June 14, 1877.]

PIG IRON.—The market continues dull and depressed; little pig iron selling except for immediate consumption. We hear of several furnaces about to blow in on the Lehigh, what they are to do with the iron when made is the question, yet we get this on good authority that five or six idle furnaces are preparing to blow in, one furnace man asserting iron cannot be made any less and will not be sold less, hence must advance in the fall. We report sales of about 2,500 tons and quote No. 1 \$19 to \$20; No. 2 \$17.50 to \$18. GRAY FORGE \$17 to \$18.

MANUFACTURED IRON.—The week past has been marked by extreme dullness for all classes of manufactured iron. Bars are only selling in a small way for immediate wants.

TANK AND PLATE are dull; as to Skelp, nothing new is coming on the market. We quote Bars 2 to 2.2c per lb. Plate and Tank 2 3/4 c. to 6 1/2 c. per lb. Skelp 2.12 to 2 1/2 c. per lb.

RAILS.—We have nothing new to report in either steel or iron rails. We quote: Steel \$46 to \$50. Iron \$33 to \$36 at mill.

OLD RAILS.—The demand is light and few sales reported. We quote: \$20 to \$21.

SCRAP is dull of sale and in plentiful supply. We quote: Wrought \$23 to \$26. Cast \$14 to \$19.

Pittsburgh, Pa. June 12, 1877.

Specially reported by A. H. CHILDS.

The market for all kinds of pig iron is very quiet, and seems likely to remain so for the balance of the month. Some of the mills have renewed their contract with the puddlers for another year, but the majority have not yet signed, and probably will not do so until they are ready to start their furnaces again. In the meantime consumption of pig iron is light, and prices rather weaker, although nominally unchanged.

No. 1 F'dry	\$22 00@24 00	Mottled & White	\$17 50@20 00
" " " 2	21 00@22 00	Hot blast C'coal	21 00@28 00
Gray Forge	19 00@22 00	Cold "	Western 40 00@45 00

San Francisco, Cal.

From the *Commercial Herald* of June 5, 1877.

Imports of iron, tin plate, pig iron, etc., have of late been very heavy, causing dullness and lower prices to rule. For some weeks past the market for Sydney pig tin was entirely bare, and lots sold as high as 21c, but upon the arrival of the *City of Sydney* on the 31st of May 1,810 ingots of block tin were received, when the price at once dropped to 17c. Had this shipment being divided into two parcels by different steamers the result would have been quite different. Of pig iron the *Dumbartonshire* from Leith brought 914 tons of Scotch. A portion of this was sold to arrive at very full prices. The *Inglewood* from Liverpool brought 454 tons pig iron, 5,930 boxes tin plate, etc. At date stocks of pig iron are excessive, and with a light demand prices are entirely nominal.

METALS.

NEW YORK, FRIDAY EVENING, June 15, 1877.

The market, on the whole, still continues very quiet, with no new features.

Gold Coin.—During the week under review the price of gold has ranged from 105 1/4 to 104 3/4 and closed at 105.

Bullion.—The price of silver in London to-day is 53 3/4 d.; in this market 118 per oz., and in San Francisco 9 per cent. discount.

Daily Range of Silver in London and New York per oz gold.

Date.	London.	New York.	Date.	London.	New York.
June 9	53 3/4 d	118 c	June 13	53 3/4 d	118 c
" 11	53 3/4 d	118 1/2 c	" 14	53 3/4 d	118 c
" 12	53 3/4 d	118 3/4 c	" 15	53 3/4 d	118 c

The price has remained steady and with but little fluctuation abroad. Our market here having been unusually bare of fine silver bars for domestic uses, there have been sales of small amounts above the commercial rate; and the price is to-day 1/2 per cent. above the shipping point. This, however, is liable to be corrected daily when the rate here, if no change occurs abroad, would fall to the parity of the latter, say 117 1/2 to 117 per ounce. Gold bars are quoted at par to 1/4 per cent. premium.

Copper.—We are reported sales of 100,000 lb. at 19 1/4 c.; about 150,000 in lots at 19 3/4 c., and 100,000 lb., July delivery, at 19 1/2 c. The market closes firm for cash lots at 19 1/4 c. bid and 19 3/4 c. asked, while for July, August and September deliveries 19 1/2 c. is asked with 19 3/4 c. as best bid. Wallaroo copper is quoted by cable at £81 in London. Mail advices of the 2d inst. quote the market quiet and nominal at £77. This sudden advance is not fully comprehended here, although the stock of this class of copper has been steadily decreasing. The mining companies are not sellers at present rates, and are holding entirely out of the market, the little business passing being done by the dealers, whose stocks are each day becoming lessened. Should manufacturers wish more copper, the price would probably reach the views of the mining companies, which at present are about 20c.

Tin.—The business in this article has only been in a small way. Straits on spot is offered at 16 1/4 c. gold, and some lots that will arrive late are quoted at 16 3/4 c. L. & F. is quoted at 15 3/4 c. gold; refined, 16 3/4 c.; and Banca 18c. Straits in London is quoted at £59, and in Singapore \$19.50 per picul.

Tin Plates are more quiet, although prices are nominally unchanged. We quote, in gold, per box, as follows: Charcoal tins, \$6.62 1/2 @ 6.87 1/2; and ternes, \$6 @ 6.25; coke tins, \$5.75 @ 5.87 1/2; and ternes, \$5.50 @ 5.75.

Messrs. Robert Crooks & Co., of Liverpool, under date of May 31, say of tin plates: "All makers are now tolerably well supplied with work, unable to quote for early delivery, and asking an advance ranging from 6d. to 1s. 6d. for forward shipment. This is for the present stopping business, but in any case rates will probably be firm until orders in hand are worked off. Whether buyers will be able to hold back till then requires to be seen. With hardly an exception, makers have signed the agreement to stop one week in three, and this materially strengthens the position."

Lead.—We note sales of 150 tons of Sacramento and 200 tons of Richmond lead at 5 60c., part of the latter on spot and part to arrive. The market is nominally at 5 65c., although a better price than 5 60c. could not be obtained for a quantity of any magnitude.

Spelter and Zinc.—Domestic spelter is very quiet and much unsettled, the quotations ranging from 5 80c. @ 6c. Sheet zinc is also quiet at 6 1/2 c. @ 6 3/4 c. currency.

Antimony.—There has been a little business in this article at 11 1/4 c. gold.

Quicksilver.—The production during the month of May was over 8,200 flasks, the largest monthly out-turn on record. In May 2,265 flasks went to New York by rail, and 308 flasks by sea. Our total exports thus far in 1877 show a large increase over those of 1876. Since our last reference several hundred flasks were sold by an operator at 40 1/2 c., he suffering a loss on the venture. Since then there has been quite a spurt in the market, fresh orders appearing for shipment to China, and the result has been several large purchases at 41 @ 41 1/2 @ 42c., the market closing strong at the latter rate. It is more than probable that the outgoing steamer for China on the 9th inst.—the *Gaelic*—will carry a large shipment.—*San Francisco Commercial Herald, June 5.*

Salt Lake Ore and Metal Market.

SALT LAKE CITY, UTAH, June 15, 1877.

Argentiferous Lead (Base Bullion).—\$60 to \$65 per ounce for lead. \$1.18 1/2 per ounce for silver. \$20 per ounce for gold. The quotations for silver are based upon the silver contents in the lead of 70 ounces per ton of 2,000 lb.

The Butte (Montana) Miner of the 29th ult. says: "A heavy sale of ore, carrying 90 ounces in silver and from \$18 to \$25 in gold, took place last week. The number of tons was about 300, and is classed as second grade. A large shipment of copper ore was also made from the Parks Mine last week, amounting to some 20 odd tons of first-class ore, which will run about 55 per cent. This ore goes to Baltimore for treatment. The rate of transportation to Corinne, Utah, is 1 1/2 cent per lb.

The Inter-Ocean's correspondent under date of the 7th inst. says:—

"There is no movement as yet in the bullion market, though a better feeling seems to prevail among the smelters, and more confidence in an early movement upward in the price of lead.

"If lead should go to six cents per pound in New York, the market would move here; but until that is done there can be but little accomplished.

"The shipments of ore and bullion for the week ending June 2 were as follows: 5 cars bullion to New York, 5 to Newark, 11 to Pittsburg, 11 to Omaha, 5 cars lead ore to Pittsburg; total bullion, 668,683 pounds; lead ore, 105,000 pounds—total, 773,683 pounds—an exceedingly small week's work. The receipts from Bingham mining district for the fourth week in May, lead ore, 1,371,620 pounds. The low price of lead is affecting the mining business seriously.

"Bullion is being shipped from here to New York via San Francisco—a commentary on the railroad charges going from here to New York direct.

"The daily press is urging a reduction in railroad freights to New York to enable a move in the bullion market."

The Tribune of the 9th inst. reports the Mineral Product for May as under:—

Table with 2 columns: Item and Value. Items include Base bullion, Silver-lead ore, Copper ore, Silver bullion from Ontario, Silver bullion from Tintic, Silver bullion from Leeds, Gold bullion from Bingham, and Gold bullion from Tintic.

Total.....\$694,082.68

The April output is given in the following:

Table with 2 columns: Item and Value. Items include Base bullion, Silver-lead ore, Copper ore, Silver bullion from Ontario, Silver bullion from Tintic, Silver bullion from Leeds, Gold bullion from Bingham, and Gold bullion from Tintic.

Total.....\$801,194.00

FINANCIAL.

New York Stocks.

NEW YORK, Friday evening, June 15, 1877.

A much larger business has taken place in the coal stocks during the week, under review, than for a long time past. The sales of Delaware Lackawanna and Western R. R. have aggregated 532,418 shares at from 36 1/2 to 37 1/2, closing at 34. The sales of Delaware and Hudson Canal have also been unusually large, amounting to 70,102 shares, at from 34 to 25 1/2, closing at 27 1/2. The transactions in New Jersey Central R. R. have aggregated but 2,550 shares at from 6 to 7, closing at 7. We also notice sales of 550 shares of Consolidation Coal Co. at 23 to 22.

New Jersey Central Railroad.—It is reported that the Coal and Navigation Company will accept from this company \$350,000 in cash and offset the improvement account against the remainder of its claim.

When the Navigation Company went to court to recover the railroad on the ground of default in the monthly payments, they were met by the counter claim for a million expended in improvements. Both parties have been ready for a settlement, and this, it is understood, will be made because the Navigation Company wants the money and not the road, while the Central needs the latter very much.

The carrying trade of this road was heavier last month than for a long time, and included 45,000 cars of coal from Phillipsburgh. It is said the earnings of the company during the month was \$250,000.

The Union Pacific Railroad Company will pay a dividend of 2 per cent. on its capital stock, on and after July 2, to stockholders of record of June 20.

Intercolonial (N. S.) Coal Mining Company.—A special general meeting of the Intercolonial Coal Mining Company was held in Montreal on the 1st inst., when the directors were authorized to issue preference stock to the extent of \$250,000, after submitting a written report of the present condition of the company.

Miscellaneous Sales and Quotations.

Sales and quotations of the stocks and bonds dealt in here and at Philadelphia, for the week ending the 15th inst. are given in the following tables. The Philadelphia quotations will have a * affixed.

STOCKS.

Table with columns: Name, High est., Low est., Closing, Sales Shares. Lists various stocks like American Coal Co, Cambria Iron Co, Pennsylvania Salt Manfg Co, etc.

BONDS.

Table with columns: Name, High est., Low est., Closing, Sales Shares. Lists various bonds like D. L. & W. 7s, Convnt., 1892 J. & D., etc.

Total transactions for the week.....\$189,800.

Philadelphia Stocks.

PHILADELPHIA, FRIDAY EVENING, June 8, 1877.

The aggregate of business on this board in the shares of those companies identified with the coal carrying business, differs but little from that of the previous week. L. C. & Nav. Co. declined up to Wednesday, but subsequently advanced, reaching the highest point of the week to-day; the range of prices has been between 16 1/2 and 18 1/2. The Lehigh Valley Railroad followed the same course as the Lehigh Coal & Navigation Company, although not recovering all the ground lost. The range of prices in this stock was between 27 1/2 and 29 1/2. Philadelphia & Reading Railroad has ranged between 11 1/2 and 12 1/2, closing at 11 3/4. The sales in all the above stocks have been greater than during last week. The transactions in Pennsylvania Railroad have been considerably reduced as compared with last week. The prices of this stock have been fairly steady, closing at the highest point of the week.

Lehigh Valley Railroad Company.—The quotations of this stock have ranged from 29 1/2 to 27 1/2, and closed at 28 1/2, with sales of 14,186 shares for the week. The company announced a quarterly dividend of 1 per cent., equal to 50 cents per share, on the 12th inst. The following statement shows the net earnings of this company from transportation for the first six months of the fiscal year, as compared with former years:

Table with 2 columns: Year and Earnings. Shows earnings for 1874, 1875, and 1877.

The total net earnings for the entire year from all sources were as follows:

Table with 2 columns: Year and Earnings. Shows total net earnings for 1874, 1875, and 1877.

The total tonnage for the first six months of the present fiscal year, as compared with former years, is as follows:

Table with 2 columns: Year and Tonnage. Shows total tonnage for 1874, 1875, and 1877.

The first half year of all coal carrying companies, embracing the winter months, has been invariably much lighter than the last half of the year, the last month of which includes miscellaneous income for the year. This will be evident from the fact that the net earnings from transportation for the month of January, 1877, were \$77,000, and for February \$99,000, while for April they were \$299,000 and for May \$300,000, although the rate to tide for the two latter months was 26 cents per ton less than for January and February. The Ledger of the 13th inst. says: "It will be observed that the falling off in net receipts for the period under consideration is inconsiderable, and, under ordinary circumstances, the company would be justified in declaring the quarterly dividend as heretofore, but in view of the uncertainty of the future it has been thought prudent to reduce it to one per cent., instead of one and a half per cent., as for the last quarter. The net earnings shown have been obtained with rates of transportation on coal to tide of less than one-half what they were during the corresponding months of last year, the exact figures from Mauch Chunk to tide at present being 86 cents against

\$1.82 for the same period of 1875, and \$2.31 for 1875. That the present condition of the business cannot always rule is certain; that it may be less favorable than the present is possible; but any improvement in the price of coal which brings with it a corresponding advance in the rates of transportation will justify a return to larger dividends. Of the list of depressed companies likely to recover and to assume its well-earned credit, we name the Lehigh Valley."

This Company are now making large shipments of petroleum over its road. The work of repairing locomotives will keep the employees at the Lehigh Valley shops, at Easton, Pa., busy the rest of the year.

The Buck Mountain Coal Company has declared a dividend of \$1.50 per share, payable to-day. Mount Farm Coal and Oil Company.—This Company has declared a dividend of 2 per cent., payable to-day.

Copper Stocks.

Reported by Wilson W. Fay & Co., Bankers and Brokers, Room 7, Traveler Building, 31 State Street.

BOSTON, THURSDAY EVENING, June 14, 1877.

We stated in our last report that the prospects of more activity in this line of stocks were bright; but, from present indications, we should say just the contrary.

There is little life in any of the stocks, but this particular line is worse than others.

Calumet & Hecla has been selling in small lots all the week at 170, none selling above that and none below except three shares, and closing this evening at 169 bid and 170 asked.

Quincy is looking stronger than last week, there being sales at 33 1/2, 33 1/2, 34 and 35, the last sales being at 35, and the stock closing at 34 1/2 bid and 35 asked.

Oseola has strengthened somewhat, there being 320 shares sold at \$20.00, and the stock closing at 19 bid and 20 1/2 asked.

Franklin is very still, \$6 being the best bid and little offering.

In Copper Falls there is very little doing, \$1.25 being the best bid and stock offering \$1.50. Pewabic is quiet, the market being \$1.50 bid and \$1.87 asked.

In the other coppers there is no effort to buy or sell, and the week closes without any important event.

Gold and Silver Stocks.

NEW YORK, FRIDAY EVENING, June 15, 1877.

During the week under review the Bobtail Gold Mining Company was placed on the list of the American Mining Board, and transactions to the extent of 2,700 shares at 1 1/2 @ 1 1/4 have taken place. The par value of this stock is \$5, and number of shares 227,326. It is announced that the Arizona Chief Gold and Silver Mining Company's stock will be placed on this board on Monday. This company is incorporated under the laws of New York, with a capital of \$1,000,000 divided into 100,000 shares of \$10 each. The property consists of 1,500 feet on the Moss lode of the San Francisco mining district, Mohave County, Arizona. The features in the transactions of the week have been Cleveland with sales of 4,550 shares at steady prices; Leeward with sales of 11,600 shares, opening at 3 1/4, declining to 2 1/2, and closing at 2 3/4; and Moose with sales of 13,250 shares at steady figures.

The American Mining Board had a ballot yesterday on the question of a consolidation with the New York Mining Stock Exchange or the Open Board of Brokers, which resulted in a vote of sixty-four in favor of the former against nineteen in favor of the latter project. After the ballot had been declared a committee of nine was appointed to modify the constitution so as to meet the requirements of the consolidation. This union, it is generally believed, will result in winding up the concerns of the Open Board.

The Consolidated Amador Mining Company has declared a dividend of 25c. per share.

The Great Western Quicksilver Mining Company announces a dividend of 25c. per share.

The Nevada Bank.—We note the following statement showing the distribution of the capital stock of this institution. These gentlemen are also controlling shareholders in the Anzania Companies and largely interested in many important mining enterprises on the Comstock:

Table with 3 columns: Name, Shares, Value. Lists James C. Flood, William S. O'Brien, James G. Fair, John Mackay, and Louis McLane.

Total.....100,000 \$10,000,000

The Nevada Stock Exchange, at San Francisco has temporarily suspended business.

San Francisco Stock Board.—The present weekly sales at this Board are but little above \$1,000,000, which is a smaller business than has been known for a long time.

The Commercial Herald, of the 5th inst., says: "The past week shows an improved feeling in mining stock circles, and this is in a great measure due to the bed-rock manner of doing business—that is, more care is exercised, the magnanimous looseness which prevailed in every department has received a check which we hope will never be allowed to have its former freedom, and a basis of operations provided by the sheer force of circumstances that will be most beneficial to all concerned in stock transactions."

NEW YORK MINING STOCK EXCHANGE.

The total transactions for the week amounted to 34,881 shares, an increase of 22,056 as compared with our last.

Lacrosse.—During the week 14,900 shares of this stock were sold at from 30c. to 32c.

American Flag.—12,500 shares of this stock sold at from 8c. to 10c.

COAL TRANSPORTATION AND GENERAL MINING STOCKS.

Main table with columns: Name and Location of Company, Feet on Vein, Capital Stock, Shares (No., Par Val.), Assessments (Total levied to date, Date and amount per share of last), Dividends (Total paid to date, Last Dividend, Rate per Ann.), Highest and Lowest Quo. per Share in Currency (June 9-15), and Sales.

g. Gold. s. Silver. L. Lead. c. Copper. ** Non-Assessable.

Total Assessments levied to date \$40,983,090 Total Sales of Coal Stocks for the week 731,402 shares, Total Dividends disbursed to date 153,283,320 Total Sales of Mining Shares for the week 87,310

† We are without our quotations of the Boston Copper Stock Market.

Copper Stocks.—4,881 shares, the heaviest week's transaction since the Board opened, were sold at lower prices:

Table of Copper Stock sales: Atlantic (1,300 shares @ \$37 1/2), Central (381 @ 39), National (2,400 @ 25), Madison (700 @ 25), Ridge (100 @ 25).

Closing Quotations.

Table of closing quotations for Allouez, Atlantic, Cal't Hecla, Central, Franklin, Madison, Mesnard, National, Osceola, Petherick, Pewabic, Quincy, Ridge, and Star.

Gas Stocks.

NEW YORK, FRIDAY EVENING, June 15, 1877.

The Chicago Gas Question.—A resolution has been introduced into the Chicago Common Council directing the Mayor and Comptroller to refuse to pay more than \$1.50 and \$2 per 1,000 cubic feet for gas on the south

side and west side respectively, and to request the gas companies to shut off the gas if they did not choose to accept those terms.

The following resolutions were subsequently referred to a special committee:

WHEREAS, The enormous sum appropriated by the Common Council of the city for gas imposes a great hardship upon the tax-payers of said city; and

WHEREAS, The cities of New York, Boston, Philadelphia and Detroit are getting gas furnished for one-half what Chicago is paying, and some of said cities at \$1 per 1,000 feet; therefore, be it

Resolved, That the Comptroller be and is hereby requested to advertise for bids for lighting our street lamps in present use, with oil or gasoline, and report what bids he may receive back to this Council before July 1, 1877.

Robert Law has been awarded the contract for

supplying the city of Chicago with 12,000 tons of anthracite coal at \$4.80 per ton. Last year the city paid \$6.48 per ton.

Gas stocks continue very dull and depressed; we lower nearly all of the quotations, and, no doubt, important concessions could be obtained on the majority of those in transactions of any importance.

AUCTION SALES OF GAS STOCKS for the week were as under.

Boston Gas Company—12 shares at from \$805 to \$807 1/2 per share.

Metropolitan (N. Y.) Gas Company—21 shares at from \$131 1/4 to \$132 per share.

Manhattan (N. Y.) Gas Company—317 shares at from \$195 to \$195 1/2 per share.

New York Gas Company—35 shares at \$130 1/2 per share.

San Francisco Gas Company—We note recent transactions in this stock at private hands, aggregating 700 shares at from \$105 to \$106 1/2 per share. The stock closing heavy.

The following list of Companies in New York and vicinity are corrected weekly by GEORGE H. PRENTISS, Broker and Dealer in Gas Stocks, No. 30 Broad St., N. Y.

Table with columns: Companies in New York and vicinity, Capital Stock, Par., Rate of an., Am. of Inst., Date of last., Dividends, Quotat'ns (Bid, As'd). Lists various companies like Mutual N. Y., N. York, Metrop., etc.

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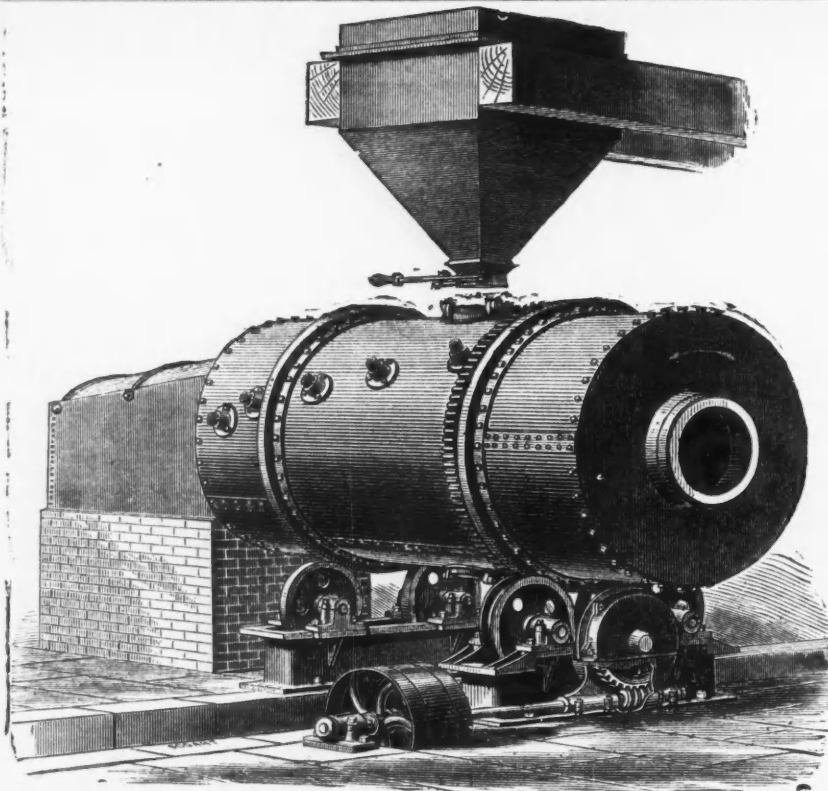
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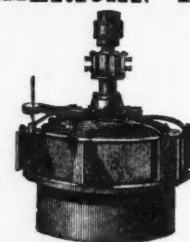
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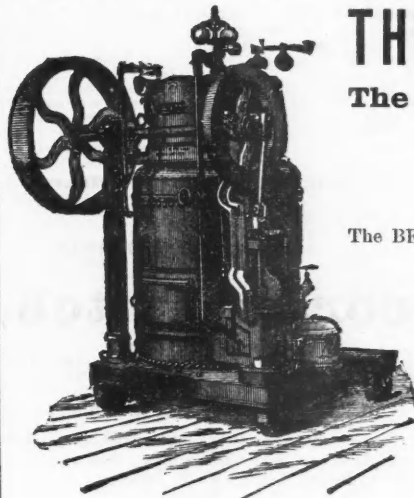
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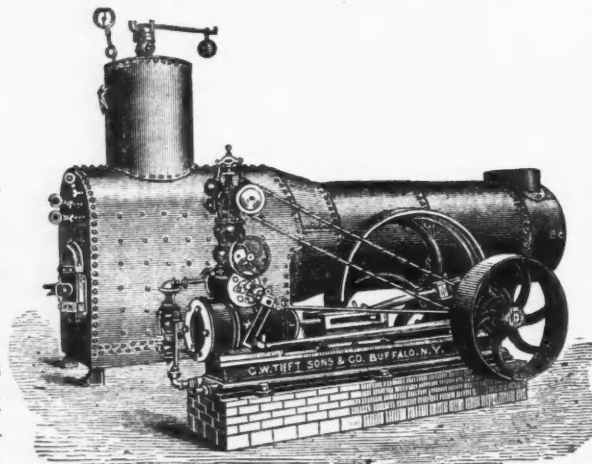
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